SCCWRP Director's Report

PUBLISHED JANUARY 29, 2021 | COVERING OCTOBER 31, 2020-JANUARY 29, 2021

WINTER 2021 ISSUE

Bight '18 finds local sportfish within 'safe to eat' thresholds

Contamination levels in the tissues of commonly caught Southern California sportfish were found to be within "safe to eat" thresholds for consumption at least once a week during the Southern California Bight Regional Monitoring Program's second sportfish bioaccumulation survey.

The Bight '18 study, published in December as a SCCWRP technical report, analyzed sportfish tissues to measure concentrations of five common contaminants that pose risks to human health. The regional study was conducted by Bight '18 in partnership with the State Water Board's Surface Water Ambient Monitoring Program (SWAMP).

None of the average contamination levels reported in the sportfish would place them in the most restrictive "Do not consume" consumption advisory threshold, as defined by California's Office of Environmental Health Hazard Assessment (OEHHA). However, not enough samples were collected to make such a determination for public-health reporting purposes. OEHHA requires more data from more species – and from more composites of each species – to set consumption advisories.

The study was the Bight program's first follow-up to its original Bight '08 sportfish bioaccumulation study, which was incorporated into a statewide SWAMP bioaccumulation report.

Compared to a decade ago, average contamination levels fell across the Southern California Bight, suggesting that consuming locally caught sportfish may overall pose less of a health risk to humans than it did during the initial survey. (Even so, seafood contamination hotspots still exist in the Bight; local consumption advisories can be found on OEHHA's website.)

Mercury and total PCBs (polychlorinated biphenyls) were the only contaminants of the five examined that exceeded thresholds that would trigger advisory limits on the number of weekly servings to consume.

Contents

Cover photo: Spotted sand bass are collected and sorted by a Bight '18 field crew on a research vessel. A Bight '18 sportfish bioaccumulation study found that average contamination levels in the spotted sand bass and other sportfish were within "safe to eat" thresholds for consumption at least once a week.

To subscribe: The SCCWRP Director's Report is published quarterly by the Southern California Coastal Water Research Project. To receive this newsletter by email, contact pubrequest@sccwrp.org.

Calendar

Thursday, February 4
CTAG quarterly meeting
(Remote participation only)

Friday, March 5
Commission meeting
(Remote participation only)

But even for mercury, average concentrations in the two most contaminated species were still below advisory thresholds that would restrict consumption to one serving or less per week, even for children and other vulnerable populations. Mercury was the contaminant that most frequently exceeded health thresholds during the Bight '18 study.

Both the Bight '08 and Bight '18 bioaccumulation studies analyzed sportfish tissue collected from areas along the Southern California coast where sportfishing is common. Concentrations of five common contaminants that can impact human health were measured: mercury, selenium, DDTs (dichlorodiphenyltrichloroethanes), PCBs and arsenic.

Bioaccumulation is the process by which contamination in sediment and the water column passes through marine food webs from prey to predator, eventually reaching humans who consume locally caught seafood.

Although production and use of some bioaccumulating contaminants have ceased, legacy contaminants like DDT and PCBs that were discharged into the coastal ocean for decades have accumulated in seafloor sediment, enabling them to continue to bioaccumulate in marine food webs.

A Bight '18 field crew uses a trawl net to collect sportfish and other marine life from along the seafloor of the coastal ocean. Bight '18 has completed a sportfish bioaccumulation survey in partnership with California's Surface Water Ambient Monitoring Program that found that regional contamination levels in the tissues of commonly caught Southern California sportfish were within "safe to eat" thresholds for consumption at least once a week.

Meanwhile, contaminants like mercury remain a global problem; distant inputs could potentially be responsible for the mercury concentrations observed during the Bight '18 study.

For more information, contact Dr. Karen McLaughlin.

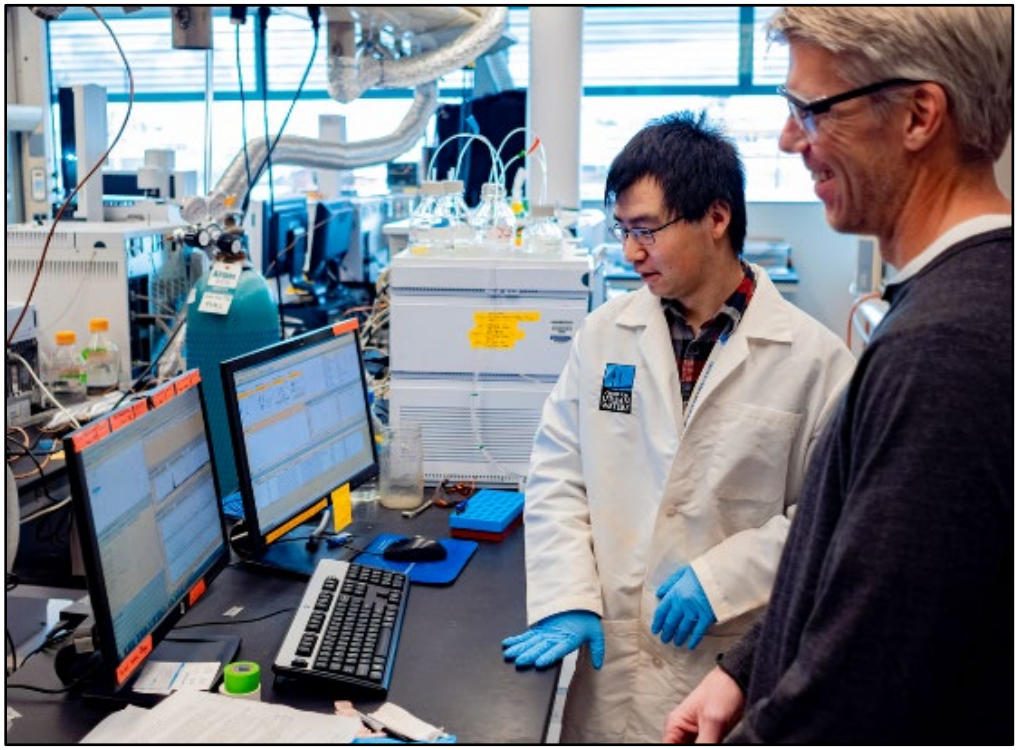
Study illustrates power of non-targeted analysis to help identify toxic chemicals

A team of researchers that includes SCCWRP has completed a high-profile, first-of-its-kind case study demonstrating how to use an analytical method known as non-targeted chemical analysis to help identify specific chemicals in complex environmental mixtures as the cause of observed toxicity.

The multi-year investigation, which focused on mass seasonal deaths of coho salmon in the Pacific Northwest, illustrates the power and potential of using non-targeted chemical analysis to help solve some of the most vexing management challenges in environmental toxicology.

During the study, which was published in December by the journal *Science*, researchers used non-targeted chemical analysis to zero in on a specific, previously unknown chemical responsible for the coho salmon toxicity in the Pacific Northwest. SCCWRP has been working to advance non-targeted chemical analysis for the past decade.

The chemical responsible for the Pacific Northwest salmon die-offs – 6PPD-quinone, a derivative of a ubiquitous preservative used in tire manufacturing – was not on researchers' radar at the beginning of the study, underscoring the value of using non-targeted chemical analysis in tandem with more established chemistry and toxicology methods to identify specific toxicity culprits.



Researchers at the University of Washington look at data generated by non-targeted chemical analysis. The analytical method, which uses high-resolution mass spectrometry technology, was recently shown by a research team that includes SCCWRP to be a key asset in identifying a specific unknown chemical as the cause of observed toxicity in an aquatic environment.

Pinpointing a precise cause of observed toxicity can be a significant management challenge in urban aquatic environments, which are commonly home to thousands of individual chemical contaminants. When environmental managers observe toxicity, such as during sudden fish die-offs or via standard toxicity testing in a laboratory, their options for intervening are limited until they can identify the specific chemical responsible.

Non-targeted chemical analysis uses high-resolution mass spectrometry technology to identify specific chemicals in complex mixtures by their physical and chemical properties, enabling researchers to cast a much wider net when investigating the cause of observed toxicity.

In addition to exploring the potential of non-targeted chemical analysis for novel chemical identification, SCCWRP also is investigating the potential to use the technology as a management strategy for pinpointing the origins of widespread fecal contamination in Southern California waterways during wet weather.

The ongoing effort involves using non-targeted chemical analysis to produce overall patterns in the chemical makeup of contaminants in wastewater and roadway runoff. Known as "fingerprints," these highly visual readouts have the potential to distinguish wastewater from roadway runoff, which could pave the way for water samples to be chemically fingerprinted as a management strategy for investigating the origins of fecal contamination. Initial findings were published in October by the journal *Environmental Science & Technology Letters*.

California managers already have taken action in response to the Pacific Northwest salmon study. California's Department of Toxic Substances Control announced in January that it will begin engaging with tire manufacturers on the 6PPD-quinone issue as part of a broader investigation targeting zinc, which is another chemical used in tire manufacturing that also is toxic to aquatic life.

6PPD-quinone is an oxidation product of 6PPD, a chemical additive in tires that prevents the rubber from being damaged by ozone. As tire wear particles containing 6-PPD are shed onto roadways, 6PPD-quinone can end up in nearby waterways. Even very small concentrations of about 1 microgram per liter can be lethal to salmon.

For more information, contact Dr. Bowen Du.

Study to probe quality-assurance issues with *Ceriodaphnia* toxicity test

SCCWRP has launched a two-year statewide effort to ensure that laboratories conducting a toxicity test commonly used to monitor the water quality of wastewater and stormwater discharges are producing consistently high-quality, comparable results.

The study, which will be recruiting State-accredited laboratories as study participants through the end of March, will focus on the Whole Effluent Toxicity *Ceriodaphnia dubia* chronic reproduction test, a foundational toxicity test that uses a species of water flea to evaluate discharge water quality.

Environmental managers have used the *C. dubia* test for decades as part of a suite of toxicity tests to protect California's enclosed bays, estuaries and inland water bodies from contaminated discharges. But in recent years, end users of the *C. dubia* test have expressed growing concerns about accuracy, repeatability and

consistency associated with interpreting test results.

These concerns came into sharp focus over the last year, as the State Water Board was preparing to adopt numeric water-quality objectives for a full suite of aquatic toxicity tests – a policy change known as the Toxicity Provisions.

In response to end-user concerns about the *C. dubia* test, the State Water Board postponed implementing numeric objectives for the *C. dubia* test until 2024. The numeric objectives for other toxicity test species were adopted last December.

Both the regulated and regulatory communities have asked SCCWRP to lead the study to investigate the quality and comparability of *C. dubia* test results. In particular, researchers will examine flexibility in the existing standard test methods that allows end users to choose from among multiple options when implementing the test.

All stakeholders want to ensure *C. dubia* test methods are optimized to reliably detect toxic or non-toxic discharges statewide.

The study, which kicked off in December, will be overseen by two groups:

» A stakeholder advisory committee comprised of regulatory agencies, regulated parties and non-governmental organizations

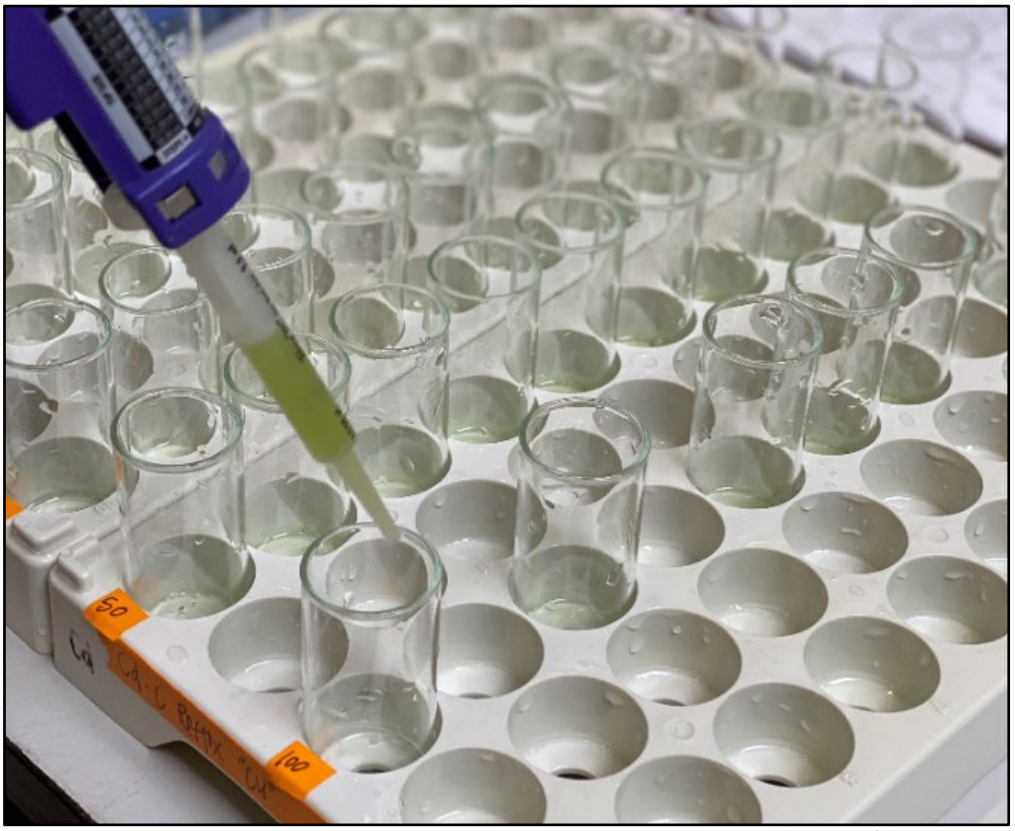


Photo courtesy of John Wood Group PLC

A water flea known as *Ceriodaphnia dubia* is placed in tubes and fed a nutrient mixture for a toxicity test in a laboratory. SCCWRP has launched a statewide effort to ensure that the *C. dubia* toxicity test, which his commonly used to monitor the water quality of wastewater and stormwater discharges, is producing consistently high-quality, comparable results.

» An expert science review panel comprised of internationally renowned aquatic toxicologists

SCCWRP is inviting all State-accredited laboratories to participate in the study, which is expected to be completed by the end of 2022.

For more information, or to join this study as a participating laboratory, contact Ken Schiff and Dr. Alvina Mehinto.

Regional monitoring network being built to evaluate BMP performance

The Southern California Stormwater Monitoring Coalition (SMC) has begun building a regional monitoring network for tracking the performance of a wide variety of stormwater BMPs (best management practices) – a critical step toward being able to optimize the long-term effectiveness of these water-quality control measures.

The three-year initiative, launched in December and led by SCCWRP, will develop a regional BMP monitoring program that stormwater managers across coastal Southern California can use to rapidly collect high-quality, comparable data sets on the field performance of structural BMPs. Structural BMPs are a ubiquitous class of engineered field solutions – everything from vegetated swales to permeable pavement – that are implemented to improve runoff water quality.

The SMC's Regional BMP Monitoring Network, expected to be operational by 2023, will help address significant, persistent knowledge gaps in managers' and BMP designers' regional understanding of structural BMP performance.

In recent years, structural BMPs have been implemented at an increasingly rapid pace across heavily populated Southern California to improve and protect the health of watersheds.

Although Southern California managers are now spending tens of millions of dollars every year to implement stormwater BMPs, they have largely lacked the monitoring tools and infrastructure necessary to meaningfully evaluate the long-term performance effectiveness of structural BMPs – and to compare performance across the many individual jurisdictions that have implemented BMPs.

Most BMP implementation decisions to date in Southern California have been made based on limited performance effectiveness data and analyses – often from outside the region – even as researchers know that local conditions can dramatically affect how well structural BMPs perform. In particular, Southern California's relatively short but intense rain events affect BMP performance, as do the major types and levels of pollutants being treated.

SCCWRP will develop a scientifically robust monitoring design for the SMC's Regional BMP Monitoring Network, enabling BMP designers, planners and managers across Southern California to use consistent, standardized methods for collecting and analyzing field data on existing structural BMPs. The network will boost management confidence in BMP performance effectiveness analyses and in the applicability of findings to all stormwater managers regionally.

In particular, the network will help BMP designers, planners and managers determine which BMPs work best for each pollutant, how BMP designs can be improved to enhance pollutant reductions, and what maintenance should be used to ensure each BMP operates at maximum efficiency throughout its lifespan.

The program's data also will be used to improve tools like the California BMP Effectiveness Calculator, a SCCWRP-developed management tool for estimating the effectiveness of BMPs in removing specific types of contaminants from runoff.

The core value of the integrated, coordinated regional monitoring effort is that SMC member agencies and other participants will be able to collect much more BMP performance data at a fraction of the effort than if they collected the data on its own. Already, 20 stormwater management agencies are signed up to serve on the project's technical working group and will be partners in building the network.

Once built, the network is expected to become the largest of its kind in the nation – a necessity in Southern California where opportunities to collect BMP performance data are limited by the region's relatively infrequent rain events.

For more information, or to become part of the Regional BMP Monitoring Network, contact Dr. Elizabeth Fassman-Beck.

A bioswale that runs along the side of a roadway in Orange County collects and treats stormwater runoff. The Southern California Stormwater Monitoring Coalition (SMC) has begun building a regional monitoring network to track the performance of a wide variety of bioswales and other stormwater BMPs.

Updates by Thematic Area

SCCWRP Research Themes BIOASSESSMENT • ECOHYDROLOGY • EUTROPHICATION • CLIMATE CHANGE • SEDIMENT QUALITY • CONTAMINANTS OF EMERGING CONCERN • MICROBIAL WATER QUALITY • STORMWATER BMPs • REGIONAL MONITORING

BIOASSESSMENT

Algae DNA being sequenced to build molecular version of stream health scoring tool

SCCWRP and its partners have begun sequencing the DNA of hundreds of stream algae samples in preparation for building a molecular version of the statewide Algal Stream Condition Index scoring tool.

The algal DNA sequencing work, which got underway last fall, will generate the data that researchers need to recalibrate the ASCI, a stream scoring tool co-developed by SCCWRP that uses the makeup of stream algal communities as a biological indicator for evaluating overall ecological health.

Researchers previously found that using DNA-based methods for identifying stream algae is a reliable, cost-effective alternative to traditional taxonomic identifications under a microscope, and also has the potential to provide richer insights into stream health.

A beta version of the molecular ASCI is expected to be released in winter 2022.

A SCCWRP field crew wades into the Santa Margarita River, which spans Riverside and San Diego Counties, to collect algae samples. Researchers have begun sequencing the DNA of hundreds of stream algae samples collected over the past few years in preparation for building a molecular version of the statewide Algal Stream Condition Index scoring tool.

ECOHYDROLOGY

Beta version of stream flow classification tool released, to be rolled out across U.S. Southwest

SCCWRP and its partners have completed development of the beta version of a tool that can rapidly distinguish among perennial, intermittent and ephemeral streams in the U.S. Southwest, paving the way for its initial rollout across an area stretching from California to Texas.

The flow duration classification tool, which was submitted in December to the U.S. Environmental Protection Agency, uses easily observable field indicators – including presence of wetland vegetation and specific types of aquatic insects – to classify streams based on the duration of their surface flows. The Streamflow Duration Assessment Method tool is a collaboration of SCCWRP, USEPA and the U.S. Army Corps of Engineers.

Ephemeral streams are water bodies that experience surface flows only after rain events, whereas intermittent streams experience sustained seasonal flows from snow melt and groundwater.

The tool is designed to support regulatory programs that require stream flow duration classifications, including a recent federal rule change that relies on stream flow duration to identify Waters of the United States.

SCCWRP and its partners will begin training state and federal agencies in the tool's use in the coming months. The tool's beta version will be used for one year, then finalized for use across the Arid Southwest region.

Draft environmental flow recommendations for L.A. River to be released in February

A research team that has been working for the past two years to determine the minimum environmental flows needed to protect the Los Angeles River's ecological health and recreational benefits is preparing to release a draft set of final flow recommendations in late February.

The draft flow recommendations, which were co-developed by SCCWRP, will be accompanied by the release of a set of tools that managers can use to evaluate various possible scenarios for diverting more treated wastewater effluent and runoff from the L.A. River for water recycling purposes – while still protecting the river's beneficial uses.

The work is part of an ongoing study evaluating how the ecological and recreational beneficial uses provided by the river's flows will be impacted as more land-based discharges to the river are diverted, reused and recycled in drought-prone California.

In recent years, California wastewater treatment agencies have been filing petitions seeking regulatory approval to begin recycling more of the effluent that they're currently discharging into the L.A. River and other urban streams. Stormwater management agencies also are capturing more land-based runoff, further reducing stream flows.

Treated wastewater effluent is discharged into the Los Angeles River from the nearby L.A.-Glendale Water Reclamation Plant. Water-quality managers for the effluent-dominated river have initiated a study to determine the minimum environmental flows needed to protect the river's ecological health and recreational benefits, as managers consider diverting effluent and runoff from the river for water recycling purposes.

EUTROPHICATION

Study to probe role of channel modification, eutrophication in impacting Central Valley watershed health

SCCWRP and its partners have launched a three-year effort to determine the degree to which human modifications to Central Valley watersheds are triggering harmful algal blooms and other eutrophication issues that contribute to observed impacts to the watersheds' ecological health.

The study, which kicked off in November, will use existing data to analyze eutrophication in Central Valley streams, lakes and reservoirs; the goal is to understand the relative contributions, if any, of channel modification, hydromodification, physical habitat alteration and nutrient loading in impacting the biological integrity of these habitats.

The work will inform the Central Valley Regional Water Quality Control Board's biointegrity-biostimulatory policies governing watershed health, and also could serve as a case study informing the development of a parallel statewide policy. The findings also will provide insights into the stressors impacting Southern California watersheds, which are subject to a similar mix of human-triggered stressors.

Researchers hope that the analyses will ultimately identify effective management options both for protecting biological integrity and for controlling the introduction of excess nutrients that can trigger biostimulatory impacts.

SCCWRP asked to co-organize special, virtual HABs national meeting

SCCWRP has been asked to co-convene and co-facilitate a special national meeting on harmful algal blooms (HABs) this spring following a decision by the National HAB Committee to postpone its upcoming, in-person symposium due to the COVID-19 pandemic.

The virtual meeting, scheduled for May 25-27, 2021, will help address a gap in continuity created by the National HAB Committee's decision to delay the 11th Symposium on Harmful Algae in the US by one year, until fall 2022. The symposium typically takes place every two years.

The National HAB Committee asked SCCWRP last fall to help put together the special meeting.

The meeting's theme will be "Emerging Voices and Blooming Careers," reflecting the National HAB Committee's desire to create opportunities during the pandemic for students and early-career researchers and managers to present and promote their work.

Registration information will be posted in mid-February to the National HAB Conference's website.

CLIMATE CHANGE

Workshop being planned on how to evaluate uncertainty for acidification modeling initiative

SCCWRP member agencies have begun planning a workshop to better understand how to evaluate uncertainty in a set of West Coast models that predicts how marine life could be adversely affected by ocean acidification and hypoxia (OAH).

The workshop – expected to take place this spring – will educate SCCWRP member agencies and San Francisco Bay Area stakeholders about a key aspect of this ongoing modeling work as a team of West Coast researchers begins using the models to estimate OAH's intensifying effects on marine life, including what role, if any, land-based nutrient discharges play in exacerbating biological impacts.

Modeling uncertainty encompasses both the uncertainty associated with the West Coast physical-biogeochemical ocean models that were developed to estimate how OAH will intensify in the coming years, as well as the uncertainty associated with predicting how marine life will respond to the OAH conditions. The two types of uncertainty are closely interrelated.

The workshop, which is being planned in partnership with the San Francisco Estuary Institute, is expected to include a multi-part webinar series featuring national experts in quantifying model uncertainty.

New phase of West Coast ocean modeling initiative to focus on OAH's biological impacts

A research team that has been modeling how ocean acidification and hypoxia (OAH) are expected to intensify along the West Coast in the coming years is moving into a new phase of the modeling investigation, where researchers will examine OAH's anticipated effects on vulnerable marine life.

The research team, which includes SCCWRP, will rely on a suite of newly developed OAH biological assessment tools to determine the degree, if any, to which sentinel coastal marine communities are expected be adversely affected by acidification-triggered changes in the availability of calcium carbonate minerals in seawater, and by reduced availability of dissolved oxygen.

Researchers also will examine the role, if any, of land-based nutrient discharges to the coastal ocean in exacerbating OAH's biological impacts, and model how potential biological impacts could be mitigated by modifying nutrient management strategies and wastewater recycling practices.

The West Coast research team has been working over the past several years to develop a computer model that predicts how the coastal ocean will change in response to intensifying OAH, including whether land-based nutrient discharges are expected to exacerbate conditions.

Study examines how to alter sediment dredging in wetlands to offset rising sea levels

SCCWRP and the University of California, Irvine have completed a four-year study exploring how altering sediment dredging practices in coastal wetlands vulnerable to sea level rise could reduce anticipated ecological impacts to plant and animal communities.

The coastal resiliency study, completed in December, found that the habitats of species like the endangered Ridgway's rail are expected to be inundated by rising sea levels by the late 21st century, but that reduced sediment dredging in areas like upper Newport Bay in Orange County could partially offset the projected ecosystem impacts.

Dredging is a routine management practice in some estuaries that is intended to protect wetland habitats from being buried by sediment that has washed off the land, and to keep navigation channels clear.

As part of the project, researchers developed regional curves to help environmental managers more readily evaluate tradeoffs associated with various dredging frequencies and intensities in coastal wetland areas under multiple sea level rise scenarios.

Photo courtesy of Kirk Gilligan

High tides surround an endangered Ridgway's rail as it tends to its nest. Researchers have completed a study examining how altering sediment dredging practices in coastal wetlands vulnerable to sea level rise could reduce anticipated impacts for species like the Ridgway's rail.

CONTAMINANTS OF EMERGING CONCERN

Non-targeted analysis used to detect bioactive contaminants in Bight '18 sediment

SCCWRP and its partners have completed screening sediment samples collected during the Southern California Bight 2018 Regional Monitoring Program for contaminants using non-targeted chemical analysis.

The work, completed in December, showed that this analytical chemistry method was able to detect chemical contaminants suspected of being responsible for sediment contamination impacts at sites across the Southern California Bight. The findings of the non-targeted analysis correlate well with the sediment contamination impacts that Bight '18 documented using traditional toxicology and chemistry analysis methods.

The ongoing study also involved screening Bight '18 sediment and fish tissue samples for bioactive contaminants using three bioanalytical cell assays. Initial assay results showed that the biological activity that was detected by the cell assays may be caused by the chemical contaminants detected by the non-targeted analysis.

The initial findings underscore the potential to use these two novel screening methods in tandem for identifying unknown chemicals suspected of exerting activity in bioanalytical cell assays. The project is expected to be completed this summer.

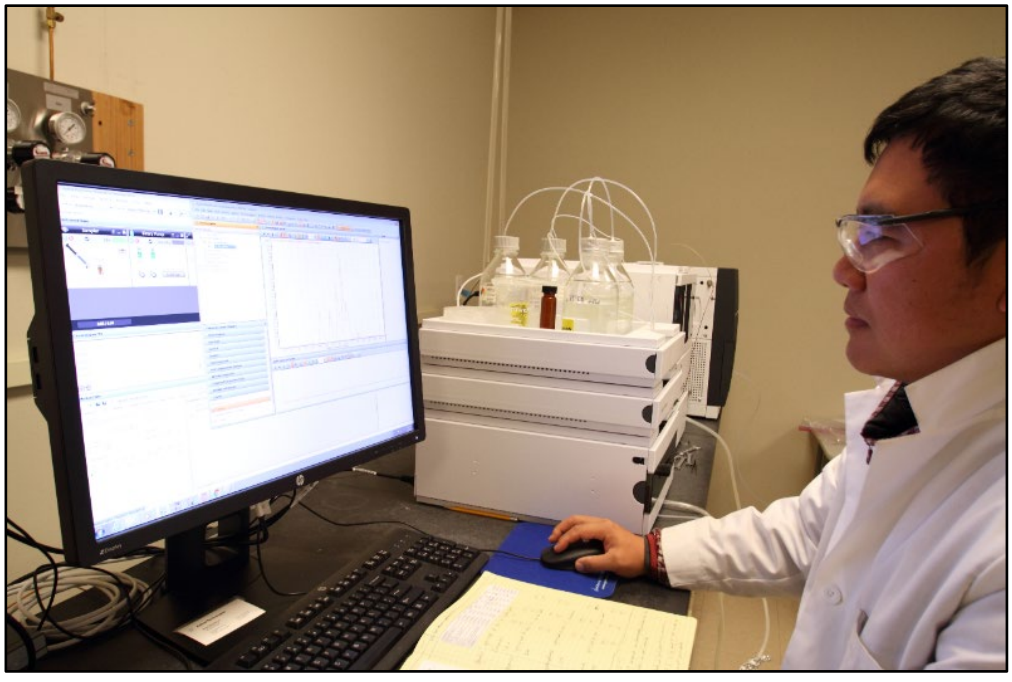
Researchers reviewing data from international microplastics measurement methods study

An international team of researchers working to develop standardized methods for measuring microplastic particles in aquatic environments has begun meeting to review the results of a recent laboratory intercalibration study evaluating the accuracy and comparability of commonly used measurement methods.

The research team, which held its first meeting in January, is examining precision, repeatability, cost and other issues associated with various microplastics measurement methods. Some 40 labs in six countries are participating in the study, including SCCWRP, which is co-facilitating the study.

The international method standardization study is a response to California legislation enacted last year that requires water-quality managers to begin tracking microplastics in drinking water and the coastal ocean. Although multiple methods have been developed to measure microplastics, the methods have not been vetted and standardized to ensure laboratories are capable of producing comparable, high-quality measurement data.

The research team is expected to develop its recommendations by the end of March.



SCCWRP's Dr. Bowen Du analyzes data on a computer to look for evidence of bioactivity in chemical contamination. Researchers have been working to detect bioactive contaminants in Bight '18 samples using non-targeted chemical analysis in tandem with bioanalytical cell assays.

MICROBIAL WATER QUALITY

Wet-weather sampling initiated to look for sewer biofilm in San Diego watershed

SCCWRP and its partners have launched an initial round of wet-weather sampling in the San Diego River watershed to investigate whether the microbial community that grows inside nearby sewer pipes – known as biofilm – can be found in stormwater runoff making its way to the river and its tributaries.

The wet-weather investigation, which will kick off January 31, is the latest step in an ongoing study intended to shed light on whether leaking sewer pipes could be responsible for the human fecal contamination that is widespread in Southern California urban waterways in wet weather.

Dry-weather sampling of runoff and sewer pipes last year showed that the biofilm inside sanitary sewer pipes is unique and distinct from the biofilm community inside storm drain pipes. Dry weather sampling in sewer pipes is ongoing.

Researchers hope to use these insights to determine whether human fecal contamination in waterways is coming from sewer pipes or from other sources, such as privately maintained lateral lines and septic tanks, and/or direct deposition into waterways.

COVID-19 wastewater study investigating sources of variability when quantifying virus counts

SCCWRP and its partners have begun investigating potential sources of variability in how the COVID-19 virus in wastewater is collected, preserved and quantified – part of an ongoing national study seeking to use wastewater streams to monitor COVID-19 infections in communities.

Researchers are looking at whether a number of discrete factors affect quantification of wastewater virus counts, including the frequency of sampling, how the samples are preserved, whether sampling is completed once daily vs. composited over a 24-hour period, and the method used to inactive the virus prior to processing. SCCWRP has been ramping up these efforts over the past few months.

The national study's research team, which includes SCCWRP, is investigating the potential of using wastewater streams to offer more accurate, earlier and comprehensive insights about community infection rates than individual testing of subsets of the population.

Researchers hope to eventually correlate the wastewater virus counts to levels of COVID-19 infections in local populations.

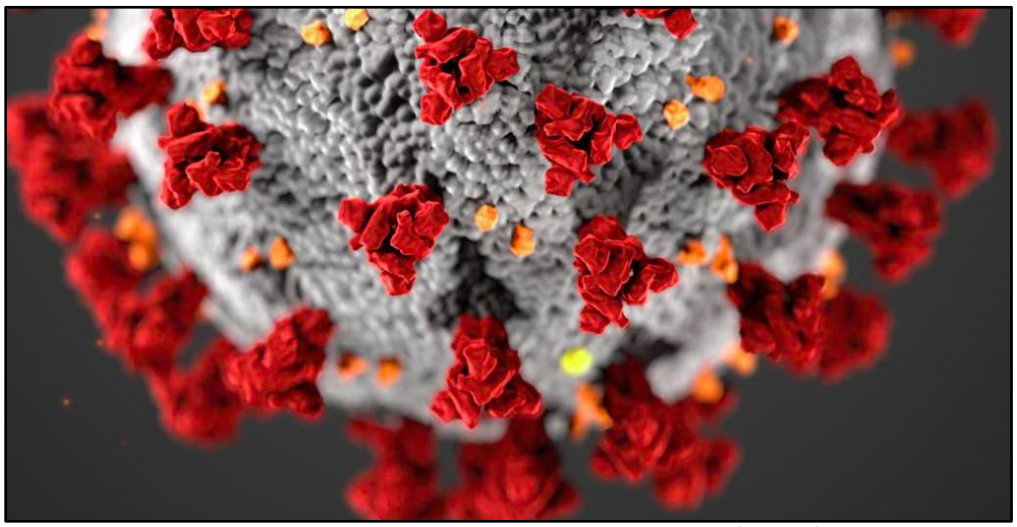


Image courtesy of U.S. Centers for Disease Control and Prevention

The SARS-CoV-2 virus, pictured in this artist rendering, can be quantified in wastewater streams to potentially provide insights into COVID-19 community infection rates. A national research team working to build a COVID-19 wastewater surveillance system has begun examining potential sources of variability in how the virus in wastewater is collected, preserved and quantified.

STORMWATER BMPs

Prototype L.A. County tool for rating BMP performance undergoing testing, calibration

SCCWRP has begun working with the Los Angeles County Department of Public Works to test and calibrate a new, SCCWRP-developed index scoring tool that rates the overall performance of various structural stormwater BMPs (best management practices) based on multiple discrete metrics.

The BMP performance index tool, which is undergoing continued development and an initial round of testing this winter, is intended to bring consistency and standardization to how L.A. County stormwater managers weigh and consider various performance-related data points – including for water quality, hydrology, maintenance and design – as they evaluate overall BMP performance.

L.A. County managers already collect data on BMP performance, but have historically not had access to a standardized tool for systematically integrating and comparing these data points.

Researchers hope the BMP performance index tool can aid L.A. County managers in making multi-million-dollar decisions about which structural BMPs to implement when and where – as well as identifying influential design features – to optimally improve water quality. The tool eventually could be adapted for use outside L.A. County.

REGIONAL MONITORING

Workplan developed for third cycle of SMC's regional stream monitoring program

The Southern California Stormwater Monitoring Coalition (SMC) has finalized plans for the third cycle of its Regional Watershed Monitoring Program that kicks off this spring.

The cyclical program's workplan – which was developed by SCCWRP and approved by the SMC in January – calls for a study design that builds on prior stream surveys, while simultaneously expanding the program into new frontiers.

Among the new study design features is a stream causal assessment investigation that will work to determine specifically why some stream sites with degraded water quality score low using bioassessment-based stream scoring tools. Other new studies will target building out more bioassessment sampling data for certain high-interest areas, and mapping wet and dry channels in the region to better understand which streams are ephemeral vs. perennially flowing.

The expanded workplan overall is a cost-neutral survey for program participants, as the extensive stream data that was collected during previous program cycles has reduced the need to collect as much core monitoring data going forward.

New SCCWRP Publications

Journal Articles

Harraka, G.T., J.T. Magnuson, B. Du, C.S. Wong, K. Maruya, D. Schlenk. 2020. Evaluating the estrogenicity of an effluent-dominated river in California, USA: Comparisons of in vitro and in vivo bioassays. *Science of the Total Environment* DOI:10.1016/j.scitotenv.2020.143965.

Howard, E.M., H. Frenzel, F. Kessouri, L. Renault, D. Bianchi, J.C. McWilliams, C.A. Deutsch. 2020. Attributing causes of future climate change in the California Current System with multimodel downscaling. *Global Biogeochemical Cycles* DOI:10.1029/2020GB006646.

Howard, M.D.A., R.M. Kudela, K. Hayashi, A.O. Tatters, D.A. Caron, S. Theroux, S. Oehrle, M. Roethler, A. Donovan, K. Loftin, Z. Laughrey. 2021. Multiple co-occurring and persistently detected cyanotoxins and associated cyanobacteria in adjacent California lakes. *Toxicon* 192:1–14.

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Mehinto, A.C., H.L. Schoenfuss, E. Wenger, D. Diehl, S.M. Bay. 2021. Application of an effects-based monitoring strategy to assess the impact of contaminants on fish health in an urbanized watershed. *Environmental Toxicology and Chemistry* 40:402-412.

Rothman, J.A., T.B. Loveless, M.L. Griffith, J.A. Steele, J.F. Griffith, K.L. Whiteson. 2020. Metagenomics of wastewater influent from Southern California wastewater treatment facilities in the era of COVID-19. *Microbiology Resource Announcements* 9:e00907-20.

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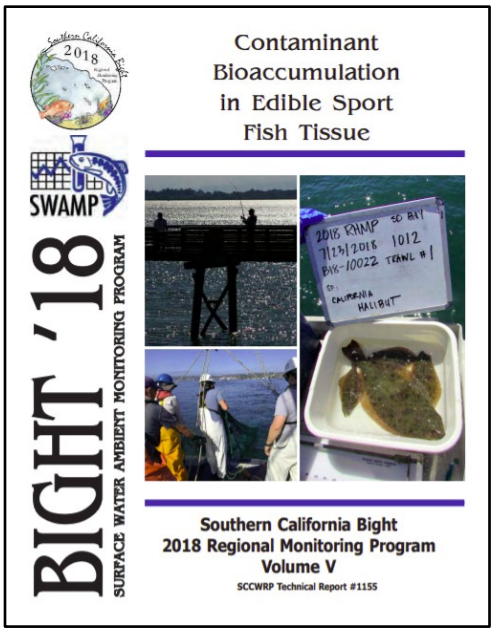


The Southern California Bight 2018 Regional Monitoring Program has published its final report on sportfish bioaccumulation. Completed in partnership with California's Surface Water Ambient Monitoring Program, the study found that contamination levels in the tissues of commonly caught Southern California sportfish were within "safe to eat" thresholds for consumption at least once a week.

Tian, Z., H. Zhao, K.T. Peter, M. Gonzalez, J. Wetzel, C. Wu, X. Hu, J. Prat, E. Mudrock, R. Hettinger, A.E. Cortina, R.G. Biswas, F.V.C. Kock, R. Soong, A. Jenne, B. Du, F. Hou, H. He, R. Lundeen, A. Gilbreath, R. Sutton, N.L. Scholz, J.W. Davis, M.C. Dodd, A. Simpson, J.K. McIntyre, E.P. Kolodziej. 2020. A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon. *Science* 371:185-189.

Tirpak, R.A., N. Afrooz, R.J. Winston, R. Valenca, K.C. Schiff, S.K. Mohanty. 2020. Conventional and amended bioretention soil media for targeted pollutant treatment: A critical review to guide the state of the practice. *Water Research* DOI:10.1016/j.watres.2020.1166480.

Zimmer-Faust, A.G., K. Schiff, J.A. Steele, J.F. Griffith. 2020. The challenges of urban beaches for Quantitative Microbial Risk Assessment. *Marine Pollution Bulletin* DOI:10.1016/j.marpolbul.2020.111546.

Journal Articles (Accepted)

Fassman-Beck, E. and F. Saleh. In press. Sources and impacts of uncertainty in uncalibrated bioretention models using SWMM. *Journal of Sustainable Water in the Built Environment.*

Gillett, D.J., L. Gilbane, and K.C. Schiff. In press. Characterizing community structure of benthic infauna from the continental slope of the Southern California Bight. *Frontiers in Marine Science.*

Rogers, J.B., E.D. Stein, M.W. Beck, K. Flint, A.M. Kinoshita, R.F. Ambrose. In press. Modeling future changes to the hydrological and thermal regime of unaltered streams using projected changes in climate to support planning for sensitive species management. *Ecohydrology.*

Book Chapters

Diehl, D.W. 2020. Key to Combfishes and Greenlings (Families Zaniolepididae and Hexagrammidae). in: M.S. Love, J.K. Passarelli (eds.), *Miller and Lea's Guide to Coastal Marine Fishes of California* pp. 175-178. UC Agriculture and Natural Resources. Davis, CA.

Diehl, D.W. 2020. Key to Driftfishes (Family Nomeidae). in: M.S. Love, J.K. Passarelli (eds.), pp. 342. UC Agriculture and Natural Resources. Davis, CA.

Diehl, D.W. 2020. Key to the Jacks (Family Carangidae). in: M.S. Love, J.K. Passarelli (eds.), *Miller and Lea's Guide to Coastal Marine Fishes of California* pp. 235-242. UC Agriculture and Natural Resources. Davis, CA.

Technical Reports

Armbrust, K., J. Constantino, J. Hunt, C. Menzie, D. Parker. 2020. Findings and recommendations of the Expert Review Panel for the Eastern San Joaquin Surface Water Monitoring Program. Technical Report 1153. Southern California Coastal Water Research Project. Costa Mesa, CA.

Maruya, K., C.S. Wong. 2020. Evaluating analytical methods for detecting unknown chemicals in recycled water. Technical Report 1164. Water Research Foundation. Alexandria, VA.

McLaughlin, K., K.C. Schiff, B. Du, J. Davis, A. Bonnema, G. Ichikawa, B. Jakl, W. Heim. 2020. Southern California Bight 2018 Regional Monitoring Program Volume V: Contaminant bioaccumulation in edible sport fish tissue. Technical Report 1155. Southern California Coastal Water Research Project. Costa Mesa, CA.

Poti, M., S.K. Henkel, J.J. Bizzarro, T.F. Hourigan, M.E. Clarke, C.E. Whitmire, A. Powell, M.M. Yoklavich, L. Bauer, A.J. Winship, M. Coyne, D.J. Gillett, L. Gilbane, J. Christensen, and C.F.G. Jeffrey. 2020. Cross-shelf habitat suitability modeling: Characterizing potential distributions of deep-sea corals, sponges, and macrofauna offshore of the US West Coast. U.S. Department of the Interior, Bureau of Ocean Energy Management. Camarillo, CA.

Stein, E.D., J. Wolfand, R. Abdi, K. Irving, V. Hennon, K.T. Taniguchi-Quan, D. Philippus, A. Tinoco, A. Rust, E. Gallo, C. Bell, T.S. Hogue. 2021. Assessment of aquatic life use needs for the Los Angeles River. Technical Report 1154. Southern California Coastal Water Research Project. Costa Mesa, CA.

Quarter in Review

Conference Presentations

Du, B. (session co-moderator) Non-targeted chemical analysis. Society of Environmental Toxicology and Chemistry's 2021 North America Annual Meeting. November 15-19, 2020. Via webinar.

Parks, A., D. Greenstein, K. McLaughlin, K. Schiff. Sediment quality changes in the Southern California Bight: 1998-2018. Society of Environmental Toxicology and Chemistry's 2021 North America Annual Meeting. November 15-19, 2020. Via webinar.

Schiff, K. Water Quality Impacts of Urbanized Watersheds on the Coastal Waters of Southern California. Center for Watershed Protection Coast and Island Conference. November 16, 2020. Via webinar.

Schiff, K. The California Stream Quality Index: A tool that helps quantify and assess impacts from multiple stressors. Society of Environmental Toxicology and Chemistry's 2021 North America Annual Meeting. November 15-19, 2020. Via webinar.

Wong, C.S. Microplastics measurement interlaboratory calibration standardization project. American Water Works Association's California-Nevada Section Annual Fall Conference. October 26-29, 2020. Via webinar.

Wong, C.S. Evaluating analytical methods for detecting unknown chemicals in recycled water. 35th Annual WateReuse Symposium. September 14-16, 2020. Via webinar.

Zimmer-Faust, A.G. Microbial comparison of oysters and water in Southern California. Pacific Coast Shellfish Growers Association Meeting. October 7, 2020. Via webinar.

Conference Posters

Du, B. Z. Tian, K. Peter, J. Steele, J. Griffith, E. Kolodziej, C. Wong. Application of non-target analysis to identify types of beach contamination in southern California. Society of Environmental Toxicology and Chemistry's 2021 North America Annual Meeting. November 15-19, 2020. Via webinar.

Parks, A.N., D. Greenstein, K. McLaughlin, and K. Schiff. Sediment Quality Changes in the Southern California Bight: 1998-2018. Society of Environmental Toxicology and Chemistry's 2021 North America Annual Meeting. November 15-19, 2020. Via webinar.

Other Presentations

Du, B. Bight '18 Sediment Chemistry Results. California Stormwater Quality Association Watershed Management and Impaired Waters Subcommittee Meeting. August 27, 2020. Via webinar.

Fassman-Beck, E. Southern California Stormwater Monitoring Coalition: The New Five-Year Research Agenda. Ventura County Public Works Stormwater Management Committee. December 17, 2020. Via webinar.

Fassman-Beck, E. Translating Green Infrastructure Research into Practice. Willamette Valley Stormwater Outreach Erosion Control and Stormwater Management Summit. January 26, 2021. Via webinar.

Schiff, K. Communication skills in science. University of California, Irvine Invited Lecture. December 2, 2020. Via webinar.

Stein, E.D. Development of tools to help manage sediment for sustainable and resilient coastal lowland habitat in Southern California. Upper Newport Bay Executive Committee. December 16, 2020. Via webinar.

Weisberg, S. Some Priority Science Needs for Microplastics Management. California Stormwater Quality Association. January 14, 2021. Via webinar.

Zimmer-Faust, A. The Scoop on Poop, Pollutants and Water Quality. Innovators Cube Talks: Discovery Science Series. November 10, 2020. Via webinar.

SCCWRP Personnel Notes

New Faces

Dr. **Christina Frieder,** who just completed a research position at UC Irvine that was a continuation of her postdoctoral studies, will start in February as a Scientist in the Biogeochemistry Department. She will focus on investigating possible solutions for offsetting the intensifying impacts of coastal ocean acidification and hypoxia on vulnerable marine species.

Scientific Leadership

Dr. **Alvina Mehinto** was appointed in November to the project advisory committee for a Water Research Foundation study titled "Develop Standard Operating Procedures for the Collection, Storage, and Extraction of Aqueous Samples for IVB screening (4828)."

Dr. **Alvina Mehinto** has been appointed an editor for the Toxicology and Risk Assessment section of the journal *Chemosphere*.

Ken Schiff has been appointed to the National Stormwater Conference Planning Committee.

Dr. **Eric Stein** has been appointed to the Editorial Board of the journal *Water*.

Dr. **Steve Weisberg** served on the Steering Committee for the U.S. Coastal Research Program's 2021 Meeting, held online over a six-day period in January. Weisberg also chaired a session on microplastics.

SCCWRP COMMISSIONER SPOTLIGHT

Manager moves State forward on climate change

At first glance, the scope of Dr. Justine Kimball's job sounds intangible and intractable: She's responsible for keeping the California Ocean Protection Council (OPC) moving forward on all of the State's climate change initiatives, from ocean acidification to sea level rise and coastal resiliency.

Dr. Justine Kimball

If it sounds like too much for one person to manage, Kimball is the first to acknowledge it can sometimes feel that way. But her day-to-day responsibilities are made much more manageable – and tangible – by one seminal document: the OPC's 64-page "Strategic Plan to Protect California's Coast and Ocean 2020-2025," which guides all of her day-to-day work.

"I basically structure all of my time around ensuring the OPC is meeting all of our deadlines and goals associated with the strategic plan," said Kimball, the OPC's Senior Climate Change Program Manager. "I am very lucky to have a strategic plan that is very specific and target-focused; we basically divvy up the plan and divide and conquer."

Kimball joined the OPC in 2019 after working for four years as a monitoring program coordinator at the federal level. In addition to serving as a SCCWRP Alternate Commissioner, she routinely interacts with SCCWRP, especially on an ongoing West Coast computer-modeling initative to understand how ocean acidification and hypoxia are impacting coastal marine health.

"I love being able to work with the academic and research communities I interacted with in my research days," said Kimball, who holds a Ph.D. in environmental earth system science.

Dr. Justine Kimball takes her mother's dog, Abbie, to Carmel Beach last fall. Kimball has been temporarily living in Half Moon Bay with her mother during the COVID-19 pandemic.

Justine Kimball, Ph.D.

Job: Senior Manager, Climate Change Program, California Ocean Protection Council (started March 2019)

SCCWRP role: Alternate Commissioner (started May 2019)

Prior jobs: Coordinator, National Coral Reef Monitoring Program, NOAA Office for Coastal Management (2015-2019); NOAA Sea Grant Knauss Fellow, U.S. Navy Office of the Oceanographer (2014-2015); Research Associate, UCLA (2013-2014); lecturer, instructor and teaching assistant, Stanford University (2008-2013); Divemaster, Two Fish Divers in Indonesia (2007)

Education: Ph.D. environmental earth system science, Stanford University (2015); B.S. biological sciences, University of California, Santa Barbara (2007)

Residence: Sacramento (temporarily living in Half Moon Bay)

Family: Dog Koda, an American Eskimo

Hometown: Half Moon Bay

Hobbies: Hiking, camping, golfing, cooking and baking, making tiki-themed alcoholic drinks

Kimball entered her Ph.D. program at Stanford University in 2007 planning to become an academic researcher. Her dissertation investigated how to use the biogeochemical properties of deep-sea corals as environmental indicators of changing ocean health.

But in grad school, Kimball realized she did not want to spend the rest of her life doing research. So she applied for and earned a coveted Knauss Sea Grant fellowship that took her to Washington, D.C., to work on climate planning issues with the U.S. Navy.

After completing her fellowship, she worked for four years as coordinator of the National Oceanic and Atmospheric Administration's National Coral Reef Monitoring Program.

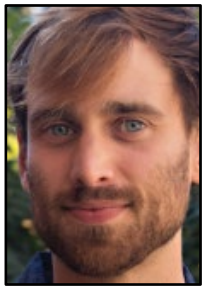
Kimball has been enamored with the ocean since she first went snorkeling as a 10-year-old child during a family vacation in Hawaii. During her teenage years, she became fixated on becoming a scuba diver, even after her mother repeatedly refused to let her take lessons. So, like any rebellious teen, the first thing Kimball said she did upon starting college at UC Santa Barbara was to become a certified scuba diver – a skill that led to research opportunities.

During the COVID-19 pandemic, Kimball has been temporarily working remotely from her childhood home in Half Moon Bay. She spends much of her free time trying out different local hiking trails. Her favorite trail is El Granada's Quarry Park Loop Trail.

SCCWRP PARTNER SPOTLIGHT

State Board scientist forges broad collaborations

Dr. Scott Coffin is officially charged with supporting policy development as a Research Scientist in the State Water Board's Division of Drinking Water. But unofficially, he act as a go-to technical expert and adviser across the State Water Board and beyond.



Dr. Scott Coffin

On issues ranging from aquatic microplastics contamination to screening water for bioactive contaminants using cell assays, Coffin provides input not just from a drinking water perspective, but also from an ecosystem health perspective. His expertise is often called upon by colleagues in places like the State Water Board's Division of Water Quality and the California Department of Toxic Substances Control.

"My classification as a Research Scientist is pretty rare in our organization – it gives me the freedom to collaborate broadly, to write papers, go to conferences and just keep one foot in academia," said Coffin, who graduated with a Ph.D. in environmental toxicology in 2018. "It really feels like a dream job."

Coffin's job also puts him into close contact with SCCWRP. In addition to being a SCCWRP research partner, he also serves as the State Water Board contract manager for SCCWRP's research to quantify microplastics contamination and investigate its health effects.

"I would be in a world of hurt without SCCWRP," Coffin said. "I really admire what SCCWRP does and SCCWRP's adaptability and openness to collaboration – just so much gets done this way."

Dr. Scott Coffin explores Joshua Tree National Park with fiancé J.C. during a 2020 climbing trip.

Scott Coffin, Ph.D.

Job: Research Scientist, Division of Drinking Water, California State Water Resources Control Board (started September 2019)

SCCWRP role: SCCWRP collaborator and contract manager for microplastics research

Prior jobs: Environmental Scientist, State Water Board (2019); graduate student researcher, UC Riverside (2014-2018); intern, Office of U.S. Senator Mike Enzi (2014); surfing and scuba diving instructor in Costa Rica and Belize (summers 2013 and 2014)

Education: Ph.D. environmental toxicology, University of California, Riverside (2018); B.S. chemistry, University of Wyoming (2013)

Residence: Sacramento

Family: Fiancé J.C., a Ph.D. student in UC Davis's School of Education (learning and mind sciences emphasis)

Hometown: Cheyenne, Wyoming

Hobbies: Surfing, rock climbing, playing board games, playing drums

Coffin has been interacting with SCCWRP since the first week of his Ph.D. program at UC Riverside. His adviser, Dr. Daniel Schlenk, a close SCCWRP collaborator, immersed Coffin in the world of CECs (contaminants of emerging concern) and helped solidify his desire to work on the applied side of research. Coffin began working for the State Water Board immediately after graduating in 2018.

Coffin originally became interested in policy development during a six-month internship in 2014 in the office of a U.S. Senator, right after earning a chemistry degree from the University of Wyoming. The internship brought him to Washington, D.C., where he saw scientific experts testifying to legislators on environmental issues.

'It was just so fascinating – it made me realize how much of the solutions are in the hands of politicians," he said.

When he's not working, Coffin is an avid surfer. Although he grew up in landlocked Cheyenne, Wyoming, Coffin took his first surfing lesson at age 12 while visiting his grandmother in Florida – and has been hooked ever since. His favorite Southern California surfing spot is Swami's Beach in Encinitas.

While at UC Riverside, Coffin also played drums for an informal psychedelic surf-rock and jazz band: "We never performed live – we just liked to jam."

SCCWRP STAFF SPOTLIGHT

Scientist looking for solutions to climate change

As a Ph.D. student, Dr. Christina Frieder immersed herself in studying the impacts of climate change on ocean health. Her doctoral dissertation chronicled the impacts of ocean acidification and hypoxia (OAH) on invertebrate larvae.

Dr. Christina Frieder

But as a postdoc, Frieder wanted to shift from studying climate change's impacts to investigating potential solutions. Frieder focused on studying coastal seaweed farming as a potential solution for offsetting OAH's intensifying local coastal impacts on vulnerable marine species; researchers hope the natural photosynthetic processes of these giant underwater plants could be used to mitigate seawater chemistry changes resulting from OAH.

"As this field has evolved, it's really become apparent to me that I wanted to move past looking at just the impacts – and also look at the solutions," Frieder said. "The climate change problem has become so big that we've got to start thinking about the solutions."

Frieder, who completed a 16-month researcher position at UC Irvine in December that was a continuation of her postdoc work, will start in February as a Scientist in SCCWRP's Biogeochemistry Department. She will continue to collaborate on the UC Irvine project – led by close SCCWRP collaborator Dr. Kristen Davis – as well as tackle broader research questions centered around coastal OAH.

"At UCI, I was looking at one possible solution for OAH, but at SCCWRP, I'll get to broaden that framework and investigate many possible solutions," Frieder said. "That gets me really excited."

Frieder, who grew up in an outdoors-loving family in Tulsa, Oklahoma, moved to California in 2002 as a UC Santa Barbara freshman. A family friend who knew of Frieder's interest in environmental science encouraged her to consider the school.

Dr. Christina Frieder, pictured holding daughter Sierra, explores Utah's Zion National Park during a 2018 family road trip – with the family's teardrop trailer in tow.

Christina Frieder, Ph.D.

Job: Scientist, SCCWRP Biogeochemistry Department (starting February 2, 2021)

Prior jobs: Associate Research Specialist and Postdoctoral Research Associate, UC Irvine (2018-2020); Postdoctoral Research Associate, USC (2014-2018); Adjunct Instructor, Green Mountain College (2018); Antarctic Biology Co-Instructor, National Science Foundation (2016); Adjunct Professor, Art Institute of California (2013); SAT tutor, Kaplan (2006-2009)

Education: Ph.D. biological oceanography, Scripps Institution of Oceanography, University of California, San Diego (2013); B.S. aquatic biology, University of California, Santa Barbara (2006)

Residence: Newport Beach

Family: Husband Stephen, an attorney; children Sierra, 3, and Boone, 1

Hometown: Tulsa, Oklahoma

Hobbies: Hiking; exploring the western U.S. states by trailer

Frieder's interest in studying climate change and its intersection with coastal ocean health was forged during an undergraduate internship at the Monterey Bay Aquarium Research Institute. The internship showed Frieder that her undergraduate major – aquatic biology – could be much more than just an academic pursuit; it also could be a gateway to studying an existential threat to the planet.

"It's really important to me that I can work in a job where I'm an advocate for the ocean," Frieder said. "I'm always thinking about how to be a better citizen of the earth."

After finishing her undergraduate degree, Frieder took a year off to travel, then began her Ph.D. in biological oceanography in 2007 at the Scripps Institution of Oceanography. She worked under Dr. Lisa Levin, a close SCCWRP collaborator, then completed back-to-back postdocs at USC and UC Irvine.

When she's not working, Frieder loves exploring national parks and other natural landmarks across the western U.S. and Canada. In 2018, she and her husband purchased a small teardrop trailer that they use for family road trips. They've already logged more than 4,000 miles visiting national parks ranging from Zion to Yellowstone to Jasper in Canada.

Of all the places she's been, though, her favorite area is right here in California: Big Sur and Morro Bay.

SCCWRP SCENES

Capturing field work on film

A SCCWRP field crew in January produced a short training video to help stream managers across the southwestern U.S. learn how to use a new tool co-developed by SCCWRP that rapidly distinguishes among perennial, intermittent and ephemeral streams. The flow duration classification tool uses easily observable field indicators – including presence of wetland vegetation and specific types of aquatic insects – to classify streams for regulatory and other management purposes. The U.S. Environmental Protection Agency intends to make the film part of the tool's training materials.

Clockwise from below: A SCCWRP video crew films a field training video for a new flow duration classification tool at Lytle Creek in San Bernardino County; SCCWRP's Dr. Raphael Mazor demonstrates for the camera how to identify aquatic plant species; SCCWRP's Caspian Thackeray-Taylor carries a microphone boom and other recording equipment to the filming site; and a screengrab from the training video shows how text has been overlaid onto the final edited film.