SCCWRP Director's Report

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FALL 2023 ISSUE

Expert panel convened to review OAH modeling tools

An independent panel of scientific experts has been convened to review a set of modeling tools that predicts the ecological consequences of intensifying ocean acidification and hypoxia (OAH) in California coastal waters and the degree to which land-based activities are influencing this trajectory.

The six-member expert panel, which will begin meeting in December, is tasked with quantifying the level of uncertainty associated with the coastal OAH modeling tools' predictions, as well as weighing in on what additional steps are needed to improve management confidence in the modeling work.

The modeling tools – which consist of a coastal ocean water-quality model and associated biological interpretation tools – were developed by a research team that includes SCCWRP, the University of California, Los Angeles, Princeton University, and the National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory.

The expert review panel was put together over the past few months by the National Water Research Institute, which formed a steering committee made up of project stakeholders to ensure the expert review process is fair and transparent. SCCWRP's role in this process is limited to serving as one of two *ex officio* science advisors to the steering committee.

Independent, transparent review of the managerial relevance of the OAH modeling tools is critical as coastal ocean managers weigh how much confidence to place in the tools' predictive abilities. For example, the State Water Resources Control Board is considering whether to financially incentivize water-quality managers to invest in removing nutrients from wastewater discharges; the modeling work is expected to be one line of evidence that helps inform these deliberations.

The coastal ocean model is made up of two component models – collectively known as ROMS-BEC (Regional Ocean Modeling System-Biogeochemical Elemental Cycling) – that work in tandem

Contents

Cover photo: Tiny sea snails known as pteropods, which are collected using a plankton tow net, have provided some of the earliest signs of the ecological effects of ocean acidification and hypoxia in California coastal waters. An independent expert panel has been convened to review the body of science that predicts how these ecological effects will intensify in the coming years.

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, November 2
CTAG quarterly meeting
(In-person meeting)

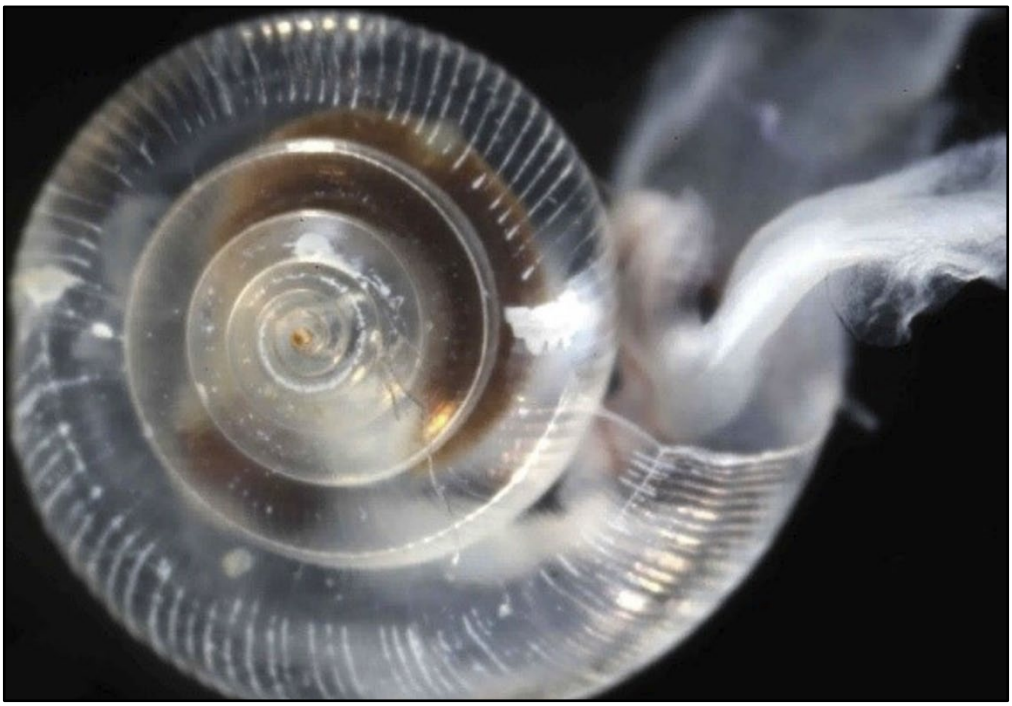
Friday, December 1
Commission meeting
(In-person meeting)

to predict the influence that local nutrient discharges are having on coastal ocean health. Excess nutrients are being introduced to the coastal ocean via wastewater effluent discharges, stormwater runoff and atmospheric deposition.

The modeling work is part of a West Coast-wide initiative to help managers understand which marine habitats are most vulnerable to a change in seawater chemistry known as ocean acidification, plus the related phenomenon of hypoxia, or low dissolved oxygen levels.

To ensure that stakeholders can trust the expert panel's findings, NWRI established an intentionally transparent and balanced process for selecting panelists. Steering committee members agreed at the upfront on the selection criteria and desired expertise for panelists. Furthermore, any committee member had power to unilaterally veto any of the panelist candidates that NWRI put forward.

More than 50 candidates were nominated and vetted by NWRI. The panelists have expertise in areas including physical and biogeochemical oceanography, biological effects of low oxygen and pH levels, and model application to support management decisions.



Courtesy of National Oceanic and Atmospheric Administration

A pteropod, or sea snail, with pit marks on its shell, shows signs of shell dissolution in response to changing seawater chemistry. A set of modeling tools that has been developed to predict how ocean acidification and hypoxia will adversely affect coastal marine life is being reviewed by an independent expert panel.

The six panelists selected represent the unanimous consensus of the steering committee:

» Dr. Neil Banas, University of Strathclyde
» Dr. Fei Chai, University of Maine
» Dr. Marjorie Friedrichs, Virginia Institute of Marine Science
» Dr. Alexander Kurapov, National Oceanic and Atmospheric Administration
» Dr. Mike Stukel, Florida State University
» Dr. Weifang (Gordon) Zhang, Woods Hole Oceanographic Institution

During the expert panel's first two meetings – which will be held virtually on December 12, 2023 and January 9, 2024 – panelists will be introduced to the charge questions developed by the stakeholder committee, the modeling tools themselves, and stakeholders' key questions and concerns about this body of work.

The expert panel will meet for its first in-person meeting on January 17-18, 2024 in the Orange County area, at a location to be determined. The panel's deliberations are expected to last about 18 months.

All meetings will be webcast and will be fully accessible to the public, except when the panel is in closed session.

For more information, contact Dr. Martha Sutula and Dr. Faycal Kessouri.

Field sampling completed for Bight '23 Sediment Quality element

The Southern California Bight 2023 Regional Monitoring Program has completed field sampling for its signature Sediment Quality study element – a coordinated, three-month field effort that lays the foundation for participants to collaboratively examine multiple aspects of Southern California's coastal ocean health, including looking for the presence of multiple, high-priority contaminants of emerging concern (CECs).

The Sediment Quality field sampling, which ran from July to October, involved more than 20 field crews collecting more than 340 sediment grab samples and completing 124 benthic trawls across more than 1,500 square miles of coastal waters, from Point Conception in Santa Barbara County to the U.S.-Mexico border.

The Bight '23 Sediment Quality study element will add to a nearly three-decade trend line tracking the overall ecological condition of Southern California's coastal ocean across multiple habitat types. Separately, the Sediment Quality trawl sampling effort will be leveraged to extend

a trend line documenting the spread of trash across the coastal seafloor.

The Sediment Quality field sampling effort also will be leveraged to look for the presence of four CECs in seafloor sediment; all of these CECs were identified by a statewide expert CEC advisory panel in spring 2023 as top monitoring priorities:

» **Microplastics**: Five years ago, microplastics emerged as a statewide legislative priority, paving the way for significant research investments to standardize microplastics monitoring methods. Bight '23 will use these newly standardized methods to quantify microplastics as small as 125 microns in size in Bight sediment, as well as in shellfish. The new methods represent a monumental advance compared to the methods used to monitor microplastics in sediment during Bight '13 a decade ago, when the smallest particles to be quantified were 1 millimeter in size.

» **PFAS (per- and polyfluoroalkyl substances)**: California has taken aggressive action in recent years to ban PFAS in clothing and other consumer products, as well as reduce PFAS levels in drinking water. PFAS are a class of chemicals that help make products resistant to heat and stains. Bight '23 will document what portion of the coastal sediment seafloor is contaminated with PFAS.

» **Neonicotinoids**: California took legislative action this year to restrict the use of neonicotinoids, the most commonly used pesticide. Bight '23 will document what portion of the sediment seafloor in Southern California's embayments is contaminated with neonicotinoids.

» **Tire wear compounds**: In 2020, a research team that included SCCWRP, discovered that a derivative of a chemical used in tire manufacturing – known as 6PPD-quinone – was linked to mass deaths of coho salmon in the Pacific Northwest. Bight '23 will document what portion of the sediment seafloor in embayments is contaminated with the tire wear compound.

A crew places sediment collected from the seafloor into jars during field sampling for the Sediment Quality element of the Southern California Bight 2023 Regional Monitoring Program. More than 20 field crews collected more than 340 sediment grab samples across more than 1,500 square miles of coastal water in the Southern California Bight.

Additionally, because Hurricane Hilary passed through Southern California as a tropical storm in August in the middle of the Sediment Quality sampling period, Bight '23 will analyze data collected before vs. after the storm to evaluate if interpretation of sediment quality conditions will be affected.

Across Southern California, much of what environmental managers know about how land-based contamination has impacted overall coastal ocean health has come from the Bight program's Sediment Quality element.

The Sediment Quality assessment uses multiple lines of evidence to provide greater confidence in its findings. For example, the program uses a quantitative scoring tool to synthesize three main lines of evidence – sediment toxicology, sediment chemistry, and sediment-dwelling biological community health – to produce a single category score reflecting sediment quality.

Bight '23 program participants already have begun conducting chemical and biological analyses of sediment samples. Technical committees will reconvene over the next year to review results and prepare assessment reports detailing their findings.

For more information, contact Dr. Karen McLaughlin.

Quality-assurance recommendations developed to improve *Ceriodaphnia* toxicity test

An expert science panel has developed best-practice recommendations for improving the quality and consistency of a toxicity test commonly used in California to monitor the water quality of treated wastewater and stormwater discharges.

The recommendations, published as a statewide guidance manual in September, were developed following a two-year,

multi-phased investigation examining multiple aspects of the culturing and testing procedures that could account for variability in results for the *Ceriodaphnia dubia* survival and chronic reproduction test. The toxicity test, which uses the *C. dubia* water flea, has been in use since the mid-1980s.

The study found that about half of laboratories were able to consistently produce high-quality testing data. For the other half, the study concluded that the variability was most likely a result of multiple causes that are unique to individual laboratories and might be occurring on an intermittent basis.

Laboratories have some flexibility under California's approved *C. dubia* testing method to adapt exactly how they perform the test, including limited options for what to feed the test organism, the laboratory reagents used to create dilution water, and age of the organisms used to initiate the test.

In response to the findings, the study's expert science panel developed a series of recommendations to help ensure that: (1) laboratory methods are implemented and documented consistently, (2) California's accreditation process is optimized to document laboratories' comparability, and (3) training is improved for all parties, including State assessors, laboratories and regulated agencies.

The panel also proposed a list of metrics that could be used to monitor laboratory performance and achieve desired levels of sensitivity, consistency and comparability.

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 in 2020, as the State Water Resources Control 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 in late 2020.

In 2020, both the regulated and regulatory communities asked SCCWRP to facilitate the study to investigate the sources of variability in *C. dubia* test results.

The study – led by a five-member expert science panel with input from a 10-member stakeholder advisory committee – began by compiling data from about 1,000 *C. dubia* toxicity tests performed by the 17 laboratories accredited to perform the test in California. The historical analysis found that while most laboratories could meet test acceptability criteria, several laboratories exhibited high variability with low reproducibility.

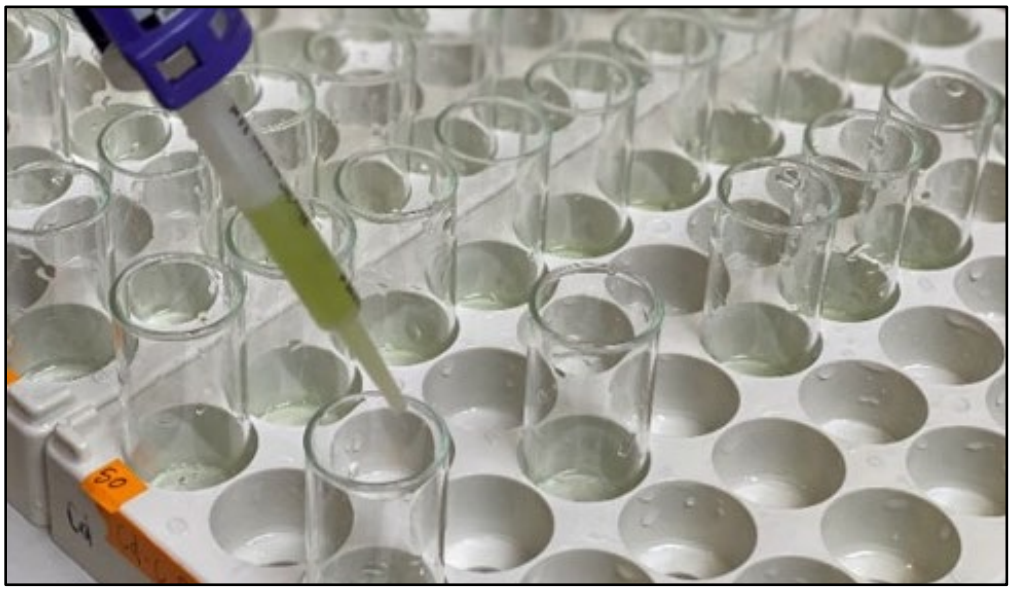
Next, study participants conducted an initial round of split-sample intercalibration testing and found that no two laboratories performed the *C. dubia* test exactly the same way – a finding that confounded researchers' ability to pinpoint which technique might be the source of variability.

After identifying areas of inconsistency and developing test techniques intended to reduce variability in test results, researchers then conducted a second intercalibration exercise. The second intercalibration exercise found that bringing more standardization to the laboratory techniques reduced but did not remove test variability among the laboratories that were producing inconsistent data.

The study's findings were presented during a State Water Board meeting in mid-October. During the hearing, regulated parties said they agreed with many of the recommendations, and expressed confidence that the *C. dubia* test methods can be reliably performed by a competent laboratory. However, concerns were expressed that an insufficient number of laboratories can perform the test well, especially given the large number of required compliance tests mandated statewide, and that the *C. dubia* Toxicity Provisions were being implemented prematurely before the study's recommendations can be fully implemented. The *C. dubia* numeric objectives are scheduled to go into effect in January 2024.

The final technical report and other project materials are available on the project's webpage.

For more information, contact Dr. Alvina Mehinto and Ken Schiff.



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. A SCCWRP-facilitated study has found that variability in results for the *Ceriodaphnia dubia* survival and chronic reproduction test is most likely a result of multiple causes that are unique to the individual laboratories that perform the test, and might be occurring on an intermittent basis.

SCCWRP member agencies to help inform development of national eDNA strategy

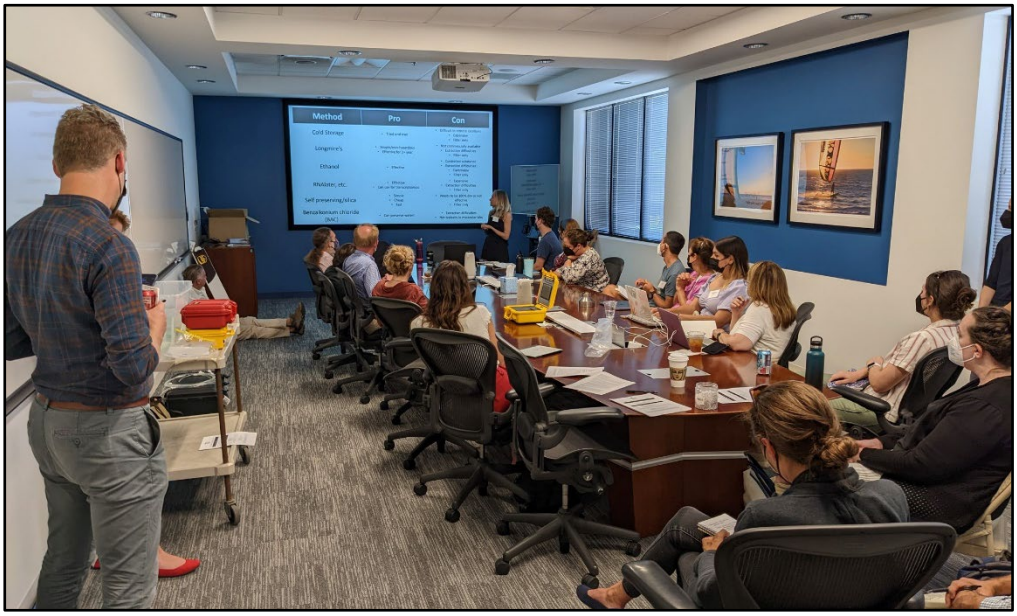
CTAG will host an all-day workshop next month to identify constraints and challenges associated with incorporating environmental DNA (eDNA) methods into aquatic monitoring programs nationwide – the latest in a series of focused, SCCWRP-facilitated investments over the past year to help inform development of a coordinated national eDNA-based monitoring strategy.

The insights from the upcoming CTAG eDNA workshop, scheduled for November 9, 2023, will be submitted to a White House-appointed federal team that is developing the national eDNA strategy over the next several months. The workshop also will help shape SCCWRP's long-term research planning efforts around advancing the science of eDNA-based monitoring.

The development of a national strategy around eDNA-based monitoring follows more than a year of strategic investments by SCCWRP and other leading eDNA researchers and management agencies to help transition eDNA-based monitoring methods from pilot-scale studies to broad-scale adoption by the end-user management community.

eDNA-based monitoring uses the DNA that organisms shed into their environment – known as environmental DNA – to monitor a broad range of organisms, often with greater speed, accuracy, and precision than traditional monitoring methods that rely on manual observation of organisms.

For the past decade, researchers and environmental management agencies across the nation have explored how to use eDNA-based methods as a cost-effective complement and/or alternative to traditional morphology-based monitoring methods. However, these agencies have worked largely in siloes to standardize eDNA sampling, processing and analytical protocols, making it difficult to build monitoring capacity, close knowledge gaps, and coordinate and harmonize eDNA policies across agencies.



Attendees at the 2nd National Workshop on Marine Environmental DNA, held in 2022 at SCCWRP, learn about field sampling methods for environmental DNA (eDNA). Following the meeting, the White House Office of Science and Technology Policy convened a federal team to begin developing a national eDNA strategy – a recognition of the fact that monitoring programs across the nation need improved coordination to advance eDNA-based monitoring.

In summer 2022, SCCWRP was asked to help bring this community together by hosting the 2nd National Workshop on Marine eDNA, a national conference that identified strategies and solutions for effectively transitioning eDNA methods to routine management adoption and use across the nation. A key outcome of this workshop was recognizing that monitoring programs across the nation would need improved coordination to advance eDNA-based monitoring.

The White House Office of Science and Technology Policy (OSTP), which gave the opening remarks at the 2022 national eDNA workshop, responded by convening a federal team charged with developing a national eDNA strategy, known officially as the National Marine and Great Lakes eDNA Strategy.

The November 9 CTAG eDNA workshop is expected to be attended by leading eDNA researchers from across the nation who are interested in gaining improved understanding of what the end-user management community needs to advance eDNA-based monitoring.

In recent years, California has emerged as a global leader in coordinating and standardizing eDNA monitoring programs statewide. In particular, the California Water Quality Monitoring Council's Molecular Methods Workgroup, led by SCCWRP's Dr. Susanna Theroux, has helped demonstrate how improved coordination among agencies can help more expeditiously transition eDNA monitoring methods into routine adoption and use.

The federal eDNA strategy team is inviting public comment through November 30, 2023 to gather perspectives and insights prior to developing the national strategy. These comments are welcome to be submitted through a federal Request for Information (RFI) process.

Once the comment period closes, the federal team convened by OSTP will begin writing the national strategy. The strategy is expected to be unveiled as part of the

3rd National Workshop on Marine eDNA, scheduled for June 3-5, 2024 in Washington, D.C.

Following the strategy's release, SCCWRP is expected to play a leading role in helping to align the national strategy with California's ongoing efforts to standardize and build capacity around eDNA monitoring methods.

For more information, contact Dr. Susanna Theroux.

Updates by Thematic Area

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

BIOASSESSMENT

Taxonomic standards developed to support biological indicators for dry streams

SCCWRP and its partners have developed taxonomic data standards for terrestrial arthropods and bryophytes, paving the way for these organisms to be used as routine bioassessment indicators for tracking the health of streams that do not flow year-round.

The standardization work, which was completed in October, is designed to facilitate management adoption of a prototype scoring tool co-developed by SCCWRP for assessing the ecological condition of dry streams. Taxonomic standards help ensure laboratories can generate high-quality, comparable bioassessment data.

The dry streams scoring tool is modeled after the California Stream Condition Index and Algal Stream Condition Index, which were co-developed by SCCWRP for use in perennial streams. Dry streams make up about 60% of all streams in Southern California.

Like the dry streams tool, the CSCI and ASCI already have been subjected to taxonomic standardization.

SCCWRP aiding U.S. Army Corps of Engineers in overhauling ecological response modeling

SCCWRP has begun working with the U.S. Army Corps of Engineers (USACE) to overhaul and modernize how the federal agency uses modeling tools to assess the ecological condition of aquatic environments nationwide.

Darkling beetles, above, are a type of terrestrial arthropod found in dry streams. Researchers have developed taxonomic data standards for terrestrial arthropods and bryophytes to pave the way for these organisms to be used as routine bioassessment indicators for tracking the health of streams that do not flow year-round.

During a workshop at USACE headquarters in September, SCCWRP's Dr. Katie Irving was invited to introduce USACE staff to the next-generation biological response modeling tools being used in California, including flow-ecology tools for understanding how sensitive aquatic organisms respond to changes in flow patterns.

SCCWRP will continue to provide support to USACE as it works to update the ecological response modeling tools that inform management decision-making for USACE projects across the nation.

A technical report summarizing the workshop's insights and outcomes is expected to be published next year.

ECOHYDROLOGY

Study launched to probe how water temperature affects stream health

SCCWRP and its partners have kicked off the technical work for a study seeking to improve managers' understanding of how water temperature affects the health of sensitive aquatic life in Southern California streams where treated wastewater effluent is being discharged.

The study, which kicked off in October following stakeholder approval of the workplan, focuses on the Upper Santa Clara River watershed, and complements a similar ongoing study in the San Gabriel watershed. Treated wastewater effluent is typically discharged into streams above the stream's ambient temperature.

Unlike much of the San Gabriel River watershed, the Santa Clara River naturally receives inputs from groundwater. Groundwater is thought to have a cooling effect on river temperature, meaning the groundwater in the Santa Clara River has the potential to help offset increased temperatures from the treated wastewater discharges.

The investigations are motivated by a new generation of treated wastewater discharge permits that have lowered the maximum temperature at which receiving water is required to be maintained.

Analysis initiated to understand how flow patterns affect biological health of modified channels

The Southern California Stormwater Monitoring Coalition (SMC) has begun examining how flow alterations affect the biological health of streams that have been modified via channel hardening – part of a three-year study working to identify which stressors are major contributors to biological degradation in these streams.

The flow-ecology investigation, launched in July, will compare the biological health of modified channels to other types of streams to understand how flow influences biological condition in streams with different types of modifications.

From the study, researchers hope to gain insights about how to improve the biological health of modified streams – without reversing existing channel modification features that are crucial for flood protection.

EUTROPHICATION

Experts on HABs, kelp convened to support development of coastal ocean health report cards

SCCWRP has convened two groups of scientific experts to develop consensus on how to assess the state of harmful algal blooms (HABs) and kelp, respectively, in California and West Coast marine waters – part of an ongoing effort to develop multi-indicator report cards for tracking coastal ocean health.

The two groups of experts, which met separately at SCCWRP during multi-day workshops in September, have been tasked with developing scientific consensus on what data sets should be used to assess HABs and kelp, respectively, as well as what thresholds should be used as the basis for assessing condition, and what level of uncertainty is acceptable.

HABs and kelp are two of 18 indicators under development that will feed into ocean health report cards being built for both California and the U.S. West Coast. The pair of report cards are being developed in a coordinated fashion and will be released in 2025.

The report cards are being designed to provide managers and policymakers with comprehensive, executive-level annual snapshots reflecting the health of the coastal ocean.

Experts convened to improve understanding of interactions between HABs, OAH

SCCWRP has convened a group of scientific experts on harmful algal blooms (HABs) and ocean acidification and hypoxia (OAH) to study the relationship between these two coastal stressors, especially how they interact to adversely affect coastal ocean health.

During a two-day workshop at SCCWRP in September, the 14 scientific experts – including from SCCWRP – discussed how existing marine monitoring efforts could be tweaked to improve understanding of the interactions of HABs and OAH.

Monitoring of HABs and OAH has historically not been well-coordinated, with relevant indicators and metrics siloed within each respective field. However, a growing body of evidence has indicated that OAH-HABs interactions present a growing risk to coastal habitats.

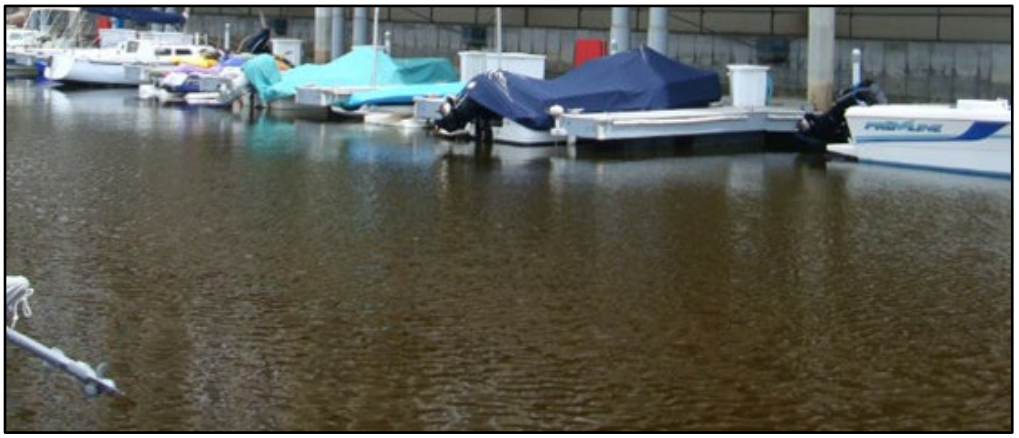
The expert group will summarize its recommendations in a report and journal manuscript expected to be published next year.

CONTAMINANTS OF EMERGING CONCERN

First experiment completed for study seeking to close knowledge gaps in microplastics exposure data

SCCWRP and its partners have completed the first of two exposure experiments for a two-year toxicity study working to close knowledge gaps in how aquatic life are adversely affected by exposure to microplastics pollution.

During the initial mesocosm experiment, completed in September, researchers examined how juvenile inland silverside fish respond when exposed to environmentally relevant levels of microplastic fibers, which come from

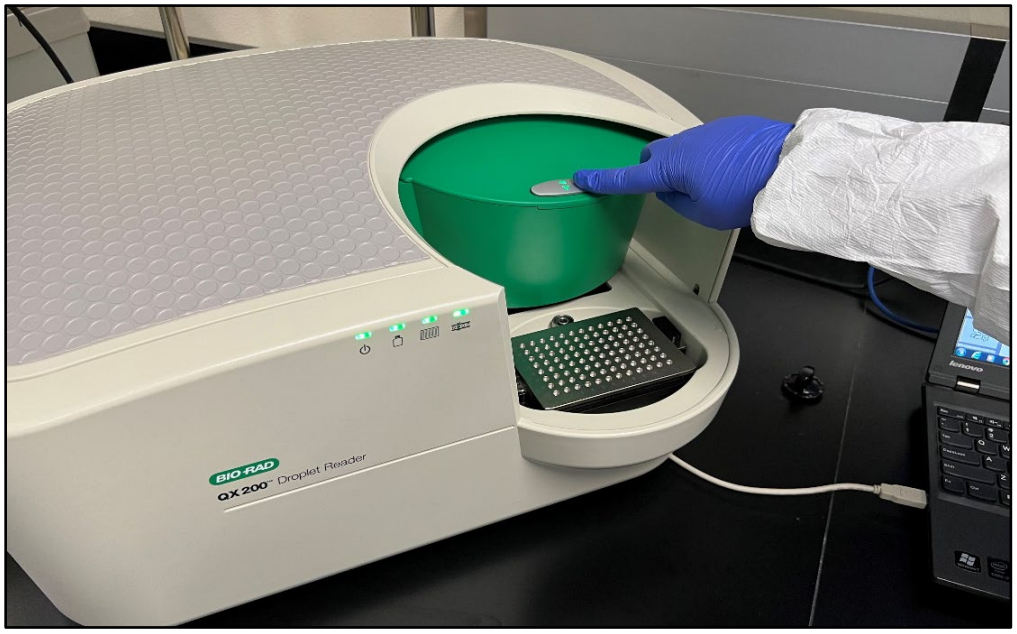


King Harbor in Los Angeles County is tainted a reddish-brown color by a harmful algal bloom (HAB) that can poison and kill seabirds. Researchers are working to study the interactions between HABs and another environmental stressor – ocean acidification and hypoxia – which emerging research has found cumulatively present a growing risk to coastal habitats.

ubiquitous sources such as synthetic clothing.

The study is part of an ongoing effort by researchers to close gaps in microplastics toxicity data that were identified by the California Ocean Protection Council in its Statewide Microplastics Strategy published last year.

The second and final exposure experiment, expected to begin early next year, will largely repeat the exposure experimental design, but this time using Pacific oysters. Researchers will study if these filter feeders have the potential to take up meaningful levels of microplastics in their bodies, thereby lowering exposure levels for other aquatic organisms.



A droplet reader instrument is used in a laboratory to detect fecal contamination in beach water using the droplet digital polymerase chain reaction (ddPCR) method. The City of Los Angeles is working toward gaining regulatory approval to use the method to reopen beaches as soon as safely possible following sewage spills.

MICROBIAL WATER QUALITY

Study launched to gain approval to use ddPCR for measuring sewage spills, fecal contamination at beaches in City of Los Angeles

SCCWRP and the City of Los Angeles have begun working to earn regulatory approvals to use a rapid, DNA-based method for detecting fecal contamination at City beaches – an advance that would enhance the City's ability to reopen beaches as soon as safely possible following sewage spills.

The study, launched in August, will compare the performance of the droplet digital polymerase chain reaction (ddPCR) method to traditional bacteria culturing methods for detecting fecal contamination in beach water. The ddPCR method, which SCCWRP and its member agencies have spent nearly two decades vetting and optimizing, enables public health agencies to notify beachgoers about contamination on the same day that water samples are collected. The soonest traditional methods can be used for beach closure and reopening decisions is the day after sampling.

Although the City is not planning to replace culturing methods with ddPCR for routine testing, the City would be granted this option following successful completion of the method comparison study.

In 2022, San Diego County became the first municipality in the nation to end reliance on culturing methods altogether in favor of using the ddPCR method across more than 50 beach locations.

Leak detection method successfully applied to test public sewer pipes across San Diego area

SCCWRP and its partners have successfully tested more than 20 underground sewer pipes in the San Diego area for leaks using a newly developed method that can detect volumetric losses of as little as a one liter out of 4,000 liters – a key milestone in ongoing efforts to estimate what portion of human fecal contamination in the region's waterways can be attributed to raw wastewater exfiltrating from public sewer systems.

Data from the field testing, which is nearing completion and will wrap up by December, will enable researchers to extrapolate how much sewage is exfiltrating from sewer pipes across the lower San Diego River watershed. A final report is expected to be published next summer.

The exfiltration method utilizes prototype equipment and methods developed by SCCWRP and its partners. It involves pumping a known volume of water at a controlled rate through an isolated, 150- to 400-foot-long section of sewer pipe, then looking for a difference in the volume pumped in vs. recovered.

The sites where the method has been deployed represent a range of different pipe materials and ages.

STORMWATER BMPS

SMC planning to double size of Regional BMP Monitoring Network for Year 2 of BMP performance monitoring

The Southern California Stormwater Monitoring Coalition (SMC) is planning to double the number of sites where field teams are collecting data on the performance of structural stormwater BMPs as the SMC enters Year 2 of its new Regional BMP Monitoring Network.

Since August, SCCWRP has been working to prepare SMC member agencies to collect BMP performance data from about

10 sites across Southern California during the upcoming rainy season.

Although collecting monitoring data from BMPs requires extensive planning and training, the insights generated from this regional monitoring program have the potential to address significant, persistent knowledge gaps in managers' understanding of how to optimize the performance, operation and maintenance of structural stormwater BMPs.

During the 2022-2023 wet-weather season, the SMC collected BMP performance data from five sites, with as many as eight storm events sampled per site.

REGIONAL MONITORING

Field training, intercalibration completed to support two new estuarine monitoring programs

SCCWRP and its partners have completed field training and intercalibration exercises to support a pair of monitoring initiatives intended to collectively generate comprehensive insights about the ecological health of coastal estuaries across California.

The intercalibration exercises, completed in August, mark the start of the field sampling season for the Southern California Bight 2023 Regional Monitoring Program's newly launched Estuary Wetland Assessment study element, as well as for the second year of field sampling for California's Estuary Marine Protected Areas (EMPA) monitoring program.

Monitoring data from the two programs will be combined to produce a comprehensive, holistic assessment of the extent and health of estuaries spanning the California coast, plus Baja California in Mexico.

Effort launched to build statewide program for monitoring estuary health

SCCWRP and its partners have begun working to establish a statewide monitoring program for coastal estuaries that is optimally responsive to the needs and priorities of managers.

During a workshop in October co-hosted by SCCWRP and the University of California, Davis, dozens of estuarine researchers and managers came together to formulate a common vision for estuarine monitoring that emphasizes producing managerially relevant, actionable data.

The workshop follows the publication earlier this year of a statewide monitoring framework intended to bring consistency to how California assesses the health of its coastal estuaries.

Although monitoring programs already are in place for estuary sites across California, these programs have never been coordinated statewide, limiting managers' ability to understand overall ecological health or compare the condition of individual sites.

A technical report summarizing the outcomes of the October workshop will be published in the coming months.

Effort launched to build network of Southern California estuary monitoring sites

SCCWRP and its partners have begun working to build a network of estuary monitoring sites across Southern California that can serve as sentinel indicators for how the region's coastal wetlands are being affected by environmental stressors brought on by climate change and human activities.

The sentinel site network, which researchers began building in September, will be optimized to generate long-term monitoring insights about coastal estuary health, including how Southern California's estuaries are being affected by sea level rise.

The sentinel site monitoring program, which will be run through the Southern California Wetlands Recovery Project, also is intended help improve coordination and data sharing among the many agencies involved with monitoring and managing the region's coastal estuaries.

Already, researchers have developed selection criteria for the sentinel sites and a list of recommended monitoring sites.

A field crew sorts through a trawl net at San Elijo Lagoon in San Diego County as part of a field training and intercalibration exercise that kicked off a pair of monitoring initiatives intended to generate comprehensive insights about the ecological health of coastal estuaries across California.

New SCCWRP Publications

Journal Articles

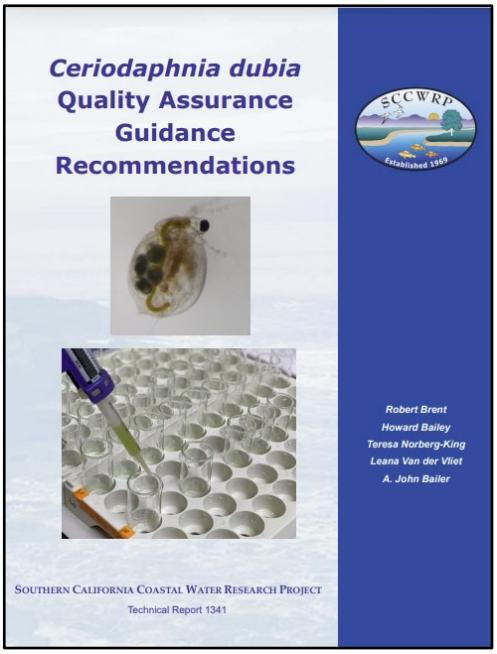
Diner, R.E., A.G. Zimmer-Faust, E. Cooksey, S. Allard, S.M. Kodera, E. Kunselman, Y. Garodia, M.P. Verhougstraete, A.E. Allen, J.F. Griffith, J.A. Gilbert. 2023. Host and Water Microbiota Are Differentially Linked to Potential Human Pathogen Accumulation in Oysters. *Applied and Environmental Microbiology* DOI:10.1128/aem.00318-23.

Rabe, A., S. Ravuri, E. Burnor, J.A. Steele, R.S. Kantor, S. Choi, S. Forman, R. Batjiaka, S. Jain, T.M. León, D.J. Vugia, and A.T. Yu. 2023 Correlation between wastewater and COVID-19 case incidence rates in major California sewersheds across three variant periods. *J Water Health* 21 (9): 1303–1317. DOI:

Rothman, J.A., A. Saghir, S. Chung, N. Boyajian, T. Dinh, J. Kim, J. Oval, V. Sharavanan, C. York, A.G. Zimmer-Faust, K. Langlois, J.A. Steele, J.F. Griffith, K.L. Whiteson. 2023. Longitudinal metatranscriptomic sequencing of Southern California wastewater representing 16 million people from August 2020–21 reveals widespread transcription of antibiotic resistance genes. *Journal of Water Research* 329:119421.

Seybold, E.C., A. Bergstrom, C. Nathan Jones, A.J. Burgin, S. Zipper, S.E. Godsey, W.K. Dodds, M.A. Zimmer, M. Shanafield, T. Datry, R.D. Mazor, M.L. Messager, J.D. Olden, A. Ward, S. Yu, K.E. Kaiser, A. Shogren, R.H. Walker. 2023. How low can you go? Widespread challenges in measuring low stream discharge and a path forward. *Limnology and Oceanography Letters* DOI:10.1002/lol2.10356.

Stein, E.D., C.L. Jerde, E. Andruszkiewicz Allan, A.J. Sepulveda, C.L. Abbott, M.R.



An expert science panel has developed best-practice recommendations for improving the quality and consistency of a toxicity test commonly used in California to monitor the water quality of treated wastewater and stormwater discharges. SCCWRP facilitated the panel's deliberations and published a SCCWRP technical report summarizing the panel's findings.

Baerwald, J. Darling, K.D. Goodwin, R.S. Meyer, M.A. Timmers, P.M. Thielen. 2023. Critical considerations for communicating environmental DNA science. *Environmental DNA* DOI:10.1002/edn3.472.

Zimmer-Faust, A.G., J.F. Griffith, J.A. Steele, B. Santos, Y. Cao, L. Asato, T. Chiem, S. Choi, A. Diaz, J. Guzman, D. Laak, M. Padilla, J. Quach-Cu, M. Woo, S.B. Weisberg. 2023. Relationship between coliphage and Enterococcus at southern California beaches and implications for beach water quality management. *Journal of Water Research* 230:119383.

Journal Articles (Accepted)

Gillett, D.J., S.B. Weisberg, S.R. Alin, D. Cadien, R. Velarde, K. Barwick, C. Larsen, A. Latker. 2023. Changes in the macrobenthic infaunal community of the Southern California continental margin over five decades in relation to oceanographic factors. *Marine Ecology Progress Series*.

Wolfand, J.M., A. Systema, K. Taniguchi-Quan, E.D. Stein, and T.S. Hogue. 2023. Impact of Wastewater Reuse on Contaminants of Emerging Concern in an Effluent-Dominated River. *Frontiers in Environmental Science – Freshwater Science*.

Technical Reports

Brent, R., H. Bailey, T. Norberg-King, L. Van der Vliet, A. John Bailer. 2023. Ceriodaphnia dubia Quality Assurance Guidance Recommendations. Technical Report 1341. Southern California Coastal Water Research Project. Costa Mesa, CA.

Mazor, R.D., J.S. Brown, R. Darling. 2023. Ecological conditions of dry streams in the Los Angeles region. Technical Report 1333. Southern California Coastal Water Research Project. Costa Mesa, CA.

Taniguchi-Quan, K.T., K. Irving, R. Darling, D. Kim, H. McMillan, E.D. Stein. 2023. Risk-Decision Framework for Evaluating Vulnerability of Streams to Hydrologic Alteration. Technical Report 1322. Southern California Coastal Water Research Project. Costa Mesa, CA.

Quarter in Review

Conference Presentations

Fassman-Beck, E. E. Tiernan, and K. Cherland. Measuring Effectiveness of Turf-Replacement BMPs to Minimize Dry and Wet Weather Runoff. EWRI Low Impact Development Conference. August 6-9, 2023. Oklahoma City, OK.

Fassman-Beck, E. and R. Winston. Permeable Pavement Maintenance: Synthesizing Knowledge for Practical Guidance. EWRI Low Impact Development Conference. August 6-9, 2023. Oklahoma City, OK

Schiff, K. Regional Assessment of Watershed Trash and Marine Debris in Southern California. California Stormwater Quality Association Annual Meeting. September 11-14, 2023. San Diego, CA.

Schiff, K. Novel Indicators for Tracking Human Sources of Fecal Pollution During Storm Events. California Stormwater Quality Association Annual Meeting. September 11-14, 2023. San Diego, CA.

Thornton Hampton, L.M. Current Status of Microplastics Analysis: A California-Based Perspective. SciX 2023 Conference. October 9, 2023. Reno, NV.

Conference Posters

Steele, J.A., K. Langlois, K.C. Schiff, and J.F. Griffith. Application of a Microbial Community Sequencing Approach to Identify Contamination from Sewers in an Urban Watershed. ASM Microbe, American Society for Microbiology. June 15-19, 2023. Houston, TX.

Other Presentations

Irving, K. Machine Learning in Flow-ecology. Emerging approaches in Ecological modelling workshop with the US Army Corp of Engineers. September 12, 2023. Vicksburg, MS.

Irving, K. Emerging approaches in Ecological modelling. U.S. Army Corp of Engineers. September 12-13, 2023. Vicksburg, MS.

Mehinto, A. *Ceriodaphnia dubia* Quality Assurance Guidance and Recommendations. State Water Resources Control Board, Board Meeting. October 17, 2023. Sacramento, CA.

Mehinto, A. Cell Assay Bioscreening in the Santa Ana Region. Santa Ana Watershed Project Authority Emerging Constituents Task Force. October 24, 2023. Via webinar.

Stein, E. and K. Taniguchi-Quan. The California Environmental Flows Framework (CEFF) and Flood Managed Aquifer Recharge (MAR): Managing Ecological Flood Flows. Flood-MAR Network's monthly Lunch-MAR series. September 6, 2023. Via webinar.

Stein, E., K. Schiff, and M. Sutula. Presentation on the state of the science for instream flows, nutrients & bacteria. 2023 California Waterkeeper Retreat. October 18-19, 2023. Pacific Grove, CA.

Stein, E. Workshop on the beneficial use of dredged material. U.S. Army Environmental Advisory Board. September 19-22, 2023. Portland, OR.

Taniguchi-Quan, K. From Sources to Streams: Scientific Perspectives on the LA River Watershed: The Development of Decision Support Tools for Flows in the Los Angeles River. 2023 State of the Los Angeles River Watershed Symposium. September 19, 2023. Los Angeles, CA.

Taniguchi-Quan, K. Presentation on the Los Angeles River Environmental Flows Project. WaterReuse Association - LA Chapter Meeting. October 10, 2023. Hacienda Heights, CA.

Thornton Hampton, L.M. Science to Inform the Management of Environmental Contaminants in California Waters. California State University Long Beach Seminar Series. September 21, 2023. Long Beach, CA.

Thornton Hampton, L.M. California Microplastic Monitoring Strategy. International Joint Commission Workshop: Towards a Monitoring Program for Microplastics in the Laurentian Great Lakes – Informing Field Methods. September 12-13, 2023. Ann Arbor, MI.

Walker, J. and E. Stein. Presentation on the overview of Statewide Estuarine Monitoring. California Estuarine Monitoring Workshop. August 28-29. Tiburon, CA.

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SCCWRP Personnel Notes

Commission

Jim Marchese, Acting Regulatory Affairs Manager for the City of Los Angeles Bureau of Sanitation, was named an Alternate Commissioner in October, replacing Dr. Mas Dojiri, who served on the SCCWRP Commission for nearly 22 years.

CTAG

Lauren Briggs, an Environmental Scientist for the Santa Ana Regional Water Quality Control Board, was appointed an Alternate CTAG Representative in October, filling a vacant position.

Scientific Leadership

Dr. **Kris Taniguchi-Quan** has been appointed to the Nature Conservancy's Actual Flows Statewide Modeling Technical Advisory Committee.

Dr. **David Gillett** has been appointed to the Alabama-Mississippi Sea Grant Alabama Center of Excellence 2023 Grant Technical Review Panel.

Dr. **Jan Walker** has been appointed co-chair of the California Estuary Monitoring Workgroup, a subcommittee of the California Water Quality Monitoring Council.

Dr. **Alvina Mehinto** has been appointed chair of the Genome Canada Research Oversight Committee for the project, iTrackDNA: Non-Destructive Precision Genomics for Environmental Impact Tracking in a Global Climate Change Era.

Ken Schiff has been appointed to the National Oceanic and Atmospheric Administration's Coastal Pollution Advisory Board.

Dr. **Alvina Mehinto** has been appointed to the Ph.D. committee of Julie Robitaille at the Institut National de la Recherche Scientifique, Québec, Canada.

New Faces

Dr. **Ryan Guillemette**, who just completed a postdoctoral research position with the U.S. Environmental Protection Agency, started in October as a joint Postdoctoral Scientist with SCCWRP's Biology Department and the University of Southern California. He will focus on examining how microbial communities affect the decay rate of marine environmental DNA (eDNA).

Promotions

Jerod Gray, who has been working as a part-time Laboratory Assistant in the Engineering Department since January, was promoted in September to a full-time Research Technician. He is finishing his coursework at California State University, Fullerton and is expected to graduate with a bachelor's in civil engineering next spring.

Nicholas Lombardo, who has been working as a part-time IT assistant since 2022, was promoted in October to a full-time Data Analyst in the Biogeochemistry Department. He recently graduated from California State University, Fullerton with a master's in statistics.

Departures

Adam Babcock, who has worked at SCCWRP since 2021, most recently as a Research Technician in the Microbiology Department, will leave SCCWRP in November.

Kelsey Cherland, who has worked at SCCWRP since 2022, most recently as a Data Analyst for SCCWRP's IT and data management team, will leave SCCWRP in November.

SCCWRP PARTNER SPOTLIGHT

Professor refines microplastics sampling system

With more than 30 years of experience in civil and environmental engineering, Dr. Robert Andrews has expertise in developing treatment systems as well as methods for monitoring emerging contaminants such as microplastics in drinking water.

Dr. Robert Andrews

After working with public utilities for three years, Andrews went into academia to establish his own research group and work with graduate students who shared his vision.

He currently co-leads the Drinking Water Research Group (DWRG) at the University of Toronto and collaborates with researchers around the world on drinking water projects, evaluating new treatment technologies to address emerging contaminants, with a recent focus on microplastic sampling and analysis.

"Water treatment facilities are effective at removing larger particles of plastics coming in, but we're mostly concerned with the water that's produced and consumed by the public," said Andrews, a Professor in the Department of Civil & Mineral Engineering at the University of Toronto. "Treatment processes that are currently in use were not specifically designed to remove very small particles such as microplastics."

A few years ago, his research group refined a system for sampling microplastic particles that utilizes a closed canister design to eliminate environmental contamination. The design is pressurized to help pass water through smaller pore sizes, enabling researchers to collect and examine microplastic particles as small as 1 µm.

"Other people have developed similar systems; we created a system that is fairly robust for use under field conditions," Andrews said. "We built something that just works."

Andrews was invited by Dr. Chelsea Rochman, his colleague from the University of Toronto and a SCCWRP research partner, to serve as a technical expert for drinking water. Since then, he has collaborated with SCCWRP in an effort to develop standarized microplastics measurement methods for drinking water.

Dr. Robert Andrews races his white 2010 Dodge Challenger in the National Hot Rod Association drag racing series. Andrews has competed in races in Canada and the United States for the past 11 years.

Robert Andrews, Ph.D., P.E.

Job: Professor, Department of Civil & Mineral Engineering, University of Toronto (started 1993)

SCCWRP role: SCCWRP collaborator investigating microplastics in drinking water

Prior jobs: Associate Chair of Research, University of Toronto (2004-2008); Associate Professor, University of Toronto (1997-2002); Assistant Professor, University of Toronto (1993-1997); Research Engineer, EPCOR (1990-1993)

Education: Ph.D. civil engineering, University of Alberta (1990); M.A.Sc. civil engineering, University of Alberta (1987); B.A.Sc. civil engineering, University of Regina (1983)

Residence: Burlington, Ontario, Canada

Hometown: Hamilton, Ontario, Canada

Family: Wife Susan, civil engineering professor at the University of Toronto; dog Piper, an 8-year-old giant schnauzer

Hobbies: Drag racing; traveling

Most recently, Andrews is partnering with SCCWRP on a study assessing two sampling methods for measuring microplastics in drinking water: an open-sieve system approved by the American Society for Testing and Materials (ASTM) and the canister system refined by his research group. The University of Toronto will collect microplastics using both methods and send selected samples to SCCWRP for analysis.

"The existing open-sieve system was initially designed for wastewater and for looking at much larger particles than what we're examining in drinking water," Andrews said. "We hope to bring attention to the need to constantly evolve microplastic sampling methods based on their specific application."

Andrews' interest in water research stems from an early passion in tropical fishkeeping, where he learned how to properly monitor and control pH and alkalinity levels in order to maintain the water quality in his aquariums. In his spare time, Andrews competes in drag races across North America with his wife Susan, who serves as the "crew chief" and analyzes performance data. During the racing offseason, they enjoy traveling to the Carribean islands - especially Saint Barthelemy Island - to escape the cold Canadian winter.

SCCWRP STAFF SPOTLIGHT

Microbiologist sequences eDNA in microbiomes

While at Stanford University for her undergraduate degree in biology, Dr. Nastassia Patin didn't know what she wanted to specialize in, but was open to exploring different research ideas.

Dr. Nastassia Patin

It was after a memorable summer internship in Germany with the Max Planck Institute for Marine Microbiology – where she worked with symbiotic bacteria in marine sponges – that she found her calling in marine microbiology.

Patin became fascinated with marine microbiomes and began exploring how culture-independent methods can be used to study these communities through DNA sequencing and bioinformatic approaches.

Patin started in April as a joint Scientist in SCCWRP's Biology Department and at the Scripps Institution of Oceanography, and will continue the work of Dr. Zachary Gold, who left SCCWRP in 2022 after being recruited for a leadership role at NOAA's Pacific Marine Environmental Laboratory.

She recently wrapped up her postdoc with the NOAA Southwest Fisheries Science Center, where she sequenced environmental DNA – DNA left behind by aquatic organisms in their environment – from the California Current to understand how microbes and other organisms respond to environmental changes like warming water temperatures.

"The approaches for metabarcoding fish and plankton are very similar so it wasn't too difficult to take the next step from microbes, but there are differences too," Patin said. "It's been a challenging but fun journey to learn more about eDNA and how it can help us better understand and manage marine ecosystems."

Dr. Nastassia Patin at a checkpoint during a summer hike in the Swiss Alps in 2020.

Nastassia Patin, Ph.D.

Job: Scientist, SCCWRP Biology Department and Scripps Institution of Oceanography (started April 2023)

Prior jobs: Postdoctoral Researcher, Southwest Fisheries Science Center in La Jolla (2020-2023); Postdoctoral Researcher, Georgia Institute of Technology (2016-2020)

Education: Ph.D. marine biology, University of California, San Diego (2016); M.S. marine biology, San Francisco State University (2011); B.S. biological sciences, Stanford University (2008)

Residence: San Diego

Hometown: Geneva, Switzerland

Hobbies: Cycling; cooking; surfing; reading

Patin is working to align eDNA sampling, processing, sequencing, and analysis methods between SCCWRP and the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program, a biomonitoring survey led jointly by Scripps, NOAA, and the California Department of Fish and Wildlife.

She is expanding this effort to include other West Coast biodiversity surveys as part of the West Coast Ocean Biomolecular Observation Network (West Coast OBON). By applying eDNA approaches harmonized among different surveys, researchers will be better equipped to provide biodiversity results to managers and end users.

Patin first learned of SCCWRP during her Ph.D. program at Scripps when she attended a presentation from SCCWRP on ddPCR (droplet digital polymerase chain reaction) experiments. Her NOAA adviser, Dr. Kelly Goodwin, has also partnered closely with SCCWRP on eDNA research.

With this partnership between Scripps and SCCWRP, Patin looks forward to advancing the eDNA field as a whole and bringing the methods and approaches for both monitoring programs together.

"Every lab has its own idea of eDNA sampling, processing and analysis, so there is a lot of interest in bringing people together to determine what are the best practices and guidelines for eDNA work," Patin said.

Patin was born in Geneva, Switzerland, but has never lived there and moved around growing up. She now lives in San Diego and plans to commute to SCCWRP at least once a week. When she is not working, Patin likes cycling with her road and gravel bicycles, surfing and hanging out with her two cats, Gidget and Diego.

SCCWRP SCENES

Shaping SCCWRP's future directions

The SCCWRP Commission met in October for its sixth strategic planning retreat, an all-day meeting that is held approximately every five to seven years to assess the organization's overall direction, ensure SCCWRP is aligned and responsive to its mission, and help shape the future trajectory of the organization. Commissioners engaged in six hours of in-depth discussions about various aspects of SCCWRP's operations, including how SCCWRP should be interacting with organizations that are not SCCWRP member agencies and the appropriateness of the strategy that informs how SCCWRP communicates with key audiences.

Above, the SCCWRP Commission gathers in the Large Conference Room at SCCWRP to discuss the organization's overall direction at a strategic planning retreat in October. Right, Commissioners and SCCWRP staff mingle during a lunch break on SCCWRP's outdoor patio.