Public Utilities

Interim Receiving Waters Monitoring Report for the Point Loma and South Bay Ocean Outfalls

2024

Environmental Monitoring and Technical Services
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The City of
SAN DIEGO
Public Utilities Department
Environmental Monitoring & Technical Services Division

June 30, 2025

Mr. David W. Gibson, Executive Officer
California Regional Water Quality Control Board
San Diego Region
2375 Northside Drive, Suite 100
San Diego, CA 92108

Attention: POTW Compliance Unit

Dear Mr. Gibson:

Enclosed is the 2024 Interim Receiving Waters Monitoring and Assessment Report for the Point Loma and South Bay Ocean Outfalls, as per requirements set forth in the following Orders/Permits:

(1) Order No. R9-2017-0007 (as amended by Order No. R9-2022-0078) for the City of San Diego's Point Loma Wastewater Treatment Plant (NPDES No. CA0107409).
(2) Order No. R9-2021-0011 for the City's South Bay Water Reclamation Plant (NPDES No. CA0109045).
(3) Order No. R9-2021-0001 for the United States Section of the International Boundary and Water Commission's South Bay International Wastewater Treatment Plant (NPDES No. CA0108928).

This combined report for the Point Loma and South Bay outfall regions contains data summaries, analyses, and assessments for all portions of the Ocean Monitoring Program conducted during 2024. Additional data in support of this report will be submitted separately to either the Regional Water Quality Control Board or the California Environmental Data Exchange Network (CEDEN) in accordance with the aforementioned permits.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have questions regarding this report, please call Dr. Ryan Kempster, the City's Senior Marine Biologist at (619) 758-2329.

Sincerely,

Peter S. Vroom, Ph.D.
Deputy Director, Public Utilities Department

PV/rk

cc: U.S. Environmental Protection Agency, Region 9
International Boundary and Water Commission, U.S. Section

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Point Loma Wastewater Treatment Plant
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as amended by Order No. R9-2022-0078)

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South Bay International Wastewater Treatment Plant
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Prepared by:

City of San Diego Ocean Monitoring Program

Environmental Monitoring & Technical Services Division

Ryan Kempster, Managing Editor

June 2025

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Executive Summary

Executive Summary

The City of San Diego (City) conducts an extensive Ocean Monitoring Program to evaluate potential environmental effects associated with the discharge of treated wastewater to the Pacific Ocean via the Point Loma and South Bay Ocean Outfalls (PLOO and SBOO, respectively). Data collected are used to determine compliance with receiving water quality requirements, as specified in National Pollutant Discharge Elimination System (NPDES) permits, and associated orders; these permits and orders are issued by the San Diego Regional Water Quality Control Board (SDRWQCB) and the U.S. Environmental Protection Agency (USEPA) for the City's Point Loma Wastewater Treatment Plant (PLWTP), South Bay Water Reclamation Plant (SBWRP), and the South Bay International Wastewater Treatment Plant (SBIWTP), which is operated by the U.S. Section of the International Boundary and Water Commission (USIBWC). Treated effluent from both the SBWRP and SBIWTP commingle before discharge to the ocean via the SBOO, thus a single monitoring and reporting program, approved by the SDRWQCB and USEPA, is conducted to comply with these two permits.

The principal objectives of the combined ocean monitoring efforts for both the PLOO and SBOO are to: (1) measure and document compliance with NPDES permit requirements and California Ocean Plan (Ocean Plan) water quality objectives and standards; (2) track movement and dispersion of the wastewater plumes discharged via the outfalls; (3) assess any impact of wastewater discharge on the local marine ecosystem, including effects on coastal water quality, seafloor sediments, and marine life.

Although governed by three separate NPDES permits, this interim report summarizes the purpose, scope, methods, and findings of all receiving waters monitoring conducted for the PLOO and SBOO regions from January through December 2024. A full biennial monitoring and assessment report covering calendar years 2024 and 2025 will be produced and submitted to the San Diego Water Board and USEPA no later than July 1, 2026. Specific details of the primary ocean monitoring activities conducted during 2024 are presented in the following five chapters herein, while additional data are presented in Appendices A–D. All raw data for the 2024 sampling period will be submitted to either the SDRWQCB or the California Environmental Data Exchange Network (CEDEN) and may be accessed upon request. Chapter 1 provides a general introduction and overview of the combined PLOO and SBOO program. Chapter 2 presents data characterizing the results of water quality monitoring at 103 different shore or offshore stations located throughout the two regions. This includes measuring concentrations of fecal indicator bacteria in seawater samples and collecting various types of oceanographic data to evaluate dispersal of the PLOO and SBOO wastewater plumes and to assess compliance with Ocean Plan water contact standards. Assessments of benthic sediment quality (e.g., sediment chemistry, particle size distributions) and the ecological status of macrobenthic invertebrate communities at 49 core monitoring stations are presented in Chapter 3. Chapter 4 presents the results of trawling activities conducted at 13 different monitoring stations to assess the health and status of bottom dwelling (demersal) fish and megabenthic invertebrate communities. Contaminants in marine fishes collected from trawl and rig fishing stations are presented in Chapter 5.

Overall, the state of San Diego's coastal ocean waters remained in good condition in 2024 and were generally within historical ranges reported for the PLOO and SBOO monitoring regions, based on the preliminary findings and conclusions summarized in this report. Results for both the PLOO and SBOO regions were consistent with conditions documented in previous years, and there were few changes to local receiving waters, benthic sediments, and marine invertebrate and fish communities that could be attributed to wastewater discharge or other human activities. Coastal water quality conditions and compliance with Ocean Plan standards were consistent with previous years, with generally higher compliance in the PLOO region and at offshore stations compared to stations along the shore particularly in the South Bay. There continues to be no evidence suggesting that wastewater plumes from either of the two outfalls were transported into nearshore recreational waters. There were also no clear outfall related patterns in sediment contaminant distributions or differences between invertebrate and fish assemblages at the different monitoring sites. Additionally, benthic habitats surrounding both outfalls, and throughout the entire San Diego region, remained in good overall condition similar to reference conditions for much of the Southern California Bight. Finally, the low levels of contaminant accumulation and general lack of physical anomalies, or other symptoms of disease or stress in local fishes was also indicative of a healthy marine environment off San Diego.

Chapter 1
General Introduction

Chapter 1. General Introduction

Program Requirements & Objectives

Ocean monitoring within the Point Loma and South Bay outfall regions is conducted by the City of San Diego (City) in accordance with requirements set forth in National Pollution Discharge Elimination System (NPDES) permits and associated orders for the following: the Point Loma Wastewater Treatment Plant (PLWTP), the South Bay Water Reclamation Plant (SBWRP), and the South Bay International Wastewater Treatment Plant (SBIWTP), which is owned and operated by the U.S. Section of the International Boundary and Water Commission (USIBWC) (see Table 1.1). These documents specify the terms and conditions that allow treated effluent to be discharged to the Pacific Ocean via the Point Loma Ocean Outfall (PLOO) and South Bay Ocean Outfall (SBOO). In addition, the Monitoring and Reporting Program (MRP), included within each of these orders, defines the requirements for monitoring ocean (receiving) waters surrounding the two outfalls. These requirements include sampling design, frequency of sampling, field operations and equipment, regulatory compliance criteria, types of laboratory tests and analyses, data management and analysis, statistical methods and procedures, environmental assessment, and reporting guidelines.

The combined ocean monitoring program for these regions is designed to assess the impact of treated wastewater discharged through the PLOO and SBOO on the coastal marine environment off San Diego. The main objectives of the program are to: (1) measure and document compliance with NPDES permit requirements and California Ocean Plan (Ocean Plan) water quality objectives and standards; (2) track movement and dispersion of the wastewater plumes discharged via the outfalls; (3) assess any impact of wastewater discharge on the local marine ecosystem, including effects on coastal water quality, seafloor sediments, and marine life. These data are used to evaluate and document any potential effects of treated wastewater discharge, or other anthropogenic inputs (e.g., storm water discharge, urban runoff), and natural influences (e.g., seasonality, climate change) on coastal water quality, seafloor sediment conditions, and local marine organisms.

Background

Point Loma Ocean Outfall

The City began operation of the PLWTP and original PLOO off Point Loma in 1963, at which time treated effluent was discharged approximately 3.9 km west of the Point Loma peninsula at a depth of around 60 m. The PLWTP operated as a primary treatment facility from 1963 to 1985, after which it was upgraded to advanced primary treatment between mid-1985 and July 1986. This improvement involved the addition of chemical coagulation to the treatment process, which resulted in an increase in removal of total suspended solids (TSS) to about 75%. Since then, the treatment process has continued to be improved with the addition of more sedimentation basins, expanded aerated grit removal, and refinements in chemical treatment, which together further reduced mass emissions from the plant. For example, TSS removals are now consistently greater than the 80%, as required by the NPDES permit.

The structure of the PLOO was significantly modified in the early 1990s when it was extended about 3.3 km farther offshore in order to prevent intrusion of the waste field into nearshore waters and to increase compliance with Ocean Plan standards for water-contact sports areas. Discharge from the original 60-m terminus was discontinued in November 1993 following completion of the outfall extension. Currently, the PLOO extends approximately 7.2 km west of the PLWTP to a depth of around 94 m, where the main outfall pipe splits into a Y-shaped (wye) multiport diffuser system. The two diffuser legs extend an additional 762 m to the north and south, each terminating at a depth of about 98 m. The average discharge of effluent through the PLOO in 2024 was ~148 million gallons per day (mgd).

South Bay Ocean Outfall
The SBOO is located just north of the international border between the United States and Mexico where it terminates approximately 5.6 km offshore and west of Imperial Beach at a depth of around 27 m. Unlike other southern California ocean outfalls that lie on the surface of the seafloor, the SBOO pipeline begins as a tunnel on land that extends from the SBWRP and SBIWTP facilities to the coastline, after which it continues beneath the seabed 4.3 km offshore. The outfall pipe connects to a vertical riser assembly that conveys effluent to a pipeline buried just beneath the surface of the seafloor. This subsurface pipeline then splits into a Y-shaped (wye) multiport diffuser system with the two diffuser legs each extending an additional 0.6 km to the north or south. The SBOO was originally designed to discharge wastewater through 165 diffuser ports and risers, which included one riser at the center of the wye and 82 risers spaced along each diffuser leg. Since discharge began, however, low flow rates have required closure of all ports along the northern diffuser leg and many along the southern diffuser leg in order for the outfall to operate effectively. Consequently, wastewater discharge is restricted primarily to the distal end of the southern diffuser leg and to a few intermediate points at or near the center of the wye. The average discharge of effluent through the SBOO in 2022 was about ~26.3 mgd, including 3.0 mgd of secondary and tertiary treated effluent from the SBWRP, and 23.3 mgd of secondary treated effluent from the SBIWTP.

Receiving Waters Monitoring

The total area for the PLOO and SBOO monitoring program covers approximately 881 km² (~340 mi²) of coastal marine waters from Northern San Diego County into Northern Baja California. Core monitoring for the Point Loma region is conducted at 82 different stations, located from the shore to a depth of around 116 m. Core monitoring for the South Bay region is conducted at a total of 53 stations, ranging from the shore to depths of around 61 m (Figure 2.1). Each of the core monitoring stations is sampled for specific parameters as stated in their respective MRPs. A summary of the results for all quality assurance procedures performed during 2024, in support of these requirements, can be found in City of San Diego (2025). Data files, detailed methodologies, completed reports, and other pertinent information submitted to the San Diego Regional Water Quality Control Board (SDRWQCB) and the U.S. Environmental Protection Agency (USEPA), during the past year, are available on the City website (http://www.sandiego.gov/oceanmonitoring), via the California Environmental Data Exchange Network (CEDEN), and may also be provided upon request.

Prior to 1994, the City conducted an extensive ocean monitoring program off Point Loma surrounding the original 60-m discharge site. This program was subsequently expanded with the construction and operation of the deeper outfall, as discussed previously. Data from the last year of regular monitoring near the original PLOO discharge site are presented in City of San Diego (1995b), while the results of a 3-year "recovery study" are summarized in City of San Diego (1998). Additionally, a more detailed assessment of spatial and temporal patterns surrounding the original discharge site is available in Zmarzly et al. (1994). From 1991 through 1993, the City also conducted "pre-discharge" monitoring for the new PLOO discharge site in order to collect baseline data prior to wastewater discharge into these deeper waters (City of San Diego 1995a,b). All permit mandated ocean monitoring for the South Bay region has also been performed by the City since wastewater discharge through the SBOO began in 1999; this included pre-discharge monitoring for 3½ years (July 1995–December 1998) in order to provide background information against which post-discharge conditions could be compared (City of San Diego 2000). Results of NPDES mandated monitoring for the extended PLOO from 1994 to 2019, and the SBOO from 1999 to 2019, are available in previous annual receiving waters monitoring reports (e.g., City of San Diego 2024a). Finally, additional detailed assessments of the PLOO region have been completed as part of past modified NPDES permit renewal applications for the PLWTP submitted by the City and subsequent technical decisions issued by the USEPA (e.g., City of San Diego 2015a, USEPA 2017).

The City has also conducted annual region-wide surveys off the coast of San Diego since 1994, either as part of regular outfall monitoring requirements (e.g., City of San Diego 1999, 2024a), or as part of larger multi-agency surveys of the entire Southern California Bight (SCB). The latter include the 1994 Southern California Bight Pilot Project (Allen et al. 1998, Bergen et al. 1998, 2001, Schiff and Gossett 1998) and subsequent Bight'98, Bight'03, Bight'08, Bight'13, Bight'18, and Bight'23 programs in 1998, 2003, 2008, 2013, 2018, and 2023 respectively (Allen et al. 2002, 2007, 2011, Noblet et al. 2002, Ranasinghe et al. 2003, 2007, 2012, Schiff et al. 2006, 2011, Dodder et al. 2016, Gillett et al. 2017, Walther et al. 2017, BSQPC 2018, SCCWRP 2023). These large-scale surveys are useful for characterizing the ecological health of diverse coastal areas to distinguish reference sites from those impacted by wastewater or storm water discharges, urban runoff, or other sources of contamination. In addition to the above activities, the City participates as a member of the Region Nine Kelp Survey Consortium to fund aerial surveys of all the major kelp beds in San Diego and Orange Counties (e.g., MBC Applied Environmental Sciences 2020).

Special Studies & Enhanced Monitoring

The City has actively participated in, or supported, numerous important special projects, or enhanced ocean monitoring studies, over the past 10 years or more. Many of these projects to date were identified as part of a scientific review of the City's Ocean Monitoring Program, conducted by the Scripps Institution of Oceanography (SIO) and other participating institutions (SIO 2004). This review evaluated the environmental monitoring needs of the region, and recommended special projects based on priorities identified. Examples of special projects currently underway, or being initiated include:

San Diego Kelp Forest Ecosystem Monitoring Project: This project represents continuation of a long-term commitment by the City to support important research conducted on local kelp forests by SIO. This work is essential to assessing the health of San Diego's kelp forests and monitoring the effects of wastewater discharge on the local coastal ecosystem relative to other anthropogenic and natural influences (see City of San Diego 2024a: Appendix A).

Real-Time Oceanographic Mooring Systems (RTOMS) for the PLOO and SBOO: This project addresses recommendations that the City should improve monitoring of the fate and behavior of wastewater discharged to the ocean via the SBOO (Terrill et al. 2009) and PLOO (Rogowski et al. 2012a, 2012b, 2013). The project involves the deployment of RTOMS at the terminal ends of the PLOO and SBOO to provide real time data on ocean conditions. The project began in late 2015 with initial deployment of the SBOO mooring in December 2016 and the PLOO mooring in March 2018. This project is being conducted in partnership with SIO, who presently operate a similar mooring system off Del Mar. The project is expected to significantly enhance the City's environmental monitoring capabilities in order to address current and emerging issues relevant to the health of San Diego's coastal waters, including plume dispersion, subsurface current patterns, ocean acidification, hypoxia, nutrient sources, and coastal upwelling. Additional details are available in the approved Plume Tracking Monitoring Plan for the project (City of San Diego 2018b) and City of San Diego 2024a: Appendix E.

Sediment Toxicity Monitoring of the San Diego Ocean Outfall Regions: This project started with a 3-year pilot study implemented as a new joint regulatory requirement for the Point Loma and South Bay outfall regions in 2015. Findings for the 2016–2018 pilot study (City of San Diego 2015b) were summarized in a final project report (City of San Diego 2019) that included recommendations for continued sampling through 2023. The City subsequently recommended continued sampling through 2028 with results being reported as part of the City's Biennial Receiving Waters Monitoring Report (see City of San Diego 2024a: Appendix H).

Remote Sensing of the San Diego/Tijuana Coastal Region: This project represents a long-term effort, funded by the City and the USIBWC since 2002, to utilize satellite and aerial imagery to better understand regional water quality conditions off San Diego. The project is conducted by Ocean Imaging (Littleton, CO), and is focused on detecting and tracking the dispersion of wastewater plumes from local ocean outfalls and nearshore sediment plumes caused by stormwater runoff or outflows from local bays and rivers (Hess 2019, 2020). Additional information can be found in City of San Diego 2024a: Appendix B.

Euphotic Zone Study: This multi-phase project aims to study the depth of the euphotic zone in the receiving waters to evaluate whether nutrients from the discharge plume reach the euphotic zone and thereby potentially stimulate phytoplankton productivity. Phase One of this study focused on a review of existing data and scientific literature to estimate the depth of the euphotic zone in the PLOO region. Based on the findings of this review, the City of San Diego prepared a Phase Two work plan to propose a study to fill data gaps identified from Phase One, which included receiving waters monitoring (City of San Diego, 2024b). The Phase Two workplan is currently underway with expected completion by December 1, 2027.

Report Components & Organization

This report presents summaries of the results of all receiving waters monitoring activities conducted during January–December 2024 for both the Point Loma and South Bay outfall regions. A more comprehensive assessment, including detailed comparisons of long-term spatial and temporal changes and trends, will be prepared as part of the Biennial Receiving Waters Monitoring and Assessment Report for 2024–2025 to be submitted to the San Diego Water Board and USEPA by July 1, 2026. Included herein are results from all regular core stations that comprise the fixed-site monitoring grids surrounding the two outfalls (Figure 2.1), as well as results from the 2024 summer benthic survey of randomly selected sites that range from near the USA/Mexico border to northern San Diego County (Figure 3.1). The major components of the combined PLOO and SBOO monitoring program are covered in the following chapters and associated appendices of this report: Executive Summary; General Introduction

(Chapter 1); Water Quality (Chapter 2, Appendix A); Benthic Conditions (Chapter 3, Appendix B); Demersal Fishes and Megabenthic Invertebrates (Chapter 4, Appendix C); Contaminants in Marine Fishes (Chapter 5, Appendix D).

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Chapter 1

Figures & Tables

Table 1.1

NPDES permits and associated orders issued by the San Diego Water Board for the Point Loma Wastewater Treatment Plant (PLWTP), South Bay Water Reclamation Plant (SBWRP), and South Bay International Wastewater Treatment Plant (SBIWTP) discharges to the Pacific Ocean via the PLOO and SBOO.

Facility	Outfall	NPDES Permit No.	Order No.	Effective Dates
PLWTP	PLOO	CA0107409	R9-2017-0007[a]	October 1, 2017–September 30, 2022
SBWRP	SBOO	CA0109045	R9-2021-0011	July 1, 2021–June 30, 2026
SBIWTP	SBOO	CA0108928	R9-2021-0001	July 1, 2021–June 30, 2026

[a] As amended by Order No. R9-2022-0078; administratively extended until superseded by another Order.

Chapter 2
Water Quality

Chapter 2. Water Quality

Introduction

The City of San Diego conducts extensive monitoring along the shoreline and in offshore coastal waters surrounding the Point Loma and South Bay Ocean Outfalls (PLOO and SBOO, respectively) to characterize regional water quality conditions and to identify possible impacts of wastewater discharge or other contaminant sources on the marine environment. In addition, the City's water quality monitoring efforts are designed to assess compliance with the water contact standards specified in the California Ocean Plan (Ocean Plan) to protect the beneficial uses of California's ocean waters (SWRCB 2019). This chapter presents summaries and preliminary analyses of the oceanographic and microbiological data collected during calendar year 2024 at a total of 103 water quality monitoring stations and two real-time oceanographic mooring systems (RTOMS) surrounding the PLOO and SBOO. Supplemental analyses supporting these results are presented in Appendix A. A more comprehensive assessment of these results will be presented in the 2024–2025 Biennial Assessment Report to be submitted by July 1, 2026.

Materials and Methods

Field Sampling

Shore Stations

Seawater samples were collected weekly at 19 shore stations to monitor concentrations of fecal indicator bacteria (FIB) in waters adjacent to public beaches (Figure 2.1). Sixteen of these stations are in California State waters and are therefore subject to Ocean Plan water contact standards (Table 2.1, Table 2.2, SWRCB 2019). These include eight PLOO stations (D4, D5, D7, D8 [D8/D8-A/D8-B], D9, D10, D11, D12) located from Mission Beach southward to the tip of Point Loma and eight SBOO stations (S4, S5, S6, S8, S9, S10, S11, S12) located between the USA/Mexico border and Coronado. Over the past several years, due to increasing instability in some cliffside areas of Point Loma, City staff have periodically been unable to safely access and sample some stations. As a result, after consultation with and approval by the Regional Board, the sampling location has varied between D8, D8-A and D8-B. Throughout the current reporting period, the sampling took place at D8-B. The remaining three SBOO shore stations (S0, S2, S3) are located south of the international border and are not subject to Ocean Plan requirements.

Seawater samples were collected from the surf zone at each of the above stations in sterile 250-mL bottles, after which they were transported on blue ice to the City's Marine Microbiology Laboratory and analyzed to determine concentrations of three types of FIB (i.e., total coliform, fecal coliform, and *Enterococcus* bacteria). In addition, weather conditions and visual observations of water color, surf height, and human/animal activity were recorded at the time of collection. These observations have been previously reported in monthly receiving waters monitoring reports submitted to the San Diego Regional Water Quality Control Board (SDRWQCB) (see City of San Diego 2024–2025a,b), and are available online (City of San Diego 2025b).

Kelp and Offshore Stations

Fifteen stations located in relatively shallow waters within or near the Point Loma or Imperial Beach kelp forests (i.e., referred to as “kelp” stations herein) were monitored weekly to assess water quality conditions and Ocean Plan compliance in nearshore areas used for recreational activities, such as SCUBA diving, surfing, fishing, and kayaking (Figure 2.1). These included PLOO stations C4, C5, and C6 located along the 9-m depth contour near the inner edge of the Point Loma kelp forest; PLOO stations A1, A6, A7, C7 and C8 located along the 18-m depth contour near the outer edge of the kelp forest; SBOO stations I25, I26 and I39 located at depths of 9–18 m contiguous to the Imperial Beach kelp bed; SBOO stations I19, I24, I32 and I40 located in other nearshore waters along the 9-m depth contour in the South Bay region.

An additional 69 offshore stations were sampled quarterly to monitor water quality conditions and to estimate dispersion of the PLOO and SBOO wastewater plumes. These stations were monitored during February, May, August, and November in 2024 with the 36 PLOO and 33 SBOO stations sampled over three to five days during each survey (Table 2.3, Table 2.4). Stations F1–F36 are arranged in a grid surrounding the PLOO along or adjacent to the 18, 60, 80 and 98-m depth contours, while stations I1–I40 are arranged in a grid surrounding the SBOO along the 9, 19, 28, 38 and 55-m depth contours (Figure 2.1). Of these, 15 of the PLOO stations (i.e., F01–F03, F06–F14, F18–F20) and 15 of the SBOO stations (i.e., I12, I14, I16–I18, I22–I23, I27, I31, I33–I38) are located within State jurisdictional waters (i.e., within 3 nautical miles of shore) and therefore subject to the Ocean Plan compliance standards.

Seawater samples for FIB analyses were collected from 3 to 5 discrete depths at the kelp and offshore stations as indicated in Tables 2.3 and 2.4. These samples were typically collected using a rosette sampler fitted with Niskin bottles surrounding a central conductivity, temperature, and depth instrument (CTD), although replacement samples due to misfires or other causes may have been collected from a separate follow-up cast using stand-alone Van Dorn bottles if necessary. All weekly kelp/nearshore samples and quarterly offshore SBOO samples were analyzed for all three types of FIB, while the quarterly offshore PLOO samples were only analyzed for *Enterococcus* per permit requirements. All FIB samples were refrigerated at sea and then transported on blue ice to the City’s Marine Microbiology Lab for processing and analysis. Oceanographic data were collected simultaneously with the water samples at each station using the central CTD in the rosette sampler (see below). Visual observations of weather, sea conditions, and human/animal activity were also recorded at the time of sampling. These observations have been previously reported in monthly receiving waters monitoring reports submitted to the SDRWQCB (see City of San Diego 2024–2025a,b), and are available online (City of San Diego 2025b).

Oceanographic data were collected using a SeaBird SBE 25 Plus CTD. The CTD was lowered through the water column at each station to collect continuous measurements of water temperature, conductivity (used to calculate salinity), pressure (used to calculate depth), dissolved oxygen (DO), pH, transmissivity (a proxy for water clarity), chlorophyll *a* fluorescence (a proxy for phytoplankton), and colored dissolved organic matter (CDOM). Vertical profiles of each parameter were constructed for each station, per survey, by averaging the data values recorded within each 1-m depth bin. This level of data reduction ensures that physical measurements used in subsequent analyses will correspond to discrete sampling depths required for bacterial monitoring (see above).

Real-time Oceanographic Mooring Systems

Two RTOMS were deployed at the terminal ends of the PLOO and SBOO (Figure 2.1). The PLOO RTOMS was anchored at a depth of approximately 100 m, just east of the northern diffuser leg, and the SBOO RTOMS was anchored at a depth of approximately 30 m, just west of the southern diffuser leg terminus. Each mooring was deployed for a period of approximately one year. The fifth PLOO deployment occurred from December 20, 2023, to December 9, 2024, and the fifth SBOO deployment occurred from June 29, 2023, to May 21, 2024. The sixth SBOO deployment began on July 30, 2024, and is on-going. Each RTOMS was outfitted with a series of instruments/sensors at fixed depths (Table 2.5). Critical parameters that were measured on a real-time basis, by both systems, included temperature, conductivity (salinity), total pH, DO, dissolved carbon dioxide (xCO2), nitrogen (nitrate + nitrite), chlorophyll *a*, CDOM, and current direction and velocity. Note that pH is reported in total scale from moored instruments with a more accurate calibration and measurement method for seawater, while pH has been reported in National Bureau of Standards (NBS) scale from CTD casts, and it is not recommended to convert between these scales (Marion et al. 2011). All parameters were recorded at 10-minute intervals, with the exception of nitrate + nitrite and xCO2, which were recorded at 1-hour intervals, and the surface chlorophyll and CDOM, which were recorded at 20-minute intervals due to power limitations. Equipment problems and sensor failures resulted in data gaps, and RTOMS data presented here include data collected in real-time and downloaded data, if available. For a summary of data issues and additional information on specific sensor issues and challenges experienced, see Appendix A.1 and City of San Diego 2025a. All raw RTOMS data for the 2024 sampling period are available on request and will be posted to the City's Open Data Portal in July of 2025.

Laboratory Analyses

The City's Marine Microbiology Laboratory follows guidelines issued by the U.S. Environmental Protection Agency (USEPA) Water Quality Office, and the California Department of Public Health (CDPH), and Environmental Laboratory Accreditation Program (ELAP) with respect to sampling and analytical procedures (Bordner et al. 1978, APHA 2005, 2012, CDPH 2000, USEPA 2006). All bacterial analyses were initiated within eight hours of sample collection and conformed to standard membrane filtration techniques (APHA 2012).

FIB densities were determined and validated in accordance with USEPA and APHA guidelines (Bordner et al. 1978, APHA 2005, 2012, USEPA 2006). Plates with FIB counts above or below the ideal counting range were given greater than (>), greater than or equal to (≥), less than (<), or estimated (e) qualifiers. However, all qualifiers were dropped, and densities treated as discrete values when determining compliance with Ocean Plan standards.

Quality assurance tests were performed routinely on bacterial samples to ensure that analyses and sampling variability did not exceed acceptable limits. Laboratory and field duplicate bacteriological samples were processed according to method requirements to measure analyst precision and variability between samples, respectively. Results of these procedures were reported in a separate report (City of San Diego 2025a).

Data Analyses

Oceanographic Conditions

Water column parameters measured in 2024 were summarized as quarterly mean values, pooled over all stations, by the following depth layers: PLOO stations = 1–20 m, 21–60 m, 61–80 m, and 81–100 m; SBOO stations = 1–9 m, 10–19 m, 20–28 m, 29–38 m, and 39–55 m. Unless otherwise noted, analyses were performed using R (R Core Team, 2022) and various functions within the following packages:

zoo, reshape2, Rmisc, ggplot2, gridExtra, mixOmics, fields, data.table, Hmisc, oce, RODBC, tidyverse (Zeileis and Grothendieck 2005, Wickham 2007, Hope 2013, Wickham et al. 2016, Auguie 2017, Rohart et al. 2017, Nychka et al. 2017, Dowle and Srinivasan 2019, Harrell et al. 2018, Kelley and Richards 2018, Ripley and Lapsley 2017, Wickham et al. 2019).

Bacteriological Compliance

Compliance with the running geometric mean standards for fecal coliforms and *Enterococcus* was assessed using running 30-day and 42-day windows, respectively. Compliance with the median standard for total coliforms was assessed over a running 30-day window. Compliance with the statistical threshold value (STV) metrics for total coliforms and *Enterococcus* was calculated at monthly intervals. Compliance calculations were limited to shore, kelp and offshore stations located within State waters, excluding resamples. In all instances, compliance was rounded to the nearest whole number (e.g., 99.5% equates to 100%). For the purpose of visualization, to assess temporal and spatial trends, and to assess compliance with the HF183 sampling standards (Table 2.2), elevated FIB was determined by the number of analyses in which FIB concentrations exceeded the threshold established by the 2019 Ocean Plan's water quality bacterial objectives for single sample maximum (SSM) or STV benchmark levels (Table 2.1, SWRCB 2019). Due to the nature of the STV metric, elevated FIB does not necessarily indicate out-of-compliance for individual analyses of *Enterococcus* and total coliform densities. Compliance with the HF183 sampling metrics was calculated as the proportion of analyses showing elevated FIB within the rolling window specified in Table 2.2, assessed daily over the report period. Compliance calculations were limited to shore, kelp and offshore stations located within State waters. These analyses were performed using R (R Core Team, 2020) and various functions within the following packages: reshape2, Hmisc, RODBC, tidyr (Wickham 2007, Harrell et al. 2020, Ripley and Lapsley 2020, Wickham and Henry 2020).

Wastewater Plume Detection and Out-of-Range Calculations

Presence or absence of the wastewater plume at the PLOO and SBOO offshore stations was estimated by evaluation of a combination of oceanographic parameters (i.e., detection criteria). The reporting and analysis of these data are not part of the 2024 interim report and will be reported as part of the 2024–2025 Biennial report, published in June 2026.

Real-time Oceanographic Mooring Systems

Prior to conducting analyses, all data were subject to a comprehensive suite of quality assurance/quality control (QA/QC) procedures following Quality Assurance of Real-Time Oceanographic Data (QARTOD) methodologies (US IOOS 2017, 2023). Results of QARTOD tests are included in Appendix A.2, A.3, see City of San Diego (2025a) for details. After review, all flagged data identified as suspect or bad, either manually or from automated tests, were excluded from further analyses and are not presented in this report. A detailed log of data flagged manually by parameter, site, depth, and date range is available upon request. When possible, additional QA/QC procedures involved analyzing quarterly CTD casts to validate data from RTOMS sensors, and seawater samples to validate and perform drift corrections to nitrate + nitrate results. For details on validation CTD casts and water sample data, see City of San Diego 2025a.

Analyses were performed in R (R Development Core Team 2022) using functions within various packages (i.e., data.table, dplyr, ggplot2, gtools, lubridate, pracma, purrr, reshape2, Rmisc, tidyverse, and mixOmics) (Dowle and Srinivasan 2019, Wickham and Francois 2021, Wickham et al. 2016, Warnes et al. 2018, Grolemund and Wickham 2011, Borchers 2021, Wickham and Henry 2023, Wickham 2007, Hope 2013, Wickham et al. 2019, Rohart et al. 2017). Annual time series of raw and daily-averaged data were plotted at each depth and site for all parameters that passed review, with the exception of acoustic doppler current profiler (ADCP) data (described below). In addition, summary statistics were completed at each depth and site with the following seasonal periods that align with quarterly water quality sampling: winter (January–March); spring (April–June); summer (July–September); fall (October–December). Large data gaps were identified as seasons with <40% data recovery, based on expected number of samples for sensor-specific sampling intervals, and were excluded from summary analyses.

Ocean current data collected by downward-facing surface-mounted RTOMS ADCP instruments (Teledyne RD Instruments 300 kHz Workhorse Broadband) were checked for quality by eliminating those measurements that did not meet echo intensity criteria (i.e., minimum average intensity >100 counts and minimum correlation among the four beams of >70%). Following this initial screening, tidal frequency data were removed using the PL33 filter (Alessi et al. 1984) and compass direction was corrected to true north (+12.8 degrees). For all RTOMS deployments, ADCP data were summarized by season and select depth bins, as described above.

Results

All CTD and bacterial water quality data and associated visual observations for calendar year 2024 have been previously reported in monthly receiving waters monitoring reports submitted to the San Diego Water Board and the USEPA (see City of San Diego 2024–2025a,b).

Oceanographic Conditions

Ocean temperature, salinity, DO, pH, transmissivity, and chlorophyll *a* data collected by CTD during 2024 in the PLOO and SBOO monitoring regions are summarized by depth layer for the entire year in Tables 2.6 and 2.7, and by depth layer for each survey in Appendices A.4 and A.5. These same parameters are plotted by depth and survey in Appendices A.6 and A.7. Ocean temperature, salinity, DO, total pH, chlorophyll *a*, CDOM, turbidity, nitrate + nitrite, BOD, and xCO2 data collected by PLOO and SBOO RTOMS during 2024 are summarized by depth and season in Appendices A.8 and A.9. Ocean current velocity and magnitude are summarized by depth layer and season in Appendices A.10 and A.11. All RTOMS parameters except current velocity are plotted over time in Appendix A.12.

Bacteriological Compliance

The distribution of microbial concentrations for each bacteriological metric during each sampling period are summarized visually with their respective 2019 Ocean Plan water contact standard thresholds for PLOO and SBOO in Figures 2.2 and 2.3. Compliance rates for STV water contact standards are summarized in Table 2.8, and compliance rates for HF183 water contact standards are summarized in Table 2.9. Compliance with 2015 Ocean Plan water contact standards (Appendix A.13) is summarized for PLOO only in Appendix A.14.

Plume Dispersion and Effects

CDOM, plotted by depth and survey, is included in Appendix A.6 and A.7. Potential plume detection results will be summarized in the 2024–25 Biennial Report, to be published June 2026.

Summary

During 2024, oceanographic conditions off San Diego were generally within historical ranges reported for the PLOO and SBOO monitoring regions. Conditions typically indicative of coastal upwelling were most evident during the spring and early summer months, while maximum stratification or layering of the water column occurred during late summer in the SBOO region and early fall in the PLOO region, after which the waters became more mixed in the winter. Decreases in water clarity or transmissivity tended to be associated with terrestrial runoff or outflows from rivers and bays, the re-suspension of nearshore bottom sediments due to waves or storm activity, and to the presence of strong and sustained phytoplankton blooms, particularly in the spring and early summer. In general, the measured occurrence of phytoplankton blooms for both the SBOO and PLOO regions was relatively low compared to observations from the prior two years (City of San Diego 2024).

Water quality conditions were mostly consistent with data reported previously for both regions. Compliance with both the SSM and geometric mean standards was higher in the PLOO region, and at kelp and offshore stations compared to stations along the shore. Under current California Ocean Plan 2019 water contact standards, compliance, especially in the case of total coliforms, is reduced compared to previous years evaluated under California Ocean Plan 2015 water contact standards. Elevated total coliform concentrations, especially in the SBOO shore region, coincided with unusually high transboundary flows from the Tijuana River reported for this period (IBWC 2024). Reduced compliance in both outfall regions tended to occur during the wet season and is significantly influenced by terrestrial outflows, such as the Tijuana River. Finally, there was no evidence that wastewater discharged into the ocean via either outfall reached nearshore recreational waters.

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Chapter 2

Figures & Tables

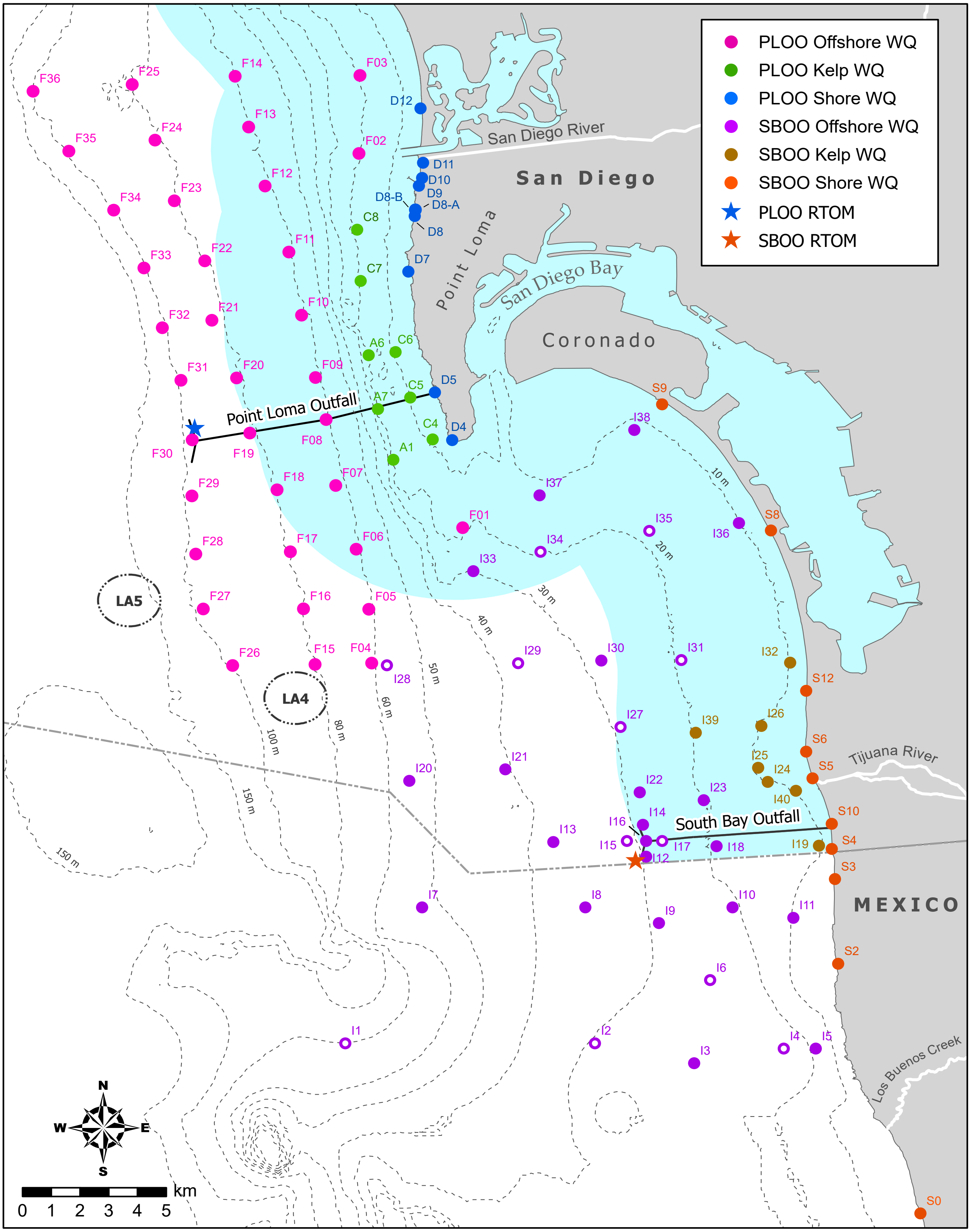

Figure 2.1
Water quality (WQ) monitoring station locations sampled around the PLOO and SBOO as part of the City of San Diego's Ocean Monitoring Program. Light blue shading represents State of California jurisdictional waters. Open circles are sampled by CTD only.

Table 2.1

Water quality objectives for water contact areas, California Ocean Plan (SWRCB 2019).

A. Bacterial Characteristics – Water Contact Standards; CFU = colony forming units.

(a) Fecal Coliforms:

1) A 30-day geometric mean of fecal coliform density shall not exceed 200 CFU/100 mL, calculated based on the five most recent samples from each site

2) A single sample maximum of fecal coliform density shall not exceed 400 CFU/100 mL.

(b) Enterococcus:

1) A 42-day geometric mean of Enterococcus density shall not exceed 30 CFU/100 mL, calculated weekly

2) A statistical threshold value of Enterococcus density shall not exceed 110 CFU/100 mL in more than 10% of samples per calendar month.

(c) Total Coliforms:

1) The median of total coliform density shall not exceed 70 CFU/100 mL*.

2) A statistical threshold value of total coliform density shall not exceed 230 CFU/100 mL in more than 10% of samples.

B. Physical Characteristics

(a) Floating particulates and oil and grease shall not be visible.

(b) The discharge of waste shall not cause aesthetically undesirable discoloration of the ocean surface.

(c) Natural light shall not be significantly reduced at any point outside of the initial dilution zone as the result of the discharge of waste.

C. Chemical Characteristics

(a) The dissolved oxygen concentration shall not at any time be depressed more than 10% from what occurs naturally, as a result of the discharge of oxygen demanding waste materials.

(b) The pH shall not be changed at any time more than 0.2 units from that which occurs naturally.

D. A time period is not specified for the total coliforms running median calculation. For the purposes of this report, the median was calculated over a 30-day running window.

Table 2.2

Receiving Water Bacterial Compliance (NPDES Permit No. CA0109045, Order No. R9-2021-0011; NPDES Permit No. CA0108928, Order No. R9-2021-0001).

Receiving water monitoring for human marker HF183 and effluent monitoring for fecal indicator bacteria may be required if any of the following conditions are true, and if the source of contamination is unknown.

A. The overall compliance rate with the receiving water limitations for bacterial characteristics is below 90% within a rolling one-year period.

B. A single monitoring location exceeds the bacteria receiving water limitations more than 50% of the time within a rolling one-year period for offshore monitoring locations.

C. A single monitoring location exceeds the bacteria receiving water limitations more than 50% of the time within a rolling quarterly period for kelp/nearshore monitoring locations.

Table 2.3

Depths from which seawater samples are collected for bacteriological analysis from kelp and offshore stations.

Station Contour	PLOO Sample Depth (m)								
	1	3	9	12	18	25	60	80	98
Kelp Bed									
9-m	x	x	x						
18-m	x			x	x				
Offshore									
18-m	x			x	x				
60-m	x					x	x		
80-m	x					x	x	x	
98-m	x					x	x	x	x

Station Contour	SBOO Sample Depth (m)							
	2	6	9/11	12	18	27	37	55
Kelp Bed								
9-m	x	x	x[a]					
19-m	x			x	x			
Offshore								
9-m	x	x	x[a]					
19-m	x			x	x			
28-m	x				x	x		
38-m	x				x		x	
55-m	x				x			x

[a] Stations I25, I26, I32, and I40 sampled at 9 m; stations I11, I19, I24, I36, I37, and I38 sampled at 11 m

Table 2.4

Sample dates for quarterly oceanographic surveys conducted during 2024. All stations in each station group were sampled on a single day (see Figure 2.1 for stations and locations).

PLOO Sampling Dates					SBOO Sampling Dates				
Station Group	**Feb**	**May**	**Aug**	**Nov**	**Station Group**	**Feb**	**May**	**Aug**	**Nov**
Kelp WQ	12	13	12	18	Kelp WQ	21	6	5	4
18 & 60-m WQ	14	15	14	20	North WQ	24	10	8	7
80-m WQ	15	16	15	21	Mid WQ	23	8	7	6
98-m WQ	13	14	13	19	South WQ	22	7	6	5

Table 2.5

Sensor configuration and model type for RTOMS by site and depth during 2024.

Sensor Depth		
PLOO	**SBOO**	**Parameters Measured (Sensor Types)**
1 m (surface)	1 m (surface)	Temperature, conductivity, pH (total), DO (Sea-Bird SeapHOx)
		Ocean currents (RDI 300kHz ADCP)
		Partial pressure of carbon dioxide (Pro-Oceanus pCO_2 System)
		Chlorophyll *a*, CDOM, turbidity (Sea-Bird ECO triplet)
		Nitrate + nitrite (Sea-Bird SUNA V2)
10 m	10 m	Temperature, conductivity (Sea-Bird MicroCAT)
	18 m	Temperature, conductivity, DO (Sea-Bird MicroCAT ODO)
		Chlorophyll *a*, CDOM, turbidity (Sea-Bird ECO triplet)
20 m		Temperature, conductivity (Sea-Bird MicroCAT)
	26 m (cage)	Temperature, conductivity, pH, DO (Sea-Bird SeapHOx)
		Chlorophyll *a*, CDOM, turbidity (Sea-Bird ECO triplet)
		Nitrate + nitrite (Sea-Bird SUNA V2)
30 m (cage-1)		Temperature, conductivity, pH, DO (Sea-Bird SeapHOx)
		Chlorophyll *a*, CDOM, turbidity (Sea-Bird ECO triplet)
		Nitrate + nitrite (Sea-Bird SUNA V2)
45 m		Temperature, conductivity (Sea-Bird MicroCAT)
60 m		Temperature, conductivity (Sea-Bird MicroCAT)
75 m		Temperature, conductivity, DO (Sea-Bird MicroCAT ODO)
87 m		Temperature, conductivity (Sea-Bird MicroCAT) (backup)
89 m (cage-2)		Temperature, conductivity, pH, DO (Sea-Bird Deep SeapHOx)
		Chlorophyll *a*, CDOM, turbidity (Sea-Bird ECO triplet)
		Nitrate + nitrite (Sea-Bird SUNA V2)

Table 2.6

Summary of temperature, salinity, DO, pH, transmissivity, and chlorophyll *a* for various depth layers as well as the entire water column for all PLOO stations during 2024. See Appendix A.4 for sample sizes.

		Depth (m)				
Parameter		**1–20**	**21–60**	**61–80**	**81–98**	**1–98**
Temperature (°C)	min	10.8	10.0	9.9	9.8	9.8
	max	23.6	15.7	12.8	12.2	23.6
	mean	15.5	12.0	10.8	10.5	12.7
Salinity (ppt)	min	32.78	33.01	33.36	33.47	32.78
	max	33.73	33.91	34.00	34.10	34.10
	mean	33.33	33.46	33.67	33.79	33.48
DO (mg/L)	min	3.6	2.9	2.7	2.6	2.6
	max	13.2	10.9	5.8	5.2	13.2
	mean	8.0	5.7	4.2	3.8	6.0
pH	min	7.7	7.7	7.7	7.7	7.7
	max	8.4	8.3	8.1	8.0	8.4
	mean	8.2	7.9	7.8	7.8	8.0
Transmissivity (%)	min	40	38	59	43	38
	max	99	100	101	100	101
	mean	91	97	97	97	95
Chlorophyll *a* (µg/L)	min	0.0	0.1	0.1	0.1	0.0
	max	26.7	11.6	1.6	0.6	26.7
	mean	1.7	0.8	0.2	0.1	0.9

Table 2.7
Summary of temperature, salinity, DO, pH, transmissivity, and chlorophyll *a* for various depth layers as well as the entire water column for all SBOO stations during 2024. See Appendix A.5 for sample sizes.

		Depth (m)					
Parameter		**1–9**	**10–19**	**20–28**	**29–38**	**39–55**	**1–55**
Temperature (°C)	min	11.3	10.9	10.6	10.5	10.2	10.2
	max	21.3	17.7	15.1	14.7	13.5	21.3
	mean	16.0	13.4	12.3	12.0	11.5	13.9
Salinity (ppt)	min	32.29	32.88	33.02	33.06	33.11	32.29
	max	33.62	33.66	33.74	33.76	33.84	33.84
	mean	33.28	33.32	33.38	33.41	33.49	33.34
DO (mg/L)	min	4.3	3.8	3.8	3.7	3.4	3.4
	max	11.2	9.5	8.8	7.9	7.6	11.2
	mean	8.2	7.0	6.1	5.8	5.3	7.0
pH	min	7.7	7.7	7.7	7.7	7.7	7.7
	max	8.4	8.3	8.2	8.2	8.1	8.4
	mean	8.2	8.0	7.9	7.9	7.9	8.0
Transmissivity (%)	min	14	23	57	47	73	14
	max	99	99	99	99	99	99
	mean	85	89	93	95	96	89
Chlorophyll *a* (µg/L)	min	0.1	0.2	0.4	0.2	0.2	0.1
	max	38.5	16.8	13.9	10.1	9.5	38.5
	mean	2.2	2.4	1.8	1.3	0.8	2.0

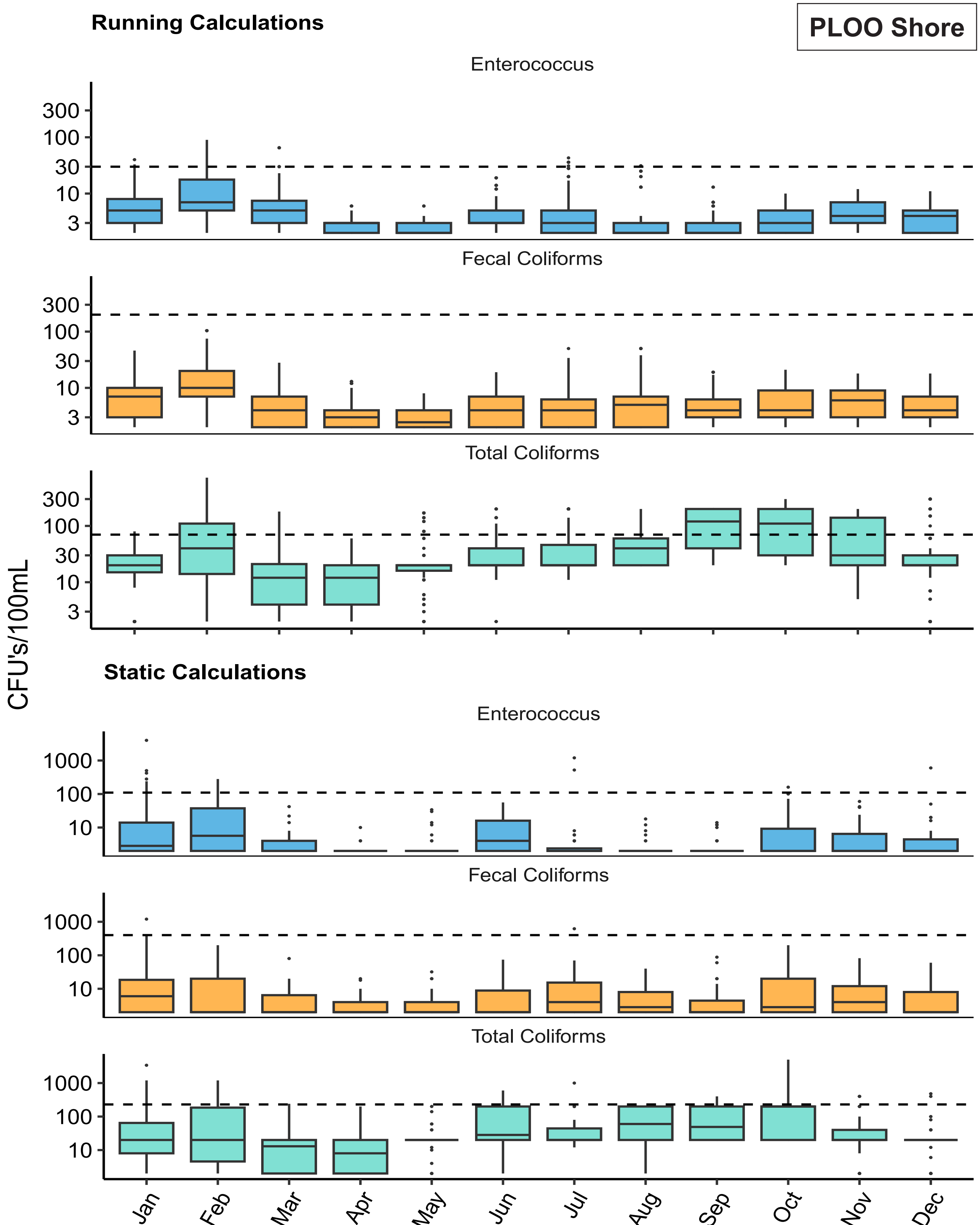

Figure 2.2

Bacteriological data for PLOO shore, kelp, and offshore stations located within state jurisdictional waters sampled in 2024, binned by month. Running calculations are not performed on offshore stations due to quarterly-only sampling frequency. Boxes represent the interquartile range. Dashed line represents the water contact standard compliance threshold*. Boxes = median, upper and lower quantiles; whiskers = 1.5x interquartile range, dots = outliers. *STV compliance is calculated separately and shown in Table 2.8

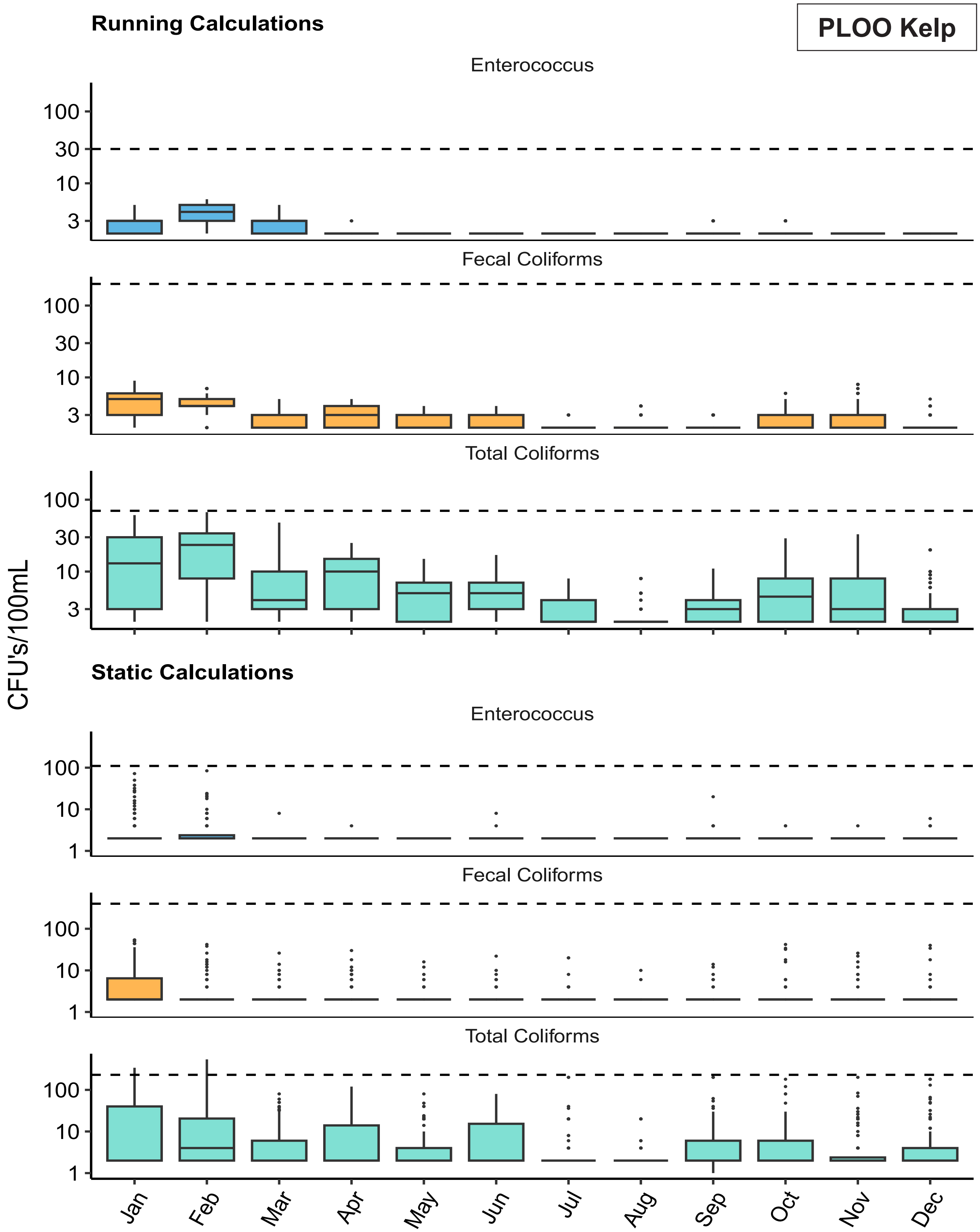

Figure 2.2 *continued*

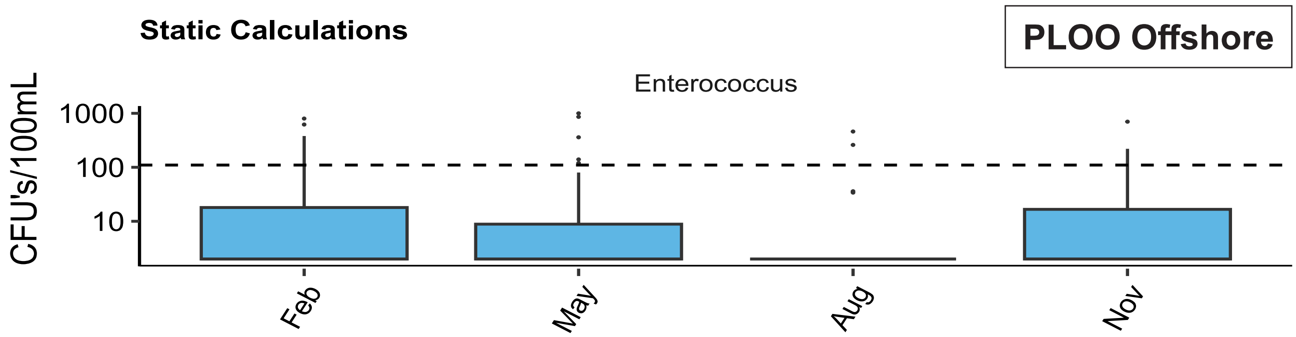

Figure 2.2 *continued*

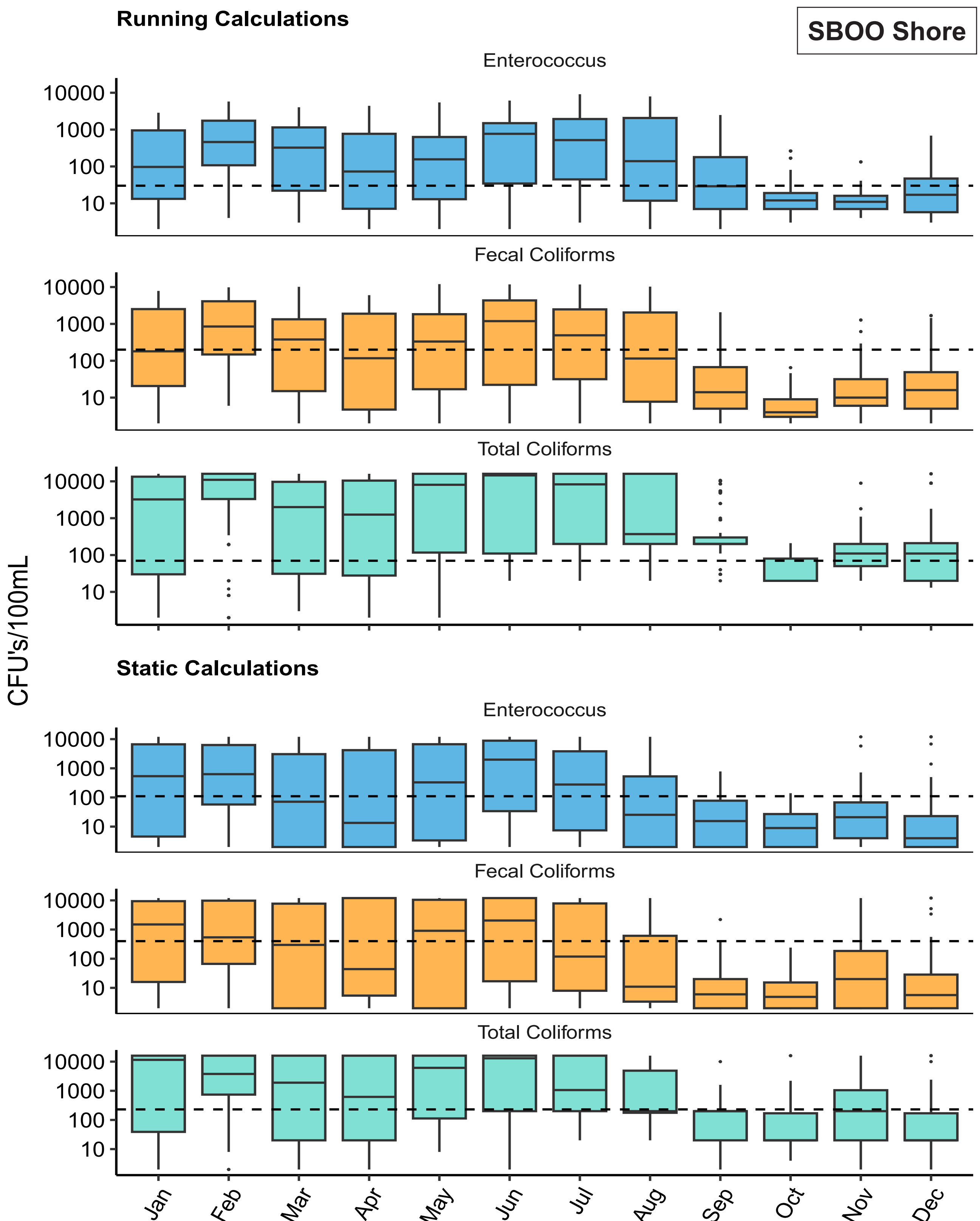

Figure 2.3
Bacteriological data for SBOO shore, kelp, and offshore stations located within state jurisdictional waters sampled in 2024, binned by month. Running calculations are not performed on offshore stations due to quarterly-only sampling frequency. Boxes represent the interquartile range. Dashed line represents the water contact standard compliance threshold*. Boxes = median, upper and lower quantiles; whiskers = 1.5x interquartile range, dots = outliers. *STV compliance is calculated separately and shown in Table 2.8

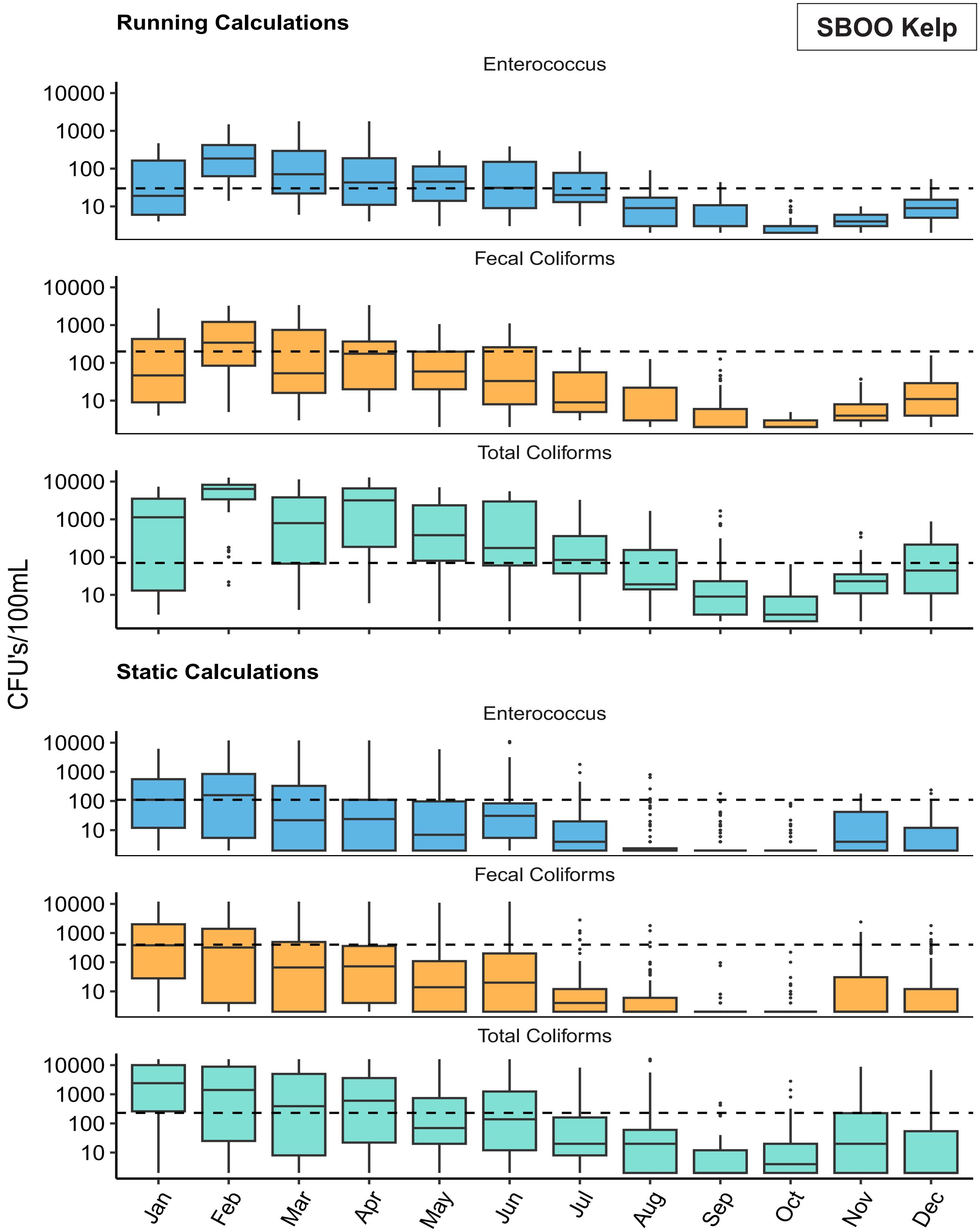

Figure 2.3 *continued*

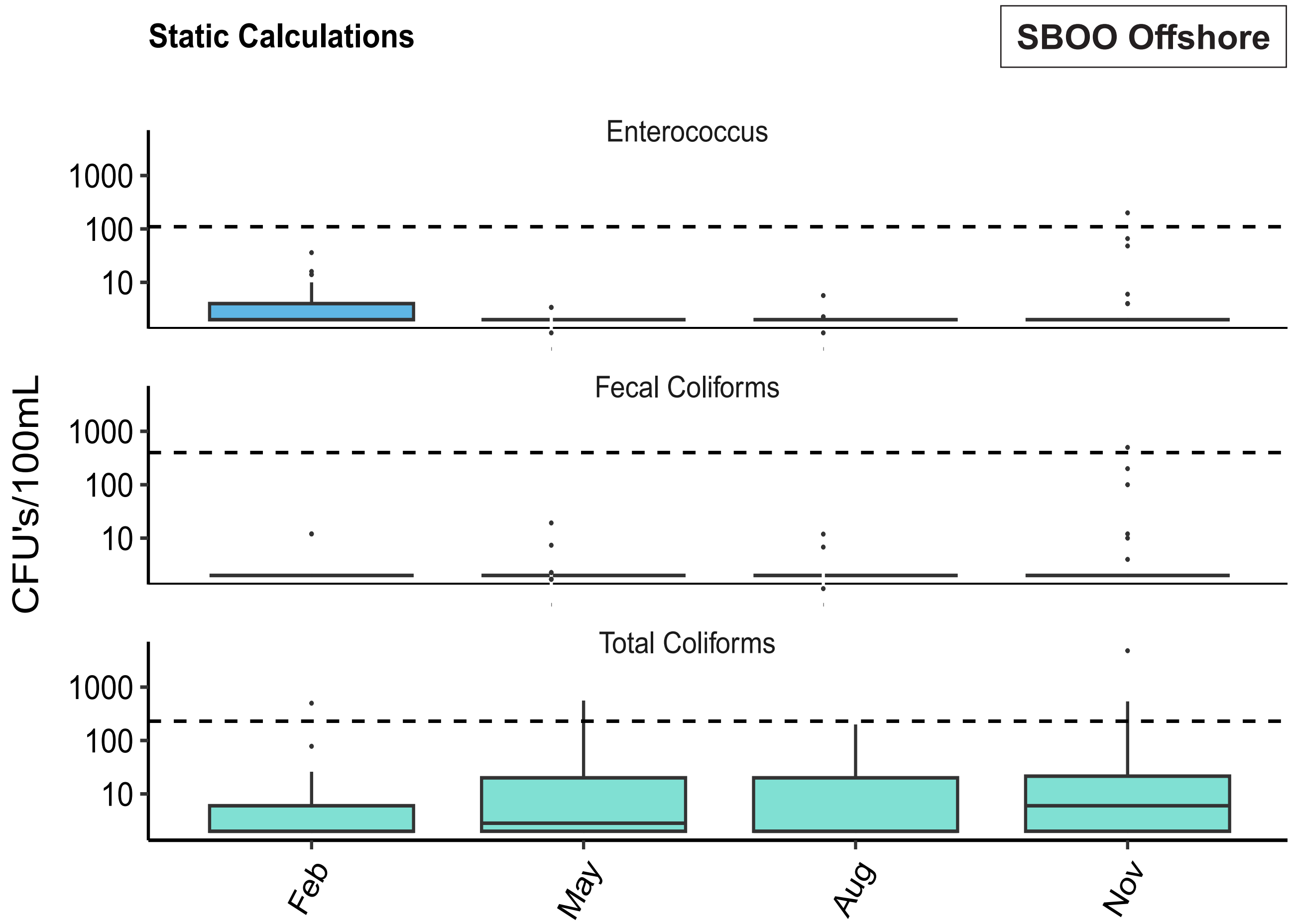

Figure 2.3 *continued*

Table 2.8
Compliance rates for Statistical Threshold Value water contact standards for PLOO and SBOO monitoring stations located within state jurisdictional waters sampled during 2024. Offshore stations are sampled quarterly; — = not sampled.

Enterococcus

Year	Project		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2024	PLOO	*Shore*	38	88	100	100	100	100	88	100	100	88	100	88
		Kelp	100	100	100	100	100	100	100	100	100	100	100	100
		Offshr	—	80	—	—	80	—	—	93	—	—	80	—
	SBOO	*Shore*	12	0	50	25	25	25	25	25	62	88	50	50
		Kelp	0	14	43	29	57	57	71	86	100	100	71	86
		Offshr	—	100	—	—	100	—	—	100	—	—	90	—

Total Coliforms

Year	Project		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2024	PLOO	*Shore*	38	50	88	100	100	75	88	100	88	88	62	75
		Kelp	100	100	100	100	100	100	100	100	100	100	100	100
	SBOO	*Shore*	0	0	25	25	25	12	12	25	62	62	25	50
		Kelp	0	14	0	0	14	0	57	71	86	86	14	57
		Offshr	—	90	—	—	90	—	—	100	—	—	80	—

Table 2.9
Percent compliance with the HF183 sampling standards, calculated as the proportion of rolling window calcualtions, taken daily over the report period, showing compliance rates above the threshold established for each metric (90% overall, 50% kelp, 50% offshore). In the case of kelp and offshore compliance metrics, any stations with compliance < 100% are listed individually.

		Fecal Coliforms	Total Coliforms	*Enterococcus*
PLOO				
Overall		100	100	100
Kelp		100	100	100
Offshore		—	—	100
SBOO				
Overall		0	0	0
Kelp	I19	69	37	64
	I24	100	60	99
	I25	100	80	100
	I26	100	86	100
	I40	66	36	62
Offshore		100	100	100

Chapter 3
Benthic Conditions

Chapter 3. Benthic Conditions

Introduction

The City of San Diego (City) conducts extensive monitoring of benthic sediments and communities of small benthic invertebrates (macrofauna) that live within, or on the surface of, soft-bottom seafloor habitats surrounding the Point Loma and South Bay Ocean Outfalls (PLOO and SBOO, respectively). This monitoring helps to characterize regional benthic conditions and identify potential effects of wastewater discharge, or other anthropogenic inputs, on the marine benthic environment. This chapter presents summaries and preliminary analyses of the sediment quality, sediment toxicity, and macrofaunal community data collected during calendar year 2024 at PLOO, SBOO, and San Diego regional benthic monitoring stations. A more comprehensive assessment of these results will be presented in the 2024-2025 Biennial Assessment Report to be submitted by July 1, 2026.

Materials And Methods

Collection and Processing of Samples

Samples were collected at a total of 89 benthic stations to monitor ocean sediments and macrofaunal communities during 2024 (Figure 3.1). These included 22 stations arranged in a grid surrounding the PLOO, along or adjacent to the 88, 98, or 116-m depth contours, and 27 stations arranged in a grid surrounding the SBOO, along or adjacent to the 19, 28, 38, or 55-m depth contours. These stations were sampled during the winter (January) and summer (July). The four stations located within 1000 m of the zone of initial dilution (ZID) for each outfall are considered to represent near-ZID conditions. These include PLOO stations E11, E14, E15, and E17, and SBOO stations I12, I14, I15, and I16. The remaining 40 “regional” stations were selected using a probability-based random stratified sampling design as described in Bergen (1996), Stevens (1997), and Stevens and Olsen (2004). Regional stations were sampled during the summer at depths ranging from 4 to 485 m, including 8 sites along the inner shelf (4–26 m), 17 sites along the mid-shelf (31–95 m), 8 sites along the outer shelf (126–198 m), and 7 sites on the upper slope (201–485 m).

Samples were collected using a double 0.1-m^2 Van Veen grab, with one grab per cast used for sediment quality analysis, one grab per cast used for benthic community analysis, and subsequent grabs used for sediment toxicity testing where required. Visual observations of weather, sea conditions, and human/animal activity were also recorded at the time of sampling. Criteria established by the U.S. Environmental Protection Agency (USEPA) to ensure consistency of these types of samples were followed with regard to sample disturbance and depth of penetration (USEPA 1987). Sub-samples for particle size and sediment chemistry analyses were taken from the top 2 cm of the sediment surface and handled according to standard guidelines (USEPA 1987, SCCWRP 2018).

For sediment toxicity samples, a plastic (e.g., high-density polyethylene [HDPE], polycarbonate, Teflon) or stainless-steel scoop was used to collect sediment from the top 2 cm of the undisturbed surface material in the grab. Contact with sediment within 1 cm of the sides of the grab was avoided to minimize cross-contamination. In most cases, multiple grabs were required to obtain enough sediment for toxicity testing (i.e., up to 6 L sediment). If more than one grab was required, sediment from each grab was added to a Teflon bag and homogenized thoroughly using either a clean Teflon or plastic spoon, or by kneading the sample within the bag. Once collected, the toxicity samples were stored in the dark at 4°C in the laboratory for no longer than four weeks prior to testing.

Samples for infauna analysis were transferred to a wash table aboard ship, rinsed with seawater, and then sieved through a 1.0-mm mesh screen to remove as much sediment as possible. The macroinvertebrates retained on the screen were transferred to sample jars, relaxed for 30 minutes in a magnesium sulfate solution, and then fixed with buffered formalin. The preserved samples were then transferred back to the City's Marine Biology Laboratory. After a minimum of 72 hours, but no more than 10 days, in formalin, each sample was thoroughly rinsed with fresh water and transferred to 70% ethanol for final preservation.

Laboratory Analyses

Sediment Particle Size

All particle size analyses were performed at the City's Environmental Chemistry Services Laboratory. Particle size analysis was performed using either a Horiba LA-950V2 Laser Particle Size Analyzer or a set of nested sieves. The Horiba measures particles ranging in size from 0.5 to 2000 µm. Coarser sediments were removed and quantified prior to laser analysis by screening samples through a 2000 µm mesh sieve. These data were later combined with the Horiba results to obtain a complete distribution of particle sizes totaling 100%, and then classified into 11 sub-fractions and four main size fractions based on the Wentworth scale (Folk 1980) (see Appendix B.1). When a sample contained substantial amounts of coarse sand, gravel, shell hash, or other large materials that could damage the Horiba analyzer or where the general distribution of sediments would be poorly represented by laser analysis, a set of nested sieves with mesh sizes of 2000, 1000, 500, 250, 125, 75, and 63 µm was used to divide the samples into eight sub-fractions. See Appendix B.2 for visual observations from each PLOO and SBOO core station, and Appendix B.3 from each regional station.

Sediment Chemistry

All sediment chemistry analyses were performed at the City's Environmental Chemistry Services Laboratory. Detailed analytical protocols are available upon request. Briefly, sediment sub-samples were analyzed on a dry weight basis to determine concentrations of various indicators of organic loading (i.e., biochemical oxygen demand, total organic carbon, total nitrogen, total sulfides, total volatile solids), 17 trace metals, 9 chlorinated pesticides, 42 polychlorinated biphenyl compound congeners (PCBs), 24 polycyclic aromatic hydrocarbons (PAHs), and 13 polybrominated diphenyl ethers (PBDEs) (see Appendix B.4).

Sediment Toxicity Testing

A detailed description of the sediment toxicity testing protocols can be found in City of San Diego (2024b). Briefly, all sediment toxicity testing was conducted by the City of San Diego Toxicology Laboratory (CSDTL) using the marine amphipod Eohaustorius estuarius. The 10-day amphipod tests were conducted in accordance with EPA 600/R-94/0925 (USEPA 1994) and the procedures previously approved for the Southern California Bight 2023 Regional Monitoring Program (Bight'23 Toxicology Committee 2023). Juvenile E. estuarius were exposed for 10 days to both test and control sediments.

Response criteria included amphipod mortality, and if considered a measurement of interest, the ability of amphipods to rebury in clean sediment at the end of the bioassay. In addition, a reference toxicant test (using seawater only) was conducted concurrently and under identical environmental conditions as the sediment toxicity tests to determine test organism sensitivity.

Macrobenthic Assemblages
All organisms were separated from the raw material (e.g., sediment grunge, shell hash, debris) and sorted into the following six taxonomic groups by an external contract lab: Annelids (e.g., polychaete and oligochaete worms), Arthropods (e.g., crustaceans and pycnogonids), Molluscs (e.g., clams, snails, scaphopods), non-ophiuroid Echinoderms (e.g., sea urchins, sea stars, sea cucumbers), Ophiuroids (i.e., brittle stars), and other phyla (e.g., flatworms, nemerteans, cnidarians). The sorted macrofaunal samples were then returned to the City's Marine Biology Laboratory where all animals were identified to species, or to the lowest taxon possible, by City Marine Biologists. All identifications followed nomenclatural standards established by the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT 2023).

Data Analyses

All raw data for 2024 have been submitted to either the Regional Water Quality Control Board or the California Environmental Data Exchange Network (CEDEN) and will be provided upon request.

Sediment Particle Size and Chemistry
Data summaries for the various sediment parameters included detection rate, mean, minimum and maximum values for all samples by outfall region (i.e., PLOO, SBOO stations) and across the region (i.e., regional stations). All means were calculated using detected values only with no substitutions made for non-detects (i.e., concentrations < MDL). Total DDT (tDDT), total hexachlorocyclohexane (tHCH), total chlordane, total PCB (tPCB), total PAH (tPAH) and total PBDE (tPBDE) were calculated for each sample as the sum of all constituents with reported values for individual constituents. Analyses were performed using R (R Core Team 2024) various functions within the zoo, reshape2, plyr, tidyr, and dplyr packages (Zeileis and Grothendieck 2005, Wickham 2007, 2011, Wickham and Henry 2017, Wickham et al. 2017).

Sediment Toxicity Testing
All data were analyzed in accordance with procedures outlined in Sections 12 and 13 of EPA 600/R-94/0925 using the acceptability criterion of ≥ 90% mean control survival at test termination. Additional information and the standard operation procedures for sediment toxicity testing are provided in Appendix B of the CSDTL's Quality Assurance Manual (City of San Diego 2024b).

Macrobenthic Assemblages
Population characteristics were summarized as percent abundance (number of individuals per species/total abundance of all species), frequency of occurrence (percentage of grabs in which a species occurred), and mean abundance per grab (number of individuals per species/total number of grabs). Additionally, the following community structure parameters were calculated for each station and expressed per 0.1-m2 grab: species richness (number of species or distinct taxa), abundance (number of individuals), Shannon diversity index (H'), Pielou's evenness index (J'), Swartz dominance index (see Swartz et al. 1986, Ferraro et al. 1994), and benthic response index (BRI; see Smith et al. 2001). Unless otherwise noted, the above analyses were performed using R (R Core Team 2022) and various functions

within the reshape2, Rmisc, RODBC, tidyverse, and vegan packages (Wickham 2007, Wickham et al. 2019, Hope 2013, Oksanen et al. 2020, Ripley and Lapsley 2021).

Multivariate analyses were performed using PRIMER v7 software to examine spatial patterns in macrofaunal data collected at the 89 PLOO, SBOO, and regional benthic stations sampled during summer 2024 (see Clarke et al. 2008, Clarke et al. 2014). These included ordination and hierarchical agglomerative clustering (cluster analysis) with group-average linking and similarity profile analysis (SIMPROF) to confirm the non-random structure of the resultant cluster dendrograms. The Bray-Curtis measure of similarity was used as the basis for clustering, and data were square-root transformed to lessen the influence of overly abundant species and increase the importance (or impact) of rare species. Major ecologically-relevant clusters receiving SIMPROF support were retained.

Results

Sediment Quality

Sediment particle size (i.e., main particle size fractions) and chemistry data collected during 2024 are summarized for PLOO, SBOO, and regional benthic stations in Tables 3.1 and 3.2. Results for sediment toxicity samples are summarized in Table 3.3. Concentrations of organic indicators, metals, and individual constituents of various pesticides, PCBs, PAHs, and PBDEs are listed by station and survey with relevant qualifiers in Appendices B.5 – B.21.

Macrobenthic Communities

Key community structure parameters, including species richness, abundance, diversity, evenness, dominance, and BRI, are summarized for PLOO, SBOO, and regional benthic stations in Table 3.4. The 25 most abundant macroinvertebrate taxa identified at PLOO and SBOO stations during 2024 are summarized by percent abundance, frequency of occurrence, and abundance per grab in Tables 3.5 and 3.6. The 10 most abundant taxa from each depth stratum are summarized for regional stations in Table 3.7. Ordination and cluster analyses were performed to illustrate and quantify the ecological patterns at the macroinvertebrate community level across the San Diego region; these results are presented in Figure 3.2.

Summary

Preliminary analysis of sediment particle size, chemistry, toxicity, and macroinvertebrate data collected in 2024 indicate that wastewater discharged through the PLOO and SBOO has not negatively impacted benthic communities in the coastal waters off San Diego. During the current reporting period, there was no evidence of fine-particle loading related to wastewater discharge via the PLOO or SBOO. Contaminant concentrations at near-ZID stations were generally within the range of variability observed throughout both outfall regions and did not appear to reflect any significant organic enrichment. The quality of PLOO and SBOO sediments in 2024 was similar to previous years (e.g., City of San Diego 2024a), with overall contaminant concentrations remaining relatively low compared to available thresholds or other southern California coastal areas (Schiff and Gossett 1998, Noblet et al. 2002, Schiff et al. 2006, 2011, Maruya and Schiff 2009, Dodder et al. 2016, Du et al. 2020). No evidence of sediment toxicity was observed at 87.5% of the near-ZID stations sampled during 2024. A single sample collected from PLOO near-ZID station E15 was found to have a control adjusted %Survival of 89%, indicating low toxicity. This is a response that is of relatively low magnitude, where the response may not be greater than test variability (Parks et al. 2020). For context, the categories nontoxic and low toxicity are jointly referred to as “not toxic” in Bight reports, because the biological significance and reliability of the low toxicity category is uncertain (Parks et al. 2020).

Overall, results for 2024 are consistent with findings from previous regional monitoring programs that have demonstrated minimal sediment toxicity on the southern California continental shelf in contrast to offshore submarine canyons and local embayments (e.g., Bay et al. 2015, Parks et al. 2020). Further, values for most benthic infauna community parameters were similar at stations located both near and far away from the outfall discharge sites. These metrics were within historical ranges reported for the San Diego region (e.g., City of San Diego 2024a), and were representative of those characteristic of similar habitats throughout the Southern California Bight (Barnard and Ziesenhenne 1961, Jones 1969, Fauchald and Jones 1979, Thompson et al. 1987, 1993a,b, Zmarzly et al. 1994, Diener and Fuller 1995, Bergen et al.1998, 2000, 2001, Ranasinghe et al. 2003, 2007, 2010, 2012, Mikel et al. 2007, Gillett et al. 2017, 2022).

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Chapter 3

Figures & Tables

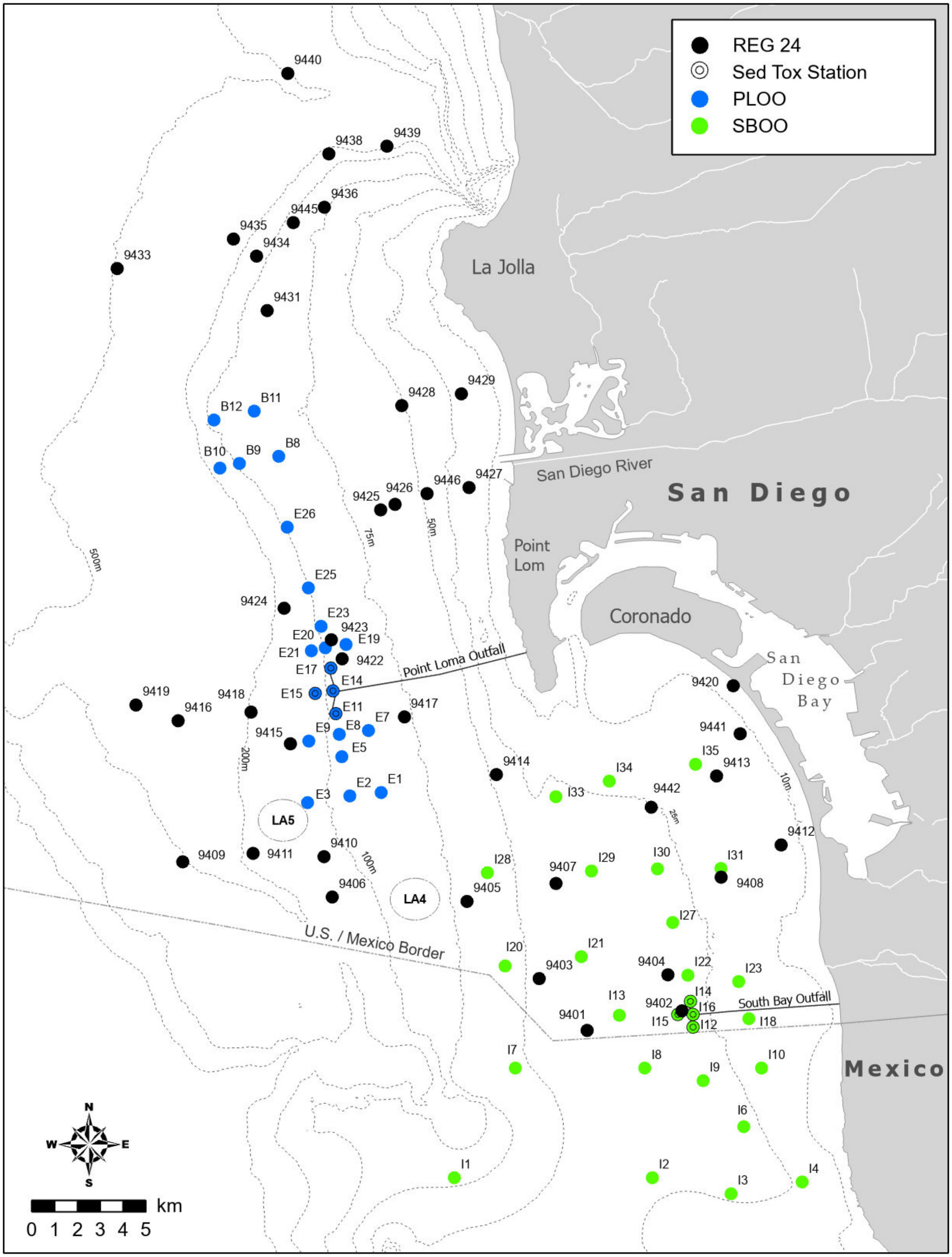

Figure 3.1
Benthic station locations sampled around the PLOO and SBOO as part of the City of San Diego's Ocean Monitoring Program.

Table 3.1

Summary of particle sizes and chemistry concentrations in sediments from PLOO and SBOO benthic stations sampled during 2024. Data include the detection rate (DR), mean, minimum, and maximum values for each survey area. Minimum and maximum values were calculated using all samples, whereas means were calculated on detected values only; nd = not detected; na = not analyzed.

	PLOO				SBOO			
Parameter	**DR (%)**	**Min**	**Max**	**Mean**	**DR (%)**	**Min**	**Max**	**Mean**
Particle Size (%)								
Coarse Particles	16	nd	14.2	1.0	50	nd	48.0	4.8
Med-Coarse Sands	93	nd	29.7	3.5	98	nd	151.4	34.6
Fine sands	100	17.9	61.9	41.8	100	0.6	106.9	40.3
Fines	100	37.6	71.0	53.8	91	nd	93.6	24.0
Organic Indicators								
BOD (ppm)	100	198	379	280	na	—	—	—
Sulfides (ppm)	80	0.00	51.60	12.36	31	nd	15.60	7.58
TN (% weight)	93	0.00	0.09	0.06	48	nd	0.05	0.03
TOC (% weight)	100	0.14	2.84	0.67	46	nd	2.13	0.37
TVS (% weight)	100	1.5	4.1	2.2	100	0.3	1.8	0.8
Trace Metals (ppm)								
Aluminum	100	2720	10900	6787	100	712	7360	3374
Antimony	89	nd	1.2	0.5	78	nd	0.9	0.4
Arsenic	100	1.11	5.94	2.65	100	0.75	10.30	2.45
Barium	100	9.7	44.2	26.4	100	1.3	37.7	15.0
Beryllium	100	0.1	0.3	0.2	100	0.02	0.13	0.07
Cadmium	100	0.02	0.11	0.07	89	nd	0.10	0.04
Chromium	100	6.0	24.4	13.8	100	2.4	13.1	8.2
Copper	100	2.3	14.2	6.1	100	0.3	5.8	1.9
Iron	100	3850	21200	9732	100	1170	8130	4904
Lead	100	1.3	5.8	2.8	100	0.7	5.5	1.6
Manganese	100	31.0	113.0	74.5	100	7.2	81.0	42.5
Mercury	100	0.011	0.076	0.029	44	nd	0.022	0.010
Nickel	100	2.5	8.8	5.3	100	0.5	5.1	2.0
Selenium	80	nd	0.621	0.357	28	nd	0.434	0.303
Silver	0	—	—	—	0	—	—	—
Tin	100	0.2	1.0	0.7	96	nd	3.0	0.3
Zinc	100	10.6	35.4	23.0	100	1.7	20.2	9.8
Pesticides (ppt)								
Total Chlordane	2	nd	94	94	0	—	—	—
Total DDT	100	98	18000	614	13	nd	1112	445
Total PCB (ppt)	16	nd	5267	2266	4	nd	720	394
Total PAH (ppb)	32	nd	192	47	2	nd	22	22
Total PBDE (ppt)	na	—	—	—	4	nd	338	296

Table 3.2

Summary of particle sizes and chemistry concentrations in sediments from San Diego regional benthic stations sampled during summer 2024. Data include detection rate (DR), minimum, maximum, and mean values for the entire survey area, as well as mean value by depth stratum. Minimum and maximum values were calculated using all samples, whereas means were calculated on detected values only; n = number of samples; nd = not detected.

	2024 Survey Area				Depth Strata			
					Inner Shelf	Mid-Shelf	Outer Shelf	Upper Slope
Parameters	**DR (%)**	**Min**	**Max**	**Mean**	**n=8**	**n=17**	**n=8**	**n=7**
Particle Size (%)								
Coarse particles	23	nd	16.1	1.7	0.4	2.6	2.8	0.0
Med-coarse sands	93	nd	91.8	12.2	7.5	20.2	10.6	0.1
Fine sands	100	1.8	87.9	38.1	66.0	31.9	35.5	24.5
Fines	95	nd	87.5	48.0	26.2	45.5	51.1	75.4
Organic Indicators								
Sulfides (ppm)	73	nd	121.00	19.41	13.19	16.95	11.75	33.33
TN (% weight)	100	0.028	0.280	0.078	0.034	0.056	0.082	0.178
TOC (% weight)	93	nd	3.35	0.96	0.23	0.49	1.37	2.26
TVS (% weight)	100	0.5	9.5	3.0	1.1	2.0	3.4	7.2
Trace Metals (ppm)								
Aluminum	100	1050	20600	8160	4545	6722	8106	15843
Antimony	95	nd	1.8	0.7	0.3	0.5	0.7	1.1
Arsenic	100	1.09	7.80	2.95	1.71	3.12	2.75	4.20
Barium	100	2.1	123.0	37.0	22.1	29.3	33.1	77.4
Beryllium	100	0.04	0.46	0.17	0.08	0.14	0.20	0.34
Cadmium	95	nd	0.53	0.13	0.04	0.08	0.13	0.34
Chromium	100	4.8	39.7	16.3	8.2	13.6	17.6	30.9
Copper	100	0.4	22.3	7.3	2.4	5.1	8.6	16.9
Iron	100	2890	22800	10135	5241	8900	11456	17214
Lead	100	1.0	6.8	3.2	1.6	3.0	3.7	5.1
Manganese	100	12.2	180.0	85.3	64.4	76.9	75.2	141.0
Mercury	83	nd	0.099	0.038	0.014	0.028	0.045	0.068
Nickel	100	0.67	21.50	6.71	2.38	4.88	7.00	15.75
Selenium	68	nd	1.65	0.59	0.22	0.39	0.50	1.06
Silver	0	—	—	—	—	—	—	—
Thallium	100	0.13	1.58	0.76	0.42	0.70	0.80	1.23
Tin	100	4.8	63.9	26.2	13.7	21.5	27.7	50.1
Zinc	100	9.1	61.4	28.3	11.9	28.1	34.1	47.7
Pesticides (ppt)								
Total DDT	75	nd	70973	3229	230	5347	452	2597
Hexachlorobenzene	3	nd	122	122	nd	nd	122	nd
Total PCB (ppt)	33	nd	4303	972	nd	425	1813	736
Total PAH (ppb)	23	nd	170	49	21	nd	63	49
Total PBDE (ppt)	18	nd	559	257	459	292	85	292

Table 3.3

Bioassay results (10-day amphipod survival tests) for sediment toxicity testing conducted for San Diego regional benthic stations sampled during summer 2024. Percent fines = percentage of silt + clay combined. Test results are expressed as mean percent survival ± 1 standard deviation (SD).

Survey	Site/Sample	Depth Stratum	Station Depth (m)	Percent Fines	Sample Date	Test Initiation	% Survival (Mean ± SD)
Summer 2024	Lab Control	—	—	—	—	8/2/2024	99 ± 2.2
	I12	Inner Shelf	28	21.3	7/16/2024	8/2/2024	97 ± 4.5
	I14	Inner Shelf	28	1.9	7/16/2024	8/2/2024	99 ± 2.2
	I15	Inner Shelf	28	48.2	7/16/2024	8/2/2024	99 ± 2.2
	I16	Inner Shelf	28	33.2	7/16/2024	8/2/2024	98 ± 2.7
	E11	Mid Shelf	98	37.6	7/17/2024	8/2/2024	97 ± 2.7
	E14	Mid Shelf	98	43.7	7/17/2024	8/2/2024	95 ± 6.1
	E15	Mid Shelf	98	49.7	7/17/2024	8/2/2024	88 ± 14.0*
	E17	Mid Shelf	98	46.9	7/17/2024	8/2/2024	97 ± 6.7

* Significant effect

Table 3.4

Summary of macrofaunal community parameters for PLOO, SBOO, and San Diego regional benthic stations sampled during 2024. Data for each region include mean, 95% confidence interval (CI), minimum, and maximum values; SR = species richness; Abun = abundance; H' = Shannon diversity index; J' = Pielou's evenness; Dom = Swartz dominance; BRI = benthic response index.

		SR	Abun	H'	J'	Dom	BRI
All PLOO Grabs	Mean	95	358	4.0	0.87	33	12
(n = 44)	95% CI	4	26	0.1	0.01	2	1
	Min	71	201	3.5	0.79	19	5
	Max	133	541	4.4	0.91	49	24
All SBOO Grabs	Mean	68	270	3.4	0.82	22	19
(n = 54)	95% CI	9	45	0.1	0.02	3	2
	Min	22	79	1.9	0.61	4	-9
	Max	162	787	4.3	0.93	50	28
All Regional Grabs	Mean	75	294	3.4	0.82	25	16
(n = 40)	95% CI	12	53	0.3	0.04	4	2
	Min	8	28	1.2	0.44	2	8
	Max	170	841	4.4	0.94	50	33

Table 3.5

The 25 most abundant macroinvertebrate taxa collected from PLOO benthic stations during 2024. A total of 44 grabs were collected. PA = percent abundance, FO = frequency of occurrence, MAG = mean abundance per grab.

Taxon	Taxonomic Classification	PA	FO	MAG
Spiophanes duplex	Polychaeta: Spionidae	6	100	21
Euphilomedes carcharodonta	Arthropoda: Ostracoda	6	86	20
Mediomastus sp	Polychaeta: Capitellidae	4	98	16
Amphiodia urtica	Echinodermata: Ophiuroidea	3	89	12
Paradiopatra parva	Polychaeta: Onuphidae	3	100	12
Euphilomedes producta	Arthropoda: Ostracoda	3	100	12
Prionospio jubata	Polychaeta: Spionidae	3	100	12
Prionospio dubia	Polychaeta: Spionidae	3	98	9
Scoloplos armiger Cmplx	Polychaeta: Orbiniidae	2	93	7
Euclymeninae sp A	Polychaeta: Maldanidae	2	89	7
Eclysippe trilobata	Polychaeta: Ampharetidae	2	95	7
Amphiuridae	Echinodermata: Ophiuroidea	2	98	6
Spiophanes kimballi	Polychaeta: Spionidae	2	84	6
Phisidia sanctaemariae	Polychaeta: Terebellidae	2	86	6
Amphiodia sp	Echinodermata: Ophiuroidea	2	93	6
Terebellides californica	Polychaeta: Trichobranchidae	1	89	5
Proclea sp A	Polychaeta: Terebellidae	1	70	5
Lumbrineris sp Group I	Polychaeta: Lumbrineridae	1	57	5
Lumbrineris cruzensis	Polychaeta: Lumbrineridae	1	66	4
Chloeia pinnata	Polychaeta: Amphinomidae	1	66	4
Praxillella pacifica	Polychaeta: Maldanidae	1	84	4
Dialychone trilineata	Polychaeta: Sabellidae	1	89	4
Polycirrus sp A	Polychaeta: Terebellidae	1	70	4
Caecognathia crenulatifrons	Arthropoda: Isopoda	1	91	3
Tellina cadieni	Mollusca: Bivalvia	1	73	3

Table 3.6

The 25 most abundant macroinvertebrate taxa collected from SBOO benthic stations during 2024. A total of 54 grabs were collected. PA = percent abundance, FO = frequency of occurrence, MAG = mean abundance per grab.

Taxon	Taxonomic Classification	PA	FO	MAG
Spiophanes norrisi	Polychaeta: Spionidae	11	93	29
Spiophanes duplex	Polychaeta: Spionidae	5	80	13
Kirkegaardia siblina	Polychaeta: Cirratulidae	3	57	8
NEMATODA		3	67	8
Euclymeninae sp A	Polychaeta: Maldanidae	2	65	6
Notomastus latericeus	Polychaeta: Capitellidae	1	44	4
Protodorvillea gracilis	Polychaeta: Dorvilleidae	1	35	4
Euphilomedes carcharodonta	Arthropoda: Ostracoda	1	63	4
Chondrochelia dubia Cmplx	Arthropoda: Tanaidacea	1	69	4
Mediomastus sp	Polychaeta: Capitellidae	1	65	4
Sthenelanella uniformis	Polychaeta: Sigalionidae	1	26	3
Exogone dwisula	Polychaeta: Syllidae	1	22	3
Edwardsia juliae	Cnidaria: Actiniaria	1	54	3
Sigalion spinosus	Polychaeta: Sigalionidae	1	72	3
Dendraster terminalis	Echinodermata: Echinoidea	1	22	3
Ampharete labrops	Polychaeta: Ampharetidae	1	57	2
Rhepoxynius menziesi	Arthropoda: Amphipoda	1	69	2
Scoloplos armiger Cmplx	Polychaeta: Orbiniidae	1	54	2
Prionospio pygmaeus	Polychaeta: Spionidae	1	35	2
Tellina modesta	Mollusca: Bivalvia	1	43	2
Lanassa venusta venusta	Polychaeta: Terebellidae	1	13	2
Lumbrinerides platypygos	Polychaeta: Lumbrineridae	1	30	2
Glycinde armigera	Polychaeta: Goniadidae	1	57	2
Polycirrus sp A	Polychaeta: Terebellidae	1	52	2
Phyllodoce hartmanae	Polychaeta: Phyllodocidae	1	48	2

Table 3.7

The 10 most abundant macroinvertebrate taxa per depth stratum collected from San Diego regional benthic stations sampled during summer 2024. PA = percent abundance, FO = frequency of occurrence, MAG = mean abundance per grab.

Strata	Taxon	Taxonomic Classification	PA	FO	MAG
Inner Shelf n = 8	*Prionospio pygmaeus*	Polychaeta: Spionidae	9	88	19
	Ampharete labrops	Polychaeta: Ampharetidae	6	75	14
	Euclymeninae sp A	Polychaeta: Maldanidae	5	75	10
	Spiophanes norrisi	Polychaeta: Spionidae	3	75	6
	Spiophanes duplex	Polychaeta: Spionidae	3	88	6
	Edwardsia juliae	Cnidaria: Actiniaria	2	38	5
	Kirkegaardia siblina	Polychaeta: Cirratulidae	2	75	5
	Sigalion spinosus	Polychaeta: Sigalionidae	2	62	5
	Glycinde armigera	Polychaeta: Goniadidae	2	75	4
	Diastylopsis tenuis	Arthropoda: Cumacea	2	38	4
	Goniada littorea	Polychaeta: Goniadidae	2	38	4
Mid-shelf n = 17	*Spiophanes duplex*	Polychaeta: Spionidae	6	94	24
	Amphiodia urtica	Echinodermata: Ophiuroidea	4	65	16
	Euclymeninae sp A	Polychaeta: Maldanidae	4	94	16
	Amphiuridae	Echinodermata: Ophiuroidea	3	82	10
	Prionospio dubia	Polychaeta: Spionidae	3	76	10
	Sthenelanella uniformis	Polychaeta: Sigalionidae	2	65	10
	Spiophanes norrisi	Polychaeta: Spionidae	2	53	9
	Mediomastus sp	Polychaeta: Capitellidae	2	76	8
	Prionospio jubata	Polychaeta: Spionidae	2	82	7
	Amphiodia sp	Echinodermata: Ophiuroidea	2	76	7
Outer Shelf n = 8	*Phyllochaetopterus limicolus*	Polychaeta: Chaetopteridae	8	88	21
	Spiophanes kimballi	Polychaeta: Spionidae	8	88	20
	Paradiopatra parva	Polychaeta: Onuphidae	6	100	15
	Spiophanes duplex	Polychaeta: Spionidae	5	100	13
	Mediomastus sp	Polychaeta: Capitellidae	4	100	10
	Amphiuridae	Echinodermata: Ophiuroidea	2	100	6
	Prionospio dubia	Polychaeta: Spionidae	2	75	5
	Paraprionospio alata	Polychaeta: Spionidae	2	100	5
	Euclymeninae sp A	Polychaeta: Maldanidae	2	88	4
	Prionospio jubata	Polychaeta: Spionidae	2	88	4
Upper Slope n = 7	*Phyllochaetopterus limicolus*	Polychaeta: Chaetopteridae	41	71	55
	Paraprionospio alata	Polychaeta: Spionidae	14	86	19
	Spiophanes kimballi	Polychaeta: Spionidae	5	57	7
	Pectinaria californiensis	Polychaeta: Pectinariidae	3	57	4
	Prionospio lobulata	Polychaeta: Spionidae	3	57	4
	Mediomastus sp	Polychaeta: Capitellidae	3	43	4
	Maldane sarsi	Polychaeta: Maldanidae	3	86	3
	Paradiopatra parva	Polychaeta: Onuphidae	2	43	2
	Kirkegaardia cryptica	Polychaeta: Cirratulidae	1	29	2
	Scoletoma tetraura Cmplx	Polychaeta: Lumbrineridae	1	57	2

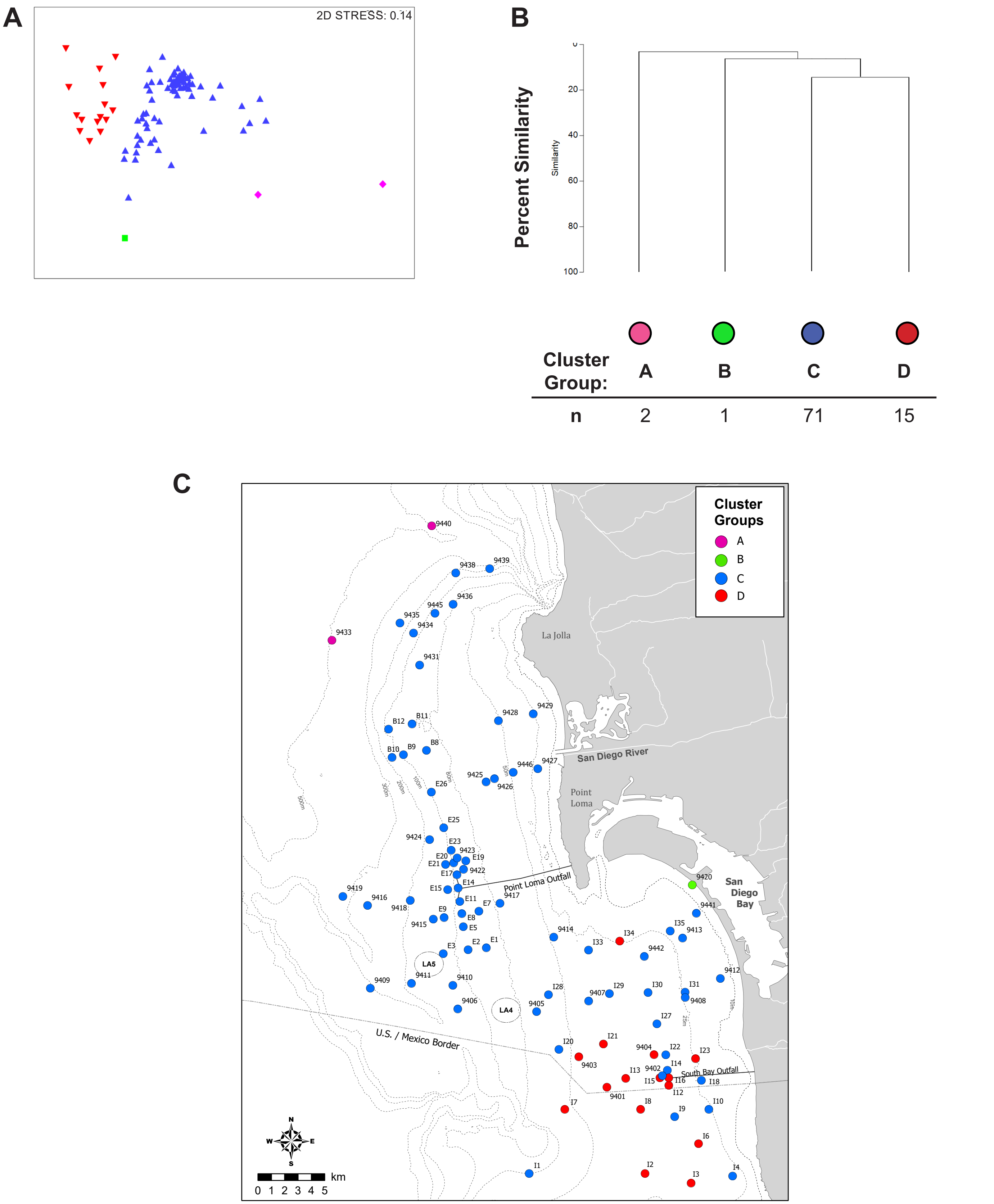

Figure 3.2
Results of ordination and cluster analysis of macrofauna data from PLOO, SBOO, and San Diego regional benthic stations sampled during summer 2024. Results are presented as (A) nMDS ordination; (B) a dendrogram of main cluster groups; (C) a map showing the distribution of cluster groups throughout the region.

Chapter 4
Demersal Fishes and Megabenthic Invertebrates

Chapter 4. Demersal Fishes and Megabenthic Invertebrates

Introduction

The City of San Diego (City) collects bottom dwelling (demersal) fishes and large (megabenthic) invertebrates by otter trawl to examine potential effects of wastewater discharge, or other disturbances, on the marine environment surrounding the Point Loma and South Bay Ocean Outfalls (PLOO and SBOO, respectively). This chapter presents summaries and preliminary analyses of the demersal fish and megabenthic invertebrate data collected during 2024 at a total of 13 trawl stations surrounding the PLOO and SBOO. Supplemental analyses supporting these results are presented in Appendix C. A more comprehensive assessment of these results will be presented in the 2024–2025 Biennial Assessment Report to be submitted by July 1, 2026.

Materials and Methods

Field Sampling

Trawls were conducted at 13 stations to monitor demersal fish and megabenthic invertebrate populations during winter (January), summer (July) 2024 (Figure 4.1). Due to schedule changes and delays, some summer stations were sampled in fall (October) 2024. The 13 stations included six PLOO stations located along the 100-m depth contour (discharge depth), ranging from 9 km south to 8 km north of the outfall, and seven SBOO stations located along the 28-m depth contour (discharge depth), ranging from 7 km south to 8.5 km north of the outfall. The two PLOO stations (SD10 and SD12) and two SBOO stations (SD17 and SD18) located within 1000 m of the outfall structures are considered to represent nearfield conditions. A single trawl was performed at each station, during each survey, using a 7.6-m Marinovich otter trawl fitted with a 1.3-cm cod-end mesh net. Standard sampling procedures require towing the net for a total of 10 minutes bottom time per trawl, at a speed of about 2 knots along a predetermined heading. Pressure-temperature sensors were attached to one of the trawl doors to measure water temperature, depth, and time of the individual trawls. Data collected by these sensors were used to confirm bottom time and depth of each trawl. The catch from each successful trawl was sorted and inspected aboard ship. All individual fish and invertebrates captured were identified to species, or to the lowest taxon possible, based on accepted taxonomic protocols for the region (Eschmeyer and Herald 1998, Page et al. 2013, SCAMIT 2023). If an animal could not be accurately identified to species in the field, it was returned to the laboratory for an attempt at further identification. The total number of individuals and total biomass (kg, wet weight) were recorded for each fish species. Additionally, each fish was inspected for the presence of physical abnormalities (e.g., tumors, lesions, fin erosion, discoloration) and external parasites (e.g., copepods, cymothoid isopods, leeches). The length of each individual fish was measured to the nearest centimeter to determine size class; total length (TL) was measured for cartilaginous fishes, while standard length (SL) was measured for bony fishes (SCCWRP 2023). For trawl-caught invertebrates, only the total number of individuals was recorded for each species. Parasitic invertebrates no longer attached to their hosts, including the cymothoid isopod *Elthusa vulgaris* and leeches in the subclass Hirudinea, were recorded as present/absent, rather than being counted individually, and are not included in the analyses presented herein.

Data Analyses

Population characteristics of fish and invertebrate species were summarized as percent abundance (number of individuals per species/total abundance of all species), frequency of occurrence (percentage of stations at which a species was collected), mean abundance per haul (number of individuals per species/total number of stations sampled), and mean abundance per occurrence (number of individuals per species/number of stations at which the species was collected). Additionally, the following community structure parameters were calculated per trawl for both fishes and invertebrates: species richness (number of species or distinct taxa), total abundance (number of individuals), and the Shannon Diversity Index (H'). Total biomass was also measured for each fish species. These analyses were performed using R (R Core Team 2018) and various functions within the devtools, flextable, ggpubr, glue, gtools, magrittr, reshape2, Rmisc, RODBC, tidyverse, and vegan packages (Wickham 2007, Wickham et al. 2019, 2021, Kassambara 2020, Ripley and Lapsley 2021, Bache and Wickham 2022, Gohel 2022, Hester and Bryan 2022, Hope 2022, Oksanen et al. 2022, Warnes et al. 2022)

Multivariate analyses were performed in PRIMER v7 software using demersal fish and megabenthic invertebrate data collected from trawls conducted in the PLOO and SBOO regions during 2024 (Clarke 1993, Warwick 1993, Clarke et al. 2014). These analyses included hierarchical agglomerative clustering (cluster analysis) with group-average linking and similarity profile analysis (SIMPROF) to confirm the non-random structure of the resultant cluster dendrogram (Clarke et al. 2008). The Bray-Curtis measure of dissimilarity was used as the basis for the cluster analysis, and abundance data were square-root transformed to lessen the influence of overly abundant species and increase the importance (or impact) of rare species.

All raw data for 2024 have been submitted to either the Regional Water Quality Control Board or the California Environmental Data Exchange Network (CEDEN) and will be provided upon request.

Results

Demersal Fishes

All fish species captured during the 2024 trawl surveys are summarized by percent abundance, frequency of occurrence, mean abundance per haul, and mean abundance per occurrence in Tables 4.1 and 4.2. Species richness, abundance, diversity, and biomass values for each station are summarized in Table 4.3. Total number of individuals, total biomass, minimum and maximum length, and mean length per species are included in Appendices C.1 and C.2. All abnormalities and parasites found on trawled fish during the reporting period are listed in Appendix C.3. Cluster analyses were performed to evaluate ecological patterns within the demersal fish communities in the San Diego region; these results are presented in Figures 4.2 and 4.3.

Megabenthic Invertebrates

All megabenthic invertebrate species captured during the 2024 trawl surveys are summarized by percent abundance, frequency of occurrence, mean abundance per haul, and mean abundance per occurrence in Tables 4.4 and 4.5. Species richness, abundance, and diversity values for each station are summarized in Table 4.6. The total number of individuals per species is included in Appendices C.4 and C.5. Cluster analyses were performed to evaluate ecological patterns within the megabenthic invertebrate communities in the San Diego region; these results are presented in Figures 4.4 and 4.5.

Summary

Preliminary analysis of the demersal fish and megabenthic invertebrate data collected in 2024 indicate that treated wastewater discharged through the PLOO and SBOO has not negatively impacted these communities in the coastal waters off San Diego. Values for most community parameters were similar at stations located both near and far away from the outfall discharge sites. Community metrics, such as species richness, abundance, and diversity, were within historical ranges reported for the San Diego region (City of San Diego 2024) and were representative of those characterizing similar habitats throughout the Southern California Bight (Allen et al. 1998, 2002, 2007, 2011, Walther et al. 2017).

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Chapter 4

Figures & Tables

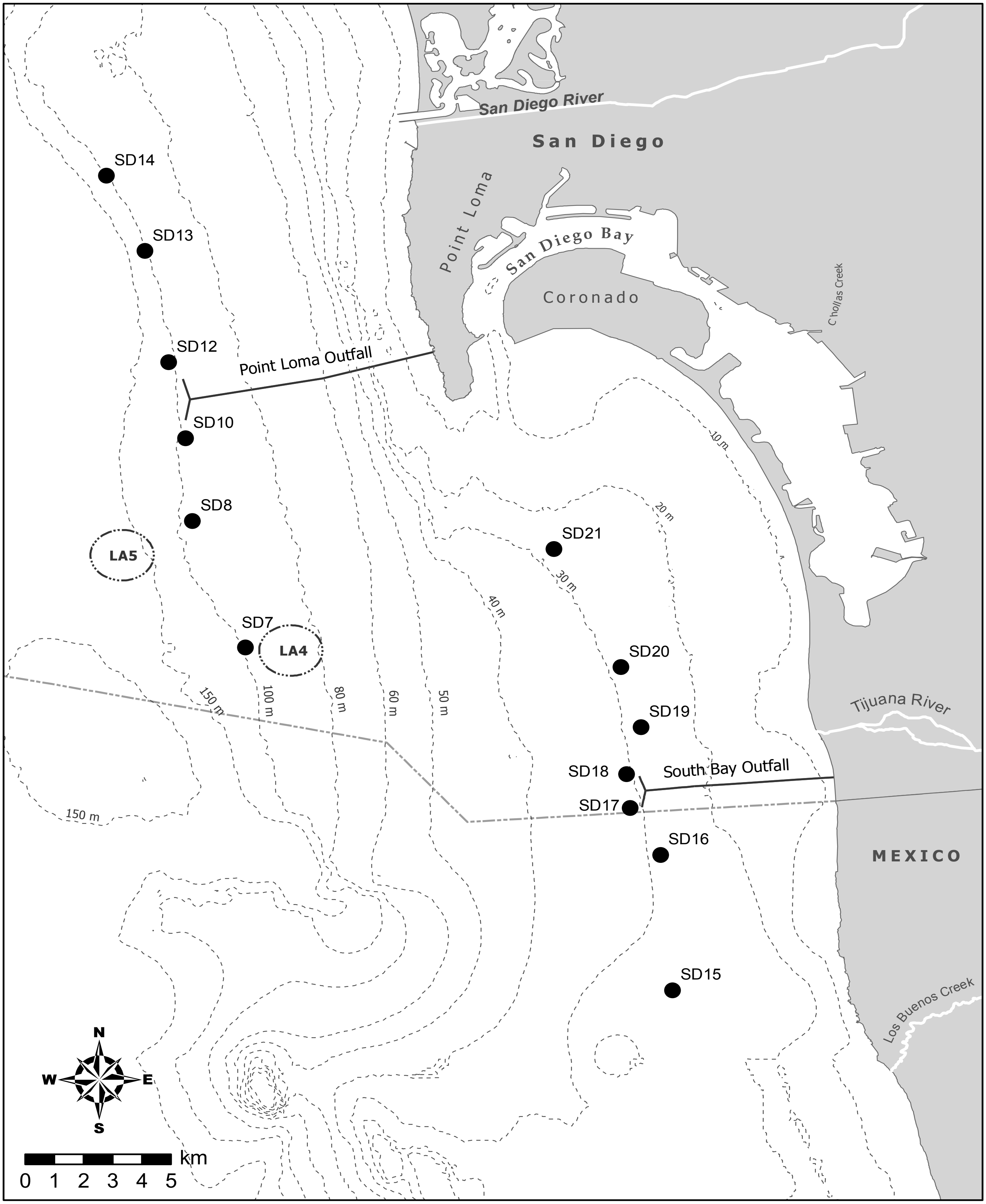

Figure 4.1
Trawl station locations sampled around the PLOO and SBOO as part of the City of San Diego's Ocean Monitoring Program.

Table 4.1

Top 30 demersal fish species collected from the PLOO region during 2024. PA = percent abundance; FO = frequency of occurrence; MAH = mean abundance per haul; MAO = mean abundance per occurence.

Species	PA	FO	MAH	MAO
Pacific Sanddab	39	100	211	211
Halfbanded Rockfish	17	100	92	92
Longfin Sanddab	9	100	46	46
Yellowchin Sculpin	8	58	45	77
Dover Sole	6	100	31	31
Longspine Combfish	5	92	27	29
Shortspine Combfish	4	100	24	24
Stripetail Rockfish	3	67	15	22
California Lizardfish	1	50	4	9
California Tonguefish	1	100	6	6
English Sole	1	67	6	9
Pink Seaperch	1	92	7	7
Slender Sole	1	33	8	24
Bigmouth Sole	<1	67	2	3
Black Eelpout	<1	8	<1	1
Blackbelly Eelpout	<1	8	<1	4
Blacktip Poacher	<1	8	<1	1
California Scorpionfish	<1	33	1	4
California Skate	<1	17	<1	2
Chilipepper	<1	25	<1	1
Cowcod	<1	8	<1	1
Flag Rockfish	<1	8	<1	1
Greenblotched Rockfish	<1	25	<1	1
Greenstriped Rockfish	<1	17	<1	2
Hornyhead Turbot	<1	83	2	2
Kelp Pipefish	<1	8	<1	1
Pacific Angel Shark	<1	8	<1	1
Pacific Argentine	<1	25	1	5
Pacific Pompano	<1	8	<1	1
Plainfin Midshipman	<1	58	2	3

Table 4.2

Top 30 demersal fish species collected from the SBOO region during 2024. PA = percent abundance; FO = frequency of occurrence; MAH = mean abundance per haul; MAO = mean abundance per occurence.

Species	PA	FO	MAH	MAO
Speckled Sanddab	49	100	85	85
Longfin Sanddab	19	79	32	41
English Sole	6	64	10	16
California Lizardfish	5	79	9	11
California Tonguefish	5	93	9	10
Roughback Sculpin	3	71	4	6
Yellowchin Sculpin	3	29	6	21
California Halibut	2	93	3	3
Hornyhead Turbot	2	71	4	6
Pacific Sanddab	2	50	3	6
Fantail Sole	1	64	1	2
Longspine Combfish	1	14	1	9
Shiner Perch	1	21	1	5
Spotted Turbot	1	43	1	3
Barcheek Pipefish	<1	14	1	4
Bigmouth Sole	<1	14	<1	2
Calico Rockfish	<1	7	<1	1
California Skate	<1	29	<1	1
Curlfin Sole	<1	14	<1	2
Lingcod	<1	7	<1	2
Northern Anchovy	<1	7	<1	1
Plainfin Midshipman	<1	14	<1	2
Pygmy Poacher	<1	21	<1	1
Rockfish Unidentified	<1	7	<1	2
Round Stingray	<1	7	<1	2
Specklefin Midshipman	<1	36	<1	1
Stripetail Rockfish	<1	7	<1	1
Vermilion Rockfish	<1	21	<1	1
White Croaker	<1	7	<1	1

Table 4.3

Summary of demersal fish community parameters for PLOO and SBOO trawl stations sampled during 2024. Data are included for richness, abundance, diversity (H'), and biomass (kg, wet weight).

	Station	Species Richness		Abundance		Diversity		Biomass	
		Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
PLOO	SD7	19	13	344	322	2.0	1.2	7.5	7.7
	SD8	18	16	648	369	1.9	1.4	18.9	10.6
	SD10	21	15	1260	357	1.4	1.4	28.1	7.6
	SD12	18	17	1134	490	1.8	1.6	16.8	13.1
	SD13	19	14	451	270	1.9	1.4	9.2	5.9
	SD14	16	13	506	282	2.0	1.5	7.4	22.6
SBOO	SD15	9	10	21	114	1.9	1.0	1.9	4.8
	SD16	11	9	63	140	1.7	1.5	3.0	9.6
	SD17	13	11	81	116	2.0	1.5	5.7	7.4
	SD18	13	16	83	506	1.7	1.2	9.0	15.6
	SD19	5	12	37	379	1.2	1.8	1.0	22.2
	SD20	6	13	86	364	1.2	1.5	1.0	14.9
	SD21	8	16	29	412	1.6	1.6	4.7	12.9

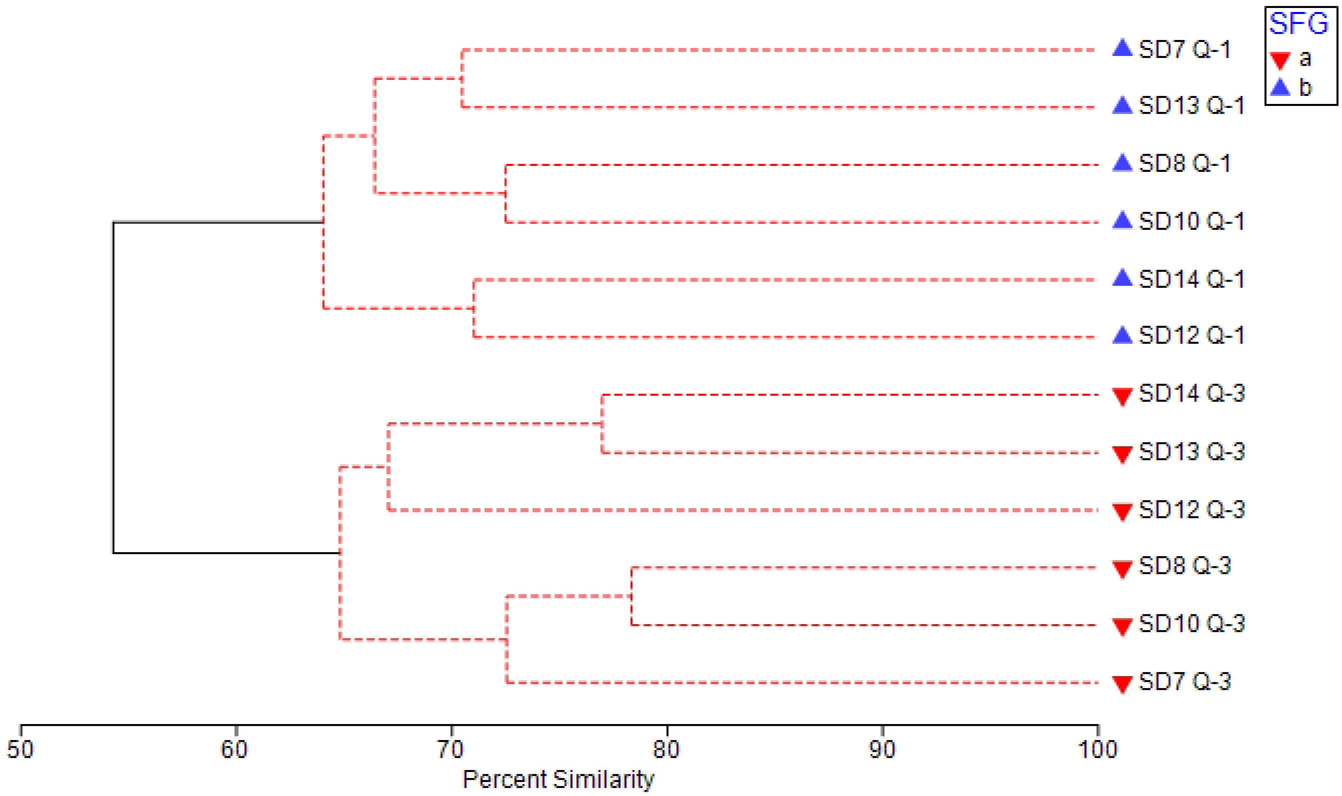

Figure 4.2
Results of cluster analysis of demersal fish data from PLOO trawl stations sampled during 2024. Solid black lines, if present, indicate non-random structure of the dendrogram as confirmed by SIMPROF; SFG = SIMPROF Group, Q-1 = winter survey, Q-3 = summer survey.

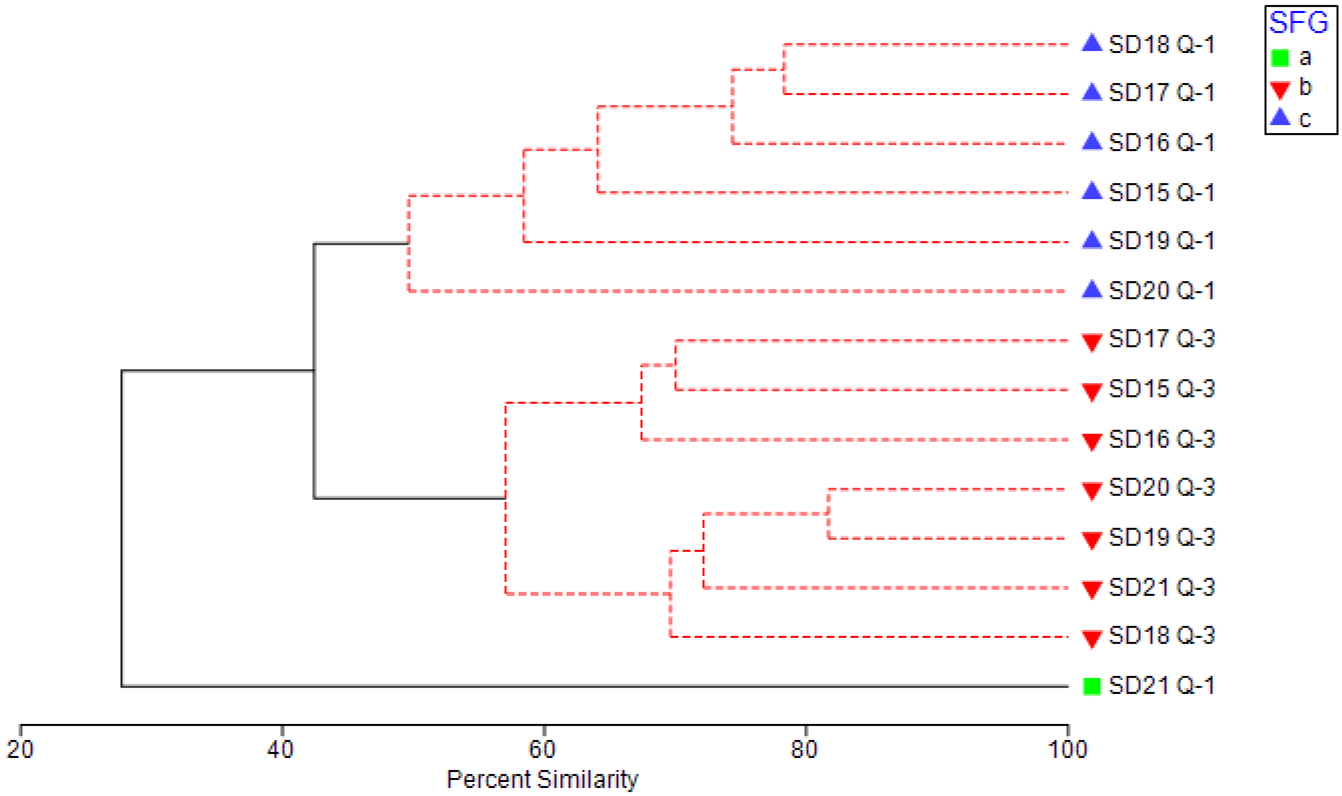

Figure 4.3
Results of cluster analysis of demersal fish data from SBOO trawl stations sampled during 2024. Solid black lines, if present, indicate non-random structure of the dendrogram as confirmed by SIMPROF; SFG = SIMPROF Group, Q-1 = winter survey, Q-3 = summer survey.

Table 4.4

Top 30 megabenthic invertebrate species collected from the PLOO region during 2024. PA = percent abundance; FO = frequency of occurrence; MAH = mean abundance per haul; MAO = mean abundance per occurence.

Species	PA	FO	MAH	MAO
Lytechinus pictus	97	100	1026	1,026
Astropecten californicus	1	92	11	12
Ophiura luetkenii	1	75	6	8
Acanthoptilum sp	<1	33	1	2
Adelogorgia phyllosclera	<1	8	<1	1
Antiplanes catalinae	<1	8	<1	1
Aphrodita refulgida	<1	8	<1	1
Apostichopus californicus	<1	50	1	2
Astropecten ornatissimus	<1	8	<1	1
Calliostoma turbinum	<1	8	<1	1
Coryrhynchus lobifrons	<1	25	<1	1
Crangon alaskensis	<1	8	<1	1
Eugorgia rubens	<1	8	<1	1
Florometra serratissima	<1	8	<1	1
Gorgonocephalus eucnemis	<1	17	<1	1
Luidia asthenosoma	<1	75	3	3
Luidia foliolata	<1	83	3	4
Malacalcyonacea	<1	8	<1	1
Metridium farcimen	<1	8	<1	1
Octopus rubescens	<1	50	1	2
Ophiopholis bakeri	<1	17	2	10
Ophiothrix spiculata	<1	8	<1	2
Paguristes turgidus	<1	33	<1	1
Philine auriformis	<1	8	<1	1
Platydoris macfarlandi	<1	25	<1	1
Platymera gaudichaudii	<1	17	<1	1
Pleurobranchaea californica	<1	42	1	2
Rossia pacifica	<1	17	<1	3
Savalia lucifica	<1	8	<1	1
Sicyonia ingentis	<1	50	2	4

Table 4.5
Top 30 megabenthic invertebrate species collected from the SBOO region during 2024. PA = percent abundance; FO = frequency of occurrence; MAH = mean abundance per haul; MAO = mean abundance per occurence.

Species	PA	FO	MAH	MAO
Astropecten californicus	62	100	28	28
Sicyonia penicillata	9	71	4	6
Lytechinus pictus	6	43	3	7
Luidia armata	4	71	2	2
Crangon nigromaculata	2	43	1	3
Pagurus spilocarpus	2	36	1	2
Pyromaia tuberculata	2	21	1	4
Achelous xantusii	1	29	1	2
Crangon alba	1	21	1	3
Hemisquilla californiensis	1	29	1	2
Lovenia cordiformis	1	7	<1	4
Ophiothrix spiculata	1	36	1	2
Philine auriformis	1	14	<1	3
Acanthodoris brunnea	<1	14	<1	1
Armina californica	<1	7	<1	1
Burchia semiinflata	<1	7	<1	1
Dendraster terminalis	<1	7	<1	3
Ericerodes hemphillii	<1	7	<1	1
Heptacarpus stimpsoni	<1	7	<1	3
Kelletia kelletii	<1	14	<1	1
Loxorhynchus grandis	<1	7	<1	1
Megasurcula carpenteriana	<1	7	<1	1
Metacarcinus anthonyi	<1	7	<1	1
Metacarcinus gracilis	<1	21	<1	1
Octopus rubescens	<1	14	<1	1
Paguristes bakeri	<1	14	<1	2
Pagurus armatus	<1	7	<1	2
Pandalus platyceros	<1	7	<1	3
Panulirus interruptus	<1	7	<1	1
Platymera gaudichaudii	<1	21	<1	1

Table 4.6

Summary of megabenthic invertebrate community parameters for PLOO and SBOO trawl stations sampled during 2024. Data are included for richness, abundance, and diversity (H').

	Station	*Species Richness*		*Abundance*		*Diversity*	
		Winter	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**
PLOO	SD7	9	11	1328	2095	0.2	0.2
	SD8	8	13	2604	4167	0.0	0.1
	SD10	16	9	81	1250	2.0	0.2
	SD12	8	12	27	289	1.5	0.7
	SD13	13	8	36	686	2.3	0.2
	SD14	7	8	25	156	1.7	0.5
SBOO	SD15	11	7	56	57	1.4	0.9
	SD16	8	5	21	15	1.8	0.9
	SD17	10	5	22	16	1.9	1.0
	SD18	12	9	55	76	1.8	1.5
	SD19	6	5	45	116	1.3	0.3
	SD20	6	3	36	59	1.2	0.3
	SD21	8	7	17	52	1.9	1.1

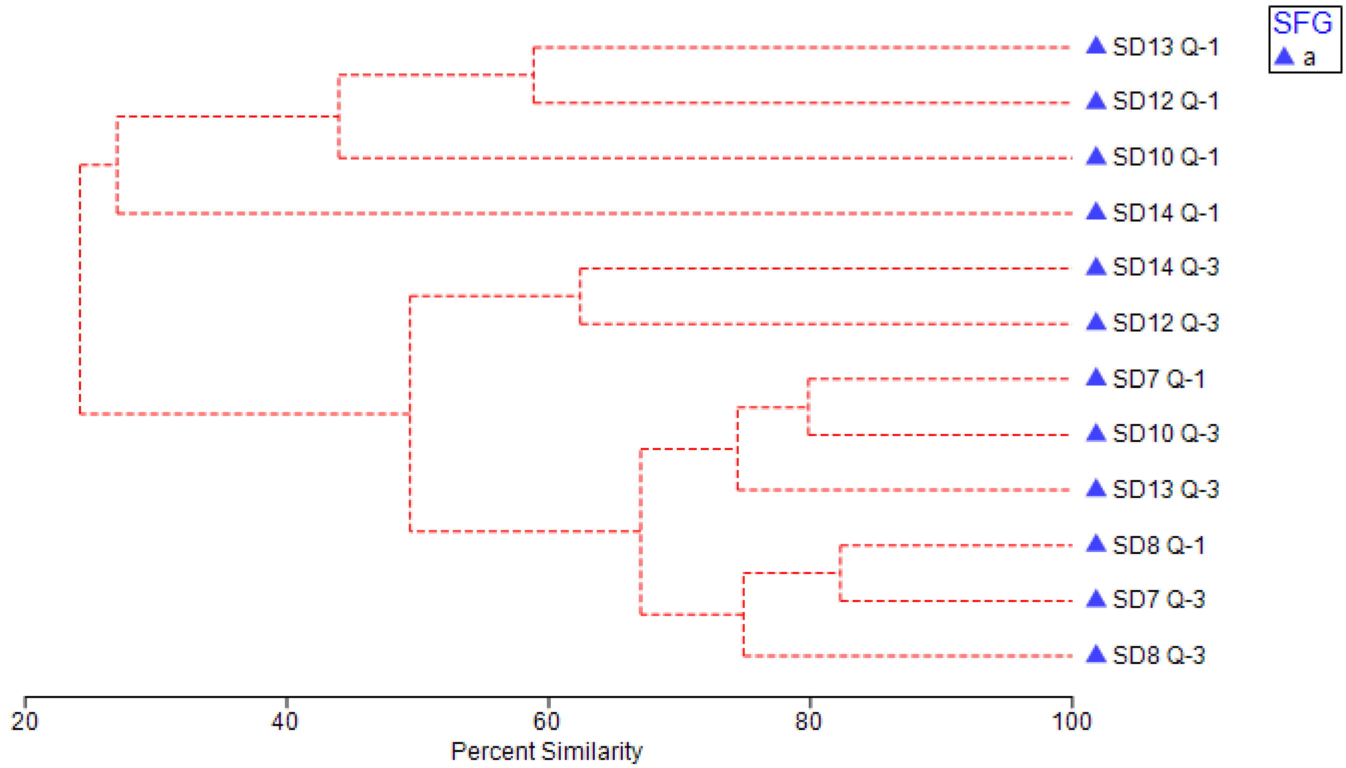

Figure 4.4
Results of cluster analysis of megabenthic invertebrate data from PLOO trawl stations sampled during 2024. Solid black lines, if present, indicate non-random structure of the dendrogram as confirmed by SIMPROF; SFG = SIMPROF Group, Q-1 = winter survey, Q-3 = summer survey.

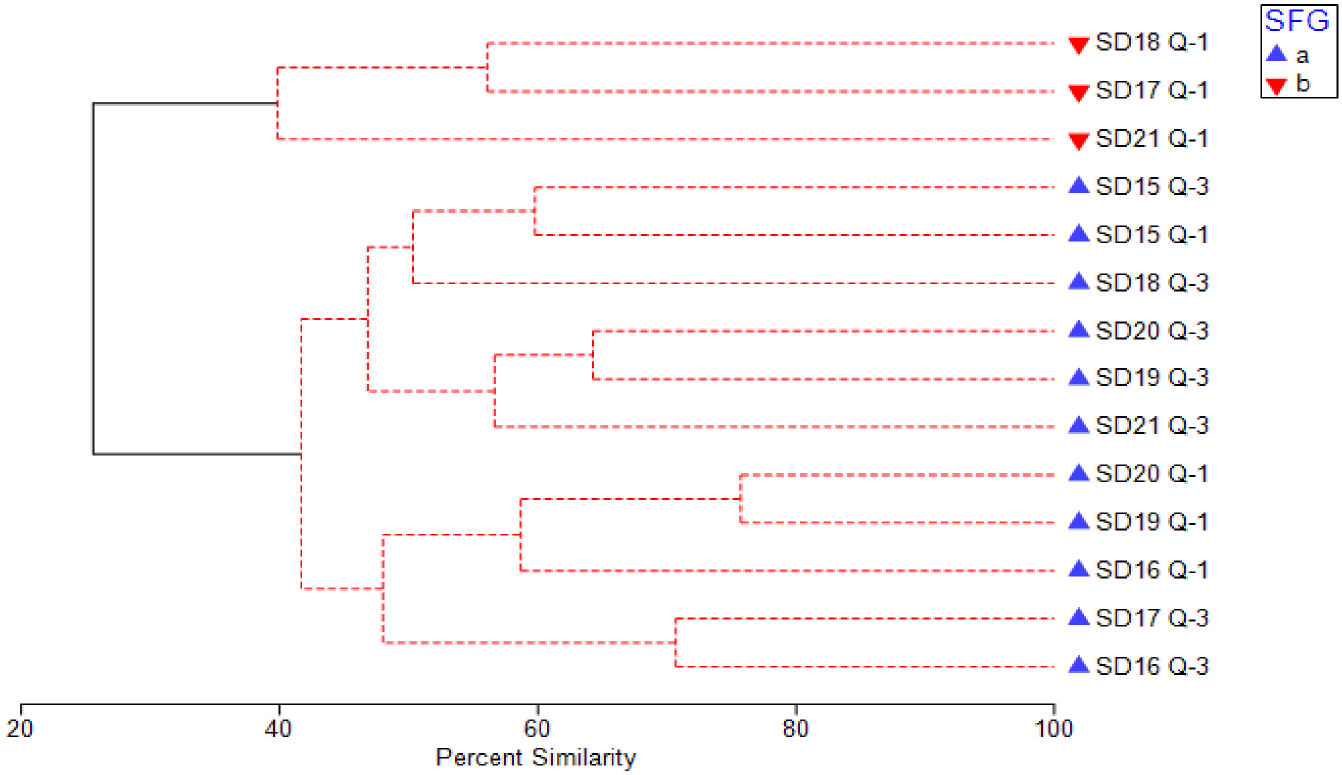

Figure 4.5
Results of cluster analysis of megabenthic invertebrate data from SBOO trawl stations sampled during 2024. Solid black lines, if present, indicate non-random structure of the dendrogram as confirmed by SIMPROF; SFG = SIMPROF Group, Q-1 = winter survey, Q-3 = summer survey.

Chapter 5
Contaminants in Marine Fishes

Chapter 5. Contaminants in Marine Fishes

Introduction

Bottom dwelling (demersal) fishes are collected by the City of San Diego (City) to evaluate the presence of contaminants in their tissues, which may result from the discharge of wastewater from the Point Loma and South Bay Ocean Outfalls (PLOO and SBOO, respectively). Anthropogenic inputs to coastal waters can result in increased concentrations of pollutants within the local marine environment, which may subsequently accumulate in the tissues of fishes and their prey. This portion of the City's Ocean Monitoring Program consists of two components: (1) analyzing liver tissues from mostly trawl-caught fishes; (2) analyzing muscle tissues from fishes collected by hook and line (rig fishing). All liver and muscle tissue samples collected were analyzed for contaminants specified in the National Pollutant Discharge Elimination System (NPDES) discharge permits that govern monitoring requirements for the PLOO and SBOO regions. This chapter presents summaries and preliminary analyses of all fish tissue data collected during calendar year 2024 at PLOO and SBOO stations. A more comprehensive assessment of these results will be presented in the 2024-2025 Biennial Assessment Report to be submitted by July 1, 2026.

Materials and Methods

Fishes were collected in fall (October) 2024 from a total of nine trawl zones (TZ1–TZ9) and four rig fishing zones (RF1–RF4) that span the PLOO and SBOO monitoring regions (Figure 5.1). Each trawl zone represents an area centered on one or two trawl stations, as specified in Chapter 4. Trawl Zone 1 includes the "nearfield" area within a 1-km radius of PLOO stations SD10 and SD12, which are located just south and north of the outfall discharge site, respectively. Trawl Zone 2 includes the area within a 1-km radius surrounding the northern "farfield" PLOO stations SD13 and SD14. Trawl Zone 3 represents the area within a 1-km radius surrounding the "farfield" PLOO station SD8, which is located south of the outfall near the LA-5 dredged material disposal site. Trawl Zone 4 is the area within a 1-km radius surrounding the "farfield" PLOO station SD7, which is located several kilometers south of the outfall. Trawl Zone 5 includes the area located within a 1-km radius of the SBOO stations SD17 and SD18, which are located just south and north of the outfall discharge site, respectively. Trawl Zone 6 includes the area within a 1-km radius surrounding the northern SBOO stations SD19 and SD20, while Trawl Zone 7 includes the area within a 1-km radius of the northern SBOO station SD21. Trawl Zone 8 represents the area within a 1-km radius surrounding the southern SBOO station SD16, while Trawl Zone 9 represents the area within a 1-km radius surrounding the southern SBOO station SD15. Rig Fishing Zones 1–4 represent the areas within a 1-km radius of the nominal coordinates for stations RF1, RF2, RF3, and RF4. Stations RF1 and RF3 are located within 1 km of the PLOO and SBOO discharge sites, respectively, and are considered the "nearfield" rig fishing sites. In contrast, station RF2 is located approximately 11 km northwest of the PLOO, while station RF4 is located approximately 13 km southeast of the SBOO. These two sites are considered "farfield", or reference, stations for the analyses herein. Efforts to collect target species by trawl were limited to five 10-minute (bottom time) trawls per site, while rig fishing effort was limited to five hours at each station. Occasionally, insufficient numbers of target species were obtained despite this effort, which resulted in inadequate amounts of tissue to complete the full suite of chemical analyses (see Table 5.1).

A total of 16 species of fish were collected for analysis of liver and muscle tissues during the 2024 survey (Table 5.1). Pacific Sanddab (*Citharichthys sordidus*) were collected by hook and line methods at the PLOO trawl stations, while Longfin Sanddab (*Citharichthys xanthostigma*), Hornyhead Turbot (*Pleuronichthys verticalis*), Fantail Sole (*Xystreurys liolepis*), and English Sole (*Parophrys vetulus*) were collected using standard otter trawl methods (see Chapter 4) at SBOO trawl stations. 12 additional species of fish were collected for analysis of muscle tissues at the rig fishing stations using standard hook and line fishing techniques. These species included Vermilion Rockfish (*Sebastes miniatus*), Starry Rockfish (*Sebastes constellatus*), Greenblotched Rockfish (*Sebastes rosenblatti*), Flag Rockfish (*Sebastes rubrivinctus*), Speckled Rockfish (*Sebastes ovalis*), Brown Rockfish (*Sebastes auriculatus*), California Scorpionfish (*Scorpaena guttata*), Treefish (*Sebastes serriceps*), Honeycomb Rockfish (*Sebastes umbrosus*), Black-and-Yellow Rockfish (*Sebastes chrysomelas*), and Gopher Rockfish (*Sebastes carnatus*).

Only fishes with standard lengths ≥ 12 cm were retained to ensure the collection of sufficient tissue for analysis, while minimizing total catch necessary. These fishes were sorted into three composite samples per station, with a minimum of three individuals in each composite. All fishes were wrapped in aluminum foil, labeled, sealed in resealable plastic bags, placed on dry ice, and then transported to the City's Marine Biology Laboratory where they were stored at -20°C prior to dissection and tissue processing.

Tissue Processing and Chemical Analyses

All dissections were performed according to standard techniques for tissue analysis. A brief summary follows, but see City of San Diego (2024b) for additional details. Prior to dissection, each fish was partially defrosted, cleaned with a paper towel to remove loose scales and excess mucus, and the standard length (cm) and weight (g) were recorded (Appendices D.1, D.2). Dissections were carried out on Teflon® pads that were cleaned between samples. The liver or muscle tissues from each fish were removed and placed in separate glass jars for each composite sample, sealed, labeled, and stored in a freezer at -20°C prior to chemical analyses.

All tissue analyses were performed at the City of San Diego's Environmental Chemistry Laboratory. Detailed analytical protocols are available upon request. Briefly, all fish tissue samples were analyzed on a wet weight basis to determine the concentrations of 17 different trace metals, 9 chlorinated pesticides, 42 polychlorinated biphenyl compound congeners (PCBs), and 24 polycyclic aromatic hydrocarbons (PAHs) (Appendix D.3).

Data Analyses

Data summaries for each parameter include detection rate, minimum, maximum, and mean values for all samples combined by species for each outfall region. All means were calculated using detected values only, with no substitutions made for non-detects (analyte concentrations < method detection limit (MDL)). Results recorded with a qualifier of Detected, But Not Quantified (DNQ) were treated as detected values. Total chlordane, total DDT (tDDT), total hexachlorocyclohexane (tHCH), total PCB (tPCB), total PAH (tPAH), and total PBDE (tPBDE) were calculated for each sample as the sum of all constituents with reported values for individual constituents. Analyses were performed using R (R Core

Team 2024) various functions within the zoo, reshape2, plyr, tidyr, and dplyr packages (Zeileis and Grothendieck 2005, Wickham 2007, 2011, Wickham and Henry 2017, Wickham et al. 2017).

All raw data for 2024 have been submitted to either the Regional Water Quality Control Board or the California Environmental Data Exchange Network (CEDEN) and will be provided upon request.

Results

Contaminants in Fish Liver Tissues

Concentrations of trace metals, pesticides, PCBs, PAHs, and PBDEs detected in fish liver tissue samples from PLOO and SBOO trawl zones during 2024 are summarized by species in Tables 5.2 and 5.3. Concentrations of metals, and individual constituents of various pesticides, PCBs, PAHs, and PBDEs are listed by station and replicated with relevant qualifiers in Appendices D.4-D.8

Contaminants in Fish Musc**le Tissues**

Concentrations of trace metals, pesticides, PCBs, PAHs, and PBDEs detected in fish muscle tissue samples from PLOO and SBOO rig fishing zones during 2024 are summarized by species in Tables 5.4 and 5.5. Concentrations of metals, and individual constituents of various pesticides, PCBs, PAHs, and PBDEs are listed by station and replicated with relevant qualifiers in Appendices D.9-D.13

Summary

Preliminary analysis of fish tissue data collected in 2024 provide no evidence of contaminant accumulation in PLOO or SBOO fishes associated with wastewater discharge from either outfall. Concentrations of most contaminants were generally similar across trawl or rig fishing zones, and no relationships with the PLOO or SBOO were evident. These results are consistent with findings of other assessments of bioaccumulation in fishes off San Diego (City of San Diego 2024a, Parnell et al. 2008). Finally, there were no other indications of poor fish health in the region, such as the presence of fin rot or other indicators of disease (see Chapter 4).

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Chapter 5

Figures & Tables

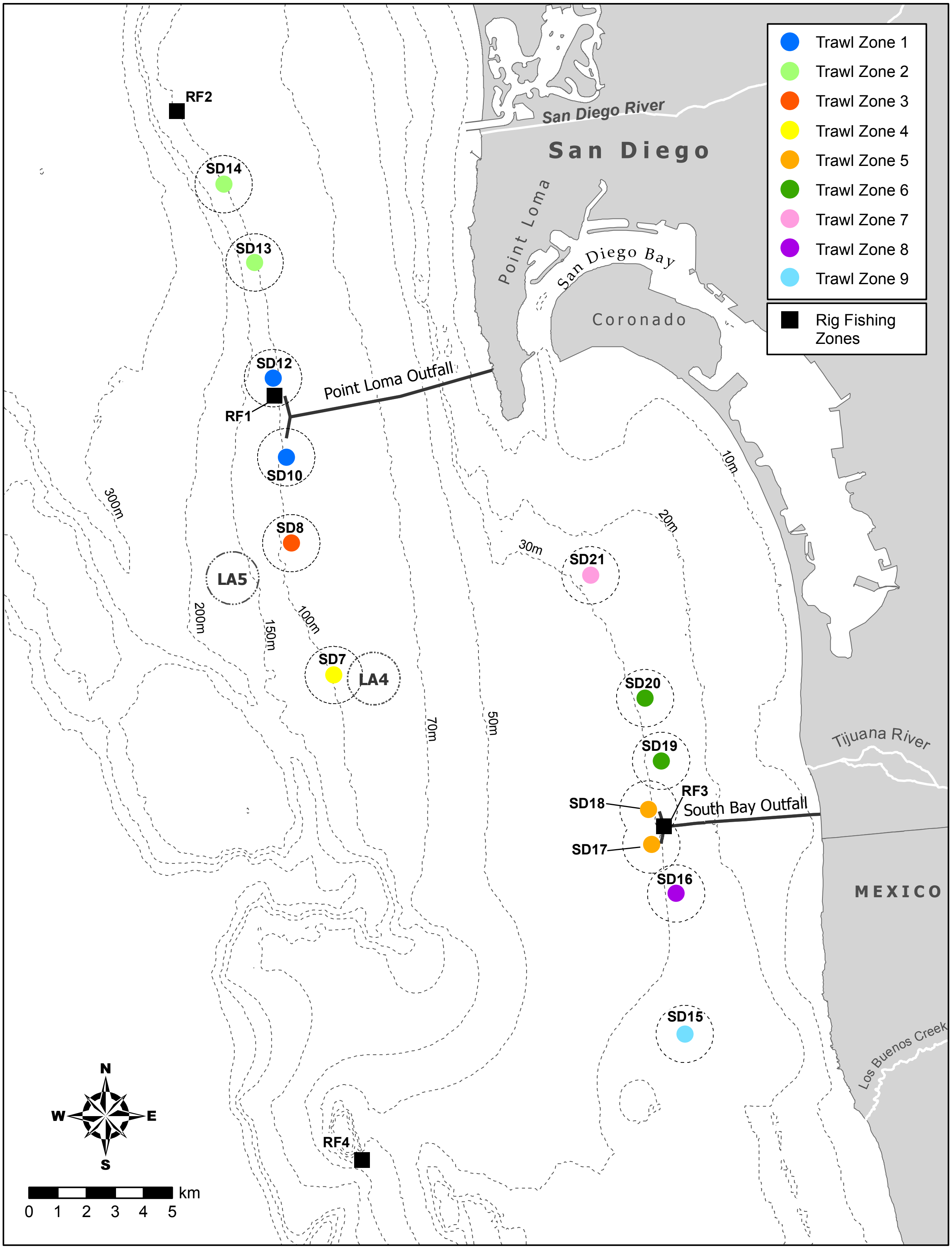


Figure 5.1

Trawl and rig fishing zone locations sampled around the PLOO and SBOO as part of the City of San Diego's Ocean Monitoring Program.

Table 5.1
Species of fish collected from each PLOO and SBOO trawl and rig fishing zone during 2024.

	Zone	Composite 1	Composite 2	Composite 3
PLOO	Rig Fishing Zone 1 (RF1)	Vermilion Rockfish	Vermilion Rockfish	Vermilion Rockfish
	Rig Fishing Zone 2 (RF2)	Starry Rockfish	Starry Rockfish	Mixed Rockfish[a]
	Trawl Zone 1 (TZ1)	Pacific Sanddab	Pacific Sanddab	Pacific Sanddab
	Trawl Zone 2 (TZ2)	Pacific Sanddab	Pacific Sanddab	Pacific Sanddab
	Trawl Zone 3 (TZ3)	Pacific Sanddab	Pacific Sanddab	Pacific Sanddab
	Trawl Zone 4 (TZ4)	Pacific Sanddab	Pacific Sanddab	Pacific Sanddab
SBOO	Rig Fishing Zone 3 (RF3)	Vermilion Rockfish	Vermilion Rockfish	Mixed Rockfish[b]
	Rig Fishing Zone 4 (RF4)	Mixed Rockfish[c]	Mixed Rockfish[d]	California Scorpionfish
	Trawl Zone 5 (TZ5)	Longfin Sanddab	Longfin Sanddab	Hornyhead Turbot
	Trawl Zone 6 (TZ6)	Longfin Sanddab	Longfin Sanddab	Longfin Sanddab
	Trawl Zone 7 (TZ7)	Longfin Sanddab	Longfin Sanddab	Longfin Sanddab
	Trawl Zone 8 (TZ8)	Longfin Sanddab	Longfin Sanddab	Longfin Sanddab
	Trawl Zone 9 (TZ9)	Fantail Sole[e,f]	English Sole	Hornyhead Turbot

[a] Includes Greenblotched, Flag, and Speckled Rockfish; [b] includes Vermilion and Brown Rockfish; [c] includes Treefish, Starry, and Honeycomb Rockfish; [d] includes Black-and-yellow and Gopher Rockfish; [e] no metals except Hg; [f] no PAHs.

Table 5.2

Summary of metals (ppm) in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2024. Data include the number of detected values (n), minimum, maximum, and mean detected concentrations for each species, and the total number of samples, detection rate, and maximum value for all species within each region. Minimum and maximum values were calculated based on all samples, whereas means were calculated from detected values only; nd = not detected; na = not analyzed.

		Al	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Sn	Zn
PLOO	Pacific Sanddab															
	n	0	12	11	12	12	12	12	0	12	12	0	12	2	12	12
	min	—	2.54	nd	2.23	0.040	2.67	55.9	—	0.78	0.048	—	1.77	nd	0.20	18.9
	max	—	4.51	0.031	4.79	0.160	4.80	120	—	1.18	0.126	—	3.08	0.092	0.54	27.6
	mean	—	3.73	0.019	3.17	0.071	3.87	83.7	—	1.01	0.085	—	2.41	0.081	0.38	23.1
	Total Samples	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Detection Rate (%)	0	100	92	100	100	100	100	0	100	100	0	100	17	100	100
	Max	nd	4.51	0.031	4.79	0.160	4.80	120	nd	1.18	0.126	nd	3.08	0.092	0.54	27.6
SBOO	English Sole															
	n	0	1	1	1	0	1	1	0	1	1	0	1	0	0	1
	value	—	3.79	0.096	0.415	—	9.51	143	—	1.00	0.025	—	3.62	—	—	56.1
	Fantail Sole															
	n	na	na	na	na	na	na	na	na	na	1	na	na	na	na	na
	value	—	—	—	—	—	—	—	—	—	0.150	—	—	—	—	—
	Hornyhead Turbot															
	n	2	2	2	2	2	2	2	0	2	2	1	2	2	2	2
	min	0.29	5.61	0.010	3.73	0.060	6.34	50.1	—	0.88	0.097	nd	1.59	0.091	0.10	63.2
	max	0.78	6.00	0.029	8.25	0.164	10.60	51.3	—	1.66	0.126	0.065	1.97	0.150	0.16	64.4
	mean	0.53	5.81	0.020	5.99	0.112	8.47	50.7	—	1.27	0.112	0.065	1.78	0.121	0.13	63.8
	Longfin Sanddab															
	n	0	11	9	11	7	11	11	3	11	11	0	11	9	11	11
	min	—	4.84	nd	0.91	nd	4.04	67.8	nd	0.61	0.042	—	2.79	nd	0.37	19.2
	max	—	7.49	0.043	2.24	0.110	7.16	118	0.30	0.75	0.097	—	3.40	0.140	0.79	24.4
	mean	—	5.81	0.016	1.69	0.065	5.38	85.3	0.26	0.67	0.067	—	3.12	0.094	0.52	22.6
	Total Samples	14	14	14	14	14	14	14	14	14	15	14	14	14	14	14
	Detection Rate (%)	14	100	86	100	64	100	100	21	100	100	7	100	79	93	100
	Max	0.78	7.49	0.096	8.25	0.164	10.60	143.0	0.30	1.66	0.150	0.065	3.62	0.150	0.79	64.4

Table 5.3

Summary of pesticides (ppb), total PCB (ppb), total PBDE (ppb), and lipids (% weight) in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2024. Data include the number of detected values (n), minimum, maximum, and mean detected concentrations for each species, and the total number of samples, detection rate and maximum value for all species within each region. Minimum and maximum values were based on all samples, whereas means were calculated from detected values only; nd = not detected.

		Pesticides				
		tDDT	HCB	tPCB	tPBDE	Lipids
PLOO	Pacific Sanddab					
	n	12	2	8	12	12
	min	22.7	nd	nd	2.56	21.5
	max	147.1	7.82	70.42	21.56	38.1
	mean	91.4	6.91	38.26	15.21	31.5
	Total Samples	12	12	12	12	12
	Detection Rate (%)	100	17	67	100	100
	Max	147.1	7.82	70.42	21.56	38.1
SBOO	English Sole					
	n	1	0	0	1	1
	value	15.8	—	—	9.37	12.5
	Fantail Sole					
	n	1	0	1	1	1
	value	397.4	—	173.23	1.21	4.1
	Hornyhead Turbot					
	n	2	0	0	2	2
	min	9.3	—	—	1.70	5.3
	max	22.8	—	—	81.90	5.6
	mean	16.0	—	—	41.80	5.4
	Longfin Sanddab					
	n	11	0	10	11	11
	min	82.4	—	nd	11.72	32.7
	max	185.9	—	164.35	72.66	45.5
	mean	122.0	—	63.68	30.40	37.8
	Total Samples	15	15	15	15	15
	Detection Rate (%)	100	0	73	100	100
	Max	397.4	nd	173.23	81.90	45.5

Table 5.4

Summary of metals (ppm) in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2024. Data include the number of detected values (n), minimum, maximum, and mean detected concentrations per species and the total number of samples, detection rate, and maximum value for all species within each region. Minimum and maximum values based on all samples, whereas means were calculated from detected values only; nd = not detected.

		Al	As	Ba	Cr	Cu	Fe	Mn	Hg	Ni	Se	Sn	Zn
PLOO	Mixed Rockfish												
	n	0	1	0	1	1	1	1	1	0	1	1	1
	value	—	1.24	—	0.040	0.28	1.5	0.04	0.082	—	1.24	0.16	3.3
	Starry Rockfish												
	n	0	2	2	2	2	2	2	2	0	2	2	2
	min	—	1.27	0.010	0.030	0.15	1.3	0.07	0.168	—	1.03	0.15	2.6
	max	—	1.31	0.040	0.040	0.21	1.3	0.08	0.178	—	1.04	0.15	2.7
	mean	—	1.29	0.025	0.035	0.18	1.3	0.08	0.173	—	1.04	0.15	2.7
	Vermilion Rockfish												
	n	0	3	3	3	3	3	3	3	0	3	3	3
	min	—	1.28	0.010	0.050	0.30	1.5	0.08	0.036	—	0.62	0.10	3.1
	max	—	2.08	0.010	0.070	0.96	2.5	0.12	0.064	—	0.93	0.18	3.3
	mean	—	1.67	0.010	0.057	0.62	1.8	0.09	0.046	—	0.81	0.14	3.2
	Total Samples	6	6	6	6	6	6	6	6	6	6	6	6
	Detection Rate (%)	0	100	83	100	100	100	100	100	0	100	100	100
	Max	—	2.08	0.040	0.070	0.96	2.5	0.12	0.178	—	1.24	0.18	3.3
SBOO	CA Scorpionfish												
	n	0	1	1	1	1	1	1	1	1	1	1	1
	value	—	4.05	0.010	0.040	1.35	1.2	0.05	0.212	0.070	0.72	0.14	3.0
	Mixed Rockfish												
	n	1	3	3	3	3	3	3	3	2	3	3	3
	min	nd	1.73	0.004	0.050	0.17	1.3	0.04	0.059	nd	0.95	0.15	3.2
	max	0.48	3.04	0.040	0.050	0.21	1.3	0.09	0.160	0.480	1.11	0.16	3.8
	mean	0.48	2.22	0.016	0.050	0.19	1.3	0.06	0.121	0.310	1.01	0.15	3.5
	Vermilion Rockfish												
	n	0	2	2	2	2	2	2	2	0	2	2	2
	min	—	2.58	0.004	0.050	0.22	1.5	0.07	0.030	—	0.96	0.11	3.2
	max	—	2.70	0.010	0.050	0.28	1.5	0.07	0.034	—	1.05	0.13	3.4
	mean	—	2.64	0.007	0.050	0.25	1.5	0.07	0.032	—	1.01	0.12	3.3
	Total Samples	6	6	6	6	6	6	6	6	6	6	6	6
	Detection Rate (%)	17	100	100	100	100	100	100	100	50	100	100	100
	Max	0.48	4.05	0.040	0.050	1.35	1.5	0.09	0.212	0.480	1.11	0.16	3.8

Table 5.5

Summary of pesticides (ppb), total PBDE (ppb), and lipids (% weight) in muscle tissues of fishes collected from PLOO and SBOO rig fishing stations during 2024. Data include the number of detected values (n), minimum, maximum, and mean detected concentrations for each species, and the total number of samples, detection rate and maximum value for all species within region. Minimum and maximum values were based on all samples, whereas means were calculated from detected values only; nd = not detected

		Pesticides			
		tDDT	HCB	tPBDE	Lipids
PLOO	Mixed Rockfish				
	n	1	0	1	1
	value	2.27	—	0.140	1.3
	Starry Rockfish				
	n	2	0	2	2
	min	2.73	—	0.145	0.8
	max	4.02	—	0.222	1.0
	mean	3.38	—	0.184	0.9
	Vermilion Rockfish				
	n	3	1	2	3
	min	1.33	nd	nd	0.4
	max	2.62	0.72	0.244	0.9
	mean	1.81	0.72	0.218	0.7
	Total Samples	6	6	6	6.0
	Detection Rate (%)	100	17	83	100
	Max	4.02	0.72	0.244	1.3
SBOO	CA Scorpionfish				
	n	1	0	1	1
	value	5.16	—	0.259	0.8
	Mixed Rockfish				
	n	2	0	0	2.0
	min	nd	—	—	nd
	max	1.67	—	—	0.4
	mean	1.45	—	—	0.4
	Vermilion Rockfish				
	n	1	0	1	2
	min	nd	—	nd	1.2
	max	0.981	—	0.165	1.2
	mean	0.981	—	0.165	1.2
	Total Samples	6	6	6	6
	Detection Rate (%)	67	0	33	83
	Max	5.16	—	0.259	1.2

Appendices

Appendix A

Water Quality

2024 Supplemental Analyses

Appendix A.1

Summary of manual QA/QC review findings, including major sensor problems and data quality issues for the PLOO and SBOO RTOMS. Gaps in data occurred when sensors did not collect data or when data were flagged as bad or suspect.

Parameter	Site	Depths (m)	Time Period	Problem	Action Taken
Nitrate + nitrite, chlorophyll *a*, CDOM, and turbidity	SBOO	26 m	01 Jan 2024 - 21 May 2024	Bottom controller failed early in the deployment due to hardware problem.	No data collected during this time period for parameters that rely on the controller.
Nitrate + nitrite	PLOO and SBOO	1, 30, 89 m	All 2024	SUNA sensors displayed occasional noise, or drift through deployment.	When possible, drift corrected data based on water sample results and zero offset. If not possible to correct, flagged data as suspect. See City of San Diego 2025a.
Nitrate + nitrite	SBOO	26 m	15 Aug 2024 - 31 Dec 2024	SUNA sensor spiked high and then flatlined to -1 values, sensor continued to intermittently malfunction.	Data qualifed as bad or suspect and not reported.
Chlorophyll *a*, CDOM, and turbidity	PLOO and SBOO	All	All 2024	ECO triplet sensors displayed intermittent noise and unreasonable data (high data spikes) throughout deployments, and impacted by biofouling and electrical issues.	Data qualifed as bad or suspect during these intermittent periods and not reported.
Ocean currents	PLOO	> 60 m depths	01 Nov 2024 - 09 Dec 2024	ADCP showed poor signal strength from mid and deep depths, may be related to heavy biofouling and thermoclines.	Data not reported from impacted depth bins.
Salinity	PLOO and SBOO	All	All 2024	MicroCAT sensors showed intermittent noise and spikes, suspect due to bubbles, fouling, or material trapped in conductivity cell.	Data qualifed as bad or suspect during these intermittent periods and not reported.
Salinity	PLOO	20 m	15 Mar 2024 - 09 Dec 2024	MicroCAT sensor began downward drift that continued, followed by excess noise and low values outside of range from CTD validation casts.	Data qualifed as suspect and not reported. On recovery, conductivity cell guard missing and cell appeared damaged.
Salinity	SBOO	26 m	01 Jan 2024 - 21 May 2024	Salinity drifted down 0.5 - 0.7 PSU units when compared to CTD casts and 18 m mooring sensor.	Unable to drift correct due to inconsistent post calibration at Sea-Bird; data qualifed as suspect and not reported.

Appendix A.1 *continued*

Parameter	Site	Depths (m)	Time Period	Problem	Action Taken
total pH	SBOO	1 m	01 Jan 2024 - 21 May 2024	SeaFET pH sensor drifted high and low of climatological range that did not correspond to any other parameters and then drifted down to unreasonable values.	Data qualified as suspect and not reported.
total pH	SBOO	26 m	01 Jan 2024 - 21 May 2024	SeaFET pH sensor exhibited non-linear behavior compared to DO and sudden step changes.	Data qualifed as suspect and not reported until pH data can be compared to pH and TA samples.
total pH	PLOO	30 m	22 Oct 2024 - 09 Dec 2024	SeaFET pH values drifted low of slope of DO vs. pH and the difference between internal and external pH reference > 0.05 pH units.	Data qualifed as suspect and not reported until pH data can be compared to pH and TA samples.
DO	PLOO	30 m	06 May 2024 - 09 Dec 2024	Oxygen values only cut out intermittently on the MicroCAT sensor, possibly due to physical connection on sensor.	No data collected during intermittent periods; remaining data appeared reasonable and passed.
xCO2	PLOO	1 m	29 Aug 2024 - 11 Sept 2024	Pro-Oceanus pCO2 sensor showed spikes and could not validate with calculated pCO2 from bottle samples.	Data qualified as suspect and not reported.
xCO2	PLOO	1 m	11 Sept 2024 - 09 Dec 2024	Pro-Oceanus pCO2 sensor stopped reporting data due to damaged solar panel and lack of power.	No data collected for time period.
xCO2	SBOO	1 m	01 Jan 2024 - 21 May 2024	Pro-Oceanus pCO2 sensor stopped reporting data due to cable failure in solar power system.	No data collected for time period.

Appendix A.2

Ranges used for automated QC data flagging for each parameter for the gross range test. Ranges were defined by manufacturers for each sensor configuration.

Parameter	Units	Min	Max	Qualifer to assign if outside of min/max
BOD equivalent	mg/L	0	50	4
CDOM - ECO triplet	ppb	0	375	4
Chl - ECO triplet	μg/L	0	75	4
xCO_2	ppm	0	2000	4
NO_3 (Nitrate + Nitrite)	μM	0	3000	4
NTU (Turbidity)	NTU	0	100	4
O_2 (DO)	mg/L	0.1	20	4
pH (total; both internal and external)	total pH	6.5	9	4
Salinity (Sal)	PSU	2	42	4
Temperature (Temp)	degC	-2.5	35	4

Appendix A.3

Annual ranges used for automated QC data flagging for each parameter, site, and depth for the climatological range test. Temperature, salinity, DO, and pH ranges were based on the minimum and maximum values recorded at each site and depth range where the sensors were found to be functional and in reasonable agreement with historical CTD ranges from the City's quarterly surveys. BOD ranges were based on the maximum value observed from all deployments, since that is a new parameter and historical data were not available. CDOM ranges were based on maximum of multiple readings recorded at the PLOO mooring due to proximity to plume. Chlorophyll *a* and turbidity ranges were based on the maximum sensor range for the ECO triplet. Nitrate ranges were based on values observed at both moorings where the sensors were found to be functional, and verified in a reasonable range compared to nearshore data collected by the California Cooperative Oceanic Fisheries Investigations (see: https://calcofi.org). Ranges for xCO2 were based on values observed at both moorings, and comparable to ranges recorded by the closest NOAA/SIO carbon program mooring (CCE2, see: https://www.pmel.noaa.gov/co2/story/CCE2).

		PLOO RTOMS						SBOO RTOMS						
		1 m		Mid depths		Bottom depths (>70m)		1 m		Mid depths		Bottom depth (>25 m)		
Parameter	Units	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Qualifer to assign if outside of site/ depth range
BOD equivalent	mg/L	NA	NA	0	10	0	10	NA	NA	0	10	0	10	3
CDOM-ECO triplet	ppb	0	50	0	50	0	50	0	50	0	50	0	50	3
Chl-ECO triplet	µg/L	0	30	0	30	0	30	0	30	0	30	0	30	3
xCO_2	ppm	100	600	NA	NA	NA	NA	50	1000	NA	NA	NA	NA	3
NO_3 (Nitrate + Nitrite)	µM	0	39	0	39	0	39	0	39	NA	NA	0	39	3
NTU (Turbidity)	NTU	0	10	0	10	0	10	0	10	0	10	0	10	3
O_2 (DO)	mg/L	5.5	24.0	2.0	9.5	1.5	7.5	5.5	24.0	3.0	11.0	1.5	11.0	3
pH (total; both internal and external)	total pH	7.6	8.9	7.5	8.1	7.4	8.1	7.6	8.7	NA	NA	7.4	8.1	3
Sal (Salinity)	PSU	32.0	34.0	32.3	34.0	32.5	34.0	31.0	34.0	32.0	34.0	33.0	34.0	3
Temp (Temperature)	degC	11.0	26.5	9.0	24.5	9.0	15.0	12.0	26.0	10.0	26.0	9.0	19.0	3

Appendix A.4

Summary of temperature, salinity, DO, pH, transmissivity, and chlorophyll *a* for various depth layers as well as the entire water column for all PLOO stations during 2024. For each quarter: n ≥ 3378 (1–20 m), n ≥ 5282 (21–60 m), n ≥ 1834 (61–80 m), n ≥ 967 (81–98 m). Sample sizes differed due to variations in bottom depth at individual stations.

		Depth (m)				
		1–20	21–60	61–80	81–98	1–98
Temperature (°C)						
February	min	13.0	11.1	10.8	10.6	10.6
	max	15.3	15.1	12.8	12.2	15.3
	mean	14.9	13.5	11.7	11.1	13.4
May	min	10.8	10.0	9.9	9.8	9.8
	max	17.9	12.4	10.3	10.1	17.9
	mean	14.4	10.6	10.0	9.9	11.6
August	min	13.1	10.7	10.6	10.5	10.5
	max	23.6	15.4	11.9	10.8	23.6
	mean	18.0	12.2	10.9	10.7	13.6
November	min	11.9	10.5	10.2	10.0	10.0
	max	15.9	15.7	11.2	10.5	15.9
	mean	14.8	11.7	10.5	10.3	12.3
Salinity (ppt)						
February	min	32.78	33.01	33.36	33.47	32.78
	max	33.34	33.57	33.85	33.97	33.97
	mean	33.06	33.29	33.57	33.73	33.31
May	min	33.28	33.44	33.79	33.86	33.28
	max	33.73	33.91	34.00	34.10	34.10
	mean	33.49	33.74	33.90	33.99	33.71
August	min	33.20	33.19	33.46	33.63	33.19
	max	33.51	33.60	33.70	33.83	33.83
	mean	33.40	33.41	33.59	33.69	33.46
November	min	33.25	33.20	33.42	33.59	33.20
	max	33.40	33.65	33.77	33.88	33.88
	mean	33.35	33.39	33.61	33.73	33.44

Appendix A.4 *continued*

		Depth (m)				
		1–20	21–60	61–80	81–98	1–98
DO (mg/L)						
February	min	6.0	3.9	3.9	2.6	2.6
	max	9.0	8.2	5.8	5.2	9.0
	mean	7.9	6.4	4.8	4.2	6.4
May	min	3.6	2.9	2.7	2.7	2.7
	max	9.4	6.0	3.8	3.3	9.4
	mean	6.8	3.9	3.2	3.0	4.6
August	min	6.7	4.2	3.6	3.5	3.5
	max	13.2	10.9	5.8	4.6	13.2
	mean	9.5	6.6	4.6	4.1	6.9
November	min	5.6	4.2	3.9	3.6	3.6
	max	9.1	8.2	5.5	4.7	9.1
	mean	7.9	5.7	4.4	4.0	6.0
pH						
February	min	8.0	7.8	7.8	7.8	7.8
	max	8.3	8.2	8.1	8.0	8.3
	mean	8.2	8.1	7.9	7.9	8.1
May	min	7.7	7.7	7.7	7.7	7.7
	max	8.3	8.0	7.8	7.7	8.3
	mean	8.1	7.8	7.7	7.7	7.8
August	min	8.0	7.8	7.7	7.7	7.7
	max	8.4	8.3	7.9	7.8	8.4
	mean	8.2	8.0	7.8	7.7	8.0
November	min	7.9	7.8	7.8	7.8	7.8
	max	8.3	8.2	7.9	7.8	8.3
	mean	8.2	8.0	7.8	7.8	8.0

Appendix A.4 *continued*

		Depth (m)				
		1–20	21–60	61–80	81–98	1–98
Transmissivity (%)						
February	min	81	91	72	80	72
	max	97	98	98	98	98
	mean	93	97	96	97	95
May	min	63	38	77	54	38
	max	99	100	100	99	100
	mean	93	97	96	96	96
August	min	40	75	59	43	40
	max	99	100	100	100	100
	mean	84	94	97	96	92
November	min	79	89	88	90	79
	max	99	100	101	100	101
	mean	94	98	98	98	97
Chlorophyll *a* (µg/L)						
February	min	0.2	0.1	0.1	0.1	0.1
	max	4.8	1.4	0.3	0.2	4.8
	mean	0.9	0.4	0.1	0.1	0.5
May	min	0.0	0.1	0.1	0.1	0.0
	max	14.8	5.2	0.4	0.2	14.8
	mean	1.5	0.5	0.1	0.1	0.7
August	min	0.0	0.2	0.1	0.1	0.0
	max	26.7	11.6	1.6	0.6	26.7
	mean	3.3	1.8	0.3	0.2	1.9
November	min	0.3	0.1	0.1	0.1	0.1
	max	7.9	2.3	0.3	0.1	7.9
	mean	1.3	0.5	0.1	0.1	0.6

Appendix A.5

Summary of temperature, salinity, DO, pH, transmissivity, and chlorophyll *a* for various depth layers as well as the entire water column from all SBOO stations during 2024. For each quarter: n ≥ 1440 (1–9 m), n ≥ 1232 (10–19 m), n ≥ 740 (20–28 m), n ≥ 351 (29–38 m), n ≥ 290 (39–55 m). Sample sizes differed due to slight variations in depth at individual stations.

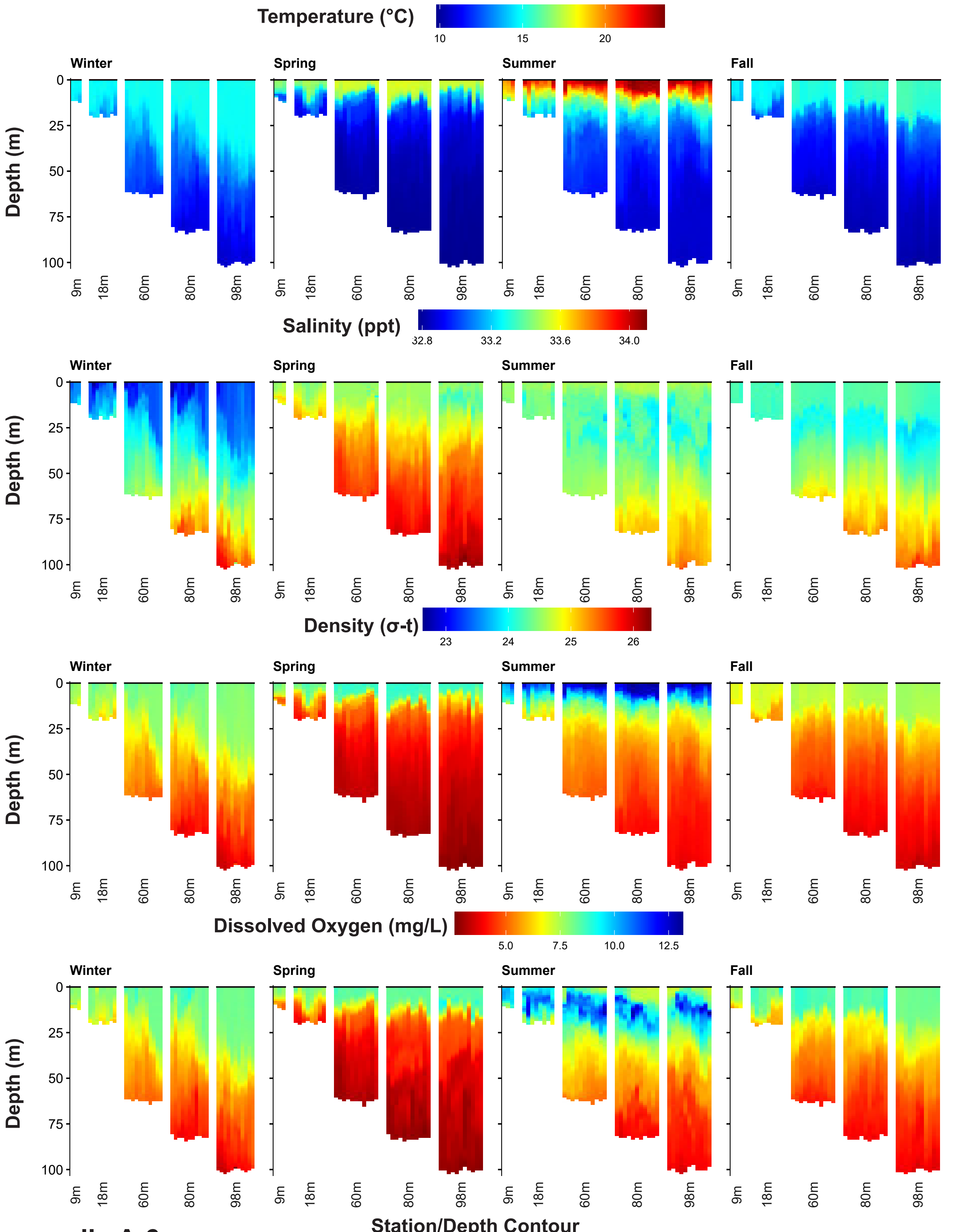
		Depth (m)					
		1–9	10–19	20–28	29–38	39–55	1–55
Temperature (°C)							
February	min	13.5	13.1	12.6	12.6	11.8	11.8
	max	15.8	15.4	15.1	14.7	13.5	15.8
	mean	15.2	14.6	14.0	13.4	12.5	14.5
May	min	11.3	10.9	10.6	10.5	10.2	10.2
	max	18.2	17.2	12.1	11.3	11.1	18.2
	mean	16.4	12.6	11.1	10.9	10.6	13.4
August	min	11.6	11.4	11.3	11.2	10.6	10.6
	max	21.3	17.7	13.2	12.5	11.9	21.3
	mean	17.3	13.2	12.0	11.7	11.3	14.2
November	min	12.2	11.9	11.5	11.3	11.1	11.1
	max	16.9	16.8	13.8	13.0	12.2	16.9
	mean	15.1	13.2	12.2	11.8	11.6	13.4
Salinity (ppt)							
February	min	32.29	32.88	33.02	33.06	33.11	32.29
	max	33.18	33.24	33.26	33.29	33.53	33.53
	mean	32.95	33.08	33.15	33.18	33.36	33.07
May	min	33.27	33.37	33.49	33.55	33.65	33.27
	max	33.62	33.66	33.74	33.76	33.84	33.84
	mean	33.45	33.53	33.64	33.68	33.74	33.55
August	min	33.14	33.07	33.17	33.25	33.34	33.07
	max	33.52	33.55	33.56	33.57	33.66	33.66
	mean	33.43	33.40	33.43	33.43	33.51	33.43
November	min	33.19	33.17	33.20	33.22	33.26	33.17
	max	33.57	33.37	33.39	33.42	33.46	33.57
	mean	33.30	33.27	33.30	33.34	33.36	33.30

Appendix A.5 *continued*

		Depth (m)					
		1–9	10–19	20–28	29–38	39–55	1–55
DO (mg/L)							
February	min	6.7	5.4	6.2	6.0	5.0	5.0
	max	8.9	8.3	8.1	7.9	7.6	8.9
	mean	8.1	7.7	7.4	7.1	5.9	7.6
May	min	4.5	3.8	3.8	3.7	3.4	3.4
	max	9.8	9.1	5.7	5.0	4.5	9.8
	mean	8.6	6.0	4.5	4.3	4.1	6.4
August	min	4.3	4.2	4.5	4.6	4.2	4.2
	max	10.2	9.5	8.8	7.4	7.0	10.2
	mean	8.0	7.7	6.2	6.0	5.4	7.2
November	min	5.9	5.6	5.4	5.3	5.0	5.0
	max	11.2	8.9	7.7	7.2	6.5	11.2
	mean	8.2	6.8	6.2	5.9	5.8	7.0
pH							
February	min	8.1	8.0	8.0	8.0	7.9	7.9
	max	8.2	8.2	8.2	8.2	8.1	8.2
	mean	8.2	8.1	8.1	8.1	8.0	8.1
May	min	7.8	7.7	7.7	7.7	7.7	7.7
	max	8.4	8.3	7.9	7.8	7.8	8.4
	mean	8.2	7.9	7.8	7.8	7.8	8.0
August	min	7.7	7.7	7.7	7.7	7.7	7.7
	max	8.2	8.2	8.1	8.0	7.9	8.2
	mean	8.1	8.0	7.9	7.9	7.8	8.0
November	min	8.0	7.9	7.9	7.9	7.9	7.9
	max	8.4	8.3	8.1	8.1	8.0	8.4
	mean	8.2	8.0	8.0	8.0	7.9	8.1

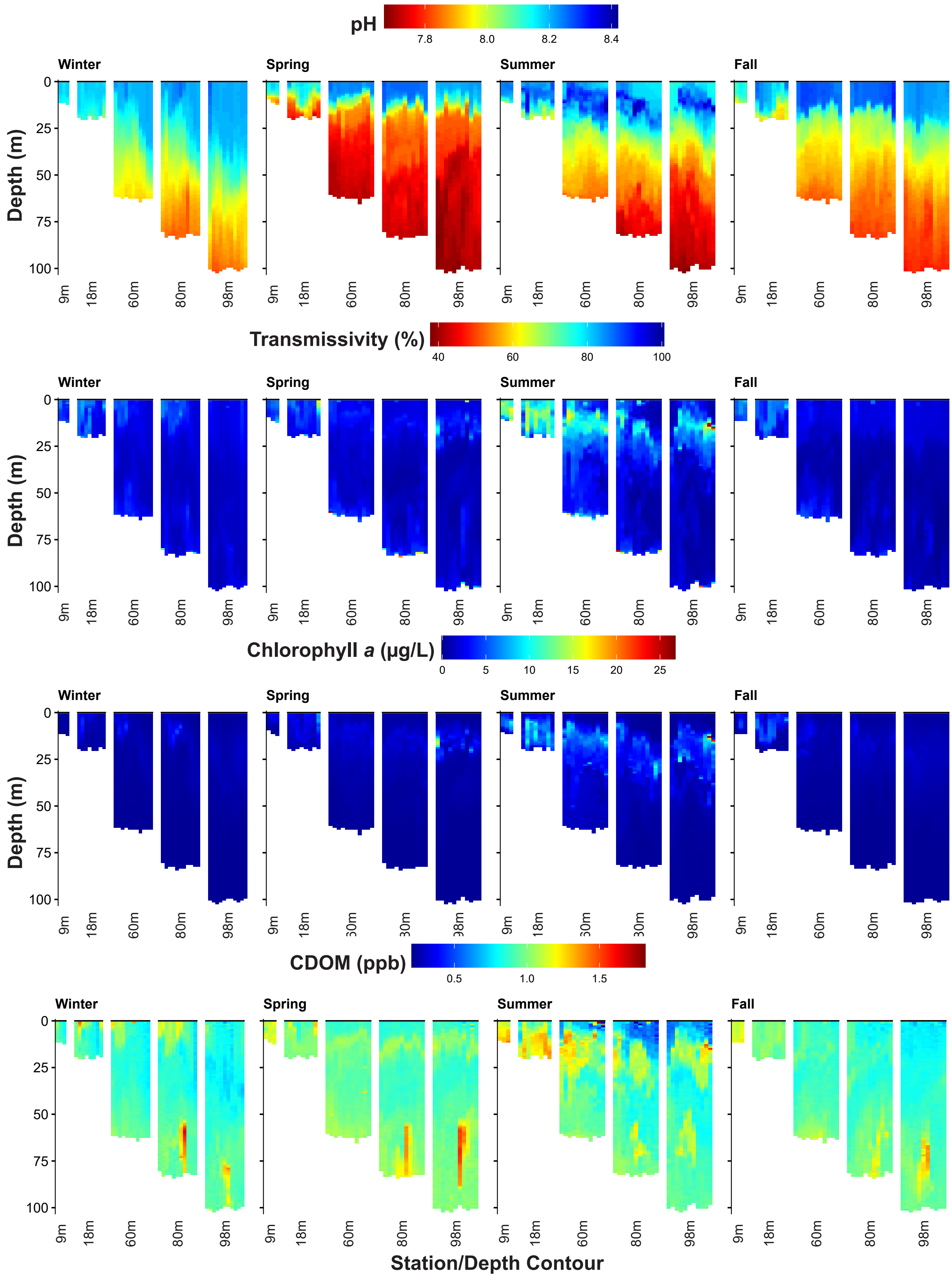
Appendix A.5 *continued*

		Depth (m)					
		1–9	10–19	20–28	29–38	39–55	1–55
Transmissivity (%)							
February	min	14	23	57	47	73	14
	max	98	98	98	98	98	98
	mean	88	90	92	93	92	90
May	min	38	37	79	92	94	37
	max	96	97	98	98	99	99
	mean	80	87	95	97	98	87
August	min	39	56	79	65	88	39
	max	99	99	98	98	99	99
	mean	88	86	91	94	97	89
November	min	38	31	75	91	97	31
	max	96	99	99	99	99	99
	mean	84	92	95	98	99	91
Chlorophyll *a* (µg/L)							
February	min	0.1	0.2	0.4	0.7	0.2	0.1
	max	15.6	2.5	2.6	1.9	1.1	15.6
	mean	0.9	1.0	1.5	1.2	0.6	1.0
May	min	0.1	0.6	0.7	0.6	0.3	0.1
	max	28.0	9.4	2.8	1.2	1.5	28.0
	mean	3.3	3.2	1.3	0.9	0.5	2.5
August	min	0.1	0.2	0.7	0.7	0.4	0.1
	max	38.5	16.8	13.9	10.1	9.5	38.5
	mean	2.1	4.1	3.7	2.4	1.8	3.0
November	min	0.4	0.6	0.5	0.2	0.2	0.2
	max	29.1	6.3	2.9	1.2	0.7	29.1
	mean	2.6	1.4	0.9	0.6	0.4	1.6

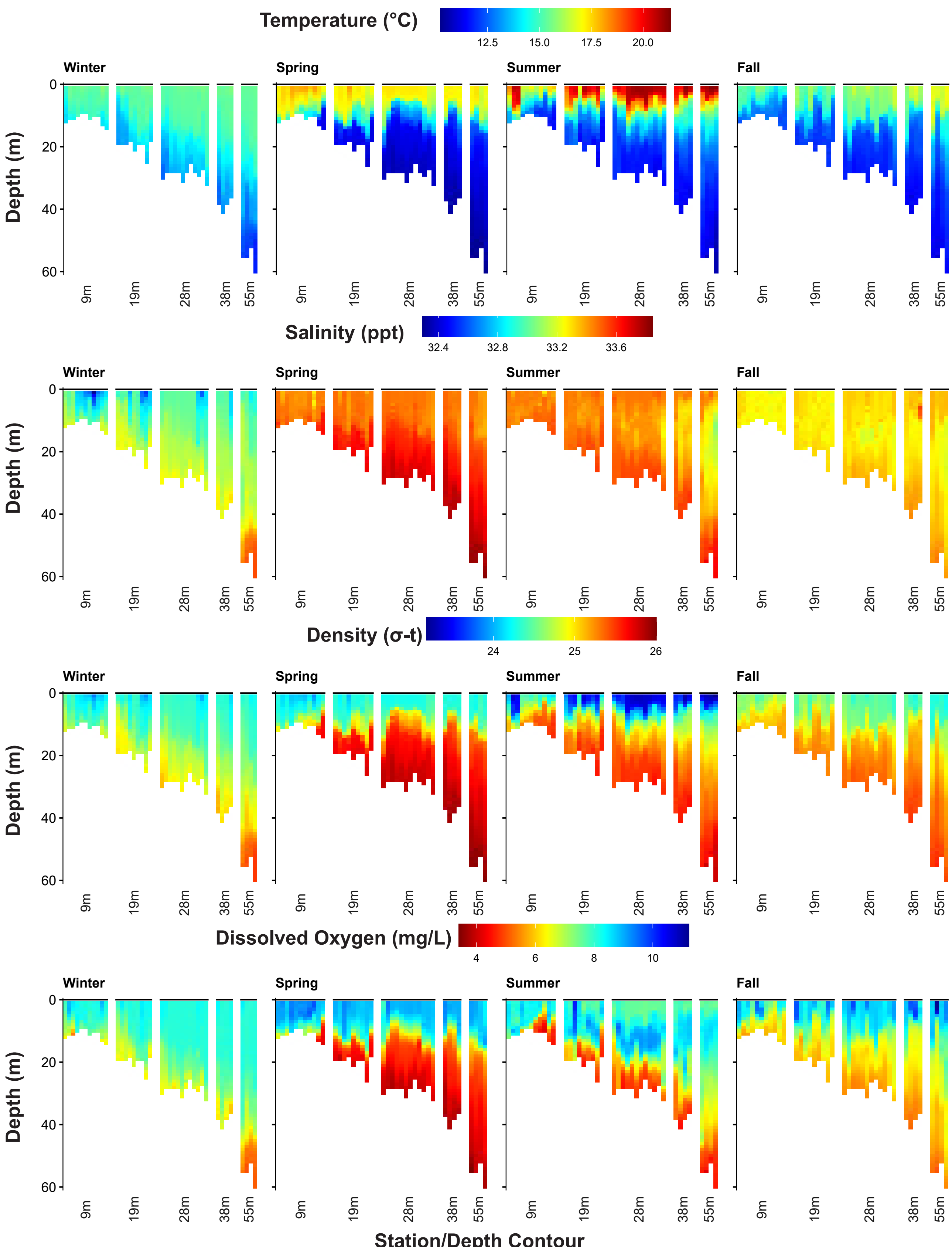


Appendix A.6

Temperature, salinity, density, dissolved oxygen, pH, transmissivity, chlorophyll *a*, and CDOM recorded in the PLOO region during 2024. Data are 1-m binned values per depth for each station and were collected over 4–5 days during each quarterly survey. Stations are depicted from north to south along each depth contour.

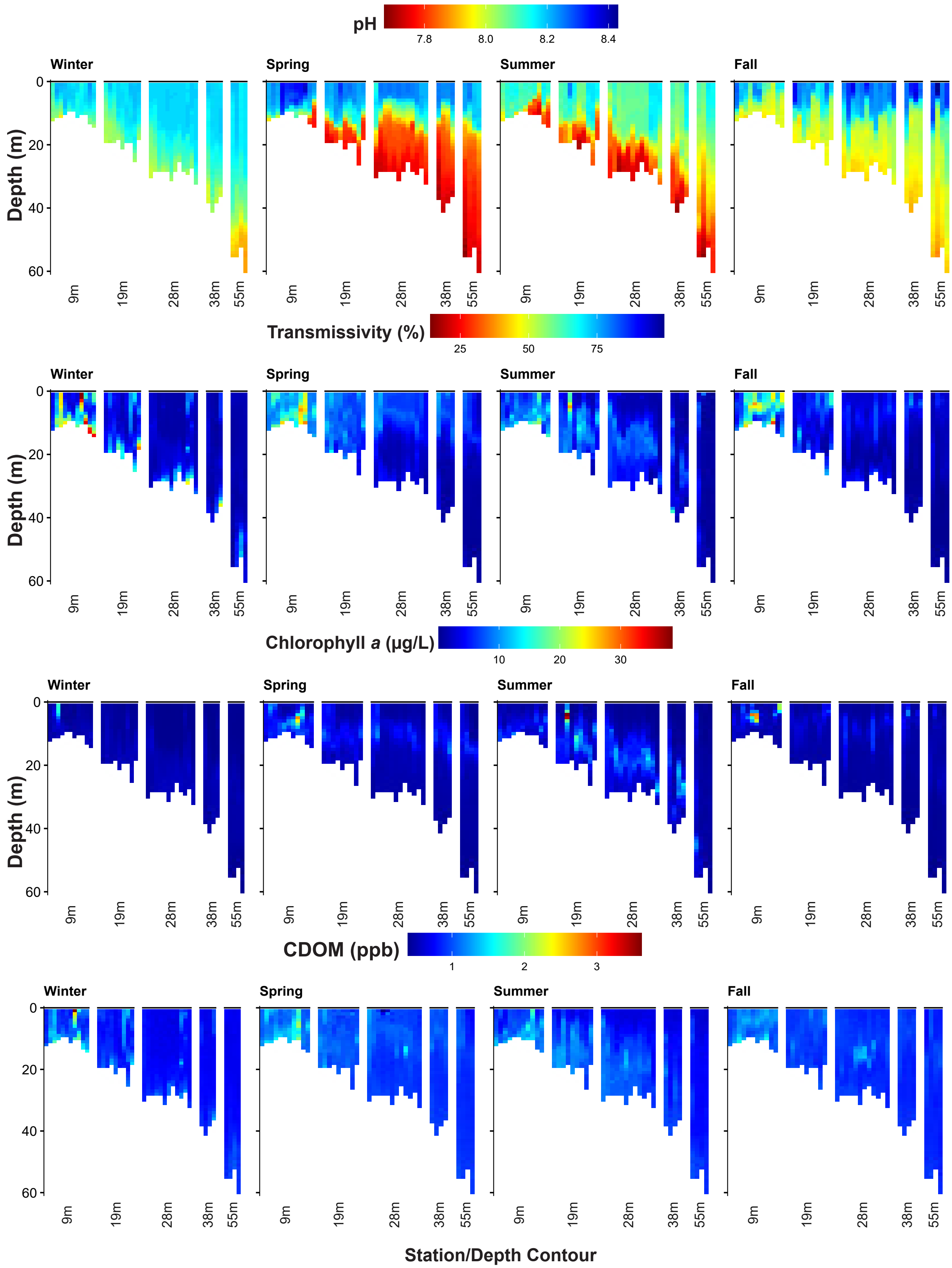


Appendix A.6 *continued*



Appendix A.7

Temperature, salinity, density, dissolved oxygen, pH, transmissivity, chlorophyll *a*, and CDOM recorded in the SBOO region during 2024. Data are 1-m binned values per depth for each station and were collected over 4–5 days during each quarterly survey. Stations are depicted from north to south along each depth contour.



Appendix A.7 *continued*

Appendix A.8

Summary of temperature, salinity, DO, pH (total), chlorophyll *a*, CDOM, turbidity, nitrate + nitrite, and xCO_2 recorded at various depths by the PLOO RTOMS in 2024. Data include mean, minimum, and maximum values, sample size (n), and proportion recovered (n_prop) for each depth by season. Sample sizes differed due to variations in sampling interval, deployment date, and data quality (see Appendices A.1 to A.3); id = insufficient data (<40% data recovery, based on expected number of samples for each season).

Parameter	Season		1m	10m	20m	30m	45m	60m	75m	90m
Temperature (°C)	*Winter*	mean	15.56	15.14	13.99	13.57	12.54	11.76	11.25	10.97
		min	14.03	12.19	10.84	10.73	9.96	9.87	9.82	9.78
		max	17.50	16.86	16.86	16.86	16.52	15.14	14.72	14.19
		n	12581	12652	12652	12582	12652	12659	6454	12669
		n_prop	0.96	0.97	0.97	0.96	0.97	0.97	0.49	0.97
	Spring	mean	17.52	14.42	11.43	11.01	10.37	10.05	9.94	9.87
		min	13.71	10.90	10.21	9.80	9.68	9.61	9.60	9.48
		max	22.83	19.75	16.82	14.51	13.32	12.12	10.79	10.50
		n	12510	12609	12626	12526	12620	12619	6439	12607
		n_prop	0.95	0.96	0.96	0.96	0.96	0.96	0.49	0.96
	Summer	mean	21.44	16.78	13.12	12.39	11.31	10.77	10.50	10.39
		min	16.55	11.40	10.68	10.41	10.00	9.79	9.83	9.82
		max	24.48	22.57	17.64	15.84	13.51	12.13	11.45	11.13
		n	12621	12738	12751	12635	12739	12726	6507	12681
		n_prop	0.95	0.96	0.96	0.95	0.96	0.96	0.49	0.96
	Fall	mean	17.08	15.91	13.21	12.56	11.52	10.95	—	10.52
		min	13.34	12.06	11.11	10.85	10.50	10.08	—	9.82
		max	20.72	19.43	16.26	15.51	13.21	12.12	—	11.29
		n	9513	9600	9594	9525	9593	9594	id	9389
		n_prop	0.72	0.72	0.72	0.72	0.72	0.72	0.37	0.71
Salinity (psu)	*Winter*	mean	33.08	33.13	33.17	33.29	33.41	33.51	33.59	33.45
		min	32.30	32.81	32.84	32.98	33.02	33.01	33.06	32.99
		max	33.33	33.42	33.58	33.74	33.95	33.97	33.96	34.02
		n	12669	12743	10476	12673	12743	12750	6545	12760
		n_prop	0.97	0.97	0.80	0.97	0.97	0.97	0.50	0.97
	Spring	mean	33.39	33.41	—	33.64	33.76	33.52	33.61	33.77
		min	32.96	33.04	—	33.17	33.22	33.18	33.41	33.54
		max	33.60	33.96	—	33.88	33.96	33.77	33.83	33.96
		n	12601	12699	id	11290	12711	12710	6530	12698
		n_prop	0.96	0.97	0.00	0.86	0.97	0.97	0.50	0.97
	Summer	mean	33.48	33.29	—	33.24	33.23	33.23	33.17	33.37
		min	33.23	32.95	—	32.94	32.73	32.63	32.79	32.86
		max	33.59	33.80	—	33.62	33.73	33.60	33.52	33.90
		n	12712	12825	id	8371	12831	12818	6599	12760
		n_prop	0.96	0.97	0.00	0.63	0.97	0.97	0.50	0.96
	Fall	mean	33.32	33.20	—	33.24	33.31	33.22	—	33.52
		min	33.11	33.02	—	32.93	33.04	32.92	—	33.24
		max	33.40	33.36	—	33.45	33.66	33.53	—	33.80
		n	9574	9663	id	9526	9656	9651	id	7899
		n_prop	0.72	0.73	0.00	0.72	0.73	0.73	0.38	0.60

Appendix A.8 *continued*

Parameter	Season		1m	10m	20m	30m	45m	60m	75m	90m
DO (mg/L)	*Winter*	mean	8.60	—	—	6.79	—	—	4.30	3.87
		min	7.40	—	—	4.27	—	—	2.52	2.25
		max	10.73	—	—	8.56	—	—	7.59	6.76
		n	12677	—	—	12676	—	—	6545	12765
		n_prop	0.97	—	—	0.97	—	—	0.50	0.97
	Spring	mean	8.79	—	—	—	—	—	2.73	2.86
		min	7.37	—	—	—	—	—	1.32	1.77
		max	14.61	—	—	—	—	—	4.11	3.93
		n	12618	—	—	id	—	—	6533	12715
		n_prop	0.96	—	—	0.39	—	—	0.50	0.97
	Summer	mean	8.02	—	—	—	—	—	3.32	3.39
		min	6.85	—	—	—	—	—	1.41	1.86
		max	11.60	—	—	—	—	—	5.95	5.25
		n	12728	—	—	id	—	—	6602	12788
		n_prop	0.96	—	—	0.36	—	—	0.50	0.97
	Fall	mean	8.42	—	—	7.01	—	—	—	4.02
		min	5.01	—	—	5.53	—	—	—	2.50
		max	13.55	—	—	8.98	—	—	—	5.37
		n	9590	—	—	7144	—	—	id	7731
		n_prop	0.72	—	—	0.54	—	—	0.38	0.58
pH (total pH)	*Winter*	mean	8.06	—	—	7.93	—	—	—	—
		min	7.94	—	—	7.74	—	—	—	—
		max	8.21	—	—	8.07	—	—	—	—
		n	13070	—	—	13075	—	—	—	—
		n_prop	1.00	—	—	1.00	—	—	—	—
	Spring	mean	8.09	—	—	7.75	—	—	—	—
		min	7.96	—	—	7.64	—	—	—	—
		max	8.43	—	—	8.06	—	—	—	—
		n	13015	—	—	13031	—	—	—	—
		n_prop	0.99	—	—	0.99	—	—	—	—
	Summer	mean	8.03	—	—	7.91	—	—	—	—
		min	7.92	—	—	7.67	—	—	—	—
		max	8.28	—	—	8.10	—	—	—	—
		n	13148	—	—	13164	—	—	—	—
		n_prop	0.99	—	—	0.99	—	—	—	—
	Fall	mean	8.05	—	—	—	—	—	—	—
		min	7.73	—	—	—	—	—	—	—
		max	8.35	—	—	—	—	—	—	—
		n	9885	—	—	id	—	—	—	—
		n_prop	0.75	—	—	0.24	—	—	—	—

Appendix A.8 *continued*

Parameter	Season		1m	10m	20m	30m	45m	60m	75m	90m
Chlorophyll *a* (µg/L)	*Winter*	mean	1.03	—	—	0.57	—	—	—	0.04
		min	0.09	—	—	0.09	—	—	—	0.00
		max	8.65	—	—	4.24	—	—	—	0.30
		n	6225	—	—	12797	—	—	—	12853
		n_prop	0.48	—	—	0.98	—	—	—	0.98
	Spring	mean	0.73	—	—	0.55	—	—	—	0.03
		min	0.11	—	—	0.09	—	—	—	0.00
		max	9.36	—	—	6.34	—	—	—	1.15
		n	6188	—	—	12709	—	—	—	12786
		n_prop	0.47	—	—	0.97	—	—	—	0.98
	Summer	mean	0.43	—	—	0.94	—	—	—	0.04
		min	0.05	—	—	0.11	—	—	—	0.00
		max	3.71	—	—	6.10	—	—	—	0.28
		n	6157	—	—	12013	—	—	—	12817
		n_prop	0.46	—	—	0.91	—	—	—	0.97
	Fall	mean	—	—	—	0.55	—	—	—	0.04
		min	—	—	—	0.00	—	—	—	0.00
		max	—	—	—	8.42	—	—	—	0.79
		n	id	—	—	9670	—	—	—	9672
		n_prop	0.35	—	—	0.73	—	—	—	0.73
CDOM (ppb)	*Winter*	mean	1.25	—	—	1.56	—	—	—	0.33
		min	0.09	—	—	0.09	—	—	—	0.18
		max	4.52	—	—	2.73	—	—	—	0.73
		n	6305	—	—	12882	—	—	—	12966
		n_prop	0.48	—	—	0.98	—	—	—	0.99
	Spring	mean	—	—	—	1.89	—	—	—	0.26
		min	—	—	—	1.45	—	—	—	0.18
		max	—	—	—	4.00	—	—	—	0.55
		n	id	—	—	12795	—	—	—	12893
		n_prop	0.01	—	—	0.98	—	—	—	0.98
	Summer	mean	—	—	—	1.72	—	—	—	0.24
		min	—	—	—	0.55	—	—	—	0.09
		max	—	—	—	4.91	—	—	—	0.45
		n	id	—	—	10936	—	—	—	12926
		n_prop	0.00	—	—	0.83	—	—	—	0.98
	Fall	mean	—	—	—	—	—	—	—	0.23
		min	—	—	—	—	—	—	—	0.09
		max	—	—	—	—	—	—	—	0.55
		n	id	—	—	id	—	—	—	9790
		n_prop	0.00	—	—	0.00	—	—	—	0.74

Appendix A.8 *continued*

Parameter	Season		1m	10m	20m	30m	45m	60m	75m	90m
Turbidity (NTU)	*Winter*	mean	0.25	—	—	0.14	—	—	—	0.14
		min	0.00	—	—	0.00	—	—	—	0.00
		max	7.45	—	—	9.96	—	—	—	2.07
		n	6231	—	—	12698	—	—	—	12681
		n_prop	0.48	—	—	0.97	—	—	—	0.97
	Spring	mean	0.16	—	—	0.06	—	—	—	0.09
		min	0.00	—	—	0.00	—	—	—	0.00
		max	7.28	—	—	1.24	—	—	—	1.37
		n	6192	—	—	11520	—	—	—	12490
		n_prop	0.47	—	—	0.88	—	—	—	0.95
	Summer	mean	—	—	—	0.11	—	—	—	0.08
		min	—	—	—	0.00	—	—	—	0.00
		max	—	—	—	5.15	—	—	—	0.87
		n	id	—	—	11858	—	—	—	11787
		n_prop	0.26	—	—	0.90	—	—	—	0.89
	Fall	mean	—	—	—	0.09	—	—	—	0.08
		min	—	—	—	0.00	—	—	—	0.00
		max	—	—	—	9.69	—	—	—	1.17
		n	id	—	—	8420	—	—	—	9264
		n_prop	0.34	—	—	0.64	—	—	—	0.70
Nitrate + nitrite (μM)	*Winter*	mean	—	—	—	8.49	—	—	—	19.46
		min	—	—	—	0.05	—	—	—	7.42
		max	—	—	—	23.86	—	—	—	26.72
		n	—	—	—	2041	—	—	—	2126
		n_prop	—	—	—	0.93	—	—	—	0.97
	Spring	mean	—	—	—	22.80	—	—	—	—
		min	—	—	—	5.09	—	—	—	—
		max	—	—	—	29.40	—	—	—	—
		n	—	—	—	2077	—	—	—	id
		n_prop	—	—	—	0.95	—	—	—	0.36
	Summer	mean	—	—	—	11.46	—	—	—	—
		min	—	—	—	1.88	—	—	—	—
		max	—	—	—	25.62	—	—	—	—
		n	—	—	—	2045	—	—	—	id
		n_prop	—	—	—	0.93	—	—	—	0.00
	Fall	mean	—	—	—	10.40	—	—	—	—
		min	—	—	—	1.71	—	—	—	—
		max	—	—	—	19.79	—	—	—	—
		n	—	—	—	1593	—	—	—	id
		n_prop	—	—	—	0.72	—	—	—	0.00

Appendix A.8 *continued*

Parameter	Season		1m	10m	20m	30m	45m	60m	75m	90m
xCO2 (ppm)	*Winter*	mean	366.02	—	—	—	—	—	—	—
		min	238.07	—	—	—	—	—	—	—
		max	492.01	—	—	—	—	—	—	—
		n	2183	—	—	—	—	—	—	—
		n_prop	1.00	—	—	—	—	—	—	—
	Spring	mean	331.29	—	—	—	—	—	—	—
		min	142.65	—	—	—	—	—	—	—
		max	422.04	—	—	—	—	—	—	—
		n	2176	—	—	—	—	—	—	—
		n_prop	1.00	—	—	—	—	—	—	—
	Summer	mean	369.83	—	—	—	—	—	—	—
		min	195.19	—	—	—	—	—	—	—
		max	505.43	—	—	—	—	—	—	—
		n	1411	—	—	—	—	—	—	—
		n_prop	0.64	—	—	—	—	—	—	—
	Fall	mean	—	—	—	—	—	—	—	—
		min	—	—	—	—	—	—	—	—
		max	—	—	—	—	—	—	—	—
		n	id	—	—	—	—	—	—	—
		n_prop	0.00	—	—	—	—	—	—	—

Appendix A.9

Summary of temperature, salinity, DO, pH (total), chlorophyll *a*, CDOM, turbidity, nitrate + nitrite, and xCO_2 recorded at various depths by the SBOO RTOMS in 2024. Data include mean, minimum, and maximum values, sample size (n), and proportion recovered (n_prop) for each depth by season. Sample sizes differed due to variations in sampling interval, deployment date, and data quality (see Appendices A.1 to A.3); id = insufficient data (<40% data recovery, based on expected number of samples for each season).

Parameter	Season		1 m	10 m	18 m	26 m
Temperature (°C)	*Winter*	mean	15.37	14.78	14.16	13.62
		min	12.76	11.25	11.01	10.92
		max	17.62	16.86	16.81	16.65
		n	12814	12896	12852	12993
		n_prop	0.98	0.98	0.98	0.99
	Spring	mean	16.13	13.32	11.71	11.21
		min	13.98	10.66	10.52	10.36
		max	18.38	17.92	15.18	14.32
		n	7009	7127	7073	7170
		n_prop	0.53	0.54	0.54	0.55
	Summer	mean	21.17	16.93	14.07	12.96
		min	16.16	11.78	11.36	11.14
		max	24.03	23.78	22.56	15.61
		n	8681	8914	8212	8639
		n_prop	0.66	0.67	0.62	0.65
	Fall	mean	15.35	13.94	12.80	12.30
		min	11.76	11.48	11.44	11.34
		max	19.42	18.94	17.32	14.87
		n	12606	12961	9687	12108
		n_prop	0.95	0.98	0.73	0.91
Salinity (psu)	*Winter*	mean	33.07	33.10	33.18	—
		min	31.92	32.74	32.74	—
		max	33.39	33.58	33.58	—
		n	12904	12986	12941	id
		n_prop	0.98	0.99	0.99	0.00
	Spring	mean	33.28	33.35	33.49	—
		min	32.67	32.93	32.78	—
		max	33.48	33.71	33.70	—
		n	7051	7167	7116	id
		n_prop	0.54	0.55	0.54	0.00
	Summer	mean	33.47	33.35	33.26	33.28
		min	33.18	33.03	32.60	32.89
		max	33.57	33.61	33.62	33.59
		n	8748	8982	8275	8705
		n_prop	0.66	0.68	0.62	0.66
	Fall	mean	33.24	33.26	33.29	33.31
		min	33.05	32.89	32.85	32.98
		max	33.38	33.44	33.56	33.55
		n	12691	13047	9753	12185
		n_prop	0.96	0.98	0.74	0.92

Appendix A.9 *continued*

Parameter	Season		1 m	10 m	18 m	26 m
DO (mg/L)	*Winter*	mean	8.39	—	7.39	6.34
		min	6.24	—	4.61	4.06
		max	11.79	—	9.43	8.30
		n	13011	—	13050	13062
		n_prop	0.99	—	1.00	1.00
	Spring	mean	8.10	—	5.09	3.84
		min	6.55	—	3.48	2.80
		max	10.03	—	9.21	7.65
		n	7111	—	7176	7191
		n_prop	0.54	—	0.55	0.55
	Summer	mean	7.93	—	8.68	7.21
		min	6.79	—	4.93	4.34
		max	10.05	—	17.57	11.23
		n	8974	—	8487	8928
		n_prop	0.68	—	0.64	0.67
	Fall	mean	8.22	—	6.91	5.82
		min	4.99	—	3.77	3.10
		max	15.99	—	10.15	8.60
		n	12964	—	9944	12431
		n_prop	0.98	—	0.75	0.94
pH (total pH)	*Winter*	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	—	id
		n_prop	0.00	—	—	0.00
	Spring	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	—	id
		n_prop	0.00	—	—	0.00
	Summer	mean	8.07	—	—	7.99
		min	7.99	—	—	7.78
		max	8.18	—	—	8.22
		n	8978	—	—	8930
		n_prop	0.68	—	—	0.67
	Fall	mean	8.07	—	—	7.91
		min	7.80	—	—	7.71
		max	8.47	—	—	8.09
		n	12980	—	—	12438
		n_prop	0.98	—	—	0.94

Appendix A.9 *continued*

Parameter	Season		1 m	10 m	18 m	26 m
Chlorophyll *a* (µg/L)	*Winter*	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	—	id
		n_prop	0.32	—	—	0.00
	Spring	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	—	id
		n_prop	0.17	—	—	0.00
	Summer	mean	—	—	—	1.75
		min	—	—	—	0.30
		max	—	—	—	29.38
		n	id	—	—	8787
		n_prop	0.33	—	—	0.66
	Fall	mean	—	—	—	0.76
		min	—	—	—	0.15
		max	—	—	—	13.24
		n	id	—	—	12223
		n_prop	0.18	—	—	0.92
CDOM (ppb)	*Winter*	mean	—	—	3.60	—
		min	—	—	0.09	—
		max	—	—	24.09	—
		n	id	—	7360	id
		n_prop	0.32	—	0.56	0.00
	Spring	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	id	id
		n_prop	0.18	—	0.00	0.00
	Summer	mean	—	—	4.91	4.83
		min	—	—	3.06	2.54
		max	—	—	29.79	8.97
		n	id	—	8336	8864
		n_prop	0.32	—	0.63	0.67
	Fall	mean	1.43	—	3.38	3.95
		min	0.00	—	0.99	2.54
		max	9.53	—	10.80	31.35
		n	6248	—	7918	10886
		n_prop	0.47	—	0.60	0.82

Appendix A.9 *continued*

Parameter	Season		1 m	10 m	18 m	26 m
Turbidity (NTU)	*Winter*	mean	—	—	0.36	—
		min	—	—	0.07	—
		max	—	—	9.13	—
		n	id	—	7299	id
		n_prop	0.31	—	0.56	0.00
	Spring	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	id	id
		n_prop	0.17	—	0.00	0.00
	Summer	mean	—	—	0.27	0.30
		min	—	—	0.01	0.06
		max	—	—	3.45	2.40
		n	id	—	8274	8787
		n_prop	0.32	—	0.62	0.66
	Fall	mean	0.35	—	0.64	0.41
		min	0.07	—	0.00	0.06
		max	9.61	—	3.60	8.45
		n	6183	—	8808	10805
		n_prop	0.47	—	0.66	0.82
Nitrate + nitrite (µM)	*Winter*	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	—	id
		n_prop	0.00	—	—	0.00
	Spring	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	—	id
		n_prop	0.00	—	—	0.00
	Summer	mean	0.80	—	—	—
		min	0.00	—	—	—
		max	3.64	—	—	—
		n	1259	—	—	id
		n_prop	0.57	—	—	0.17
	Fall	mean	1.31	—	—	—
		min	0.00	—	—	—
		max	11.53	—	—	—
		n	1558	—	—	id
		n_prop	0.71	—	—	0.00

Appendix A.9 *continued*

Parameter	Season		1 m	10 m	18 m	26 m
xCO2 (ppm)	*Winter*	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	—	—
		n_prop	0	—	—	—
	Spring	mean	—	—	—	—
		min	—	—	—	—
		max	—	—	—	—
		n	id	—	—	—
		n_prop	0.00	—	—	—
	Summer	mean	374.51	—	—	—
		min	280.45	—	—	—
		max	431.18	—	—	—
		n	2997	—	—	—
		n_prop	0.68	—	—	—
	Fall	mean	359.96	—	—	—
		min	226.62	—	—	—
		max	626.52	—	—	—
		n	4438	—	—	—
		n_prop	1.00	—	—	—

Appendix A.10

Summary of current velocity magnitude and direction from the PLOO RTOMS ADCP during 2024. Data are presented by depth bin as seasonal recovered observations (n), minimum (min), maximum (max), and means with 95% confidence intervals (CI). Proportion of recovered observations (n_prop) differed due to variations in data quality (see Appendices A.1 to A.3). Minimum and maximum angles of velocity are not shown due to the circular nature of the measurement.

				Magnitude (mm/s)				Angle	
Season	**Depth (m)**	**n**	**n_prop**	**Min**	**Max**	**Mean**	**95% CI**	**Mean**	**95% CI**
Winter	3	13047	1	2	495	151	2	201	70
	4	13047	1	15	590	172	2	194	71
	5	13047	1	11	608	175	2	191	71
	6	13047	1	11	593	173	2	191	70
	7	13047	1	2	581	172	2	191	70
	8	13047	1	5	568	169	2	191	69
	9	13047	1	7	494	156	2	201	68
	10	13047	1	4	476	153	2	197	68
	11	13047	1	5	510	163	2	189	69
	12	13047	1	8	496	160	2	188	69
	13	13046	1	10	489	157	2	187	70
	14	13047	1	11	479	153	2	186	69
	15	13045	1	12	468	150	2	185	69
	16	13046	1	11	453	148	2	183	69
	17	13045	1	3	440	145	2	183	70
	18	13047	1	4	429	141	2	181	70
	19	13045	1	0	413	138	1	180	70
	20	13045	1	2	395	133	1	183	70
	21	13044	1	0	363	125	1	197	69
	22	13044	1	1	338	121	1	184	70
	23	13044	1	2	357	128	1	166	71
	24	13044	1	6	336	124	1	170	71
	25	13044	1	3	308	117	1	190	69
	26	13045	1	3	271	112	1	257	62
	27	13044	1	0	206	84	1	273	64
	28	13043	1	2	259	101	1	120	69
	29	13045	1	1	285	112	1	130	70
	30	13043	1	2	276	107	1	144	70
	31	13043	1	2	277	105	1	134	70
	32	13043	1	1	273	102	1	132	70
	33	13043	1	3	274	101	1	119	70
	34	13046	1	5	279	99	1	106	70
	35	13043	1	1	276	96	1	101	70
	36	13043	1	1	274	95	1	90	70
	37	13042	1	1	280	93	1	82	70
	38	13044	1	0	280	93	1	77	70
	39	13040	1	1	271	91	1	69	70
	40	13043	1	1	271	89	1	54	70
	41	13044	1	1	273	87	1	37	69

Appendix A.10 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
Winter	42	13043	1	3	267	84	1	42	69
cont.	43	13044	1	0	277	85	1	54	70
	44	13043	1	0	274	86	1	58	69
	45	13042	1	0	277	85	1	54	69
	46	13044	1	1	273	85	1	49	69
	47	13044	1	3	274	85	1	59	69
	48	13042	1	0	282	84	1	57	69
	49	13043	1	1	282	85	1	57	69
	50	13041	1	1	276	83	1	58	69
	51	13043	1	0	271	83	1	56	70
	52	13043	1	3	267	80	1	57	70
	53	13042	1	1	268	81	1	53	70
	54	13043	1	0	267	80	1	50	71
	55	13041	1	3	261	78	1	48	71
	56	13043	1	2	248	78	1	50	71
	57	13044	1	1	246	80	1	58	71
	58	13046	1	3	248	82	1	65	70
	59	13043	1	1	252	83	1	66	70
	60	13044	1	1	252	83	1	63	71
	61	13041	1	0	261	83	1	64	71
	62	13042	1	2	254	83	1	63	71
	63	13041	1	0	248	83	1	66	71
	64	13044	1	2	247	84	1	68	71
	65	13041	1	2	246	84	1	68	71
	66	13046	1	1	254	84	1	70	70
	67	13041	1	6	249	85	1	71	71
	68	13039	1	5	242	85	1	72	70
	69	13042	1	7	248	84	1	73	71
	70	13041	1	4	247	84	1	74	71
	71	13043	1	8	236	84	1	77	71
	72	13043	1	2	236	83	1	78	70
	73	13042	1	3	235	83	1	80	70
	74	13041	1	1	233	82	1	84	70
	75	13041	1	3	234	80	1	84	69
	76	13038	1	1	236	79	1	88	69
	77	13039	1	2	232	76	1	91	69
	78	13041	1	2	232	73	1	92	70
	79	13038	1	1	219	71	1	100	70
	80	13035	1	1	220	69	1	119	69
	81	13034	1	2	223	67	1	213	69
	82	13037	1	1	218	65	1	239	71
	83	13034	1	0	200	63	1	183	70
	84	13036	1	0	201	62	1	106	68

Appendix A.10 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s)				Angle	
				Min	Max	Mean	95% CI	Mean	95% CI
Winter	85	13027	1	0	200	64	1	110	65
cont.	86	13019	1	1	204	66	1	125	63
	87	13016	1	1	207	62	1	145	62
	88	13014	1	2	200	57	1	215	65
	89	13016	1	1	170	51	1	243	67
	90	13018	1	2	135	44	0	259	65
	91	13030	1	0	77	29	0	276	61
	92	13043	1	0	66	20	0	293	51
Spring	3	12972	1	1	431	177	2	186	71
	4	12972	1	6	455	214	2	177	69
	5	12972	1	8	435	217	2	177	69
	6	12970	1	10	426	213	2	179	69
	7	12971	1	6	410	205	2	180	70
	8	12971	1	5	406	198	2	180	71
	9	12971	1	6	386	185	2	181	72
	10	12971	1	2	378	178	2	179	72
	11	12971	1	2	372	174	2	177	71
	12	12971	1	1	369	168	2	178	71
	13	12971	1	0	359	161	2	177	72
	14	12970	1	4	346	154	1	177	71
	15	12971	1	2	341	148	1	176	72
	16	12970	1	1	325	143	1	176	71
	17	12970	1	0	306	137	1	175	71
	18	12971	1	4	297	132	1	175	71
	19	12969	1	3	280	128	1	174	71
	20	12970	1	4	269	122	1	174	71
	21	12970	1	4	247	116	1	178	71
	22	12971	1	5	248	108	1	178	70
	23	12970	1	4	252	112	1	169	70
	24	12971	1	3	245	107	1	173	70
	25	12971	1	3	230	102	1	175	71
	26	12971	1	2	232	92	1	222	68
	27	12971	1	1	176	74	1	247	66
	28	12971	1	2	215	83	1	164	70
	29	12970	1	7	234	99	1	148	70
	30	12970	1	0	204	93	1	156	70
	31	12971	1	3	202	87	1	160	70
	32	12970	1	2	193	82	1	160	71
	33	12970	1	4	201	80	1	155	71
	34	12970	1	4	197	78	1	149	71
	35	12971	1	5	195	76	1	144	71
	36	12971	1	3	189	74	1	140	71
	37	12970	1	0	190	71	1	134	71

Appendix A.10 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
Spring	38	12970	1	0	187	70	1	122	70
cont.	39	12970	1	1	182	70	1	109	70
	40	12971	1	0	172	67	1	101	70
	41	12969	1	3	171	66	1	88	70
	42	12970	1	3	165	65	1	74	69
	43	12969	1	4	153	63	1	74	68
	44	12970	1	5	159	64	1	81	68
	45	12970	1	4	155	62	1	74	66
	46	12969	1	3	155	62	1	68	66
	47	12969	1	1	143	61	1	63	65
	48	12971	1	1	141	61	1	63	65
	49	12969	1	3	147	60	1	59	64
	50	12970	1	0	140	60	1	59	64
	51	12970	1	3	141	59	1	57	64
	52	12969	1	2	139	59	1	57	64
	53	12970	1	1	141	59	1	60	64
	54	12970	1	0	139	59	1	60	63
	55	12968	1	0	139	57	1	57	64
	56	12969	1	0	146	56	1	54	64
	57	12968	1	0	147	56	0	58	64
	58	12967	1	0	146	62	0	67	63
	59	12966	1	2	145	62	0	70	61
	60	12967	1	4	144	61	0	68	62
	61	12967	1	2	141	60	0	67	62
	62	12966	1	0	146	59	0	68	62
	63	12968	1	5	142	59	0	67	63
	64	12966	1	3	142	59	0	69	65
	65	12965	1	2	136	59	0	70	63
	66	12964	1	9	138	59	0	70	65
	67	12963	1	9	137	57	0	72	64
	68	12962	1	5	137	58	0	72	64
	69	12962	1	5	136	57	0	74	63
	70	12963	1	11	132	57	0	73	63
	71	12962	1	6	135	56	0	74	64
	72	12961	1	8	132	55	0	75	66
	73	12957	1	0	134	55	0	77	66
	74	12961	1	3	138	54	0	75	66
	75	12961	1	8	131	54	0	78	66
	76	12962	1	6	131	51	0	75	68
	77	12962	1	2	129	49	0	74	67
	78	12963	1	2	136	47	0	69	69
	79	12960	1	3	128	45	0	61	70
	80	12958	1	0	131	42	0	39	71

Appendix A.10 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
Spring	81	12959	1	2	134	41	1	351	70
cont.	82	12962	1	1	139	41	0	332	73
	83	12959	1	0	129	39	0	336	73
	84	12956	1	1	125	37	0	10	71
	85	12959	1	1	148	44	0	58	66
	86	12959	1	2	120	48	0	74	63
	87	12956	1	1	120	45	0	63	66
	88	12953	1	0	115	39	0	15	68
	89	12951	1	2	105	36	0	342	68
	90	12957	1	1	102	29	0	332	69
	91	12963	1	2	93	26	0	337	66
	92	12966	1	0	77	22	0	337	58
Summer	3	13177	1	4	194	65	1	159	54
	4	13176	1	1	280	99	1	168	57
	5	13176	1	8	316	111	1	162	54
	6	13177	1	1	308	115	1	161	55
	7	13177	1	7	262	119	1	160	56
	8	13176	1	4	241	119	1	158	56
	9	13176	1	7	221	115	1	159	57
	10	13177	1	7	230	115	1	157	58
	11	13176	1	9	242	119	1	152	58
	12	13177	1	3	246	118	1	149	59
	13	13176	1	4	233	117	1	142	59
	14	13176	1	13	241	116	1	140	60
	15	13175	1	1	242	113	1	132	60
	16	13175	1	4	240	112	1	125	61
	17	13173	1	2	251	108	1	113	61
	18	13174	1	2	252	105	1	100	62
	19	13175	1	4	245	103	1	90	63
	20	13174	1	1	243	102	1	75	65
	21	13175	1	3	241	100	1	60	64
	22	13173	1	3	231	95	1	51	66
	23	13174	1	5	219	99	1	61	65
	24	13174	1	3	221	99	1	50	65
	25	13171	1	1	219	98	1	41	66
	26	13170	1	6	235	94	1	13	65
	27	13173	1	9	229	83	1	356	66
	28	13173	1	10	190	77	1	30	67
	29	13173	1	5	205	90	1	49	66
	30	13170	1	4	217	92	1	38	66
	31	13172	1	6	220	91	1	34	66
	32	13173	1	9	216	90	1	33	67
	33	13172	1	7	214	90	1	31	66

Appendix A.10 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
Summer	34	13171	1	1	214	89	1	31	66
cont.	35	13174	1	2	215	87	1	27	66
	36	13173	1	1	206	86	1	25	66
	37	13173	1	8	206	85	1	25	66
	38	13173	1	13	207	85	1	25	66
	39	13172	1	9	205	83	1	25	66
	40	13172	1	6	204	82	1	25	67
	41	13173	1	7	199	80	1	22	67
	42	13173	1	8	200	79	1	21	67
	43	13171	1	6	199	78	1	21	68
	44	13172	1	3	190	79	1	24	68
	45	13170	1	1	187	77	1	24	67
	46	13171	1	0	184	79	1	23	69
	47	13170	1	2	188	78	1	23	68
	48	13173	1	3	188	77	1	23	68
	49	13170	1	3	189	76	1	22	69
	50	13174	1	0	194	75	1	23	69
	51	13173	1	1	197	76	1	24	68
	52	13173	1	3	197	74	1	25	68
	53	13174	1	6	220	75	1	24	70
	54	13173	1	5	215	76	1	27	70
	55	13172	1	5	211	76	1	26	70
	56	13174	1	7	209	75	1	25	72
	57	13174	1	8	205	74	1	27	72
	58	13172	1	6	209	74	1	28	73
	59	13173	1	12	199	73	1	30	73
	60	13168	1	13	196	73	1	30	73
	61	13172	1	2	198	73	1	31	72
	62	13173	1	2	199	72	1	32	72
	63	13171	1	2	188	73	1	33	72
	64	13171	1	6	193	72	1	34	72
	65	13175	1	6	186	71	1	34	73
	66	13173	1	1	186	71	1	36	73
	67	13171	1	3	186	70	1	37	74
	68	13172	1	3	184	70	1	37	73
	69	13172	1	1	180	69	1	39	75
	70	13173	1	9	177	68	1	37	75
	71	13171	1	5	174	67	1	39	74
	72	13172	1	2	178	68	1	39	74
	73	13169	1	6	155	66	1	40	74
	74	13169	1	7	160	66	1	43	74
	75	13170	1	1	164	65	1	44	72
	76	13170	1	2	171	63	1	42	73

Appendix A.10 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
Summer	77	13171	1	5	160	64	1	41	72
cont.	78	13166	1	0	167	64	1	37	72
	79	13171	1	1	164	63	1	37	73
	80	13164	1	1	165	62	1	34	72
	81	13164	1	1	167	57	1	25	74
	82	13164	1	3	169	59	1	14	71
	83	13155	1	1	167	59	1	13	71
	84	13161	1	2	194	61	1	7	71
	85	13152	1	0	181	58	1	10	69
	86	13137	1	1	157	55	1	10	70
	87	13119	1	2	142	58	1	11	70
	88	13110	0.99	1	151	54	1	11	66
	89	13098	0.99	1	142	55	1	356	66
	90	13093	0.99	4	145	51	1	355	64
	91	13121	1	3	125	45	0	336	60
	92	13146	1	1	96	37	0	340	62
Fall	3	9901	1	1	161	58	1	124	43
	4	9901	1	1	413	108	2	190	67
	5	9901	1	7	481	131	2	196	64
	6	9901	1	4	493	137	2	197	63
	7	9901	1	8	477	133	2	199	63
	8	9900	1	2	468	129	2	199	64
	9	9901	1	1	445	124	2	200	64
	10	9901	1	2	427	120	2	201	65
	11	9900	1	4	425	119	2	199	65
	12	9901	1	2	413	118	2	201	66
	13	9901	1	2	389	113	2	199	67
	14	9900	1	4	369	109	2	202	67
	15	9899	1	0	362	107	2	205	69
	16	9901	1	0	348	105	2	207	69
	17	9899	1	4	336	102	1	213	68
	18	9901	1	2	317	101	1	219	70
	19	9900	1	3	316	98	1	223	70
	20	9900	1	0	322	97	1	237	69
	21	9900	1	2	319	96	1	258	69
	22	9900	1	6	311	91	1	266	69
	23	9900	1	1	322	94	1	263	69
	24	9899	1	2	333	97	1	278	69
	25	9898	1	2	334	96	1	293	68
	26	9899	1	6	317	97	1	298	66
	27	9899	1	5	298	77	1	306	65
	28	9899	1	2	314	73	1	333	68
	29	9899	1	5	328	86	1	356	69

Appendix A.10 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s)				Angle	
				Min	Max	Mean	95% CI	Mean	95% CI
Fall	30	9898	1	4	349	92	1	338	69
cont.	31	9895	1	9	346	93	1	332	67
	32	9898	1	1	343	91	1	337	69
	33	9898	1	5	344	92	1	342	68
	34	9896	1	6	348	92	1	345	67
	35	9892	1	2	349	91	1	348	68
	36	9891	1	3	348	90	1	350	68
	37	9889	1	0	344	88	1	353	68
	38	9890	1	2	333	89	1	354	67
	39	9893	1	3	332	89	1	356	67
	40	9893	1	2	323	88	1	357	66
	41	9892	1	3	321	86	1	358	65
	42	9897	1	2	312	86	1	1	66
	43	9895	1	2	302	83	1	3	66
	44	9895	1	5	282	88	1	5	66
	45	9895	1	3	273	85	1	4	65
	46	9894	1	1	262	86	1	7	65
	47	9893	1	0	251	84	1	6	64
	48	9892	1	1	247	86	1	8	65
	49	9892	1	2	251	83	1	8	66
	50	9888	1	2	247	84	1	9	64
	51	9891	1	5	236	84	1	8	63
	52	9892	1	2	233	82	1	10	66
	53	9893	1	1	232	84	1	6	63
	54	9890	1	1	232	82	1	12	62
	55	9893	1	1	222	83	1	11	63
	56	9894	1	2	215	81	1	5	63
	57	9894	1	2	209	79	1	11	60
	58	9895	1	2	214	77	1	14	64
	59	9896	1	1	215	79	1	18	62
	60	9895	1	3	217	82	1	9	58
	61	9889	1	1	215	77	1	10	64
	62	9901	0	—	—	—	—	—	—
	63	9901	0	—	—	—	—	—	—
	64	9901	0	—	—	—	—	—	—
	65	9901	0	—	—	—	—	—	—
	66	9901	0	—	—	—	—	—	—
	67	9901	0	—	—	—	—	—	—
	68	9901	0	—	—	—	—	—	—
	69	9901	0	—	—	—	—	—	—
	70	9901	0	—	—	—	—	—	—
	71	9901	0	—	—	—	—	—	—
	72	9901	0	—	—	—	—	—	—

Appendix A.10 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
Fall	73	9901	0	—	—	—	—	—	—
cont.	74	9901	0	—	—	—	—	—	—
	75	9901	0	—	—	—	—	—	—
	76	9901	0	—	—	—	—	—	—
	77	9901	0	—	—	—	—	—	—
	78	9901	0	—	—	—	—	—	—
	79	9901	0	—	—	—	—	—	—
	80	9901	0	—	—	—	—	—	—
	81	9901	0	—	—	—	—	—	—
	82	9901	0	—	—	—	—	—	—
	83	9901	0	—	—	—	—	—	—
	84	9901	0	—	—	—	—	—	—
	85	9901	0	—	—	—	—	—	—
	86	9901	0	—	—	—	—	—	—
	87	9901	0	—	—	—	—	—	—
	88	9901	0	—	—	—	—	—	—
	89	9901	0	—	—	—	—	—	—
	90	9901	0	—	—	—	—	—	—
	91	9901	0	—	—	—	—	—	—
	92	9901	0	—	—	—	—	—	—

Appendix A.11

Summary of current velocity magnitude and direction from the SBOO RTOMS ADCP during 2024. Data are presented by depth bin as seasonal recovered observations (n), minimum (min), maximum (max), and means with 95% confidence intervals (CI). Proportion of recovered observations (n_prop) differed due to variations in data quality (see Appendices A.1 to A.3). Minimum and maximum angles of velocity are not shown due to the circular nature of the measurement.

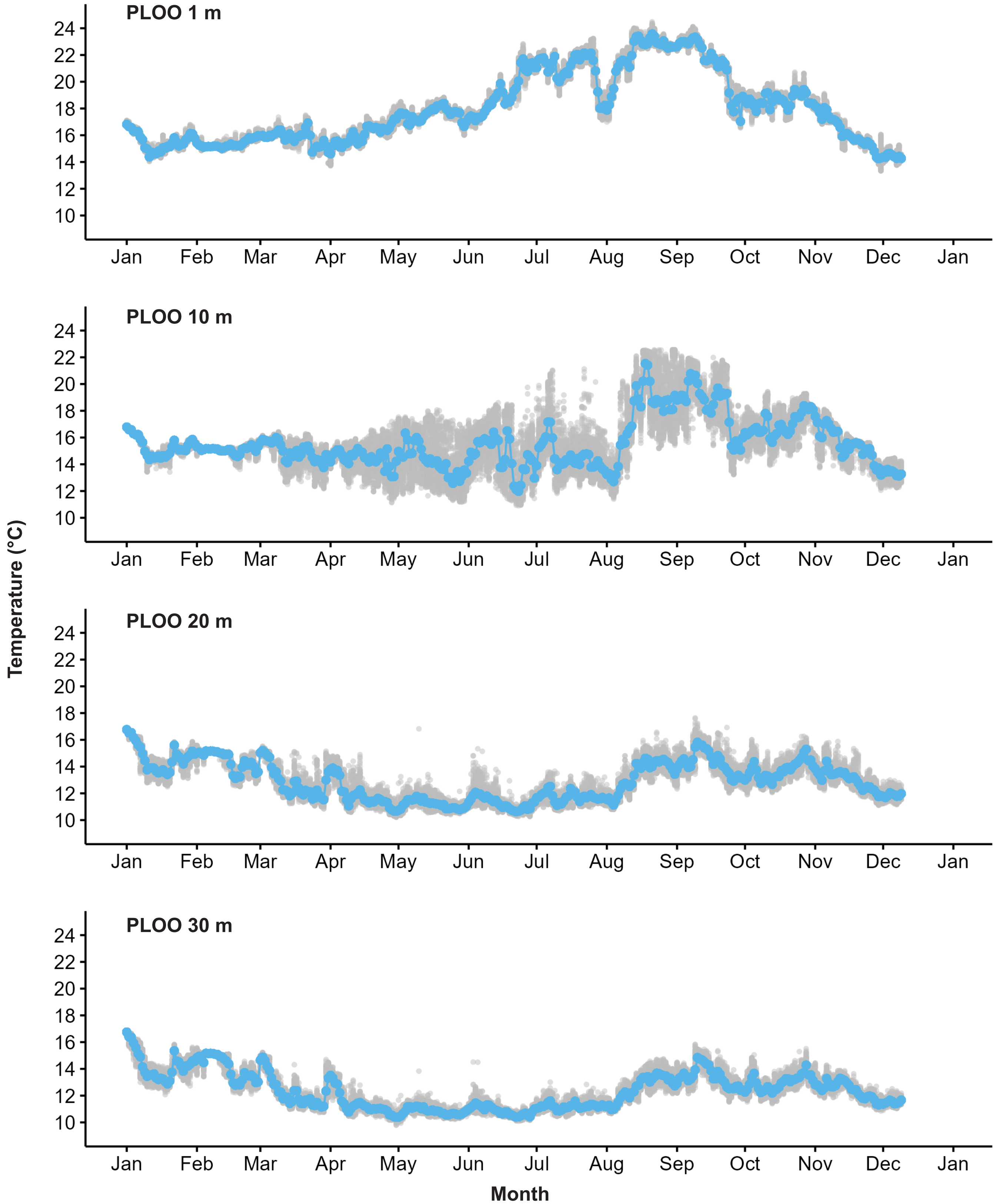
				Magnitude (mm/s)				Angle	
Season	Depth (m)	n	n_prop	Min	Max	Mean	95% CI	Mean	95% CI
Winter	3	13046	1	1	257	75	1	138	73
	4	13046	1	3	287	108	1	147	75
	5	13045	1	0	319	118	1	147	76
	6	13045	1	0	308	120	1	146	77
	7	13046	1	0	307	120	1	147	78
	8	13045	1	2	322	121	1	144	79
	9	13044	1	0	271	112	1	148	80
	10	13045	1	2	273	111	1	146	80
	11	13042	1	2	314	117	1	142	80
	12	13042	1	1	314	116	1	142	80
	13	13044	1	0	307	114	1	139	80
	14	13043	1	2	310	112	1	138	80
	15	13042	1	1	297	109	1	135	80
	16	13042	1	1	252	102	1	133	80
	17	13043	1	1	237	93	1	133	79
	18	13040	1	1	234	91	1	131	79
	19	13043	1	9	259	99	1	122	79
	20	13040	1	9	267	99	1	118	78
	21	13044	1	11	220	94	1	115	78
	22	13043	1	7	184	82	1	111	77
	23	13044	1	1	177	71	1	106	74
	24	13044	1	0	175	68	1	311	73
	25	13043	1	0	193	69	1	87	74
	26	13040	1	3	181	68	1	80	73
	27	13043	1	1	173	60	1	66	70
Spring	3	7171	1	1	179	60	1	170	66
	4	7170	1	1	233	79	1	162	68
	5	7170	1	3	262	86	1	156	69
	6	7172	1	4	262	85	1	149	68
	7	7170	1	0	272	82	1	142	70
	8	7170	1	2	274	80	1	139	70
	9	7169	1	0	256	73	1	139	68
	10	7170	1	2	245	68	1	138	68
	11	7169	1	1	266	66	1	136	71
	12	7171	1	0	258	64	1	132	69
	13	7169	1	2	248	60	1	127	70
	14	7170	1	3	231	57	1	120	70
	15	7169	1	3	219	54	1	114	73
	16	7168	1	2	193	53	1	105	73

Appendix A.11 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s)				Angle	
				Min	Max	Mean	95% CI	Mean	95% CI
Spring	17	7170	1	0	153	48	1	84	73
cont.	18	7168	1	2	170	46	1	85	74
	19	7169	1	8	196	50	1	88	75
	20	7168	1	3	216	51	1	85	74
	21	7170	1	4	196	49	1	79	72
	22	7170	1	3	160	46	1	71	74
	23	7167	1	4	139	38	1	44	73
	24	7171	1	1	149	35	1	23	70
	25	7169	1	2	153	37	1	49	70
	26	7170	1	4	163	40	1	57	71
	27	7168	1	7	147	37	0	56	67
Summer	3	8979	1	5	308	147	2	175	74
	4	8979	1	20	343	145	2	174	79
	5	8978	1	18	367	151	2	171	80
	6	8979	1	9	354	147	2	168	80
	7	8979	1	4	361	140	2	165	80
	8	8979	1	1	363	136	2	163	80
	9	8979	1	3	302	112	1	164	77
	10	8979	1	2	290	108	1	162	77
	11	8979	1	1	312	115	2	160	78
	12	8979	1	1	296	105	1	159	79
	13	8979	1	1	268	97	1	159	80
	14	8978	1	1	247	91	1	161	80
	15	8977	1	0	234	86	1	162	81
	16	8978	1	3	209	76	1	167	82
	17	8979	1	1	197	64	1	173	80
	18	8979	1	4	183	65	1	158	79
	19	8979	1	3	174	70	1	154	79
	20	8979	1	1	169	70	1	153	81
	21	8979	1	1	171	67	1	149	80
	22	8979	1	1	172	56	1	155	78
	23	8979	1	1	165	48	1	157	78
	24	8979	1	1	155	44	1	292	78
	25	8979	1	1	152	46	1	109	76
	26	8979	1	0	157	46	1	82	76
	27	8979	1	0	134	41	1	52	75
Fall	3	13052	1	4	313	104	1	188	72
	4	13051	1	1	399	99	1	182	74
	5	13052	1	3	398	99	1	178	75
	6	13052	1	0	376	96	1	172	75
	7	13051	1	1	350	94	1	169	75
	8	13052	1	1	326	92	1	162	75
	9	13052	1	1	293	86	1	160	74

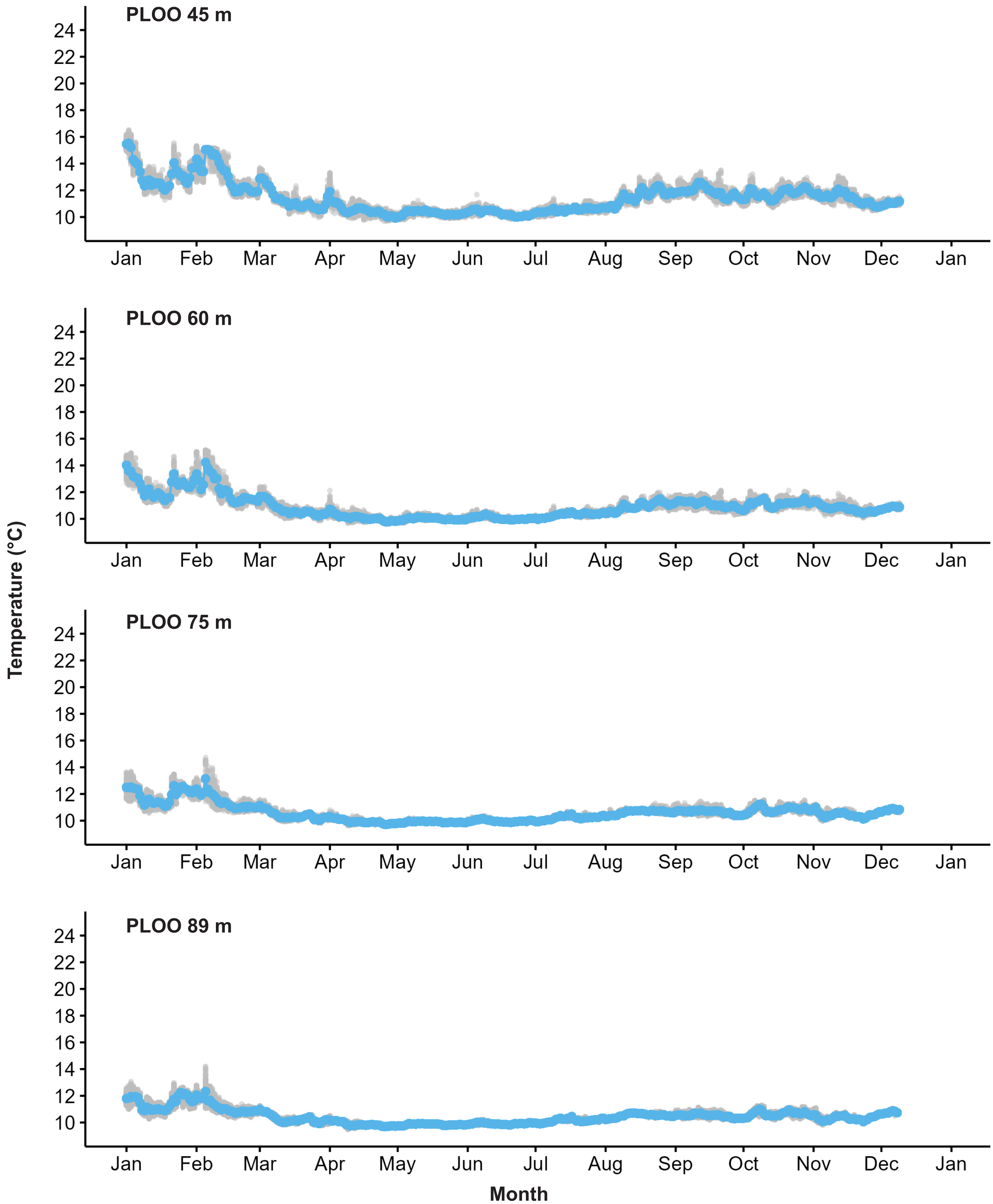
Appendix A.11 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
Fall	10	13052	1	2	293	83	1	153	76
cont.	11	13051	1	2	289	82	1	144	76
	12	13052	1	2	284	80	1	136	77
	13	13052	1	1	283	78	1	130	78
	14	13052	1	0	277	77	1	119	78
	15	13051	1	0	271	75	1	105	78
	16	13051	1	0	255	73	1	94	79
	17	13048	1	1	251	70	1	69	79
	18	13050	1	0	245	69	1	64	79
	19	13050	1	3	241	73	1	68	77
	20	13050	1	2	232	73	1	64	77
	21	13050	1	2	231	71	1	55	77
	22	13050	1	3	224	65	1	34	76
	23	13051	1	3	208	59	1	8	76
	24	13050	1	1	186	54	1	351	75
	25	13051	1	2	178	53	1	7	75
	26	13051	1	4	161	52	1	25	72
	27	13050	1	0	152	47	1	23	72



Appendix A.12

Temperature, salinity, DO, pH (total), chlorophyll *a,* CDOM, turbidity, nitrate + nitrite, and xCO_2 recorded at various depths by the PLOO and SBOO RTOMS during 2024. Grey points represent raw data and blue points represent daily averaged data.



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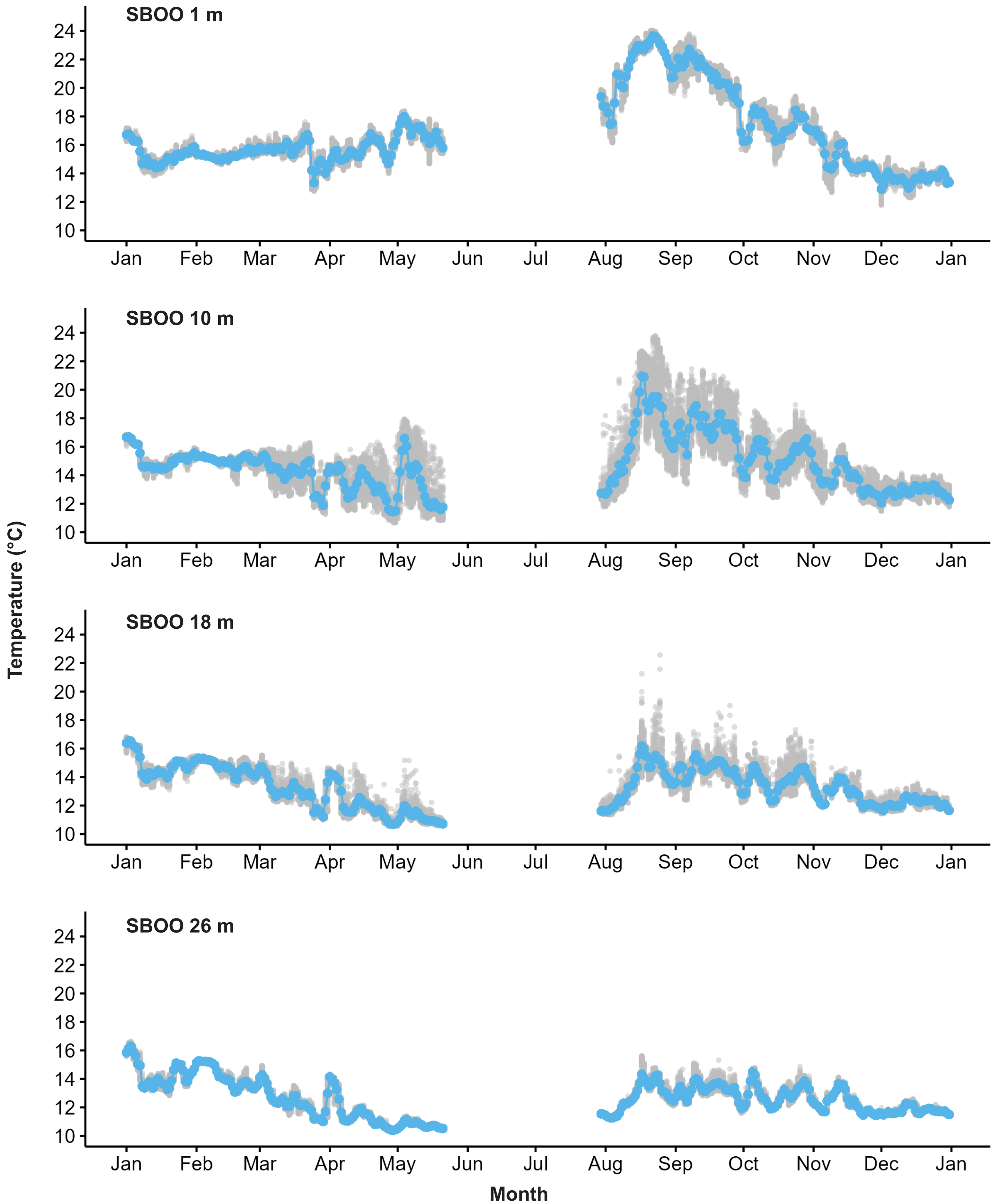

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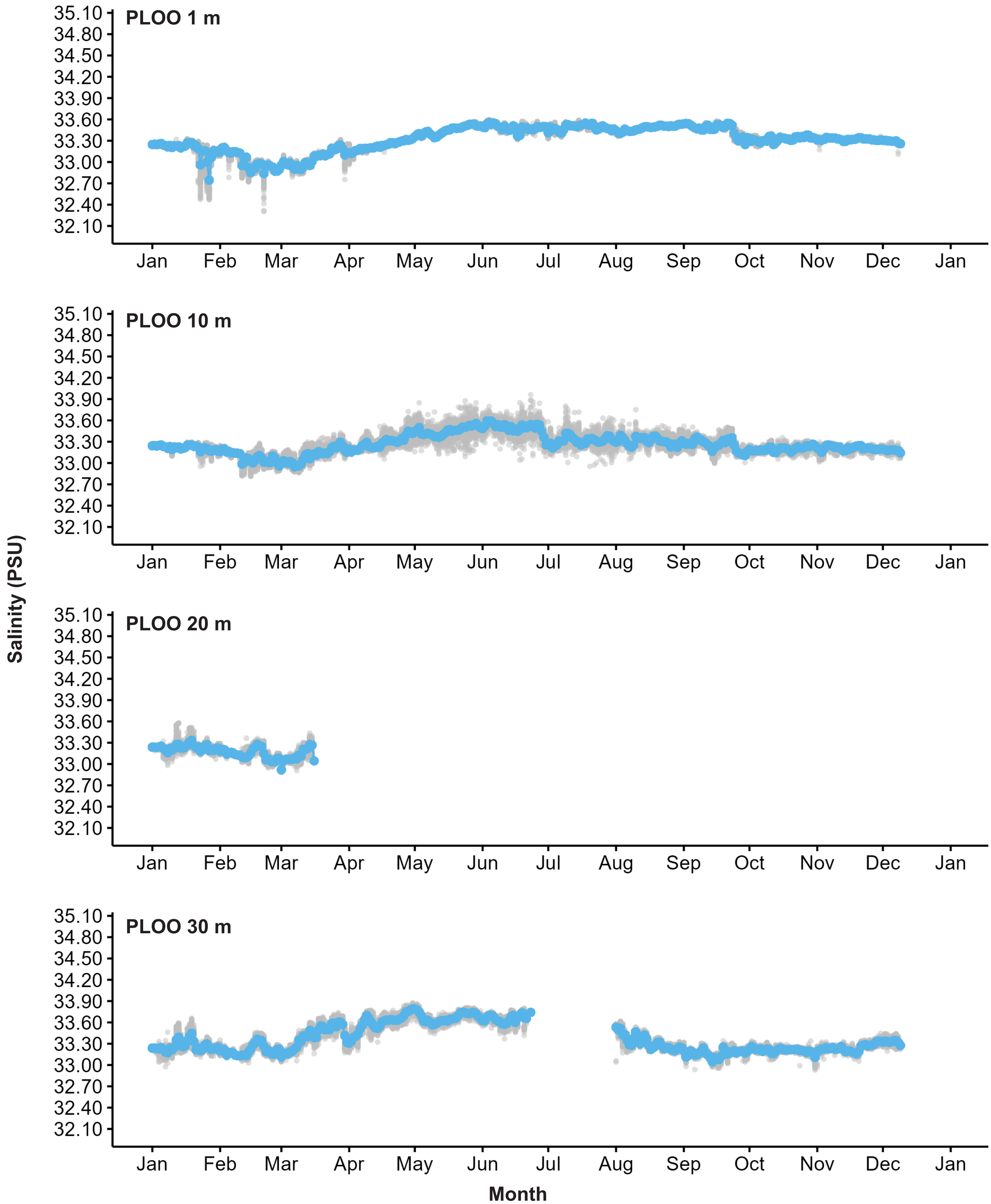

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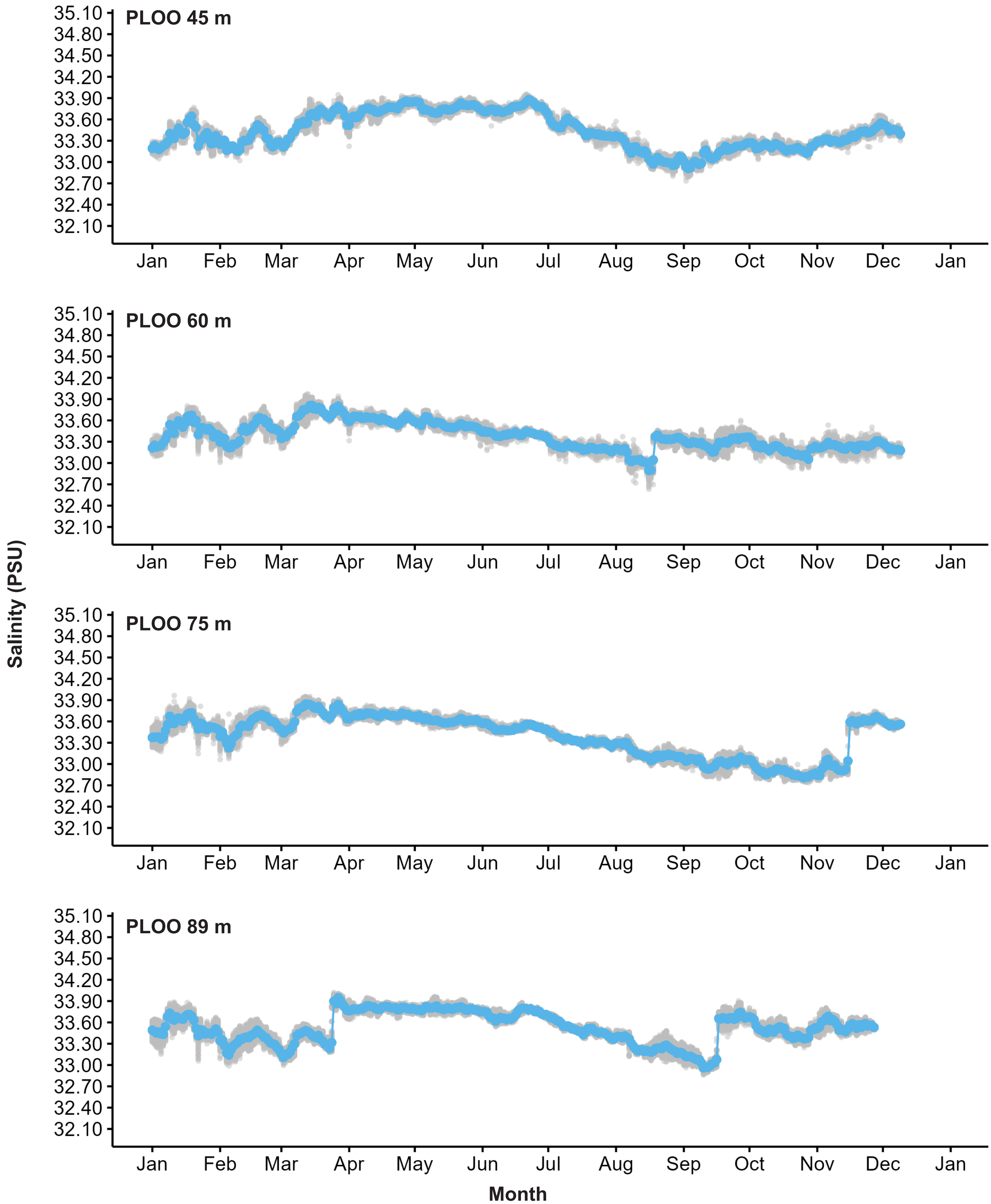

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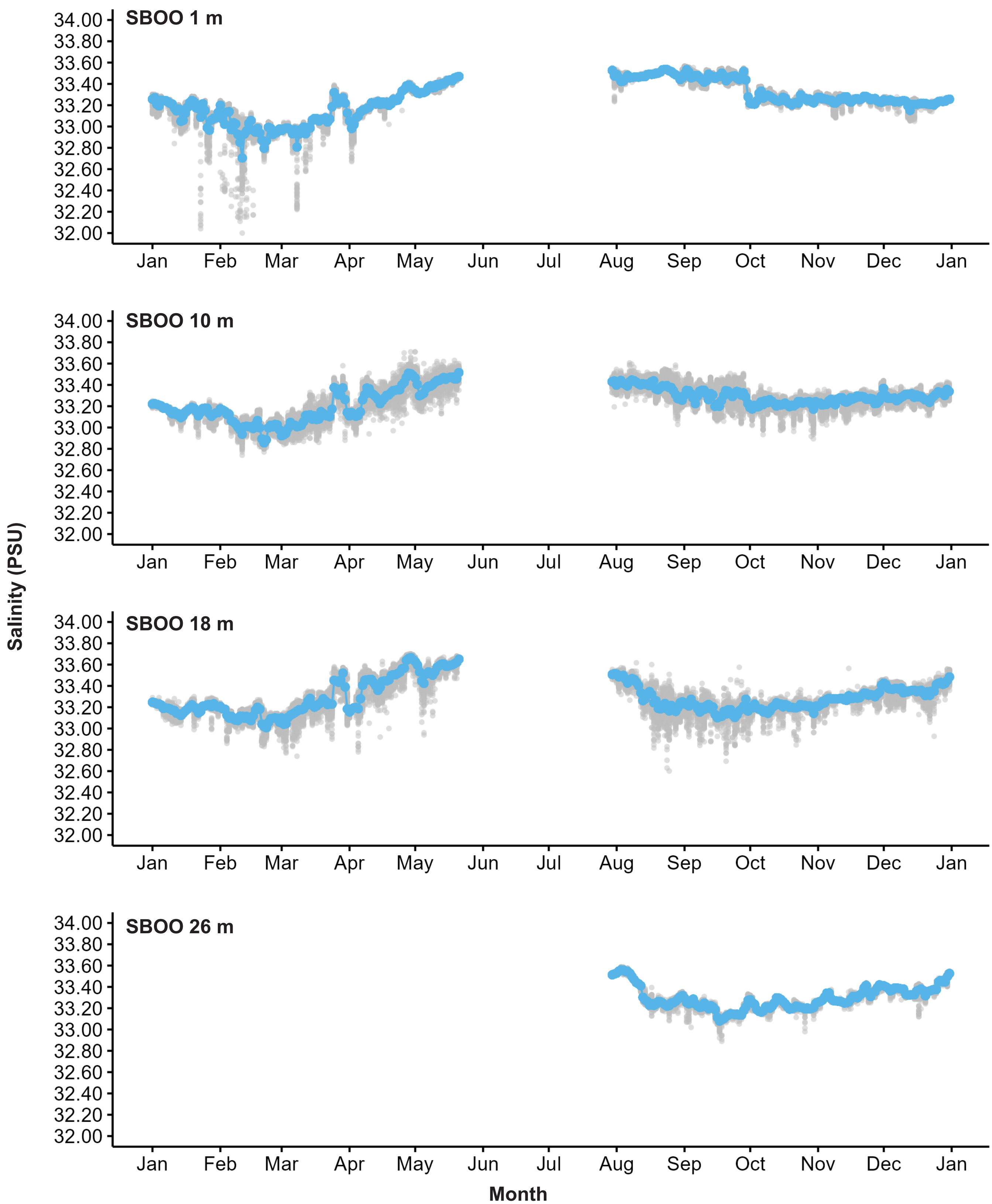

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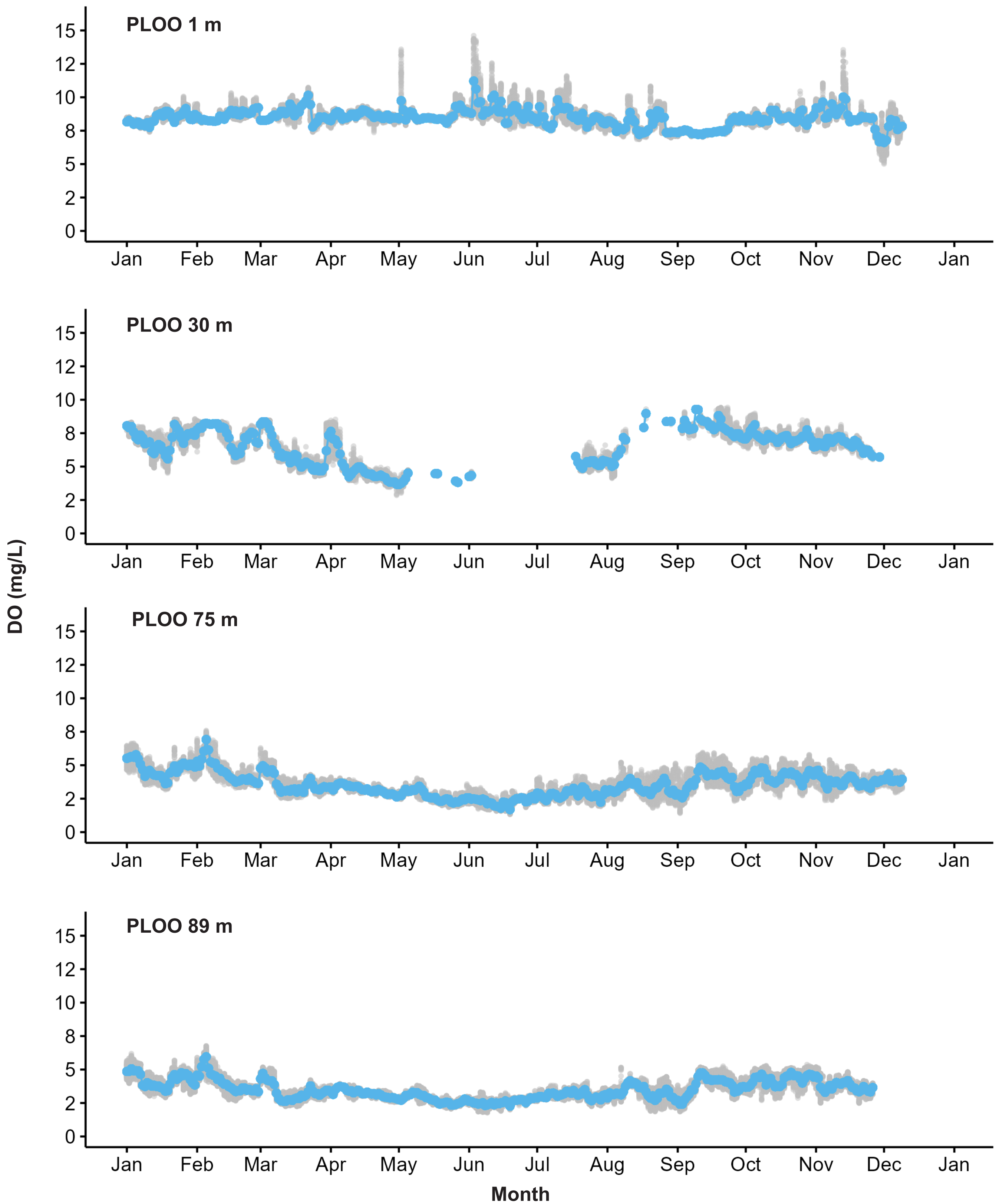

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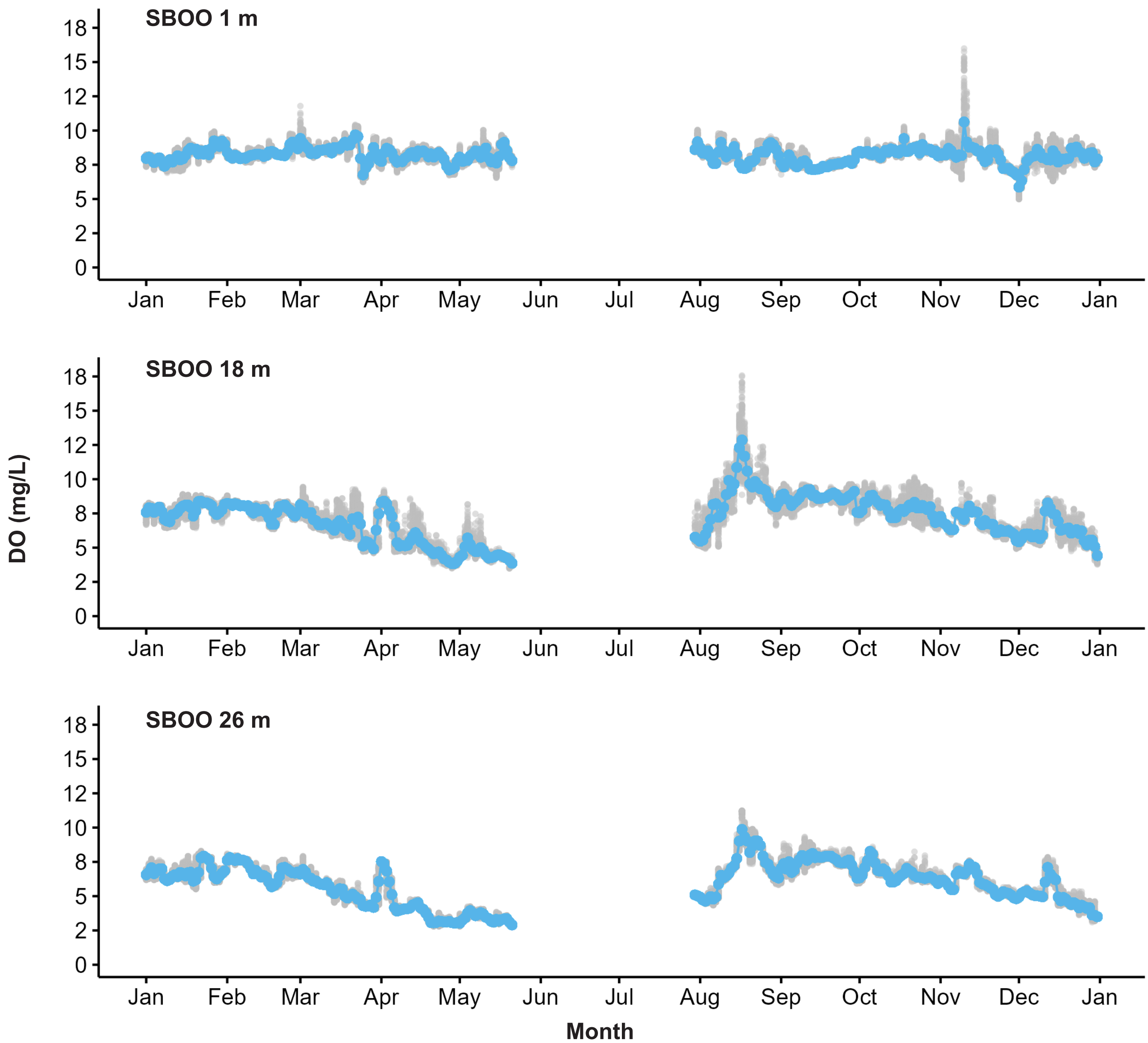

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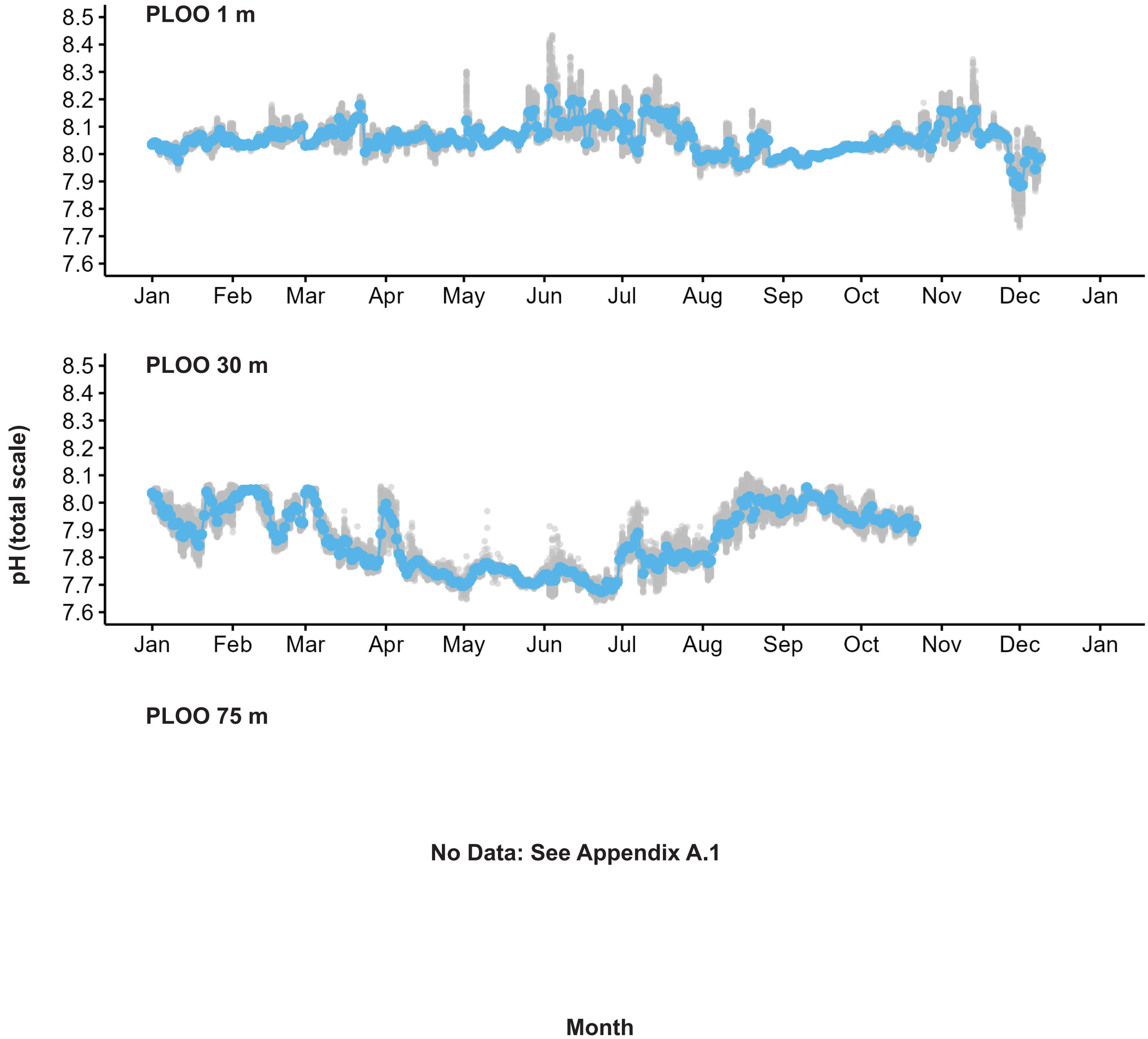

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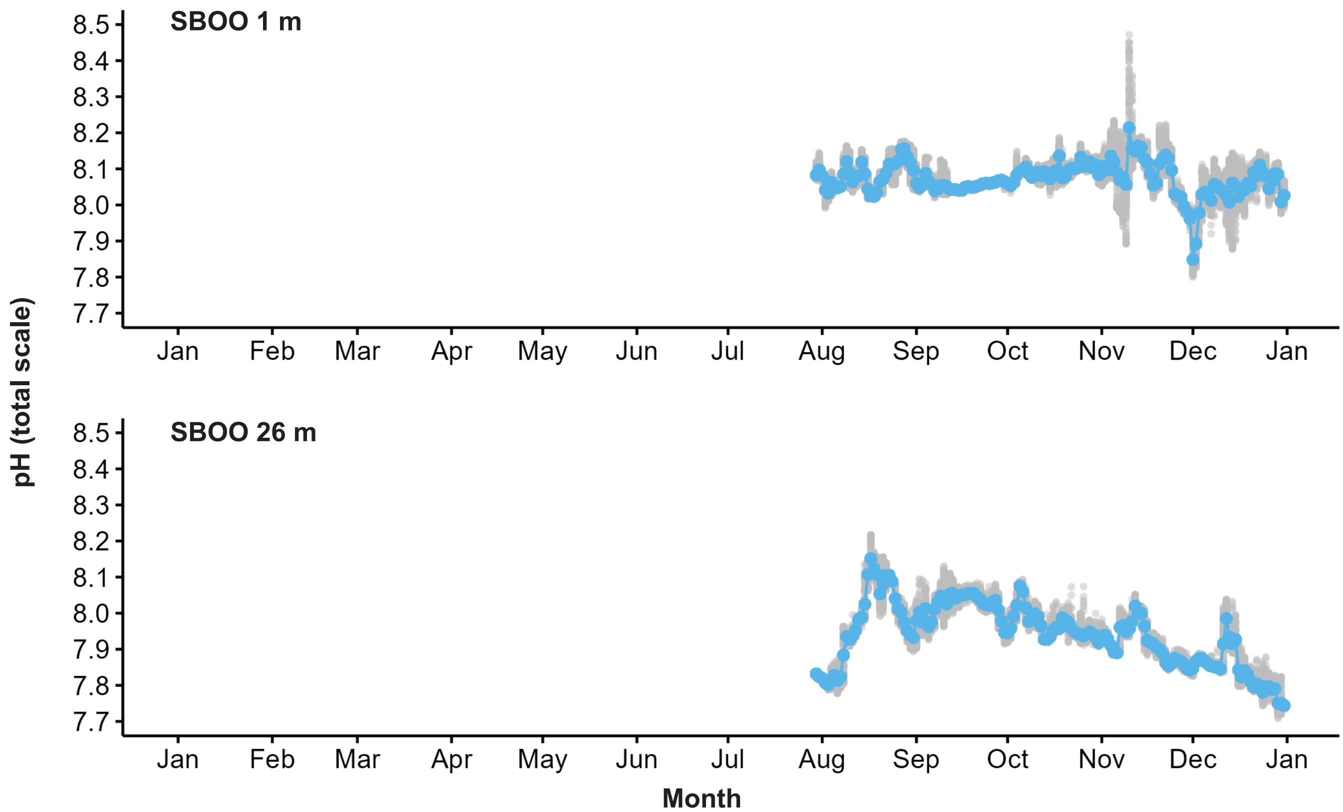

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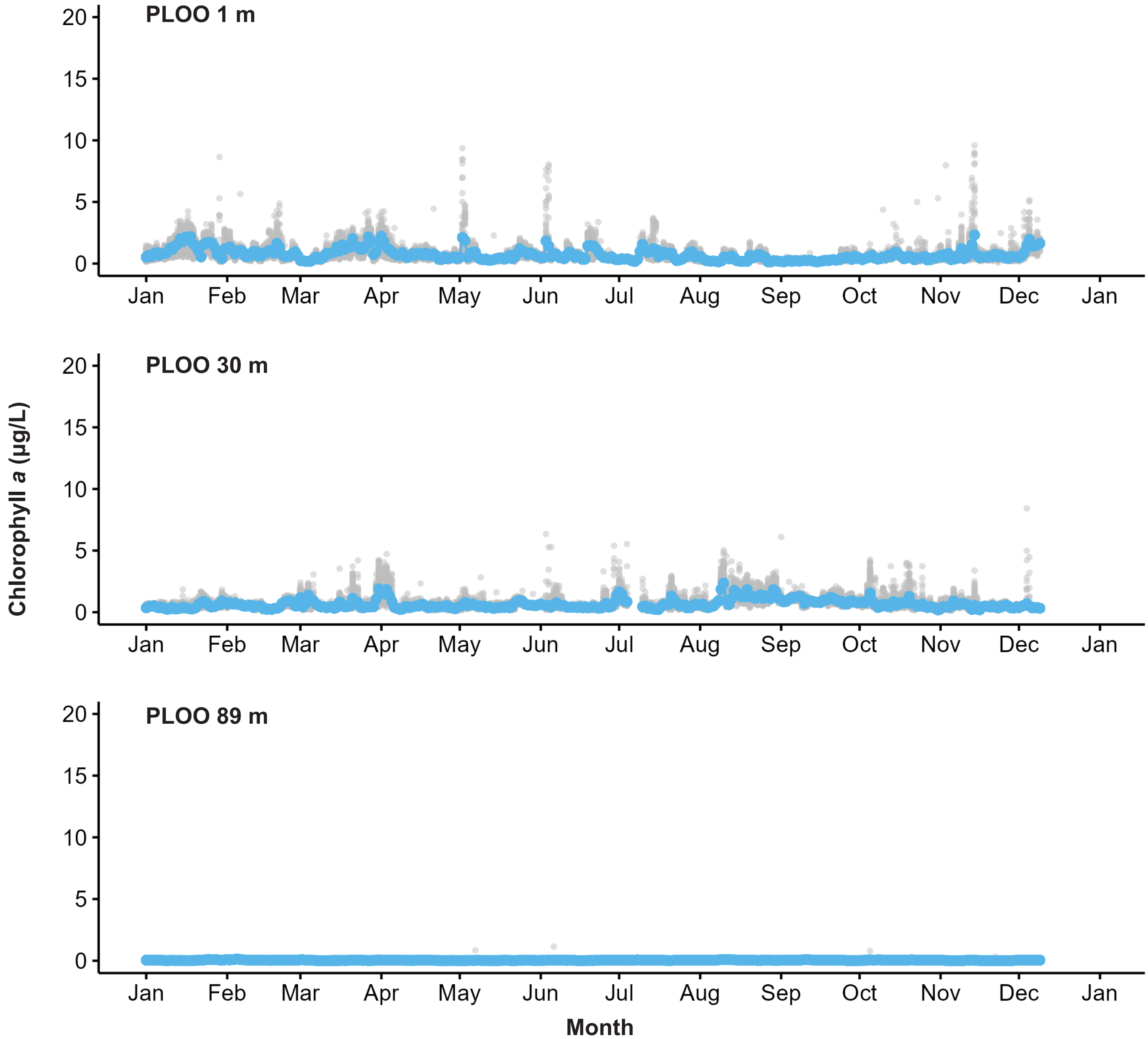

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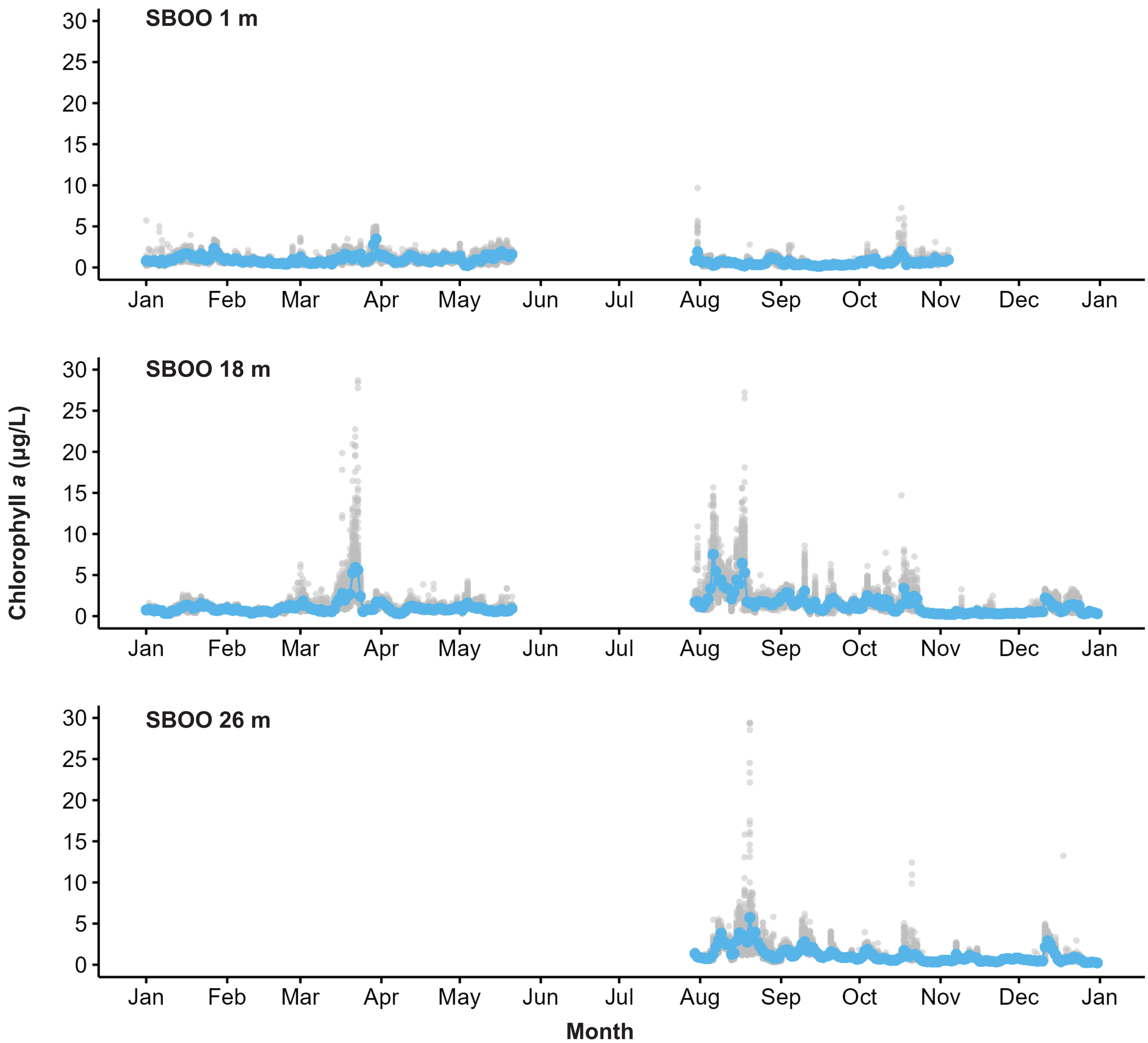

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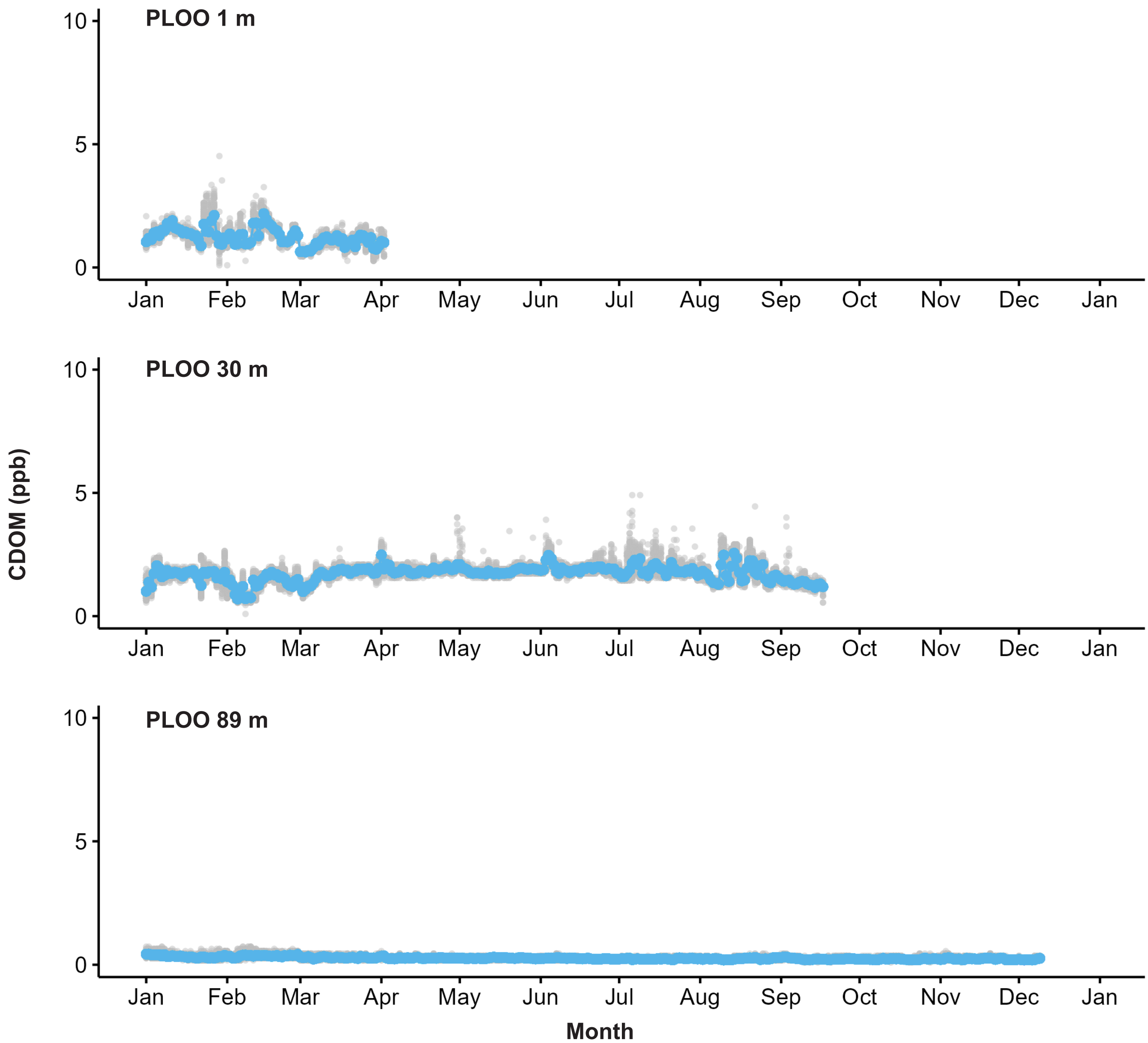

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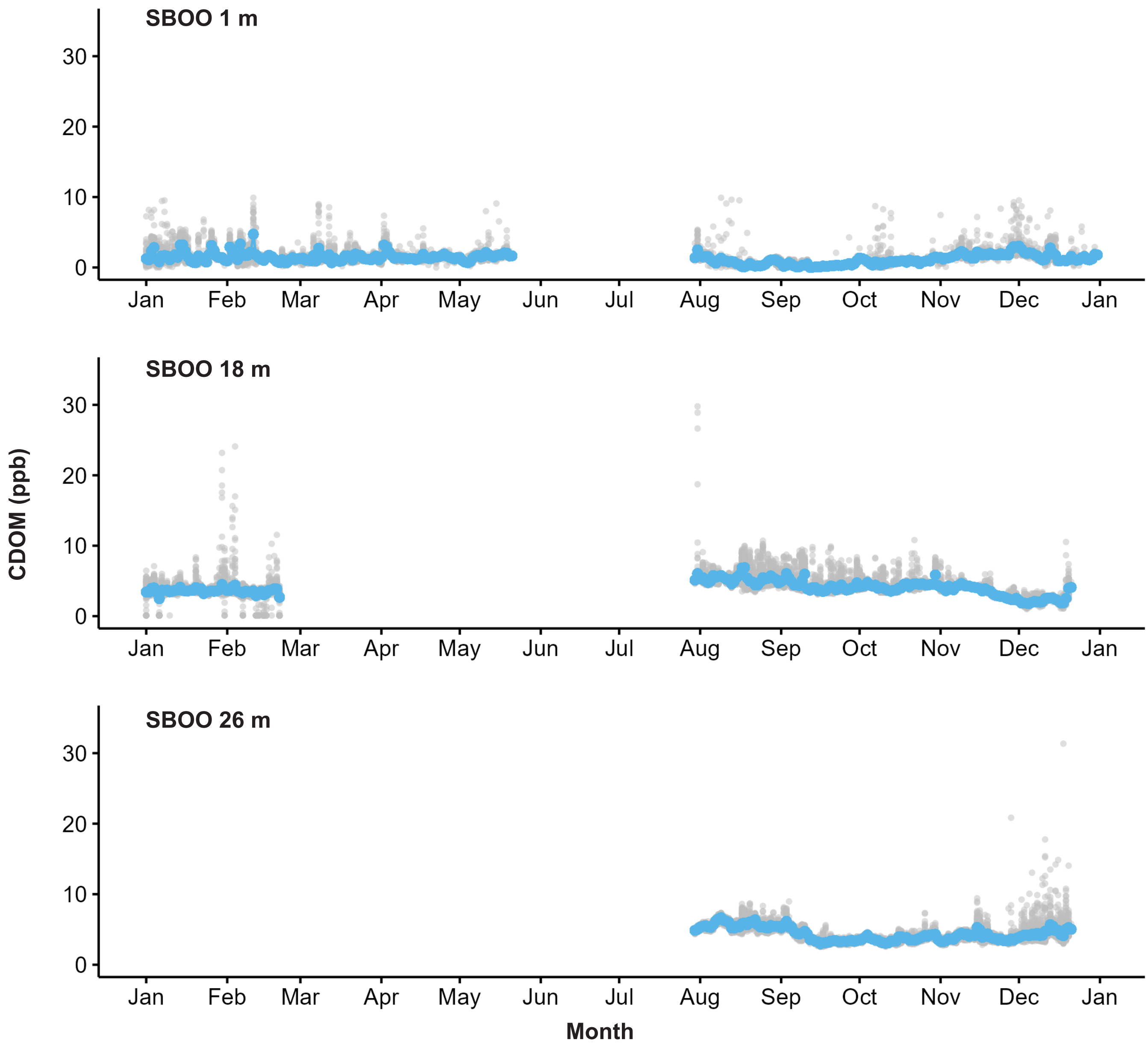

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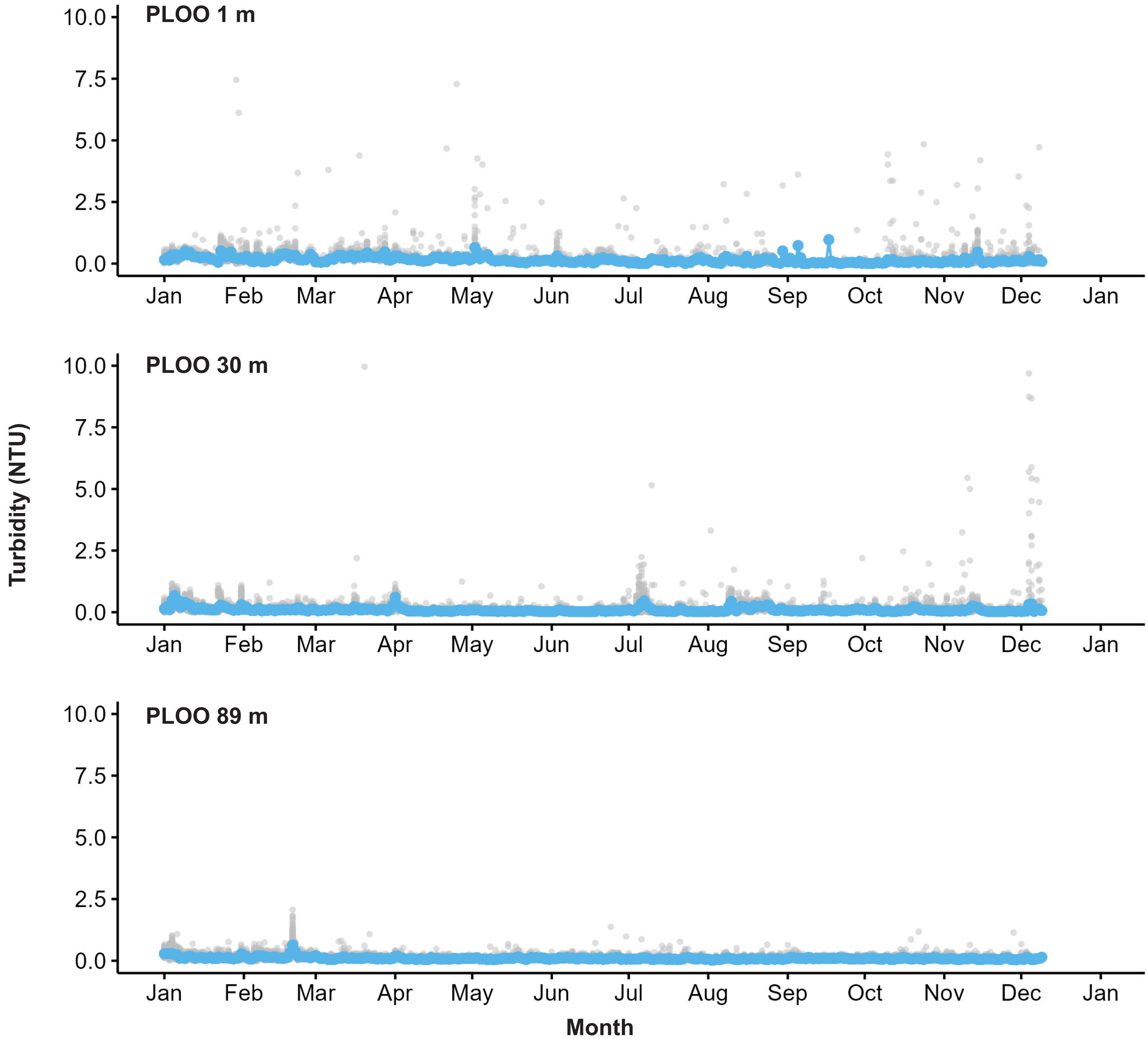

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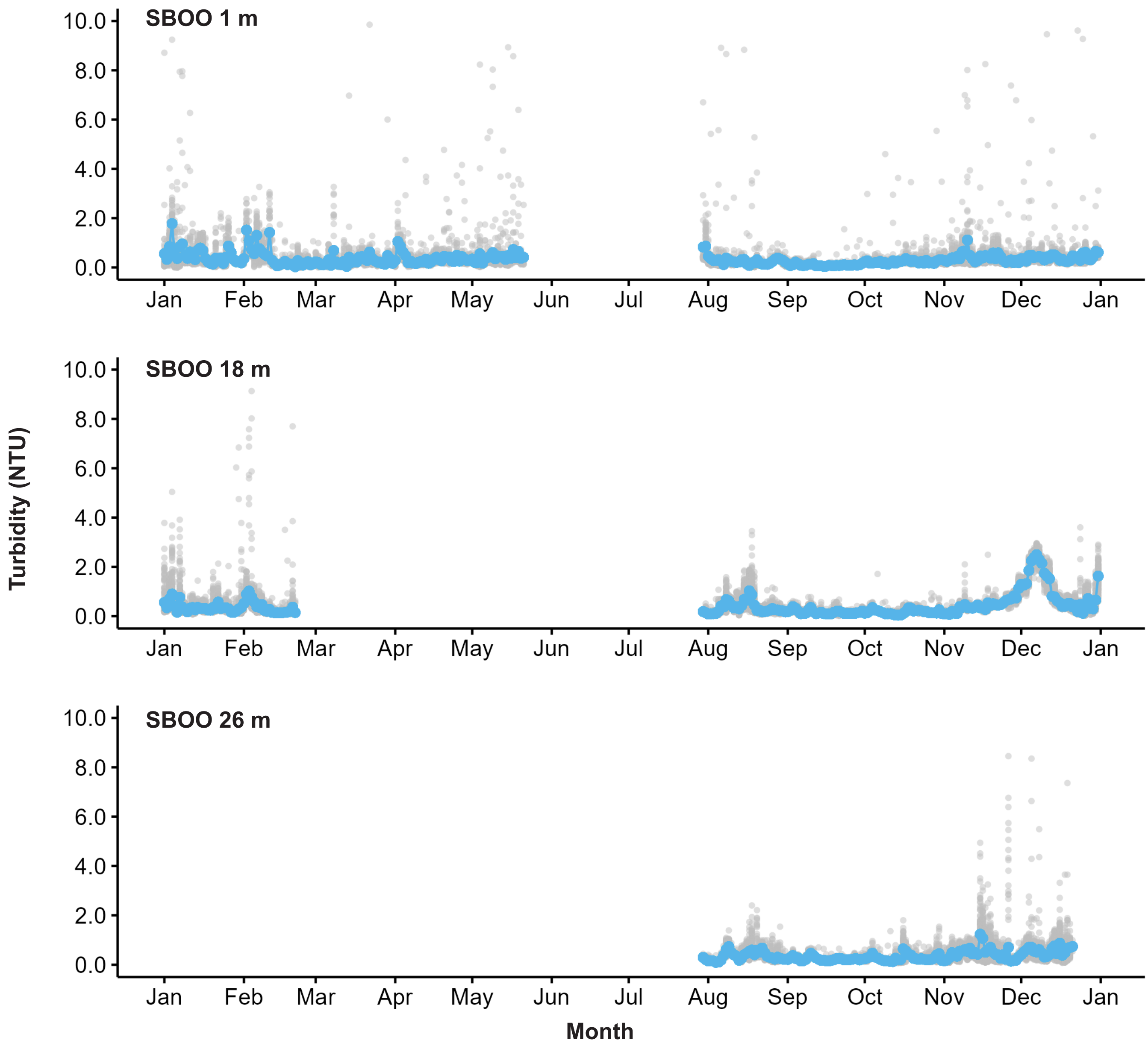

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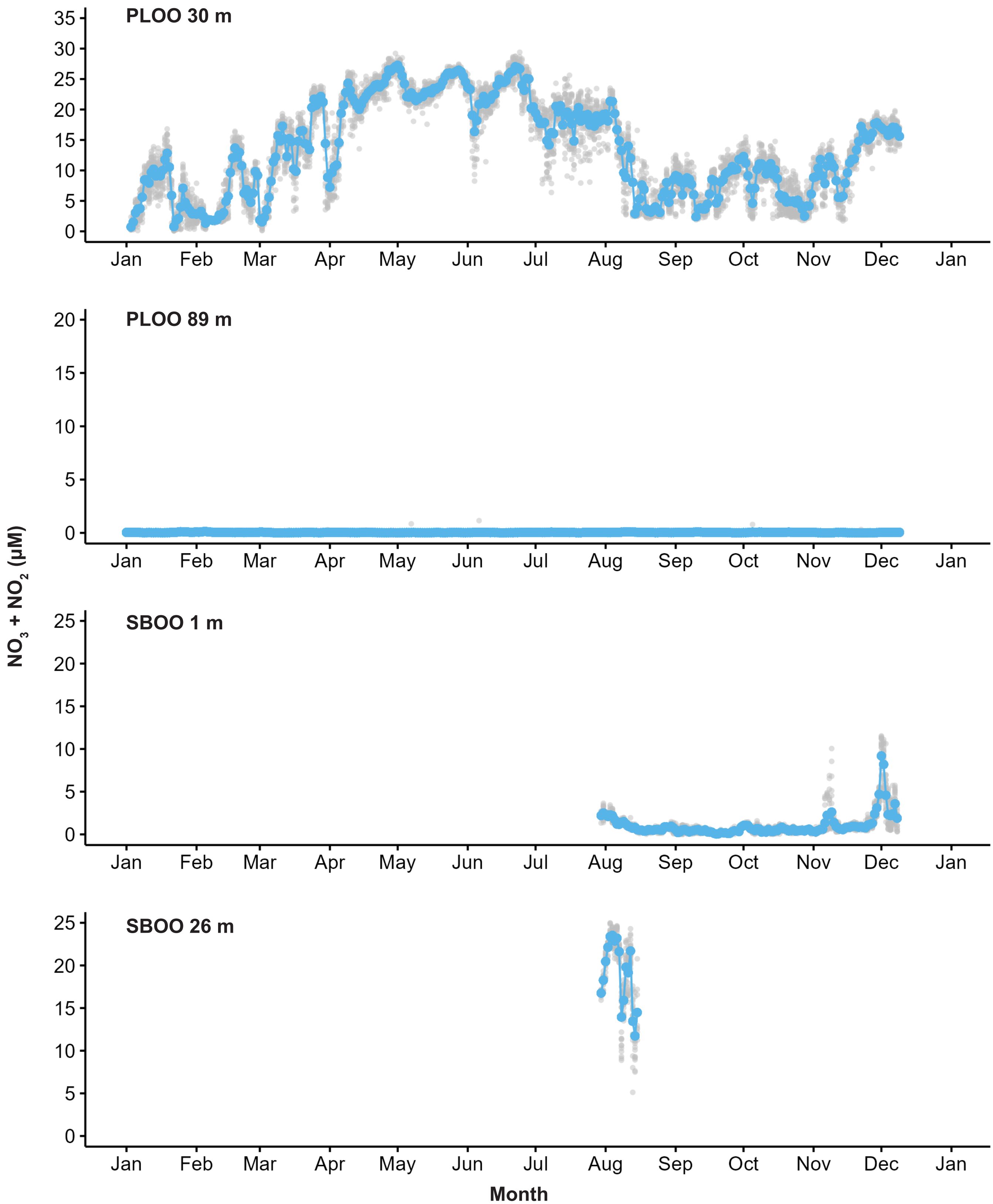

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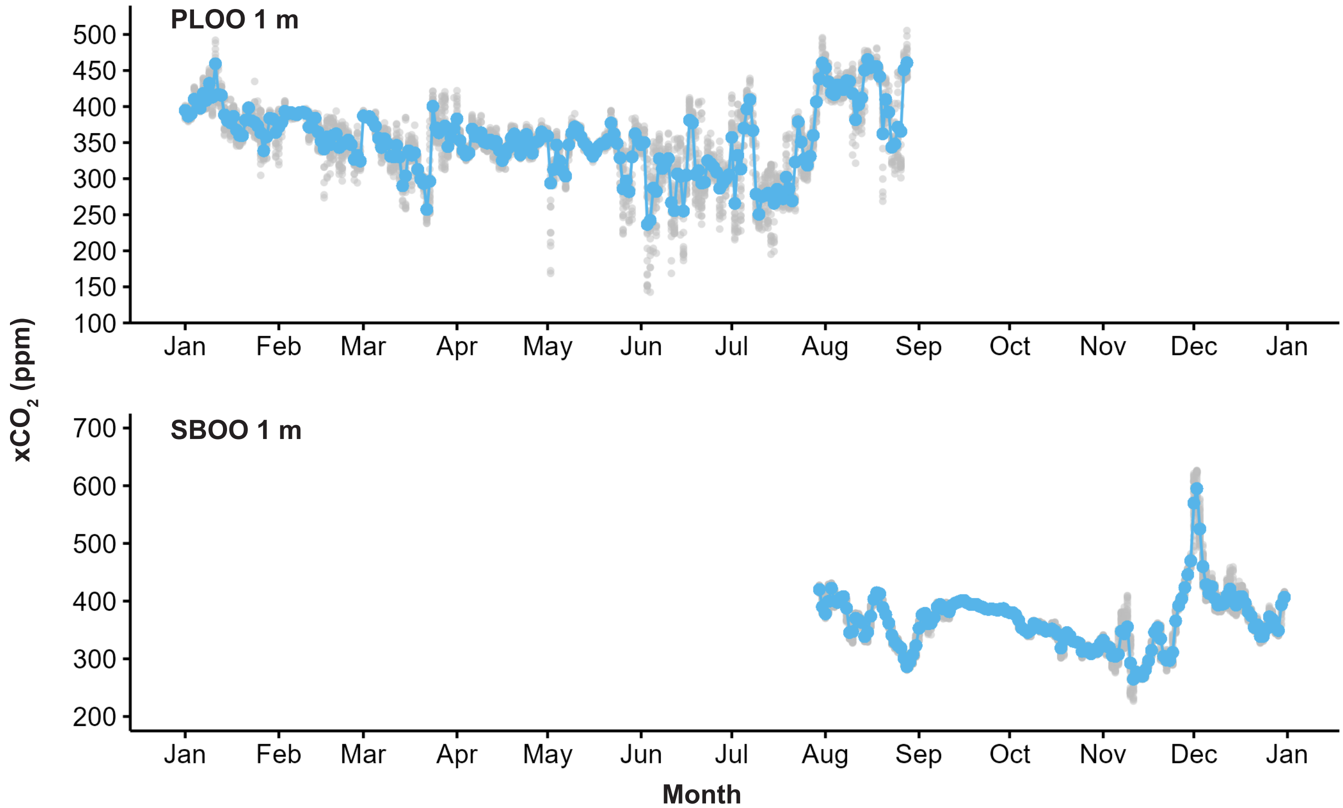

Appendix A.12 *continued*

Appendix A.13

Water quality objectives for water-contact areas, California Ocean Plan (SWRCB 2015).

A. Bacterial Characteristics – Water Contact Standards; CFU = colony forming units

(a) 30-day Geometric Mean - The following standards are based on the geometric mean of the five most recent samples from each site:

1) Total coliform density shall not exceed 1000 CFU/100 mL
2) Fecal coliform density shall not exceed 200 CFU/100 mL
3) *Enterococcus* density shall not exceed 35 CFU/100 mL

(b) Single Sample Maxium:

1) Total coliform density shall not exceed 10,000 CFU/100 mL
2) Fecal coliform density shall not exceed 400 CFU/100 mL
3) *Enterococcus* density shall not exceed 104 CFU/100 mL
4) Total coliform density shall not exceed 1000 CFU/100 mL when the fecal coliform:total coliform ratio exceeds 0.1

B. Physical Characteristics

(a) Floating particulates and oil and grease shall not be visible
(b) The discharge of waste shall not cause aesthetically undesirable discoloration of the ocean surface
(c) Natural light shall not be significantly reduced at any point outside of the initial dilution zone as the result of the discharge of waste

C. Chemical Characteristics

(a) The dissolved oxygen concentration shall not at any time be depressed more than 10 percent from what occurs naturally, as a result of the discharge of oxygen demanding waste materials
(b) The pH shall not be changed at any time more than 0.2 units from that which occurs naturally

Appendix A.14

Compliance rates for the three geometric mean water-contact standards and for the four single sample maximum water contact standards for PLOO monitoring stations sampled during 2024. PLOO offshore stations are sampled quarterly, and total and fecal coliform bacteria are not analyzed at these stations; ns = not sampled.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Geometric Mean												
Shore Stations												
Total	100	100	100	100	100	100	100	100	100	100	100	100
Fecal	100	100	100	100	100	100	100	100	100	100	100	100
Entero	95	84	100	100	100	100	95	100	100	100	100	100
Kelp Stations												
Total	100	100	100	100	100	100	100	100	100	100	100	100
Fecal	100	100	100	100	100	100	100	100	100	100	100	100
Entero	100	100	100	100	100	100	100	100	100	100	100	100
Single Sample Maximum												
Shore Stations												
Total	100	100	100	100	100	100	100	100	100	100	100	100
Fecal	98	100	100	100	100	100	98	100	100	100	100	100
Entero	88	97	100	100	100	100	95	100	100	98	100	97
F:T	95	97	100	100	100	100	100	100	100	100	100	100
Kelp Stations												
Total	100	100	100	100	100	100	100	100	100	100	100	100
Fecal	100	100	100	100	100	100	100	100	100	100	100	100
Entero	100	100	100	100	100	100	100	100	100	100	100	100
F:T	100	100	100	100	100	100	100	100	100	100	100	100
Offshore Stations												
Entero	ns	96	ns	ns	90	ns	ns	96	ns	ns	93	ns

Appendix B

Benthic Conditions

2024 Supplemental Analyses

Appendix B.1

Particle size classification schemes (based on Folk 1980) used in the analysis of sediments during 2024. Included is a subset of the Wentworth scale presented as "phi" categories with corresponding Horiba channels, sieve sizes, and size fractions.

Wentworth Scale

	Horiba [a]				
Phi size	Min µm	Max µm	Sieve Size	Sub-Fraction	Fraction
-1	—	—	SIEVE_2000	Granules	Coarse Particles
0	1000	2000	SIEVE_1000	Very coarse sand	Coarse Particles
1	500	1000	SIEVE_500	Coarse sand	Med-Coarse Sands
2	250	500	SIEVE_250	Medium sand	Med-Coarse Sands
3	125	250	SIEVE_125	Fine sand	Fine Sands
3.5	88	125	SIEVE_75	Very fine sand	Fine Sands
4	62.5	88	SIEVE_63	Very fine sand	Fine Sands
5	31	62.5	SIEVE_0 [b]	Coarse silt	Fine Particles [c]
6	15.6	31	—	Medium silt	Fine Particles [c]
7	7.8	15.6	—	Fine silt	Fine Particles [c]
8	3.9	7.8	—	Very fine silt	Fine Particles [c]
9	≤	3.9	—	Clay	Fine Particles [c]

[a] Values correspond to Horiba channels; particles >2000 µm measured by sieve
[b] SIEVE_0 = sum of all silt and clay, which cannot be distinguished for samples processed by nested sieves
[c] Fine particles also referred to as percent fines

Appendix B.2

Summary of visual observations for each PLOO and SBOO station sampled during 2024. Visual observations are from sieved "grunge" (i.e., particles retained on 1-mm mesh screen and preserved with infauna for benthic community analysis).

		Winter 2024	Summer 2024
PLOO			
88-m Stations	B11	shell hash, coarse sand, gravel	pea gravel, shell hash
	B8	organic debris, coarse sand	—
	E19	shell hash, coarse sand	—
	E7	—	—
	E1	shell hash	cobble, shell has
98-m Stations	B12	shell hash, coarse sand	pea gravel, shell hash
	B9	—	—
	E26	—	—
	E25	organic debris, shell hash	shell hash
	E23	shell hash	coarse sand, shell hash
	E20	shell hash	—
	E17 [a]	—	—
	E14 [a]	coarse black sand, shell hash	organic debris, coarse black sand
	E11 [a]	—	—
	E8	—	—
	E5	—	—
	E2	shell hash, coarse sand	cobble, shell has
116-m Stations	B10	shell hash, coarse sand	shell hash
	E21	—	—
	E15 [a]	coarse sand	—
	E9	coarse black sand	coarse black sand
	E3	shell hash, coarse sand	shell hash

[a] Near-ZID station

Appendix B.2 *continued*

		Winter 2024	Summer 2024
SBOO			
19-m Stations	I35	—	—
	I34	shell hash, coarse sand	—
	I31	—	coarse black sand, organic debris
	I23	coarse sand, large shell hash	coarse sand, shell hash
	I18	coarse sand	—
	I10	—	—
	I4	shell hash, gravel	—
28-m Stations	I33	organic debris, coarse sand	—
	I30	—	—
	I27	—	—
	I22	—	—
	I14 [a]	—	—
	I16 [a]	—	—
	I15 [a]	organic debris, shell hash	—
	I12 [a]	—	shell hash
	I9	organic debris, shell hash	—
	I6	shell hash	—
	I2	—	—
	I3	shell hash, coarse sand	—
38-m Stations	I29	—	—
	I21	—	relict red sand, shell hash
	I13	—	—
	I8	—	—
55-m Stations	I28	coarse black sand, shell hash	coarse black sand, organic debris
	I20	red relict sand	—
	I7	fine red relict sand, shell hash	relict red sand
	I1	—	—

[a] Near-ZID station

Appendix B.3

Summary of visual observations for each regional station sampled during 2024. Visual observations are from sieved "grunge" (i.e., particles retained on 1-mm mesh screen and preserved with infauna for benthic community analysis).

	Summer 2024		
Strata	Station	Depth (m)	Vis Obs
Inner Shelf	9420	4	—
	9441	12	very coarse sand
	9412	14	—
	9427	16	—
	9413	19	—
	9408	20	—
	9429	20	—
	9442	26	—
Mid Shelf	9402	31	—
	9404	32	—
	9401	43	—
	9407	44	—
	9446	45	—
	9414	47	—
	9403	48	red relict sand
	9428	51	—
	9426	62	—
	9405	68	—
	9425	68	coarse sand
	9417	79	—
	9436	80	—
	9422	91	—
	9431	93	—
	9423	94	coarse sand, organic debris
	9445	95	—
Outer Shelf	9434	126	cobble, shell hash
	9410	133	—
	9406	134	shell hash, coarse sand
	9415	141	—
	9424	168	—
	9438	172	—
	9411	193	cobble, shell hash, worm tubes
	9409	198	pea gravel
Upper Slope	9418	201	worm tubes
	9435	233	worm tubes
	9416	264	worm tubes
	9439	311	—
	9419	322	—
	9440	484	—
	9433	485	—
	9315	321	gravel; shell hash
	9332	422	—
	9325	453	—

Appendix B.4

Constituents and method detection limits (MDL) used for the analysis of sediments during 2024. MDLs are summarized as minimum, and maximum values over the two years, abbreviations are in parentheses.

Parameter	MDL Min	MDL Max	Parameter	MDL Min	MDL Max
Organic Indicators					
Biochemical Oxygen Demand (ppm)	2	2	Total Sulfides (ppm)	2.2	2.2
Total Nitrogen (TN; % wt.)	0.005	0.005	Total Volitile Solids (TVS; % wt.)	0.1	0.1
Total Organic Carbon (TOC; % wt.)	0.119	0.119			
Metals (ppm)					
Aluminum (Al)	0.551	0.551	Lead (Pb)	0.101	0.101
Antimony (Sb)	0.167	0.167	Manganese (Mn)	0.021	0.021
Arsenic (As)	0.151	0.151	Mercury (Hg)	0.004	0.004
Barium (Ba)	0.077	0.077	Nickel (Ni)	0.094	0.094
Beryllium (Be)	0.002	0.002	Selenium (Se)	0.213	0.213
Cadmium (Cd)	0.014	0.014	Silver (Ag)	0.032	0.032
Chromium (Cr)	0.029	0.029	Tin (Sn)	0.054	0.054
Copper (Cu)	0.047	0.047	Zinc (Zn)	0.19	0.19
Iron (Fe)	1.97	1.97			
Chlorinated Pesticides (ppt)					
Chlordanes					
Alpha (cis) Chlordane [A(c)C]	97.8	180	Heptachlor Epoxide (HeptEpox)	83.3	154
Cis Nonachlor (cNon)	64.2	118	Methoxychlor (Methoxy)	527	988
Gamma (trans) Chlordane [G(t)C]	76.3	141	Oxychlordane (Oxychlor)	55.8	103
Heptachlor (Hept)	93	172	Trans Nonachlor (tNon)	80.3	149
Dichlorodiphenyltrichloroethane (DDT)					
o,p–DDD	51.8	95.7	p,p–DDE	63.4	117
o,p–DDE	68.6	127	p,p–DDMU	64.6	120
o,p–DDT	53.7	99.3	p,p–DDT	68.8	255
p,p–DDD	67.6	125			
Endrin					
Endrin	106	195	Endrin aldehyde (EndAld)	444	821
Endosulfan					
Alpha-Endosulfan	57.1	105	Endosulfan Sulfate	106	195
Beta-Endosulfan	75.4	139			
Hexachlorocyclohexane (HCH)					
HCH, Alpha isomer	55.2	102	HCH, Delta isomer	66.7	123
HCH, Beta isomer	65.9	122	HCH, Gamma isomer	63.9	118
Miscellaneous Pesticides					
Aldrin	82	152	Hexachlorobenzene (HCB)	105	304
Dieldrin	113	208	Mirex	64.7	120

Appendix B.4 *continued*

Parameter	MDL Min	MDL Max	Parameter	MDL Min	MDL Max
Polychlorinated Biphenyl Congeners (PCBs) (ppt)					
PCB 8	74.7	138	PCB 126	103	190
PCB 18	63.7	118	PCB 128	81.5	151
PCB 28	59.7	110	PCB 138	61.3	113
PCB 37	70.4	130	PCB 149	69.3	128
PCB 44	64.5	119	PCB 151	59.3	110
PCB 49	64.5	119	PCB 153/168	172	318
PCB 52	68.2	126	PCB 156	86.7	160
PCB 66	53.8	99.6	PCB 157	70.6	131
PCB 70	58.4	108	PCB 158	70.6	131
PCB 74	58.7	108	PCB 167	74	137
PCB 77	66.5	123	PCB 169	62.4	115
PCB 81	49.5	91.5	PCB 170	59.2	110
PCB 87	61.8	114	PCB 177	59.7	110
PCB 99	59	109	PCB 180	59.5	110
PCB 101	50.7	93.8	PCB 183	62.1	115
PCB 105	87.8	162	PCB 187	61.6	114
PCB 110	62.9	116	PCB 189	115	212
PCB 114	62.8	116	PCB 194	66.3	123
PCB 118	53.8	99.6	PCB 195	63.8	118
PCB 119	64.7	120	PCB 201	60.5	112
PCB 123	55.6	103	PCB 206	86.8	160
Polycyclic Aromatic Hydrocarbons (PAHs) (ppb)					
1-methylnaphthalene	5.23	9.13	Benzo[G,H,I]perylene	4.4	7.67
1-methylphenanthrene	4.7	8.2	Benzo[K]fluoranthene	6.14	10.7
2-methylnaphthalene	4.25	7.41	Biphenyl	7.18	12.5
2,3,5-trimethylnaphthalene	10.5	18.3	Chrysene	3.77	6.58
2,6-dimethylnaphthalene	3.86	6.73	Dibenzo(A,H)anthracene	3.43	5.99
3,4-benzo(B)fluoranthene	3.23	5.63	Fluoranthene	6.16	10.8
Acenaphthene	4.08	7.12	Fluorene	3.67	6.4
Acenaphthylene	4.7	8.2	Indeno(1,2,3-CD)pyrene	3.67	6.41
Anthracene	3.99	6.97	Naphthalene	3.97	6.94
Benzo[A]anthracene	2.06	9.64	Perylene	10.2	17.8
Benzo[A]pyrene	4.17	7.27	Phenanthrene	3.4	5.93
Benzo[e]pyrene	3.08	5.37	Pyrene	3.45	10.8

Appendix B.4 *continued*

Parameter	MDL Min	MDL Max	Parameter	MDL Min	MDL Max
Polybrominated Diphenyl Ethers (PBDEs) (ppt)					
BDE-17	19.4	36.9	BDE-100	24.5	46.7
BDE-28	27.2	51.8	BDE-138	39.5	75.4
BDE-47	78.6	150	BDE-153	24.7	47.1
BDE-49	13.8	26.3	BDE-154	22.9	43.7
BDE-66	15.5	29.5	BDE-183	33.5	63.9
BDE-85	60.8	116	BDE-190	52.8	101
BDE-99	118	225			

Appendix B.5

Concentrations of organic loading indicators detected in sediments from PLOO stations sampled during winter and summer 2024. See Appendix B.4 for MDLs; BOD = Biochemical Oxygen Demand; TN = total nitrogen; TOC = total organic carbon; TVS = total volatile solids; ND = not detected.

	Winter					Summer				
2024	BOD[b] (ppm)	Sulfides (ppm)	TN (% wt)	TOC (% wt)	TVS (% wt)	BOD (ppm)	Sulfides (ppm)	TN (% wt)	TOC (% wt)	TVS (% wt)
88-m Depth Contour										
B11	—	20.2	0.09	2.08	3.2	—	11.1	0.084	1.69	4.1
B8	—	15.6	0.07	0.756	2.6	—	5.12	0.079	0.725	2.8
E19	—	7.83	0.063	0.561	2.3	—	ND	0.065	0.591	2.3
E7	—	15.9	0.062	0.542	2	—	2.83	0.08	1.01	2.1
E1	—	2.52	0.038	0.379	1.8	—	ND	0.039	0.273	2.1
98-m Depth Contour										
B12	309	18.1	0.046	1.66	2.7	265	9.51	0.082	2.84	2.7
B9	266	20.5	0.054	0.616	2.4	288	ND	0.071	0.774	2.6
E26	282	5.48	0.034	0.321	1.9	307	2.5	0.063	0.499	2.2
E25	263	9.58	0.036	0.347	1.8	280	13	0.065	0.582	2
E23	243	4.3	ND	0.278	2	373	ND	0.044	0.345	2
E20	217	6.76	0.033	0.352	1.8	252	13.7	0.047	0.378	1.9
E17[a]	243	18.9	0.029	0.318	1.6	333	23.4	0.049	0.365	1.85
E14[a]	327	18.7	ND	0.135	1.5	379	51.6	0.054	0.418	1.8
E11[a]	301	12.1	0.028	0.329	1.8	300	5.14	0.052	0.441	1.8
E8	206	18.6	0.034	0.351	2.3	278	10.4	0.054	0.47	2
E5	208	3.82	0.037	0.413	2.3	375	14.5	0.063	0.536	2.3
E2	198	ND	0.043	0.537	2.3	230	ND	0.058	0.628	2.5
116-m Depth Contour										
B10	—	26.1	0.062	0.834	2.2	—	ND	0.061	1.01	2.9
E21	—	3.37	0.054	0.469	1.8	—	12.2	0.054	0.484	1.9
E15[a]	—	7	0.058	0.52	1.8	—	12.6	0.05	0.456	1.9
E9	—	2.32	0.068	1.11	2.2	—	ND	0.056	1.11	2.2
E3	—	ND	0.053	0.472	1.5	—	7.28	ND	0.56	2
Detection Rate (%)	100	91	91	100	100	100	68	95	100	100

[a] Near-ZID station

[b] BOD only sampled at PLOO primary core stations

Appendix B.6

Concentrations of organic indicators detected in sediments from SBOO stations sampled during winter and summer 2024. See Appendix B.4 for MDLs; TN = total nitrogen; TOC = total organic carbon; TVS = total volatile solids; ND = not detected.

2024	Winter				Summer			
	Sulfides (ppm)	TN (% wt)	TOC (% wt)	TVS (% wt)	Sulfides (ppm)	TN (% wt)	TOC (% wt)	TVS (% wt)
19-m Stations								
I35	15.1	0.031	0.236	1	15.6	0.038	0.226	1.3
I34	ND	ND	0.648	1.1	ND	ND	ND	0.6
I31	ND	ND	ND	0.5	5.1	0.026	ND	0.8
I23	ND	0.037	1.66	1	2.35	0.051	2.13	1.4
I18	4.64	ND	ND	0.7	ND	0.03	0.122	0.8
I10	2.48	ND	ND	0.7	ND	0.023	ND	0.8
I4	ND	ND	ND	0.3	3.91	ND	ND	1
28-m Stations								
I33	7.6	ND	0.139	1.3	7.34	0.034	0.2	1.4
I30	ND	0.034	ND	1	ND	0.034	0.179	1.3
I27	6.27	0.033	ND	0.9	ND	ND	ND	1.3
I22	10	0.035	ND	0.7	ND	0.031	0.155	0.9
I14 [a]	ND	ND	ND	0.9	ND	0.033	0.163	0.9
I16 [a]	ND	0.03	ND	0.7	ND	ND	0.119	0.6
I15	ND	0.033	0.156	0.9	ND	0.038	0.227	0.6
I12 [a]	9.08	ND	ND	0.4	ND	0.04	0.23	0.6
I9	5.65	ND	0.165	1.1	ND	ND	ND	1.3
I6	2.92	ND	ND	0.4	ND	ND	ND	0.6
I2	ND	ND	ND	0.4	ND	ND	ND	0.5
I3	ND	ND	ND	0.4	ND	ND	ND	0.5
38-m Stations								
I29	ND	0.053	0.327	1.8	2.39	0.035	0.416	1.4
I21	ND	ND	ND	0.6	ND	ND	ND	0.7
I13	ND	ND	ND	0.4	ND	0.03	0.208	0.7
I8	ND	ND	0.123	0.4	ND	ND	ND	0.5
55-m Stations								
I28	15.1	0.051	0.649	1.3	ND	0.036	0.302	1.4
I20	ND	ND	ND	0.5	ND	ND	ND	0.7
I7	ND	0.029	0.153	0.35	ND	ND	ND	0.5
I1	ND	0.03	0.161	0.9	13.4	0.033	0.21	1.2
Detection Rate (%)	37	41	41	100	26	56	52	100

[a] Near-ZID station

Appendix B.7

Concentrations of organic indicators detected in sediments from the San Diego regional benthic stations sampled during summer 2024. See Appendix B.4 for MDLs; TN = total nitrogen; TOC = total organic carbon; TVS = total volatile solids; DR = detection rate; ND = not detected.

	Station	Depth (m)	Sulfides (ppm)	TN (% wt)	TOC (% wt)	TVS (% wt)
Inner Shelf	9420	4	ND	0.035	0.325	0.7
	9441	12	23.3	0.038	0.207	1.5
	9412	14	14.6	0.033	0.228	0.9
	9427	16	17.1	0.028	ND	1.2
	9413	19	7.52	0.035	0.269	1.3
	9408	20	ND	0.033	0.239	0.75
	9429	20	8.33	0.031	0.12	1.1
	9442	26	8.27	0.04	0.25	1.2
Mid Shelf	9402	31	ND	0.033	0.164	1
	9404	32	ND	0.032	ND	0.5
	9401	43	ND	0.028	ND	0.6
	9407	44	2.7	0.039	0.332	1.2
	9446	45	30.1	0.061	0.433	2.2
	9414	47	10.3	0.05	0.416	2.2
	9403	48	ND	0.029	0.176	0.5
	9428	51	47.5	0.073	0.557	2.8
	9426	62	27.8	0.072	0.59	3
	9405	68	ND	0.039	0.282	1.2
	9425	68	8.46	0.076	0.63	3.2
	9417	79	2.51	0.082	0.778	3.2
	9436	80	16.2	0.069	0.655	2.7
	9422	91	32.8	0.059	0.534	2.2
	9431	93	12.7	0.074	0.663	2.8
	9423	94	7.13	0.064	0.493	2.1
	9445	95	5.21	0.073	0.627	2.85
Outer Shelf	9434	126	10.5	0.076	1.63	2.2
	9410	133	ND	0.061	0.893	3.1
	9406	134	ND	0.067	0.853	3.3
	9415	141	ND	0.064	0.797	2.9
	9424	168	18.6	0.081	0.914	2.9
	9438	172	11.8	0.065	0.646	2.7
	9411	193	6.09	0.149	2.04	6.6
	9409	198	ND	0.09	3.17	3.1
Upper Slope	9418	201	5.79	0.125	1.73	6.3
	9435	233	7.28	0.095	1.2	4
	9416	264	9.05	0.179	2.64	7.4
	9439	311	121	0.16	1.72	6.4
	9419	322	31.5	0.191	2.65	8.4
	9440	484	27.1	0.219	2.5	8.1
	9433	485	31.6	0.28	3.35	9.5
	DR (%)		72	100	92.5	100

Appendix B.8

Concentrations of trace metals (ppm) detected in sediments from PLOO stations sampled during winter and summer 2024. See Appendix B.4 for MDLs and translation of periodic table symbols; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Winter 2024	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Sn	Zn
88-m Depth Contour																	
B11	9360	0.655 DNQ	3.28	33.5	0.255	0.068 DNQ	20.5	7.74	15700	3.78	113	0.038	7.41	0.571 DNQ	ND	0.864	33.4
B8	10900	0.409 DNQ	2.92	44.2	0.225	0.07 DNQ	19.9	9.06	13300	4.05	113	0.048	8.82	0.621 DNQ	ND	1.02	32.2
E19	9160	0.295 DNQ	3.11	37.1	0.18	0.078 DNQ	16.7	7.63	11200	3.31	96.6	0.034	7.29	0.498 DNQ	ND	0.856	26.7
E7	7950	0.237 DNQ	2.65	32.8	0.16	0.063 DNQ	14.7	7.08	9830	3.2	86	0.033	6.45	0.373 DNQ	ND	0.818	23.7
E1	7120	0.311 DNQ	2.31	30.4	0.145	0.051 DNQ	14.5	6.99	9090	3.71	77.7	0.044	5.69	0.429 DNQ	ND	0.812	22.4
98-m Depth Contour																	
B12	6230	1.23	5.94	17.4	0.313	0.066 DNQ	24.4	4.23	21200	2.73	53.6	0.016	5.02	0.422 DNQ	ND	0.492 DNQ	34
B9	7880	0.558 DNQ	3.23	39	0.22	0.068 DNQ	17.9	5.98	12800	3.05	91.4	0.027	6.6	0.39 DNQ	ND	0.743	28.9
E26	7730	0.495 DNQ	2.79	28	0.173	0.083 DNQ	14.4	6.03	9750	2.97	86.2	0.062	6.3	0.469 DNQ	ND	0.733	23.4
E25	7240	0.494 DNQ	2.57	26.3	0.164	0.082 DNQ	13.7	5.83	9350	2.84	81.1	0.041	5.79	0.309 DNQ	ND	0.704	22.5
E23	7340	0.356 DNQ	2.62	28.7	0.165	0.086 DNQ	14.2	6.11	9520	2.81	82.2	0.03	6.13	0.266 DNQ	ND	0.743	22.9
E20	6890	0.443 DNQ	2.56	26.3	0.156	0.095	13.3	5.74	8890	2.75	77.2	0.023	5.64	0.35 DNQ	ND	0.697	21.6
E17 [a]	6310	0.439 DNQ	2.53	22.3	0.143	0.105	12.5	5.4	8300	2.38	71.7	0.021	5.16	0.379 DNQ	ND	0.684	20.3
E14 [a]	4760	0.474 DNQ	2.72	15.9	0.123	0.11	10.4	4.79	6940	1.92	63.7	0.018	4.41	0.379 DNQ	ND	0.592	17.2
E11 [a]	5810	0.427 DNQ	2.58	20.1	0.141	0.09 DNQ	11.6	4.84	7880	2.1	66.3	0.02	4.67	0.293 DNQ	ND	0.607	18.7
E8	6780	0.291 DNQ	2.68	25.5	0.158	0.074 DNQ	12.6	5.64	9380	2.17	76.4	0.019	5.19	0.226 DNQ	ND	0.604	21.8
E5	6960	0.541 DNQ	2.66	28.1	0.16	0.07 DNQ	13.2	9.67	9600	2.5	78.1	0.025	5.52	0.255 DNQ	ND	0.673	23.2
E2	8270	0.474 DNQ	2.37	35.7	0.181	0.062 DNQ	14.5	7.32	11100	2.94	88.5	0.038	5.92	0.352 DNQ	ND	0.718	26.4
116-m Depth Contour																	
B10	6140	0.447 DNQ	2.09	21.2	0.17	0.071 DNQ	15	4.98	9910	2.55	65.8	0.026	4.88	0.418 DNQ	ND	0.573	22.3
E21	6380	0.229 DNQ	2.45	23.8	0.137	0.069 DNQ	12.7	5.47	8350	2.61	69.8	0.023	5.42	0.292 DNQ	ND	0.62	19.6
E15 [a]	5210	ND	2.19	18	0.125	0.066 DNQ	11.6	4.45	7430	2.19	56.3	0.02	4.43	0.329 DNQ	ND	0.514	17.2
E9	6300	0.633 DNQ	3.42	21.9	0.174	0.081 DNQ	15.6	7.46	10400	3.04	64.7	0.021	5.21	0.397 DNQ	ND	0.628	30.1
E3	6700	0.941 DNQ	2.01	37.6	0.115	0.047 DNQ	11.4	14.2	9200	5.8	74.8	0.076	4.04	0.256 DNQ	ND	0.794	30.8
DR (%)	100	95	100	100	100	100	100	100	100	100	100	100	100	100	0	100	100

[a] Near-ZID station

Appendix B.8 *continued*

Summer 2024	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Sn	Zn
88-m Depth Contour																	
B11	8840	1.06	3.96	28.7	0.268	0.097	20.7	7.11	17000	3.76	101	0.029	6.83	0.527 DNQ	ND	0.783	35.4
B8	10300	0.803 DNQ	3.45	42.3	0.22	0.1	19.4	8.91	13200	4.28	108	0.035	8.47	0.43 DNQ	ND	0.976	32.6
E19	5180	0.267 DNQ	1.71	21.4	0.099	0.046 DNQ	9.14	4.14	6440	1.92	57	0.033	4.01	ND	ND	0.517	15.7
E7	8280	0.459 DNQ	2.69	35	0.167	0.084 DNQ	15.2	7.39	9940	3.3	88.9	0.031	6.63	0.361 DNQ	ND	0.861	24.9
E1	7890	0.602 DNQ	3.01	38	0.162	0.05 DNQ	14.2	7.94	10200	4.03	80.6	0.058	5.61	0.384 DNQ	ND	0.869	24.2
98-m Depth Contour																	
B12	3370	0.524 DNQ	3.08	9.72	0.153	0.046 DNQ	12.9	2.26	10700	1.55	31	0.017	2.9	0.303 DNQ	ND	0.224 DNQ	17.4
B9	4370	0.278 DNQ	1.8	23.2	0.114	0.021 DNQ	9.83	3.26	7380	1.72	51.3	0.033	3.52	0.213 DNQ	ND	0.388 DNQ	16.2
E26	8420	0.3 DNQ	2.95	30.7	0.169	0.08 DNQ	15	6.32	10300	2.98	91	0.028	6.43	0.335 DNQ	ND	0.786	24.3
E25	7570	0.184 DNQ	2.57	26	0.153	0.084 DNQ	13.3	5.28	9240	2.25	85.7	0.018	5.68	ND	ND	0.639	21.7
E23	8100	0.242 DNQ	2.96	28.8	0.156	0.085 DNQ	14.1	5.87	9730	2.57	86.3	0.022	6.02	0.353 DNQ	ND	0.723	23
E20	3780	ND	1.2	14.7	0.077	0.037 DNQ	7.01	2.97	4810	1.45	44.3	0.023	3.06	ND	ND	0.372 DNQ	11.7
E17 [a]	6270	0.483 DNQ	2.9	22.7	0.13	0.076 DNQ	12.4	5.14	8120	2.58	70.5	0.021	4.95	0.229 DNQ	ND	0.647	20.7
E14 [a]	2720	ND	1.11	11	0.061	0.075 DNQ	5.95	3.18	3850	1.34	33	0.015	2.45	ND	ND	0.334 DNQ	10.6
E11 [a]	5790	0.398 DNQ	2.82	19.8	0.128	0.074 DNQ	11.3	4.63	7550	2.16	67.1	0.02	4.52	ND	ND	0.554	19.1
E8	6390	0.5 DNQ	2.31	23.6	0.146	0.053 DNQ	13	5.07	8450	2.51	72.8	0.02	4.89	ND	ND	0.622	21.8
E5	7850	0.474 DNQ	3.22	28.1	0.161	0.073 DNQ	14.1	6.45	10000	2.81	81.8	0.026	5.76	0.283 DNQ	ND	0.9	23.5
E2	8990	0.599 DNQ	2.76	39.3	0.179	0.062 DNQ	15.7	8.45	11600	3.29	98.6	0.034	6.27	0.333 DNQ	ND	0.808	29.3
116-m Depth Contour																	
B10	6070	0.587 DNQ	2.68	20.6	0.183	0.096	15.2	4.54	10600	2.51	62.4	0.018	4.48	0.239 DNQ	ND	0.508	23.6
E21	3690	ND	1.21	13.4	0.078	0.047 DNQ	7.04	3.09	4730	1.37	42.5	0.023	3.07	ND	ND	0.313 DNQ	11.6
E15 [a]	3690	ND	1.17	11.9	0.079	0.052 DNQ	7.06	3.14	4640	1.31	42.1	0.021	2.88	ND	ND	0.386 DNQ	11.5
E9	5870	0.559 DNQ	3.15	20.6	0.159	0.061 DNQ	15.1	7.08	10100	2.54	58.8	0.011	4.78	ND	ND	0.562	22.5
E3	7770	0.533 DNQ	2.03	38.9	0.134	0.058 DNQ	12.4	9.3	10500	4.39	89.4	0.044	4.44	0.237 DNQ	ND	1.01	30.2
DR (%)	100	82	100	100	100	100	100	100	100	100	100	100	100	59	0	100	100

[a] Near-ZID station

Appendix B.9

Concentrations of trace metals (ppm) detected in sediments from SBOO stations sampled during winter and summer 2024. See Appendix B.4 for MDLs and translation of periodic table symbols; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Winter 2024	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Sn	Zn
19-m Stations																	
I35	6000	0.242 DNQ	2.36	29.9	0.108	0.065 DNQ	10.6	3.79	7310	2.24	80.9	0.017	3.4	ND	ND	0.571	18.9
I34	1280	0.29 DNQ	2.4	5.08	0.028 DNQ	0.045 DNQ	2.35	1.13	2650	1.3	43.2	0.004 DNQ	0.581	ND	ND	0.103 DNQ	4.6
I31	3280	0.192 DNQ	1.48	14.1	0.059	0.032 DNQ	6.98	1.55	3740	1.04	51.9	ND	1.61	ND	ND	0.331 DNQ	8.03
I23	1180	ND	3.01	4.9	0.057	0.035 DNQ	3.91	0.704	3220	1.56	21	ND	0.638	0.434 DNQ	ND	0.071 DNQ	5.44
I18	4200	0.333 DNQ	1.44	35.7	0.063	0.026 DNQ	10.9	2.09	6180	1.28	72.3	ND	2.09	ND	ND	0.341 DNQ	11.1
I10	4740	0.336 DNQ	1.36	23.4	0.084	0.025 DNQ	9.42	2.26	5660	1.13	65.4	ND	2.32	ND	ND	0.322 DNQ	12.1
I4	712	ND	1.3	1.65	0.024 DNQ	ND	3.51	0.404 DNQ	1550	0.847	15.7	ND	0.463 DNQ	ND	ND	0.085 DNQ	2.42
28-m Stations																	
I33	4250	0.325 DNQ	1.86	17.6	0.08	0.036 DNQ	7.61	2.77	5510	2.06	63.1	0.019	2.3	ND	ND	0.477 DNQ	13.5
I30	5490	0.316 DNQ	1.51	24.1	0.093	0.052 DNQ	9.82	2.97	5640	1.39	58.2	0.006 DNQ	3.01	ND	ND	0.411 DNQ	14.3
I27	5860	ND	1.57	26	0.091	0.043 DNQ	9.66	2.95	5970	1.29	63.4	0.006 DNQ	3	0.282 DNQ	ND	0.346 DNQ	14.6
I22	4840	ND	1.31	23.5	0.079	0.04 DNQ	9.09	2.38	5080	1.2	61.4	0.005 DNQ	2.72	0.269 DNQ	ND	0.319 DNQ	12
I14 [a]	5650	ND	1.4	26.8	0.087	0.025 DNQ	9.43	2.64	5630	1.08	66.1	0.004 DNQ	2.86	0.345 DNQ	ND	0.395 DNQ	13.5
I16 [a]	4460	ND	1.34	21.7	0.076	0.025 DNQ	8.03	2.63	5030	1.03	58.8	0.005 DNQ	2.22	0.245 DNQ	ND	0.306 DNQ	11.9
I15	4590	ND	1.61	20	0.083	0.03 DNQ	10.3	2.3	5650	5.5	57.8	0.005 DNQ	2.74	0.254 DNQ	ND	0.311 DNQ	13.7
I12 [a]	2050	0.245 DNQ	1.56	8.68	0.053	0.019 DNQ	5.34	0.807	3250	0.974	24.1	ND	1.08	ND	ND	0.134 DNQ	7
I9	7250	0.436 DNQ	1.67	37.7	0.123	0.045 DNQ	11.8	3.95	7520	1.19	78.7	0.007 DNQ	4.17	ND	ND	0.419 DNQ	19.3
I6	1060	0.43 DNQ	4.81	2.56	0.041 DNQ	0.03 DNQ	7.74	0.459 DNQ	3880	1.34	12.8	ND	0.607	ND	ND	0.073 DNQ	3.65
I2	1190	ND	0.752 DNQ	2.12	0.026 DNQ	0.031 DNQ	5.43	0.374 DNQ	1270	0.688	10.6	ND	0.698	ND	ND	0.081 DNQ	2.41
I3	739	0.191 DNQ	0.936 DNQ	1.26	0.023 DNQ	0.02 DNQ	5.09	0.276 DNQ	1200	0.704	7.87	ND	0.548	ND	ND	ND	1.67
38-m Stations																	
I29	7180	0.37 DNQ	1.96	33.8	0.134	0.07 DNQ	13.1	5.27	7980	2.44	77	0.021	5.08	0.239 DNQ	ND	0.667	20.2
I21	1120	0.403 DNQ	9.21	1.96	0.061	0.023 DNQ	10.6	0.417 DNQ	7860	2.91	15.3	ND	0.78	0.283 DNQ	ND	0.132 DNQ	5.79
I13	1010	0.258 DNQ	5.82	1.82	0.042 DNQ	0.021 DNQ	8.89	0.381 DNQ	5080	2.11	14	ND	0.793	ND	ND	0.087 DNQ	4.48
I8	1790	0.252 DNQ	2.23	4.38	0.059	0.021 DNQ	8.79	0.578	4010	1.09	21.6	ND	1.05	0.232 DNQ	ND	0.142 DNQ	7.14
55-m Stations																	
I28	5540	ND	2.33	17.8	0.107	0.046 DNQ	8.98	3.86	6250	1.91	52.3	0.009 DNQ	4.28	0.377 DNQ	ND	0.462 DNQ	13.7
I20	1110	0.191 DNQ	3.33	1.97	0.052	ND	5.12	0.335 DNQ	4900	1.42	13.6	ND	0.632	0.35 DNQ	ND	ND	5.07
I7	1070	0.427 DNQ	5.54	1.8	0.055	0.035 DNQ	8.48	0.405 DNQ	5930	1.9	13.8	ND	0.668	ND	ND	0.099 DNQ	4.72
I1	2740	0.932 DNQ	1.27	8.02	0.066	0.077 DNQ	6.97	1.45	3730	1.32	41.2	0.007 DNQ	2.55	ND	ND	0.223 DNQ	7.61
DR (%)	100	67	100	100	100	93	100	100	100	100	100	48	100	41	0	93	100

[a] Near-ZID station

Appendix B.9 *continued*

Summer 2024	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Sn	Zn
19-m Stations																	
I35	6190	0.537 DNQ	2.22	29.3	0.108	0.102	11	3.95	7290	2.51	81	0.016	3.5	ND	ND	0.559	19.5
I34	1640	ND	1.56	7.34	0.033 DNQ	ND	3.72	0.924	3100	1.38	28.9	0.004 DNQ	0.981	ND	ND	0.162 DNQ	5.72
I31	3430	ND	1.32	13.3	0.057	0.028 DNQ	6.94	1.62	3550	1.14	48.6	ND	1.65	ND	ND	0.319 DNQ	8.12
I23	1220	0.241 DNQ	3.14	6.67	0.057	0.058 DNQ	3.9	1.08	2840	1.54	18	ND	0.914	ND	ND	0.134 DNQ	5.45
I18	4690	0.586 DNQ	1.54	29.5	0.079	0.019 DNQ	10	5.76	5990	1.19	65.1	ND	2.45	ND	ND	0.388 DNQ	13.4
I10	5030	0.292 DNQ	1.46	26.2	0.076	0.021 DNQ	9.4	2.5	5790	1.26	65	ND	2.48	ND	ND	0.375 DNQ	12.7
I4	3600	ND	1.26	20.1	0.062	0.017 DNQ	8.14	2.11	4410	1.07	51.6	ND	2.47	ND	ND	0.34 DNQ	9.39
28-m Stations																	
I33	4010	0.391 DNQ	1.74	18.6	0.077	0.033 DNQ	7.43	2.54	5310	2.2	66.7	0.022	2.13	ND	ND	0.463 DNQ	12.6
I30	6060	0.263 DNQ	1.48	27.2	0.097	0.045 DNQ	10.9	3.33	6030	1.62	63	0.006 DNQ	3.39	ND	ND	0.397 DNQ	16
I27	6290	0.462 DNQ	1.62	26.2	0.101	0.024 DNQ	10.3	3.04	5970	1.36	64.6	0.004 DNQ	3.17	ND	ND	0.448 DNQ	15.3
I22	4370	0.376 DNQ	1.44	21.2	0.078	0.044 DNQ	8.6	2.32	4720	1.37	53.8	0.006 DNQ	2.5	ND	ND	0.334 DNQ	11.1
I14 [a]	6040	0.44 DNQ	1.6	32	0.101	0.03 DNQ	10.5	3.42	6440	1.42	68.9	0.005 DNQ	3.45	0.219 DNQ	ND	0.444 DNQ	16.8
I16 [a]	2530	0.294 DNQ	1.48	9.94	0.058	0.022 DNQ	6.25	1.42	4020	1.84	36.4	ND	1.3	ND	ND	3.02	9.83
I15	2100	0.419 DNQ	2.4	7.12	0.062	ND	7.82	0.854	4300	1.53	24.2	ND	1.19	ND	ND	0.191 DNQ	8.46
I12 [a]	2740	0.304 DNQ	1.66	16.1	0.059	0.026 DNQ	6.24	1.4	4040	1.09	34	ND	1.45	ND	ND	0.216 DNQ	9.85
I9	7360	0.357 DNQ	1.71	37.3	0.112	0.037 DNQ	11.9	3.99	7470	1.25	78.5	0.005 DNQ	4.17	ND	ND	0.461 DNQ	19.4
I6	1200	0.343 DNQ	4.99	3.07	0.039 DNQ	0.024 DNQ	8.54	0.527	4100	1.64	12.7	ND	0.707	ND	ND	0.125 DNQ	4.16
I2	1080	0.292 DNQ	0.811 DNQ	1.97	0.022 DNQ	0.02 DNQ	5.25	0.413 DNQ	1250	0.819	10.4	ND	0.692	ND	ND	0.054 DNQ	2.47
I3	874	0.237 DNQ	0.888 DNQ	1.4	0.022 DNQ	ND	5.99	0.311 DNQ	1170	0.824	7.19	ND	0.597	ND	ND	0.075 DNQ	1.79
38-m Stations																	
I29	6710	0.506 DNQ	2.05	31.3	0.126	0.032 DNQ	12.3	4.35	7490	2.12	72.9	0.019	4.5	0.433 DNQ	ND	0.636	17.9
I21	1130	0.65 DNQ	10.3	2.09	0.063	0.032 DNQ	11	0.426 DNQ	8130	2.99	13.9	ND	0.818	ND	ND	0.169 DNQ	5.89
I13	1090	0.393 DNQ	5.84	2.26	0.048 DNQ	0.023 DNQ	10.3	0.425 DNQ	5490	2.03	14	ND	0.705	ND	ND	0.167 DNQ	4.67
I8	1490	0.268 DNQ	2.26	3.49	0.049 DNQ	0.016 DNQ	7.44	0.52	3520	1.05	17.4	ND	0.885	ND	ND	0.096 DNQ	5.71
55-m Stations																	
I28	5000	0.371 DNQ	2.24	21.2	0.11	0.041 DNQ	8.91	4.04	6080	2.98	50.8	0.017	4.47	0.357 DNQ	ND	0.535	14.4
I20	1740	0.348 DNQ	1.94	3.05	0.058	ND	5.79	0.645	4120	1.33	25.9	ND	1.01	0.229 DNQ	ND	0.236 DNQ	6.32
I7	1230	0.558 DNQ	6.72	2.4	0.051	0.027 DNQ	8.59	0.563	6500	2.23	15.4	ND	0.903	ND	ND	0.108 DNQ	5.07
I1	2990	0.242 DNQ	1.39	12.5	0.067	0.075 DNQ	7.41	1.86	4010	1.48	45.9	0.011	2.94	ND	ND	0.271 DNQ	8.41
DR (%)	100	89	100	100	100	85	100	100	100	100	100	41	100	15	0	100	100

[a] Near-ZID station

Appendix B.10

Concentrations of metals (ppm) detected in sediments from the San Diego regional benthic stations sampled during summer 2024. See Appendix B.4 for MDLs and translation of periodic table symbols; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

	Station	Depth (m)	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe
Inner Shelf	9420	4	2920	ND	1.27	15.7	0.048 DNQ	ND	4.77	1.27	3610
	9441	12	5560	0.448 DNQ	2.73	22.7	0.1	0.055 DNQ	9.6	3.5	6940
	9412	14	4600	0.327 DNQ	1.97	20.7	0.083	0.043 DNQ	8.72	2.55	4980
	9427	16	4200	0.467 DNQ	1.42	30.3	0.064	0.02 DNQ	8	1.84	5570
	9413	19	5590	0.413 DNQ	2.21	22.6	0.1	0.08 DNQ	10.2	3.35	6150
	9408	20	3490	0.201 DNQ	1.09	16.6	0.056	0.017 DNQ	7.06	1.53	3630
	9429	20	3080	0.217 DNQ	1.31	19.4	0.054	0.022 DNQ	6.18	1.22	3870
	9442	26	6920	ND	1.68	28.6	0.109	0.054 DNQ	11	4.09	7180
Mid Shelf	9402	31	4020	0.373 DNQ	1.75	18.2	0.079	0.043 DNQ	9.1	2.17	5070
	9404	32	1210	0.304 DNQ	2.07	3.61	0.043 DNQ	ND	5.05	0.571	2890
	9401	43	1050	0.53 DNQ	6.21	2.11	0.045 DNQ	0.03 DNQ	10.2	0.428 DNQ	5700
	9407	44	3970	0.396 DNQ	2.21	15.4	0.089	0.037 DNQ	9.73	2.59	5290
	9446	45	6230	0.515 DNQ	2.35	32.3	0.119	0.104	12.8	4.57	8050
	9414	47	7100	0.447 DNQ	2.73	32.9	0.135	0.072 DNQ	13	6.48	8660
	9403	48	1180	0.564 DNQ	6.96	2.4	0.051	0.024 DNQ	7.37	0.448 DNQ	5960
	9428	51	9210	0.707 DNQ	3.42	47.2	0.18	0.194	17.1	6.85	11400
	9426	62	9910	0.739 DNQ	3.31	45.5	0.198	0.122	18.2	8.22	11800
	9405	68	3410	0.41 DNQ	1.57	11.9	0.079	0.038 DNQ	7.11	2.7	5010
	9425	68	10800	0.905 DNQ	3.62	47.6	0.217	0.099	19.6	8.98	12900
	9417	79	12600	1.06	4.09	60	0.232	0.113	21.7	10.9	14100
	9436	80	8850	0.915 DNQ	2.68	44.1	0.192	0.119	17.4	6.32	12100
	9422	91	4610	0.202 DNQ	1.35	18.1	0.09	0.042 DNQ	8.2	3.71	5670
	9431	93	11200	0.252 DNQ	2.95	41.1	0.22	0.083 DNQ	19.5	7.68	13300
	9423	94	8430	0.589 DNQ	2.97	32.3	0.174	0.095	15.9	7.09	10400
	9445	95	10500	0.397 DNQ	2.77	42.8	0.206	0.1	18.8	7.12	13000
Outer Shelf	9434	126	5050	0.384 DNQ	2.97	26	0.159	0.084 DNQ	13.2	3.48	9400
	9410	133	8660	0.389 DNQ	2.32	36.6	0.188	0.067 DNQ	16.6	11.4	11800
	9406	134	8600	0.568 DNQ	2.7	31.7	0.189	0.071 DNQ	16.2	8.49	10600
	9415	141	8110	0.441 DNQ	2.21	30.2	0.186	0.086 DNQ	16.8	7.94	10700
	9424	168	5450	0.205 DNQ	1.1	20.2	0.109	0.07 DNQ	9.98	4.58	6350
	9438	172	8180	0.846 DNQ	2.45	37.8	0.182	0.414	17.3	7.62	10700
	9411	193	15500	1.54	3.65	63.3	0.323	0.141	28.9	19.8	17000
	9409	198	5300	1.24	4.61	19.1	0.283	0.079 DNQ	21.9	5.17	15100
Upper Slope	9418	201	14000	0.962 DNQ	3.16	53.8	0.289	0.163	26.7	15.6	14900
	9435	233	11800	0.352 DNQ	2.55	43.6	0.24	0.302	21.5	9.24	12900
	9416	264	14600	0.79 DNQ	3.58	62.2	0.314	0.191	29.7	16.9	16100
	9439	311	15200	1.25	4.38	75.5	0.322	0.401	28.7	14.6	17700
	9419	322	16000	1.18	4.21	83.9	0.343	0.252	32.9	18.2	16800
	9440	484	20600	1.75	7.8	100	0.459	0.531	37.3	21.5	22800
	9433	485	18700	1.44	3.74	123	0.41	0.526	39.7	22.3	19300
	DR (%)		100	95	100	100	100	95	100	100	100

Appendix B.10 *continued*

	Station	Depth (m)	Pb	Mn	Hg	Ni	Se	Ag	Sn	Zn
Inner Shelf	9420	4	1.03	38.8	ND	1.5	ND	ND	0.246 DNQ	9.64
	9441	12	2.33	67.2	0.015	3.05	ND	ND	0.531	18.2
	9412	14	1.45	53.2	0.005 DNQ	2.5	ND	ND	0.366 DNQ	12.9
	9427	16	1.51	87.7	ND	2	ND	ND	0.381 DNQ	15.6
	9413	19	2.16	63.3	0.012	3.35	ND	ND	0.515	16.1
	9408	20	1.23	56.6	ND	1.51	ND	ND	0.318 DNQ	8.64
	9429	20	1.04	66.2	0.028	1.48	0.218 DNQ	ND	0.331 DNQ	9.73
	9442	26	1.99	82.1	0.012 DNQ	3.67	ND	ND	0.65	19.1
Mid Shelf	9402	31	1.57	48.4	0.005 DNQ	2.45	ND	ND	0.295 DNQ	11.9
	9404	32	1.26	13.9	ND	0.777	ND	ND	0.127 DNQ	4.97
	9401	43	1.88	12.2	ND	0.672	ND	ND	0.162 DNQ	4.76
	9407	44	2.64	40.4	0.009 DNQ	2.82	0.357 DNQ	ND	0.567	16.3
	9446	45	2.95	88.6	0.02	4.05	0.354 DNQ	ND	0.706	21.8
	9414	47	3.29	86.7	0.033	5	ND	ND	0.918	24
	9403	48	2.15	14.6	ND	1.15	0.224 DNQ	ND	0.151 DNQ	5.24
	9428	51	3.61	114	ND	6.07	0.341 DNQ	ND	0.895	32.9
	9426	62	4.41	111	0.042	7.31	0.334 DNQ	ND	1.15	31.3
	9405	68	2.08	49.7	0.012	3.11	0.292 DNQ	ND	0.516	10.4
	9425	68	4.64	116	0.043	8.22	0.598 DNQ	ND	1.3	33.2
	9417	79	5.21	134	0.048	9.38	0.513 DNQ	ND	1.28	38.5
	9436	80	3.2	105	0.024	6.53	0.505 DNQ	ND	0.812	29.1
	9422	91	1.64	51.4	0.028	3.56	ND	ND	0.438 DNQ	13.9
	9431	93	3.05	118	0.027	7.98	0.399 DNQ	ND	0.93	31.4
	9423	94	3.27	89.1	0.032	6.7	0.322 DNQ	ND	0.821	25.7
	9445	95	3.36	115	0.035	7.24	0.449 DNQ	ND	0.89	30.6
Outer Shelf	9434	126	2.01	50.8	0.014 DNQ	3.9	ND	ND	0.417 DNQ	21.3
	9410	133	5.33	82.3	0.073	6.16	0.463 DNQ	ND	1.01	30.4
	9406	134	5.42	83.3	0.047	7.38	0.404 DNQ	ND	0.971	26.2
	9415	141	3.39	78.9	0.044	7	0.331 DNQ	ND	0.81	26.1
	9424	168	1.9	57.4	0.04	4.77	0.288 DNQ	ND	0.506	16.5
	9438	172	3.56	88.5	0.026	6.83	0.444 DNQ	ND	0.701	27.9
	9411	193	5.95	127	0.099	14.6	0.936 DNQ	ND	1.45	49.3
	9409	198	2.43	33.4	0.015	5.33	0.655 DNQ	ND	0.538	24
Upper Slope	9418	201	5.01	123	0.077	13.3	0.641 DNQ	ND	1.22	42.8
	9435	233	3.52	116	0.036	9.37	0.447 DNQ	ND	0.884	34.1
	9416	264	4.83	119	0.071	16.5	0.963 DNQ	ND	1.16	45.1
	9439	311	5.74	158	0.073	12.9	0.892 DNQ	ND	1.41	50.7
	9419	322	4.6	137	0.062	19	1.29	ND	1.16	52.3
	9440	484	6.76	180	0.082	17.7	1.52	ND	1.58	63.9
	9433	485	5.28	154	0.075	21.5	1.65	ND	1.22	62
	DR (%)		100	100	83	100	68	0	100	100

Appendix B.11

Concentrations of pesticides (ppt) detected in sediments from PLOO stations sampled during winter and summer 2024. See Appendix B.4 for MDLs and abbreviations; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Winter	Chlordane								DDT						
2024	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon	o,p-DDD	o,p-DDE	o,p-DDT	p,p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT
88-m Depth Contour															
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	345	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	506	102
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	286	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	281	84.5
E1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	127	476	ND
98-m Depth Contour															
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	176	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	253	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	167	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	123	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	139	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	203	ND
E17 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	115	ND
E14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	118	ND
E11 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	133	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	185	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	170	ND
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	265	ND
116-m Depth Contour															
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	296	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	142	ND
E15 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	ND
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	123	ND
E3	ND	ND	93.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	178	ND
DR (%)	0	0	5	0	0	0	0	0	0	0	0	0	5	100	9

[a] Near-ZID station

Appendix B.11 *continued*

Winter	HCH						Endosulfan						
2024	Alpha	Beta	Delta	Gamma	Aldrin	Dieldrin	Alpha	Beta	Sulfate	Endrin	EndAld	HCB	Mirex
88-m Depth Contour													
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98-m Depth Contour													
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E17[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E11[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
116-m Depth Contour													
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.11 *continued*

Summer	Chlordane								DDT						
2024	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon	o,p-DDD	o,p-DDE	o,p-DDT	p,-p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT
88-m Depth Contour															
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	260	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	281	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	291	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	ND
E1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	276	ND
98-m Depth Contour															
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	137	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	203	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	164	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	106	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	97.8	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	129	ND
E17 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	141	ND
E14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	124	ND
E11 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	111	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	141	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	620	180	17200
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	193	ND
116-m Depth Contour															
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	168	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	214	ND
E15 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	125	ND
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	194	ND
E3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	83.1 DNQ	180	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	9	100	5

[a] Near-ZID station

Appendix B.11 *continued*

Summer	HCH						Endosulfan						
2024	Alpha	Beta	Delta	Gamma	Aldrin	Dieldrin	Alpha	Beta	Sulfate	Endrin	EndAld	HCB	Mirex
88-m Depth Contour													
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
98-m Depth Contour													
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E17 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E11 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
116-m Depth Contour													
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.12

Concentrations of pesticides (ppt) detected in sediments from SBOO stations sampled during 2024. See Appendix B.4 for MDLs and abbreviations; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Winter 2024	Chlordane								DDT						
	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon	o,p-DDD	o,p-DDE	o,p-DDT	p,-p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT
19-m Stations															
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations															
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	117	ND	ND	471	524
I12[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations															
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	488	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations															
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	235	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	4	0	0	11	4

[a] Near-ZID station

Appendix B.12 *continued*

Winter 2024	HCH						Endosulfan						
	Alpha	Beta	Delta	Gamma	Aldrin	Dieldrin	Alpha	Beta	Sulfate	Endrin	EndAld	HCB	Mirex
19-m Stations													
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations													
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations													
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations													
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.12 *continued*

Summer 2024	Chlordane								DDT						
	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon	o,p-DDD	o,p-DDE	o,p-DDT	p,-p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT
19-m Stations															
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations															
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	108	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	146	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations															
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	495	109
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations															
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	425	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	15	4

[a] Near-ZID station

Appendix B.12 *continued*

Summer 2024	HCH						Endosulfan						
	Alpha	Beta	Delta	Gamma	Aldrin	Dieldrin	Alpha	Beta	Sulfate	Endrin	EndAld	HCB	Mirex
19-m Stations													
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND									
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations					ND	ND	ND	ND	ND	ND	ND	ND	ND
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND									
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations					ND	ND	ND	ND	ND	ND	ND	ND	ND
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND									
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations					ND	ND	ND	ND	ND	ND	ND	ND	ND
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	0	0	0	0	0	0	0	0	0
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	4

[a] Near-ZID station

Appendix B.13

Concentrations of pesticides (ppt) detected in sediments from the San Diego regional benthic stations sampled during summer 2024. See Appendix B.4 for MDLs and abbreviations; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

	Station	Depth (m)	Chlordane							
			A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	ND	ND	ND	ND	ND	ND	ND
	9406	134	ND	ND	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	ND	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	ND	ND	ND	ND	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	ND	ND	ND	ND
	9435	233	ND	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	ND	ND	ND	ND	ND	ND
	9419	322	ND	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	0	0	0	0	0	0	0

Appendix B.13 *continued*

	Station	Depth (m)	DDT						
			o,p-DDD	o,p-DDE	o,p-DDT	p,-p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	230
	9442	26	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	85.5 DNQ	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	91.6	318	207
	9446	45	ND	ND	ND	ND	ND	95.5	ND
	9414	47	62.5 DNQ	ND	ND	ND	214	216	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	208	ND
	9426	62	ND	ND	ND	ND	1940	433	68600
	9405	68	ND	ND	ND	ND	ND	129	ND
	9425	68	ND	ND	ND	ND	ND	371	167
	9417	79	ND	ND	ND	ND	103	484	174
	9436	80	ND	ND	ND	ND	ND	210	ND
	9422	91	ND	ND	ND	ND	ND	165	ND
	9431	93	ND	ND	ND	ND	ND	195	ND
	9423	94	ND	ND	ND	ND	ND	163	ND
	9445	95	ND	ND	ND	ND	ND	228	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	149	ND
	9410	133	ND	ND	ND	ND	ND	157	136
	9406	134	ND	ND	ND	ND	ND	200	123
	9415	141	ND	ND	ND	ND	ND	434	ND
	9424	168	ND	ND	ND	ND	ND	299	ND
	9438	172	ND	ND	ND	ND	ND	329	ND
	9411	193	ND	ND	ND	115 DNQ	173	1300	ND
	9409	198	ND	ND	ND	ND	ND	200	ND
Upper Slope	9418	201	ND	ND	ND	ND	121	871	ND
	9435	233	ND	ND	ND	ND	ND	393	ND
	9416	264	ND	ND	ND	ND	149	1170	ND
	9439	311	ND	ND	ND	ND	115 DNQ	1010	153
	9419	322	ND	ND	ND	ND	166	1580	278
	9440	484	102 DNQ	296	102 DNQ	316	551	3230	5600
	9433	485	ND	165	ND	ND	119 DNQ	1690	ND
	DR (%)		5	5	2.5	5	27.5	72.5	25

Appendix B.13 *continued*

	Station	Depth (m)	HCH Alpha	HCH Beta	HCH Delta	HCH Gamma	Endosulfan Alpha	Endosulfan Beta	Endosulfan Sulfate
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	191	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	1070	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	ND	ND	ND	ND	ND	ND
	9406	134	ND	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	ND	ND	ND	250	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	ND	ND	ND
	9435	233	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	ND	ND	ND	ND	ND
	9419	322	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	381	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	0	0	0	0	10	0

Appendix B.13 *continued*

	Station	Depth (m)	Aldrin	Dieldrin	Endrin	EndAld	HCB	Mirex
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	122	ND
	9410	133	ND	ND	ND	ND	ND	ND
	9406	134	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	ND	ND	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	ND	ND
	9435	233	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	ND	ND	ND	ND
	9419	322	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND
	DR (%)		0	0	0	0	2.5	0

Appendix B.14

Concentrations of PCBs (ppt) detected in sediments from PLOO stations sampled during 2024. See Appendix B.4 for MDLs; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Winter	PCB Congener																			
2024	8	18	28	37	44	49	52	66	70	74	77	81	87	99	101	105	110	114	118	119
88-m Depth Contour																				
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110 DNQ	190	ND	210	ND	210	ND
98-m Depth Contour																				
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E17 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E11 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	72 DNQ	110	ND	120	ND	100	ND
116-m Depth Contour																				
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	61.5 DNQ	ND	ND	ND	60.4 DNQ	ND
E3	ND	73.4 DNQ	69 DNQ	ND	ND	160	180	140	110	ND	ND	ND	71.5 DNQ	140	230	ND	210	ND	180	ND
DR (%)	0	5	5	0	0	5	5	5	5	0	0	0	5	14	18	0	14	0	18	0

[a] Near-ZID station

Appendix B.14 *continued*

Winter	PCB Congener																					
2024	123	126	128	138	149	151	153/168	156	157	158	167	169	170	177	180	183	187	189	194	195	201	206
88-m Depth Contour																						
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E1	ND	ND	ND	220	200	ND	340	ND	ND	ND	ND	ND	ND	ND	130	ND	110 DNQ	ND	ND	ND	ND	ND
98-m Depth Contour																						
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E17[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E11[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E2	ND	ND	ND	130	130	ND	220	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
116-m Depth Contour																						
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	69.6 DNQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E3	ND	ND	ND	180	200	ND	320	ND	ND	ND	ND	ND	ND	ND	120	ND	95	ND	ND	ND	ND	ND
DR (%)	0	0	0	18	14	0	14	0	0	0	0	0	0	0	9	0	9	0	0	0	0	0

[a] Near-ZID station

Appendix B.14 *continued*

Summer 2024	PCB Congener 8	18	28	37	44	49	52	66	70	74	77	81	87	99	101	105	110	114	118	119
88-m Depth Contour																				
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E1	ND	ND	ND	ND	ND	ND	100	ND	77.6 DNQ	ND	ND	ND	91	100	220	ND	220	ND	190	ND
98-m Depth Contour																				
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E17[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E11[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E2	ND	ND	ND	ND	110	ND	270	ND	150	ND	ND	ND	300	220	720	220	550	ND	460	ND
116-m Depth Contour																				
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E3	ND	ND	71.3 DNQ	ND	93	110	200	100	140	ND	ND	ND	140	140	340	130	340	ND	300	ND
DR (%)	0	0	5	0	9	4	14	5	14	0	0	0	14	14	14	9	14	0	14	0

[a] Near-ZID station

Appendix B.14 *continued*

Summer	PCB Congener																				
2024	123	126	128	138	149	151	153/168	156	157	158	167	169	170	177	180	183	187	189	194	195	201	206
88-m Depth Contour																						
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E1	ND	ND	ND	210	220	ND	340	ND	ND	ND	ND	ND	ND	ND	170	ND	100	ND	ND	ND	ND	ND
98-m Depth Contour																						
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E17[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E11[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E2	ND	ND	160	460	400	85.1 DNQ	640	ND	ND	ND	ND	ND	110	ND	240	72.7 DNQ	99	ND	ND	ND	ND	ND
116-m Depth Contour																						
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E3	ND	ND	ND	300	260	ND	420	ND	ND	ND	ND	ND	ND	ND	110	ND	91	ND	ND	ND	ND	ND
DR (%)	0	0	5	14	14	5	14	0	0	0	0	0	5	0	14	5	14	0	0	0	0	0

[a] Near-ZID station

Appendix B.15

Concentrations of PCBs (ppt) detected in sediments from SBOO stations sampled during winter and summer 2024. See Appendix B.4 for MDLs; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable.

Winter 2024	PCB Congener																			
	8	18	28	37	44	49	52	66	70	74	77	81	87	99	101	105	110	114	118	119
19-m Stations																				
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations																				
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations																				
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations																				
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.15 *continued*

Winter 2024	PCB Congener																					
	123	126	128	138	149	151	153/168	156	157	158	167	169	170	177	180	183	187	189	194	195	201	206
19-m Stations																						
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations																						
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	110	ND	ND	ND	120	ND	ND	ND	ND	200	ND	290	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations																						
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations																						
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	4	0	0	0	4	0	0	0	0	4	0	4	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.15 *continued*

Summer 2024	PCB Congener																			
	8	18	28	37	44	49	52	66	70	74	77	81	87	99	101	105	110	114	118	119
19-m Stations																				
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations																				
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations																				
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations																				
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.15 *continued*

Summer 2024	PCB Congener																					
	123	126	128	138	149	151	153/168	156	157	158	167	169	170	177	180	183	187	189	194	195	201	206
19-m Stations																						
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations																						
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations																						
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations																						
I28	ND	ND	ND	68.8 DNQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.16

Concentrations of PCBs (ppt) detected in sediments from the San Diego regional benthic stations sampled during summer 2024. See Appendix B.4 for MDLs; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Region	Station	Depth (m)	PCB 8	PCB 18	PCB 28	PCB 37	PCB 44	PCB 49	PCB 52	PCB 66	PCB 70	PCB 74
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND	94	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9406	134	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	ND	ND	ND	ND	ND	84 DNQ	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9435	233	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9419	322	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)			0	0	0	0	0	0	3	3	0	0

Appendix B.16 *continued*

	Station	Depth (m)	PCB 77	81	87	99	101	105	110	114	118	119
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	77.5 DNQ	150	ND	150	ND	140	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	66.3 DNQ	ND	ND	ND	86.3 DNQ	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	69 DNQ	ND	ND	ND	83.3 DNQ	ND
	9417	79	ND	ND	ND	ND	ND	ND	ND	ND	79.2 DNQ	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	ND	ND	100 DNQ	150	ND	160	ND	180	ND
	9406	134	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	ND	150	ND	140	ND	120	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	100	ND	98	ND	97	ND
	9411	193	ND	ND	120 DNQ	210	300	150	320	ND	360	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	160	ND	200	ND	160	ND
	9435	233	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	170	ND	150	ND	140	ND
	9439	311	ND	ND	ND	ND	82.4 DNQ	ND	ND	ND	93.1 DNQ	ND
	9419	322	ND	ND	ND	ND	110 DNQ	ND	ND	ND	110 DNQ	ND
	9440	484	ND	ND	ND	ND	123 DNQ	ND	ND	ND	133 DNQ	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	0	3	8	30	3	18	0	33	0

Appendix B.16 *continued*

	Station	Depth (m)	PCB 123	126	128	138	149	151	153/168	156	157	158	167
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	120	100	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	90.8 DNQ	ND	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	98	88.6 DNQ	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	97.7 DNQ	ND	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	ND	ND	200	190	ND	320	ND	ND	ND	ND
	9406	134	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	150	130	ND	240	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	120	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	130	450	410	99 DNQ	700	ND	ND	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	240	190	ND	350	ND	ND	ND	ND
	9435	233	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	180	130	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	ND	130	ND	ND	ND	ND	ND	ND	ND
	9419	322	ND	ND	ND	140	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	190	131 DNQ	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	0	3	33	20	3	10	0	0	0	0

Appendix B.16 *continued*

			PCB										
	Station	Depth (m)	169	170	177	180	183	187	189	194	195	201	206
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	110	ND	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	ND	ND	140	ND	ND	ND	ND	ND	ND	ND
	9406	134	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	83 DNQ	ND	80.3 DNQ	ND	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	120	100 DNQ	200	ND	260	ND	ND	ND	ND	290
	9409	198	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	110	ND	160	ND	ND	ND	ND	ND
	9435	233	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	97.7 DNQ	ND	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9419	322	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	3	3	15	0	8	0	0	0	0	3

Appendix B.17

Concentrations of PAHs (ppb) detected in sediments from PLOO stations sampled during 2024. See Appendix B.4 for MDLs; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Winter 2024	1-methyl naphthalene	1-methyl phenanthrene	2-methyl naphthalene	2,3,5-trimethyl naphthalene	2,6-dimethyl naphthalene	3,4-benzo(B) fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo[A] anthracene	Benzo[A] pyrene
88-m Depth Contour											
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	ND	ND	ND	ND	8.61 DNQ	ND	ND	ND	ND	ND
E1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.54
98-m Depth Contour											
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E17 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E11 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
116-m Depth Contour											
B10	ND	9.72	8.84	ND	9.63	ND	7.29	7.49	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	ND	ND	15.3	ND	ND	ND	ND	11
E3	ND	ND	ND	ND	ND	43.3	ND	ND	4.4	ND	ND
DR (%)	0	5	5	0	5	14	5	5	5	0	9

[a] Near-ZID station

Appendix B.17 *continued*

Winter 2024	Benzo[e] pyrene	Benzo[G,H,I] perylene	Benzo[K] fluoranthene	Biphenyl	Chrysene	Dibenzo(A,H) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-CD) pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
88-m Depth Contour													
B11	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	7.46	ND	ND	ND	9.41 DNQ	ND	ND	ND	ND	ND	ND	ND
E1	5.81 DNQ	7.98	ND	NR	ND	ND	8.49	ND	5.76 DNQ	ND	ND	ND	11
98-m Depth Contour													
B12	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E17 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E11 [a]	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
116-m Depth Contour													
B10	ND	ND	ND	NR	ND	ND	ND	4.66 DNQ	ND	11.6	ND	ND	ND
E21	ND	ND	ND	ND	ND	8.29 DNQ	ND	ND	ND	ND	ND	ND	ND
E15 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	8.03	10.3	ND	ND	ND	ND	8.18	ND	6.79 DNQ	ND	ND	ND	8.11
E3	23.2	23.6	18.6	ND	17.8	ND	15.6	ND	19.1	ND	ND	8.5	18.2
DR (%)	14	18	5	0	5	9	14	5	14	5	0	5	14

[a] Near-ZID station

Appendix B.17 *continued*

Summer 2024	1-methyl naphthalene	1-methyl phenanthrene	2-methyl naphthalene	2,3,5-trimethyl naphthalene	2,6-dimethyl naphthalene	3,4-benzo(B) fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo[A] anthracene	Benzo[A] pyrene
88-m Depth Contour											
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E1	ND	ND	ND	ND	ND	13.8	ND	ND	ND	ND	12.9
98-m Depth Contour											
B12	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E17[a]	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E14[a]	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E11[a]	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E5	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E2	ND	ND	ND	ND	ND	9.47 DNQ	ND	ND	NR	ND	6.78 DNQ
116-m Depth Contour											
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E15[a]	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
E9	ND	ND	ND	ND	ND	5.59 DNQ	ND	ND	ND	ND	ND
E3	ND	ND	ND	ND	ND	22.5	ND	ND	ND	ND	18.3
DR (%)	0	0	0	0	0	18	0	0	0	0	14

[a] Near-ZID station

Appendix B.17 *continued*

Summer 2024	Benzo[e] pyrene	Benzo[G,H,I] perylene	Benzo[K] fluoranthene	Biphenyl	Chrysene	Dibenzo(A,H) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-CD) pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
88-m Depth Contour													
B11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E1	7.55	ND	ND	ND	7.55	ND	10.3	ND	ND	ND	ND	ND	11.7
98-m Depth Contour													
B12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E20	ND	ND	ND	ND	ND	5.68 DNQ	ND	ND	ND	ND	ND	ND	ND
E17 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E14 [a]	ND	ND	ND	ND	ND	4.53 DNQ	ND	ND	ND	ND	ND	ND	ND
E11 [a]	ND	ND	ND	ND	ND	5.78 DNQ	ND	ND	ND	ND	ND	ND	ND
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E5	ND	5.75 DNQ	ND	ND	ND	4.98 DNQ	ND	ND	ND	ND	ND	ND	ND
E2	5.15 DNQ	6.43 DNQ	ND	ND	ND	4.18 DNQ	ND	ND	4.88 DNQ	ND	ND	ND	ND
116-m Depth Contour													
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E3	12	ND	10	ND	12.5	ND	17.6	ND	ND	ND	ND	9.79	16.5
DR (%)	14	9	5	0	9	23	9	0	5	0	0	5	9

[a] Near-ZID station

Appendix B.18

Concentrations of PAHs (ppb) detected in sediments from SBOO stations sampled during 2024. See Appendix B.4 for MDLs; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Winter 2024	1-methyl naphthalene	1-methyl phenanthrene	2-methyl naphthalene	2,3,5-trimethyl naphthalene	2,6-dimethyl naphthalene	3,4-benzo(B) fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo[A] anthracene	Benzo[A] pyrene
19-m Stations											
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations											
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	10.1	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations											
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations											
I28	ND	ND	ND	ND	10.4	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	7	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.18 *continued*

Winter 2024	Benzo[e] pyrene	Benzo[G,H,I] perylene	Benzo[K] fluoranthene	Biphenyl	Chrysene	Dibenzo(A,H) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-CD) pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
19-m Stations													
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations													
I33	ND	ND	ND	ND	11.2	6.34 DNQ	ND	ND	4.62 DNQ	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations													
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations													
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	4	4	0	0	4	0	0	0	0

[a] Near-ZID station

Appendix B.18 *continued*

Summer 2024	1-methyl naphthalene	1-methyl phenanthrene	2-methyl naphthalene	2,3,5-trimethyl naphthalene	2,6-dimethyl naphthalene	3,4-benzo(B) fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo[A] anthracene	Benzo[A] pyrene
19-m Stations											
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations											
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations											
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations											
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.18 *continued*

Summer 2024	Benzo[e] pyrene	Benzo[G,H,I] perylene	Benzo[K] fluoranthene	Biphenyl	Chrysene	Dibenzo(A,H) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-CD) pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
19-m Stations													
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations													
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations													
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations													
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.19

Concentrations of PAHs (ppb) detected in sediments from the San Diego regional benthic stations sampled during summer 2024. See Appendix B.4 for MDLs; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

	Station	Depth (m)	1-methyl naphthalene	1-methyl phenanthrene	2-methyl naphthalene	2,3,5-trimethyl naphthalene	2,6-dimethyl naphthalene	3,4-benzo(B) fluoranthene	Acenaphthene	Acenaphthylene
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	6.29 DNQ	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	ND	ND	5.43 DNQ	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	ND	ND	ND	ND	29.8	ND	ND
	9406	134	ND	ND	ND	ND	ND	5.25 DNQ	ND	ND
	9415	141	ND	ND	ND	ND	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	ND	ND	ND	11 DNQ	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	ND	ND	ND	ND
	9435	233	ND	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	ND	5.12 DNQ	ND	ND
	9439	311	ND	ND	ND	ND	ND	14.9	ND	ND
	9419	322	ND	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	0	0	0	0	18	0	0

Appendix B.19 *continued*

	Station	Depth (m)	Anthracene	Benzo[A] anthracene	Benzo[A] pyrene	Benzo[e] pyrene	Benzo[G,H,I] perylene	Benzo[K] fluoranthene	Biphenyl	Chrysene
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND	4.98 DNQ
	9413	19	ND	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND	ND
	9442	26	NR	ND	ND	ND	6.29 DNQ	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND	ND
	9431	93	NR	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND	ND
	9445	95	NR	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	NR	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	ND	28.1 DNQ	17.7 DNQ	20.6 DNQ	11.8 DNQ	ND	16.9 DNQ
	9406	134	ND	ND	ND	ND	6.43 DNQ	ND	ND	ND
	9415	141	ND	ND	7.8 DNQ	5.45 DNQ	7.16 DNQ	ND	ND	ND
	9424	168	NR	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	9.47 DNQ	6.18 DNQ	8.5 DNQ	ND	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	8.29 DNQ	6.84 DNQ	7.54 DNQ	ND	ND	ND
	9435	233	NR	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	12.4	ND	10.1	ND	ND	10.5 DNQ
	9419	322	ND	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	0	13	10	18	3	0	8

Appendix B.19 *continued*

	Station	Depth (m)	Dibenzo(A,H) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-CD) pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	9.6	ND	ND	ND	ND	ND	9.49
	9413	19	ND	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	ND	NR	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	ND	ND	ND	ND	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	ND	ND	ND	ND	ND	ND
	9410	133	ND	13.7 DNQ	ND	14.5 DNQ	ND	ND	ND	16.4 DNQ
	9406	134	ND	ND	ND	4.83 DNQ	ND	ND	ND	ND
	9415	141	ND	ND	ND	5.13 DNQ	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	ND	6.17 DNQ	ND	ND	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	ND	ND	ND	ND
	9435	233	ND	ND	ND	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	ND	ND	ND	ND
	9439	311	ND	26.1	ND	ND	ND	ND	24.6	20.7
	9419	322	ND	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	8	0	10	0	0	3	8

Appendix B.20

Concentrations of PBDEs (ppt) detected in sediments from SBOO stations sampled during 2024. See Appendix B.4 for MDLs; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

Winter 2024	BDE-17	BDE-28	BDE-47	BDE-49	BDE-66	BDE-85	BDE-99	BDE-100	BDE-138	BDE-153	BDE-154	BDE-183	BDE-190
19-m Stations													
I35	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations													
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations													
I29	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations													
I28	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] Near-ZID station

Appendix B.20 *continued*

Summer 2024	BDE-17	BDE-28	BDE-47	BDE-49	BDE-66	BDE-85	BDE-99	BDE-100	BDE-138	BDE-153	BDE-154	BDE-183	BDE-190
19-m Stations													
I35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations													
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	ND	171	45.5 DNQ	ND	37.6 DNQ	ND	ND	ND	ND
I22	ND	128	ND	ND	ND	176	33.7 DNQ	ND	ND	ND	ND	ND	ND
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations													
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations													
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	4	0	0	0	7	7	0	4	0	0	0	0

[a] Near-ZID station

Appendix B.21

Concentrations of PBDEs (ppt) detected in sediments from the San Diego regional benthic stations sampled during summer 2024. See Appendix B.4 for MDLs; DR = detection rate; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

	Station	Depth (m)	BDE-17	BDE-28	BDE-47	BDE-49	BDE-66	BDE-85	BDE-99
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND	ND
	9442	26	ND	ND	210	ND	ND	ND	206
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND	ND
	9417	79	ND	ND	142	21.2 DNQ	ND	ND	193
	9436	80	ND	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	137	ND	ND	ND	ND
Outer Shelf	9434	126	ND	ND	116	ND	ND	ND	ND
	9410	133	ND	ND	ND	ND	ND	ND	ND
	9406	134	ND	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	ND	22.2 DNQ	ND	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	ND	ND	ND
	9435	233	ND	ND	234	ND	ND	ND	265
	9416	264	ND	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	ND	25 DNQ	ND	ND	ND
	9419	322	ND	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND	ND
	DR (%)		0	0	13	8	0	0	8

Appendix B.21 *continued*

	Station	Depth (m)	BDE-100	BDE-138	BDE-153	BDE-154	BDE-183	BDE-190
Inner Shelf	9420	4	ND	ND	ND	ND	ND	ND
	9441	12	ND	ND	ND	ND	ND	ND
	9412	14	ND	ND	ND	ND	ND	ND
	9427	16	ND	ND	ND	ND	ND	ND
	9413	19	ND	ND	ND	ND	ND	ND
	9408	20	ND	ND	ND	ND	ND	ND
	9429	20	ND	ND	ND	ND	ND	ND
	9442	26	42.7 DNQ	ND	ND	ND	ND	ND
Mid Shelf	9402	31	ND	ND	ND	ND	ND	ND
	9404	32	ND	ND	ND	ND	ND	ND
	9401	43	ND	ND	ND	ND	ND	ND
	9407	44	ND	ND	ND	ND	ND	ND
	9446	45	ND	ND	ND	ND	ND	ND
	9414	47	ND	ND	ND	ND	ND	ND
	9403	48	ND	ND	ND	ND	ND	ND
	9428	51	ND	ND	ND	ND	ND	ND
	9426	62	ND	ND	ND	ND	ND	ND
	9405	68	ND	ND	ND	ND	ND	ND
	9425	68	ND	ND	ND	ND	ND	ND
	9417	79	56 DNQ	ND	ND	34.5 DNQ	ND	ND
	9436	80	ND	ND	ND	ND	ND	ND
	9422	91	ND	ND	ND	ND	ND	ND
	9431	93	ND	ND	ND	ND	ND	ND
	9423	94	ND	ND	ND	ND	ND	ND
	9445	95	ND	ND	ND	ND	ND	ND
Outer Shelf	9434	126	32 DNQ	ND	ND	ND	ND	ND
	9410	133	ND	ND	ND	ND	ND	ND
	9406	134	ND	ND	ND	ND	ND	ND
	9415	141	ND	ND	ND	ND	ND	ND
	9424	168	ND	ND	ND	ND	ND	ND
	9438	172	ND	ND	ND	ND	ND	ND
	9411	193	ND	ND	ND	ND	ND	ND
	9409	198	ND	ND	ND	ND	ND	ND
Upper Slope	9418	201	ND	ND	ND	ND	ND	ND
	9435	233	59.7 DNQ	ND	ND	ND	ND	ND
	9416	264	ND	ND	ND	ND	ND	ND
	9439	311	ND	ND	ND	ND	ND	ND
	9419	322	ND	ND	ND	ND	ND	ND
	9440	484	ND	ND	ND	ND	ND	ND
	9433	485	ND	ND	ND	ND	ND	ND
	DR (%)		10	0	0	3	0	0

Appendix C

Demersal Fishes and Megabenthic Invertebrates

2024 Supplemental Analyses

Appendix C.1

Taxonomic listing of demersal fish species captured at PLOO trawl stations during 2024. Data are total number of fish (n), biomass (BM, wet weight, kg), minimum (Min), maximum (Max), and mean length (standard length, cm). Taxonomic arrangement follows Eschmeyer and Herald (1998) and Page et al. (2013).

Taxonomic Classification			Common Name	n	BM	Length Min	Length Max	Length Mean
CHIMAERIFORMES								
	Chimaeridae	*Hydrolagus colliei*	Spotted Ratfish	1	0.7	—	—	45
SQUATINIFORMES								
	Squatinidae	*Squatina californica*	Pacific Angel Shark	1	11.5	—	—	99
RAJIFORMES								
	Rajidae	*Raja inornata*	California Skate [a]	3	1.6	28	50	37
ARGENTINIFORMES								
	Argentinidae	*Argentina sialis*	Pacific Argentine	15	0.3	5	7	6
STOMIIFORMES								
	Sternoptychidae	*Argyropelecus lychnus*	Tropical Hatchetfish	4	0.2	11	15	13
AULOPIFORMES								
	Synodontidae	*Synodus lucioceps*	California Lizardfish	54	0.9	10	26	12
OPHIDIIFORMES								
	Ophidiidae	*Chilara taylori*	Spotted Cusk-eel	2	0.2	16	20	18
BATRACHOIDIFORMES								
	Batrachoididae	*Porichthys notatus*	Plainfin Midshipman	23	0.9	11	18	14
GASTEROSTEIFORMES								
	Syngnathidae	*Syngnathus californiensis*	Kelp Pipefish	1	0.1	—	—	21
SCORPAENIFORMES								
	Scorpaenidae	*Scorpaena guttata*	California Scorpionfish	14	3.6	13	25	20
	Sebastidae	*Sebastes elongatus*	Greenstriped Rockfish	3	0.2	5	12	8
		Sebastes goodei	Chilipepper	4	0.3	10	13	11
		Sebastes hopkinsi	Squarespot Rockfish	8	0.3	11	15	12
		Sebastes levis	Cowcod	1	0.1	—	—	13
		Sebastes miniatus	Vermilion Rockfish	2	0.3	16	20	18
		Sebastes rosenblatti	Greenblotched Rockfish	4	0.3	9	16	11
		Sebastes rubrivinctus	Flag Rockfish	1	0.1	—	—	8
		Sebastes saxicola	Stripetail Rockfish	177	2.7	6	12	9
		Sebastes semicinctus	Halfbanded Rockfish	1109	25.6	6	14	10
		Sebastes sp	Rockfish Unidentified	9	0.5	4	6	5
	Hexagrammidae	*Zaniolepis frenata*	Shortspine Combfish	286	5.1	7	17	12
		Zaniolepis latipinnis	Longspine Combfish	322	5.3	7	18	12
	Cottidae	*Chitonotus pugetensis*	Roughback Sculpin	27	0.7	7	11	9
		Icelinus quadriseriatus	Yellowchin Sculpin	541	2.6	4	8	7
		Icelinus tenuis	Spotfin Sculpin	2	0.1	9	9	9
	Agonidae	*Xeneretmus latifrons*	Blacktip Poacher	1	0.1	—	—	12
PERCIFORMES								
	Sciaenidae	*Genyonemus lineatus*	White Croaker	1	0.1	—	—	17
	Embiotocidae	*Cymatogaster aggregata*	Shiner Perch	1	0.1	—	—	12
		Zalembius rosaceus	Pink Seaperch	80	2.0	4	18	9
	Zoarcidae	*Lycodes diapterus*	Black Eelpout	1	0.1	—	—	22
		Lycodes pacificus	Blackbelly Eelpout	4	0.1	13	20	15
	Stromateidae	*Peprilus simillimus*	Pacific Pompano	1	0.1	—	—	6

[a] Length measured as total length, not standard length (see text)

Appendix C.1 *continued*

Taxonomic Classification			Common Name	n	BM	Length		
						Min	Max	Mean
PLEURONECTIFORMES								
	Paralichthyidae	*Citharichthys sordidus*	Pacific Sanddab	2529	39.1	3	25	9
		Citharichthys xanthostigma	Longfin Sanddab	548	22.0	6	20	13
		Hippoglossina stomata	Bigmouth Sole	21	2.4	14	23	18
	Pleuronectidae	*Glyptocephalus zachirus*	Rex Sole	4	0.2	11	13	12
		Lyopsetta exilis	Slender Sole	95	1.9	8	15	12
		Microstomus pacificus	Dover Sole	369	12.6	7	23	12
		Parophrys vetulus	English Sole	73	5.5	11	25	16
		Pleuronichthys verticalis	Hornyhead Turbot	20	2.4	12	18	15
	Cynoglossidae	*Symphurus atricaudus*	California Tonguefish	71	2.5	11	16	13

Appendix C.2

Taxonomic listing of demersal fish species captured at SBOO trawl stations during 2024. Data are total number of fish (n), biomass (BM, wet weight, kg), minimum (Min), maximum (Max), and mean length (standard length, cm). Taxonomic arrangement follows Eschmeyer and Herald (1998) and Page et al. (2013).

Taxonomic Classification			Common Name	n	BM	Length		
						Min	Max	Mean
RAJIFORMES								
	Rajidae	*Raja inornata*	California Skate [a]	5	2.6	37	42	40
MYLIOBATIFORNES								
	Urolophidae	*Urobatis halleri*	Round Stingray	2	0.9	24	27	26
CLUPEIFORMES								
	Engraulidae	*Engraulis mordax*	Northern Anchovy	1	0.1	—	—	12
AULOPIFORMES								
	Synodontidae	*Synodus lucioceps*	California Lizardfish	120	4.5	7	31	14
BATRACHOIDIFORMES								
	Batrachoididae	*Porichthys myriaster*	Specklefin Midshipman	6	0.9	8	27	14
		Porichthys notatus	Plainfin Midshipman	4	0.2	7	14	12
GASTEROSTEIFORMES								
	Syngnathidae	*Syngnathus exilis*	Barcheek Pipefish	8	0.2	16	21	18
SCORPAENIFORMES								
	Sebastidae	*Sebastes dallii*	Calico Rockfish	1	0.1	—	—	4
		Sebastes miniatus	Vermilion Rockfish	4	0.3	6	9	8
		Sebastes saxicola	Stripetail Rockfish	1	0.1	—	—	5
		Sebastes sp	Rockfish Unidentified	2	0.1	3	3	3
	Hexagrammidae	*Ophiodon elongatus*	Lingcod	2	0.1	13	13	13
		Zaniolepis latipinnis	Longspine Combfish	18	0.2	11	15	14
	Cottidae	*Chitonotus pugetensis*	Roughback Sculpin	63	1.6	3	11	9
		Icelinus quadriseriatus	Yellowchin Sculpin	85	0.6	4	8	7
	Agonidae	*Odontopyxis trispinosa*	Pygmy Poacher	3	0.3	8	9	9
PERCIFORMES								
	Sciaenidae	*Genyonemus lineatus*	White Croaker	1	0.1	—	—	10
	Embiotocidae	*Cymatogaster aggregata*	Shiner Perch	15	0.5	8	10	9
PLEURONECTIFORMES								
	Paralichthyidae	*Citharichthys sordidus*	Pacific Sanddab	39	0.7	4	11	6
		Citharichthys stigmaeus	Speckled Sanddab	1196	10.0	3	26	8
		Citharichthys xanthostigma	Longfin Sanddab	452	29.3	6	23	14
		Hippoglossina stomata	Bigmouth Sole	3	0.7	18	23	21
		Paralichthys californicus	California Halibut	38	27.0	24	57	34
		Xystreurys liolepis	Fantail Sole	18	4.1	15	31	22
	Pleuronectidae	*Parophrys vetulus*	English Sole	143	16.2	14	28	19
		Pleuronichthys decurrens	Curlfin Sole	3	0.4	6	19	12
		Pleuronichthys ritteri	Spotted Turbot	16	3.0	13	21	18
		Pleuronichthys verticalis	Hornyhead Turbot	56	6.9	5	22	16
	Cynoglossidae	*Symphurus atricaudus*	California Tonguefish	126	2.0	6	16	10

[a] Length measured as total length, not standard length (see text)

Appendix C.3

Summary of demersal fish abnormalities and parasites at PLOO and SBOO trawl stations during 2024.

Region	Year	Survey	Station	Species	Anomaly/Parasite	n
PLOO	2024	Winter	SD7	California Skate	Tumor	1
			SD7	Pacific Sanddab	*Phrixocephalus cininnatus*	2
			SD8	Pacific Sanddab	*Phrixocephalus cininnatus*	3
			SD10	Pacific Sanddab	*Phrixocephalus cininnatus*	2
			SD12	Dover Sole	Tumor	1
			SD12	Pacific Sanddab	*Phrixocephalus cininnatus*	6
			SD14	Pacific Sanddab	*Phrixocephalus cininnatus*	1
SBOO	2024	Winter	SD17	English Sole	Tumor	1
		Summer	SD18	California Halibut	*Elthusa vulgaris*	1
			SD18	Speckled Sanddab	*Elthusa vulgaris*, Fin Rot	1
			SD19	California Halibut	Tumor	1
			SD19	Speckled Sanddab	Ambicoloration	1
			SD19	Speckled Sanddab	Lesion	1
			SD19	Speckled Sanddab	Tumor	1

Appendix C.4

Taxonomic listing of megabenthic invertebrate taxa captured at PLOO trawl stations during 2024. Data are number of individuals (n). Taxonomic arrangement follows SCAMIT (2023).

Taxonomic Classification				n
CNIDARIA	Octocorallia		Malacalcyonacea	1
		Gorgoniidae	*Adelogorgia phyllosclera*	1
			Eugorgia rubens	1
		Plexauridae	*Thesea* sp B	11
		Virgulariidae	*Acanthoptilum* sp	8
	Hexacorallia	Metridiidae	*Metridium farcimen*	1
		Parazoanthidae	*Savalia lucifica*	1
MOLLUSCA	Gastropoda	Calliostomatidae	*Calliostoma turbinum*	1
		Pseudomelatomidae	*Antiplanes catalinae*	1
		Discodorididae	*Platydoris macfarlandi*	3
		Pleurobranchaeidae	*Pleurobranchaea californica*	9
		Philinidae	*Philine auriformis*	1
	Cephalopoda	Sepiolidae	*Rossia pacifica*	6
		Octopodidae	*Octopus rubescens*	9
ANNELIDA	Polychaeta	Aphroditidae	*Aphrodita refulgida*	1
ARTHROPODA	Malacostraca	Sicyoniidae	*Sicyonia ingentis*	21
			Sicyonia penicillata	22
		Crangonidae	*Crangon alaskensis*	1
		Diogenidae	*Paguristes turgidus*	5
		Calappidae	*Platymera gaudichaudii*	2
		Inachidae	*Coryrhynchus lobifrons*	4
ECHINODERMATA	Crinoidea	Antedonidae	*Florometra serratissima*	1
	Asteroidea	Luidiidae	*Luidia asthenosoma*	31
			Luidia foliolata	36
		Astropectinidae	*Astropecten californicus*	136
			Astropecten ornatissimus	1
		Asteriidae	*Stylasterias forreri*	2
	Ophiuroidea	Gorgonocephalidae	*Gorgonocephalus eucnemis*	2
		Ophiuridae	*Ophiura luetkenii*	68
		Ophiopholidae	*Ophiopholis bakeri*	21
		Ophiotrichidae	*Ophiothrix spiculata*	2
	Echinoidea	Toxopneustidae	*Lytechinus pictus*	12313
		Strongylocentrotidae	*Strongylocentrotus fragilis*	5
		Spatangidae	*Spatangus californicus*	2
	Holothuroidea	Stichopodidae	*Apostichopus californicus*	14

Appendix C.5

Taxonomic listing of megabenthic invertebrate taxa captured at SBOO trawl stations during 2024. Data are number of individuals (n). Taxonomic arrangement follows SCAMIT (2023).

Taxonomic Classification				n
CNIDARIA	Octocorallia	Renillidae	*Renilla koellikeri*	1
		Virgulariidae	*Stylatula elongata*	1
MOLLUSCA	Gastropoda	Austrosiphonidae	*Kelletia kelletii*	2
		Pseudomelatomidae	*Burchia semiinflata*	1
			Megasurcula carpenteriana	1
		Arminidae	*Armina californica*	1
		Onchidorididae	*Acanthodoris brunnea*	2
		Philinidae	*Philine auriformis*	6
	Cephalopoda	Octopodidae	*Octopus rubescens*	2
ARTHROPODA	Malacostraca	Hemisquillidae	*Hemisquilla californiensis*	9
		Sicyoniidae	*Sicyonia ingentis*	1
			Sicyonia penicillata	58
		Thoridae	*Heptacarpus stimpsoni*	3
		Pandalidae	*Pandalus platyceros*	3
		Crangonidae	*Crangon alba*	8
			Crangon nigromaculata	16
		Palinuridae	*Panulirus interruptus*	1
		Diogenidae	*Paguristes bakeri*	3
		Paguridae	*Pagurus armatus*	2
			Pagurus spilocarpus	11
		Calappidae	*Platymera gaudichaudii*	3
		Epialtidae	*Loxorhynchus grandis*	1
		Inachidae	*Ericerodes hemphillii*	1
		Inachoididae	*Pyromaia tuberculata*	13
		Cancridae	*Metacarcinus anthonyi*	1
			Metacarcinus gracilis	3
		Portunidae	*Achelous xantusii*	9
ECHINODERMATA	Asteroidea	Luidiidae	*Luidia armata*	23
		Astropectinidae	*Astropecten californicus*	398
	Ophiuroidea	Ophiotrichidae	*Ophiothrix spiculata*	9
	Echinoidea	Toxopneustidae	*Lytechinus pictus*	40
		Dendrasteridae	*Dendraster terminalis*	3
		Loveniidae	*Lovenia cordiformis*	4
CHORDATA	Ascidiacea	Polyclinidae	*Polyclinum planum*	3

Appendix D

Contaminants in Marine Fishes

2024 Supplemental Analyses

Appendix D.1

Lengths and weights of fishes used for each composite (Comp) tissue sample from PLOO trawl and rig fishing zones during 2024. Data are summarized as number of individuals (n), minimum, maximum, and mean values.

				Length (cm)			Weight (g)		
Zone	Comp	Species	n	Min	Max	Mean	Min	Max	Mean
RF1	1	Vermilion Rockfish	3	21	30	25	205	544	358
RF1	2	Vermilion Rockfish	3	19	21	20	170	213	188
RF1	3	Vermilion Rockfish	3	23	29	25	328	677	457
RF2	1	Starry Rockfish	3	19	25	21	155	324	230
RF2	2	Starry Rockfish	3	18	22	19	129	211	161
RF2	3	Mixed Rockfish	3	19	26	22	195	414	292
TZ1	1	Pacific Sanddab	5	16	21	18	67	178	115
TZ1	2	Pacific Sanddab	4	15	17	16	64	168	122
TZ1	3	Pacific Sanddab	4	18	23	20	106	234	157
TZ2	1	Pacific Sanddab	4	15	21	19	59	173	120
TZ2	2	Pacific Sanddab	4	14	21	17	44	160	106
TZ2	3	Pacific Sanddab	4	16	22	18	85	191	114
TZ3	1	Pacific Sanddab	4	17	21	20	96	204	144
TZ3	2	Pacific Sanddab	4	18	20	20	116	180	151
TZ3	3	Pacific Sanddab	3	19	21	20	131	206	168
TZ4	1	Pacific Sanddab	3	20	23	21	119	232	168
TZ4	2	Pacific Sanddab	3	17	25	20	85	270	154
TZ4	3	Pacific Sanddab	3	19	21	20	136	172	149

Appendix D.2

Lengths and weights of fishes used for each composite (Comp) tissue sample from SBOO trawl and rig fishing zones during 2024. Data are summarized as number of individuals (n), minimum, maximum, and mean values.

				Length (cm)			Weight (g)		
Zone	**Comp**	**Species**	**n**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**
RF3	1	Vermilion Rockfish	3	12	26	20	122	522	300
RF3	2	Vermilion Rockfish	3	22	29	24	286	706	436
RF3	3	Mixed Rockfish	3	17	27	22	136	540	311
RF4	1	Mixed Rockfish	3	22	22	22	321	371	352
RF4	2	Mixed Rockfish	3	29	32	31	801	1154	999
RF4	3	California Scorpionfish	3	21	27	24	303	542	427
TZ5	1	Longfin Sanddab	4	13	21	16	39	195	101
TZ5	2	Longfin Sanddab	3	14	20	17	58	208	139
TZ5	3	Hornyhead Turbot	6	17	22	19	133	282	185
TZ6	1	Longfin Sanddab	5	17	19	18	84	134	103
TZ6	2	Longfin Sanddab	5	14	16	15	57	89	70
TZ6	3	Longfin Sanddab	4	15	18	17	61	116	90
TZ7	1	Longfin Sanddab	8	13	14	14	45	61	51
TZ7	2	Longfin Sanddab	7	13	18	14	44	112	59
TZ7	3	Longfin Sanddab	7	13	16	14	46	70	54
TZ8	1	Longfin Sanddab	6	15	19	17	67	137	91
TZ8	2	Longfin Sanddab	6	15	17	16	60	112	78
TZ8	3	Longfin Sanddab	6	15	16	16	65	91	76
TZ9	1	Fantail Sole	5	13	20	16	51	271	131
TZ9	2	English Sole	3	18	22	20	89	180	138
TZ9	3	Hornyhead Turbot	3	17	25	22	105	296	221

Appendix D.3

Constituents and method detection limits (MDL) used for the analysis of liver and muscle tissues of fishes collected during 2024.

Parameter	MDL Liver	MDL Muscle	Parameter	MDL Liver	MDL Muscle
Metals (ppm)					
Aluminum (Al)	0.232-2.12	0.183-0.206	Lead (Pb)	0.086-0.792	0.067-0.076
Antimony (Sb)	0.315-2.9	0.246-0.277	Manganese (Mn)	0.015-0.14	0.012-0.013
Arsenic (As)	0.164-1.51	0.127-0.143	Mercury (Hg)	0.009-0.019	0.001-0.002
Barium (Ba)	0.003-0.029	0-0.003	Nickel (Ni)	0.049-0.452	0.039-0.043
Beryllium (Be)	0.005-0.042	0.004-0.004	Selenium (Se)	0.386-3.55	0.302-0.4
Cadmium (Cd)	0.014-0.13	0.011-0.013	Silver (Ag)	0.026-0.243	0.021-0.023
Chromium (Cr)	0.014-0.129	0.011-0.012	Tin (Sn)	0.088-0.804	0.069-0.077
Copper (Cu)	0.042-0.382	0.032-0.037	Zinc (Zn)	0.037-0.338	0.03-0.033
Iron (Fe)	0.546-5.01	0.425-0.479			
Chlorinated Pesticides (ppb)					
Hexachlorocyclohexane (HCH)					
HCH, Alpha isomer	4.94-6.38	0.59-0.637	HCH, Delta isomer	4.84-6.12	0.578-0.624
HCH, Beta isomer	4.7-5.96	0.562-0.607	HCH, Gamma isomer	4.96-6.28	0.593-0.64
Total Chlordane					
Alpha (cis) chlordane	5.71-7.23	0.682-0.737	Heptachlor epoxide	4.62-5.97	0.552-0.596
Cis nonachlor	5.92-7.5	0.707-0.764	Methoxychlor	8.98-11.4	1.07-1.16
Gamma (trans) chlordane	5.07-6.42	0.606-0.654	Oxychlordane	5.02-6.36	0.6-0.648
Heptachlor	5.39-6.96	0.643-0.695	Trans nonachlor	5.94-7.64	0.71-0.767
Total Dichlorodiphenyltrichloroethane (DDT)					
o,p-DDD	5.8-7.35	0.693-0.749	p,p-DDD	7.12-9.01	0.851-0.919
o,p-DDE	5.96-7.54	0.712-0.769	p,p-DDE	5.46-7.05	0.652-0.704
o,p-DDT	6-7.59	0.716-0.774	p,p-DDT	8.28-10.5	0.989-1.07
p,-p-DDMU	5.4-6.84	0.645-0.697			
Miscellaneous Pesticides					
Aldrin	5.2-6.58	0.621-0.671	Endrin	6.78-8.58	0.81-0.875
AlphaEndosulfan	5.58-7.17	0.667-0.72	Endrin aldehyde	7.6-9.62	0.908-0.981
BetaEndosulfan	5.8-7.35	0.693-0.749	Hexachlorobenzene (HCB)	4.86-6.25	0.581-0.627
Dieldrin	5.66-7.17	0.677-0.731	Mirex	5.49-6.95	0.655-0.708
EndosulfanSulfate	7.65-9.89	0.914-0.988			

Appendix D.3 *continued*

Parameter	MDL Liver	MDL Muscle	Parameter	MDL Liver	MDL Muscle
Polychlorinated Biphenyls Congeners (PCBs) (ppb)					
PCB 8	5.08-6.43	0.606-0.655	PCB 126	6.1-7.84	0.728-0.787
PCB 18	5.16-6.53	0.617-0.666	PCB 128	5.63-7.23	0.672-0.726
PCB 28	5.31-6.72	0.634-0.685	PCB 138	5.01-6.45	0.599-0.647
PCB 37	5.64-7.14	0.674-0.728	PCB 149	5.52-7	0.66-0.713
PCB 44	5.08-6.43	0.606-0.655	PCB 151	5.18-6.67	0.619-0.669
PCB 49	4.87-6.16	0.581-0.628	PCB 153/168	10.9-14	1.3-1.41
PCB 52	4.91-6.22	0.587-0.634	PCB 156	6.41-8.24	0.765-0.827
PCB 66	5.17-6.54	0.618-0.667	PCB 157	6.41-8.12	0.766-0.828
PCB 70	5.08-6.43	0.606-0.655	PCB 158	5.31-6.83	0.634-0.685
PCB 74	5.26-6.66	0.629-0.679	PCB 167	5.95-7.65	0.711-0.768
PCB 77	5.96-7.66	0.712-0.769	PCB 169	5.76-7.29	0.688-0.743
PCB 81	5.11-6.58	0.611-0.66	PCB 170	6.02-7.62	0.719-0.777
PCB 87	5.35-6.77	0.639-0.69	PCB 177	5.57-7.05	0.666-0.719
PCB 99	4.88-6.18	0.583-0.63	PCB 180	5.29-6.69	0.631-0.682
PCB 101	4.99-6.32	0.596-0.644	PCB 183	5.59-7.07	0.667-0.721
PCB 105	5.85-7.41	0.699-0.755	PCB 187	5.47-6.93	0.654-0.706
PCB 110	5.14-6.51	0.614-0.663	PCB 189	3.97-5.03	0.474-0.512
PCB 114	5.41-6.85	0.646-0.698	PCB 194	5.11-6.48	0.611-0.66
PCB 118	5.22-6.6	0.623-0.673	PCB 195	4.73-5.99	0.565-0.61
PCB 119	5.25-6.64	0.627-0.677	PCB 201	5.27-6.67	0.63-0.68
PCB 123	5.27-6.67	0.63-0.68	PCB 206	7.27-9.2	0.868-0.938
Polycyclic Aromatic Hydrocarbons (PAHs) (ppb)					
1-methylnaphthalene	67.8-149	66.7-86.5	Benzo[G,H,I]perylene	105-136	104-135
1-methylphenanthrene	52.4-103	51.6-66.9	Benzo[K]fluoranthene	78.3-181	77.1-100
2-methylnaphthalene	50-101	49.2-63.9	Biphenyl	75.5-146	74.4-96.4
2,3,5-trimethylnaphthalene	54.3-163	53.5-69.4	Chrysene	85.3-135	84-109
2,6-dimethylnaphthalene	56.3-121	55.4-71.9	Dibenzo(A,H)anthracene	94.6-122	93.1-121
3,4-benzo(B)fluoranthene	59.1-128	58.2-75.4	Fluoranthene	69-152	67.9-88.1
Acenaphthene	60-131	59.1-76.6	Fluorene	55.4-133	54.6-70.8
Acenaphthylene	52.1-130	51.3-66.5	Indeno(1,2,3-CD)pyrene	66.7-112	65.7-85.2
Anthracene	67.2-140	66.2-85.8	Naphthalene	49.5-76	48.8-63.3
Benzo[A]anthracene	64-107	63.1-81.8	Perylene	112-144	110-143
Benzo[A]pyrene	59.8-149	58.9-76.3	Phenanthrene	64.8-130	63.8-82.8
Benzo[e]pyrene	64.8-160	63.8-82.8	Pyrene	73.3-150	72.2-93.7
Polybrominated Diphenyl Ethers (PBDEs)					
BDE-17	1.24-1.59	0.148-0.16	BDE-100	1.04-1.33	0.124-0.134
BDE-28	1.29-1.66	0.154-0.167	BDE-138	1.15-1.46	0.138-0.149
BDE-47	1.1-1.41	NA	BDE-153	1.01-1.3	0.121-0.131
BDE-49	0.828-1.05	0.099-0.107	BDE-154	1.09-1.4	0.13-0.141
BDE-66	0.602-0.762	0.072-0.078	BDE-183	1.3-1.65	0.155-0.168
BDE-85	1.21-1.54	0.145-0.157	BDE-190	1.66-2.11	0.199-0.215
BDE-99	1.05-1.33	NA			

Appendix D.4

Concentrations of metals (ppm) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2024. See Appendix D.3 for MDLs and abbreviations; DNQ = do not quantify; ND = not detected; NR = not reportable; NA = not analyzed.

	Zone	Comp	Species	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe
PLOO	TZ1	1	Pacific Sanddab	ND	ND	3.67	0.030 DNQ	ND	3.05	0.098 DNQ	3.77	77.4
		2	Pacific Sanddab	ND	ND	3.22	0.017 DNQ	ND	3.97	0.063 DNQ	4.43	96.5
		3	Pacific Sanddab	ND	ND	3.93	0.030 DNQ	ND	3.99	0.05 DNQ	4.31	69.3
	TZ2	1	Pacific Sanddab	ND	ND	3.89	0.010 DNQ	ND	2.23	0.08 DNQ	2.67	83.2
		2	Pacific Sanddab	ND	ND	3.46	0.020 DNQ	ND	2.43	0.05 DNQ	4.22	96.6
		3	Pacific Sanddab	ND	ND	2.54	0.020 DNQ	ND	2.63	0.05 DNQ	3.60	81.5
	TZ3	1	Pacific Sanddab	ND	ND	3.42	0.031 DNQ	ND	4.79	0.082 DNQ	3.55	120
		2	Pacific Sanddab	ND	ND	4.35	0.012 DNQ	ND	2.94	0.057 DNQ	4.80	78.9
		3	Pacific Sanddab	ND	ND	4.51	0.020 DNQ	ND	3.31	0.16 DNQ	3.32	89.9
	TZ4	1	Pacific Sanddab	ND	ND	3.90	0.010 DNQ	ND	3.17	0.06 DNQ	3.99	76.7
		2	Pacific Sanddab	ND	ND	3.67	0.010 DNQ	ND	2.64	0.06 DNQ	3.94	78.7
		3	Pacific Sanddab	ND	ND	4.22	ND	ND	2.84	0.04 DNQ	3.89	55.9
SBOO	TZ5	1	Longfin Sanddab	ND	ND	5.87	0.010 DNQ	ND	1.58	0.05 DNQ	4.04	79.5
		2	Longfin Sanddab	ND	ND	6.05	0.010 DNQ	ND	2.24	ND	4.80	71.1
		3	Hornyhead Turbot	0.29 DNQ	ND	6.00	0.010 DNQ	ND	3.73	0.06 DNQ	10.6	50.1
	TZ6	1	Longfin Sanddab	ND	ND	5.74	ND	ND	1.86	0.11 DNQ	5.74	101
		2	Longfin Sanddab	ND	ND	7.49	0.030 DNQ	ND	1.40	0.05 DNQ	5.18	85.4
		3	Longfin Sanddab	ND	ND	6.95	0.010 DNQ	ND	2.21	0.05 DNQ	6.27	86.7
	TZ7	1	Longfin Sanddab	ND	ND	5.84	0.010 DNQ	ND	1.07	ND	6.33	69.1
		2	Longfin Sanddab	ND	ND	5.00	ND	ND	0.91	ND	4.37	67.8
		3	Longfin Sanddab	ND	ND	5.25	0.010 DNQ	ND	0.96	ND	7.16	78.6
	TZ8	1	Longfin Sanddab	ND	ND	5.17	0.043 DNQ	ND	2.24	0.04 DNQ	4.39	72
		2	Longfin Sanddab	ND	ND	4.84	0.011 DNQ	ND	2.16	0.065 DNQ	4.87	118
		3	Longfin Sanddab	ND	ND	5.66	0.010 DNQ	ND	1.99	0.088 DNQ	6.08	109
	TZ9	1	Fantail Sole	NA	NA	NA	NA	NA	NA	NA	NA	NA
		2	English Sole	ND	ND	3.79	0.096 DNQ	ND	0.42 DNQ	ND	9.51	143
		3	Hornyhead Turbot	0.776 DNQ	ND	5.61	0.029 DNQ	ND	8.25	0.164	6.34	51.3

Appendix D.4 *continued*

	Zone	Comp	Species	Pb	Mn	Hg	Ni	Se	Ag	Sn	Zn
PLOO	TZ1	1	Pacific Sanddab	ND	1.17	0.065	ND	2.69	0.07 DNQ	0.43 DNQ	24.5
		2	Pacific Sanddab	ND	1.14	0.102	ND	1.81 DNQ	0.09 DNQ	0.22 DNQ	27.6
		3	Pacific Sanddab	ND	1.18	0.115	ND	2.30 DNQ	ND	0.36 DNQ	23.2
	TZ2	1	Pacific Sanddab	ND	0.92	0.067	ND	2.76 DNQ	ND	0.52 DNQ	22.1
		2	Pacific Sanddab	ND	1.12	0.048	ND	2.23 DNQ	ND	0.36 DNQ	23.1
		3	Pacific Sanddab	ND	0.78	0.073	ND	1.77 DNQ	ND	0.20 DNQ	20.7
	TZ3	1	Pacific Sanddab	ND	1.10	0.107	ND	2.90	ND	0.36 DNQ	24.0
		2	Pacific Sanddab	ND	1.06	0.082	ND	2.19 DNQ	ND	0.37 DNQ	25.9
		3	Pacific Sanddab	ND	0.87	0.126	ND	3.08	ND	0.54 DNQ	25.0
	TZ4	1	Pacific Sanddab	ND	0.98	0.096	ND	2.07 DNQ	ND	0.36 DNQ	22.2
		2	Pacific Sanddab	ND	0.89	0.090	ND	2.29 DNQ	ND	0.38 DNQ	20.5
		3	Pacific Sanddab	ND	0.91	0.050	ND	2.79	ND	0.45 DNQ	18.9
SBOO	TZ5	1	Longfin Sanddab	ND	0.61	0.052	ND	2.79	0.08 DNQ	0.51 DNQ	21.8
		2	Longfin Sanddab	0.23 DNQ	0.61	0.077	ND	3.15	0.07 DNQ	0.57 DNQ	24.1
		3	Hornyhead Turbot	ND	0.88	0.097	ND	1.97	0.15	0.10 DNQ	64.4
	TZ6	1	Longfin Sanddab	ND	0.70	0.075	ND	3.39	0.08 DNQ	0.48 DNQ	22.4
		2	Longfin Sanddab	ND	0.70	0.042	ND	2.88	0.08 DNQ	0.37 DNQ	21.8
		3	Longfin Sanddab	0.26 DNQ	0.75	0.077	ND	2.93	0.11 DNQ	0.79	23.7
	TZ7	1	Longfin Sanddab	ND	0.66	0.066	ND	3.06	0.12 DNQ	0.54 DNQ	22.2
		2	Longfin Sanddab	ND	0.71	0.052	ND	2.97	0.09 DNQ	0.49 DNQ	19.2
		3	Longfin Sanddab	0.30 DNQ	0.71	0.057	ND	3.18	0.14 DNQ	0.54 DNQ	23.9
	TZ8	1	Longfin Sanddab	ND	0.61	0.070	ND	3.36	ND	0.49 DNQ	20.9
		2	Longfin Sanddab	ND	0.67	0.075	ND	3.24	0.08 DNQ	0.43 DNQ	24.0
		3	Longfin Sanddab	ND	0.65	0.097	ND	3.40	ND	0.47 DNQ	24.4
	TZ9	1	Fantail Sole	NA	NA	0.150	NA	NA	NA	NA	NA
		2	English Sole	ND	1.00	0.025	ND	3.62 DNQ	ND	ND	56.1
		3	Hornyhead Turbot	ND	1.66	0.126	0.065 DNQ	1.59	0.09 DNQ	0.16 DNQ	63.2

Appendix D.5

Concentrations of pesticides (ppb) and lipids (% weight) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2024. See Appendix D.3 for MDLs and abbreviations; DNQ=do not quantify; ND = not detected.

				Chlordane							
	Zone	Comp	Species	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
	TZ7	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND
	TZ9	1	Fantail Sole	ND	ND	ND	ND	ND	ND	ND	ND
		2	English Sole	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.5 *continued*

	Zone	Comp	Species	DDT							Endosulfan		
				o,p-DDD	o,p-DDE	o,p-DDT	p,-p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT	Alpha	Beta	Sulfate
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	74.5	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	80.3	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	6.86	ND	90.4	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	22.7	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	9.13	ND	138	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	95.5	ND	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	ND	ND	ND	75.5	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	95.2	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	95.0	ND	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	ND	ND	110	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	6.59	ND	115	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	82.1	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	ND	ND	151	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	7.16	ND	170	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	22.8	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	ND	ND	ND	136	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	6.85	ND	125	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	7.92	ND	178	ND	ND	ND	ND
	TZ7	1	Longfin Sanddab	ND	ND	ND	ND	ND	109	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	93.8	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	86.4	ND	ND	ND	ND
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	102	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	82.4	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	86.7	ND	ND	ND	ND
	TZ9	1	Fantail Sole	ND	ND	ND	15.4	ND	382	ND	ND	ND	ND
		2	English Sole	ND	ND	ND	ND	ND	15.8	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	9.25	ND	ND	ND	ND

Appendix D.5 *continued*

	Zone	Comp	Species	HCH										
				Alpha	Beta	Delta	Gamma	Aldrin	Dieldrin	Endrin	EndAld	HCB	Mirex	Lipids
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30.6
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30.9
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	31.4
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	38.1
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	37.3
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30.7
	TZ3	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	28.7
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	29.7
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	7.82	ND	21.5
	TZ4	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	5.99	ND	28.7
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33.0
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	37.0
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	39.7
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	37.3
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.6
	TZ6	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	35.2
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	37.9
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	44.3
	TZ7	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	38.0
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	38.2
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	32.7
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33.2
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33.5
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	45.5
	TZ9	1	Fantail Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.1
		2	English Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.5
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.3

Appendix D.6

Concentrations of PCBs (ppb) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2024. See Appendix D.3 for MDLs; DNQ=do not quantify; ND = not detected.

				PCB Congener								
	Zone	Comp	Species	8	18	28	37	44	49	52	66	70	74
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ7	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ9	1	Fantail Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	English Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.6 *continued*

	Zone	Comp	Species	PCB Congener 77	81	87	99	101	105	110	114	118	119
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	6.12	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	ND	6.12	ND	ND	ND	ND	7.37	ND
		2	Pacific Sanddab	ND	ND	ND	5.50	ND	ND	ND	ND	6.69	ND
		3	Pacific Sanddab	ND	ND	ND	6.70	ND	ND	ND	ND	8.84	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	6.84	ND	ND	ND	ND	8.86	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	6.52	ND
		2	Longfin Sanddab	ND	ND	ND	5.19	ND	ND	ND	ND	6.25	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	6.86	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	6.33	ND	ND	ND	ND	8.60	ND
	TZ7	1	Longfin Sanddab	ND	ND	ND	ND	7.05	ND	ND	ND	7.72	ND
		2	Longfin Sanddab	ND	ND	ND	6.46	5.78	ND	ND	ND	8.56	ND
		3	Longfin Sanddab	ND	ND	ND	17.10	7.66	ND	ND	ND	23.10	ND
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ9	1	Fantail Sole	ND	ND	ND	16.90	11.50	ND	5.91	ND	19.70	ND
		2	English Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Fantail Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.6 *continued*

	Zone	Comp	Species	PCB Congener									
				123	126	128	138	149	151	153/168	156	157	158
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	6.20	ND	ND	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	7.61	ND	ND	16.9	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	6.34	ND	ND	13.0	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	ND	10.60	ND	ND	21.0	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	8.86	ND	ND	19.9	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	10.60	ND	ND	20.9	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	12.30	ND	ND	25.6	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	7.97	ND	ND	17.8	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	8.63	ND	ND	19.1	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	7.90	ND	ND	18.7	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	ND	10.2	ND	ND	39.9	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	24.1	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	12.70	ND	ND	47.4	ND	ND	ND
	TZ7	1	Longfin Sanddab	ND	ND	ND	11.80	ND	ND	48.4	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	13.10	ND	ND	33.7	ND	ND	ND
		3	Longfin Sanddab	ND	ND	7.06	24.60	ND	ND	64.1	ND	ND	ND
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	7.18	ND	ND	17.8	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	7.61	ND	ND	22.3	ND	ND	ND
	TZ9	1	Fantail Sole	ND	ND	ND	24.00	8.74	ND	62.5	ND	ND	ND
		2	English Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.6 *continued*

	Zone	Comp	Species	PCB Congener 167	169	170	177	180	183	187	189	194	195	201	206
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	ND	ND	7.18	ND	6.75	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	6.70	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	ND	8.42	ND	8.40	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	ND	6.57	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	ND	ND	6.77	ND	7.47	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	9.49	ND	ND	ND	ND	ND
	TZ7	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	8.68	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	7.65	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	11.40	ND	9.33	ND	ND	ND	ND	ND
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ9	1	Fantail Sole	ND	ND	ND	ND	8.78	ND	15.20	ND	ND	ND	ND	ND
		2	English Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.7

Concentrations of PAHs (ppb) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2024. See Appendix D.3 for MDLs; ND = not detected; NA = not analyzed.

	Zone	Comp	Species	1-methyl naphthalene	1-methyl phenanthrene	2-methyl naphthalene	2,3,5-trimethyl naphthalene	2,6-dimethyl naphthalene	3,4-benzo(B) fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo[A] anthracene	Benzo[A] pyrene
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ7	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ9	1	Fantail Sole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		2	English Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.7 *continued*

	Zone	Comp	Species	Benzo[e] pyrene	Benzo[G,H,I] perylene	Benzo[K] fluoranthene	Biphenyl	Chrysene	Dibenzo(A,H) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-CD)pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
PLOO	TZ1	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ7	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ8	1	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ9	1	Fantail Sole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		2	English Sole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.8

Concentrations of PBDEs (ppb) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2024. See Appendix D.3 for MDLs; DNQ=do not quantify; ND = not detected; NR = not reportable.

				PBDE											
	Zone	Comp	Species	17	28	47	49	66	85	99	100	138	153	154	183	190
PLOO	TZ1	1	Pacific Sanddab	ND	ND	15.1	ND	ND	ND	ND	4.03	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	13.1	ND	ND	ND	ND	3.33	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	15.0	ND	ND	ND	ND	3.45	ND	ND	ND	ND	ND
	TZ2	1	Pacific Sanddab	ND	ND	NR	ND	ND	ND	NR	2.56 DNQ	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	16.7	1.04 DNQ	ND	ND	ND	3.82	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	10.8	ND	ND	ND	ND	3.72	ND	ND	ND	ND	ND
	TZ3	1	Pacific Sanddab	ND	ND	11.9	1.04 DNQ	ND	ND	ND	3.39	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	9.7	ND	ND	ND	ND	2.52 DNQ	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	12.4	ND	ND	ND	ND	3.21	ND	ND	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	14.1	ND	ND	ND	ND	3.84	ND	ND	ND	ND	ND
		2	Pacific Sanddab	ND	ND	10.4	ND	ND	ND	ND	3.92	ND	ND	ND	ND	ND
		3	Pacific Sanddab	ND	ND	11.3	ND	ND	ND	ND	2.17 DNQ	ND	ND	ND	ND	ND
SBOO	TZ5	1	Longfin Sanddab	ND	ND	22.4	3.05 DNQ	ND	ND	2.23 DNQ	10.2	ND	2.37 DNQ	2.90 DNQ	ND	ND
		2	Longfin Sanddab	ND	ND	39.8	4.49	ND	ND	3.77	16.5	ND	3.90	4.20	ND	ND
		3	Hornyhead Turbot	ND	ND	31.2	4.72	ND	ND	27	7.91	ND	4.51	6.56	ND	ND
	TZ6	1	Longfin Sanddab	ND	ND	25.7	2.96 DNQ	ND	ND	NR	12.7	ND	2.26 DNQ	3.58	ND	ND
		2	Longfin Sanddab	ND	ND	25.0	3.64	ND	ND	NR	11.6	ND	2.99 DNQ	3.31	ND	ND
		3	Longfin Sanddab	ND	ND	22.9	2.84 DNQ	ND	ND	NR	14.7	ND	2.54 DNQ	3.70	ND	ND
	TZ7	1	Longfin Sanddab	ND	ND	NR	1.56 DNQ	ND	ND	NR	7.05	ND	1.56 DNQ	2.38 DNQ	ND	ND
		2	Longfin Sanddab	ND	ND	NR	1.83 DNQ	ND	ND	NR	7.37	ND	1.59 DNQ	2.50 DNQ	ND	ND
		3	Longfin Sanddab	ND	ND	NR	1.52 DNQ	ND	ND	NR	7.35	ND	1.55 DNQ	2.61 DNQ	ND	ND
	TZ8	1	Longfin Sanddab	ND	ND	NR	1.82 DNQ	ND	ND	NR	8.16	ND	ND	2.54 DNQ	ND	ND
		2	Longfin Sanddab	ND	ND	NR	1.57 DNQ	ND	ND	NR	7.44	ND	ND	2.71 DNQ	ND	ND
		3	Longfin Sanddab	ND	ND	NR	2.30 DNQ	ND	ND	NR	8.57	ND	1.46 DNQ	2.78	ND	ND
	TZ9	1	Fantail Sole	ND	ND	NR	ND	ND	ND	NR	1.21 DNQ	ND	ND	ND	ND	ND
		2	English Sole	ND	ND	NR	ND	ND	ND	NR	4.60	ND	2.01 DNQ	2.76 DNQ	ND	ND
		3	Hornyhead Turbot	ND	ND	NR	ND	ND	ND	NR	1.70 DNQ	ND	ND	ND	ND	ND

Appendix D.9

Concentrations of metals (ppm) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2024. See Appendix D.3 for MDLs and abbreviations; DNQ = do not quantify; ND = not detected; NR = not reportable.

	Zone	Comp	Species	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe
PLOO	RF1	1	Vermilion Rockfish	ND	ND	1.28	0.010 DNQ	ND	ND	0.05 DNQ	0.61	1.51 DNQ
PLOO	RF1	2	Vermilion Rockfish	ND	ND	2.08	0.010 DNQ	ND	ND	0.05 DNQ	0.96	1.47 DNQ
PLOO	RF1	3	Vermilion Rockfish	ND	ND	1.64	0.010 DNQ	ND	ND	0.07 DNQ	0.30	2.51 DNQ
PLOO	RF2	1	Starry Rockfish	ND	ND	1.31	0.040	ND	ND	0.04 DNQ	0.15 DNQ	1.30 DNQ
PLOO	RF2	2	Starry Rockfish	ND	ND	1.27	0.010 DNQ	ND	ND	0.03 DNQ	0.21 DNQ	1.34 DNQ
PLOO	RF2	3	Mixed Rockfish	ND	ND	1.24	ND	ND	ND	0.04 DNQ	0.28	1.45 DNQ
SBOO	RF3	1	Vermilion Rockfish	ND	ND	2.70	0.010 DNQ	ND	ND	0.05 DNQ	0.28	1.53 DNQ
SBOO	RF3	2	Vermilion Rockfish	ND	ND	2.58	0.004 DNQ	ND	ND	0.05 DNQ	0.22 DNQ	1.52 DNQ
SBOO	RF3	3	Mixed Rockfish	ND	ND	1.90	0.005 DNQ	ND	ND	0.05 DNQ	0.18 DNQ	1.34 DNQ
SBOO	RF4	1	Mixed Rockfish	0.48 DNQ	ND	1.73	0.040 DNQ	ND	ND	0.05 DNQ	0.21 DNQ	1.31 DNQ
SBOO	RF4	2	Mixed Rockfish	ND	ND	3.04	0.004 DNQ	ND	ND	0.05 DNQ	0.17 DNQ	1.27 DNQ
SBOO	RF4	3	CA Scorpionfish	ND	ND	4.05	0.010 DNQ	ND	ND	0.04 DNQ	1.35	1.16 DNQ

Appendix D.9 continued

Zone		Comp	Species	Pb	Mn	Hg	Ni	Se	Ag	Tl	Sn	Zn
PLOO	RF1	1	Vermilion Rockfish	ND	0.08	0.036	ND	0.62	ND	0.10 DNQ	3.10	4.32
	RF1	2	Vermilion Rockfish	ND	0.08	0.064	ND	0.93	ND	0.18 DNQ	3.25	3.64
	RF1	3	Vermilion Rockfish	ND	0.12	0.039	ND	0.89	ND	0.14 DNQ	3.23	4.31
	RF2	1	Starry Rockfish	ND	0.08	0.168	ND	1.03	ND	0.15 DNQ	2.58	3.32
	RF2	2	Starry Rockfish	ND	0.07	0.178	ND	1.04	ND	0.15 DNQ	2.73	3.14
	RF2	3	Mixed Rockfish	ND	0.04	0.082	ND	1.24	ND	0.16 DNQ	3.30	3.61
SBOO	RF3	1	Vermilion Rockfish	ND	0.07	0.030	ND	0.96	ND	0.11 DNQ	3.42	3.75
	RF3	2	Vermilion Rockfish	ND	0.07	0.034	ND	1.05	ND	0.13 DNQ	3.21	3.69
	RF3	3	Mixed Rockfish	ND	0.06	0.059	ND	1.11	ND	0.15 DNQ	3.15	4.54
	RF4	1	Mixed Rockfish	ND	0.09	0.160	0.48	0.95	ND	0.16 DNQ	3.56	4.68
	RF4	2	Mixed Rockfish	ND	0.04	0.143	0.14 DNQ	0.97	ND	0.15 DNQ	3.84	3.68
	RF4	3	CA Scorpionfish	ND	0.05	0.212	0.07 DNQ	0.72 DNQ	ND	0.14 DNQ	2.99	4.19

Appendix D.10

Concentrations of pesticides (ppb) and lipids (% weight) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2024. See Appendix D.3 for MDLs and abbreviations; ND = not detected.

				Chlordane							
Zone		Comp	Species	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.10 *continued*

				DDT						Endosulfan		
	Zone	Comp	Species	o,p-DDD	o,p-DDE	o,p-DDT	p,-p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT	Alpha	Beta	Sulfate
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	1.47	ND	ND	ND	ND
	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	2.62	ND	ND	ND	ND
	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	1.33	ND	ND	ND	ND
	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	2.73	ND	ND	ND	ND
	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	4.02	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	2.27	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	0.98	ND	ND	ND	ND
	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	1.23	ND	ND	ND	ND
	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	1.67	ND	ND	ND	ND
	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	5.16	ND	ND	ND	ND

Appendix D.10 *continued*

				HCH									
	Zone	Comp	Species	Alpha	Beta	Delta	Gamma	Aldrin	Dieldrin	Endrin	EndAld	HCB	Mirex	Lipids
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.945
	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.447
	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	0.72	ND	0.809
	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.981
	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.817
	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.300
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.190
	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.190
	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.443
	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.393
	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.760

Appendix D.11

Concentrations of PCBs (ppb) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2024. See Appendix D.3 for MDLs; ND = not detected.

				PCB Congener								
Zone		Comp	Species	8	18	28	37	44	49	52	66	70	74
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.11 *continued*

				PCB Congener								
Zone		**Comp**	**Species**	**77**	**81**	**87**	**99**	**101**	**105**	**110**	**114**	**118**	**119**
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.11 *continued*

				PCB Congener								
Zone		Comp	Species	123	126	128	138	149	151	153/168	156	157	158
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.11 *continued*

	Zone	Comp	Species	PCB Congener										
				167	169	170	180	183	187	189	194	195	201	206
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.12

Concentrations of PAHs (ppb) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2024. See Appendix D.3 for MDLs; ND = not detected.

	Zone	Comp	Species	1-methyl naphthalene	1-methyl phenanthrene	2-methyl naphthalene	2,3,5-trimethyl naphthalene	2,6-dimethyl naphthalene	3,4-benzo(B) fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo[A] anthracene	Benzo[A] pyrene
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.12 *continued*

Zone		Comp	Species	Benzo[e] pyrene	Benzo[G,H,I] perylene	Benzo[K] fluoranthene	Biphenyl	Chrysene	Dibenzo(A,H) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-CD)pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	3	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	2	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	3	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	2	Mixed Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	CA Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix D.13

Concentrations of PBDEs (ppb) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2024. See Appendix D.3 for MDLs; DNQ=do not quantify; ND = not detected; NR = not reportable.

	Zone	Comp	Species	PBDE												
				17	28	47	49	66	85	99	100	138	153	154	183	190
PLOO	RF1	1	Vermilion Rockfish	ND	ND	NR	ND	ND	ND	NR	0.191 DNQ	ND	ND	ND	ND	ND
PLOO	RF1	2	Vermilion Rockfish	ND	ND	NR	ND	ND	ND	NR	0.244 DNQ	ND	ND	ND	ND	ND
PLOO	RF1	3	Vermilion Rockfish	ND	ND	NR	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND
PLOO	RF2	1	Starry Rockfish	ND	ND	NR	ND	ND	ND	NR	0.145 DNQ	ND	ND	ND	ND	ND
PLOO	RF2	2	Starry Rockfish	ND	ND	NR	ND	ND	ND	NR	0.222 DNQ	ND	ND	ND	ND	ND
PLOO	RF2	3	Mixed Rockfish	ND	ND	NR	ND	ND	ND	NR	0.140 DNQ	ND	ND	ND	ND	ND
SBOO	RF3	1	Vermilion Rockfish	ND	ND	NR	ND	ND	ND	NR	0.165 DNQ	ND	ND	ND	ND	ND
SBOO	RF3	2	Vermilion Rockfish	ND	ND	NR	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND
SBOO	RF3	3	Mixed Rockfish	ND	ND	NR	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND
SBOO	RF4	1	Mixed Rockfish	ND	ND	NR	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND
SBOO	RF4	2	Mixed Rockfish	ND	ND	NR	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND
SBOO	RF4	3	CA Scorpionfish	ND	ND	NR	ND	ND	ND	NR	0.259 DNQ	ND	ND	ND	ND	ND