SD Public Utilities

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

2020

Environmental Monitoring and Technical Services
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Public Utilities Department
Continual Improvement, Prevention of Pollution, Regulatory Compliance
ISO 14001

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

June 30, 2021

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 2020 Interim Receiving Waters Monitoring 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 for the City of San Diego's Point Loma Wastewater Treatment Plant (NPDES No. CA0107409).
(2) Order No. R9-2013-0006 (as amended) for the City's South Bay Water Reclamation Plant (NPDES No. CA0109045).
(3) Order R9-2014-0009 (as amended) 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 for all portions of the Ocean Monitoring Program conducted during 2020. Additional data in support of this report will be submitted in separate addenda, which will be available online by July 1, 2021.

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 Public Utilities Director

RK/akl

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
(Order No. R9-2017-0007; NPDES No. CA0107409)

South Bay Water Reclamation Plant
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Prepared by:

City of San Diego Ocean Monitoring Program

Environmental Monitoring & Technical Services Division

Ryan Kempster, Editor

Ami Latker, Editor

June 2021

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https://www.sandiego.gov/public-utilities/sustainability/ocean-monitoring/reports

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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 regions include: (1) measure and document compliance with NPDES permit requirements and California Ocean Plan (Ocean Plan) water quality objectives and standards; (2) assess any impact of wastewater discharge, or other anthropogenic inputs, on the local marine ecosystem, including effects on coastal water quality, seafloor sediments, and marine life; (3) monitor natural spatial and temporal fluctuations of key oceanographic parameters, and evaluate the overall health and status of the San Diego marine environment.

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 2020. A full biennial monitoring and assessment report covering calendar years 2020 and 2021 will be produced and submitted to the San Diego Water Board and USEPA no later than July 1, 2022. Specific details of the main ocean monitoring activities conducted during 2020 are presented in the following five chapters herein, while raw data are presented in Appendices A–D or are available online and by 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 2020 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 excellent, and there was no evidence that wastewater plumes from 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) provide data that satisfy NPDES permit requirements; (2) demonstrate compliance with water-contact standards specified in the California Ocean Plan (Ocean Plan); (3) track movement and dispersion of the wastewater plumes discharged via the outfalls; (4) identify any biological, chemical or physical changes that may be associated with the outfalls and wastewater discharge. 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 2020 was ~144 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 2020 was about ~31 mgd, including 4 mgd of secondary and tertiary treated effluent from the SBWRP, and 27 mgd of secondary treated effluent from the SBIWTP.

Receiving Waters Monitoring

The total area for the PLOO and SBOO monitoring program covers approximately 881 km^2 (~340 mi^2) 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 1.1). 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 2020, in support of these requirements, can be found in City of San Diego (2021a). 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 online (City of San Diego 2021b).

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 2020). 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, 2020), 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 and Bight'18 programs in 1998, 2003, 2008, 2013 and 2018 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 2018). 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:

- <u>San Diego Kelp Forest Ecosystem Monitoring Project</u>: 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 2020: Appendix A).

- <u>Real-Time Oceanographic Mooring Systems (RTOMS) for the PLOO and SBOO</u>: 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, whom 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 2020: Appendix B.

- 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. This final project report has been updated to include results from 2019 as City of San Diego 2020: Appendix C.

- 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).

- San Diego Regional Benthic Condition Assessment Project: This multi-phase study represents an ongoing, long-term project designed to assess the condition of continental shelf and slope habitats throughout the entire San Diego region. A preliminary summary of the deeper slope (>200 m) results for data collected between 2003–2013 was included in Appendix C.5 of City of San Diego (2015a), while several publications covering the remainder of the project are planned for completion in late 2021.

Report Components & Organization

This report presents summaries of the results of all receiving waters monitoring activities conducted during January–December 2020 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 2020–2021 to be submitted to the San Diego Water Board and USEPA by July 1, 2022. Included herein are results from all regular core stations that comprise the fixed-site monitoring grids surrounding the two outfalls (Figure 1.1), as well as results from the 2020 summer benthic survey of randomly selected sites that range from near the USA/Mexico border to northern San Diego County (Figure 1.2). Data from the 2018 SCB Regional Monitoring Program are not yet available and are therefore not included herein. 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

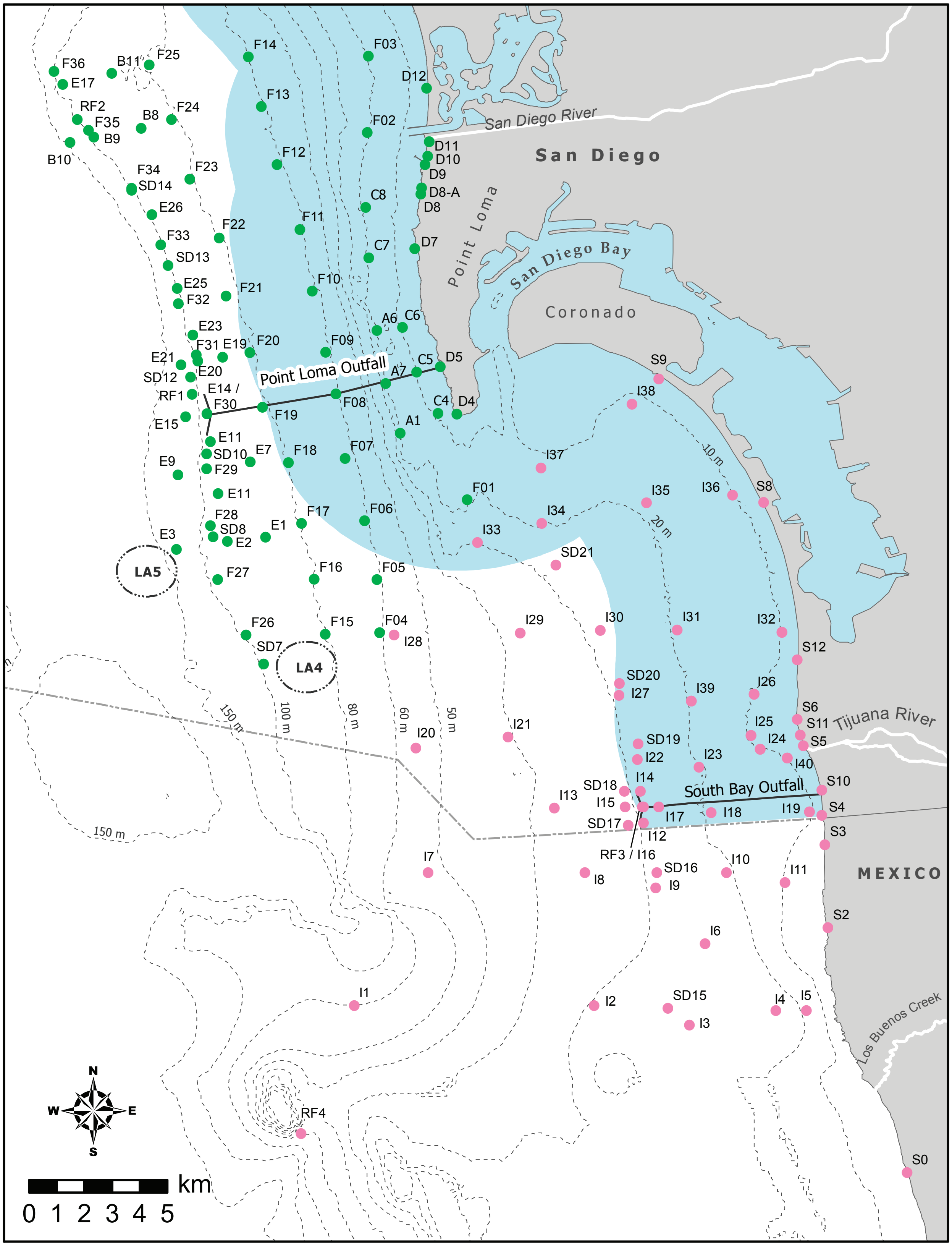

Figure 1.1
Core receiving waters monitoring stations for the PLOO (green) and SBOO (pink) as part of the City of San Diego's Ocean Monitoring Program. Light blue shading represents State of California jurisdictional waters.

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	October 1, 2017–September 30, 2022
SBWRP	SBOO	CA0109045	R9-2013-0006 [a]	April 4, 2013–April 3, 2018
SBIWTP	SBOO	CA0108928	R9-2014-0009 [b]	August 1, 2014–July 31, 2019

[a] Order R9-2013-0006 amended by Order R9-2014-0071 and R9-2017-0023 (permit administratively extended)

[b] Order R9-2014-0009 amended by Order R9-2014-0094, R9-2017-0024 and R9-2019-0012

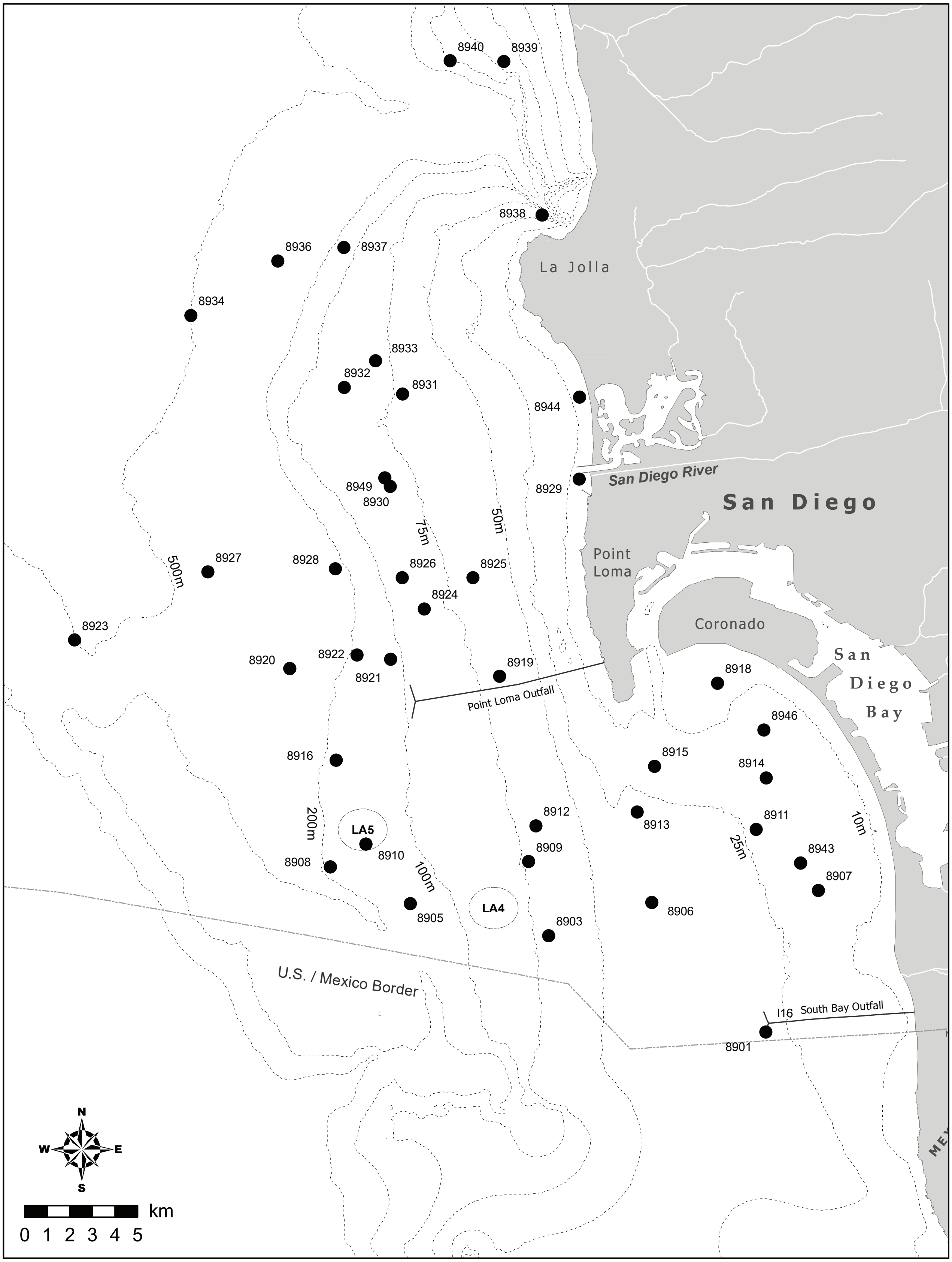

Figure 1.2

Regional randomly selected benthic survey stations sampled during summer 2020 as part of the City of San Diego's Ocean Monitoring Program.

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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 2015). This chapter presents summaries and preliminary analyses of the oceanographic and microbiological data collected during 2020 at a total of 103 water quality monitoring stations and two real-time oceanographic mooring systems (RTOMS) surrounding the PLOO and SBOO. Raw data summaries supporting these results are presented in Appendix A. A more comprehensive assessment of these results will be presented in the 2020-2021 Biennial Assessment Report to be submitted by July 1, 2022.

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, SWRCB 2015). These include eight PLOO stations (D4, D5, D7, 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, the following modifications to sampling locations, which were fully approved by the Regional Board, have occurred: (1) Station D8 was replaced by alternate station D8-A during July 2016; (2) D8-A was subsequently replaced by station D8-B in March 2018; (3) D8-A sampling resumed in December 2020. The remaining three SBOO shore stations (S0, S2, S3) are located south of the international border and are not subject to Ocean Plan comliance standards.

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, *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 2020–2021a,b), and are available online (City of San Diego 2021b).

Kelp and other offshore stations

Fifteen stations located in relatively shallow waters within or near the Point Loma or Imperial Beach kelp forests (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 SBOO 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 2020 with the 36 PLOO and 33 SBOO stations sampled over three to five days during each survey (Table 2.2). 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 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 Table 2.3. 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 collection. These observations have been previously reported in monthly receiving waters monitoring reports submitted to the SDRWQCB (see City of San Diego 2020–2021a,b), and are available online (City of San Diego 2021b).

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.

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 second PLOO deployment occurred from October 7, 2019 to September 29, 2020, and the third SBOO deployment occurred from December 18, 2019 to December 17, 2020. Each RTOMS was outfitted with a series of instruments/sensors at fixed depths (Table 2.4). Critical parameters that were measured on a real-time basis, by both systems, included temperature, conductivity (salinity), total pH, DO, dissolved carbon dioxide (xCO_2), nitrogen (nitrate + nitrite), chlorophyll *a*, CDOM, biological oxygen demand (BOD), 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, which was recorded at 1-hour intervals, and xCO_2, which was recorded at 10-hour intervals. Equipment problems and sensor failures resulted in data gaps, and RTOMS data presented here include only data collected in real-time. For a summary of data issues and additional information on specific sensor issues and challenges experienced, see Addendum 2-1.

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).

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 2021a).

Data Analyses

Oceanographic conditions

Water column parameters measured in 2020 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, 2020) and various functions within the following packages: zoo, reshape2, Rmisc, gridExtra, mixOmics, fields, ggplot2, data.table, Hmisc, oce, RODBC, tidyr, dplyr (Zeileis and Grothendieck 2005, Wickham 2007, Hope 2013, Auguie 2017, Rohart et al. 2017, Nychka et al. 2017, Wickham et al. 2018, Dowle and Srinivasan 2020, Harrell et al. 2020, Kelley and Richards 2020, Ripley and Lapsley 2020, Wickham and Henry 2020, Wickham and Francois 2021).

Bacteriological compliance

Compliance with Ocean Plan water contact standards was summarized as the number of times per sampling period that each shore, kelp, and offshore station within State waters exceeded geometric mean or single sample maximum (SSM) standards for total coliforms, fecal coliforms, and *Enterococcus* (Table 2.1, SWRCB 2015). Compliance calculations were limited to shore, kelp and offshore stations located within State waters, and included resamples. 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). All stations along the 9-m depth contour were excluded from analyses due to the potential for coastal runoff or sediment resuspension in shallow nearshore waters to confound any CDOM signal that could be associated with plume dispersion from the outfalls. Previous monitoring results have consistently shown that the PLOO plume remains trapped below the pycnocline with no evidence of surfacing throughout the year (City of San Diego 2010a–2014a, 2015a,b, 2016a, 2018, 2020, Rogowski et al. 2012a, b, 2013, Hess 2019, Hess 2020). In contrast, the SBOO plume stays trapped below the pycnocline during seasonal periods of water column stratification, but may rise to the surface when waters become more mixed and stratification breaks down (City of San Diego 2010b–2014b, 2015c, 2016b, 2018, 2020, Terrill et al. 2009, Hess 2019, Hess 2020). Water column stratification and pycnocline depth were quantified using buoyancy frequency (BF, cycles/min) calculations for each quarterly survey. This measure of the water column's static stability was used to quantify the magnitude of stratification for each survey and was calculated as follows:

$$BF = \sqrt{((g)/\rho) \times (d\rho/dz)}$$

where g is the acceleration due to gravity, ρ is the seawater density, and $d\rho/dz$ is the density gradient (Mann and Lazier 1991). The depth of maximum BF was used as a proxy for the depth at which stratification was the greatest. If the water column was determined to be stratified (i.e., maximum BF > 5.5 cycles/min), subsequent analyses were limited to depths below the pycnocline.

Identification of potential plume signal was determined for each quarterly survey at each monitoring station on a combination of CDOM, chlorophyll a and salinity levels, as well as a visual review of the overall water column profile. Detection thresholds for the PLOO and SBOO stations were adaptively set for each quarterly sampling period according to the criteria described in City of San Diego (2016a, b). It should be noted that these thresholds are based on observations of ocean properties specific to the distinct PLOO and SBOO monitoring regions and are thus constrained to use within those regions. Finally, water column profiles were visually interpreted to remove stations with spurious signals (e.g., CDOM signals near the sea floor that were likely caused by resuspension of sediments). All analyses were performed using R (R Core Team, 2020) and the various functions within the following packages: reshape2, Rmisc, gridExtra, fields, mixOmics, gtools, oce, RODBC, tidyverse, pracma (Wickham 2007, Hope 2013, Auguie 2017, Nychka et al 2017, Rohart et al 2017, Warnes et al 2018, Kelley and Richards 2020, Ripley and Lapsley 2020, Wickham et al. 2020, Borchers 2021).

The effect of any potential "plume detection" on local water quality was evaluated by comparing mean values of DO, pH, and transmissivity within the possible plume boundaries to thresholds calculated for the same depths from reference stations. Stations with CDOM values below the 85^{th} percentile were considered "reference" (Appendix A.1). Individual non-reference stations were then determined to be out-of-range (OOR) compared to the reference stations if values for the above parameters exceeded narrative water quality standards defined in the Ocean Plan (see Table 2.1). For example, the Ocean Plan defines OOR thresholds for DO as a 10% reduction from that which occurs naturally, for pH as a 0.2 pH unit change, and for transmissivity as below the lower 95% confidence interval from the mean. For purposes of this report, “naturally” is defined for DO as the mean concentration minus one standard deviation (see Nezlin et al. 2016).

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, 2020). Results of QARTOD tests are included in Addenda 2-2, 2-3, and 2-4; see City of San Diego 2020 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 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 nitrate + nitrate results.

Analyses were performed in R (R Development Core Team 2020) using functions within various packages: reshape2, lubridate, Rmisc, mixOmics, gtools, purrr, ggplot2, tidyverse, data.table, pracma, and dplyr (Wickham 2007, Grolemund and Wickham 2011, Hope 2013, Rohart et al. 2017, Warnes et al. 2018, Henry and Wickham 2019, Wickham et al. 2018, Wickham et al. 2019, Dowle and Srinivasan 2020, Borchers 2021, Wickham and Francois 2021). 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 ADCP data (ADCPs: Acoustic Doppler Current Profilers; 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 2020 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 2020–2021a, b).

Oceanographic Conditions

Ocean temperature, salinity, DO, pH, transmissivity, and chlorophyll *a* data collected by CTD during 2020 in the PLOO and SBOO monitoring regions are summarized by depth layer for the entire year in Tables 2.5 and 2.6, and by depth layer for each survey in Appendices A.2 and A.3. These same parameters are plotted by depth and survey in Appendices A.4–A.15. Ocean temperature, salinity, DO, total pH, chlorophyll *a*, CDOM, turbidity, nitrate + nitrite, BOD, and xCO_2 data collected by PLOO and SBOO RTOMS during 2020 are summarized by depth and season in Appendices A.16 and A.17. Ocean current velocity and magnitude are summarized by depth layer and season in Appendices A.18 and A.19. All parameters except current velocity are plotted over time in Appendix A.20.

Bacteriological Compliance

Compliance rates for all Ocean Plan water contact standards are summarized in Tables 2.7 and 2.8. All seawater samples collected from the PLOO and SBOO water quality stations that contained elevated FIB densities are listed in Appendices A.21 and A.22.

Plume Dispersion and Effects

The dispersion of wastewater plumes in 2020 and their effects on natural light, DO and pH levels in local ocean waters off San Diego were assessed by evaluating the results of 164 CTD profile casts performed at the PLOO stations and another 116 CTD casts performed at the SBOO stations. CDOM is plotted by depth and survey in Appendix A.23 and A.24. Potential plume detection results are summarized in Appendices A.25 and A.26.

Summary

During 2020, oceanographic conditions off San Diego were generally within historical ranges reported for the PLOO and SBOO monitoring regions. However, an unprecedented, large spring phytoplankton bloom resulted in higher than normal DO, pH, and chlorophyll *a*, and record low xCO_2, observed near the surface by CTD profiles and RTOMS in April/May 2020, corresponding to a regional red tide event (Anderson and Hepner-Medina, 2020). Conditions typically indicative of coastal upwelling were most evident during the spring months, while maximum stratification or layering of the water column occurred during mid-summer, 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.

The detection of the PLOO and SBOO wastewater plumes and their effects on various water quality indicators, such as natural light levels, DO concentrations, and pH, were low in 2020. Additionally, 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. Samples collected from SBOO shore stations showed notably lower compliance rates this year, particularly in March and April 2020. These data coincide with unusually high transboundary flows from the Tijuana River reported for this period (IBWC, 2020). Reduced compliance in both outfall regions tends 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

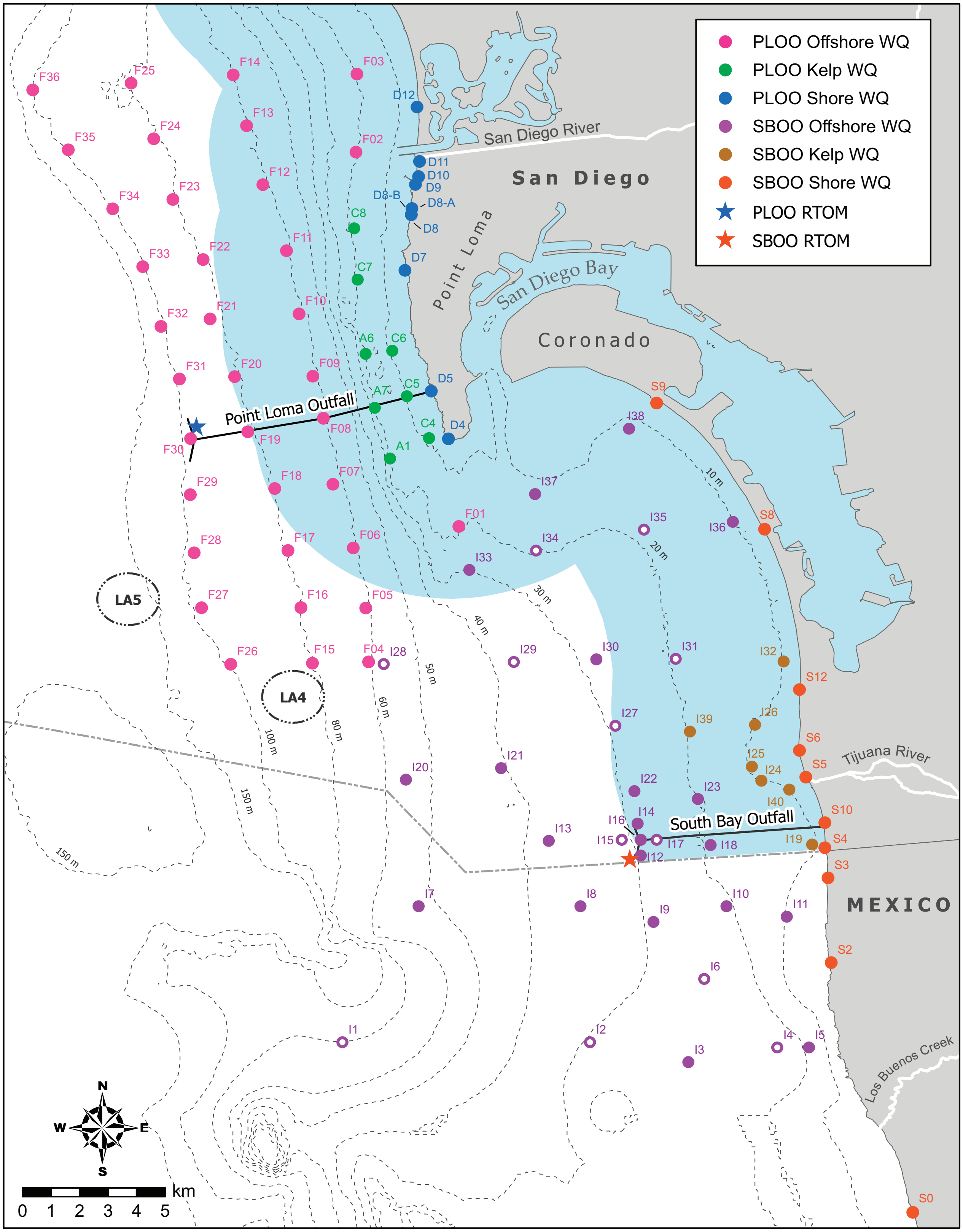

Figure 2.1

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 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

Table 2.2

Sample dates for quarterly oceanographic surveys conducted during 2020. 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	18	18	17	11	Kelp WQ	10	26	27	2
18 & 60-m WQ	20	22	19	12	North WQ	14	29	25	5
80-m WQ	21	21	20	13	Mid WQ	13	28	24	4
98-m WQ	19	20	18	10	South WQ	12	27	26	3

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

Sensor configuration and model type for RTOMS by site and depth during 2020.

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)
		BOD (Chelsea UviLux)
30 m (cage-1)		Temperature, conductivity, pH, DO (Sea-Bird SeapHOx)
		Chlorophyll *a*, CDOM, turbidity (Sea-Bird ECO triplet)
		BOD (Chelsea UviLux)
45 m		Temperature, conductivity (Sea-Bird MicroCAT)
60 m		Temperature, conductivity (Sea-Bird MicroCAT)
75 m		Temperature, conductivity (Sea-Bird MicroCAT)
90 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)
		BOD (Chelsea UviLux)

Table 2.5

Summary of temperature, salinity, dissolved oxygen (DO), pH, transmissivity, and chlorophyll *a* for various depth layers as well as the entire water column for all PLOO stations during 2020. See Appendix A.2 for sample sizes.

		Depth (m)				
Parameter		**1–20**	**21–60**	**61–80**	**81–98**	**1–98**
Temperature (°C)	min	11.2	10.1	10.0	9.7	9.7
	max	23.9	16.4	13.1	12.1	23.9
	mean	16.1	12.6	11.3	10.9	13.3
Salinity (ppt)	min	33.31	33.31	33.48	33.58	33.31
	max	33.98	33.92	33.96	34.04	34.04
	mean	33.59	33.59	33.71	33.80	33.63
DO (mg/L)	min	1.9	2.9	3.0	3.1	1.9
	max	9.3	8.5	6.8	6.3	9.3
	mean	7.1	6.0	4.8	4.2	6.0
pH	min	7.6	7.7	7.7	7.7	7.6
	max	8.4	8.2	8.0	7.9	8.4
	mean	8.1	7.9	7.8	7.8	8.0
Transmissivity (%)	min	22	84	28	55	22
	max	93	94	94	94	94
	mean	85	91	91	90	89
Chlorophyll *a* (µg/L)	min	0.2	0.1	0.1	0.1	0.1
	max	31.8	5.1	3.7	0.7	31.8
	mean	2.3	1.1	0.4	0.3	1.3

Table 2.6

Summary of temperature, salinity, dissolved oxygen (DO), pH, transmissivity, and chlorophyll *a* for various depth layers as well as the entire water column for all SBOO stations during 2020. See Appendix A.3 for sample sizes.

		Depth (m)					
Parameter		**1–9**	**10–19**	**20–28**	**29–38**	**39–55**	**1–55**
Temperature (°C)	min	12.2	11.6	11.4	11.3	10.5	10.5
	max	23.8	20.7	17.6	15.4	15.1	23.8
	mean	17.3	15.0	14.0	13.4	12.8	15.3
Salinity (ppt)	min	33.27	33.27	33.38	33.38	33.41	33.27
	max	34.28	33.84	33.76	33.76	33.87	34.28
	mean	33.57	33.54	33.54	33.54	33.58	33.55
DO (mg/L)	min	1.3	0.6	4.0	3.9	3.5	0.6
	max	9.9	9.5	8.7	8.5	8.2	9.9
	mean	7.8	7.3	6.8	6.5	6.0	7.2
pH	min	7.6	7.5	7.8	7.8	7.7	7.5
	max	8.3	8.3	8.2	8.1	8.1	8.3
	mean	8.1	8.1	8.0	8.0	7.9	8.1
Transmissivity (%)	min	47	41	73	84	88	41
	max	92	92	92	93	93	93
	mean	81	85	88	90	91	85
Chlorophyll *a* (µg/L)	min	0.2	0.3	0.4	0.5	0.3	0.2
	max	12.3	7.9	5.4	5.0	3.7	12.3
	mean	2.1	2.3	2.2	1.7	1.1	2.1

Table 2.7

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 2020. 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	99	100	100	100	100	100	100	100	100	100	100	97
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	100	100	100	100	100	100	100	100	100	100	100	100
Entero	98	100	94	98	100	100	100	100	100	97	100	100
F:T	100	100	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	100	ns	ns	98	ns	ns	98	ns	ns	94	ns

Table 2.8

Compliance rates for the three geometric mean water-contact standards and the four single sample maximum water contact standards for SBOO monitoring stations sampled during 2020. SBOO offshore stations are sampled quarterly; ns = not sampled.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Geometric Mean												
Shore Stations												
Total	52	63	50	27	54	77	77	88	100	100	100	100
Fecal	52	63	42	23	53	81	76	91	100	100	100	100
Entero	30	63	29	4	19	60	60	82	100	100	100	100
Kelp Stations												
Total	68	86	94	69	89	100	100	100	100	100	100	100
Fecal	76	86	93	70	84	100	100	100	100	100	100	100
Entero	48	60	83	48	46	100	100	89	100	100	100	100
Single Sample Maximum												
Shore Stations												
Total	73	70	48	43	70	70	78	89	98	100	92	100
Fecal	54	56	37	28	53	70	64	87	87	100	89	100
Entero	47	40	35	12	46	57	58	86	87	100	91	100
F:T	52	50	43	27	54	66	69	84	87	100	89	100
Kelp Stations												
Total	90	99	90	90	100	100	100	97	90	100	99	100
Fecal	76	85	80	70	98	100	100	89	81	100	96	100
Entero	68	81	87	50	93	100	95	91	81	100	100	100
F:T	72	85	76	68	99	100	99	90	86	100	95	100
Offshore Stations												
Total	ns	100	ns	ns	100	ns	ns	100	ns	ns	100	ns
Fecal	ns	100	ns	ns	100	ns	ns	100	ns	ns	100	ns
Entero	ns	100	ns	ns	100	ns	ns	100	ns	ns	100	ns
F:T	ns	100	ns	ns	100	ns	ns	100	ns	ns	100	ns

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Chapter 3
Benthic Conditions

Chapter 3. Benthic Conditions

Introduction

The City of San Diego 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 2020 at PLOO, SBOO, and San Diego regional benthic monitoring stations. Raw data summaries supporting these results are presented in Appendix B. A more comprehensive assessment of these results will be presented in the 2020-2021 Biennial Assessment Report to be submitted by July 1, 2022.

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 2020 (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 7 to 523 m, including 11 sites along the inner shelf (7–30 m), 17 sites along the mid-shelf (30–120 m), six sites along the outer shelf (120–200 m), and six sites on the upper slope (200–523 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 (see Addenda 1-1A, 1-1B, 1-1C). 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 sediment chemistry and 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.

Sediment Chemistry

A detailed description of the analytical protocols can be found in City of San Diego (2021). Briefly, sediment sub-samples were analyzed on a dry weight basis to determine concentrations of various indictors of organic loading (i.e., biochemical oxygen demand, total organic carbon, total nitrogen, total sulfides, total volatile solids), 18 trace metals, 9 chlorinated pesticides, 42 polychlorinated biphenyl compound congeners (PCBs), and 24 polycyclic aromatic hydrocarbons (PAHs). These data were generally limited to values above the method detection limit (MDL) for each parameter (see Appendix B.2). However, concentrations below MDLs were included as estimated values if presence of the specific constituent was verified by mass spectrometry.

Sediment Toxicity Testing

A detailed description of the sediment toxicity testing protocols can be found in City of San Diego (2020b). 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 approved for Southern California Bight 2018 Regional Monitoring Program (Parks et al. 2020). Juvenile *E. estuarius* were exposed for 10 days to both test and control sediments. Response criteria included amphipod mortality, emergence from sediment during exposure, 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 2018).

Data Analyses

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), and total PAH (tPAH) were calculated for each sample as the sum of all constituents with reported values for individual constituents. Contaminant concentrations were compared to the Effects Range Low (ERL) and Effects Range Median (ERM) sediment quality guidelines of Long et al. (1995) when available. ERLs represent chemical concentrations below which adverse biological effects are rarely observed, while values above ERLs, but below ERMs, represent levels at which effects occasionally occur. Concentrations above the ERM indicate likely biological effects, although these may not always be validated by toxicity testing (Schiff and Gossett 1998). Analyses were performed using R (R Core Team 2020) and various functions within the dplyr, plyr, reshape2, tidyr, and zoo 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 2020b).

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-m^2 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 2020) and various functions within the reshape2, Rmisc, RODBC, tidyverse, and vegan packages (Wickham 2007, 2017, Hope 2013, Oksanen et al. 2017, Ripley and Lapsley 2017).

Multivariate analyses were performed using PRIMER v7 software to examine spatial and temporal patterns in macrofaunal data collected at the 89 PLOO, SBOO, and regional benthic stations sampled during summer 2020 (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 grain size (i.e., main particle size fractions) and chemistry data are summarized for PLOO, SBOO, and regional benthic stations in Tables 3.1 and 3.2. Sediment particle size composition is described for each sample in Appendices B.3, B.4, and B.5. Concentrations of organic loading indicators are listed by sample in Appendices B.6, B.7, and B.8, trace metals are listed by sample in B.9, B.10, and B.11, pesticides are listed by sample in B.12, B.13, and B.14, PCBs are listed by sample in B.15, B.16, and B.17, and PAHs are listed by sample in B.18, B.19, and B.20. Results for sediment toxicity samples collected during 2020 are summarized in Table 3.3.

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. These same parameters are listed by sample in Appendices B.21, B.22, and B.23. The 25 most abundant macroinvertebrate taxa identified at PLOO and SBOO stations during 2020 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. Total numbers of each individual taxon encountered are listed in Appendices B.24, B.25, and B.26. 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 2020 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 2020 was similar to previous years (e.g., City of San Diego 2020a), 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). No evidence of sediment toxicity was observed at any offshore station tested in the San Diego region during 2020, regardless of depth, sediment type, or proximity to either outfall. These results 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 2020), 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).

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Chapter 3

Figures & Tables

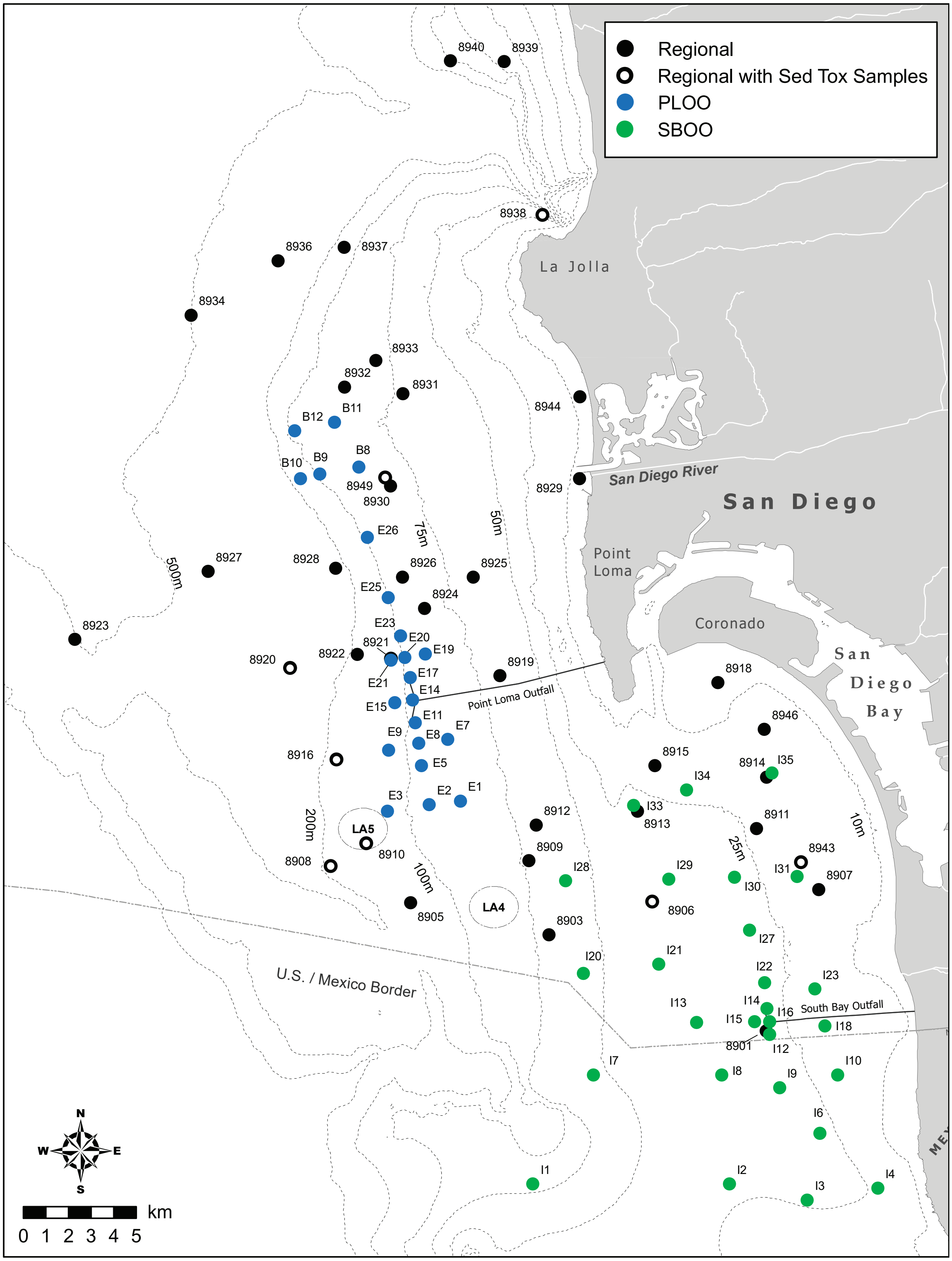

Figure 3.1
Benthic station locations sampled around the PLOO and SBOO as part of the City of San Diego's Ocean Monitoring Program.

Table 3.1

Summary of particle sizes and chemistry concentrations in sediments from PLOO and SBOO benthic stations sampled during 2020. 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; n = number of samples; nd = not detected; na = not analyzed.

	PLOO				SBOO			
Parameter	**DR (%)**	**Mean**	**Min**	**Max**	**DR (%)**	**Mean**	**Min**	**Max**
Particle Size (%)								
Coarse Particles	14	0.0	38.6	11.6	41	0.0	46.1	7.8
Med-Coarse Sands	100	0.1	26.0	2.6	94	0.0	92.3	29.2
Fine sands	100	24.3	63.1	39.2	98	0.0	89.2	38.3
Fines	100	17.3	73.1	56.6	96	0.0	100.1	32.9
Organic Indicators								
BOD (ppm)	100	187	546	263	na	—	—	—
Sulfides (ppm)	86	nd	30.80	5.14	46	nd	28.90	5.47
TN (% weight)	100	0.032	0.113	0.051	43	nd	0.062	0.027
TOC (% weight)	100	0.28	3.49	0.77	83	nd	1.15	0.24
TVS (% weight)	100	1.2	3.7	2.1	100	0.4	1.7	0.9
Trace Metals (ppm)								
Aluminum	100	4440	11,000	6847	100	597	7220	3278
Antimony	100	0.8	2.9	1.1	96	nd	1.3	0.6
Arsenic	100	1.79	5.72	2.90	100	0.84	8.95	2.50
Barium	100	13.1	54.1	27.2	100	0.3	38.9	15.1
Beryllium	100	0.1	0.3	0.2	100	0.0	0.1	0.1
Cadmium	50	nd	0.08	0.07	22	nd	0.07	0.04
Chromium	100	10.0	23.9	15.1	100	2.3	13.4	8.4
Copper	100	4.2	17.0	6.6	50	nd	4.9	2.8
Iron	100	6300	18,900	10,369	100	1190	8820	4954
Lead	100	1.9	7.5	3.3	100	0.8	3.2	1.6
Manganese	100	51.3	138.0	81.1	100	6.1	101.0	44.0
Mercury	100	0.008	0.057	0.025	41	nd	0.020	0.009
Nickel	100	3.8	10.0	5.9	100	0.5	5.0	2.0
Selenium	20	nd	0.54	0.32	0	—	—	—
Silver	0	—	—	—	0	—	—	—
Thallium	0	—	—	—	0	—	—	—
Tin	100	0.5	1.5	0.8	100	0.1	1.2	0.4
Zinc	100	16.8	52.5	25.7	100	1.7	41.3	11.0
Pesticides (ppt)								
Total Chlordane	34	nd	248	65	17	nd	169	49
Total DDT	100	93	1213	532	74	nd	3493	281
Dieldrin	2	nd	9	9	2	nd	10	10
Endosulfan Sulfate	2	nd	13	13	0	—	—	—
Hexachlorobenzene	23	nd	167	77	9	nd	179	78
Total HCH	7	nd	19	14	22	nd	218	40
Mirex	0	—	—	—	2	nd	29	29
Total PCB (ppt)	100	95	4563	977	37	nd	1881	351
Total PAH (ppb)	95	nd	199	43	48	nd	53	13

Table 3.2

Summary of particle sizes and chemistry concentrations in sediments from San Diego regional benthic stations sampled during summer 2020. 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.

	2020 Survey Area				Depth Strata			
					Inner Shelf	Mid-Shelf	Outer Shelf	Upper Slope
Parameters	DR (%)	Min	Max	Mean	n=11	n=17	n=6	n=6
Particle Size (%)								
Coarse particles	13	0.0	14.2	8.1	4.5	10.5	0.0	0.0
Med-coarse sands	100	0.1	77.0	7.0	9.0	10.2	1.2	0.1
Fine sands	100	11.4	84.2	41.1	62.9	35.8	35.4	21.9
Fines	100	7.4	87.7	50.9	27.3	52.1	63.5	78.0
Organic Indicators								
Sulfides (ppm)	95	nd	42.90	13.57	16.41	9.84	13.51	18.83
TN (% weight)	85	nd	0.270	0.081	0.026	0.058	0.085	0.189
TOC (% weight)	98	nd	3.39	0.92	0.16	0.61	1.35	2.63
TVS (% weight)	100	0.5	9.5	2.9	0.9	2.3	3.7	7.3
Trace Metals (ppm)								
Aluminum	100	1390	15,700	6859	3238	6787	8548	12,008
Antimony	95	nd	1.4	0.6	0.3	0.6	0.7	1.0
Arsenic	100	0.83	3.83	2.05	1.36	2.33	2.42	2.15
Barium	100	2.1	120.0	36.4	18.1	31.2	44.0	77.3
Beryllium	50	nd	0.4	0.1	nd	0.1	0.2	0.3
Cadmium	25	nd	0.18	0.08	0.05	0.07	0.13	nd
Chromium	100	4.2	41.9	16.4	7.4	15.5	20.1	32.0
Copper	93	nd	34.5	8.7	2.4	6.8	15.6	16.3
Iron	100	3130	24,100	10,598	4728	10,582	14,203	17,800
Lead	100	0.9	72.7	5.3	1.5	3.9	16.7	4.6
Manganese	100	13.2	158.0	83.6	53.5	82.6	100.4	124.9
Mercury	83	nd	0.107	0.043	0.009	0.039	0.063	0.061
Nickel	100	0.9	21.7	7.0	2.0	6.1	9.2	16.4
Selenium	18	nd	0.87	0.55	nd	0.29	0.44	0.67
Silver	0	—	—	—	—	—	—	—
Thallium	20	nd	0.223	0.177	0.153	0.199	0.211	0.173
Tin	75	nd	2.8	0.8	0.3	0.8	1.4	1.0
Zinc	100	7.1	79.2	28.6	12.2	26.4	43.3	50.2
Pesticides (ppt)								
Total Chlordane	48	nd	918	107	81	80	211	49
Total DDT	98	nd	4231	940	80	637	1219	2951
Dieldrin	8	nd	66	62	56	66	65	nd
Hexachlorobenzene	25	nd	71	46	nd	40	50	51
Total HCH	10	nd	131	63	89	131	12	20
Mirex	8	nd	41	27	21	21	nd	41
Total PCB (ppt)	77	nd	13,651	1876	116	1733	3560	1428
Total PAH (ppb)	90	nd	318	62	14	34	140	121

Table 3.3

Bioassay results (10-day amphipod survival tests) for sediment toxicity testing conducted for San Diego regional benthic stations sampled during summer 2020. Percent fines = percentage of silt + clay combined. Test results are expressed as mean percent survival ± 1 standard deviation.

Survey	Site/Sample	Depth Stratum	Station Depth (m)	Percent Fines	Sample Date	Test Initiation	% Survival (Mean ± SD)
Summer 2020	Lab Control	—	—	—	—	7/21/20	95 ± 6.1
	8943	Inner Shelf	19	37.0	7/13/2020	7/21/2020	98 ± 2.7
	8938	Inner Shelf	28	54.2	7/14/2020	7/21/2020	99 ± 2.2
	8906	Mid Shelf	41	13.6	7/13/2020	7/21/2020	96 ± 4.2
	8930	Mid Shelf	83	55.1	7/14/2020	7/21/2020	98 ± 4.5
	8910	Outer Shelf	169	51.7	7/13/2020	7/21/2020	93 ± 6.7
	8916	Outer Shelf	189	53.3	7/13/2020	7/21/2020	96 ± 8.9
	8908	Outer Shelf	194	51.1	7/13/2020	7/21/2020	92 ± 8.4
	8920	Upper Slope	270	55.9	7/14/2020	7/21/2020	97 ± 4.2

Table 3.4

Summary of macrofaunal community parameters for PLOO, SBOO, and San Diego regional benthic stations sampled during 2020. 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	82	421	3.6	0.81	23	14
(n = 44)	95% CI	5	29	0.1	0.02	3	2
	Min	54	241	2.9	0.70	11	8
	Max	115	636	4.2	0.90	41	33
All SBOO Grabs	Mean	60	226	3.3	0.83	21	16
(n = 54)	95% CI	8	51	0.1	0.02	3	2
	Min	17	30	2.3	0.64	6	1
	Max	160	890	4.3	0.92	52	28
All Regional Grabs	Mean	60	265	3.3	0.81	19	17
(n = 40)	95% CI	8	49	0.2	0.04	3	2
	Min	20	48	0.4	0.12	1	8
	Max	113	645	4.1	0.94	40	28

Table 3.5

The 25 most abundant macroinvertebrate taxa collected from PLOO benthic stations during 2020. 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	14	100	57
Axinopsida serricata	Mollusca: Bivalvia	10	95	43
Mediomastus sp	Polychaeta: Capitellidae	5	100	20
Amphiodia urtica	Echinodermata: Ophiuroidea	5	89	19
Prionospio jubata	Polychaeta: Spionidae	4	100	15
Spiophanes kimballi	Polychaeta: Spionidae	3	95	15
Paradiopatra parva	Polychaeta: Onuphidae	3	98	12
Amphiuridae	Echinodermata: Ophiuroidea	2	89	9
Tellina sp B	Mollusca: Bivalvia	2	84	9
Eclysippe trilobata	Polychaeta: Ampharetidae	2	91	8
Prionospio dubia	Polychaeta: Spionidae	2	93	8
Praxillella pacifica	Polychaeta: Maldanidae	2	89	8
Scoloplos armiger Cmplx	Polychaeta: Orbiniidae	2	95	8
Euclymeninae sp A	Polychaeta: Maldanidae	2	89	7
Aphelochaeta glandaria Cmplx	Polychaeta: Cirratulidae	2	93	7
Amphiodia sp	Echinodermata: Ophiuroidea	2	86	7
Phisidia sanctaemariae	Polychaeta: Terebellidae	2	86	6
Rhepoxynius bicuspidatus	Arthropoda: Amphipoda	1	86	6
Maldanidae	Polychaeta: Maldanidae	1	91	5
Heteronemertea sp SD2	Nemertea: Heteronemertea	1	93	4
Tellina carpenteri	Mollusca: Bivalvia	1	68	4
Nuculana sp A	Mollusca: Bivalvia	1	89	4
Glycera nana	Polychaeta: Glyceridae	1	82	3
Rhodine bitorquata	Polychaeta: Maldanidae	1	77	3
Chaetozone hartmanae	Polychaeta: Cirratulidae	1	82	3

Table 3.6

The 25 most abundant macroinvertebrate taxa collected from SBOO benthic stations during 2020. 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 duplex	Polychaeta: Spionidae	7	78	16
Spiophanes norrisi	Polychaeta: Spionidae	7	89	16
Jasmineira sp B	Polychaeta: Sabellidae	3	15	6
Mediomastus sp	Polychaeta: Capitellidae	3	57	6
Protodorvillea gracilis	Polychaeta: Dorvilleidae	2	33	5
Paramphinome sp	Polychaeta: Amphinomidae	2	4	5
Hesionura coineaui difficilis	Polychaeta: Phyllodocidae	2	7	5
Chondrochelia dubia Cmplx	Arthropoda: Tanaidacea	2	76	5
Pisione sp	Polychaeta: Sigalionidae	2	7	4
Lanassa venusta venusta	Polychaeta: Terebellidae	2	26	4
Dendraster terminalis	Echinodermata: Echinoidea	2	35	3
Sigalion spinosus	Polychaeta: Sigalionidae	1	74	3
Spiochaetopterus costarum Cmplx	Polychaeta: Chaetopteridae	1	65	3
Nematoda	Nematoda	1	63	3
Rhepoxynius heterocuspidatus	Arthropoda: Amphipoda	1	30	3
Gadila aberrans	Mollusca: Scaphopoda	1	48	2
Onuphidae	Polychaeta: Onuphidae	1	26	2
Sthenelanella uniformis	Polychaeta: Sigalionidae	1	26	2
Tellina modesta	Mollusca: Bivalvia	1	39	2
Euclymeninae sp A	Polychaeta: Maldanidae	1	54	2
Tubulanus polymorphus	Nemertea: Palaeonemertea	1	50	2
Rhepoxynius menziesi	Arthropoda: Amphipoda	1	59	2
Glycera oxycephala	Polychaeta: Glyceridae	1	28	2
Mooreonuphis sp	Polychaeta: Onuphidae	1	19	2
Euphilomedes carcharodonta	Arthropoda: Ostracoda	1	43	2

Table 3.7

The 10 most abundant macroinvertebrate taxa per depth stratum collected from San Diego regional benthic stations sampled during summer 2020. PA = percent abundance, FO = frequency of occurrence, MAG = mean abundance per grab.

Strata	Taxon	Taxonomic Classification	PA	FO	MAG
Inner	*Prionospio pygmaeus*	Polychaeta: Spionidae	27	82	59
Shelf	*Mediomastus* sp	Polychaeta: Capitellidae	6	64	13
n = 11	*Spiophanes duplex*	Polychaeta: Spionidae	5	100	12
	Spiophanes norrisi	Polychaeta: Spionidae	4	100	8
	Owenia collaris	Polychaeta: Oweniidae	2	36	5
	Spiochaetopterus costarum Cmplx	Polychaeta: Chaetopteridae	2	73	5
	Gadila aberrans	Mollusca: Scaphopoda	2	55	4
	Carinoma mutabilis	Nemertea: Palaeonemertea	1	73	3
	Callianax baetica	Mollusca: Gastropoda	1	45	3
	Tellina modesta	Mollusca: Bivalvia	1	100	3
Mid-shelf	*Spiophanes duplex*	Polychaeta: Spionidae	14	100	51
n = 17	*Amphiodia urtica*	Echinodermata: Ophiuroidea	9	82	35
	Axinopsida serricata	Mollusca: Bivalvia	7	88	24
	Mediomastus sp	Polychaeta: Capitellidae	4	100	15
	Amphiuridae	Echinodermata: Ophiuroidea	4	88	13
	Paradiopatra parva	Polychaeta: Onuphidae	3	88	10
	Amphiodia sp	Echinodermata: Ophiuroidea	2	82	9
	Prionospio jubata	Polychaeta: Spionidae	2	94	8
	Spiophanes kimballi	Polychaeta: Spionidae	2	71	8
	Euclymeninae sp A	Polychaeta: Maldanidae	2	94	7
Outer	*Phyllochaetopterus limicolus*	Polychaeta: Chaetopteridae	13	100	33
Shelf	*Axinopsida serricata*	Mollusca: Bivalvia	11	100	28
n = 6	*Mediomastus* sp	Polychaeta: Capitellidae	7	100	18
	Paraprionospio alata	Polychaeta: Spionidae	5	100	13
	Spiophanes kimballi	Polychaeta: Spionidae	5	100	11
	Paradiopatra parva	Polychaeta: Onuphidae	4	83	11
	Prionospio jubata	Polychaeta: Spionidae	4	83	10
	Spiophanes duplex	Polychaeta: Spionidae	3	67	8
	Laonice nuchala	Polychaeta: Spionidae	3	50	6
	Scoletoma tetraura Cmplx	Polychaeta: Lumbrineridae	2	83	4

Table 3.7 *continued*

Strata	Species	Taxonomic Classification	PA	FO	MAG
Upper Slope n = 6	*Paraprionospio alata*	Polychaeta: Spionidae	17	67	12
	Maldane sarsi	Polychaeta: Maldanidae	9	67	7
	Prionospio ehlersi	Polychaeta: Spionidae	6	83	4
	Phyllochaetopterus limicolus	Polychaeta: Chaetopteridae	5	50	4
	Pectinaria californiensis	Polychaeta: Pectinariidae	4	67	3
	Eclysippe trilobata	Polychaeta: Ampharetidae	3	50	2
	Mediomastus sp	Polychaeta: Capitellidae	3	50	2
	Yoldiella nana	Mollusca: Bivalvia	2	50	1
	Aphelochaeta monilaris	Polychaeta: Cirratulidae	1	50	1
	Axinopsida serricata	Mollusca: Bivalvia	1	50	1
	Bipalponephtys cornuta	Polychaeta: Nephtyidae	1	33	1
	Fauveliopsis sp SD1	Polychaeta: Fauveliopsidae	1	33	1
	Prionospio jubata	Polychaeta: Spionidae	1	33	1
	Sternaspis affinis	Polychaeta: Sternaspidae	1	33	1

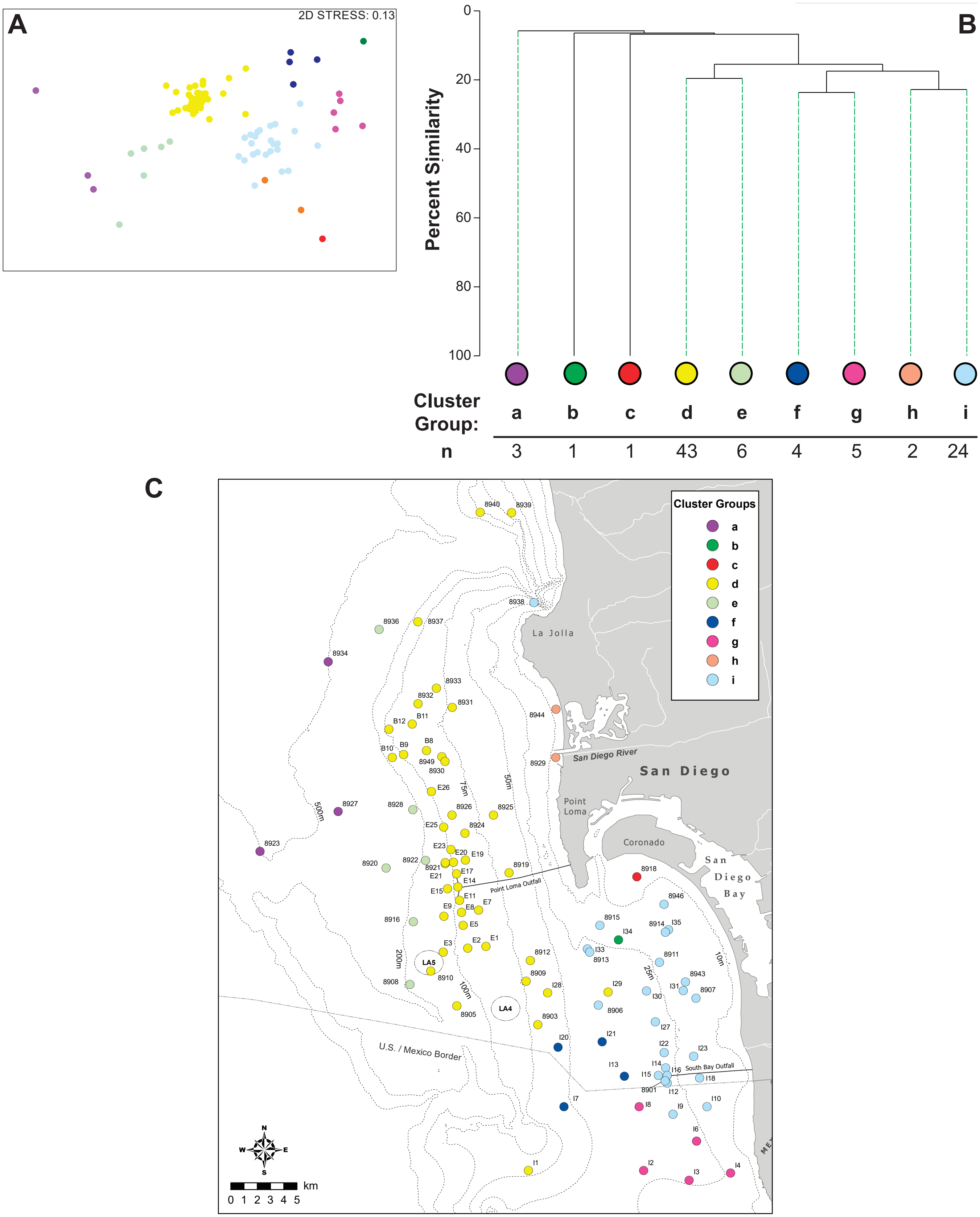

Figure 3.2

Results of ordination and cluster analysis of macrofauna data from PLOO, SBOO, and San Diego regional benthic stations sampled during summer 2020. 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 collects bottom dwelling (demersal) fishes and large (megabenthic) mobile 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 2020 at a total of 13 trawl stations surrounding the PLOO and SBOO. Raw data summaries supporting these results are presented in Appendix C. A more comprehensive assessment of these results will be presented in the 2020-2021 Biennial Assessment Report to be submitted by July 1, 2022.

Materials and Methods

Field Sampling

Trawls were conducted at 13 stations to monitor demersal fish and megabenthic invertebrate populations during winter (January) and summer (July) 2020 (Figure 4.1). These 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 2018). 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 2018). 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. Visual observations of weather, sea conditions, and human/animal activity were also recorded at the time of sampling (see Addenda 1-2A, 1-2B).

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 dplyr, plyr, reshape2, RODBC, sqldf, and vegan packages (Wickham 2007, 2011, Grothendieck 2014, Wickham and Francois 2016, Oksanen et al. 2018, Ripley and Lapsley 2018).

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 2020 (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 either square-root (PLOO and SBOO fish, SBOO invertebrates) or log (PLOO invertebrates) transformed to lessen the influence of overly abundant species and increase the importance (or impact) of rare species.

Results

Demersal Fishes

All fish species captured during the 2020 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. Total abundance and biomass by species for each station are summarized in Appendices C.3–C.6. All abnormalities and parasites found on trawled fish during the reporting period are listed in Appendix C.7. 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 2020 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.8 and C.9. Total abundance by species for each station is summarized in Appendices C.10 and C.11. 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 2020 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 2020) 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

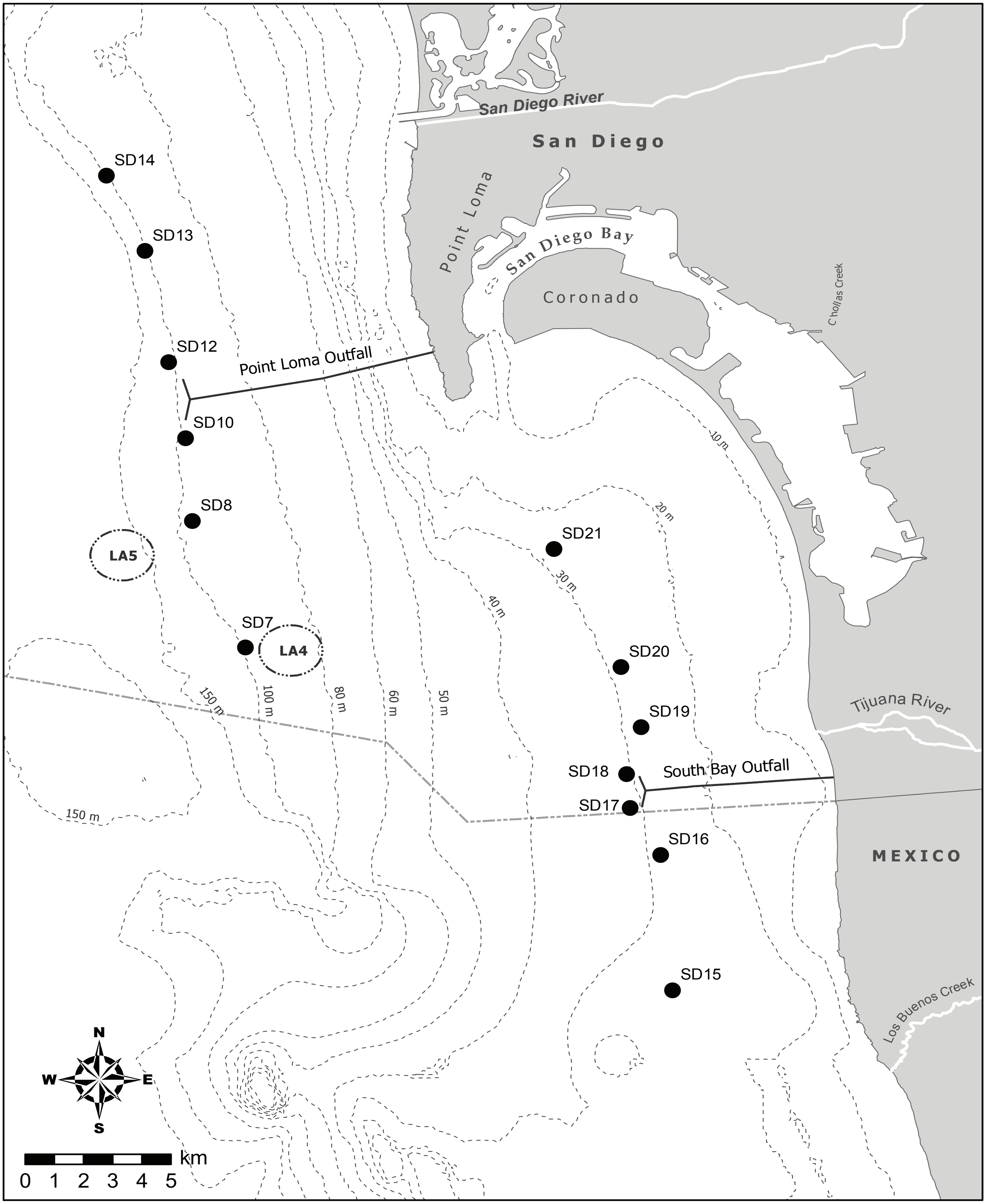

Figure 4.1
Trawl station locations sampled around the PLOO and SBOO as part of the City of San Diego's Ocean Monitoring Program.

Table 4.1

Demersal fish species collected from 12 trawls conducted in the PLOO region during 2020. PA = percent abundance; FO = frequency of occurrence; MAH = mean abundance per haul; MAO = mean abundance per occurence.

Species	PA	FO	MAH	MAO
Pacific Sanddab	41	100	111	111
Halfbanded Rockfish	23	67	63	94
Dover Sole	10	100	26	26
English Sole	4	92	12	13
Shortspine Combfish	4	100	10	10
Longfin Sanddab	4	83	10	12
Longspine Combfish	3	75	9	12
Plainfin Midshipman	2	67	5	8
Hornyhead Turbot	1	83	4	4
Stripetail Rockfish	1	67	3	4
Pink Seaperch	1	75	3	3
California Tonguefish	1	67	2	3
Slender Sole	1	33	2	6
Yellowchin Sculpin	1	25	2	8
Bigmouth Sole	1	75	2	2
California Scorpionfish	1	67	1	2
Squarespot Rockfish	1	17	1	9
California Lizardfish	< 1	58	1	2
Pacific Argentine	< 1	17	1	5
Specklefin Midshipman	< 1	8	1	10
Rockfish Unidentified	< 1	42	1	2
Spotted Cusk-eel	< 1	67	1	1
White Croaker	< 1	8	< 1	4
California Skate	< 1	25	< 1	1
Curlfin Sole	< 1	17	< 1	2
Greenstriped Rockfish	< 1	17	< 1	2
Vermilion Rockfish	< 1	8	< 1	3
Blackbelly Eelpout	< 1	8	< 1	1
Blacktip Poacher	< 1	8	< 1	1
California Halibut	< 1	8	< 1	1
Fantail Sole	< 1	8	< 1	1
Rosethorn Rockfish	< 1	8	< 1	1
Smooth Stargazer	< 1	8	< 1	1
Spotfin Sculpin	< 1	8	< 1	1
Stripefin Ronquil	< 1	8	< 1	1

Table 4.2

Demersal fish species collected from 14 trawls conducted in the SBOO region during 2020. PA = percent abundance; FO = frequency of occurrence; MAH = mean abundance per haul; MAO = mean abundance per occurence.

Species	PA	FO	MAH	MAO
Speckled Sanddab	51	100	63	63
Longfin Sanddab	17	71	21	29
California Lizardfish	9	93	11	12
California Tonguefish	5	93	6	6
Pacific Sardine	4	7	4	62
White Croaker	3	21	4	19
Yellowchin Sculpin	3	29	3	12
Pacific Sanddab	2	43	2	6
Hornyhead Turbot	2	57	2	3
Plainfin Midshipman	1	29	1	4
Specklefin Midshipman	1	50	1	2
English Sole	1	29	1	3
Roughback Sculpin	1	43	1	2
California Halibut	1	29	1	3
Fantail Sole	< 1	29	< 1	2
Spotted Turbot	< 1	36	< 1	1
Barcheek Pipefish	< 1	14	< 1	2
Bigmouth Sole	< 1	14	< 1	2
Pipefish Unidentified	< 1	7	< 1	3
Queenfish	< 1	7	< 1	3
Round Stingray	< 1	14	< 1	1
Shovelnose Guitarfish	< 1	14	< 1	1
California Scorpionfish	< 1	7	< 1	1
Giant Kelpfish	< 1	7	< 1	1
Longspine Combfish	< 1	7	< 1	1
Pacific Pompano	< 1	7	< 1	1

Table 4.3

Summary of demersal fish community parameters for PLOO and SBOO trawl stations sampled during 2020. Data are included for species richness, abundance, diversity (H'), and biomass (kg, wet weight).

		Species Richness		*Abundance*		*Diversity*		*Biomass*	
	Station	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**
PLOO	SD7	17	14	221	126	2.0	1.6	3.4	2.9
	SD8	22	13	453	229	1.7	1.3	7.2	3.6
	SD10	14	19	184	327	1.5	2.0	9.2	8.0
	SD12	6	17	51	174	1.1	1.8	0.6	8.5
	SD13	12	21	151	929	1.5	1.5	5.3	29.1
	SD14	12	16	119	274	1.7	1.4	5.9	7.7
SBOO	SD15	5	5	48	38	0.5	0.6	1.2	0.5
	SD16	7	9	68	183	0.9	1.2	1.0	3.9
	SD17	7	5	100	19	1.2	1.4	1.2	0.5
	SD18	9	8	66	80	1.5	0.9	6.3	0.8
	SD19	9	12	153	194	1.5	1.2	2.2	3.6
	SD20	8	11	162	299	1.4	1.3	3.1	6.1
	SD21	15	10	144	178	1.9	1.6	7.2	4.9

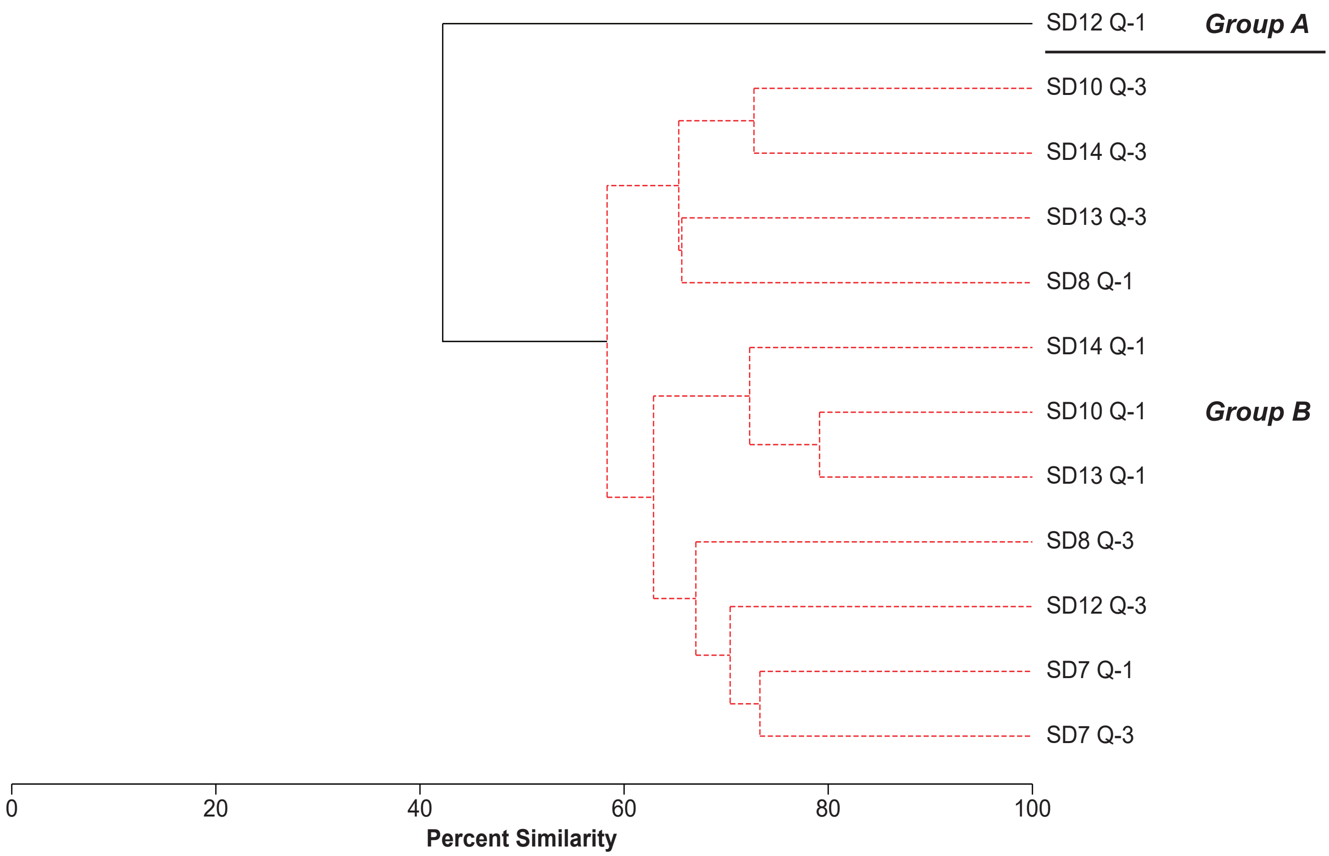

Figure 4.2

Results of cluster analysis of demersal fish data from PLOO trawl stations sampled during 2020. Solid black lines indicate non-random structure of the dendrogram as confirmed by SIMPROF; Q-1 = winter survey, Q-3 = summer survey.

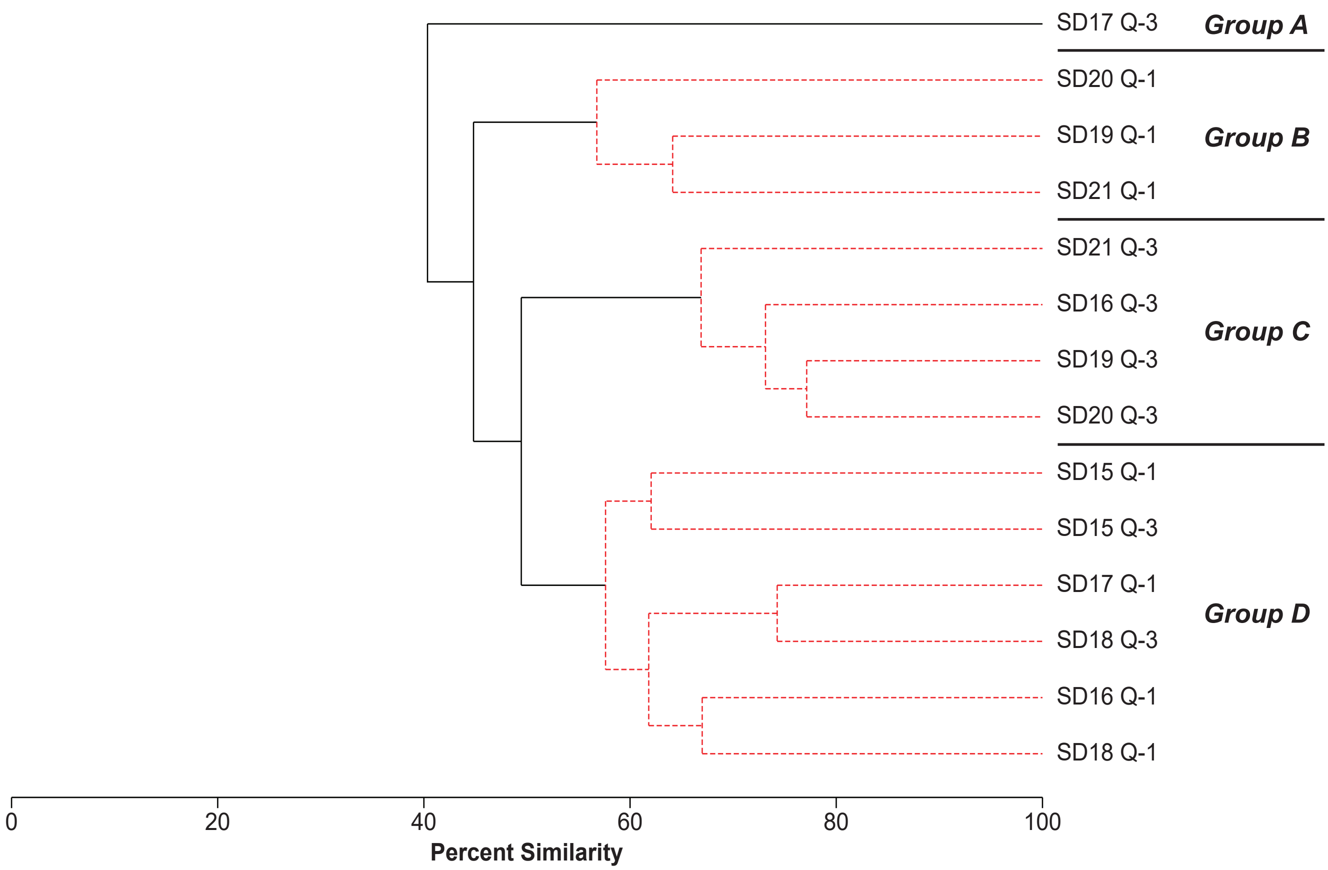

Figure 4.3
Results of cluster analysis of demersal fish data from SBOO trawl stations sampled during 2020. Solid black lines indicate non-random structure of the dendrogram as confirmed by SIMPROF; Q-1 = winter survey, Q-3 = summer survey.

Table 4.4

Megabenthic invertebrate species collected from 12 trawls conducted in the PLOO region during 2020. PA = percent abundance; FO = frequency of occurrence; MAH = mean abundance per haul; MAO = mean abundance per occurence.

Species	PA	FO	MAH	MAO
Pleuroncodes planipes	97	67	12,635	18,952
Lytechinus pictus	2	100	293	293
Sicyonia ingentis	1	92	93	102
Platymera gaudichaudii	< 1	67	38	57
Paguroidea	< 1	8	3	32
Luidia foliolata	< 1	58	2	3
Astropecten californicus	< 1	75	2	2
Paguristes bakeri	< 1	8	1	13
Apostichopus californicus	< 1	58	1	1
Luidia armata	< 1	17	< 1	3
Ophiopholis bakeri	< 1	17	< 1	2
Ophiothrix spiculata	< 1	17	< 1	2
Ophiura luetkenii	< 1	8	< 1	3
Aphrodita refulgida	< 1	17	< 1	1
Loxorhynchus crispatus	< 1	8	< 1	2
Phimochirus californiensis	< 1	8	< 1	2
Strongylocentrotus fragilis	< 1	17	< 1	1
Acanthoptilum sp	< 1	8	< 1	1
Amphichondrius granulatus	< 1	8	< 1	1
Austrotrophon catalinensis	< 1	8	< 1	1
Calliostoma turbinum	< 1	8	< 1	1
Halichondria sp	< 1	8	< 1	1
Loxorhynchus grandis	< 1	8	< 1	1
Luidia asthenosoma	< 1	8	< 1	1
Octopus rubescens	< 1	8	< 1	1
Pagurus armatus	< 1	8	< 1	1
Tritia insculpta	< 1	8	< 1	1

Table 4.5

Megabenthic invertebrate species collected from 14 trawls conducted in the SBOO region during 2020. PA = percent abundance; FO = frequency of occurrence; MAH = mean abundance per haul; MAO = mean abundance per occurence.

Species	PA	FO	MAH	MAO
Astropecten californicus	24	79	10	13
Philine auriformis	21	43	9	22
Crangon nigromaculata	20	64	9	14
Sicyonia penicillata	7	50	3	6
Lovenia cordiformis	6	36	3	8
Portunus xantusii	5	50	2	4
Lytechinus pictus	4	43	2	4
Dendraster terminalis	2	14	1	7
Luidia armata	2	43	1	2
Crossata ventricosa	1	36	< 1	1
Pyromaia tuberculata	1	36	< 1	1
Ophiothrix spiculata	1	21	< 1	2
Suberites sp	1	29	< 1	1
Kelletia kelletii	1	14	< 1	2
Loxorhynchus grandis	1	14	< 1	2
Armina californica	< 1	14	< 1	2
Stylatula elongata	< 1	21	< 1	1
Acanthodoris brunnea	< 1	7	< 1	2
Acanthodoris rhodoceras	< 1	14	< 1	1
Hemisquilla californiensis	< 1	14	< 1	1
Platymera gaudichaudii	< 1	14	< 1	1
Sinum scopulosum	< 1	14	< 1	1
Crangon alba	< 1	7	< 1	1
Crassispira semiinflata	< 1	7	< 1	1
Farfantepenaeus californiensis	< 1	7	< 1	1
Latulambrus occidentalis	< 1	7	< 1	1
Moreiradromia sarraburei	< 1	7	< 1	1
Neverita recluziana	< 1	7	< 1	1
Octopus rubescens	< 1	7	< 1	1
Paguristes bakeri	< 1	7	< 1	1
Pagurus spilocarpus	< 1	7	< 1	1
Pleuroncodes planipes	< 1	7	< 1	1
Pteropurpura festiva	< 1	7	< 1	1

Table 4.6

Summary of megabenthic invertebrate community parameters for PLOO and SBOO trawl stations sampled during 2020. Data are included for species richness, abundance, and diversity (H').

	Station	*Species Richness*		*Abundance*		*Diversity*	
		Winter	Summer	Winter	Summer	Winter	Summer
PLOO	SD7	7	9	24	28	1.8	1.7
	SD8	13	9	1092	1010	0.3	0.1
	SD10	9	6	24,242	839	0.1	0.1
	SD12	5	4	46,255	11,558	0.1	0.3
	SD13	7	6	34,371	137	0.0	0.4
	SD14	7	5	36,118	1164	0.1	0.3
SBOO	SD15	10	9	45	46	1.6	1.6
	SD16	7	9	33	49	1.4	1.3
	SD17	13	10	34	75	2.2	0.8
	SD18	7	9	23	47	1.5	1.4
	SD19	7	2	64	48	1.3	0.4
	SD20	5	6	33	41	1.2	0.6
	SD21	6	5	46	32	1.0	0.6

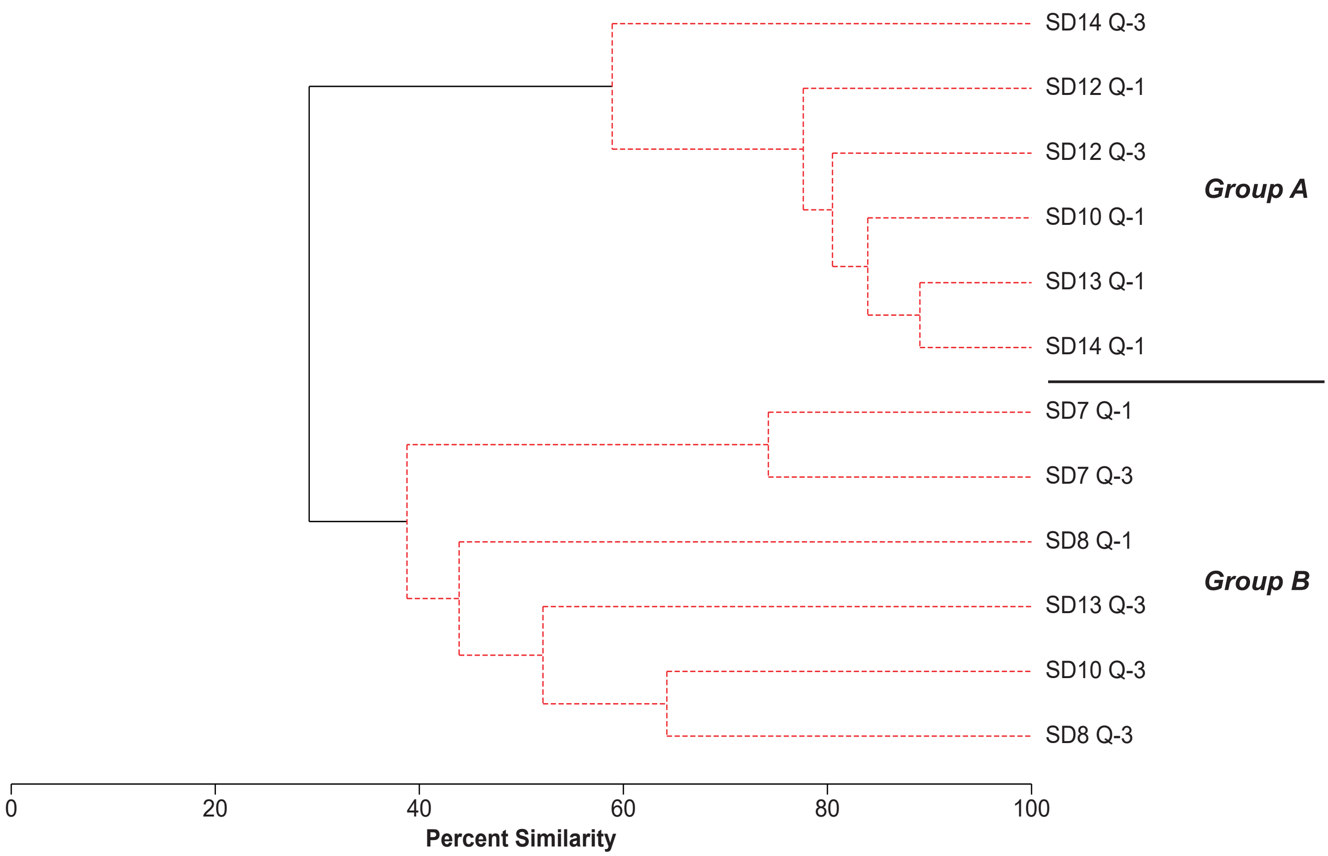

Figure 4.4

Results of cluster analysis of megabenthic invertebrate data from PLOO trawl stations sampled during 2020. Solid black lines indicate non-random structure of the dendrogram as confirmed by SIMPROF; Q-1 = winter survey, Q-3 = summer survey.

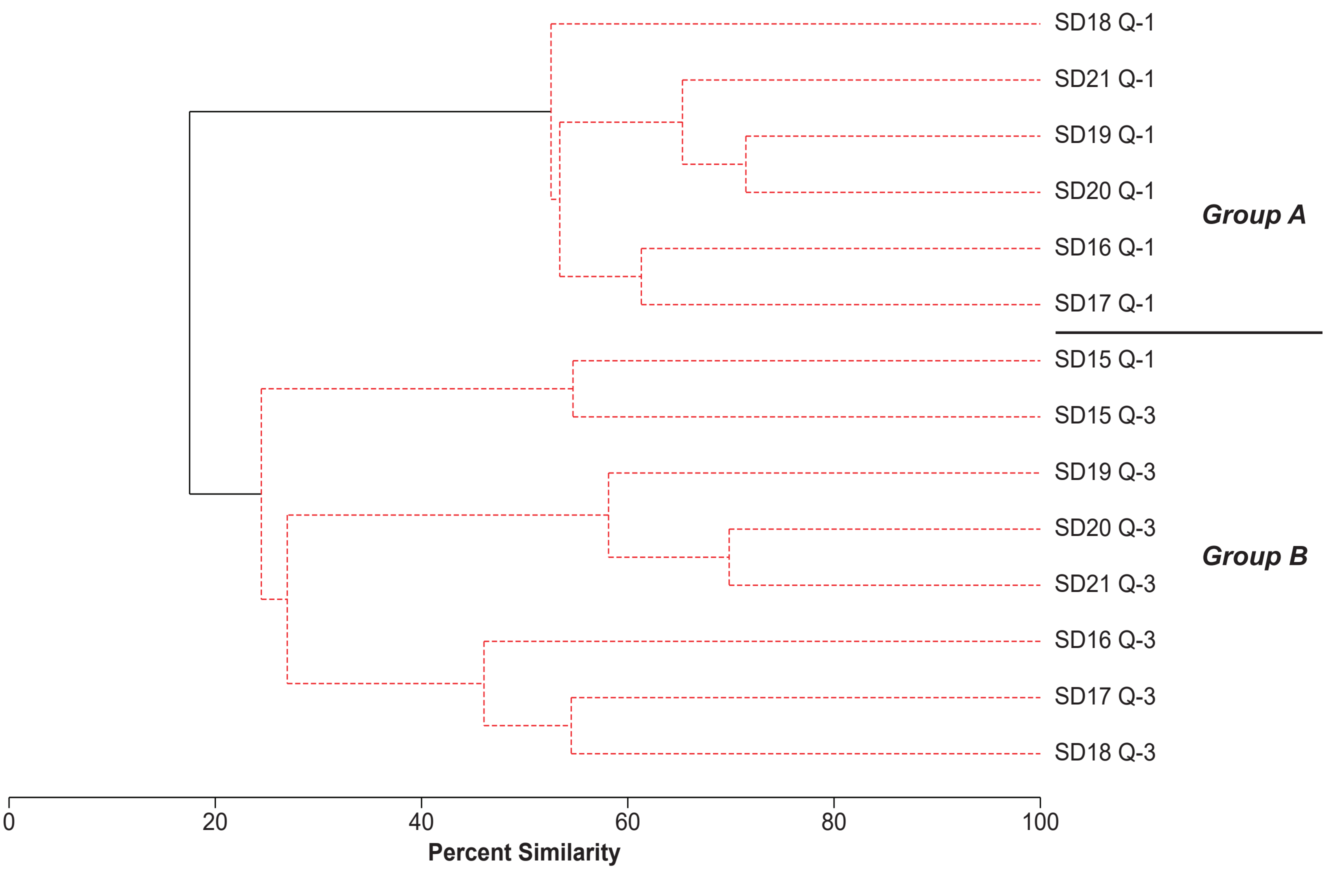

Figure 4.5

Results of cluster analysis of megabenthic invertebrate data from SBOO trawl stations sampled during 2020. Solid black lines indicate non-random structure of the dendrogram as confirmed by SIMPROF; Q-1 = winter survey, Q-3 = summer survey.

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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 2020 at PLOO and SBOO stations. Raw data summaries supporting these results are presented in Appendix D. A more comprehensive assessment of these results will be presented in the 2020-2021 Biennial Assessment Report to be submitted by July 1, 2022.

Materials and Methods

Fishes were collected in fall (October) 2020 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 5 hours at each station. Occasionally, insufficient numbers of target species are obtained despite this effort; during 2020, this resulted in inadequate amounts of tissue at Trawl Zone 9 to complete three full composite samples.

A total of 14 species of fish were collected for analysis of liver and muscle tissues during the 2020 survey (Table 5.1). Four different species of flatfish were collected from the nine trawl zones for analysis of liver tissues, including Pacific Sanddab (*Citharichthys sordidus*), Longfin Sanddab (*Citharichthys xanthostigma*), Hornyhead Turbot (*Pleuronichthys verticalis*), and Spotted Turbot (*Pleuronichthys ritteri*). These flatfish were collected from regular trawls at the SBOO stations, and by alternative hook and line methods at the PLOO stations. An additional 10 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 California Scorpionfish (*Scorpaena guttata*), Brown Rockfish (*Sebastes auriculatus*), Flag Rockfish (*Sebastes rubrivinctus*), Gopher Rockfish (*Sebastes carnatus*), Olive Rockfish (*Sebastes serranoides*), Speckled Rockfish (*Sebastes ovalis*), Starry Rockfish (*Sebastes constellatus*), Treefish (*Sebastes serriceps*), and Vermilion Rockfish (*Sebastes miniatus*).

Only fishes with standard lengths ≥11 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 re-sealable 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 (2020b) 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.2, D.3). 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. A detailed description of the analytical protocols can be found in City of San Diego (2021). Briefly, all fish tissue samples were analyzed on a wet weight basis to determine the concentrations of 18 different trace metals, nine chlorinated pesticides, 40 polychlorinated biphenyl compound congeners (PCBs), and 24 polycyclic aromatic hydrocarbons (PAHs). Data were generally limited to values above the method detection limit (MDL) for each parameter (Appendix D.1). However, concentrations below MDLs were included as estimated values if the presence of the specific constituent was verified by mass-spectrometry.

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 < MDL). Total chlordane, total DDT (tDDT), total hexachlorocyclohexane (tHCH), total PCB (tPCB), and total PAH (tPAH) were calculated for each sample as the sum of all constituents with reported values for individual constituents. Data analyses were performed using R (R Core Team 2020) using various functions within the zoo, reshape2, tidyr, psych, and dplyr packages (Zeileis and Grothendieck 2005, Wickham 2007, Wickham 2018, Revelle 2019, Wickham et al. 2020).

Contaminant levels in muscle tissue samples were compared to state, national, and international limits and standards in order to address seafood safety and public health issues. These included: (1) fish contaminant goals for chlordane, DDT, methylmercury, selenium, and PCBs developed by the California Office of Environmental Health Hazard Assessment (OEHHA) (Klasing and Brodberg 2008); (2) action limits on the amount of mercury, DDT, and chlordane in seafood that can be sold for human consumption, which are set by the U.S. Food and Drug Administration (USFDA) (Mearns et al. 1991); (3) international standards for acceptable concentrations of various metals and DDT (Mearns et al. 1991).

Results

Contaminants in Fish Liver Tissues

Concentrations of trace metals, pesticides, PCBs, and PAHs detected in fish liver tissue samples from PLOO and SBOO trawl zones during 2020 are summarized by species in Tables 5.2 and 5.3. Raw data, including individual constituents summed for total chlordane, tDDT, tHCH, tPCB, and tPAH, are listed by sample in Appendices D.4 – D.7.

Contaminants in Fish Muscle Tissues

Concentrations of trace metals, pesticides, PCBs, and PAHs detected in fish muscle tissue samples from PLOO and SBOO rig fishing zones during 2020 are summarized by species in Tables 5.4 and 5.5. Raw data, including individual constituents summed for total chlordane, tDDT, tHCH, tPCB, and tPAH, are listed by sample in Appendices D.8 – D.11.

Summary

Preliminary analysis of fish tissue data collected in 2020 provide no evidence of contaminant accumulation in PLOO or SBOO fishes associated with wastewater discharge from either outfall, which is consistent with historical findings (City of San Diego 2020a). 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 2020a, 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

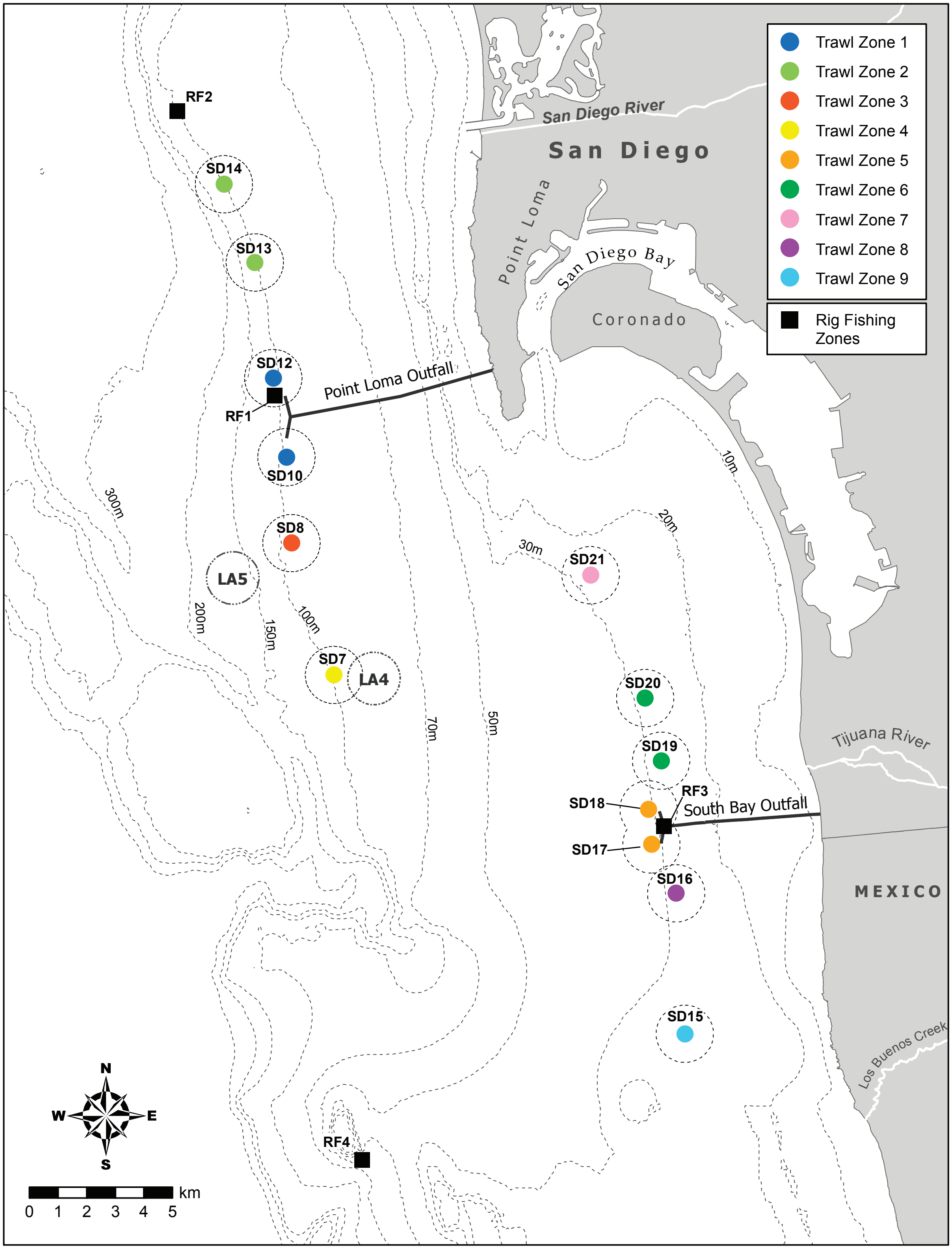


Figure 5.1

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 2020.

	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	Longfin Sanddab
SBOO	Rig Fishing Zone 3 (RF3)	California Scorpionfish	Mixed Rockfish [b]	Mixed Rockfish [c]
	Rig Fishing Zone 4 (RF4)	Mixed Rockfish[b]	California Scorpionfish	California Scorpionfish
	Trawl Zone 5 (TZ5)	Longfin Sanddab	Hornyhead Turbot	Spotted 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)	Hornyhead Turbot	Longfin Sanddab	California Scorpionfish
	Trawl Zone 9 (TZ9)	Spotted Turbot	No sample	No sample

[a] Includes Flag, Speckled, and Starry Rockfish; [b] includes Gopher Rockfish and Treefish; [c] includes Brown and Olive Rockfish

Table 5.2

Summary of metals (ppm) in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2020. 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.

		Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Tl	Sn	Zn
PLOO	Longfin Sanddab																		
	n	0	0	1	0	0	1	0	1	1	0	1	1	0	0	0	0	0	1
	value	—	—	11.1	—	—	3.36	—	7.82	135	—	0.606	0.175	—	—	—	—	—	34.6
	Pacific Sanddab																		
	n	0	0	11	0	0	11	0	11	11	0	10	11	1	7	0	0	10	11
	min	—	—	4.28	—	—	2.11	—	4.32	81.4	—	ND	0.097	ND	ND	—	—	ND	24.4
	max	—	—	10.8	—	—	4.6	—	8.19	136	—	0.926	0.195	0.121	2.35	—	—	7.96	35.1
	mean	—	—	7.11	—	—	2.83	—	5.94	101.18	—	0.774	0.138	0.121	2.35	—	—	7.96	29.05
	Total Samples	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Detection Rate (%)	0	0	100	0	0	100	0	100	100	0	92	100	8	58	0	0	83	100
	Max	ND	ND	11.1	ND	ND	4.6	ND	8.19	136	ND	0.926	0.195	0.121	2.35	ND	ND	7.96	35.1
SBOO	CA Scorpionfish																		
	n	0	0	1	0	0	1	0	1	1	0	1	1	0	0	0	0	0	1
	value	—	—	1.75	—	—	4.3	—	30.1	154	—	0.67	0.174	—	—	—	—	—	141
	Hornyhead Turbot																		
	n	0	0	2	0	0	2	0	2	2	0	2	2	0	0	0	0	0	2
	min	—	—	3.4	—	—	3.77	—	6.21	67.6	—	0.914	0.095	—	—	—	—	—	65.1
	max	—	—	3.93	—	—	5.04	—	7.56	78.9	—	1.06	0.108	—	—	—	—	—	75.5
	mean	—	—	3.67	—	—	4.41	—	6.89	73.25	—	0.987	0.102	—	—	—	—	—	70.3
	Longfin Sanddab																		
	n	0	0	8	0	0	8	0	8	8	0	7	8	0	0	0	0	0	8
	min	—	—	3.44	—	—	0.45	—	3.12	44.4	—	ND	0.028	—	—	—	—	—	13.5
	max	—	—	12.1	—	—	2.97	—	8.42	117	—	1.19	0.092	—	—	—	—	—	27
	mean	—	—	5.95	—	—	0.938	—	5.85	80.01	—	0.866	0.050	—	—	—	—	—	22.06
	Spotted Turbot																		
	n	0	0	2	0	0	2	0	2	2	1	2	2	0	0	0	0	0	2
	min	—	—	11.4	—	—	2	—	12.5	133	ND	1.49	0.076	—	—	—	—	—	57.4
	max	—	—	21.2	—	—	4.2	—	19.5	149	0.288	1.58	0.093	—	—	—	—	—	73.6
	mean	—	—	16.3	—	—	3.1	—	16	141	0.288	1.535	0.085	—	—	—	—	—	65.5
	Total Samples	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
	Detection Rate (%)	0	0	100	0	0	100	0	100	100	8	92	100	0	0	0	0	0	100
	Max	ND	ND	21.2	ND	ND	5.04	ND	30.1	154	0.288	1.58	0.174	ND	ND	ND	ND	ND	141

Table 5.3

Summary of pesticides (ppb), total PCB (ppb), total PAH (ppb), and lipids (% weight) in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2020. 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. See Appendices D.5–D.7 for values of individual constituents summed for total chlordane (tChlor), tDDT, tHCH, tPCB, and tPAH.

		Pesticides							
		tChlor	tDDT	HCB	tHCH	Mirex	tPCB	tPAH	Lipids
PLOO	Longfin Sanddab								
	n	1	1	0	1	0	1	1	1
	value	8.39	362.08	—	0.52	—	604.9	67.5	35.2
	Pacific Sanddab								
	n	11	11	4	9	5	11	5	11
	min	8.09	329.87	14.1	ND	ND	ND	35.8	19.5
	max	18.41	761.93	126	2.63	5.8	890.49	132.6	38.1
	mean	11.66	492.29	52.2	1.347	2.29	670.32	66.48	31.42
	Total Samples	12	12	4	12	12	12	6	12
	Detection Rate (%)	100	100	100	83	42	100	100	100
	Max	18.41	761.93	126	2.63	5.8	890.49	132.6	38.1
SBOO	CA Scorpionfish								
	n	1	1	0	0	0	1	0	1
	value	3.06	153.5	—	—	—	85.84	—	9.02
	Hornyhead Turbot								
	n	2	2	0	0	0	2	0	2
	min	0.47	32.23	—	—	—	11.48	—	5.08
	max	0.55	33.89	—	—	—	15.41	—	6.78
	mean	0.51	33.06	—	—	—	13.45	—	5.93
	Longfin Sanddab								
	n	8	8	0	8	1	8	0	8
	min	3.54	133.99	—	1.04	ND	93.04	—	29.5
	max	7.58	256.77	—	1.65	2.37	245.07	—	40.4
	mean	4.51	192.83	—	1.45	2.37	145.49	—	35.03
	Spotted Turbot								
	n	1	2	0	0	0	2	0	2
	min	ND	9.79	—	—	—	5.74	—	2.5
	max	0.41	17.94	—	—	—	29.87	—	4.69
	mean	0.41	13.865	—	—	—	17.81	—	3.60
	Total Samples	13	13	2	13	13	13	0	13
	Detection Rate (%)	92	100	0	62	8	100	—	100
	Max	7.58	256.77	ND	1.65	2.37	245.07	—	40.4

Table 5.4

Summary of metals (ppm) in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2020. 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	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Tl	Sn	Zn
PLOO	Mixed Rockfish																		
	n	0	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	0	1
	value	—	—	1.28	—	—	—	—	0.213	4.51	—	—	0.122	—	0.878	—	—	—	3.02
	Starry Rockfish																		
	n	0	0	2	0	0	0	0	2	2	0	0	2	0	0	0	0	0	2
	min	—	—	1.04	—	—	—	—	0.269	1.02	—	—	0.132	—	—	—	—	—	2.87
	max	—	—	1.1	—	—	—	—	0.299	1.79	—	—	0.233	—	—	—	—	—	3.01
	mean	—	—	1.07	—	—	—	—	0.284	1.405	—	—	0.183	—	—	—	—	—	2.94
	Vermilion Rockfish																		
	n	0	0	3	0	0	1	0	3	3	0	0	3	0	1	0	0	0	3
	min	—	—	3.53	—	—	ND	—	0.22	2.67	—	—	0.062	—	ND	—	—	—	3.51
	max	—	—	4	—	—	0.018	—	0.446	3.08	—	—	0.077	—	0.817	—	—	—	4.28
	mean	—	—	3.78	—	—	0.018	—	0.316	2.86	—	—	0.068	—	0.817	—	—	—	3.95
	Total Samples	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Detection Rate (%)	0	0	100	0	0	17	0	100	100	0	0	100	0	33	0	0	0	100
	Max	ND	ND	4	ND	ND	0.018	ND	0.446	4.51	ND	ND	0.233	ND	0.878	ND	ND	ND	4.28
SBOO	California Scorpionfish																		
	n	0	0	3	0	0	0	0	3	3	0	0	3	0	0	0	0	0	3
	min	—	—	1.73	—	—	—	—	0.241	1.87	—	—	0.164	—	—	—	—	—	3.9
	max	—	—	2.65	—	—	—	—	0.602	4.74	—	—	0.218	—	—	—	—	—	4.59
	mean	—	—	2.21	—	—	—	—	0.430	3.10	—	—	0.186	—	—	—	—	—	4.26
	Mixed Rockfish																		
	n	1	0	3	0	0	0	0	3	3	0	0	3	0	0	0	0	0	3
	min	ND	—	1.14	—	—	—	—	0.182	1.29	—	—	0.059	—	—	—	—	—	4.2
	max	2.05	—	1.87	—	—	—	—	0.602	1.91	—	—	0.137	—	—	—	—	—	4.5
	mean	2.05	—	1.43	—	—	—	—	0.329	1.65	—	—	0.109	—	—	—	—	—	4.37
	Total Samples	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Detection Rate (%)	17	0	100	0	0	0	0	100	100	0	0	100	0	0	0	0	0	100
	Max	2.05	ND	2.65	ND	ND	ND	ND	0.602	4.74	ND	ND	0.218	ND	ND	ND	ND	ND	4.59

Table 5.5

Summary of pesticides (ppb), total PCB (ppb), total PAH (ppb), and lipids (% weight) in muscle tissues of fishes collected from PLOO and SBOO rig fishing stations during 2020. 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; aEndSul = Alpha Endosulfan: bEndSul = Beta Endosulfan: EndSulSul = Endosulfan Sulfate: ND = not detected. See Appendices D.9–D.11 for values of individual constituents summed for total chlordane (tChlor), tDDT, tHCH, tPCB, and tPAH.

		Pesticide											
		tChlor	tDDT	Dieldrin	HCB	tHCH	Endrin	aEndSul	bEndSul	EndSulSul	tPCB	tPAH	Lipids
PLOO	Mixed Rockfish												
	n	1	1	0	1	1	0	0	1	0	1	1	1
	value	0.22	4.81	—	0.14	0.14	—	—	0.05	—	3.03	340	0.22
	Starry Rockfish												
	n	1	2	0	2	0	0	0	0	0	2	2	2
	min	ND	1.74	—	0.09	—	—	—	—	—	0.81	21	0.15
	max	0.04	4.63	—	0.11	—	—	—	—	—	2.93	41.4	0.19
	mean	0.04	3.19	—	0.1	—	—	—	—	—	1.87	31.2	0.17
	Vermilion Rockfish												
	n	2	3	1	3	2	0	0	0	0	3	3	3
	min	ND	4.3	ND	0.11	ND	—	—	—	—	3.94	21.6	0.21
	max	0.22	6.77	0.08	0.17	0.05	—	—	—	—	10.15	299	0.39
	mean	0.17	5.55	0.08	0.147	0.045	—	—	—	—	6.21	115.93	0.317
	Total samples	6	6	6	6	6	6	6	6	6	6	6	6
	Detection Rate (%)	67	100	17	100	50	0	0	17	0	100	100	100
	Max	0.22	6.77	0.08	0.17	0.14	0	0	0.05	0	10.145	340	0.39
SBOO	California Scorpionfish												
	n	2	3	0	2	1	1	0	1	0	3	2	3
	min	ND	1.44	—	ND	ND	ND	—	ND	—	0.57	ND	0.09
	max	0.22	13.43	—	0.19	0.04	0.05	—	0.05	—	6.56	63.2	0.2
	mean	0.13	5.87	—	0.165	0.04	0.05	—	0.05	—	2.64	39.7	0.15
	Mixed Rockfish												
	n	3	3	3	1	2	1	1	1	1	3	3	3
	min	0.1	1.57	0.04	ND	ND	ND	ND	ND	ND	0.71	34.2	0.12
	max	0.64	2.79	0.26	0.1	0.33	0.67	0.18	0.05	0.06	1.88	485.9	0.18
	mean	0.29	2.03	0.12	0.1	0.225	0.67	0.18	0.05	0.06	1.28	185.45	0.15
	Total samples	6	6	6	6	6	6	6	6	6	6	6	6
	Detection Rate (%)	83	100	50	50	50	33	17	33	17	100	83	100
	Max	0.64	13.43	0.26	0.19	0.33	0.67	0.18	0.05	0.06	6.56	485.9	0.2

Appendices

Appendix A

Water Quality

2020 Raw Data Summaries

Appendix A.1

Summary of PLOO and SBOO reference stations used during 2020 to calculate out-of-range thresholds (see text for details).

Month	Stations
February	
PLOO	A1, A6, A7, C7, C8, F01, F02, F03, F04, F05, F06, F07, F08, F09, F10, F11, F12, F13, F14, F25, F36
SBOO	I1, I6, I7, I8, I9, I10, I13, I14, I15, I16, I2, I20, I21, I28, I29, I3, I30, I33, I34, I35
May	
PLOO	A1, A7, F01
SBOO	I1, I3, I6, I7, I8, I9, I10, I13, I18, I2, I21
August	
PLOO	A1, A6, A7, C8, F01, F02, F03, F04, F05, F06, F07, F09, F10, F11, F12, F13, F14
SBOO	I1, I8, I12, I14, I16, I17, I2, I21, I34, I39
November	
PLOO	A1, A6, C7, F04, F05, F06, F07, F08, F09, F10, F11, F12, F13, F15, F17, F18, F21, F22, F24
SBOO	I1, I3, I6, I7, I8, I9, I13, I14, I17, I18, I2, I20, I21, I28, I29

Appendix A.2

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 2020. For each quarter: n ≥ 3381 (1–20 m), n ≥ 5283 (21–60 m), n ≥ 1851 (61–80 m), n ≥ 994 (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	13.4	11.8	11.7	11.2	11.2
	max	15.9	15.5	13.1	12.1	15.9
	mean	15.4	13.9	12.2	11.6	13.8
May	min	11.2	10.1	10.0	9.7	9.7
	max	19.8	12.4	10.6	10.3	19.8
	mean	14.2	10.8	10.2	10.0	11.7
August	min	12.9	10.9	10.6	10.5	10.5
	max	23.9	16.4	11.9	10.9	23.9
	mean	18.8	12.7	11.0	10.7	14.0
November	min	12.6	11.7	11.2	10.8	10.8
	max	17.7	16.4	12.6	11.8	17.7
	mean	15.9	13.0	11.9	11.2	13.5
Salinity (ppt)						
February	min	33.40	33.42	33.48	33.58	33.40
	max	33.60	33.60	33.67	33.85	33.85
	mean	33.51	33.52	33.59	33.69	33.54
May	min	33.63	33.67	33.83	33.90	33.63
	max	33.98	33.92	33.96	34.04	34.04
	mean	33.73	33.80	33.90	33.96	33.81
August	min	33.31	33.31	33.55	33.68	33.31
	max	33.84	33.68	33.85	33.90	33.90
	mean	33.57	33.50	33.67	33.80	33.57
November	min	33.45	33.44	33.56	33.66	33.44
	max	33.63	33.70	33.79	33.85	33.85
	mean	33.56	33.54	33.66	33.77	33.59

Appendix A.2 *continued*

		Depth (m)				
		1–20	21–60	61–80	81–98	1–98
DO (mg/L)						
February	min	6.5	4.7	4.2	3.9	3.9
	max	8.5	8.3	6.8	6.3	8.5
	mean	7.9	7.2	5.4	4.6	6.9
May	min	1.9	2.9	3.0	3.1	1.9
	max	9.3	5.6	4.0	3.9	9.3
	mean	5.5	4.0	3.7	3.5	4.3
August	min	5.1	4.9	3.9	3.7	3.7
	max	9.2	8.5	6.0	5.2	9.2
	mean	7.9	6.9	5.2	4.3	6.7
November	min	4.7	4.7	4.4	4.0	4.0
	max	7.7	7.4	5.9	5.0	7.7
	mean	7.0	5.9	5.1	4.4	6.0
pH						
February	min	7.9	7.8	7.7	7.7	7.7
	max	8.1	8.1	7.9	7.9	8.1
	mean	8.0	8.0	7.8	7.8	7.9
May	min	7.6	7.7	7.7	7.7	7.6
	max	8.4	8.0	7.8	7.8	8.4
	mean	8.0	7.8	7.8	7.8	7.9
August	min	7.9	7.8	7.8	7.7	7.7
	max	8.3	8.2	8.0	7.9	8.3
	mean	8.2	8.0	7.9	7.8	8.0
November	min	7.8	7.8	7.8	7.8	7.8
	max	8.2	8.1	8.0	7.9	8.2
	mean	8.1	7.9	7.9	7.8	8.0

Appendix A.2 *continued*

		Depth (m)				
		1–20	21–60	61–80	81–98	1–98
Transmissivity (%)						
February	min	79	84	28	55	28
	max	91	92	92	92	92
	mean	89	90	89	84	89
May	min	25	84	77	87	25
	max	93	93	93	93	93
	mean	74	92	91	91	86
August	min	22	84	86	80	22
	max	92	93	94	93	94
	mean	88	91	93	92	91
November	min	76	87	80	85	76
	max	92	94	94	94	94
	mean	88	92	93	93	91
Chlorophyll *a* (µg/L)						
February	min	0.2	0.3	0.2	0.2	0.2
	max	2.4	2.8	1.1	0.6	2.8
	mean	0.6	1.3	0.6	0.3	0.9
May	min	0.3	0.1	0.1	0.1	0.1
	max	31.8	3.3	3.7	0.7	31.8
	mean	6.2	0.7	0.4	0.3	2.2
August	min	0.3	0.4	0.2	0.2	0.2
	max	5.6	5.1	0.8	0.5	5.6
	mean	1.1	1.5	0.5	0.3	1.1
November	min	0.3	0.3	0.2	0.2	0.2
	max	4.8	3.1	0.6	0.3	4.8
	mean	1.4	0.9	0.3	0.2	0.9

Appendix A.3

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 2020. For each quarter: n ≥ 1440 (1–9 m), n ≥ 1236 (10–19 m), n ≥ 737 (20–28 m), n ≥ 349 (29–38 m), n ≥ 289 (39–55 m). Sample sizes differed due to slight variations in depth at individual stations.

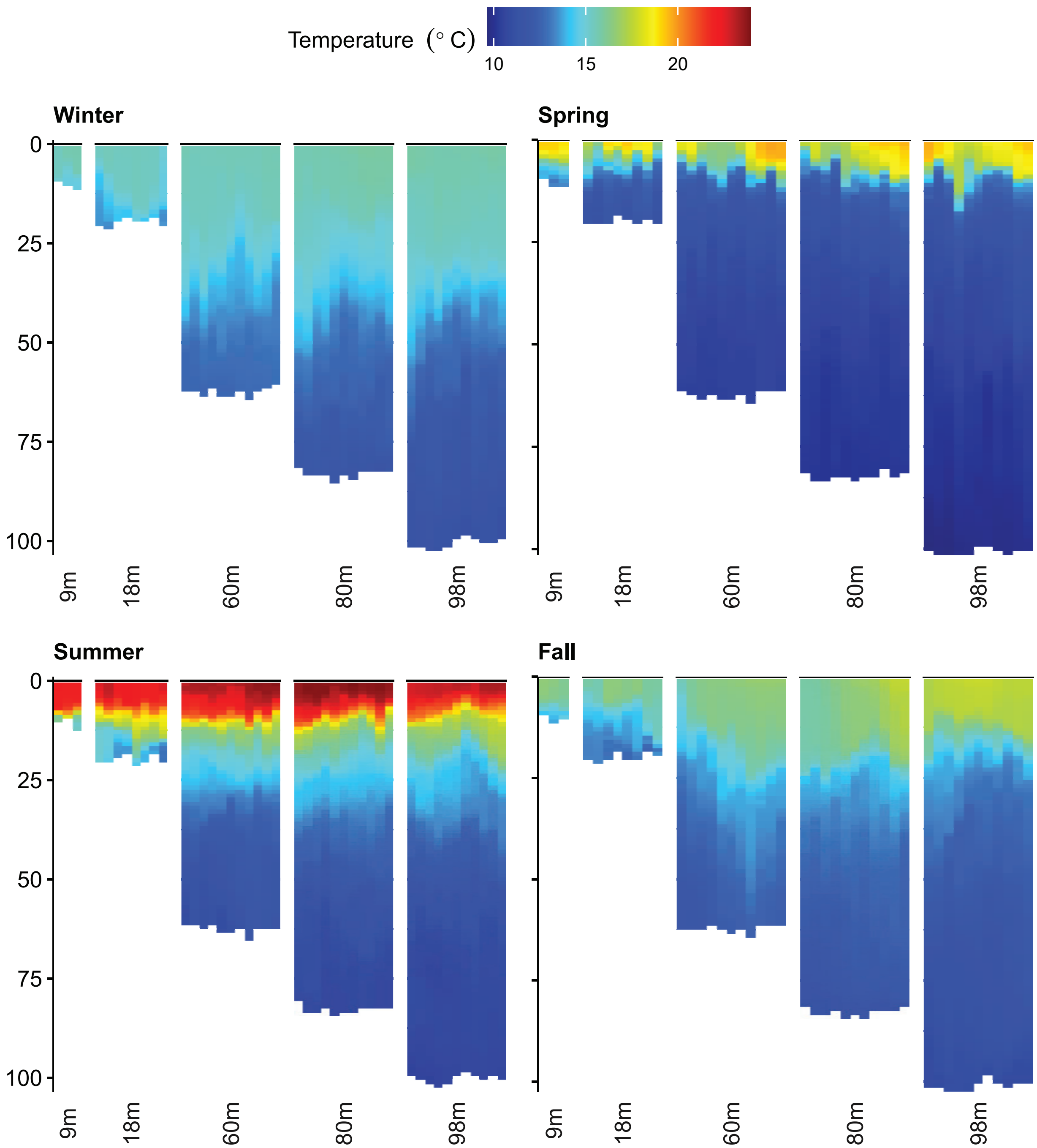
		Depth (m)					
		1–9	10–19	20–28	29–38	39–55	1–55
Temperature (°C)							
February	min	14.2	13.7	13.4	13.4	12.4	12.4
	max	15.5	15.4	15.3	15.4	15.1	15.5
	mean	14.9	14.6	14.3	14.3	13.7	14.6
May	min	12.2	11.6	11.4	11.3	10.5	10.5
	max	20.1	16.7	14.5	13.1	11.6	20.1
	mean	16.9	13.2	12.1	11.6	11.1	14.0
August	min	13.4	12.7	13.4	12.7	11.8	11.8
	max	23.8	20.7	17.6	15.1	14.1	23.8
	mean	19.8	16.1	14.3	13.5	12.9	16.7
November	min	15.1	14.9	14.3	13.4	12.7	12.7
	max	19.2	18.1	16.5	14.9	14.2	19.2
	mean	17.5	16.0	15.0	14.3	13.3	16.0
Salinity (ppt)							
February	min	33.27	33.36	33.46	33.47	33.49	33.27
	max	33.54	33.58	33.57	33.58	33.62	33.62
	mean	33.48	33.50	33.52	33.52	33.55	33.50
May	min	33.55	33.58	33.55	33.53	33.61	33.53
	max	34.28	33.84	33.76	33.76	33.87	34.28
	mean	33.73	33.68	33.67	33.65	33.73	33.70
August	min	33.37	33.27	33.38	33.38	33.41	33.27
	max	33.71	33.63	33.57	33.59	33.64	33.71
	mean	33.59	33.50	33.49	33.49	33.52	33.53
November	min	33.28	33.31	33.45	33.46	33.49	33.28
	max	33.64	33.57	33.49	33.52	33.58	33.64
	mean	33.50	33.47	33.47	33.48	33.53	33.48

Appendix A.3 *continued*

		Depth (m)					
		1–9	10–19	20–28	29–38	39–55	1–55
DO (mg/L)							
February	min	6.9	6.8	6.7	6.6	6.0	6.0
	max	8.3	8.2	7.9	7.9	7.8	8.3
	mean	7.9	7.7	7.4	7.4	6.9	7.6
May	min	1.3	0.6	4.0	3.9	3.5	0.6
	max	8.4	8.6	8.0	6.7	5.9	8.6
	mean	7.0	6.2	5.5	5.3	4.5	6.2
August	min	7.0	6.5	6.9	6.0	5.4	5.4
	max	9.9	9.5	8.7	8.5	8.2	9.9
	mean	8.2	8.3	7.7	7.3	6.7	7.9
November	min	6.4	5.0	6.0	5.4	5.7	5.0
	max	9.3	8.3	7.5	6.7	6.3	9.3
	mean	8.1	7.1	6.6	6.2	6.0	7.2
pH							
February	min	8.0	8.0	8.0	8.0	7.9	7.9
	max	8.1	8.1	8.1	8.1	8.1	8.1
	mean	8.1	8.1	8.0	8.0	8.0	8.1
May	min	7.6	7.5	7.8	7.8	7.7	7.5
	max	8.3	8.2	8.1	8.0	8.0	8.3
	mean	8.1	8.0	7.9	7.9	7.8	8.0
August	min	8.0	7.9	8.0	8.0	7.8	7.8
	max	8.3	8.3	8.2	8.1	8.1	8.3
	mean	8.2	8.2	8.1	8.0	8.0	8.1
November	min	8.1	8.0	8.0	8.0	7.9	7.9
	max	8.3	8.2	8.2	8.1	8.0	8.3
	mean	8.2	8.1	8.1	8.0	8.0	8.1

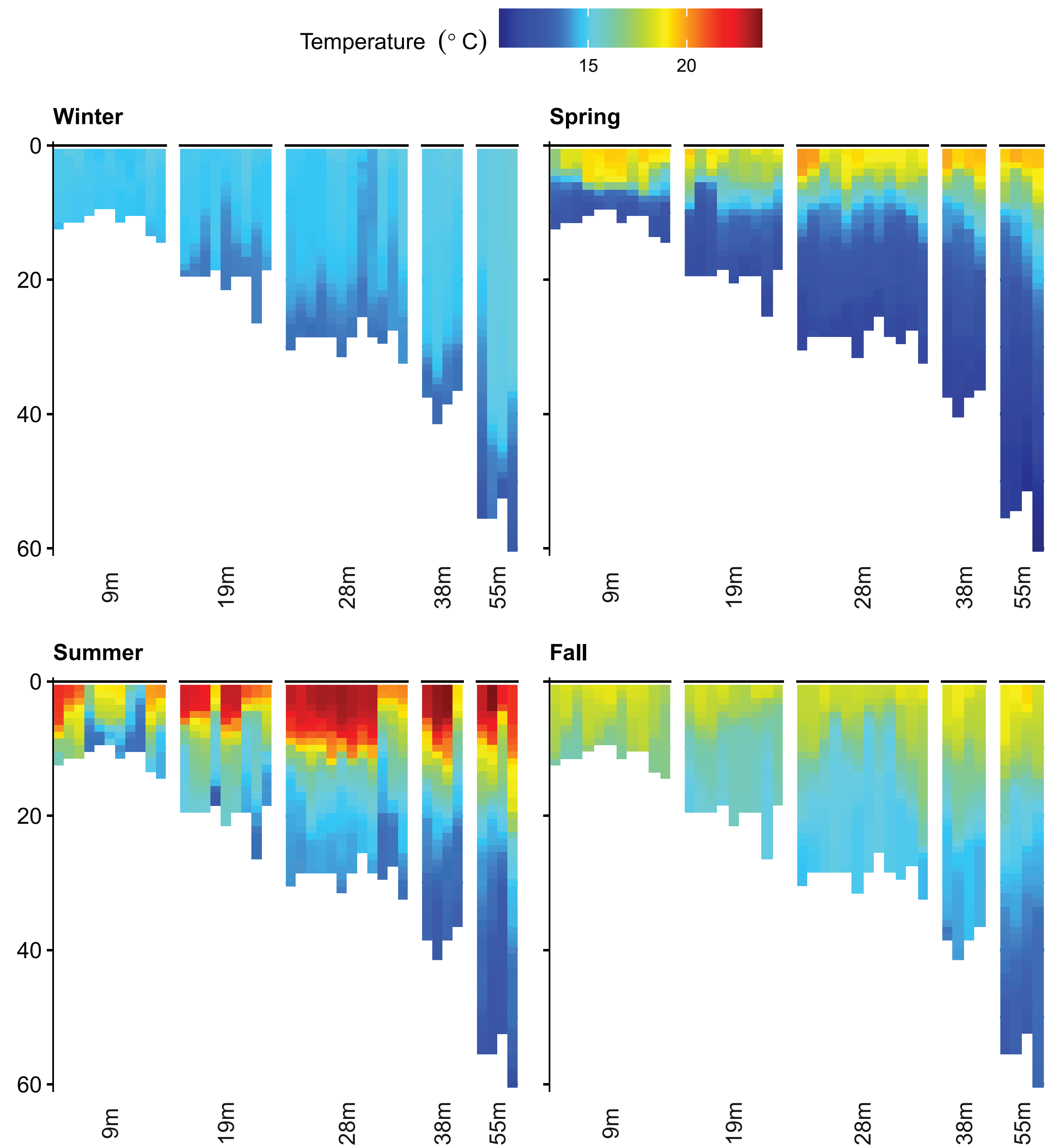
Appendix A.3 *continued*

		Depth (m)					
		1–9	**10–19**	**20–28**	**29–38**	**39–55**	**1–55**
Transmissivity (%)							
February	min	49	41	78	85	89	41
	max	91	91	91	91	91	91
	mean	83	86	89	90	90	86
May	min	47	50	73	85	91	47
	max	88	90	92	93	93	93
	mean	77	84	89	91	92	84
August	min	62	75	82	84	88	62
	max	92	92	92	92	92	92
	mean	83	85	87	88	90	85
November	min	69	74	85	87	91	69
	max	90	88	91	92	93	93
	mean	82	85	88	90	92	85
Chlorophyll *a* (µg/L)							
February	min	0.2	0.3	0.4	0.6	0.8	0.2
	max	3.5	3.0	2.4	2.0	1.5	3.5
	mean	1.2	1.5	1.4	1.2	1.1	1.3
May	min	0.6	0.7	0.8	0.7	0.3	0.3
	max	8.2	4.8	5.4	4.3	1.6	8.2
	mean	2.1	2.2	2.5	1.4	0.6	2.0
August	min	0.5	0.5	0.8	1.0	0.7	0.5
	max	12.3	7.9	5.4	5.0	3.7	12.3
	mean	2.3	2.9	2.8	2.9	1.9	2.6
November	min	0.7	1.1	1.0	0.5	0.4	0.4
	max	5.5	4.0	3.4	2.6	1.1	5.5
	mean	2.7	2.7	2.3	1.5	0.6	2.4



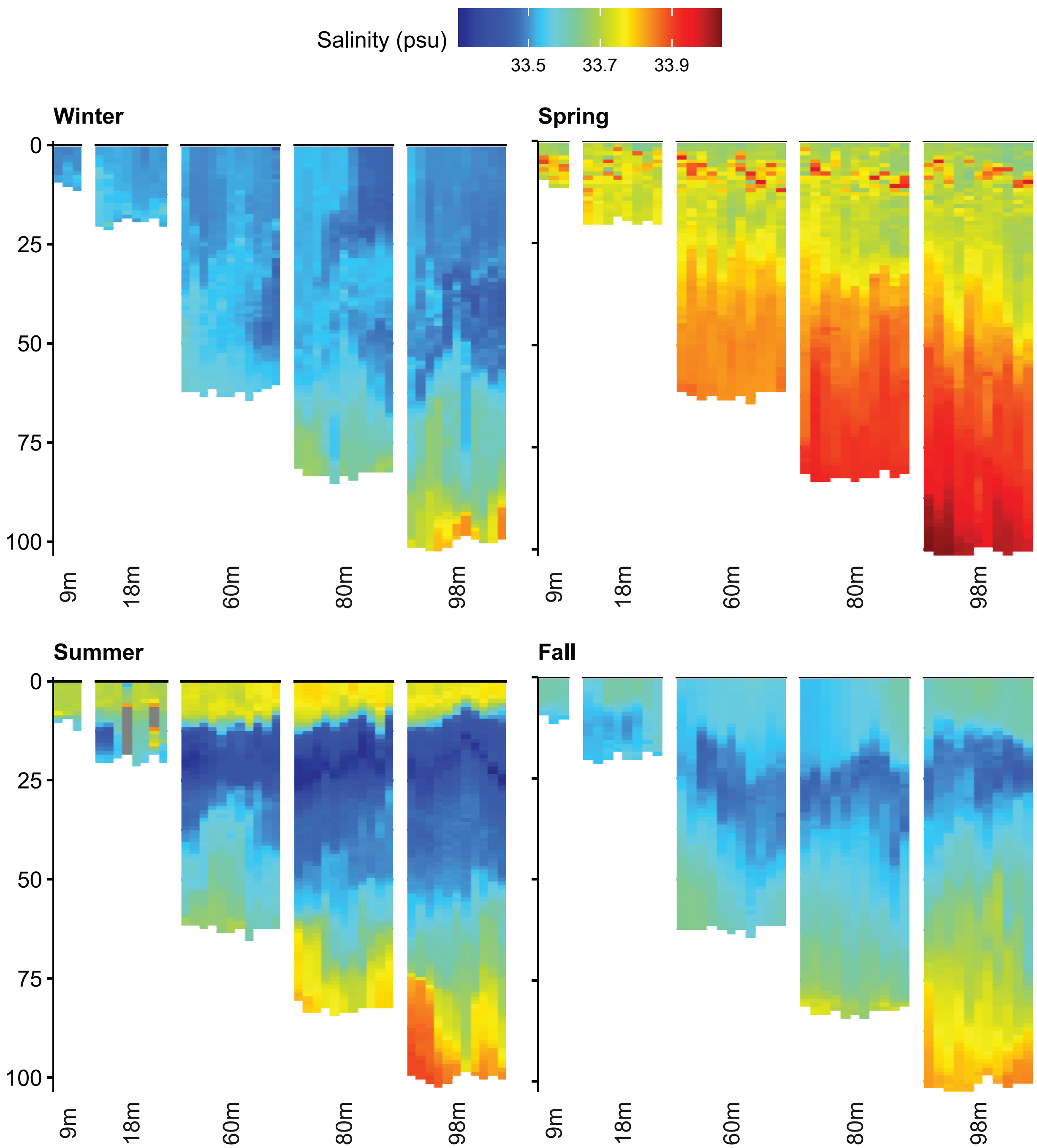
Appendix A.4

Temperature recorded in the PLOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



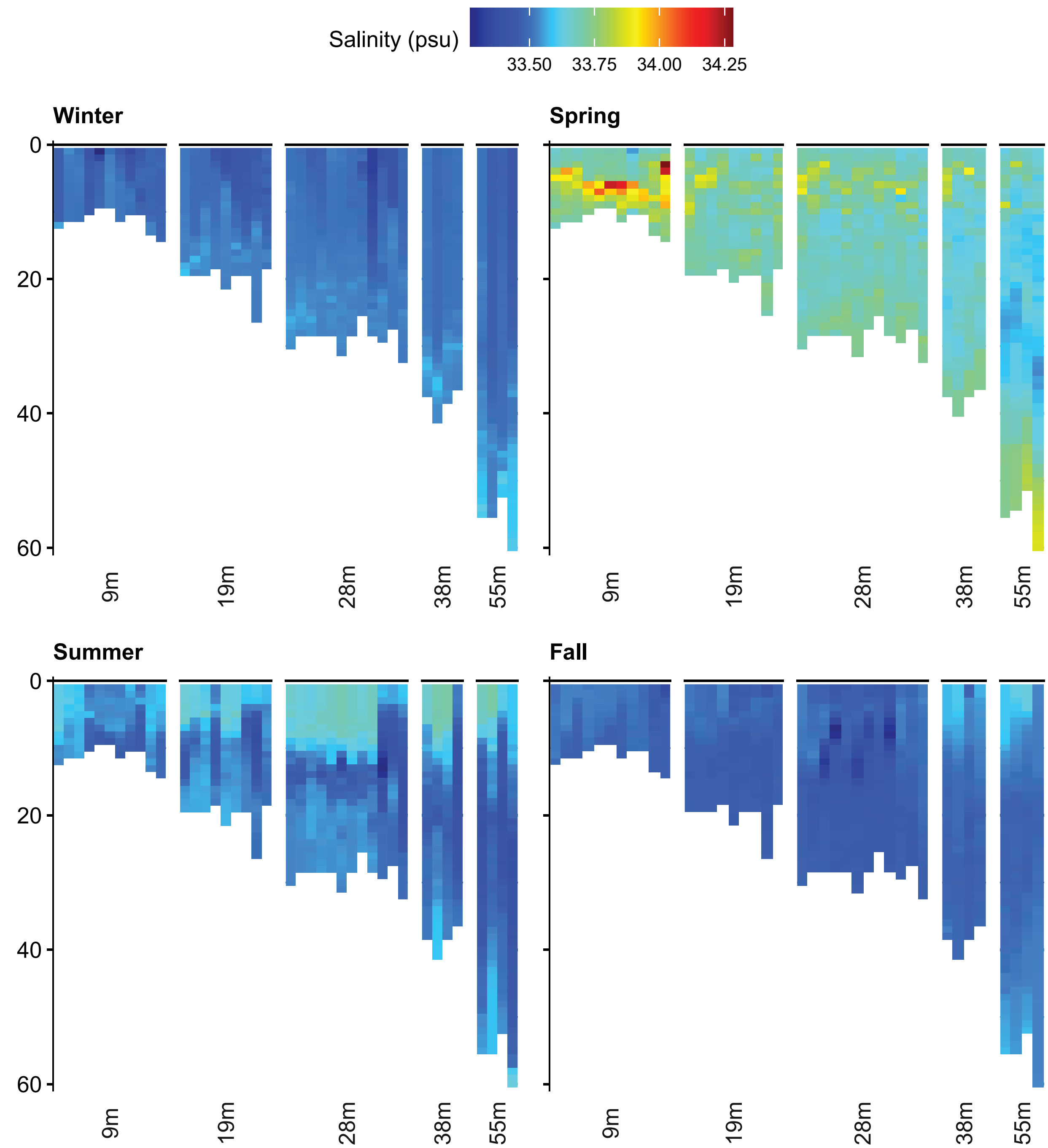
Appendix A.5

Temperature recorded in the SBOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



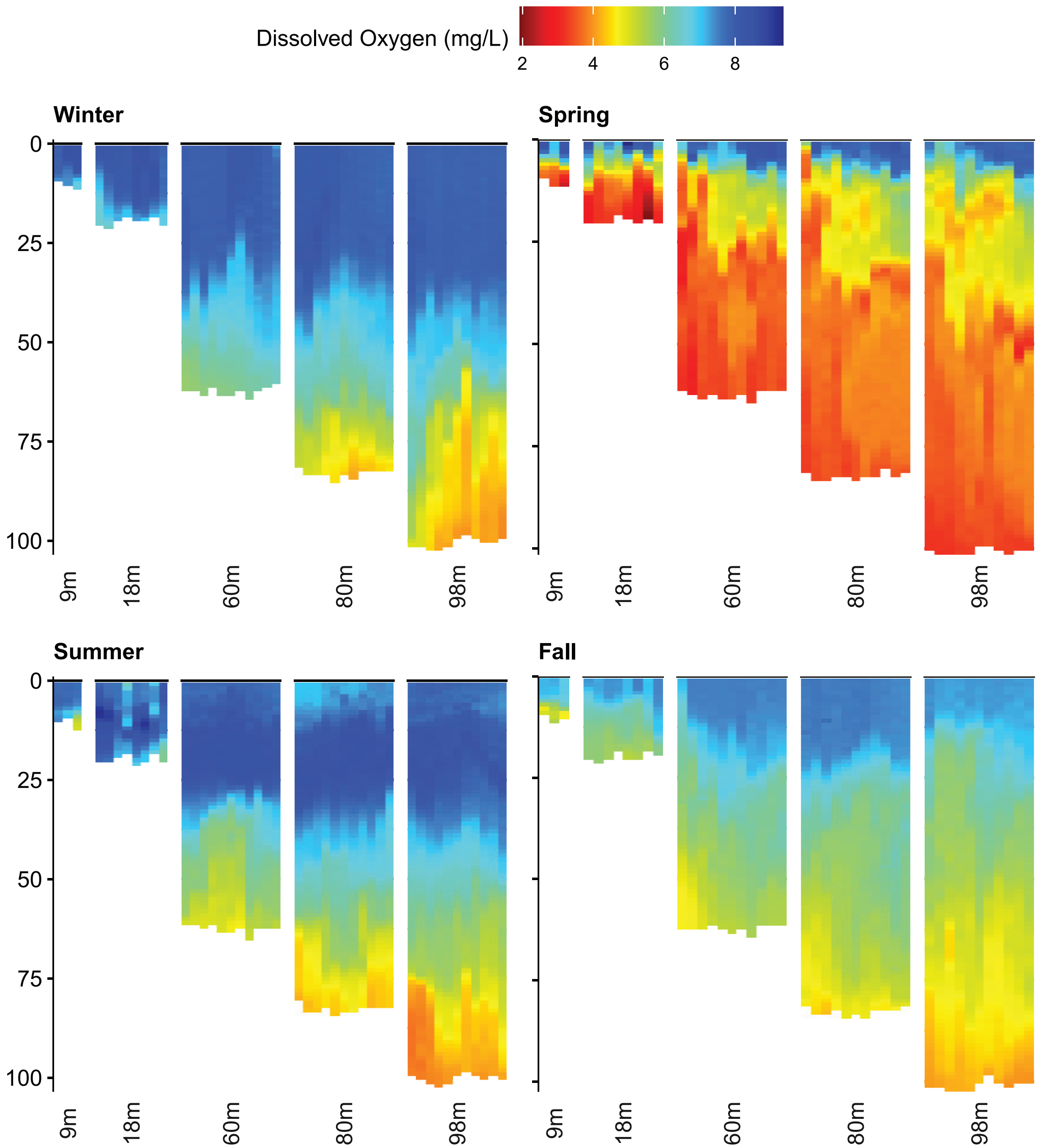
Appendix A.6

Salinity recorded in the PLOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



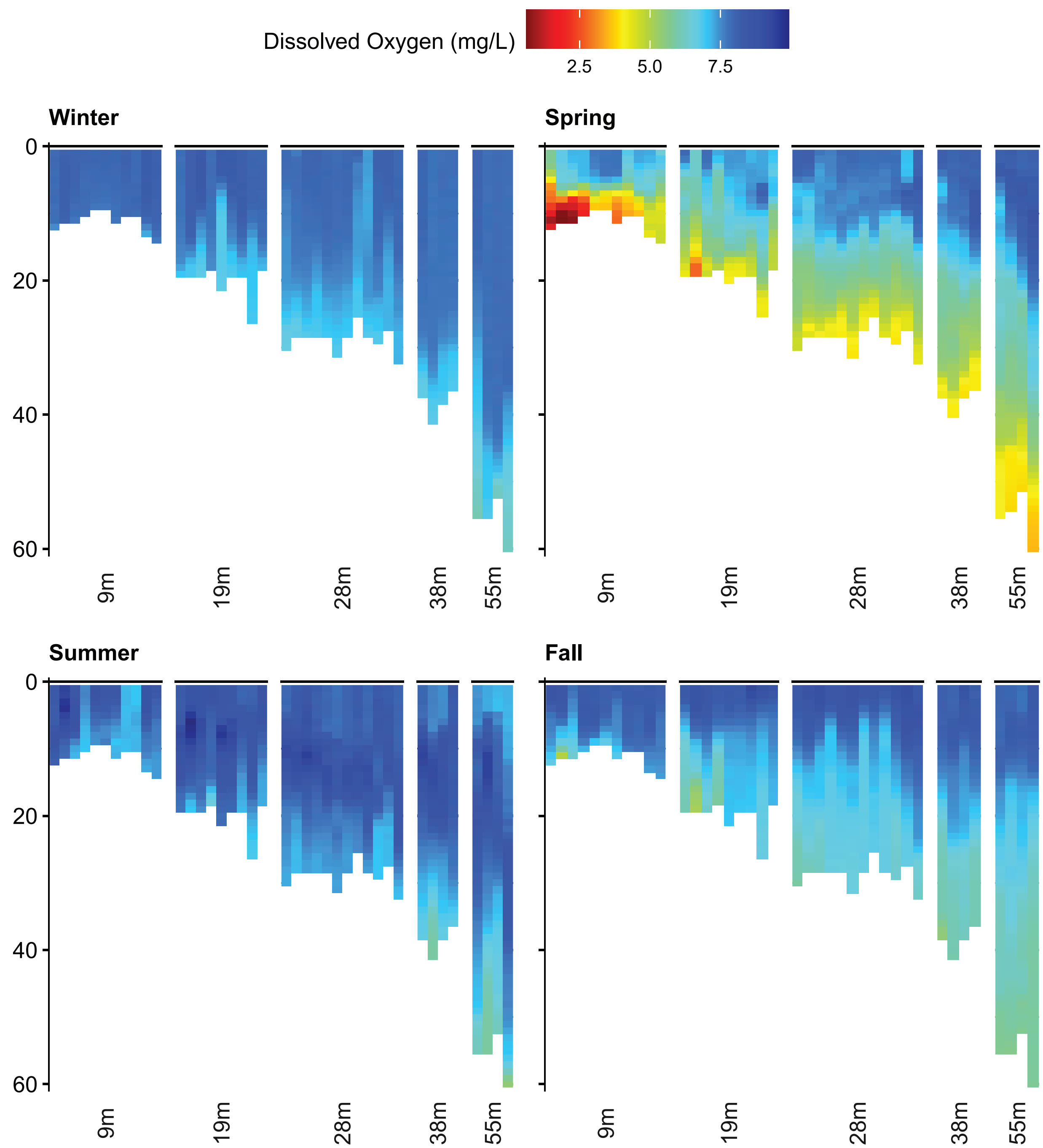
Appendix A.7

Salinity recorded in the SBOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



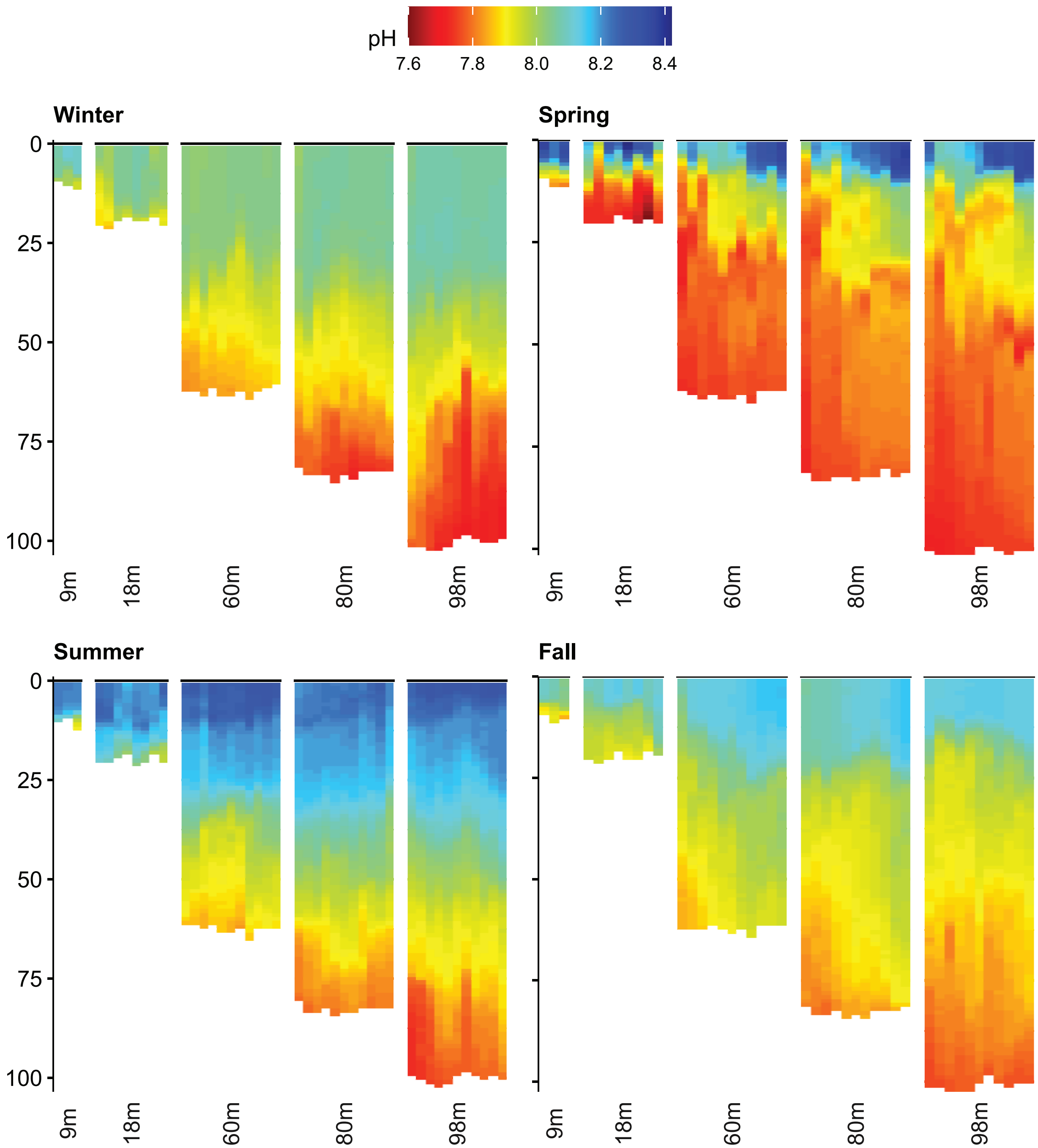
Appendix A.8

Dissolved oxygen recorded in the PLOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



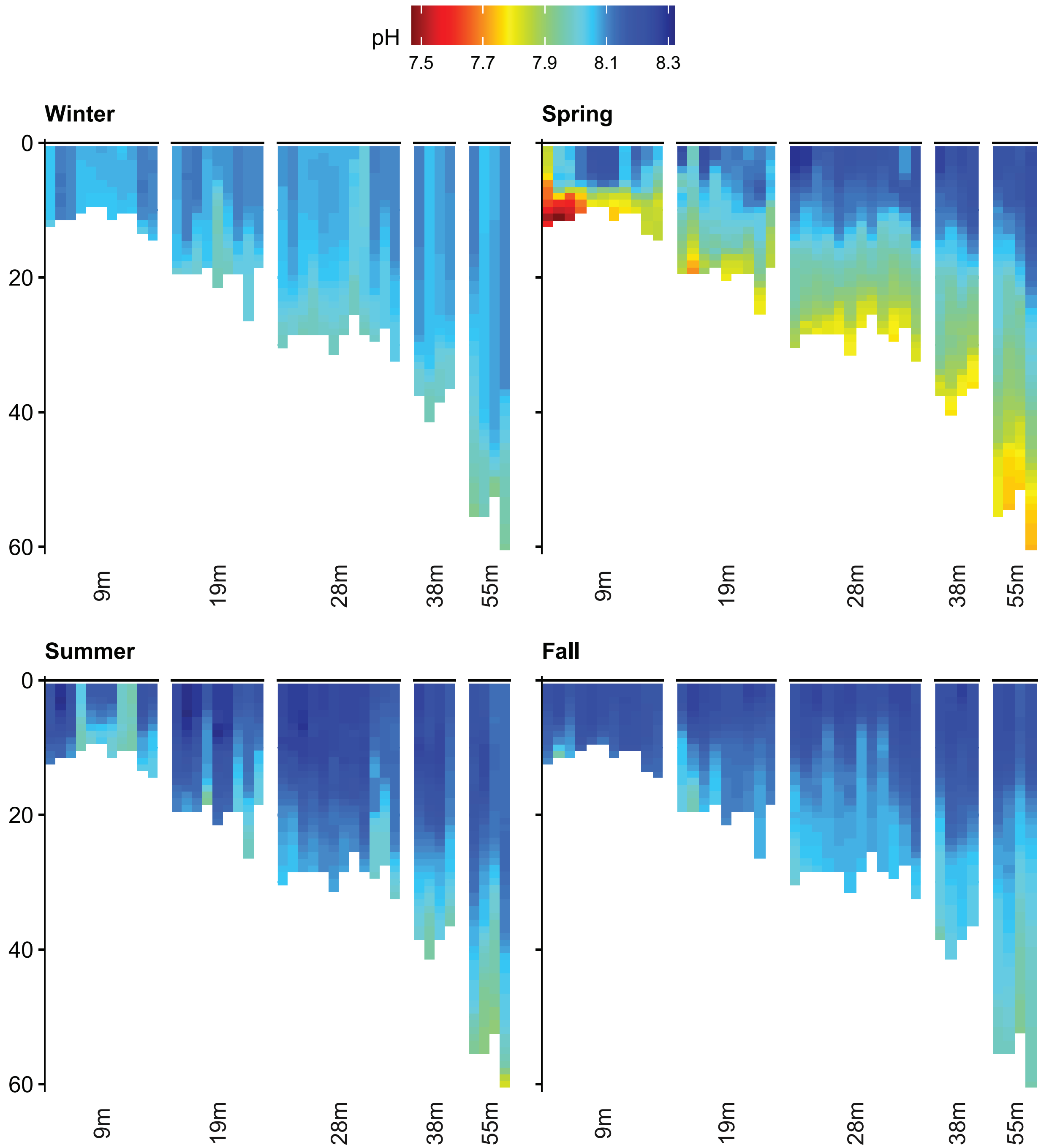
Appendix A.9

Dissolved oxygen recorded in the SBOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



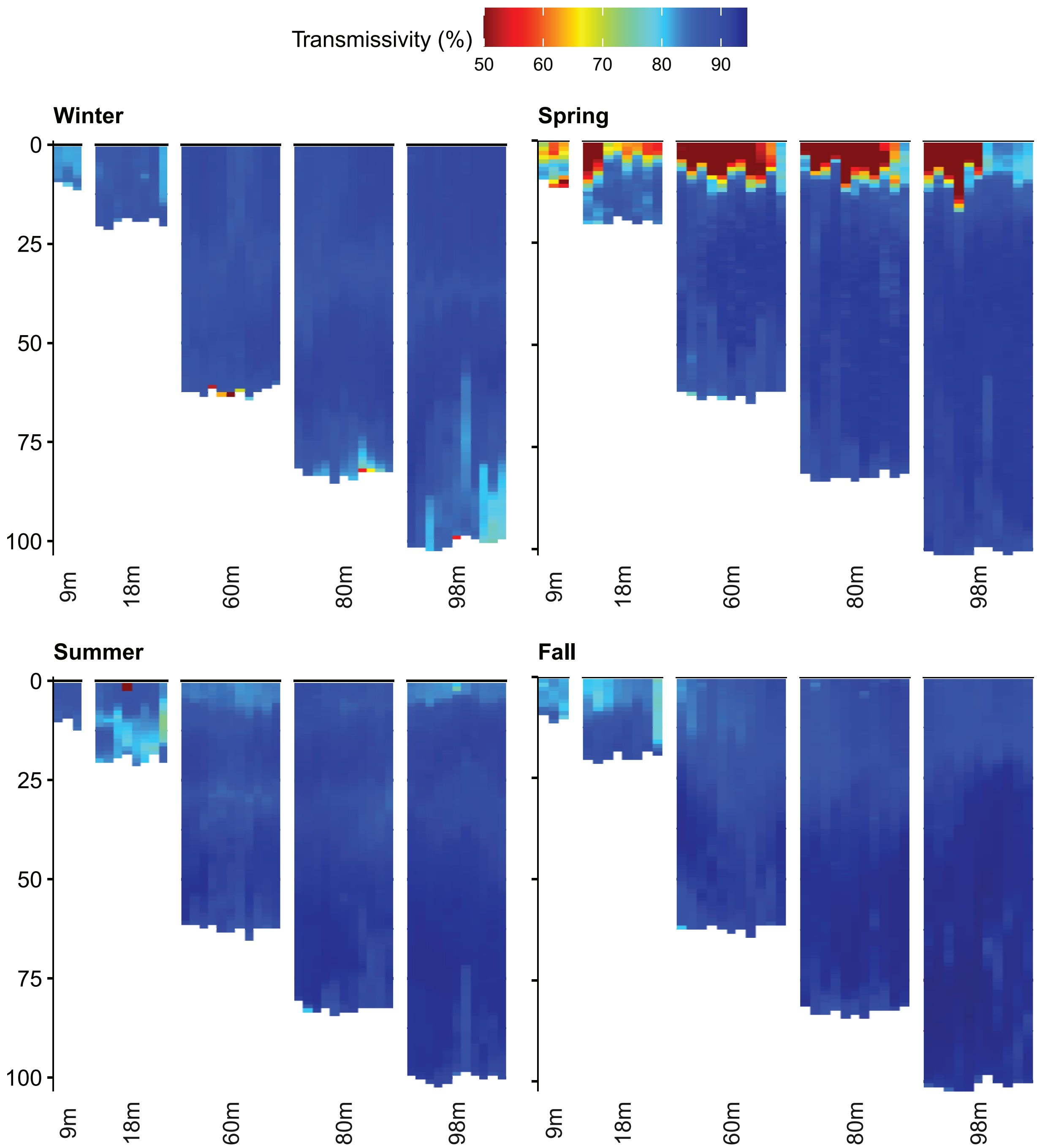
Appendix A.10

Values of pH recorded in the PLOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



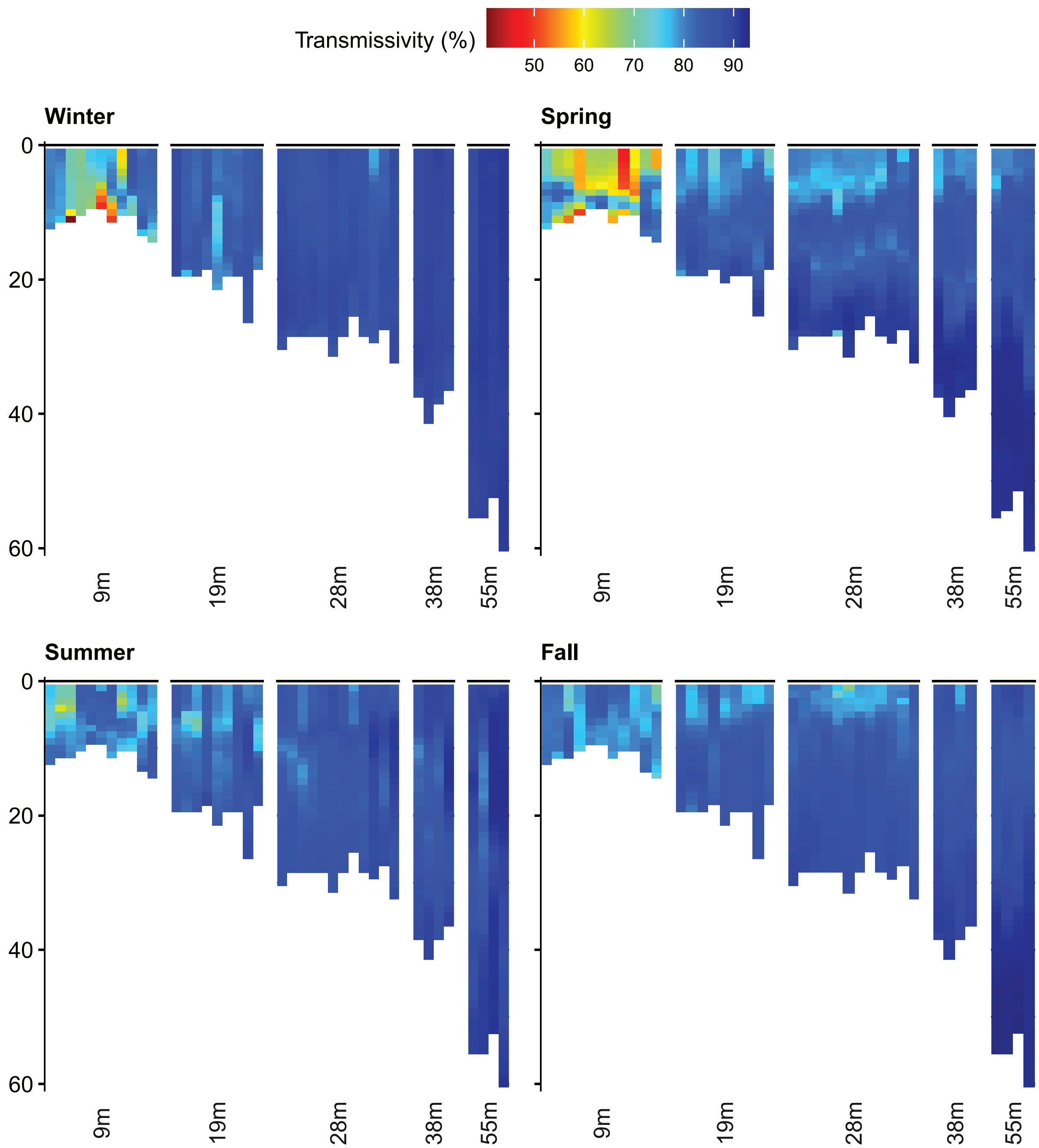
Appendix A.11

Values of pH recorded in the SBOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



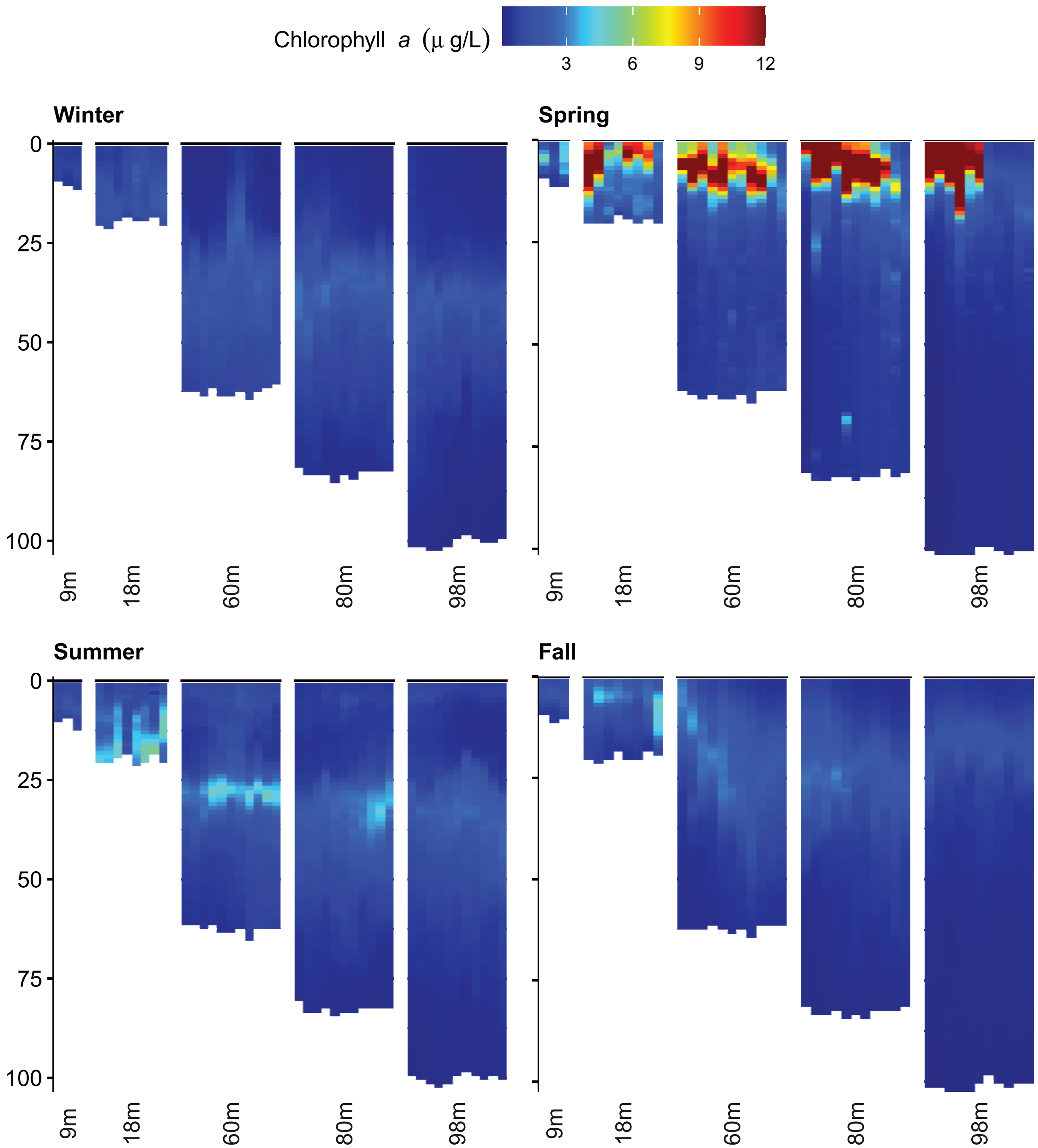
Appendix A.12

Transmissivity recorded in the PLOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



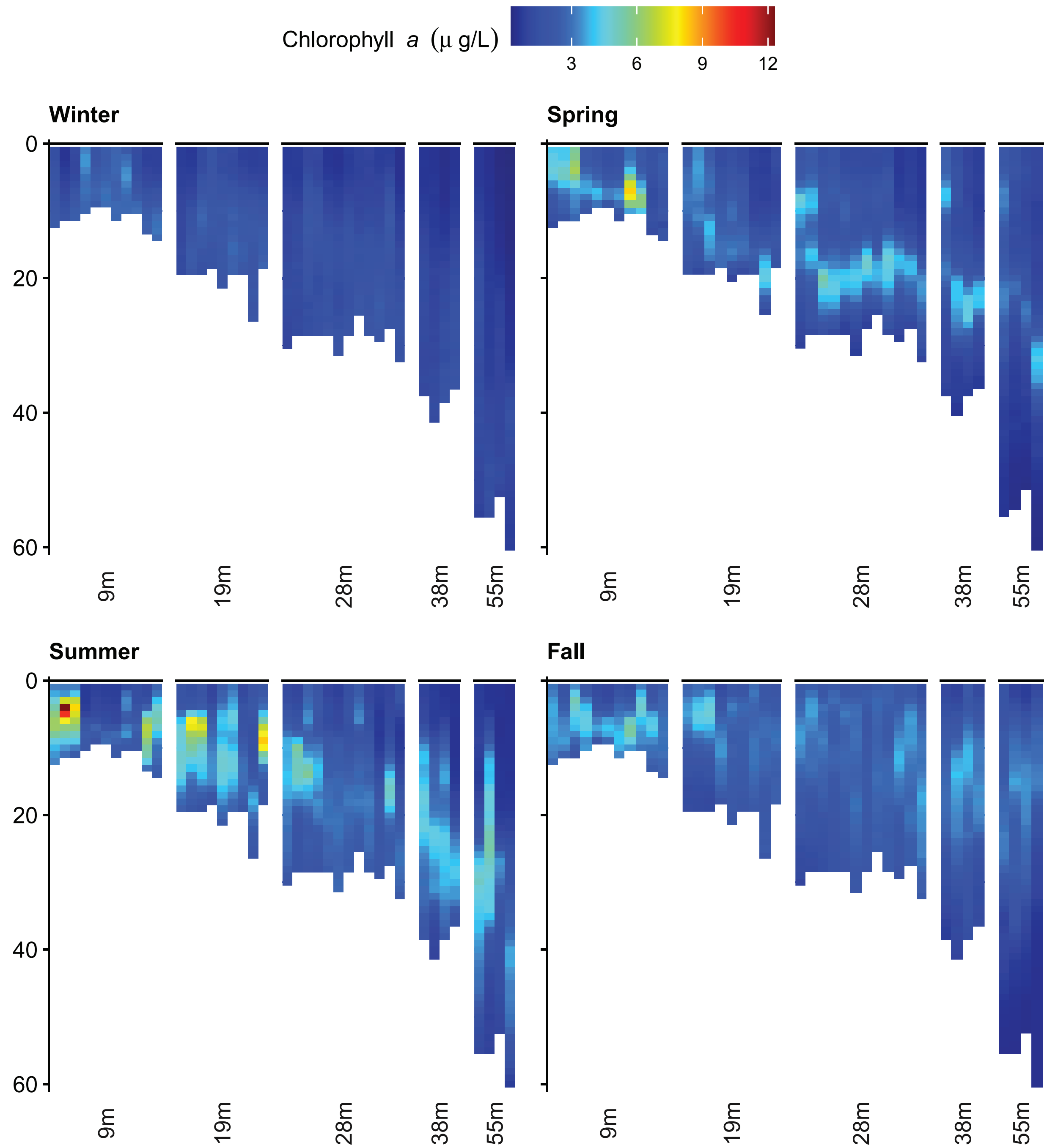
Appendix A.13

Transmissivity recorded in the SBOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



Appendix A.14

Chlorophyll *a* recorded in the PLOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



Appendix A.15

Chlorophyll *a* recorded in the SBOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.

Appendix A.16

Summary of temperature, salinity, DO, pH (total), chlorophyll *a*, CDOM, turbidity, nitrate + nitrite, BOD, and xCO_2 recorded at various depths by the PLOO RTOMS in 2020. 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 (Addenda 2-1 to 2-4); id = insufficient data (see text). The PLOO RTOMS was not deployed during Fall 2020.

Parameter	Season		1 m	10 m	20 m	30 m	45 m	60 m	75 m	89 m
Temperature (°C)	*Winter*	mean	15.93	15.77	15.39	—	13.69	12.68	11.98	11.47
		min	14.84	13.95	12.56	—	10.92	10.15	9.78	9.61
		max	17.86	16.63	16.39	—	15.83	14.90	13.87	13.06
		n	10,103	10,226	10,228	id	10,233	10,229	10,225	8257
		n_prop	0.78	0.79	0.79	0.35	0.79	0.79	0.79	0.64
	Spring	mean	18.87	15.82	13.17	—	10.94	10.43	10.19	10.06
		min	14.76	11.81	10.93	—	10.05	9.84	9.58	9.29
		max	22.46	20.36	19.03	—	15.07	13.17	12.12	11.22
		n	12,267	12,430	12,420	0	12,425	12,432	12,434	12,312
		n_prop	0.94	0.95	0.95	—	0.95	0.95	0.95	0.94
	Summer	mean	21.21	16.85	13.83	—	11.80	11.22	10.93	10.76
		min	15.16	11.74	11.13	—	10.42	10.14	9.94	9.84
		max	25.46	23.27	18.80	—	14.30	13.24	12.74	12.30
		n	11,949	12,163	12,159	0	12,119	12,109	12,104	11,971
		n_prop	0.90	0.92	0.92	—	0.91	0.91	0.91	0.90
Salinity (psu)	*Winter*	mean	33.49	33.46	33.47	—	33.51	33.48	33.34	33.31
		min	33.32	33.29	33.34	—	33.32	33.19	32.89	32.97
		max	33.57	33.54	33.57	—	33.65	33.79	33.84	33.72
		n	10,100	10,222	10,222	id	6315	10,227	10,224	8252
		n_prop	0.78	0.79	0.79	0.35	0.49	0.79	0.79	0.64
	Spring	mean	33.49	33.45	33.53	—	33.56	33.59	33.61	33.44
		min	32.12	33.09	33.23	—	33.20	33.22	33.31	33.11
		max	33.62	33.80	33.86	—	33.80	33.87	33.94	33.70
		n	12,252	12,241	12,393	0	7916	12,431	12,434	12,312
		n_prop	0.93	0.93	0.95	—	0.60	0.95	0.95	0.94
	Summer	mean	33.66	33.41	33.43	—	—	33.35	33.36	33.28
		min	33.45	33.15	33.07	—	—	33.00	33.01	32.97
		max	33.81	33.87	33.67	—	—	33.69	33.66	33.50
		n	11,895	12,049	12,157	0	0	12,091	12,094	11,971
		n_prop	0.90	0.91	0.92	—	—	0.91	0.91	0.90
DO (mg/L)	*Winter*	mean	8.38	—	—	—	—	—	—	4.24
		min	8.05	—	—	—	—	—	—	2.20
		max	9.83	—	—	—	—	—	—	5.42
		n	10,159	—	—	id	—	—	—	8305
		n_prop	0.78	—	—	0.36	—	—	—	0.64
	Spring	mean	10.38	—	—	—	—	—	—	3.25
		min	7.07	—	—	—	—	—	—	2.13
		max	22.49	—	—	—	—	—	—	3.88
		n	12,384	—	—	0	—	—	—	12,435
		n_prop	0.95	—	—		—	—	—	0.95

Appendix A.16 *continued*

Parameter	Season		1 m	10 m	20 m	30 m	45 m	60 m	75 m	89 m
	Summer	mean	8.14	—	—	—	—	—	—	3.76
		min	7.17	—	—	—	—	—	—	3.01
		max	10.05	—	—	—	—	—	—	5.18
		n	12,050	—	—	0	—	—	—	12,104
		n_prop	0.91	—	—	—	—	—	—	0.91
pH (total pH)	*Winter*	mean	8.07	—	—	—	—	—	—	7.75
		min	8.04	—	—	—	—	—	—	7.60
		max	8.15	—	—	—	—	—	—	7.84
		n	10,177	—	—	id	—	—	—	8300
		n_prop	0.79	—	—	0.36	—	—	—	0.64
	Spring	mean	8.21	—	—	—	—	—	—	7.70
		min	8.00	—	—	—	—	—	—	7.58
		max	8.88	—	—	—	—	—	—	7.78
		n	12,383	—	—	0	—	—	—	12,435
		n_prop	0.94	—	—	—	—	—	—	0.95
	Summer	mean	8.05	—	—	—	—	—	—	7.69
		min	7.97	—	—	—	—	—	—	7.58
		max	8.16	—	—	—	—	—	—	7.78
		n	12,042	—	—	0	—	—	—	12,104
		n_prop	0.91	—	—	—	—	—	—	0.91
Chlorophyll *a* (µg/L)	*Winter*	mean	—	—	—	0.76	—	—	—	0.07
		min	—	—	—	0.03	—	—	—	0.03
		max	—	—	—	2.23	—	—	—	0.22
		n	id	—	—	7210	—	—	—	9641
		n_prop	0.20	—	—	0.56	—	—	—	0.74
	Spring	mean	2.76	—	—	0.79	—	—	—	0.05
		min	0	—	—	0.05	—	—	—	0.03
		max	29.40	—	—	14.72	—	—	—	0.18
		n	8848	—	—	10,394	—	—	—	12,271
		n_prop	0.68	—	—	0.79	—	—	—	0.94
	Summer	mean	—	—	—	—	—	—	—	0.07
		min	—	—	—	—	—	—	—	0.03
		max	—	—	—	—	—	—	—	0.33
		n	0	—	—	0	—	—	—	11,946
		n_prop	—	—	—	—	—	—	—	0.90
CDOM (ppb)	*Winter*	mean	—	—	—	0.92	—	—	—	0.68
		min	—	—	—	0.64	—	—	—	0.36
		max	—	—	—	1.73	—	—	—	1.36
		n	id	—	—	7103	—	—	—	9641
		n_prop	0.19	—	—	0.55	—	—	—	0.74

Appendix A.16 *continued*

Parameter	Season		1 m	10 m	20 m	30 m	45 m	60 m	75 m	89 m
	Spring	mean	1.64	—	—	0.95	—	—	—	0.56
		min	0	—	—	0.45	—	—	—	0.36
		max	22.08	—	—	1.55	—	—	—	1.00
		n	8702	—	—	10,453	—	—	—	12,279
		n_prop	0.66	—	—	0.80	—	—	—	0.94
	Summer	mean	—	—	—	—	—	—	—	0.54
		min	—	—	—	—	—	—	—	0.36
		max	—	—	—	—	—	—	—	1.00
		n	0	—	—	0	—	—	—	11,949
		n_prop	—	—	—	—	—	—	—	0.90
Turbidity (NTU)	*Winter*	mean	—	—	—	0.11	—	—	—	0.25
		min	—	—	—	0.05	—	—	—	0.02
		max	—	—	—	0.60	—	—	—	1.70
		n	id	—	—	7195	—	—	—	9641
		n_prop	0.20	—	—	0.56	—	—	—	0.74
	Spring	mean	0.81	—	—	0.14	—	—	—	0.13
		min	0	—	—	0.02	—	—	—	0.01
		max	9.79	—	—	1.84	—	—	—	0.65
		n	6515	—	—	10,435	—	—	—	12,274
		n_prop	0.50	—	—	0.80	—	—	—	0.94
	Summer	mean	—	—	—	—	—	—	—	0.22
		min	—	—	—	—	—	—	—	0.05
		max	—	—	—	—	—	—	—	1.02
		n	0	—	—	0	—	—	—	8125
		n_prop	—	—	—	—	—	—	—	0.61
Nitrate + nitrite (μM)	*Winter*	mean	—	—	—	—	—	—	—	14.91
		min	—	—	—	—	—	—	—	0
		max	—	—	—	—	—	—	—	40.28
		n	0	—	—	—	—	—	—	1516
		n_prop	—	—	—	—	—	—	—	0.70
	Spring	mean	2.01	—	—	—	—	—	—	17.68
		min	0.74	—	—	—	—	—	—	0.07
		max	3.64	—	—	—	—	—	—	39.23
		n	949	—	—	—	—	—	—	896
		n_prop	0.43	—	—	—	—	—	—	0.41
	Summer	mean	1.81	—	—	—	—	—	—	—
		min	0	—	—	—	—	—	—	—
		max	3.60	—	—	—	—	—	—	—
		n	1941	—	—	—	—	—	—	0
		n_prop	0.88	—	—	—	—	—	—	—

Appendix A.16 *continued*

Parameter	Season		1 m	10 m	20 m	30 m	45 m	60 m	75 m	89 m
BOD (mg/L)	*Winter*	mean	—	—	—	0.12	—	—	—	—
		min	—	—	—	0.08	—	—	—	—
		max	—	—	—	0.60	—	—	—	—
		n	—	—	—	9318	—	—	—	id
		n_prop	—	—	—	0.72	—	—	—	0.07
	Spring	mean	—	—	—	0.14	—	—	—	—
		min	—	—	—	0.09	—	—	—	—
		max	—	—	—	0.43	—	—	—	—
		n	—	—	—	7537	—	—	—	id
		n_prop	—	—	—	0.58	—	—	—	0.30
	Summer	mean	—	—	—	—	—	—	—	0.04
		min	—	—	—	—	—	—	—	0
		max	—	—	—	—	—	—	—	0.35
		n	—	—	—	id	—	—	—	5546
		n_prop	—	—	—	0	—	—	—	0.42
xCO2 (ppm)	*Winter*	mean	370.49	—	—	—	—	—	—	—
		min	301.08	—	—	—	—	—	—	—
		max	390.05	—	—	—	—	—	—	—
		n	171	—	—	—	—	—	—	—
		n_prop	0.79	—	—	—	—	—	—	—
	Spring	mean	271.73	—	—	—	—	—	—	—
		min	59.20	—	—	—	—	—	—	—
		max	422.16	—	—	—	—	—	—	—
		n	212	—	—	—	—	—	—	—
		n_prop	0.97	—	—	—	—	—	—	—
	Summer	mean	384.65	—	—	—	—	—	—	—
		min	303.55	—	—	—	—	—	—	—
		max	476.94	—	—	—	—	—	—	—
		n	207	—	—	—	—	—	—	—
		n_prop	0.94	—	—	—	—	—	—	—

Appendix A.17

Summary of temperature, salinity, DO, pH (total), chlorophyll *a*, CDOM, turbidity, nitrate + nitrite, BOD, and xCO_2 recorded at various depths by the SBOO RTOMS in 2020. 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 (Addenda 2-1 to 2-4); id = insufficient data (see text).

Parameter	Season		1 m	10 m	18 m	26 m
Temperature (°C)	*Winter*	mean	15.52	15.23	14.84	14.18
		min	13.61	11.55	10.99	10.81
		max	17.35	16.80	16.30	16.14
		n	12,731	12,787	12,801	12,757
		n_prop	0.98	0.99	0.99	0.98
	Spring	mean	17.77	13.66	12.50	11.69
		min	13.70	10.91	10.60	10.56
		max	22.70	19.71	16.91	15.81
		n	11,286	11,442	8527	11,345
		n_prop	0.86	0.87	0.65	0.87
	Summer	mean	19.75	14.89	—	—
		min	13.87	11.24	—	—
		max	24.38	22.70	—	—
		n	11,258	12,429	0	id
		n_prop	0.85	0.94	—	0.30
	Fall	mean	—	15.56	—	—
		min	—	13.12	—	—
		max	—	21.31	—	—
		n	0	10,034	0	0
		n_prop	—	0.76	—	—
Salinity (psu)	*Winter*	mean	33.47	33.44	33.47	33.52
		min	33.21	33.17	33.05	33.32
		max	33.56	33.63	33.72	33.76
		n	12,724	12,778	12,798	12,730
		n_prop	0.98	0.99	0.99	0.98
	Spring	mean	33.53	33.48	33.60	33.65
		min	32.90	33.20	33.24	33.34
		max	33.77	33.70	33.83	33.84
		n	11,279	5534	8494	11,338
		n_prop	0.86	0.42	0.65	0.87
	Summer	mean	33.61	—	—	—
		min	33.36	—	—	—
		max	33.78	—	—	—
		n	11,210	0	0	id
		n_prop	0.85	—	—	0.28
	Fall	n	0	0	0	0
DO (mg/L)	*Winter*	mean	8.22	—	7.76	7.35
		min	6.97	—	4.90	4.86
		max	9.19	—	8.86	8.80
		n	12,650	—	12,811	12,770
		n_prop	0.98	—	0.99	0.99

Appendix A.17 *continued*

Parameter	Season		1 m	10 m	18 m	26 m
	Spring	mean	9.84	—	5.85	5.03
		min	5.81	—	3.73	3.38
		max	23.31	—	10.21	10.13
		n	11,319	—	6519	11,380
		n_prop	0.86	—	0.50	0.87
	Summer	mean	8.47	—	—	—
		min	6.96	—	—	—
		max	10.95	—	—	—
		n	11,302	—	0	id
		n_prop	0.85	—	—	0.30
	Fall	n	0	—	0	0
pH (total pH)	*Winter*	mean	7.88	—	—	7.79
		min	7.78	—	—	7.61
		max	7.96	—	—	7.89
		n	12,828	—	—	12,862
		n_prop	0.99	—	—	0.99
	Spring	mean	8.01	—	—	7.61
		min	7.69	—	—	7.44
		max	8.61	—	—	8.00
		n	11,365	—	—	11,429
		n_prop	0.87	—	—	0.87
	Summer	mean	7.90	—	—	—
		min	7.78	—	—	—
		max	8.03	—	—	—
		n	11,224	—	—	id
		n_prop	0.85	—	—	0.30
	Fall	n	0	—	—	0
Chlorophyll *a* (µg/L)	*Winter*	mean	0.73	—	1.11	1.16
		min	0	—	0.17	0.36
		max	3.33	—	4.68	4.75
		n	11,931	—	12,673	11,411
		n_prop	0.92	—	0.98	0.88
	Spring	mean	2.08	—	1.56	0.95
		min	0.02	—	0.12	0.10
		max	29.40	—	12.50	12.63
		n	11,183	—	11,252	9718
		n_prop	0.85	—	0.86	0.74
	Summer	mean	—	—	2.43	—
		min	—	—	0.25	—
		max	—	—	9.44	—
		n	id	—	12,327	id
		n_prop	0.36	—	0.93	0.31

Appendix A.17 *continued*

Parameter	Season		1 m	10 m	18 m	26 m
	Fall	mean	—	—	1.38	—
		min	—	—	0.09	—
		max	—	—	5.42	—
		n	0	—	7393	0
		n_prop	—	—	0.56	—
CDOM (ppb)	*Winter*	mean	0.87	—	1.01	1.13
		min	0	—	0.54	0.72
		max	3.16	—	2.53	2.62
		n	11,874	—	12,574	11,411
		n_prop	0.92	—	0.97	0.88
	Spring	mean	0.95	—	1.15	1.09
		min	0	—	0.72	0.72
		max	18.35	—	2.89	2.98
		n	11,184	—	11,251	9718
		n_prop	0.85	—	0.86	0.74
	Summer	mean	—	—	1.26	—
		min	—	—	0.81	—
		max	—	—	2.89	—
		n	id	—	11,157	id
		n_prop	0.10	—	0.84	0.31
	Fall	n	0	—	0	0
Turbidity (NTU)	*Winter*	mean	0.21	—	0.19	0.36
		min	0	—	0.06	0.08
		max	3.04	—	1.76	4.46
		n	12,000	—	12,673	11,410
		n_prop	0.93	—	0.98	0.88
	Spring	mean	0.58	—	0.22	0.22
		min	0.04	—	0.05	0.05
		max	9.80	—	1.48	1.36
		n	5609	—	11,252	9717
		n_prop	0.43	—	0.86	0.74
	Summer	mean	—	—	0.30	—
		min	—	—	0.05	—
		max	—	—	2.57	—
		n	0	—	11,528	id
		n_prop	—	—	0.87	0.31
	Fall	n	0	—	0	0
Nitrate + nitrite (μM)	*Winter*	mean	2.43	—	—	4.78
		min	0.17	—	—	0.01
		max	11.20	—	—	20.77
		n	2059	—	—	2036
		n_prop	0.95	—	—	0.94

Appendix A.17 *continued*

Parameter	Season		1 m	10 m	18 m	26 m
	Spring	mean	1.41	—	—	12.23
		min	0	—	—	0.01
		max	5.87	—	—	25.41
		n	1793	—	—	1773
		n_prop	0.82	—	—	0.81
	Summer	mean	1.22	—	—	—
		min	0	—	—	—
		max	3.65	—	—	—
		n	1949	—	—	id
		n_prop	0.88	—	—	0.29
	Fall	n	id	—	—	0
		n_prop	0	—	—	—
BOD (mg/L)	*Winter*	mean	—	—	—	0.10
		min	—	—	—	0.04
		max	—	—	—	9.27
		n	—	—	—	12,769
		n_prop	—	—	—	0.99
	Spring	mean	—	—	—	0.08
		min	—	—	—	0.04
		max	—	—	—	1.67
		n	—	—	—	11,350
		n_prop	—	—	—	0.87
	Summer	n	—	—	—	id
		n_prop	—	—	—	0.30
	Fall	n	—	—	—	id
		n_prop	—	—	—	0.01
xCO2 (ppm)	*Winter*	mean	385.18	—	—	—
		min	317.81	—	—	—
		max	478.34	—	—	—
		n	214	—	—	—
		n_prop	0.99	—	—	—
	Spring	mean	296.49	—	—	—
		min	60.71	—	—	—
		max	564.50	—	—	—
		n	190	—	—	—
		n_prop	0.87	—	—	—
	Summer	mean	359.64	—	—	—
		min	251.88	—	—	—
		max	462.21	—	—	—
		n	217	—	—	—
		n_prop	0.98	—	—	—

Appendix A.17 *continued*

Parameter	Season		1 m	10 m	18 m	26 m
	Fall	mean	398.04	—	—	—
		min	313.57	—	—	—
		max	530.59	—	—	—
		n	169	—	—	—
		n_prop	0.76	—	—	—

Appendix A.18

Summary of current velocity magnitude and direction from the PLOO RTOMS ADCP during 2020. The deployment ended prior to the Fall. 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 (Addenda 2-1 to 2-4). 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	4	10,168	1.00	0	574	137	2	544	75
	6	10,168	1.00	0	660	159	2	542	74
	8	10,168	1.00	7	498	137	2	550	72
	10	10,168	1.00	1	515	137	2	546	73
	12	10,168	1.00	5	611	151	2	177	75
	14	10,168	1.00	4	590	148	2	175	75
	16	10,168	1.00	14	538	143	2	175	75
	18	10,167	1.00	9	489	130	2	179	74
	20	10,166	1.00	13	510	136	2	174	75
	22	10,166	1.00	14	503	134	2	172	76
	24	10,167	1.00	10	494	130	2	171	75
	26	10,166	1.00	11	484	123	2	171	75
	28	10,166	1.00	6	473	117	2	170	74
	30	10,167	1.00	9	471	115	2	168	74
	32	10,165	1.00	10	462	112	2	168	74
	34	10,165	1.00	4	459	109	2	168	73
	36	10,165	1.00	1	460	105	2	168	73
	38	10,165	1.00	2	458	99	2	168	73
	40	10,165	1.00	4	447	93	1	168	72
	42	10,165	1.00	0	435	89	1	167	72
	44	10,164	1.00	6	421	85	1	165	71
	46	10,164	1.00	3	397	79	1	163	71
	48	10,162	1.00	7	379	75	1	160	70
	50	10,148	1.00	3	346	70	1	156	70
	52	10,128	1.00	0	298	64	1	152	69
	54	10,090	0.99	6	233	59	1	142	69
	56	10,012	0.98	1	229	57	1	128	69
	58	9794	0.96	1	210	56	1	110	69
	60	9440	0.93	0	186	56	1	83	69
	62	8964	0.88	1	170	56	1	64	69
	64	8348	0.82	0	156	55	1	61	69
	66	7677	0.76	0	131	54	1	58	69
	68	6840	0.67	2	124	53	1	60	69
	70	5982	0.59	2	126	54	1	64	70
	72	5144	0.51	5	127	53	1	66	71
	74	4407	0.43	0	141	54	1	69	71

Appendix A.18 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
	76	3765	0.37	—	—	—	—	—	—
	78	3251	0.32	—	—	—	—	—	—
	80	2861	0.28	—	—	—	—	—	—
	82	2631	0.26	—	—	—	—	—	—
	84	2386	0.23	—	—	—	—	—	—
	86	2283	0.22	—	—	—	—	—	—
	88	2276	0.22	—	—	—	—	—	—
	90	2337	0.23	—	—	—	—	—	—
	92	2499	0.25	—	—	—	—	—	—
Spring	4	12,413	1.00	2	541	250	2	173	69
	6	12,412	1.00	2	550	270	2	170	69
	8	12,412	1.00	2	498	232	2	173	67
	10	12,411	1.00	8	509	233	2	171	68
	12	12,405	1.00	10	519	260	2	166	69
	14	12,397	1.00	7	501	250	2	165	70
	16	12,396	1.00	6	485	236	2	164	70
	18	12,403	1.00	7	477	207	2	165	70
	20	12,399	1.00	10	475	208	2	162	70
	22	12,396	1.00	10	474	202	2	161	71
	24	12,390	1.00	11	476	191	2	159	71
	26	12,368	1.00	9	474	175	2	157	72
	28	12,349	0.99	6	459	160	2	155	72
	30	12,315	0.99	13	458	158	2	154	73
	32	12,261	0.99	9	450	151	1	151	73
	34	12,204	0.98	5	449	143	1	149	73
	36	12,113	0.98	2	449	135	1	145	73
	38	12,035	0.97	3	445	127	1	141	73
	40	11,919	0.96	3	437	112	1	135	73
	42	11,831	0.95	8	422	108	1	130	72
	44	11,587	0.93	10	407	106	1	124	72
	46	11,365	0.92	3	382	99	1	118	72
	48	11,008	0.89	4	363	94	1	107	72
	50	10,477	0.84	1	326	89	1	92	72
	52	9657	0.78	6	275	83	1	73	72
	54	8669	0.70	12	196	74	1	49	70
	56	7423	0.60	13	172	74	1	44	69
	58	5895	0.47	12	165	72	1	43	67
	60	4457	0.36	—	—	—	—	—	—
	62	3270	0.26	—	—	—	—	—	—
	64	2317	0.19	—	—	—	—	—	—

Appendix A.18 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
	66	1590	0.13	—	—	—	—	—	—
	68	995	0.08	—	—	—	—	—	—
	70	617	0.05	—	—	—	—	—	—
	72	354	0.03	—	—	—	—	—	—
	74	210	0.02	—	—	—	—	—	—
	76	146	0.01	—	—	—	—	—	—
	78	117	0.01	—	—	—	—	—	—
	80	94	0.01	—	—	—	—	—	—
	82	100	0.01	—	—	—	—	—	—
	84	110	0.01	—	—	—	—	—	—
	86	110	0.01	—	—	—	—	—	—
	88	115	0.01	—	—	—	—	—	—
	90	149	0.01	—	—	—	—	—	—
	92	175	0.01	—	—	—	—	—	—
Summer	4	12,165	1.00	1	431	171	2	173	60
	6	12,162	1.00	4	440	173	2	167	62
	8	12,160	1.00	7	345	141	1	169	64
	10	12,162	1.00	5	320	133	1	165	65
	12	12,161	1.00	2	379	138	1	159	66
	14	12,161	1.00	6	373	128	1	158	66
	16	12,162	1.00	0	360	120	1	157	67
	18	12,162	1.00	1	312	107	1	153	67
	20	12,160	1.00	6	326	108	1	147	68
	22	12,158	1.00	6	313	106	1	137	68
	24	12,157	1.00	2	287	102	1	124	68
	26	12,156	1.00	3	240	96	1	95	67
	28	12,158	1.00	3	226	92	1	63	68
	30	12,155	1.00	0	220	90	1	59	68
	32	12,150	1.00	1	206	87	1	46	68
	34	12,143	1.00	2	206	85	1	37	69
	36	12,136	1.00	3	206	84	1	32	68
	38	12,110	1.00	4	205	82	1	27	69
	40	12,090	0.99	1	187	81	1	20	69
	42	12,108	1.00	3	200	82	1	20	69
	44	11,990	0.99	3	208	83	1	18	69
	46	11,847	0.97	0	209	82	1	14	69
	48	11,693	0.96	2	200	82	1	11	68
	50	11,465	0.94	3	199	81	1	10	68
	52	11,012	0.91	0	189	81	1	8	67
	54	10,382	0.85	4	193	79	1	5	67
	56	9678	0.80	1	179	79	1	6	67

Appendix A.18 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
	58	8536	0.70	0	173	79	1	7	67
	60	7117	0.58	1	172	76	1	8	68
	62	5758	0.47	3	166	73	1	8	67
	64	4266	0.35	—	—	—	—	—	—
	66	3110	0.26	—	—	—	—	—	—
	68	1949	0.16	—	—	—	—	—	—
	70	1221	0.10	—	—	—	—	—	—
	72	714	0.06	—	—	—	—	—	—
	74	469	0.04	—	—	—	—	—	—
	76	314	0.03	—	—	—	—	—	—
	78	249	0.02	—	—	—	—	—	—
	80	204	0.02	—	—	—	—	—	—
	82	163	0.01	—	—	—	—	—	—
	84	157	0.01	—	—	—	—	—	—
	86	150	0.01	—	—	—	—	—	—
	88	156	0.01	—	—	—	—	—	—
	90	161	0.01	—	—	—	—	—	—
	92	163	0.01	—	—	—	—	—	—

Appendix A.19

Summary of current velocity magnitude and direction from the SBOO RTOMS ADCP during 2020. 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 (Addenda 2-1 to 2-4). Minimum and maximum angles of velocity are not shown due to the circular nature of the measurement.

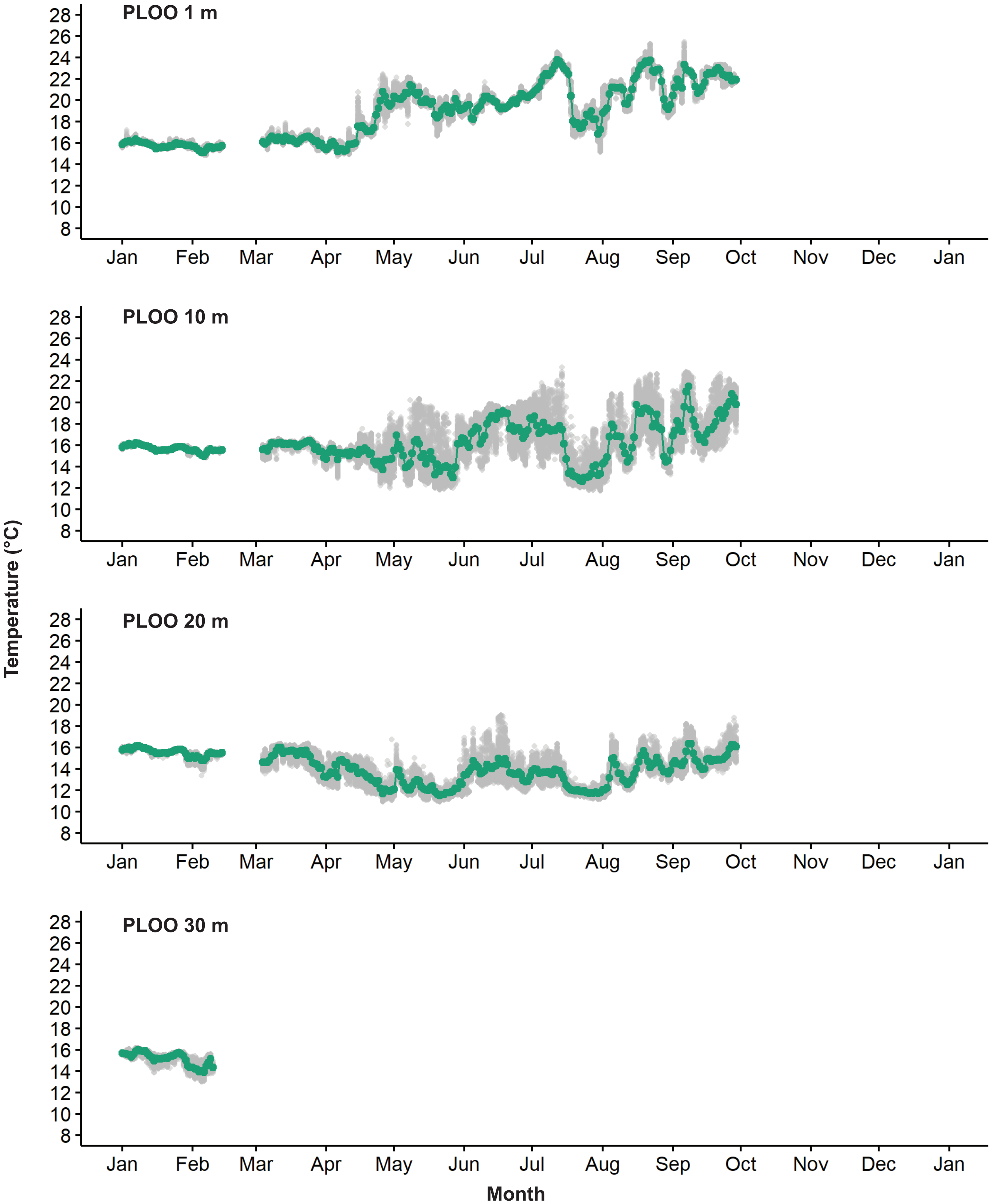
				Magnitude (mm/s)				Angle	
Season	**Depth (m)**	**n**	**n_prop**	**Min**	**Max**	**Mean**	**95% CI**	**Mean**	**95% CI**
Winter	3	12,861	1.00	4	271	99	1	180	72
	4	12,860	1.00	3	330	115	1	174	72
	5	12,860	1.00	3	331	117	1	173	73
	6	12,860	1.00	10	317	117	1	172	73
	7	12,860	1.00	10	307	116	1	170	73
	8	12,860	1.00	2	302	114	1	170	73
	9	12,860	1.00	2	149	70	1	561	60
	10	12,860	1.00	1	242	93	1	174	69
	11	12,859	1.00	4	292	108	1	164	71
	12	12,859	1.00	6	277	107	1	162	70
	13	12,859	1.00	4	266	106	1	160	70
	14	12,859	1.00	7	258	104	1	158	69
	15	12,859	1.00	1	231	99	1	159	68
	16	12,858	1.00	3	184	83	1	166	65
	17	12,857	1.00	2	172	78	1	172	62
	18	12,856	1.00	1	213	93	1	152	69
	19	12,856	1.00	4	207	91	1	152	69
	20	12,855	1.00	5	195	89	1	149	70
	21	12,856	1.00	0	188	86	1	148	70
	22	12,856	1.00	9	151	71	1	152	71
	23	12,856	1.00	1	115	55	0	173	66
	24	12,856	1.00	0	119	50	0	576	64
	25	12,856	1.00	0	160	54	1	170	69
	26	12,857	1.00	4	153	55	0	147	68
	27	12,857	1.00	1	135	47	0	145	66
	28	12,856	1.00	0	125	42	0	156	62
Spring	3	11,406	1.00	3	330	125	1	163	75
	4	11,406	1.00	4	352	147	2	163	72
	5	11,405	1.00	8	348	144	2	159	72
	6	11,402	1.00	4	351	138	2	155	72
	7	11,404	1.00	12	344	130	1	153	71
	8	11,404	1.00	2	326	124	1	147	72
	9	11,394	1.00	3	197	88	1	589	71
	10	11,395	1.00	4	299	106	1	145	71
	11	11,396	1.00	8	324	110	1	122	70
	12	11,396	1.00	4	318	106	1	104	71

Appendix A.19 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
	13	11,396	1.00	1	310	104	1	88	70
	14	11,396	1.00	7	307	101	1	70	71
	15	11,395	1.00	6	271	94	1	49	72
	16	11,394	1.00	7	210	82	1	10	72
	17	11,394	1.00	1	243	81	1	357	71
	18	11,394	1.00	2	296	92	1	44	71
	19	11,394	1.00	2	283	90	1	47	71
	20	11,394	1.00	1	281	90	1	46	71
	21	11,394	1.00	1	253	88	1	45	72
	22	11,393	1.00	2	202	76	1	28	72
	23	11,393	1.00	2	183	65	1	353	70
	24	11,393	1.00	1	170	64	1	335	69
	25	11,393	1.00	0	192	66	1	2	70
	26	11,392	1.00	9	180	66	1	26	69
	27	11,393	1.00	3	145	56	1	15	68
	28	11,396	1.00	3	145	48	1	5	65
Summer	3	12,669	1.00	6	318	89	1	166	71
	4	12,668	1.00	7	425	108	1	162	71
	5	12,668	1.00	1	450	109	2	156	70
	6	12,668	1.00	3	435	107	1	150	70
	7	12,668	1.00	5	420	103	1	145	71
	8	12,668	1.00	5	399	98	1	140	71
	9	12,668	1.00	4	264	74	1	152	71
	10	12,668	1.00	4	296	83	1	131	71
	11	12,668	1.00	1	371	88	1	128	71
	12	12,667	1.00	2	366	87	1	121	71
	13	12,667	1.00	1	356	84	1	113	71
	14	12,667	1.00	2	339	83	1	95	71
	15	12,667	1.00	0	306	81	1	78	72
	16	12,667	1.00	0	221	74	1	43	72
	17	12,666	1.00	3	241	71	1	34	72
	18	12,666	1.00	0	270	77	1	64	71
	19	12,666	1.00	3	270	77	1	63	71
	20	12,666	1.00	3	259	76	1	59	71
	21	12,666	1.00	0	237	73	1	56	71
	22	12,666	1.00	10	166	65	1	39	70
	23	12,665	1.00	1	156	55	1	19	69
	24	12,665	1.00	2	142	51	1	4	68
	25	12,665	1.00	5	139	53	1	23	67
	26	12,665	1.00	5	132	52	0	30	66
	27	12,664	1.00	6	124	47	0	21	66

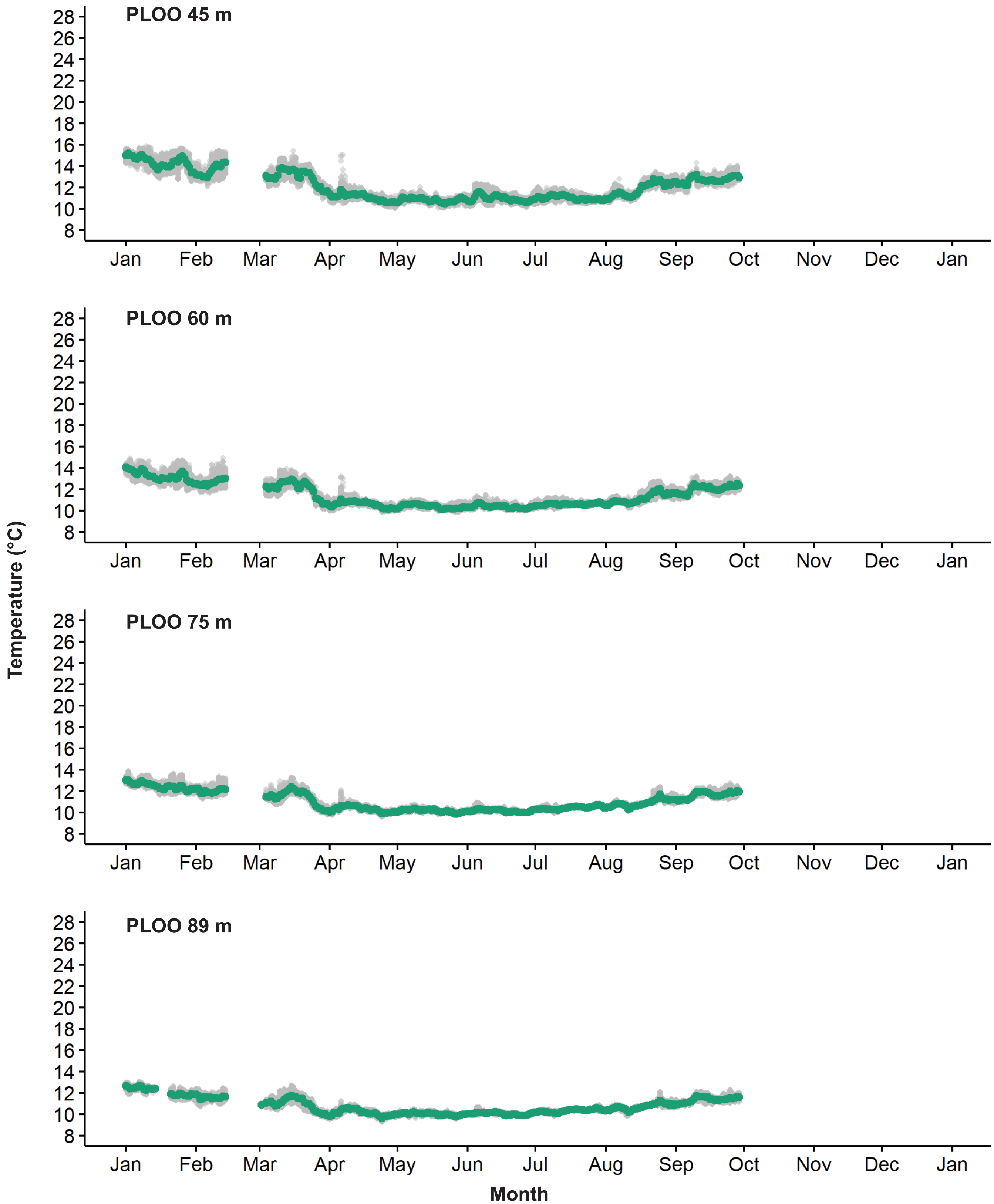
Appendix A.19 *continued*

Season	Depth (m)	n	n_prop	Magnitude (mm/s) Min	Max	Mean	95% CI	Angle Mean	95% CI
	28	12,664	1.00	0	103	41	0	11	61
Fall	3	10,022	1.00	0	225	51	1	166	46
	4	10,021	1.00	2	239	68	1	153	35
	5	10,021	1.00	4	246	68	1	157	40
	6	10,021	1.00	7	244	65	1	162	46
	7	10,021	1.00	2	246	61	1	167	50
	8	10,021	1.00	0	232	57	1	170	52
	9	10,021	1.00	0	178	47	1	546	53
	10	10,021	1.00	2	205	48	1	545	54
	11	10,021	1.00	2	226	48	1	179	54
	12	10,022	1.00	1	213	48	1	542	56
	13	10,021	1.00	0	214	49	1	549	57
	14	10,020	1.00	2	216	49	1	134	57
	15	10,021	1.00	1	192	49	1	33	57
	16	10,022	1.00	0	142	47	1	8	57
	17	10,021	1.00	1	140	47	1	10	56
	18	10,021	1.00	1	169	51	1	23	56
	19	10,021	1.00	1	164	53	1	19	55
	20	10,021	1.00	0	169	53	1	18	57
	21	10,020	1.00	0	129	50	1	18	57
	22	10,020	1.00	3	109	48	0	13	55
	23	10,019	1.00	3	104	43	0	1	54
	24	10,019	1.00	1	107	40	0	349	56
	25	10,019	1.00	1	96	37	0	0	56
	26	10,020	1.00	1	90	38	0	9	54
	27	10,020	1.00	0	84	35	0	11	55
	28	10,020	1.00	0	81	33	0	353	50



Appendix A.20

Temperature, salinity, DO, pH (total), chlorophyll *a,* CDOM, turbidity, nitrate + nitrite, BOD, and xCO_2 recorded at various depths by the PLOO and SBOO RTOMS during 2020. Grey points represent raw data and green points represent daily averaged data.



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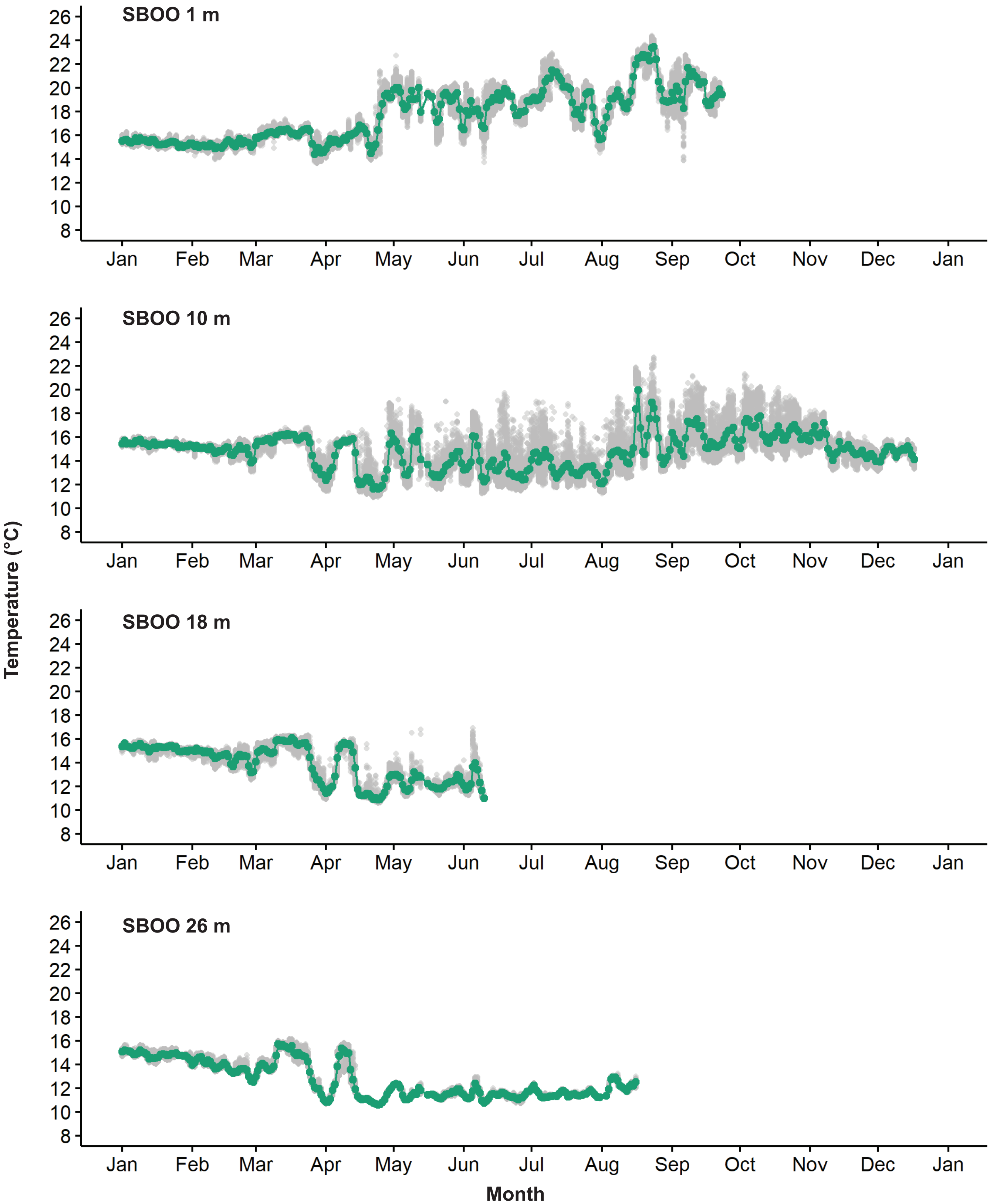

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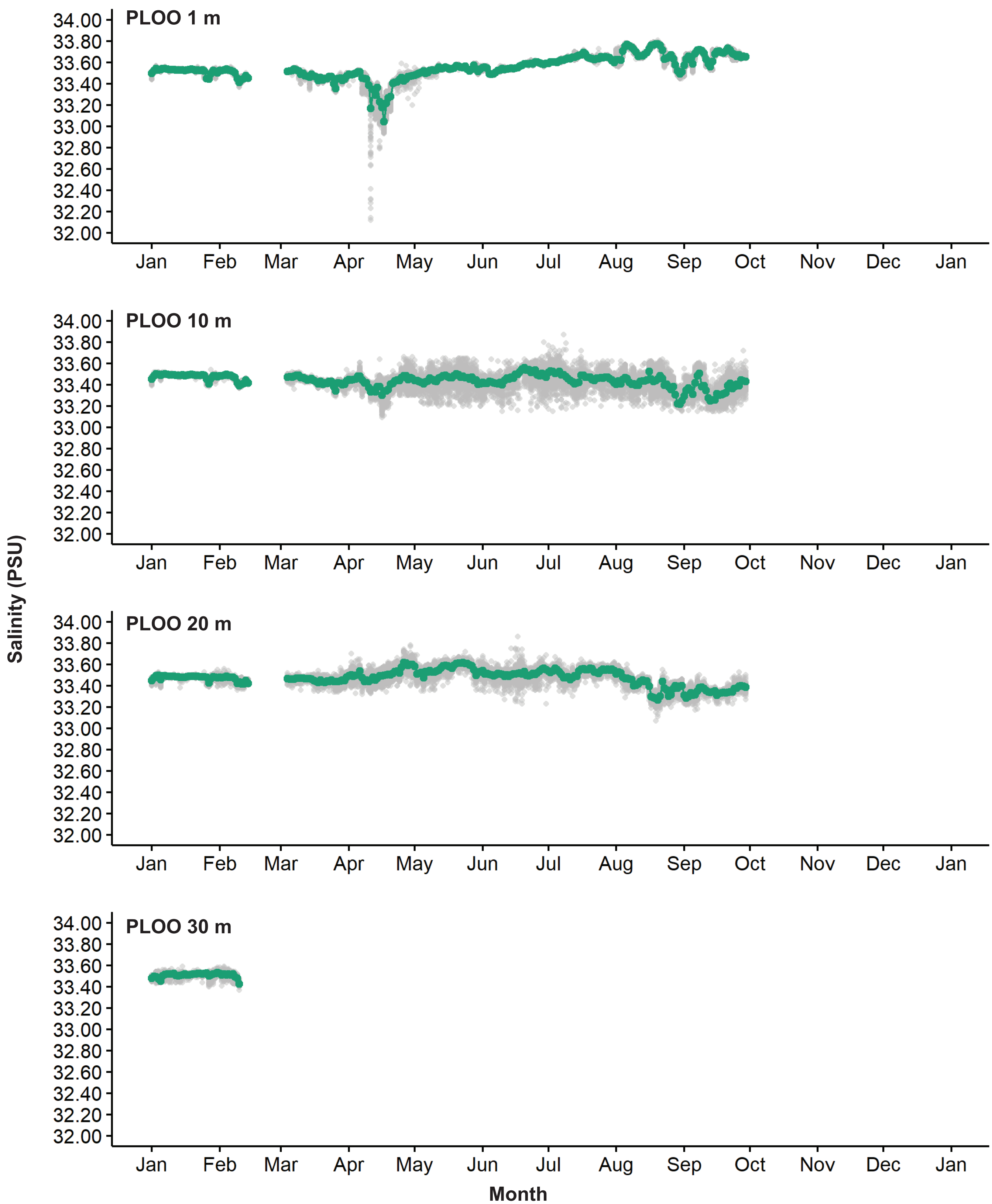

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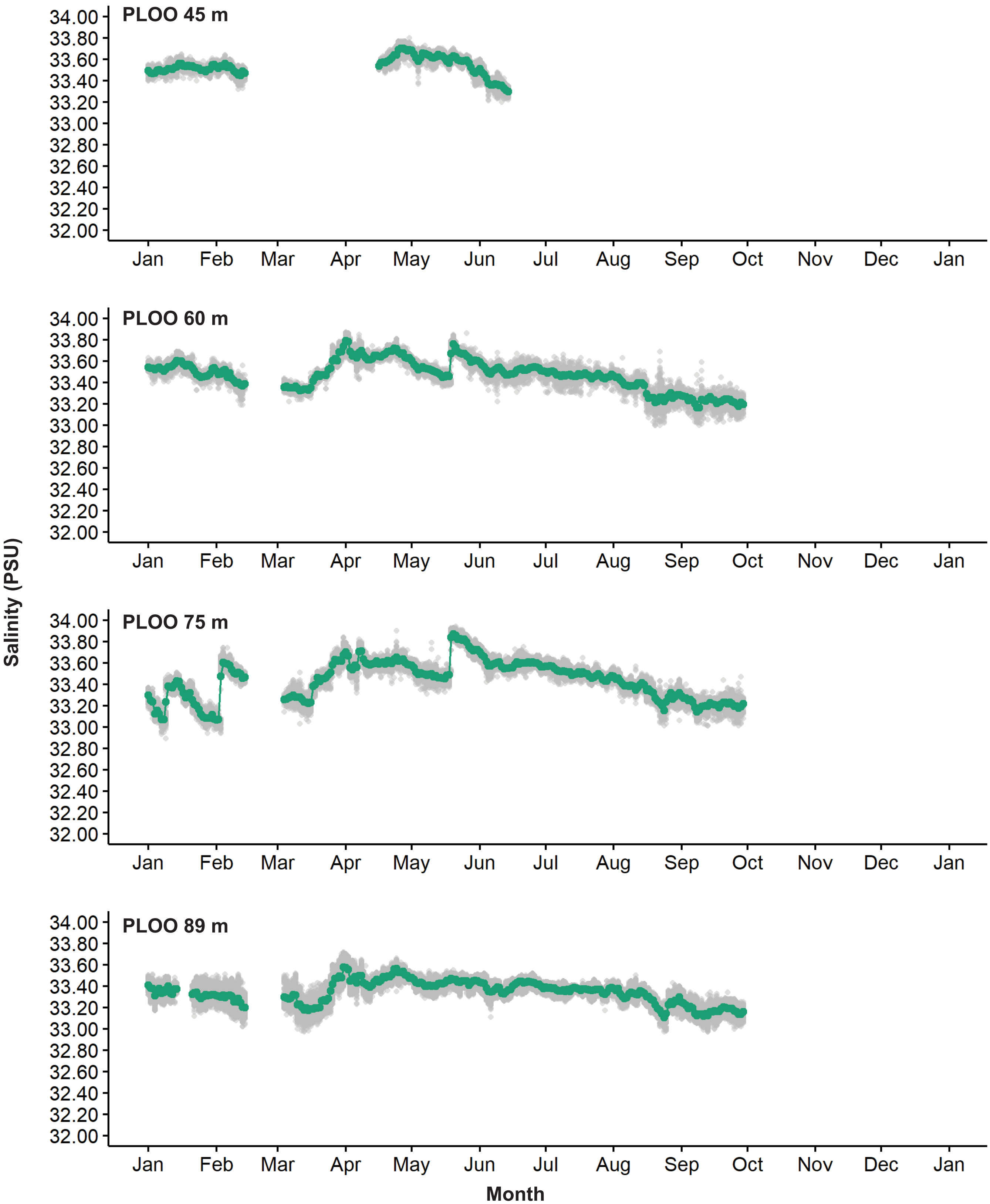

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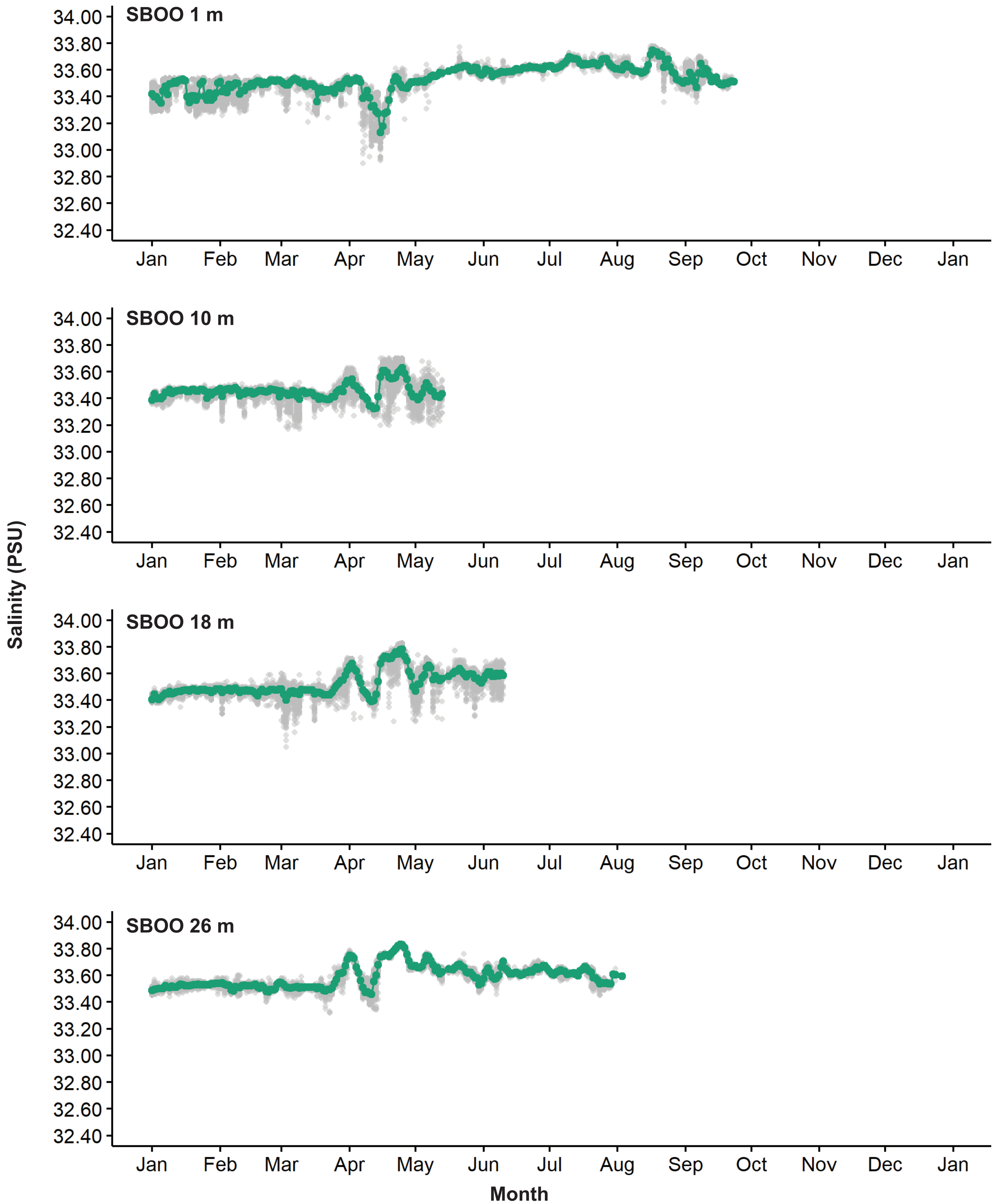

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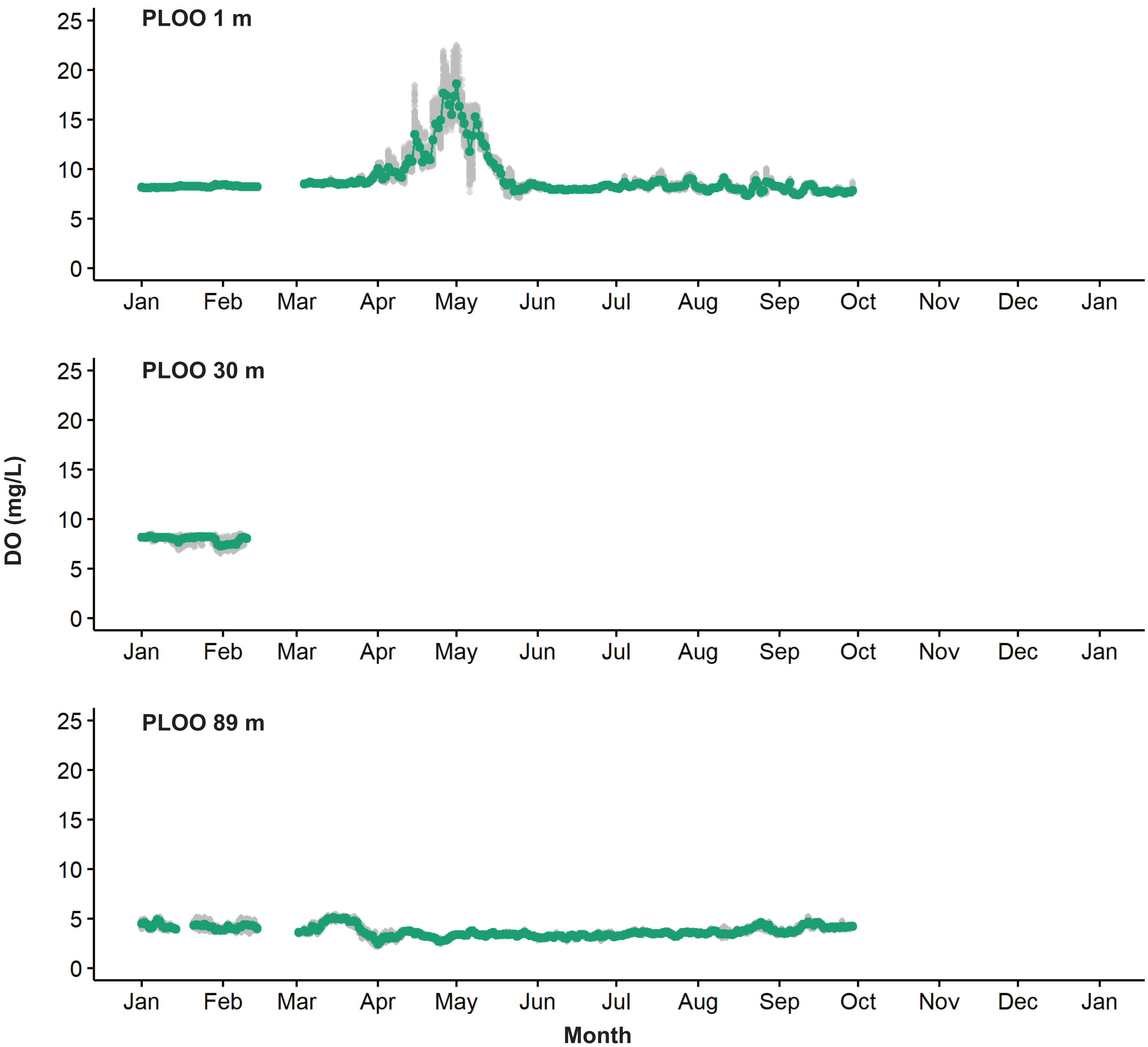

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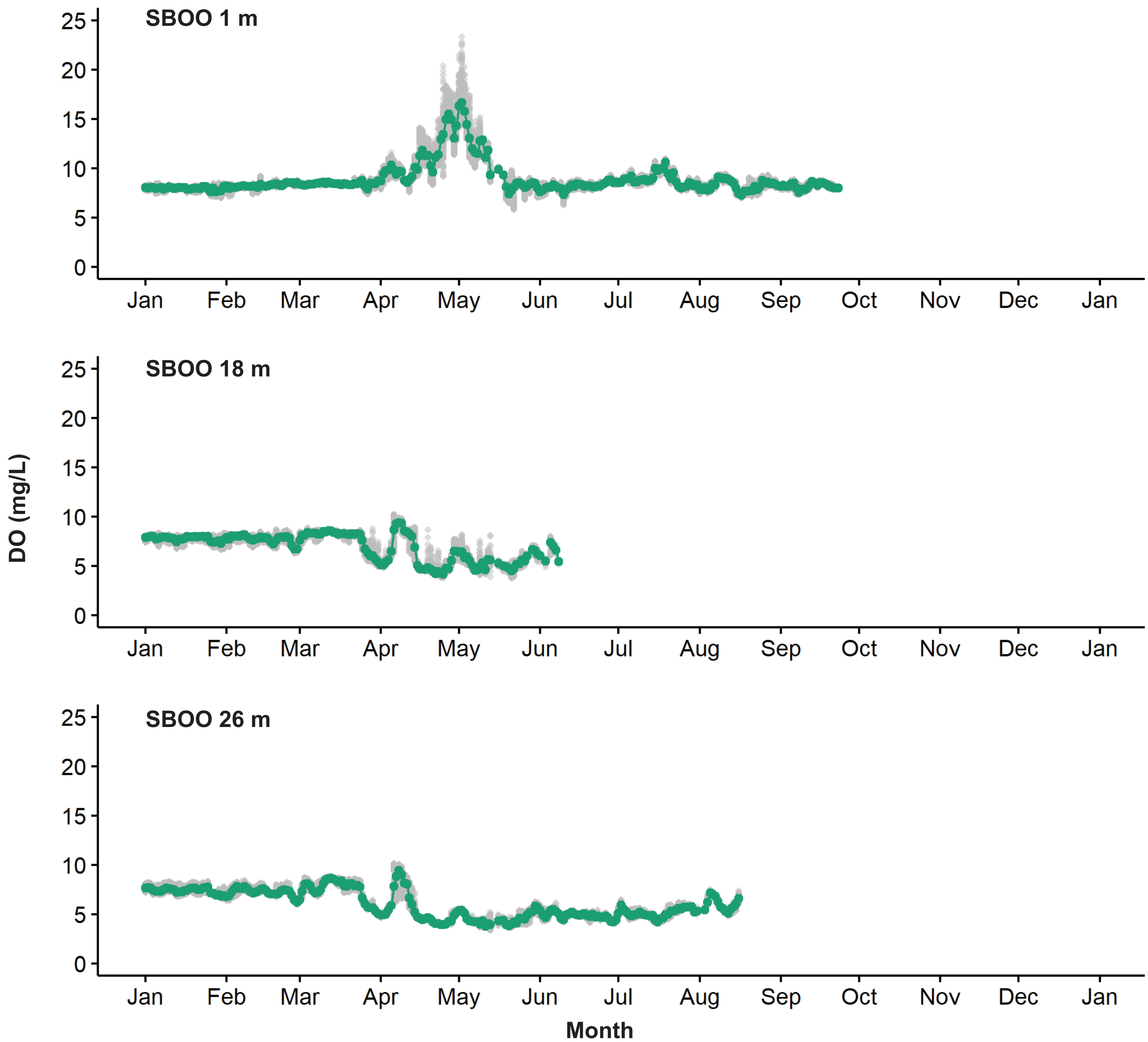

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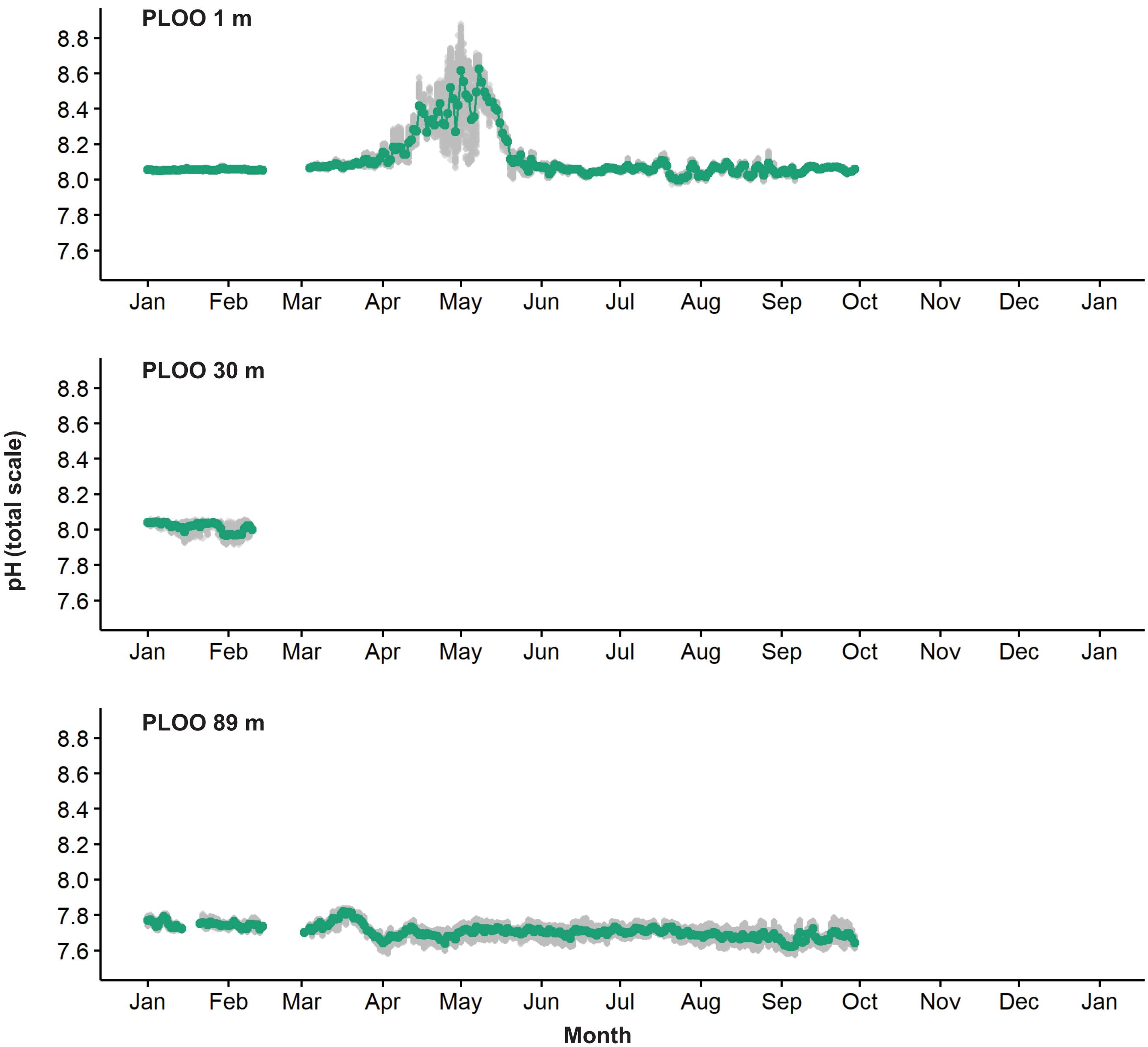

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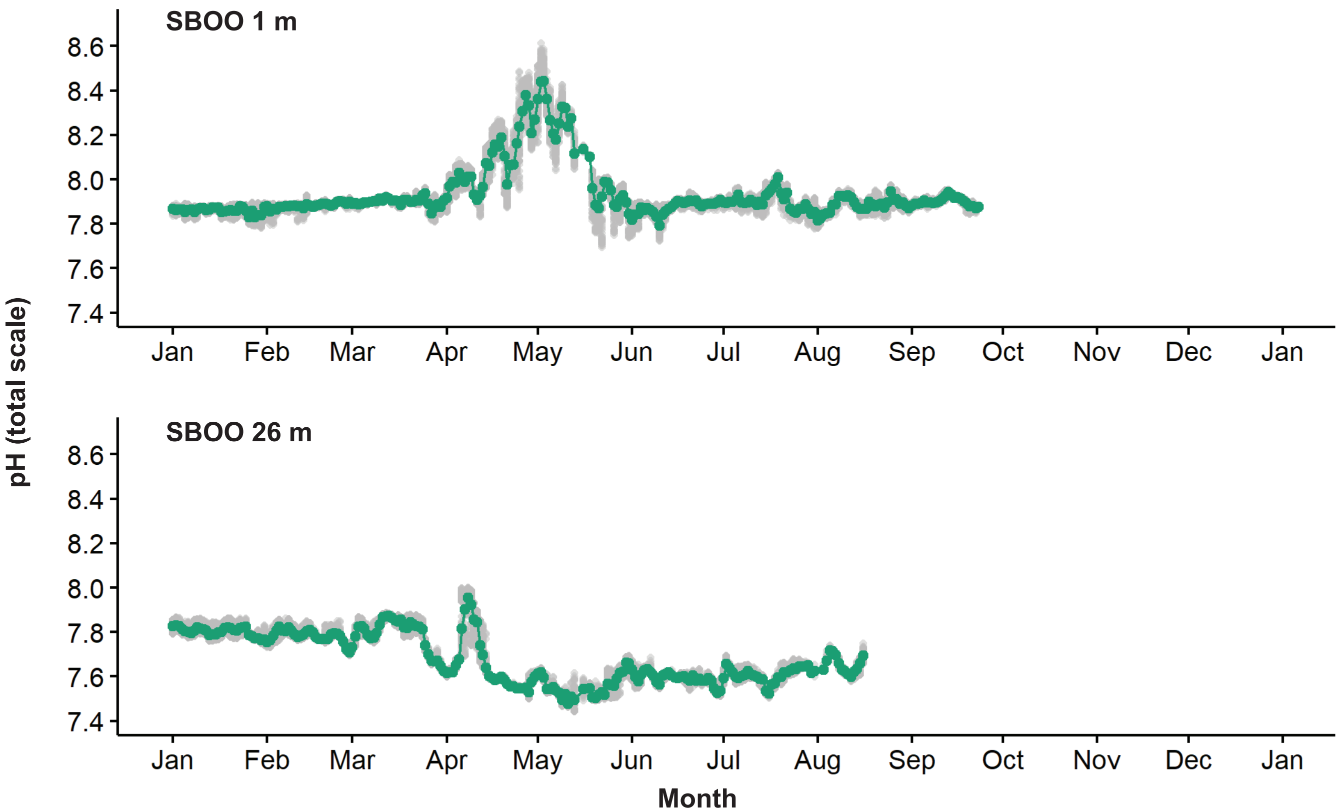

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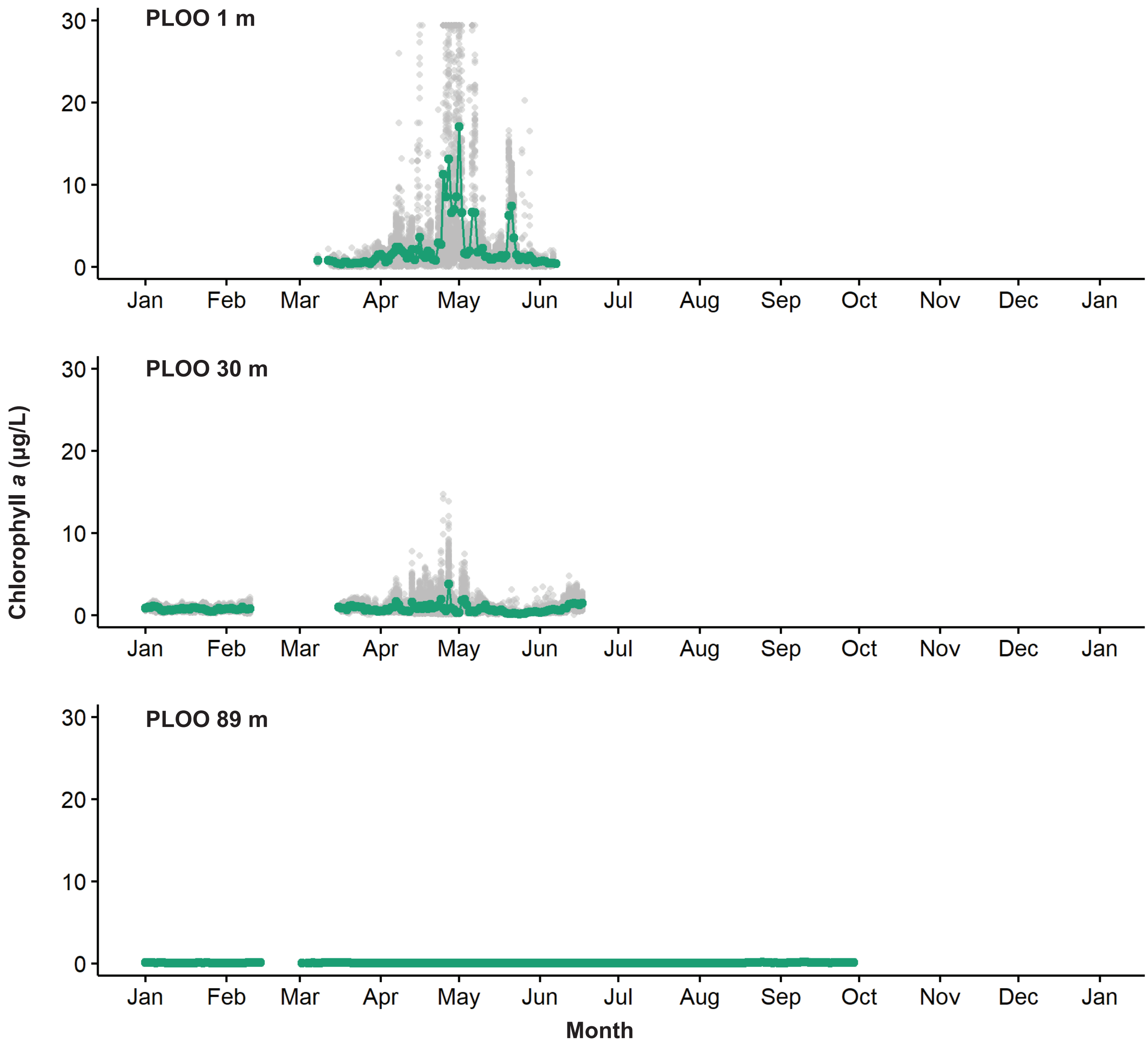

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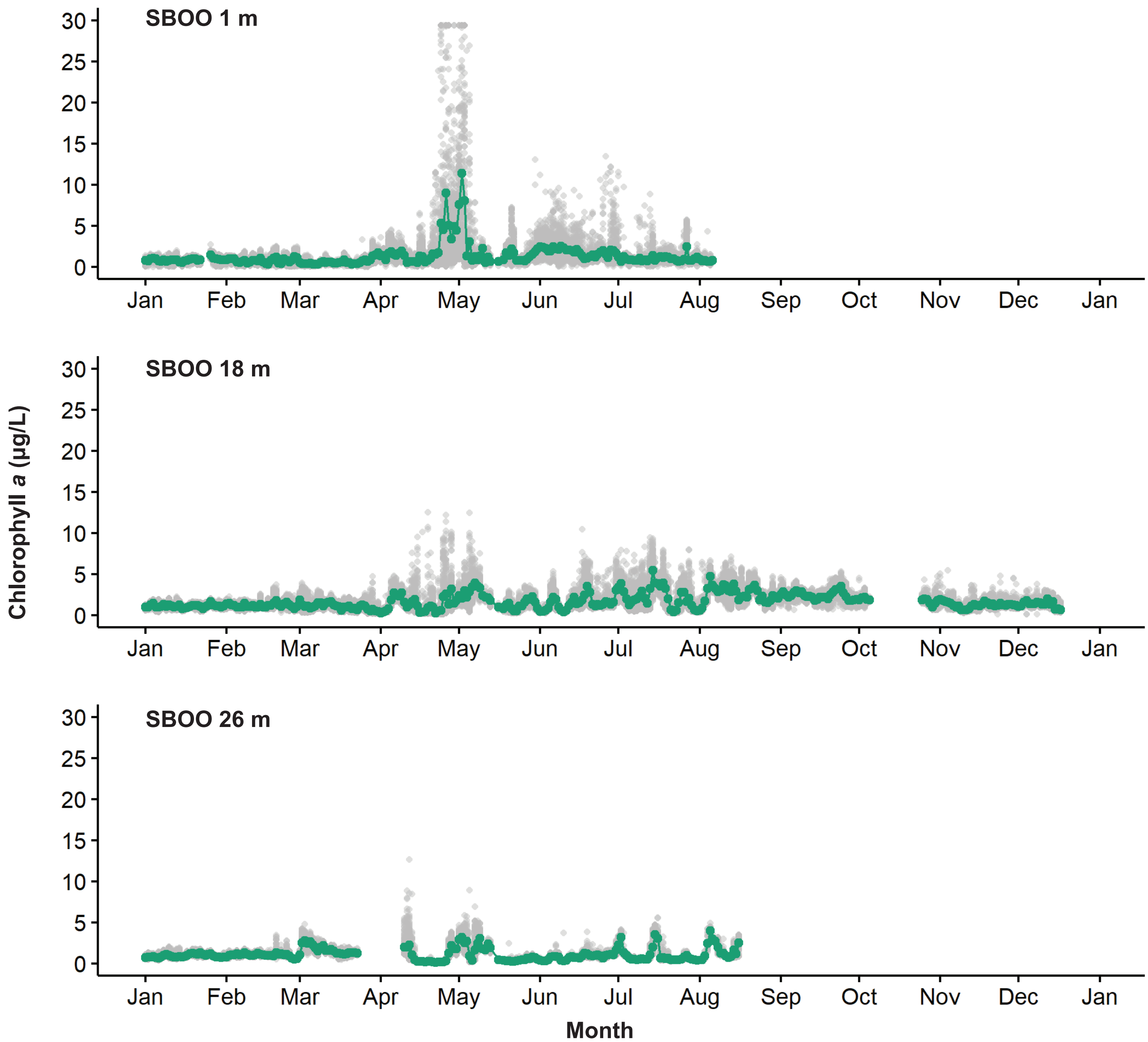

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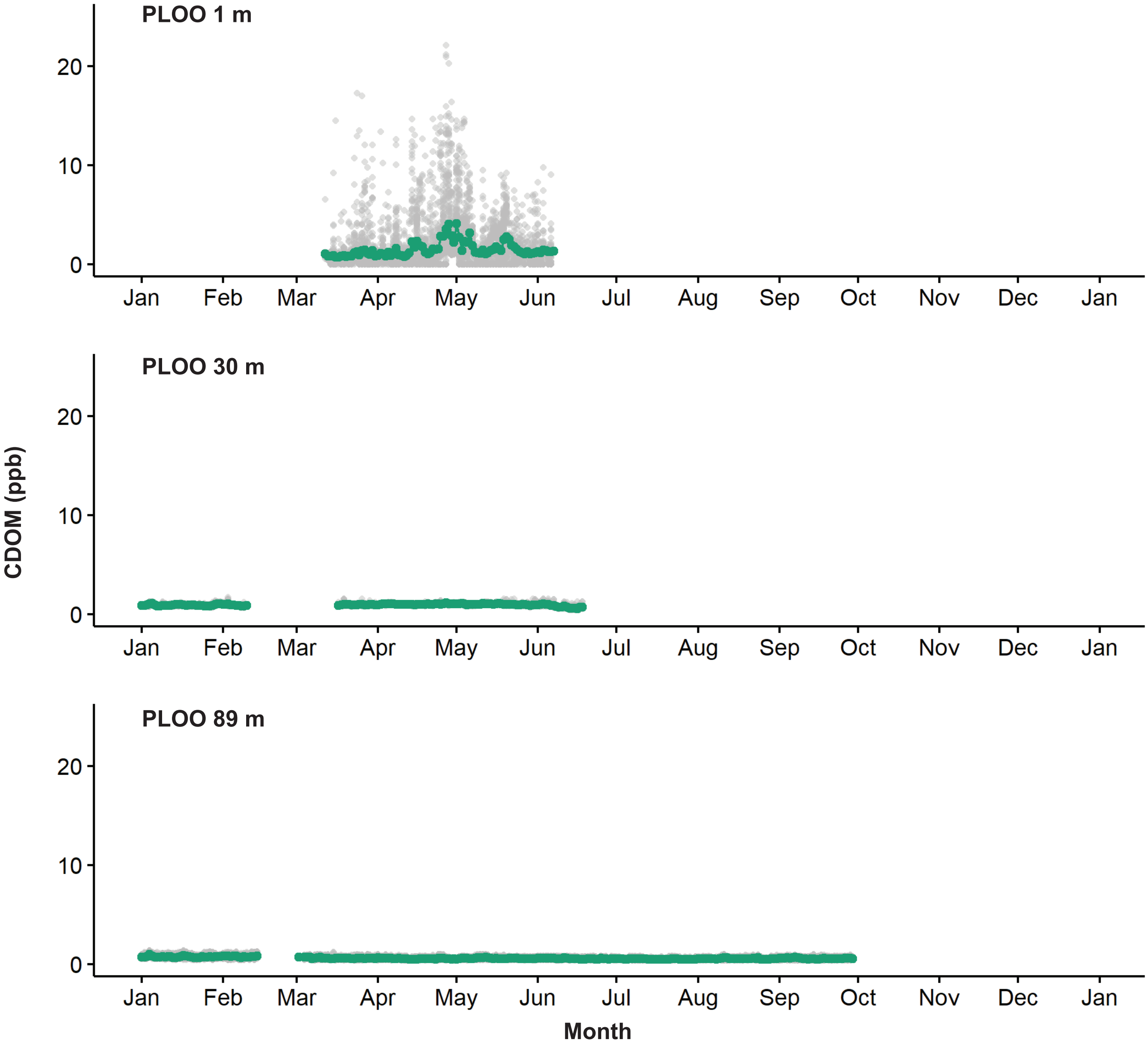

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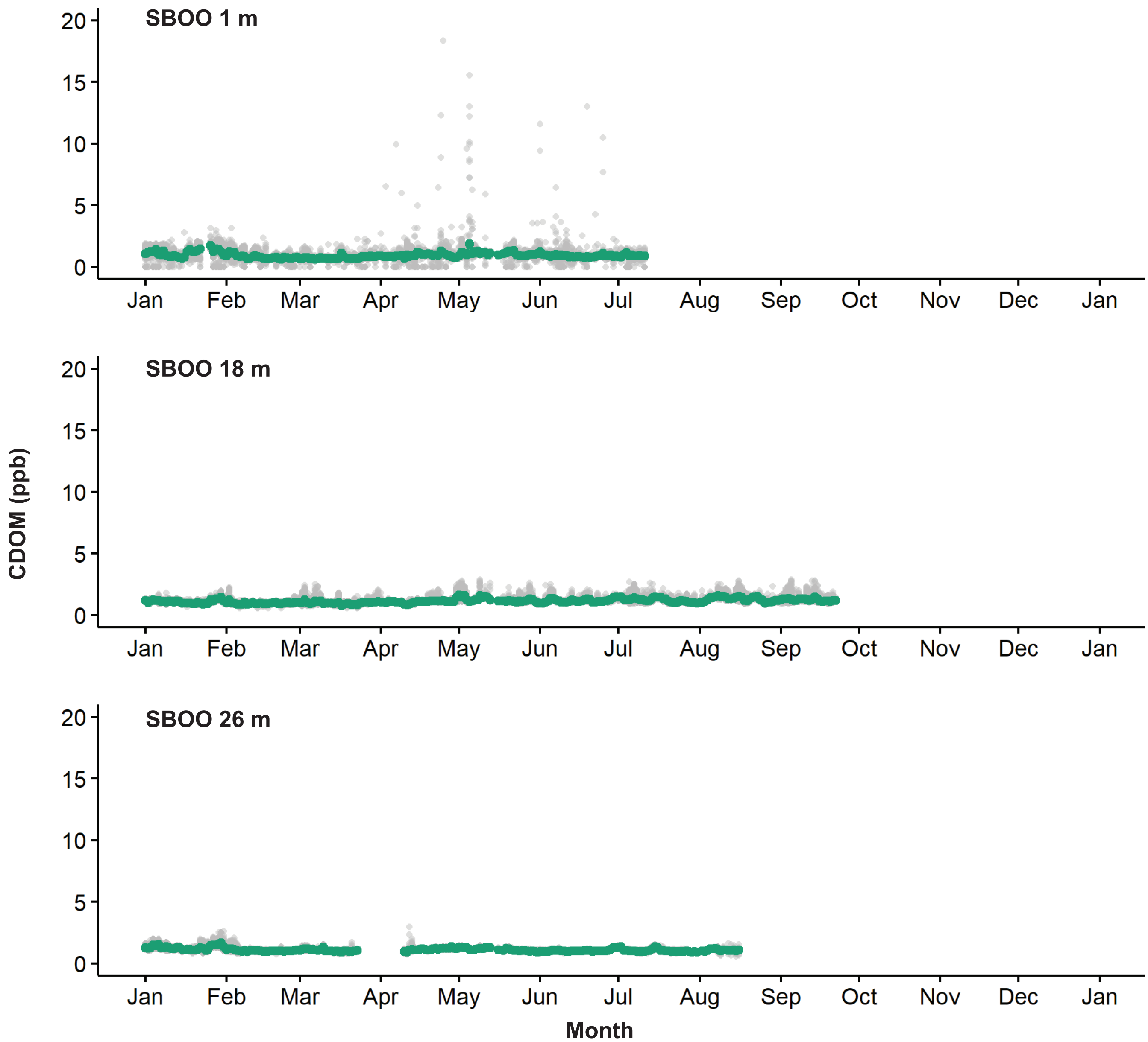

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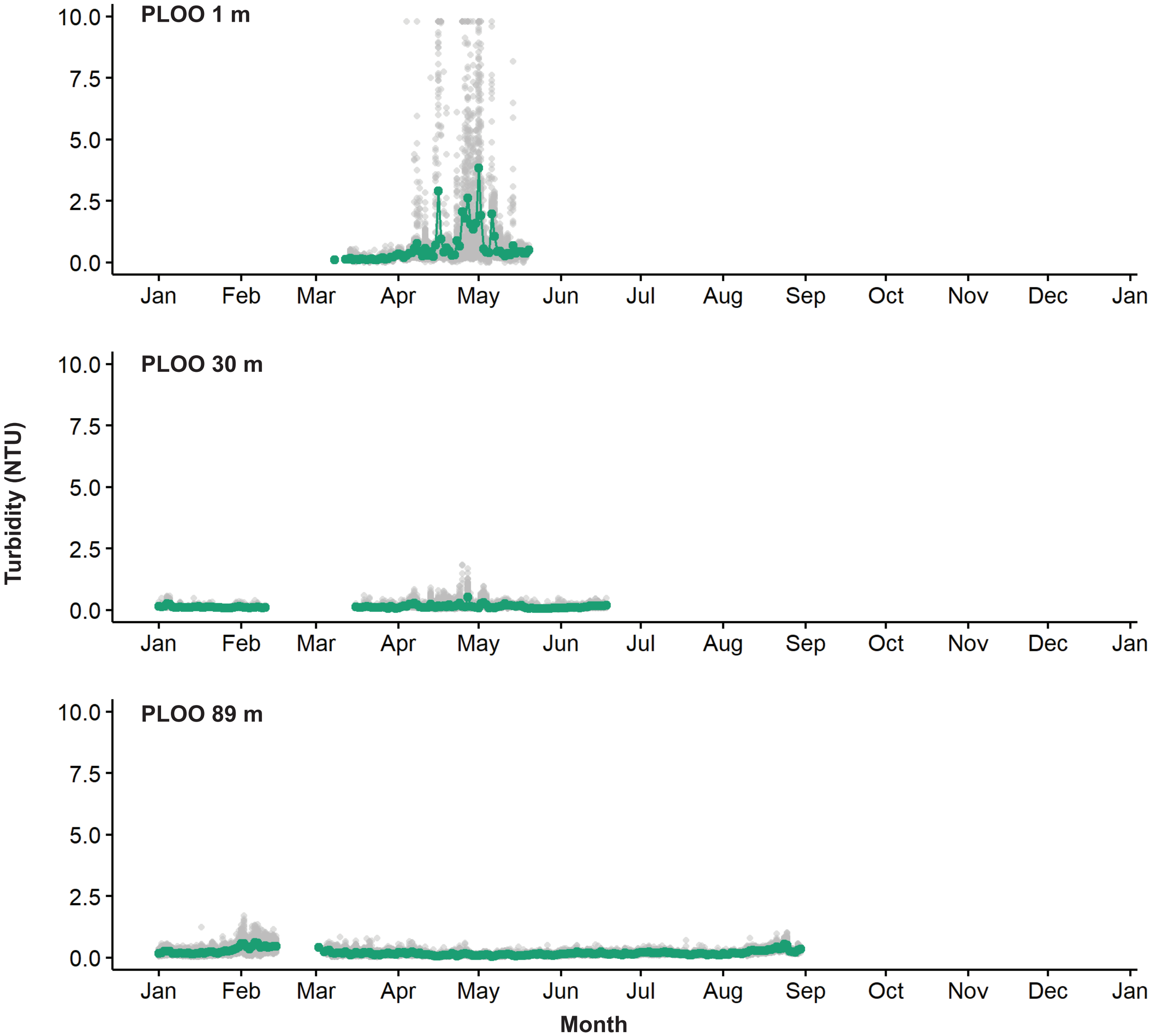

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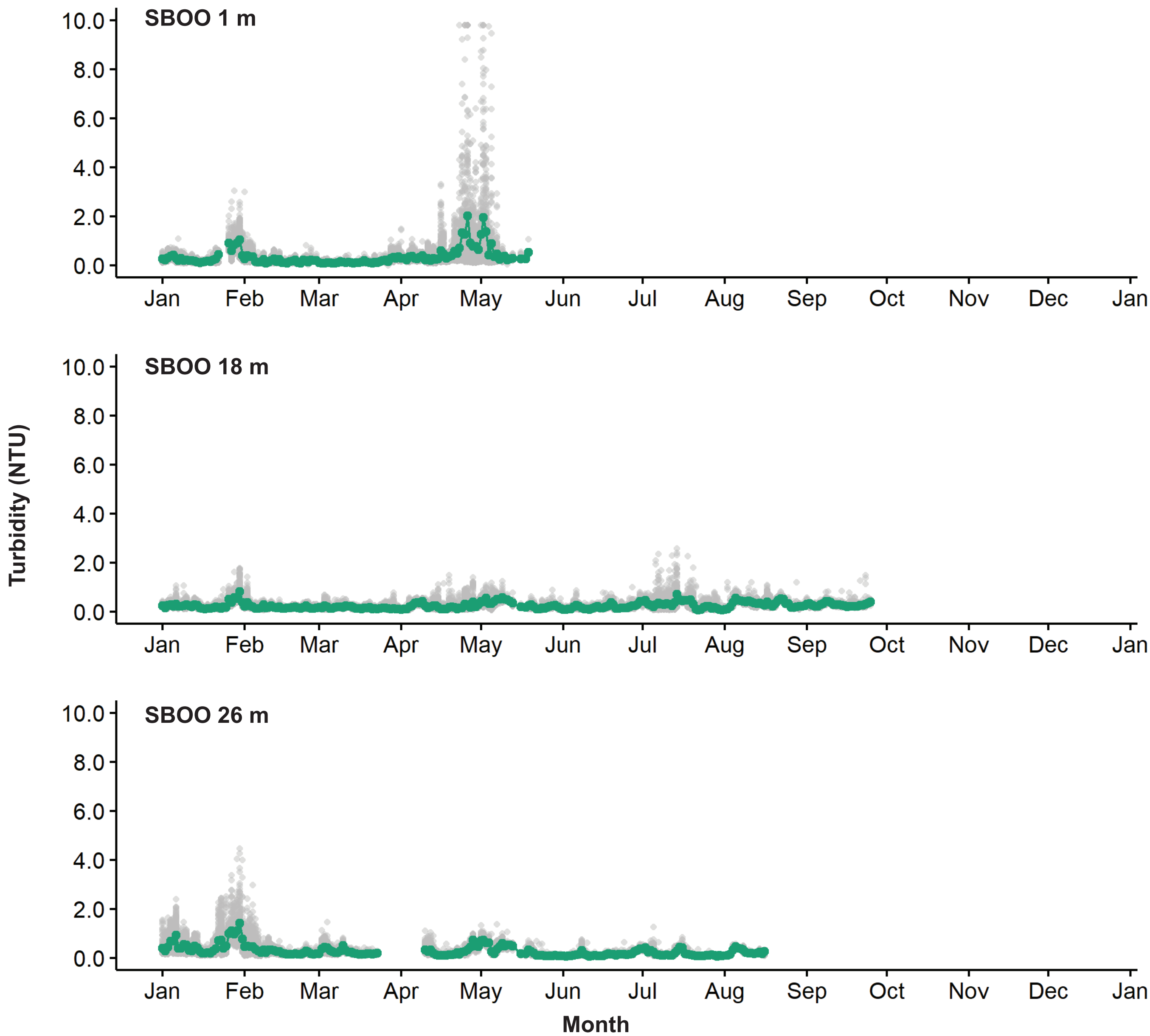

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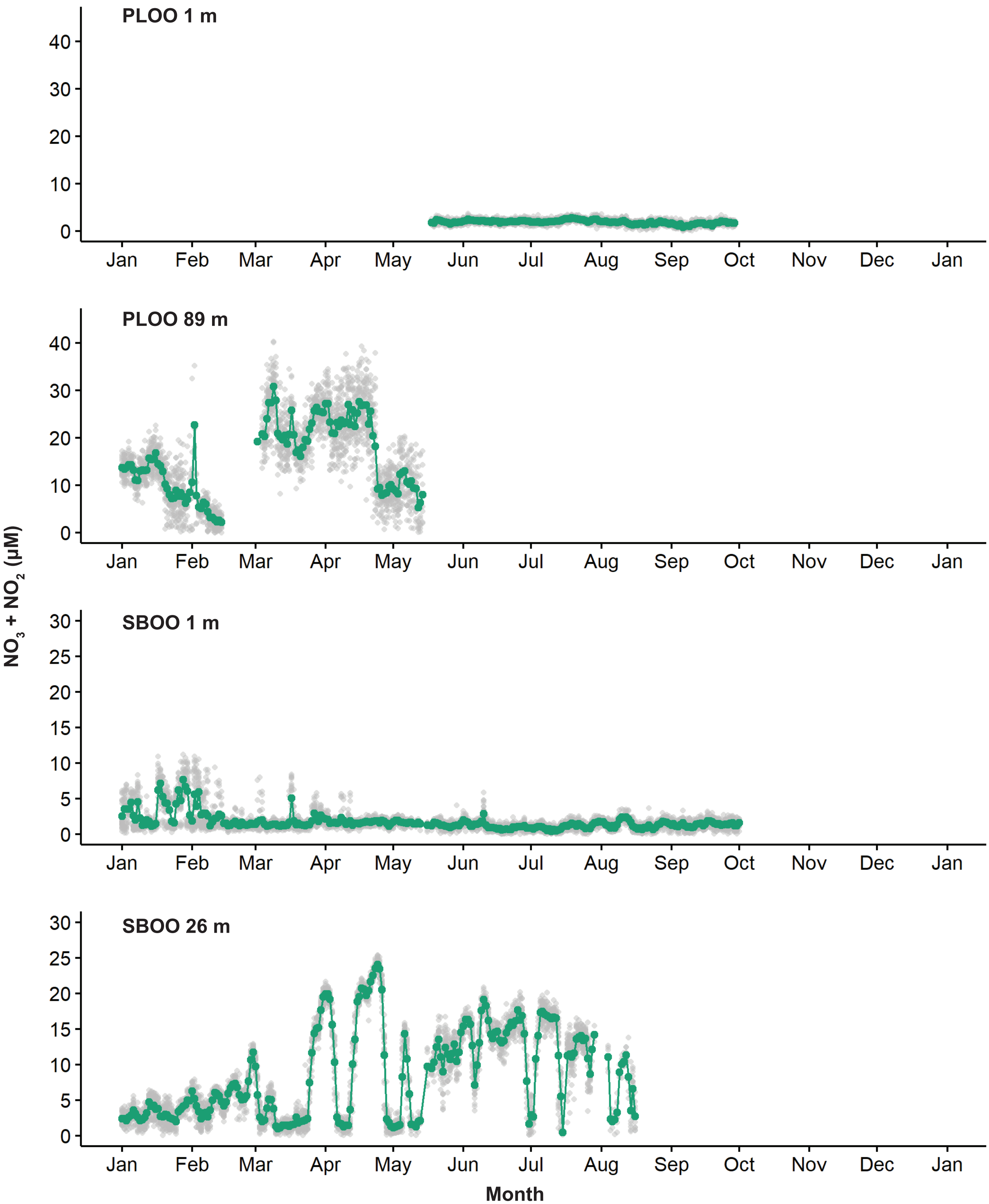

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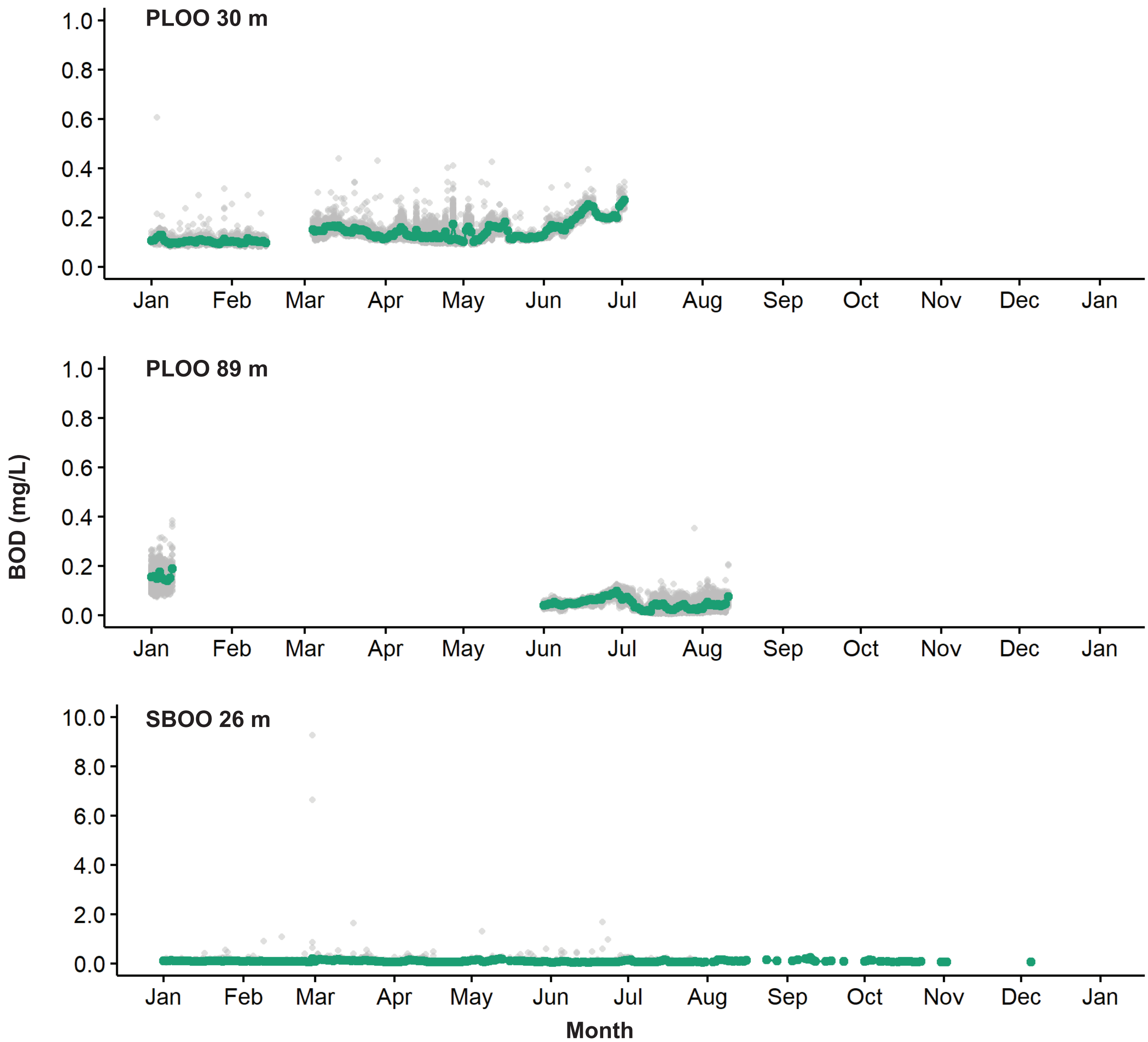
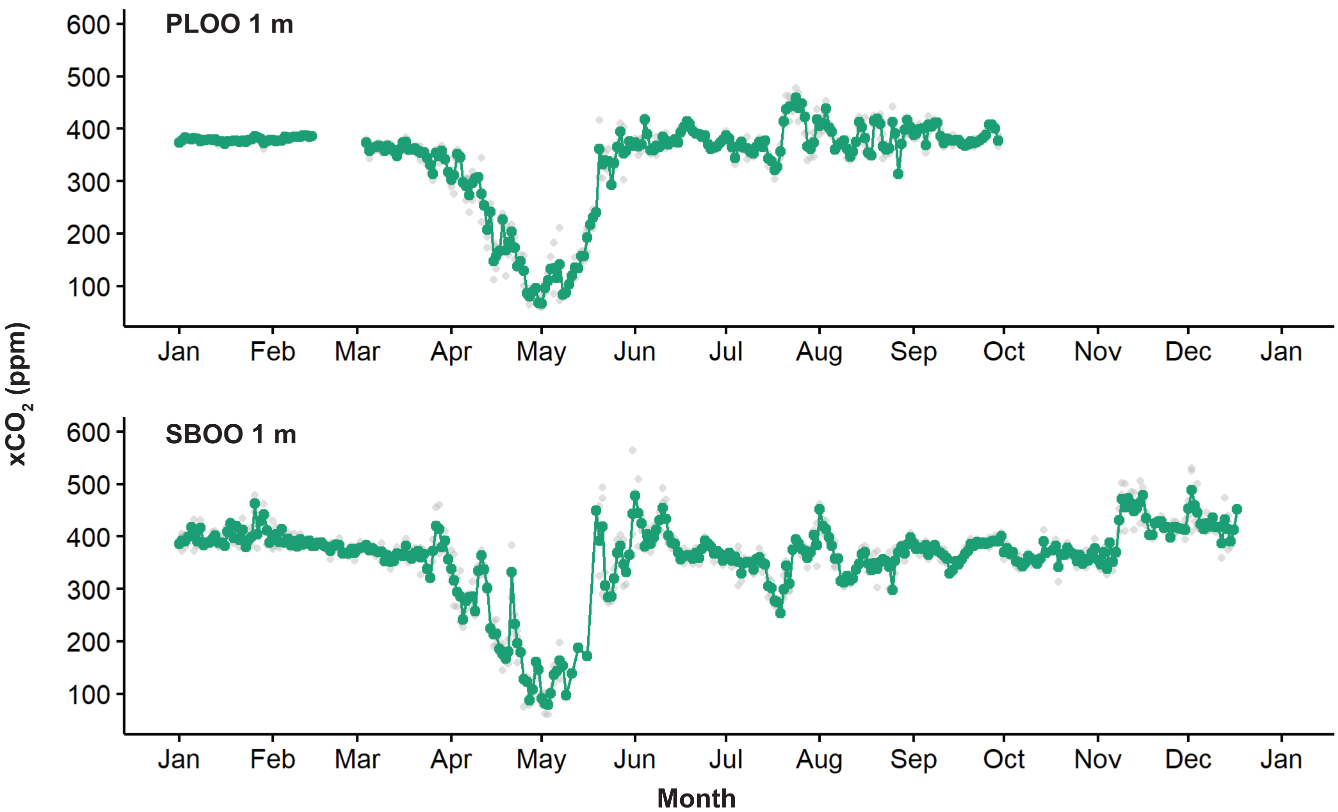


Appendix A.20 *continued*



Appendix A.20 *continued*

Appendix A.21

Summary of elevated bacteria densities in samples collected from PLOO shore, kelp, and offshore stations during 2020. Bold values exceed benchmarks for total coliform (>10,000 CFU/100 mL), fecal coliform (>400 CFU/100 mL), *Enterococcus* (>104 CFU/100 mL), or the FTR criterion (total coliforms>1000 CFU/100 mL and F:T>0.10).

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
Shore Stations						
D9	22-Jan-20	—	340	96	**200**	0.28
D11	18-Mar-20	—	5400	200	**1000**	0.04
D8-B	18-Mar-20	—	200	120	**260**	0.60
D11	15-Apr-20	—	3000	220	**180**	0.07
D12	7-Oct-20	—	40	42	**140**	1.05
Offshore Stations						
F30	19-Feb-20	60	—	—	**600**	—
F30	19-Feb-20	80	—	—	**520**	—
F31	19-Feb-20	80	—	—	**160**	—
F32	19-Feb-20	80	—	—	**200**	—
F21	21-May-20	80	—	—	**200**	—
F11	22-May-20	60	—	—	**120**	—
F29	18-Aug-20	98	—	—	**220**	—
F30	18-Aug-20	80	—	—	**900**	—
F30	18-Aug-20	98	—	—	**300**	—
F31	18-Aug-20	80	—	—	**260**	—
F17	20-Aug-20	80	—	—	**320**	—
F19	20-Aug-20	80	—	—	**110**	—
F26	10-Nov-20	60	—	—	**160**	—
F27	10-Nov-20	80	—	—	**260**	—
F27	10-Nov-20	60	—	—	**240**	—
F28	10-Nov-20	60	—	—	**540**	—
F29	10-Nov-20	80	—	—	**240**	—
F15	13-Nov-20	60	—	—	**160**	—
F18	13-Nov-20	80	—	—	**110**	—
F19	13-Nov-20	80	—	—	**140**	—
F20	13-Nov-20	80	—	—	**160**	—

Appendix A.22

Summary of elevated bacteria densities in samples collected from SBOO shore, kelp, and offshore stations during 2020. Bold values exceed benchmarks for total coliform (> 10,000 CFU/100 mL), fecal coliform (> 400 CFU/100 mL), *Enterococcus* (> 104 CFU/100 mL), or the FTR criterion (total coliforms > 1000 CFU/100 mL and F:T > 0.10).

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
Shorline Stations South of the USA/Mexico Border						
S0	7-Jan-20	—	5000	**1200**	**2000**	**0.24**
S2	7-Jan-20	—	8000	**460**	82	0.06
S3	7-Jan-20	—	7000	**760**	**110**	**0.11**
S0	14-Jan-20	—	3200	400	**180**	**0.13**
S2	14-Jan-20	—	7200	**1400**	40	**0.19**
S3	14-Jan-20	—	**16000**	**12000**	**2200**	**0.75**
S0	21-Jan-20	—	**14000**	400	**1400**	0.03
S2	21-Jan-20	—	1200	240	**120**	**0.20**
S3	21-Jan-20	—	5800	**600**	**360**	**0.10**
S0	28-Jan-20	—	7000	**600**	**1800**	0.09
S2	28-Jan-20	—	6200	**1000**	**540**	**0.16**
S3	28-Jan-20	—	**16000**	**960**	60	0.06
S0	4-Feb-20	—	5400	**600**	**1200**	**0.11**
S2	4-Feb-20	—	480	280	**140**	0.58
S3	4-Feb-20	—	**16000**	**6600**	**8200**	**0.41**
S0	18-Feb-20	—	4000	**500**	**820**	**0.13**
S0	25-Feb-20	—	8600	**1200**	**2000**	**0.14**
S2	25-Feb-20	—	1800	320	32	**0.18**
S0	3-Mar-20	—	**16000**	**5400**	**440**	**0.34**
S2	3-Mar-20	—	800	120	**340**	0.15
S0	10-Mar-20	—	**16000**	**3800**	**4800**	**0.24**
S2	10-Mar-20	—	6000	**680**	**760**	**0.11**
S3	10-Mar-20	—	4000	**440**	**480**	**0.11**
S0	17-Mar-20	—	**16000**	**2000**	**2000**	**0.13**
S2	17-Mar-20	—	3800	**480**	**380**	**0.13**
S3	17-Mar-20	—	4600	**640**	**720**	**0.14**
S0	30-Mar-20	—	6000	**2800**	**600**	**0.47**
S2	30-Mar-20	—	8000	**1000**	64	**0.13**

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S3	30-Mar-20	—	**16000**	**9000**	**500**	**0.56**
S0	7-Apr-20	—	**16000**	**4000**	**5000**	**0.25**
S2	7-Apr-20	—	3800	**500**	**960**	**0.13**
S3	7-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S0	14-Apr-20	—	8800	**1400**	**1000**	**0.16**
S3	14-Apr-20	—	580	160	**120**	0.28
S0	21-Apr-20	—	**16000**	**2200**	**2800**	**0.14**
S3	21-Apr-20	—	**16000**	**11000**	**3000**	**0.69**
S0	28-Apr-20	—	**16000**	**12000**	**6800**	**0.75**
S3	28-Apr-20	—	600	220	**400**	0.37
S0	5-May-20	—	6800	**1000**	**480**	**0.15**
S2	5-May-20	—	200	32	**140**	0.16
S0	19-May-20	—	2200	**960**	**600**	**0.44**
S0	26-May-20	—	**13000**	**5600**	**880**	**0.43**
S0	9-Jun-20	—	1600	400	**220**	**0.25**
S0	23-Jun-20	—	10000	**2200**	**2800**	**0.22**
S0	30-Jun-20	—	440	120	**260**	0.27
S0	7-Jul-20	—	3800	**2600**	**1100**	**0.68**
S0	14-Jul-20	—	2400	**820**	**480**	**0.34**
S0	21-Jul-20	—	**16000**	**2200**	**8400**	**0.14**
S0	4-Aug-20	—	4400	**1200**	**880**	**0.27**
S2	4-Aug-20	—	**16000**	**4800**	**600**	**0.30**
S3	4-Aug-20	—	**16000**	**8600**	**5000**	**0.54**
S0	11-Aug-20	—	160	60	**110**	0.38
S0	25-Aug-20	—	10000	240	**300**	0.02

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S0	1-Sep-20	—	9000	**620**	**320**	0.07
S0	15-Sep-20	—	9400	**560**	**560**	0.06
S0	22-Sep-20	—	9000	**900**	**820**	0.10
S0	29-Sep-20	—	1400	**540**	**300**	**0.39**
S2	29-Sep-20	—	1300	**540**	**240**	**0.42**
S3	29-Sep-20	—	1000	**640**	100	0.64
S0	13-Oct-20	—	**16000**	**3200**	**800**	**0.20**
S3	20-Oct-20	—	**16000**	**7000**	**1200**	**0.44**
S0	27-Oct-20	—	8200	**1400**	**960**	**0.17**
S0	10-Nov-20	—	**16000**	**2800**	**2000**	**0.18**
S2	10-Nov-20	—	6800	**1100**	30	**0.16**
S3	10-Nov-20	—	**16000**	**2000**	**200**	**0.13**
S0	24-Nov-20	—	**16000**	**12000**	**12000**	**0.75**
S0	8-Dec-20	—	**16000**	**12000**	**12000**	**0.75**
S0	15-Dec-20	—	**16000**	**9200**	**6200**	**0.58**
S0	22-Dec-20	—	**16000**	**12000**	**12000**	**0.75**
S3	22-Dec-20	—	2600	**2400**	50	**0.92**
S0	29-Dec-20	—	**16000**	**3200**	**3600**	**0.20**
S2	29-Dec-20	—	**11000**	**1000**	**680**	0.09
S3	29-Dec-20	—	1000	140	**180**	0.14
Shorline Stations North of the USA/Mexico Border						
S5*	1-Jan-20	—	**16000**	**12000**	**10000**	**0.75**
S6*	1-Jan-20	—	—	—	**200**	—
S11*	1-Jan-20	—	—	—	**220**	—
S5*	3-Jan-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	3-Jan-20	—	—	—	**360**	—

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S11*	3-Jan-20	—	—	—	**300**	—
S5*	5-Jan-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	5-Jan-20	—	—	—	**120**	—
S4	7-Jan-20	—	7400	**800**	**420**	**0.11**
S10	7-Jan-20	—	2600	**900**	**280**	**0.35**
S4*	9-Jan-20	—	4400	**1400**	**500**	**0.32**
S10*	9-Jan-20	—	6400	**980**	**520**	**0.15**
S4*	11-Jan-20	—	10000	**3200**	**1000**	**0.32**
S10*	11-Jan-20	—	5000	**540**	**240**	**0.11**
S4*	13-Jan-20	—	5600	**740**	**180**	**0.13**
S10*	13-Jan-20	—	4400	**500**	76	**0.11**
S4	14-Jan-20	—	**15000**	**3200**	**360**	**0.21**
S10	14-Jan-20	—	**11000**	**2000**	**260**	**0.18**
S4*	16-Jan-20	—	**16000**	**12000**	**4200**	**0.75**
S10*	16-Jan-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	18-Jan-20	—	**16000**	**4800**	**2600**	**0.30**
S10*	18-Jan-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	20-Jan-20	—	2600	400	**180**	**0.15**
S10*	20-Jan-20	—	**16000**	**2000**	**1100**	**0.13**
S4	21-Jan-20	—	**16000**	**6600**	**2400**	**0.41**
S5	21-Jan-20	—	**16000**	**9000**	**3000**	**0.56**
S4*	23-Jan-20	—	2600	200	**160**	0.08
S5*	23-Jan-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	25-Jan-20	—	—	—	**400**	—
S5*	25-Jan-20	—	3800	**1200**	**340**	**0.32**
S4*	27-Jan-20	—	—	—	**620**	—

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S4	4-Feb-20	—	**16000**	**12000**	**11000**	**0.75**
S5	4-Feb-20	—	200	200	**110**	1.00
S10	4-Feb-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	5-Feb-20	—	5600	**3600**	**4200**	**0.64**
S5*	5-Feb-20	—	—	—	**12000**	—
S10*	5-Feb-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	7-Feb-20	—	1500	300	**240**	**0.20**
S5*	7-Feb-20	—	—	—	**3000**	—
S10*	7-Feb-20	—	1200	**440**	**140**	**0.37**
S4*	9-Feb-20	—	**11000**	**2200**	**4200**	**0.20**
S5*	9-Feb-20	—	—	—	**9000**	—
S10*	9-Feb-20	—	**15000**	**4400**	**3800**	**0.29**
S5*	12-Feb-20	—	**16000**	**12000**	**12000**	**0.75**
S5*	14-Feb-20	—	**16000**	**12000**	**12000**	**0.75**
S5*	16-Feb-20	—	**16000**	**12000**	**12000**	**0.75**
S4	18-Feb-20	—	8200	400	**920**	0.05
S5	18-Feb-20	—	**16000**	**12000**	**12000**	**0.75**
S6	18-Feb-20	—	4600	**1200**	**540**	**0.26**
S10	18-Feb-20	—	**16000**	**7800**	**5800**	**0.49**
S11	18-Feb-20	—	9000	**1800**	**400**	**0.20**
S4*	20-Feb-20	—	—	—	**220**	—
S5*	20-Feb-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	20-Feb-20	—	340	110	**200**	0.32
S5*	21-Feb-20	—	160	62	**120**	0.39
S5*	23-Feb-20	—	—	—	**2200**	—
S4	25-Feb-20	—	**12000**	**2200**	**240**	**0.18**
S10	25-Feb-20	—	4400	**1400**	**120**	**0.32**
S4*	27-Feb-20	—	8000	**3000**	**1000**	**0.38**

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S10*	27-Feb-20	—	**16000**	**9000**	**1000**	**0.56**
S4*	28-Feb-20	—	1100	360	**240**	**0.33**
S10*	28-Feb-20	—	6400	**1600**	**1400**	**0.25**
S4	3-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S5	3-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S10	3-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	5-Mar-20	—	9000	**1200**	**360**	**0.13**
S5*	5-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	5-Mar-20	—	7600	**1000**	**110**	**0.13**
S4*	7-Mar-20	—	**16000**	**12000**	**8000**	**0.75**
S5*	7-Mar-20	—	**16000**	**12000**	**9200**	**0.75**
S10*	7-Mar-20	—	**16000**	**12000**	**10000**	**0.75**
S4*	9-Mar-20	—	**16000**	**4800**	**960**	**0.30**
S5*	9-Mar-20	—	5600	**1000**	**540**	**0.18**
S10*	9-Mar-20	—	**13000**	**3800**	**860**	**0.29**
S4	10-Mar-20	—	2200	**740**	**580**	**0.34**
S5	10-Mar-20	—	**16000**	**5000**	**4800**	**0.31**
S6	10-Mar-20	—	**12000**	**3400**	**3800**	**0.28**
S8	10-Mar-20	—	**15000**	**4600**	**2200**	**0.31**
S9	10-Mar-20	—	440	120	**340**	0.27
S10	10-Mar-20	—	3200	**800**	**980**	**0.25**
S11	10-Mar-20	—	10000	**3800**	**2000**	**0.38**
S12	10-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	12-Mar-20	—	400	46	**140**	0.12
S5*	12-Mar-20	—	**16000**	**12000**	**4000**	**0.75**
S6*	12-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S8*	12-Mar-20	—	**11000**	**2000**	**320**	**0.18**
S10*	12-Mar-20	—	1400	94	**220**	0.07
S11*	12-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S12*	12-Mar-20	—	**16000**	**12000**	**9000**	**0.75**
S4*	14-Mar-20	—	—	—	**1200**	—
S5*	14-Mar-20	—	**16000**	**12000**	**12000**	**0.75**

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S6*	14-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S8*	14-Mar-20	—	**16000**	**12000**	**4600**	**0.75**
S10*	14-Mar-20	—	—	—	**820**	—
S11*	14-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S12*	14-Mar-20	—	**16000**	**12000**	**7400**	**0.75**
S5*	16-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	16-Mar-20	—	**16000**	**4600**	**800**	**0.29**
S11*	16-Mar-20	—	**16000**	**12000**	**11000**	**0.75**
S12*	16-Mar-20	—	8200	**1600**	**120**	**0.20**
S4	17-Mar-20	—	**16000**	**4400**	**2000**	**0.28**
S5	17-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S6	17-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S8	17-Mar-20	—	**14000**	**800**	**300**	0.06
S10	17-Mar-20	—	**16000**	**6200**	**4600**	**0.39**
S11	17-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S12	17-Mar-20	—	**16000**	**1000**	**500**	0.06
S4*	19-Mar-20	—	**16000**	**12000**	**8000**	**0.75**
S5*	19-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	19-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	20-Mar-20	—	7200	**800**	**1100**	**0.11**
S5*	20-Mar-20	—	**11000**	**1200**	**1000**	**0.11**
S10*	20-Mar-20	—	8400	**900**	**840**	**0.11**
S5	24-Mar-20	—	**16000**	**1200**	**700**	0.08
S6	24-Mar-20	—	**16000**	**5800**	**980**	**0.36**
S8	24-Mar-20	—	**16000**	**820**	**140**	0.05
S11	24-Mar-20	—	**16000**	**1000**	**380**	0.06
S12	24-Mar-20	—	**16000**	**8600**	**1200**	**0.54**
S4	30-Mar-20	—	**16000**	**12000**	**6200**	**0.75**
S5	30-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S10	30-Mar-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	1-Apr-20	—	2800	340	**140**	**0.12**
S5*	1-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	1-Apr-20	—	6600	**540**	**320**	0.08

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S4*	3-Apr-20	—	820	300	**340**	0.37
S5*	3-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	3-Apr-20	—	—	**420**	**600**	—
S4*	5-Apr-20	—	—	—	**280**	—
S5*	5-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	5-Apr-20	—	—	80	**180**	—
S4	7-Apr-20	—	**16000**	**5600**	**4000**	**0.35**
S5	7-Apr-20	—	**12000**	**2000**	**3400**	**0.17**
S6	7-Apr-20	—	**16000**	**8600**	**8200**	**0.54**
S8	7-Apr-20	—	2400	**1800**	**980**	**0.75**
S9	7-Apr-20	—	2400	**1100**	**740**	**0.46**
S10	7-Apr-20	—	**16000**	**4600**	**3600**	**0.29**
S11	7-Apr-20	—	**16000**	**12000**	**8200**	**0.75**
S12	7-Apr-20	—	6000	**1600**	**800**	**0.27**
S4*	9-Apr-20	—	**13000**	**3200**	**1600**	**0.25**
S5*	9-Apr-20	—	7600	**2400**	**1100**	**0.32**
S6*	9-Apr-20	—	8400	**1100**	**840**	**0.13**
S9*	9-Apr-20	—	**16000**	**6800**	**1800**	**0.43**
S10*	9-Apr-20	—	3200	240	**480**	0.08
S11*	9-Apr-20	—	8200	**1000**	**1400**	**0.12**
S12*	9-Apr-20	—	**16000**	**12000**	**7200**	**0.75**
S4*	11-Apr-20	—	**16000**	**8000**	**3600**	**0.50**
S5*	11-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	11-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S8*	11-Apr-20	—	**16000**	**6000**	**4600**	**0.38**
S9*	11-Apr-20	—	**16000**	**6000**	**3600**	**0.38**
S10*	11-Apr-20	—	—	—	**5000**	—
S11*	11-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S12*	11-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S4*	13-Apr-20	—	**16000**	**7400**	**1800**	**0.46**
S5*	13-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	13-Apr-20	—	**16000**	**12000**	**5400**	**0.75**
S8*	13-Apr-20	—	**16000**	**8200**	**1000**	**0.51**
S10*	13-Apr-20	—	—	—	**3000**	—
S11*	13-Apr-20	—	**16000**	**12000**	**4600**	**0.75**

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S12*	13-Apr-20	—	**16000**	**4200**	**1100**	**0.26**
S4	14-Apr-20	—	4800	**1600**	**620**	**0.33**
S5	14-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S6	14-Apr-20	—	460	60	**160**	0.13
S10	14-Apr-20	—	6800	**2000**	**660**	**0.29**
S11	14-Apr-20	—	**16000**	**7200**	**4800**	**0.45**
S5*	16-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	16-Apr-20	—	—	—	**12000**	—
S11*	16-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S5*	17-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	17-Apr-20	—	—	—	**12000**	—
S11*	17-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S5*	19-Apr-20	—	**16000**	**3600**	**740**	**0.23**
S6*	19-Apr-20	—	—	—	**760**	—
S11*	19-Apr-20	—	2200	380	**1000**	**0.17**
S4	21-Apr-20	—	**16000**	**7000**	**820**	**0.44**
S5	21-Apr-20	—	**16000**	**12000**	**4200**	**0.75**
S6	21-Apr-20	—	3000	**600**	**480**	**0.20**
S10	21-Apr-20	—	**16000**	**12000**	**2200**	**0.75**
S11	21-Apr-20	—	**16000**	**9000**	**2200**	**0.56**
S4*	23-Apr-20	—	**16000**	**4000**	**920**	**0.25**
S5*	23-Apr-20	—	**16000**	**12000**	**3200**	**0.75**
S6*	23-Apr-20	—	240	20	**340**	0.08
S10*	23-Apr-20	—	**16000**	**11000**	**3000**	**0.69**
S11*	23-Apr-20	—	600	60	**520**	0.10
S4*	24-Apr-20	—	**15000**	**9600**	**3200**	**0.64**
S5*	24-Apr-20	—	**16000**	**12000**	**4200**	**0.75**
S10*	24-Apr-20	—	**16000**	**12000**	**6200**	**0.75**
S11*	24-Apr-20	—	—	—	**220**	—
S4*	26-Apr-20	—	1000	**580**	**500**	**0.58**
S5*	26-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	26-Apr-20	—	4800	**2800**	**840**	**0.58**

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S11*	26-Apr-20	—	—	—	**3000**	—
S4	28-Apr-20	—	600	2	**260**	0.00
S5	28-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S6	28-Apr-20	—	**16000**	**3800**	**1600**	**0.24**
S8	28-Apr-20	—	200	24	**120**	0.12
S9	28-Apr-20	—	200	40	**220**	0.20
S10	28-Apr-20	—	200	20	**120**	0.10
S11	28-Apr-20	—	**16000**	**6600**	**3200**	**0.41**
S12	28-Apr-20	—	600	340	**420**	0.57
S4*	30-Apr-20	—	—	—	**12000**	—
S5*	30-Apr-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	30-Apr-20	—	400	220	**600**	0.55
S10*	30-Apr-20	—	—	—	**12000**	—
S11*	30-Apr-20	—	1200	**520**	**600**	**0.43**
S12*	30-Apr-20	—	—	—	**180**	—
S4*	2-May-20	—	—	—	**5200**	—
S5*	2-May-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	2-May-20	—	—	—	**12000**	—
S11*	2-May-20	—	20	2	**160**	0.10
S4*	4-May-20	—	—	—	**520**	—
S5*	4-May-20	—	**16000**	**12000**	**12000**	**0.75**
S10*	4-May-20	—	—	—	**12000**	—
S4	5-May-20	—	4800	**2600**	**700**	**0.54**
S5	5-May-20	—	**11000**	**1800**	**820**	**0.16**
S10	5-May-20	—	6200	**1400**	**720**	**0.23**
S4*	7-May-20	—	**16000**	**8400**	**2600**	**0.53**
S5*	7-May-20	—	2000	**720**	**400**	**0.36**
S10*	7-May-20	—	**16000**	**12000**	**8400**	**0.75**
S5*	9-May-20	—	**16000**	**12000**	**12000**	**0.75**
S5*	11-May-20	—	**16000**	**12000**	**12000**	**0.75**
S5	12-May-20	—	**16000**	**12000**	**12000**	**0.75**

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S6	12-May-20	—	4200	**1200**	**4800**	**0.29**
S8	12-May-20	—	1200	100	**460**	0.08
S11	12-May-20	—	**16000**	**2800**	**9400**	**0.18**
S12	12-May-20	—	6200	**800**	**4400**	**0.13**
S5*	14-May-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	14-May-20	—	80	60	**260**	0.75
S11*	14-May-20	—	720	**600**	**800**	0.83
S5*	15-May-20	—	7800	**7200**	**12000**	**0.92**
S4	19-May-20	—	200	30	**180**	0.15
S5	26-May-20	—	**16000**	**12000**	**12000**	**0.75**
S6	26-May-20	—	8400	**2400**	**1600**	**0.29**
S11	26-May-20	—	**12000**	**1200**	**5200**	0.10
S5*	28-May-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	28-May-20	—	2600	**1000**	**800**	**0.38**
S11*	28-May-20	—	**12000**	**6000**	**7000**	**0.50**
S5*	29-May-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	29-May-20	—	9800	**4000**	**2800**	**0.41**
S11*	29-May-20	—	**16000**	**9000**	**7800**	**0.56**
S5*	31-May-20	—	**16000**	**6800**	**6800**	**0.43**
S6*	31-May-20	—	280	140	**140**	0.50
S11*	31-May-20	—	2800	300	**360**	**0.11**
S5	9-Jun-20	—	**16000**	**12000**	**12000**	**0.75**
S11	9-Jun-20	—	840	260	**120**	0.31
S5*	11-Jun-20	—	**16000**	**12000**	**12000**	**0.75**
S11*	11-Jun-20	—	—	—	**6400**	—
S5*	12-Jun-20	—	**16000**	**12000**	**12000**	**0.75**
S11*	12-Jun-20	—	—	—	**3000**	—
S5*	14-Jun-20	—	**16000**	**2800**	**9000**	**0.18**

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S12	16-Jun-20	—	1300	300	**260**	**0.23**
S5	23-Jun-20	—	**16000**	**12000**	**5400**	**0.75**
S6	23-Jun-20	—	800	280	**160**	0.35
S11	23-Jun-20	—	**16000**	**6000**	**4600**	**0.38**
S5*	25-Jun-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	25-Jun-20	—	—	—	**3000**	—
S11*	25-Jun-20	—	**16000**	**10000**	**5600**	**0.63**
S5*	27-Jun-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	27-Jun-20	—	—	—	**580**	—
S11*	27-Jun-20	—	**16000**	**12000**	**6600**	**0.75**
S5*	29-Jun-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	29-Jun-20	—	—	—	**5400**	—
S11*	29-Jun-20	—	**16000**	**12000**	**12000**	**0.75**
S5	30-Jun-20	—	**16000**	**12000**	**12000**	**0.75**
S6	30-Jun-20	—	**16000**	**7000**	**4200**	**0.44**
S11	30-Jun-20	—	**16000**	**12000**	**11000**	**0.75**
S12	30-Jun-20	—	1200	200	**180**	**0.17**
S5*	2-Jul-20	—	240	50	**220**	0.21
S5*	4-Jul-20	—	—	—	**12000**	—
S5*	6-Jul-20	—	—	—	**2800**	—
S5	7-Jul-20	—	**16000**	**12000**	**12000**	**0.75**
S6	7-Jul-20	—	1400	180	**960**	**0.13**
S11	7-Jul-20	—	1600	**580**	**1800**	**0.36**
S5*	9-Jul-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	9-Jul-20	—	**16000**	**2600**	**1600**	**0.16**
S11*	9-Jul-20	—	**16000**	**12000**	**11000**	**0.75**
S5*	11-Jul-20	—	**16000**	**12000**	**12000**	**0.75**
S6*	11-Jul-20	—	1000	**520**	**300**	0.52
S11*	11-Jul-20	—	**16000**	**12000**	**11000**	**0.75**

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S5*	13-Jul-20	—	**16000**	**12000**	**12000**	**0.75**
S5	14-Jul-20	—	**16000**	**12000**	**12000**	**0.75**
S5*	16-Jul-20	—	4200	**960**	**540**	**0.23**
S5*	17-Jul-20	—	**16000**	**12000**	**12000**	**0.75**
S5*	19-Jul-20	—	**16000**	**12000**	**12000**	**0.75**
S5	21-Jul-20	—	5000	**2600**	**500**	**0.52**
S10	21-Jul-20	—	7000	**1000**	**640**	**0.14**
S5*	23-Jul-20	—	9000	**600**	**1000**	0.07
S5*	24-Jul-20	—	—	**12000**	**12000**	—
S5	28-Jul-20	—	**16000**	**12000**	**12000**	**0.75**
S11	28-Jul-20	—	6800	**680**	**380**	0.10
S5*	30-Jul-20	—	6800	**600**	**340**	0.09
S4	4-Aug-20	—	6000	**1100**	**780**	**0.18**
S5	4-Aug-20	—	**16000**	**3400**	**1100**	**0.21**
S6	4-Aug-20	—	**16000**	**6800**	**2200**	**0.43**
S10	4-Aug-20	—	1400	320	**280**	**0.23**
S11	4-Aug-20	—	**16000**	**4400**	**840**	**0.28**
S12	18-Aug-20	—	**11000**	**1200**	80	**0.11**
S4	8-Sep-20	—	8800	**1800**	**880**	**0.20**
S5	8-Sep-20	—	**11000**	**5000**	**800**	**0.45**
S6	8-Sep-20	—	7200	**2400**	**980**	**0.33**
S10	8-Sep-20	—	5200	**2000**	**1100**	**0.38**
S11	8-Sep-20	—	6200	**2600**	**600**	**0.42**
S12	8-Sep-20	—	2400	**440**	**200**	**0.18**
S4	10-Nov-20	—	**16000**	**4000**	**110**	**0.25**
S5	10-Nov-20	—	**16000**	**12000**	**12000**	**0.75**
S10	10-Nov-20	—	**16000**	**12000**	**720**	**0.75**

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
S5*	12-Nov-20	—	6400	**660**	50	**0.10**
Kelp Stations						
I19	2-Jan-20	6	2200	**760**	**200**	**0.35**
I19	2-Jan-20	2	**16000**	**3200**	**720**	**0.20**
I19	2-Jan-20	11	2400	320	**180**	**0.13**
I24	2-Jan-20	11	2400	**520**	**180**	**0.22**
I24	2-Jan-20	6	9600	**1400**	**320**	**0.15**
I24	2-Jan-20	2	7000	**1000**	**340**	**0.14**
I25	2-Jan-20	6	3200	**620**	**180**	**0.19**
I25	2-Jan-20	9	800	68	**220**	0.09
I26	2-Jan-20	6	3400	**680**	**460**	**0.20**
I26	2-Jan-20	9	3400	**480**	**600**	**0.14**
I26	2-Jan-20	2	2600	360	**860**	**0.14**
I32	2-Jan-20	6	200	48	**480**	0.24
I32	2-Jan-20	9	320	64	**620**	0.20
I32	2-Jan-20	2	340	58	**300**	0.17
I40	2-Jan-20	9	2400	400	**260**	**0.17**
I40	2-Jan-20	6	2800	380	**200**	**0.14**
I19	7-Jan-20	6	9200	**1800**	**580**	**0.20**
I19	7-Jan-20	11	8800	**1400**	**440**	**0.16**
I19	7-Jan-20	2	**11000**	**900**	**240**	0.08
I26	7-Jan-20	9	60	20	**400**	0.33
I40	7-Jan-20	2	1400	380	50	**0.27**
I19	13-Jan-20	11	1400	340	94	**0.24**
I19	13-Jan-20	2	**11000**	**2000**	**280**	**0.18**
I19	13-Jan-20	6	7400	**1200**	**280**	**0.16**
I24	13-Jan-20	11	1500	200	58	**0.13**
I24	13-Jan-20	6	**16000**	**2000**	**300**	**0.13**
I24	13-Jan-20	2	**16000**	**1800**	**660**	**0.11**
I25	13-Jan-20	9	3200	**420**	74	**0.13**
I25	13-Jan-20	6	10000	**1100**	**120**	**0.11**
I25	13-Jan-20	2	**14000**	**1200**	**140**	0.09
I40	13-Jan-20	6	5800	**780**	60	**0.13**
I40	13-Jan-20	2	**14000**	**1000**	**160**	0.07
I19	21-Jan-20	2	5400	**720**	**160**	**0.13**
I24	21-Jan-20	2	**16000**	**600**	**2200**	0.04
I26	21-Jan-20	9	20	2	**200**	0.10

[a]Resample

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
I40	21-Jan-20	2	**12000**	**5000**	**960**	**0.42**
I40	21-Jan-20	6	**11000**	**1200**	**800**	**0.11**
I40	21-Jan-20	9	5600	200	**220**	0.04
I19	28-Jan-20	6	3200	**540**	**160**	**0.17**
I19	28-Jan-20	11	1600	200	88	**0.13**
I19	5-Feb-20	6	3600	**1000**	**520**	**0.28**
I19	5-Feb-20	11	4800	**1100**	**360**	**0.23**
I19	5-Feb-20	2	4200	**600**	**380**	**0.14**
I40	5-Feb-20	2	1800	**560**	**880**	**0.31**
I24	10-Feb-20	2	600	**520**	100	0.87
I26	10-Feb-20	9	600	**440**	**340**	0.73
I26	10-Feb-20	2	1800	**740**	**1100**	**0.41**
I26	10-Feb-20	6	2000	400	**440**	**0.20**
I32	10-Feb-20	9	1800	**860**	**480**	**0.48**
I32	10-Feb-20	2	200	84	**300**	0.42
I32	10-Feb-20	6	2800	**680**	**640**	**0.24**
I40	10-Feb-20	2	4200	**980**	**760**	**0.23**
I19	18-Feb-20	2	580	260	**340**	0.45
I19	18-Feb-20	6	8200	**2400**	**640**	**0.29**
I19	18-Feb-20	11	**16000**	**3800**	**1200**	**0.24**
I40	18-Feb-20	6	4400	**1100**	**360**	**0.25**
I40	18-Feb-20	2	2000	400	**1100**	**0.20**
I19	5-Mar-20	2	**16000**	**12000**	**820**	**0.75**
I19	5-Mar-20	11	1200	**560**	2	**0.47**
I19	5-Mar-20	6	**16000**	**1600**	**380**	0.10
I24	9-Mar-20	2	640	160	**110**	0.25
I25	9-Mar-20	2	1500	240	100	**0.16**
I40	9-Mar-20	2	520	360	**240**	0.69
I24	16-Mar-20	2	**16000**	**11000**	**1000**	**0.69**
I24	16-Mar-20	6	3400	**740**	32	**0.22**
I24	16-Mar-20	11	2400	**460**	24	**0.19**
I25	16-Mar-20	2	**16000**	**8600**	**560**	**0.54**
I25	16-Mar-20	6	4400	**1400**	92	**0.32**
I25	16-Mar-20	9	6000	**520**	42	0.09

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
I32	16-Mar-20	6	1800	300	18	**0.17**
I32	16-Mar-20	9	2400	320	68	**0.13**
I39	16-Mar-20	2	2000	**440**	34	**0.22**
I40	16-Mar-20	2	**16000**	**8000**	**700**	**0.50**
I40	16-Mar-20	9	1400	200	18	**0.14**
I24	24-Mar-20	2	300	**480**	16	1.60
I25	24-Mar-20	6	2800	**420**	28	**0.15**
I25	24-Mar-20	9	1400	200	12	**0.14**
I25	24-Mar-20	2	6400	**800**	42	**0.13**
I26	24-Mar-20	2	2800	**1600**	26	**0.57**
I32	24-Mar-20	2	**16000**	**4400**	**160**	**0.28**
I39	24-Mar-20	2	**15000**	**3200**	**340**	**0.21**
I40	24-Mar-20	9	1400	360	**420**	**0.26**
I40	24-Mar-20	6	**11000**	400	**220**	0.04
I19	1-Apr-20	2	4200	**980**	**240**	**0.23**
I19	1-Apr-20	6	3000	340	**110**	**0.11**
I19	1-Apr-20	11	1800	120	**320**	0.07
I40	1-Apr-20	2	**14000**	**5800**	**600**	**0.41**
I40	1-Apr-20	6	**16000**	**5000**	**1000**	**0.31**
I40	1-Apr-20	9	4800	**700**	**110**	**0.15**
I19	10-Apr-20	11	7200	**1400**	**1800**	**0.19**
I19	10-Apr-20	2	5800	**800**	**600**	**0.14**
I19	10-Apr-20	6	4600	**600**	**1200**	**0.13**
I24	10-Apr-20	6	1000	300	**160**	**0.30**
I24	10-Apr-20	11	980	280	**120**	0.29
I24	10-Apr-20	2	1400	200	**320**	**0.14**
I25	10-Apr-20	9	500	180	**200**	0.36
I25	10-Apr-20	6	620	140	**180**	0.23
I26	10-Apr-20	6	480	100	**240**	0.21
I26	10-Apr-20	2	440	60	**120**	0.14
I26	10-Apr-20	9	500	40	**120**	0.08
I32	10-Apr-20	2	**16000**	**12000**	**11000**	**0.75**
I32	10-Apr-20	9	**16000**	**12000**	**3200**	**0.75**
I32	10-Apr-20	6	**16000**	**6400**	**2000**	**0.40**
I40	10-Apr-20	9	400	340	**620**	0.85
I40	10-Apr-20	6	1100	320	**400**	**0.29**
I40	10-Apr-20	2	1000	140	**320**	0.14

Appendix A.22 *continued*

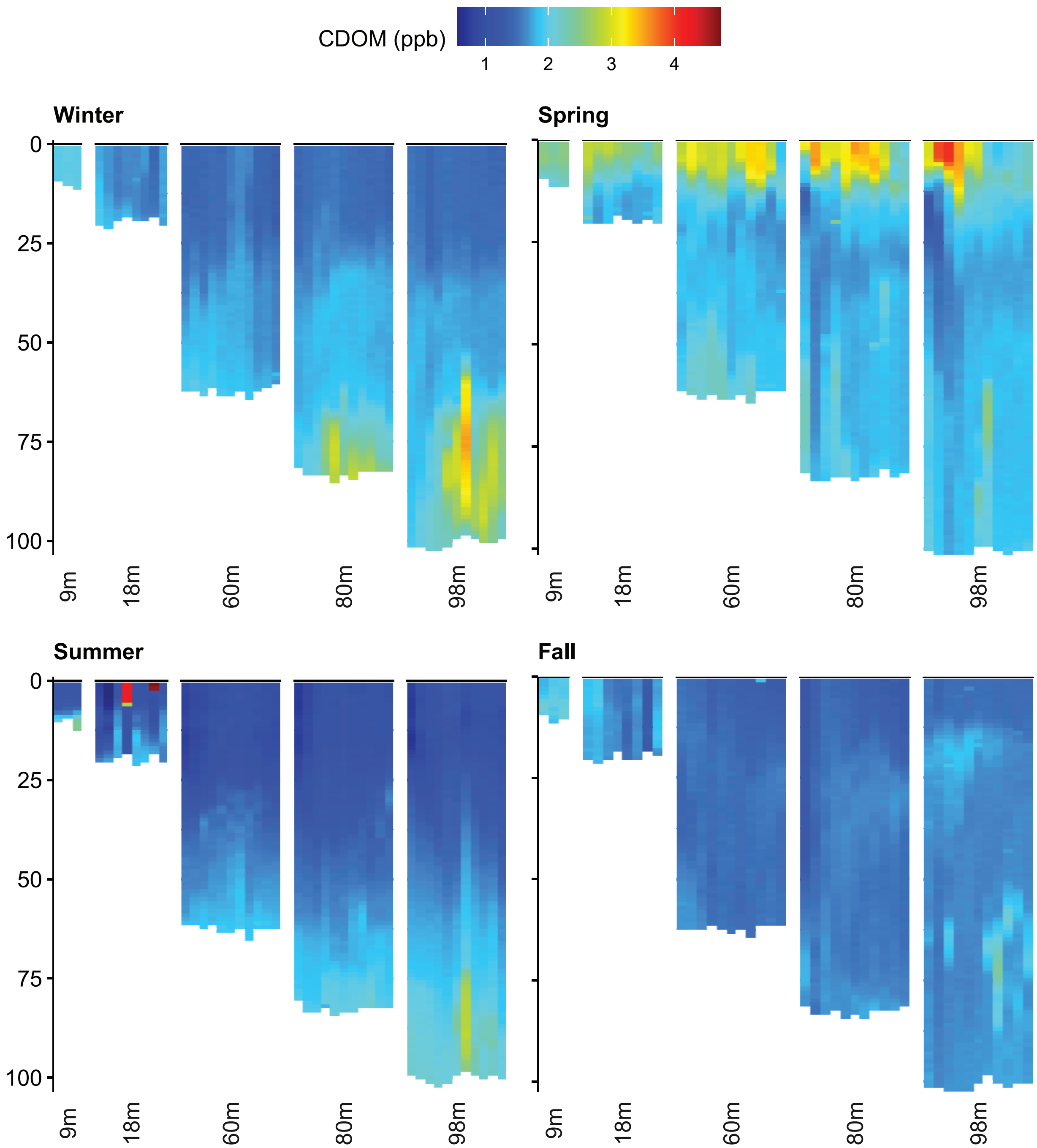
Station	Date	Depth (m)	Total	Fecal	Entero	F:T
I19	14-Apr-20	2	1200	**720**	**220**	**0.60**
I19	14-Apr-20	11	3400	**840**	**340**	**0.25**
I19	14-Apr-20	6	5800	**1400**	**240**	**0.24**
I24	14-Apr-20	11	400	68	**320**	0.17
I40	14-Apr-20	2	6800	**1000**	**1100**	**0.15**
I40	14-Apr-20	9	7400	**1000**	**1200**	**0.14**
I40	14-Apr-20	6	**11000**	**1100**	**1800**	0.10
I19	21-Apr-20	2	**11000**	**1800**	40	**0.16**
I19	21-Apr-20	6	6800	**840**	**160**	**0.12**
I19	21-Apr-20	11	1600	180	**280**	**0.11**
I24	21-Apr-20	6	**16000**	**3800**	**560**	**0.24**
I24	21-Apr-20	2	**16000**	**3800**	**320**	**0.24**
I24	21-Apr-20	11	7600	200	**300**	0.03
I32	21-Apr-20	6	200	76	**240**	0.38
I32	21-Apr-20	9	140	50	**120**	0.36
I40	21-Apr-20	2	**16000**	**7600**	**520**	**0.48**
I40	21-Apr-20	6	6800	**1800**	**280**	**0.26**
I40	21-Apr-20	9	5400	**1200**	**360**	**0.22**
I19	28-Apr-20	2	5400	**2000**	**3000**	**0.37**
I19	28-Apr-20	6	4400	**1400**	**800**	**0.32**
I19	28-Apr-20	11	1200	160	**280**	**0.13**
I24	28-Apr-20	6	400	60	**160**	0.15
I26	28-Apr-20	2	**16000**	**8400**	**5000**	**0.53**
I26	28-Apr-20	9	2800	**460**	**240**	**0.16**
I32	28-Apr-20	6	1200	**800**	**480**	**0.67**
I32	28-Apr-20	9	800	240	**320**	0.30
I32	28-Apr-20	2	4400	**600**	**200**	**0.14**
I40	28-Apr-20	6	200	160	**110**	0.80
I40	28-Apr-20	2	1000	**600**	**600**	0.60
I40	28-Apr-20	9	5200	**920**	**440**	**0.18**
I19	5-May-20	6	1000	**560**	**200**	0.56
I19	5-May-20	2	6600	**3200**	**140**	**0.48**
I40	5-May-20	9	800	160	**260**	0.20
I24	12-May-20	11	20	8	**120**	0.40
I32	12-May-20	6	140	46	**110**	0.33
I40	12-May-20	9	20	6	**110**	0.30

Appendix A.22 *continued*

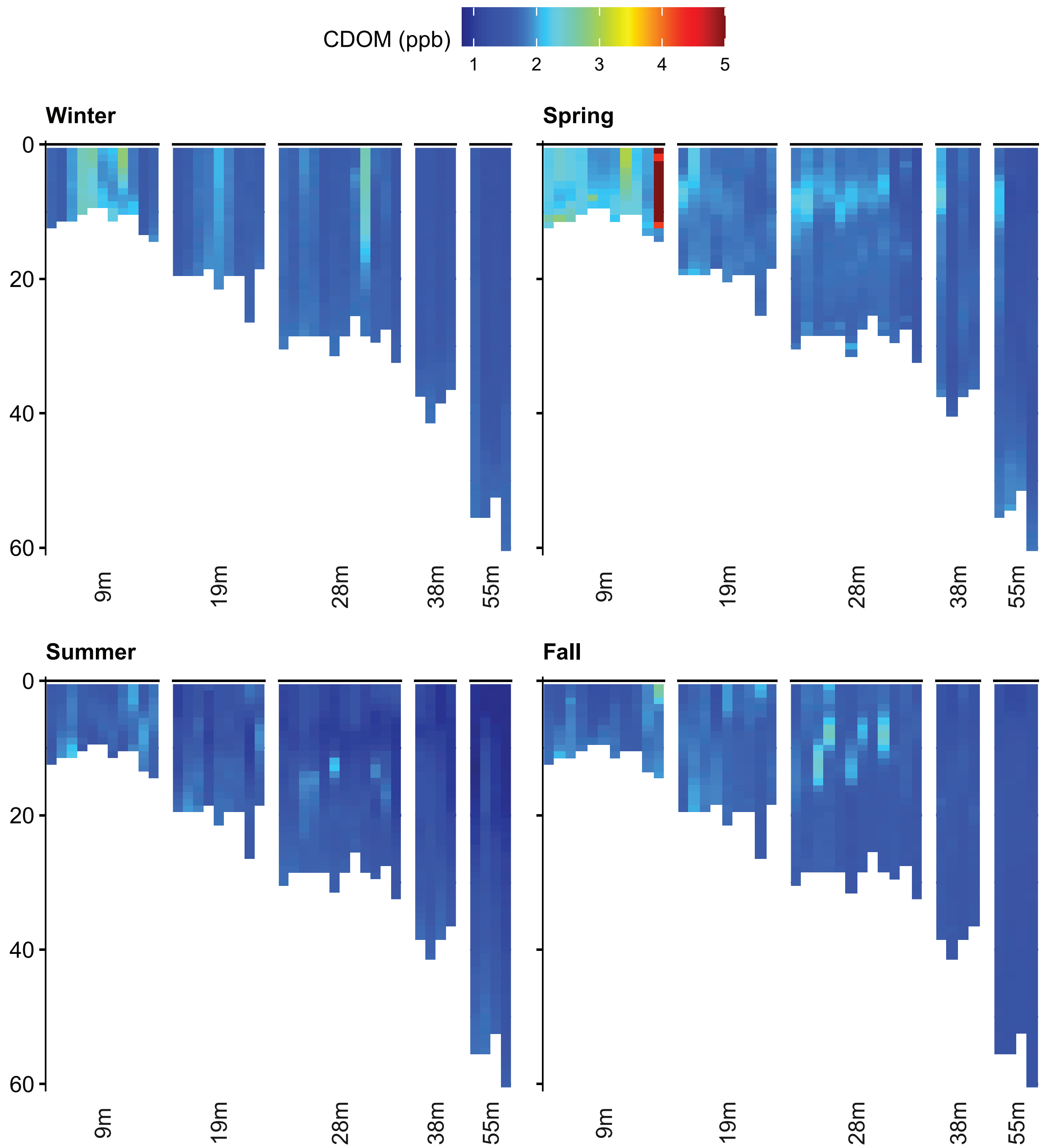
Station	Date	Depth (m)	Total	Fecal	Entero	F:T
I24	21-Jul-20	2	400	96	**460**	0.24
I24	21-Jul-20	6	2800	300	**800**	**0.11**
I40	21-Jul-20	2	400	140	**320**	0.35
I19	28-Jul-20	2	680	56	**120**	0.08
I19	4-Aug-20	2	900	**560**	90	0.62
I19	4-Aug-20	11	**16000**	**9800**	**2200**	**0.61**
I19	4-Aug-20	6	6000	**820**	**320**	**0.14**
I24	4-Aug-20	6	6400	**2200**	**560**	**0.34**
I24	4-Aug-20	11	4200	**660**	**140**	**0.16**
I25	4-Aug-20	6	9000	**2000**	**580**	**0.22**
I25	4-Aug-20	9	4000	**820**	**140**	**0.21**
I26	4-Aug-20	6	4800	**800**	100	**0.17**
I26	4-Aug-20	9	4000	**540**	100	**0.14**
I40	4-Aug-20	9	**16000**	**8400**	**1400**	**0.53**
I40	4-Aug-20	6	**16000**	**4800**	**1100**	**0.30**
I40	4-Aug-20	2	8400	**960**	**140**	**0.11**
I19	8-Sep-20	2	**12000**	**8600**	**2000**	**0.72**
I19	8-Sep-20	6	8600	**2400**	**3200**	**0.28**
I19	8-Sep-20	11	**11000**	**1000**	**900**	0.09
I24	8-Sep-20	11	6000	**1200**	**540**	**0.20**
I24	8-Sep-20	2	7000	**840**	**500**	**0.12**
I24	8-Sep-20	6	8000	**720**	**620**	0.09
I25	8-Sep-20	9	8200	**3600**	**540**	**0.44**
I25	8-Sep-20	6	**11000**	**1800**	**780**	**0.16**
I25	8-Sep-20	2	9600	**980**	**720**	**0.10**
I26	8-Sep-20	2	**12000**	**4200**	**820**	**0.35**
I26	8-Sep-20	6	**14000**	**4400**	**2000**	**0.31**
I26	8-Sep-20	9	**16000**	**4000**	**900**	**0.25**
I39	8-Sep-20	2	20	**460**	**360**	23.00
I40	8-Sep-20	6	9000	**2000**	**1100**	**0.22**
I40	8-Sep-20	2	**13000**	**2400**	**1400**	**0.18**
I40	8-Sep-20	9	**12000**	**1000**	**960**	0.08
I25	11-Nov-20	9	2200	280	2	**0.13**
I25	11-Nov-20	2	4000	**420**	8	**0.11**
I25	11-Nov-20	6	**11000**	**840**	22	0.08
I40	11-Nov-20	2	1200	200	2	**0.17**

Appendix A.22 *continued*

Station	Date	Depth (m)	Total	Fecal	Entero	F:T
I40	11-Nov-20	6	1600	180	8	**0.11**
I40	11-Nov-20	9	10000	**580**	4	0.06
Offshore Stations						
I5	3-Nov-20	2	**16000**	**9600**	**5400**	**0.60**
I5	3-Nov-20	6	4000	**600**	**120**	**0.15**
I5	3-Nov-20	11	3400	**500**	**140**	**0.15**
I11	3-Nov-20	6	6200	**680**	**280**	**0.11**



Appendix A.23
Concentrations of CDOM recorded in the PLOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.



Appendix A.24

Concentrations of CDOM recorded in the SBOO region during 2020. Within each contour, stations are ordered north to south. Data were collected over four to five days during each survey.

Appendix A.25

Summary of oceanographic data within potential detected plume at PLOO offshore stations and corresponding reference values during 2020. Plume depth is the minimum depth at which CDOM exceeds the 95th percentile while plume width is the number of meters across which that exceedance occurs. Out-of-range values are indicated with an asterisk. DO = dissolved oxygen; XMS = transmissivity; SD = standard deviation; CI = confidence interval.

		Potential Plume					Reference[b]		
Station	Date	Depth (m)	Width (m)	Mean DO	Mean pH	Mean XMS	DO (Mean - SD)	pH (Mean)	XMS (Mean - 95% CI)
F27	19-Feb-20	72	21	4.3*	7.7	85	5.5	7.8	77
F28	19-Feb-20	82	16	4.2*	7.7	81*	5.8	7.8	91
F29	19-Feb-20	87	10	4.4*	7.7	84*	5.6	7.8	91
F30	19-Feb-20	59	36	4.3*	7.7	83	5.7	7.9	83
F31	19-Feb-20	71	24	4.5*	7.7	85	5.5	7.8	78
F32	19-Feb-20	78	10	4.5*	7.8	86	5.9	7.9	86
F19[a]	21-Feb-20	78	4	4.4*	7.7	84	5.8	7.9	79
F21	21-Feb-20	71	12	4.7*	7.8	87	5.4	7.8	70
F30	20-May-20	61	15	3.5	7.8	89	—	—	—
F27	18-Aug-20	84	13	4.3	7.8	92	—	—	—
F28	18-Aug-20	83	15	4.3	7.8	93	—	—	—
F29	18-Aug-20	85	12	4.3	7.8	92	—	—	—
F30	18-Aug-20	72	24	4.4	7.8	90	—	—	—
F31	18-Aug-20	81	16	4.6	7.8	92	—	—	—
F32	18-Aug-20	94	4	4.2	7.8	93	—	—	—
F33	18-Aug-20	97	3	4.0	7.8	93	—	—	—
F34	18-Aug-20	91	7	3.9	7.8	93	—	—	—
F35	18-Aug-20	90	7	3.8	7.8	93	—	—	—
F36	18-Aug-20	86	11	3.7	7.7	93	—	—	—
F26	10-Nov-20	62	12	5.1	7.9	93	5.1	7.9	93
F27	10-Nov-20	55	8	5.0	7.9	93	5.1	7.9	92
F28	10-Nov-20	55	10	5.0	7.9	93	5.2	7.9	92
F29	10-Nov-20	61	27	4.7	7.8	93	5.0	7.9	92
F30	10-Nov-20	64	8	4.8	7.8	92*	5.2	7.9	93
F34	10-Nov-20	64	9	4.7*	7.8	93	5.5	7.9	92

[a]Station located within State jurisdictional waters [b]No reference values possible at plume depths in May or August

Appendix A.26

Summary of oceanographic data within potential detected plume at SBOO offshore stations and corresponding reference values during 2020. Plume depth is the minimum depth at which CDOM exceeds the 95th percentile while plume width is the number of meters across which that exceedance occurs. Out-of-range values are indicated with an asterisk. DO = dissolved oxygen; XMS = transmissivity; SD = standard deviation; CI = confidence interval.

		Potential Plume					Reference		
Station	Date	Depth (m)	Width (m)	Mean DO	Mean pH	Mean XMS	DO (Mean - SD)	pH (Mean)	XMS (Mean - 95% CI)
I12[a]	13-Feb-2020	2	16	7.3	8.0	87	7.7	8.1	86
I23[a]	13-Feb-2020	2	11	7.5	8.0	78*	7.8	8.1	86
I12[a]	28-May-2020	6	1	7.6	8.1	79*	7.5	8.2	82
I14[a]	28-May-2020	9	2	7.5	8.1	77*	7.2	8.1	84
I34[a]	29-May-2020	6	3	6.2*	8.0	79*	7.5	8.2	83
I15	24-Aug-2020	12	3	8.4	8.2	85	8.1	8.2	84
I22[a]	24-Aug-2020	14	5	8.2	8.2	83*	8.0	8.2	84
I27[a]	24-Aug-2020	14	9	8.2	8.2	82*	7.9	8.2	84
I31[a]	25-Aug-2020	14	3	8.0	8.1	83*	8.0	8.2	84
I35[a]	25-Aug-2020	16	1	7.8	8.1	84	8.1	8.2	84
I9	26-Aug-2020	13	2	8.0	8.1	89	8.1	8.2	84
I12[a]	4-Nov-2020	5	7	7.1	8.1	85	7.6	8.2	83
I15	4-Nov-2020	11	4	7.3	8.1	85	7.2	8.2	84
I16[a]	4-Nov-2020	6	4	6.9*	8.1	86	7.7	8.2	83
I22[a]	4-Nov-2020	6	5	7.1	8.1	85	7.6	8.2	83
I27[a]	4-Nov-2020	9	7	7.2	8.1	85	7.2	8.2	84
I35[a]	5-Nov-2020	15	2	5.6*	8.0	87	7.0	8.1	85

[a]Station located within State jurisdictional waters

Appendix B

Benthic Conditions

2020 Raw Data Summaries

Appendix B.1

Particle size classification schemes (based on Folk 1980) used in the analysis of sediments during 2020. 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

Constituents and method detection limits (MDL) used for the analysis of sediments during 2020. NA=not available.

Parameter	MDL	Parameter	MDL
Organic Indicators			
Biological Oxygen Demand (BOD, ppm)	2	Total Sulfides (ppm)	0.68-1.50
Total Nitrogen (TN, % wt.)	0.008	Total Volatile Solids (TVS, % wt.)	0.11
Total Organic Carbon (TOC, % wt.)	0.07		
Metals (ppm)			
Aluminum (Al)	3.1	Lead (Pb)	0.1
Antimony (Sb)	0.17	Manganese (Mn)	0.061
Arsenic (As)	0.152	Mercury (Hg)	0.003-0.0145
Barium (Ba)	0.155	Nickel (Ni)	0.28
Beryllium (Be)	0.003	Selenium (Se)	0.213
Cadmium (Cd)	0.018	Silver (Ag)	0.133
Chromium (Cr)	0.049	Thallium (Tl)	0.122
Copper (Cu)	1.19	Tin (Sn)	0.059
Iron (Fe)	1.88-9.40	Zinc (Zn)	0.384
Chlorinated Pesticides (ppt)			
Hexachlorocyclohexane (HCH)			
HCH, Alpha isomer (HCH-A)	26.4-110	HCH, Delta isomer (HCH-D)	71.8-147
HCH, Beta isomer (HCH-B)	37.6-76.9	HCH, Gamma isomer (HCH-G)	14.1-147
Total Chlordane			
Alpha (cis) Chlordane (A(c)C)	48.6-95	Heptachlor epoxide (HeptEpox)	33.2-67.9
Cis Nonachlor (cNon)	46.5-95.1	Methoxychlor (Methoxy)	91.1-847
Gamma (trans) Chlordane (G(t)C)	27-126	Oxychlordane (Oxychlor)	70-143
Heptachlor (Hept)	100-344	Trans Nonachlor (tNon)	29.3-125
Total Dichlorodiphenyltrichloroethane (DDT)			
o,p-DDD	36.4-111	p,p-DDE	17.2-138
o,p-DDE	14.1-115	p,p-DDMU	37.5-76.6
o,p-DDT	31.6-96.2	p,p-DDT	21.3-130
p,p-DDD	30.3-69.7		
Miscellaneous Pesticides			
Aldrin	30.4-62.1	Endrin	97.6-200
Alpha Endosulfan	78.2-329	Endrin aldehyde (EndAld)	153-313
Beta Endosulfan	50.9-1020	Hexachlorobenzene (HCB)	50.9-35
Dieldrin	53.5-109	Mirex	27.9-57.1
Endosulfan Sulfate	41.5-308		

Appendix B.2 *continued*

Parameter	MDL	Parameter	MDL
Polychlorinated Biphenyl Congeners (PCBs) (ppt)			
PCB 8	40.9	PCB 126	56.7-116
PCB 18	55.2-113	PCB 128	43.3-77.2
PCB 28	25.6-122	PCB 138	49.3-101
PCB 37	26.1-150	PCB 149	20.6-112
PCB 44	22.3-87.8	PCB 151	38.1-66.2
PCB 49	27.2-85.7	PCB 153/168	87-266
PCB 52	25.4-92.6	PCB 156	29.7-146
PCB 66	21.9-83.5	PCB 157	18.8-174
PCB 70	18.9-87.8	PCB 158	30.5-184
PCB 74	13.2-87.1	PCB 167	17.5-106
PCB 77	28-114	PCB 169	42-85.9
PCB 81	30.1-61.5	PCB 170	35.2-62.7
PCB 87	25.7-83.9	PCB 177	23.2-83.8
PCB 99	19.6-71	PCB 180	38.2-67.9
PCB 101	40.4-82.6	PCB 183	25.9-52.1
PCB 105	37.9-136	PCB 187	32.2-65.8
PCB 110	35.4-104	PCB 189	17-167
PCB 114	50.6-103	PCB 194	21.4-91.7
PCB 118	17.6-97.7	PCB 195	29.2-29.2
PCB 119	29.6-142	PCB 201	42.9-87.7
PCB 123	20.4-134	PCB 206	20.6-97.3
Polycyclic Aromatic Hydrocarbons (PAHs) (ppb)			
1-methylnaphthalene	7.78-14.5	Benzo[G,H,I]perylene	5.12-9.55
1-methylphenanthrene	5.22-9.74	Benzo[K]fluoranthene	4.69-8.76
2,3,5-trimethylnaphthalene	5.62-10.5	Biphenyl	NA
2,6-dimethylnaphthalene	6.74-12.6	Chrysene	4.97-9.28
2-methylnaphthalene	7.25-13.5	Dibenzo(A,H)anthracene	4.77-8.89
3,4-benzo(B)fluoranthene	5.3-9.89	Fluoranthene	6.01-9.37
Acenaphthene	9.72-18.1	Fluorene	9.86-18.4
Acenaphthylene	7.02-13.1	Indeno(1,2,3-CD)pyrene	4.44-8.29
Anthracene	9.61-17.9	Naphthalene	5.9-11
Benzo[A]anthracene	4.88-9.1	Perylene	5.16-9.62
Benzo[A]pyrene	5.58-10.4	Phenanthrene	7.83-14.6
Benzo[e]pyrene	4.49-8.39	Pyrene	6.47-12.1

Appendix B.3

Summary of particle size parameters (%) for each PLOO station sampled during winter 2020. Visual observations are from sieved “grunge” (i.e., particles retained on 1-mm mesh screen and preserved with infauna for benthic community analysis). Gran = Granules; VCS = Very Coarse Sand; CS = Coarse Sand; MS = Medium Sand; FS = Fine Sand; VFS = Very Fine Sand; CSi = Coarse Silt; MSi = Medium Silt; FSi = Fine Silt; VFSi = Very Fine Silt.

		Coarse Particles			Med-Coarse Sands			Fine Sands			Fine Particles						
		Gran	VCS	Total	CS	MS	Total	FS	VFS	Total	CSi	MSi	FSi	VFSi	Clay	Total	Visual Observations
88-m Stations	B11	0.0	0.0	0.0	0.0	0.8	0.8	8.0	19.7	27.7	18.3	18.4	28.0	6.7	0.1	71.5	shell hash; gravel; cobble
	B8	0.0	0.0	0.0	0.0	0.1	0.1	4.7	26.3	31.0	27.0	16.0	20.6	5.3	0.1	69.0	none
	E19	0.0	0.0	0.0	0.0	0.1	0.1	6.9	33.7	40.6	25.5	12.8	16.8	4.2	0.0	59.3	none
	E7	0.0	0.0	0.0	0.0	0.1	0.1	6.5	32.5	39.0	23.9	13.6	18.9	4.6	0.0	61.0	none
	E1	0.0	0.0	0.0	0.0	0.7	0.7	9.1	22.8	31.9	19.6	17.4	24.7	5.7	0.0	67.4	shell hash
98-m Stations	B12	0.0	0.0	0.0	0.0	2.0	2.0	10.4	16.3	26.7	13.6	17.6	31.5	8.6	0.2	71.5	shell hash; gravel; cobble
	B9	0.0	0.0	0.0	0.0	0.1	0.1	7.0	26.8	33.8	20.5	15.7	24.0	5.8	0.0	66.0	pea gravel
	E26	0.0	0.0	0.0	0.0	0.1	0.1	6.6	30.6	37.2	23.5	15.1	19.8	4.3	0.0	62.7	shell hash
	E25	0.0	0.0	0.0	0.0	0.5	0.5	10.1	32.8	42.9	20.3	12.7	18.9	4.6	0.0	56.5	shell hash; gravel
	E23	0.0	0.0	0.0	0.0	0.1	0.1	7.4	29.0	36.4	20.7	14.3	22.8	5.8	0.0	63.6	none
	E20	0.0	0.0	0.0	0.0	0.2	0.2	9.2	32.4	41.6	19.6	13.1	20.5	5.1	0.0	58.3	none
	E17[a]	0.0	0.0	0.0	0.0	0.2	0.2	10.0	33.7	43.7	20.1	12.9	18.7	4.4	0.0	56.1	none
	E14[a, s]	20.7	17.9	38.6	8.8	1.3	10.0	1.0	33.2	34.2	—	—	—	—	—	17.3	gravel
	E11[a]	0.0	0.0	0.0	0.0	0.6	0.6	12.6	36.6	49.2	17.7	11.1	17.3	4.2	0.0	50.3	black sand; organic debris
	E8	0.0	0.0	0.0	0.0	0.8	0.8	13.2	34.6	47.8	17.8	11.8	17.6	4.3	0.0	51.5	none
	E5	0.0	0.0	0.0	0.0	0.8	0.8	10.2	26.5	36.7	17.5	14.7	24.2	6.1	0.0	62.5	none
	E2[s]	0.0	0.0	0.0	0.0	1.3	1.3	10.0	25.0	35.0	20.4	16.2	22.0	5.1	0.0	63.7	shell hash; gravel; organic debris
116-m Stations	B10	0.0	0.0	0.0	0.0	1.2	1.2	15.6	33.5	49.1	16.7	12.1	16.8	4.1	0.0	49.7	shell hash
	E21	0.0	0.0	0.0	0.0	0.2	0.2	9.8	32.7	42.5	18.6	12.8	20.6	5.3	0.0	57.3	none
	E15[a]	0.0	0.0	0.0	0.0	0.2	0.2	9.1	28.7	37.8	17.3	14.1	24.1	6.3	0.1	61.9	organic debris
	E9	0.0	0.0	0.0	0.0	1.3	1.3	10.3	26.6	36.9	17.9	13.4	23.3	7.0	0.2	61.8	none
	E3	0.0	0.0	0.0	0.0	1.5	1.5	9.5	16.0	25.5	15.1	19.8	31.3	6.9	0.0	73.1	shell hash; gravel; organic debris

[a] Near-ZID station
[s] measured by sieve (not Horiba; silt and clay fractions are indistinguishable)

Appendix B.3 *continued*

Summary of particle size parameters (%) for each PLOO station sampled during summer 2020. Visual observations are from sieved "grunge" (i.e., particles retained on 1-mm mesh screen and preserved with infauna for benthic community analysis). Gran = Granules; VCS = Very Coarse Sand; CS = Coarse Sand; MS = Medium Sand; FS = Fine Sand; VFS = Very Fine Sand; CSi = Coarse Silt; MSi = Medium Silt; FSi = Fine Silt; VFSi = Very Fine Silt; ns = not sampled.

		Coarse Particles			Med-Coarse Sands			Fine Sands			Fine Particles						
		Gran	VCS	Total	CS	MS	Total	FS	VFS	Total	CSi	MSi	FSi	VFSi	Clay	Total	Visual Observations
88-m Stations	B11	0.0	0.0	0.0	0.0	0.8	0.8	8.0	20.2	28.2	18.0	17.1	28.0	7.6	0.2	70.9	gravel; shell hash
	B8	0.0	0.0	0.0	0.0	0.1	0.1	4.7	26.1	30.8	28.4	17.5	19.3	4.0	0.0	69.2	none
	E19	0.0	0.0	0.0	0.0	0.2	0.2	7.4	32.3	39.7	24.4	12.9	18.0	4.9	0.0	60.2	worm tubes; shell hash
	E7	0.0	0.0	0.0	0.0	0.2	0.2	7.7	32.1	39.8	24.0	13.8	18.2	4.2	0.0	60.2	shell hash
	E1	0.0	0.0	0.0	0.0	1.5	1.5	11.8	26.5	38.3	20.2	14.2	20.5	5.4	0.0	60.3	shell hash
98-m Stations	B12	0.3	5.9	6.2	14.0	9.5	23.5	10.4	13.9	24.3	10.4	11.2	18.8	5.5	0.1	46.0	black sand; shell hash
	B9	0.0	0.0	0.0	0.0	0.7	0.7	8.7	28.3	37.0	20.8	15.0	21.4	5.1	0.0	62.3	pea gravel; shell hash
	E26	0.0	0.0	0.0	0.0	0.2	0.2	7.6	30.5	38.1	24.3	15.2	18.4	3.9	0.0	61.8	shell hash
	E25	0.0	0.0	0.0	0.0	0.5	0.5	9.6	33.6	43.2	22.0	12.8	17.1	4.3	0.0	56.2	shell hash
	E23	0.0	0.0	0.0	0.0	0.6	0.6	10.1	36.5	46.6	21.8	11.0	15.9	4.1	0.0	52.8	shell hash
	E20	0.0	0.0	0.0	0.0	0.2	0.2	10.3	38.2	48.5	20.9	11.2	15.5	3.7	0.0	51.3	worm tubes; shell hash
	E17 [a]	0.0	0.0	0.0	0.0	0.6	0.6	12.8	38.2	51.0	18.7	10.5	15.4	3.8	0.0	48.4	worm tubes; shell hash
	E14 [a]	0.0	0.0	0.0	0.0	1.2	1.2	18.5	44.6	63.1	13.2	7.1	11.8	3.6	0.0	35.7	black sand; shell hash
	E11 [a]	0.4	8.9	9.3	4.1	1.1	5.2	11.5	34.4	45.9	16.0	8.3	12.1	3.2	0.0	39.6	none
	E8	0.0	0.0	0.0	0.0	0.6	0.6	11.2	33.7	44.9	20.6	12.7	17.1	4.1	0.0	54.5	none
	E5	0.0	0.0	0.0	0.0	0.9	0.9	10.8	30.0	40.8	20.5	13.9	19.4	4.5	0.0	58.3	none
	E2 [s]	0.0	6.8	6.8	17.0	9.0	26.0	8.5	17.1	25.6	14.3	9.2	13.4	4.4	0.1	41.5	shell hash
116-m Stations	B10	0.0	0.0	0.0	0.0	0.8	0.8	14.7	35.3	50.0	15.6	11.2	17.8	4.5	0.0	49.1	shell hash
	E21	0.0	0.0	0.0	0.0	0.2	0.2	11.7	42.5	54.2	18.8	9.1	14.0	3.7	0.0	45.6	none
	E15 [a]	0.0	0.0	0.0	0.0	0.6	0.6	13.1	38.9	52.0	18.4	10.7	14.9	3.4	0.0	47.4	worm tubes; shell hash
	E9	0.3	8.1	8.5	9.7	2.8	12.5	7.4	21.6	29.0	16.1	11.7	17.5	4.9	0.0	50.2	shell hash
	E3	0.0	0.1	0.1	5.4	9.6	15.1	12.5	16.0	28.5	13.6	15.2	22.4	5.2	0.0	56.4	shell hash

[a] Near-ZID station

Appendix B.4

Summary of particle size parameters (%) for each SBOO station sampled during winter 2020. Visual observations are from sieved "grunge" (i.e., particles retained on 1-mm mesh screen and preserved with infauna for benthic community analysis). Gran = Granules; VCS = Very Coarse Sand; CS = Coarse Sand; MS = Medium Sand; FS = Fine Sand; VFS = Very Fine Sand; CSi = Coarse Silt; MSi = Medium Silt; FSi = Fine Silt; VFSi = Very Fine Silt.

		Coarse Particles			Med-Coarse Sands			Fine Sands			Fine Particles						
		Gran	VCS	Total	CS	MS	Total	FS	VFS	Total	CSi	MSi	FSi	VFSi	Clay	Total	Visual Observations
19-m Stations	I35	0.0	0.0	0.0	0.0	2.1	2.1	14.0	27.1	41.1	21.5	15.3	16.7	3.3	0.0	56.8	organic debris
	I34 [s]	19.3	26.8	46.1	21.5	20.0	41.5	10.4	0.3	10.7	—	—	—	—	—	1.7	red relict sand; shell hash
	I31	0.0	0.0	0.0	0.0	0.9	0.9	23.1	61.2	84.3	5.1	1.2	4.7	3.6	0.1	14.7	none
	I23	0.0	0.5	0.5	16.5	15.6	32.1	14.1	33.6	47.7	8.7	2.9	5.4	2.7	0.0	19.7	none
	I18	0.0	0.0	0.0	0.0	3.1	3.1	26.7	51.6	78.3	7.0	2.4	6.0	3.3	0.0	18.7	none
	I10	2.1	14.9	17.0	20.7	6.8	27.5	17.7	23.4	41.1	4.4	3.0	5.4	1.7	0.0	14.5	none
	I4	0.0	0.0	0.0	4.0	65.2	69.2	19.3	1.5	20.8	1.0	2.1	4.8	2.0	0.0	9.9	shell hash
28-m Stations	I33	0.0	0.0	0.0	0.0	3.1	3.1	19.7	21.4	41.1	10.5	15.5	24.9	4.9	0.0	55.8	none
	I30	0.0	0.0	0.0	0.0	1.6	1.6	18.0	43.4	61.4	12.9	7.9	13.1	3.2	0.0	37.1	none
	I27	0.0	0.0	0.0	0.0	0.9	0.9	17.8	60.1	77.9	10.5	1.9	5.0	3.7	0.1	21.2	none
	I22	0.0	0.0	0.0	3.8	30.7	34.5	15.3	11.7	27.0	10.7	10.5	13.3	4.0	0.0	38.5	none
	I14 [a]	0.0	0.0	0.0	0.0	1.7	1.7	20.6	55.5	76.1	10.9	2.2	5.4	3.5	0.1	22.2	none
	I16 [a]	0.0	1.0	1.0	14.9	43.2	58.1	26.6	6.1	32.7	2.0	2.3	3.2	0.7	0.0	8.2	gravel; shell hash
	I15	0.0	10.0	10.0	52.1	26.9	79.0	3.6	2.3	5.9	1.4	1.3	1.9	0.6	0.0	5.2	none
	I12 [a]	0.0	0.0	0.0	3.5	31.8	35.3	28.6	6.3	34.9	5.2	8.2	13.0	3.4	0.0	29.8	shell hash
	I9	0.0	0.0	0.0	0.0	0.9	0.9	16.1	58.6	74.7	13.5	2.4	5.2	3.3	0.1	24.5	none
	I6	0.0	0.0	0.0	8.4	71.5	79.9	12.5	1.0	13.5	0.7	1.4	3.1	1.4	0.0	6.6	shell hash
	I2	0.0	0.1	0.1	12.4	59.8	72.2	24.4	2.0	26.4	0.1	0.4	0.9	0.1	0.0	1.4	none
	I3	0.0	0.0	0.0	0.0	0.1	0.1	2.1	6.0	8.0	10.6	21.8	37.7	17.4	4.5	92.0	shell hash
38-m Stations	I29	0.0	0.0	0.0	0.0	0.8	0.8	12.6	41.7	54.3	20.5	8.9	12.3	3.2	0.0	44.9	red relict sand; gravel
	I21	0.0	8.9	8.9	56.4	23.4	79.8	2.2	1.4	3.5	1.4	2.1	3.5	0.9	0.0	7.8	none
	I13	0.0	3.9	3.9	43.7	31.8	75.5	2.6	1.4	4.1	1.7	3.9	8.3	2.7	0.0	16.6	shell hash
	I8	0.0	0.0	0.0	0.0	0.1	0.1	2.4	5.8	8.2	10.4	25.8	44.9	10.5	0.2	91.8	none
55-m Stations	I28	0.0	0.0	0.0	0.0	0.8	0.8	7.1	11.9	19.0	12.6	19.6	36.0	11.5	0.5	80.2	black gravel; shell hash
	I20	0.0	5.3	5.3	47.3	10.1	57.4	1.8	3.0	4.8	4.9	9.8	15.0	2.9	0.0	32.6	red relict sand
	I7	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.4	1.7	4.4	19.5	53.2	20.1	1.1	98.3	red relict sand; shell hash
	I1	0.0	0.0	0.0	0.0	2.4	2.4	23.6	29.4	53.0	9.7	11.7	19.1	4.1	0.0	44.6	none

[a] Near-ZID station
[s] measured by sieve (not Horiba; silt and clay fractions are indistinguishable)

Appendix B.4 *continued*

Summary of particle size parameters (%) for each SBOO station sampled during summer 2020. Visual observations are from sieved "grunge" (i.e., particles retained on 1-mm mesh screen and preserved with infauna for benthic community analysis). Gran = Granules; VCS = Very Coarse Sand; CS = Coarse Sand; MS = Medium Sand; FS = Fine Sand; VFS = Very Fine Sand; CSi = Coarse Silt; MSi = Medium Silt; FSi = Fine Silt; VFSi = Very Fine Silt; not sampled.

		Coarse Particles			Med-Coarse Sands			Fine Sands			Fine Particles						
		Gran	VCS	Total	CS	MS	Total	FS	VFS	Total	CSi	MSi	FSi	VFSi	Clay	Total	Visual Observations
19-m Stations	I35	0.0	0.0	0.0	0.0	1.5	1.5	15.3	40.4	55.7	21.8	9.0	9.6	2.4	0.0	42.8	organic debris
	I34 [s]	11.7	16.7	28.4	29.0	31.1	60.1	9.0	0.3	9.3	—	—	—	—	—	2.2	red relict sand; shell hash
	I31	0.0	0.0	0.0	0.0	0.6	0.6	19.2	68.8	88.0	5.0	0.2	2.8	3.3	0.2	11.4	none
	I23	0.0	0.0	0.0	0.0	2.1	2.1	22.2	50.9	73.1	9.2	3.3	8.0	4.2	0.1	24.8	none
	I18	0.0	0.0	0.0	0.0	0.9	0.9	24.2	65.0	89.2	4.3	0.2	2.4	2.8	0.2	9.9	shell hash
	I10	0.0	0.6	0.6	8.9	8.4	17.3	18.7	38.1	56.8	9.3	4.0	8.0	3.8	0.1	25.2	worm tubes
	I4	0.0	3.3	3.3	50.4	41.9	92.3	4.1	0.4	4.4	0.0	0.0	0.0	0.0	0.0	0.0	shell hash
28-m Stations	I33	0.0	0.0	0.0	0.0	2.7	2.7	30.4	37.9	68.3	7.2	5.2	11.7	4.9	0.1	29.1	worm tubes
	I30	0.0	0.0	0.0	0.0	0.8	0.8	15.6	58.4	74.0	14.1	2.9	5.3	2.8	0.1	25.2	none
	I27	0.0	0.0	0.0	0.0	0.6	0.6	15.0	61.2	76.2	12.7	2.1	4.9	3.4	0.1	23.2	none
	I22	0.0	0.4	0.4	10.1	10.7	20.8	3.3	3.7	7.0	6.9	19.2	36.1	9.3	0.2	71.7	none
	I14 [a]	0.0	0.0	0.0	0.0	1.0	1.0	17.3	60.8	78.1	11.1	1.7	4.6	3.4	0.1	21.0	none
	I16 [a]	0.0	0.1	0.1	8.2	33.7	41.9	40.9	11.2	52.1	1.8	1.5	2.1	0.6	0.0	6.0	shell hash
	I15	0.0	2.3	2.3	24.1	47.3	71.4	16.4	4.3	20.7	1.7	1.4	2.0	0.5	0.0	5.5	none
	I12 [a]	0.0	0.0	0.0	1.3	13.8	15.1	30.7	36.8	67.5	7.9	2.6	4.7	2.2	0.0	17.4	none
	I9	0.0	0.0	0.0	0.0	1.1	1.1	16.5	58.5	75.0	13.9	2.3	4.7	2.8	0.1	23.8	organic debris
	I6	0.0	4.3	4.3	51.5	38.9	90.4	4.8	0.4	5.2	0.0	0.0	0.0	0.0	0.0	0.0	shell hash
	I2	0.0	0.0	0.0	0.1	6.2	6.3	6.1	6.6	12.8	10.0	24.7	38.7	7.5	0.0	80.9	none
	I3	0.0	0.0	0.0	0.0	0.0	0.0	0.9	5.2	6.1	12.5	28.9	43.0	9.3	0.2	93.8	red relict sand; shell hash
38-m Stations	I29	0.0	3.0	3.0	5.0	5.0	9.9	13.0	28.9	41.9	16.3	10.0	14.9	3.9	0.0	45.1	organic debris
	I21	0.0	8.1	8.1	59.4	28.2	87.6	2.6	0.2	2.8	0.0	0.5	0.9	0.1	0.0	1.6	shell hash
	I13	0.0	2.6	2.6	15.3	10.7	26.0	5.7	5.5	11.2	7.2	16.5	29.4	7.0	0.1	60.2	shell hash
	I8	0.0	2.6	2.6	35.9	51.1	87.0	8.3	0.8	9.1	0.0	0.4	0.8	0.1	0.0	1.3	none
55-m Stations	I28	2.2	14.4	16.6	30.7	4.6	35.3	4.6	9.7	14.3	7.7	7.8	13.5	4.7	0.1	33.8	black gravel
	I20	0.0	7.8	7.8	39.6	8.9	48.5	2.4	3.7	6.0	5.5	11.3	17.5	3.3	0.0	37.6	red relict sand
	I7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	23.0	61.0	14.6	0.2	100.1	red relict sand; shell hash
	I1	0.0	0.0	0.0	0.0	6.2	6.2	41.9	29.0	70.9	5.8	4.7	9.0	3.4	0.0	22.9	none

[a] Near-ZID station

[s] measured by sieve (not Horiba; silt and clay fractions are indistinguishable)

Appendix B.5

Summary of particle size parameters (%) for sediments from the San Diego regional benthic stations sampled during summer 2020. Visual observations are from sieved "grunge" (i.e., particles retained on 1-mm mesh screen and preserved with infauna for benthic community analysis). Gran = Granules; VCS = Very Coarse Sand; CS = Coarse Sand; MS = Medium Sand; FS = Fine Sand; VFS = Very Fine Sand; CSi = Coarse Silt; MSi = Medium Silt; FSi = Fine Silt; VFSi = Very Fine Silt.

	Depth	Coarse Particles			Med-Coarse Sands			Fine Sands			Fine Particles						
Station	(m)	Gran	VCS	Total	CS	MS	Total	FS	VFS	Total	CSi	MSi	FSi	VFSi	Clay	Total	Visual Observations
Inner Shelf																	
8929	7	0.0	0.0	0.0	1.2	14.4	15.6	44.8	29.8	74.6	3.9	1.8	2.9	1.2	0.0	9.8	none
8944	7	0.0	2.7	2.7	5.9	9.0	15.0	33.7	38.5	72.2	4.0	1.2	3.1	1.8	0.0	10.2	none
8918	8	0.0	0.0	0.0	2.5	12.1	14.6	11.5	10.1	21.6	9.2	17.0	30.9	6.7	0.0	63.8	shell hash
8946	15	0.0	0.0	0.0	0.5	12.4	12.9	38.7	16.9	55.6	6.7	8.7	12.5	3.6	0.0	31.5	none
8915	16	1.5	4.7	6.3	8.6	15.0	23.6	40.1	17.9	58.0	2.3	2.4	5.3	2.2	0.0	12.2	gravel; shell hash
8907	18	0.0	0.0	0.0	0.0	1.3	1.3	23.5	60.7	84.2	5.5	1.1	4.2	3.6	0.1	14.5	none
8943	19	0.0	0.0	0.0	0.0	0.7	0.7	19.0	52.3	71.3	9.0	3.6	10.0	5.3	0.1	28.0	none
8914	20	0.0	0.0	0.0	0.0	1.7	1.7	15.7	38.1	53.8	21.9	10.0	10.1	2.5	0.0	44.5	none
8911	24	0.0	0.0	0.0	0.0	0.2	0.2	12.8	60.2	73.0	14.3	3.8	6.5	2.3	0.0	26.8	none
8938	28	0.0	0.0	0.0	0.0	5.8	5.8	32.1	25.6	57.7	8.3	8.9	14.4	4.8	0.1	36.5	organic debris
8901	29	0.0	0.0	0.0	0.1	7.8	7.8	28.5	40.9	69.4	10.4	3.3	6.0	3.1	0.1	22.9	none
Mid Shelf																	
8913	31	0.0	0.0	0.0	0.0	1.5	1.5	29.5	48.7	78.2	6.2	2.6	7.3	4.1	0.1	20.2	none
8906	41	0.0	4.3	4.3	33.8	43.2	77.0	9.3	2.1	11.4	1.4	2.0	3.1	0.8	0.0	7.4	none
8939	65	0.0	0.0	0.0	0.0	2.1	2.1	17.1	29.8	46.9	14.5	12.4	19.4	4.7	0.0	51.0	none
8903	66	0.0	13.0	13.0	45.7	7.7	53.4	8.0	7.9	15.9	4.4	4.2	7.0	2.3	0.0	17.8	none
8912	67	0.0	0.0	0.0	0.0	0.7	0.7	9.9	31.5	41.4	21.4	13.7	18.6	4.3	0.0	58.0	organic debris
8925	67	0.0	0.0	0.0	0.0	0.1	0.1	5.0	28.4	33.4	25.3	16.1	20.6	4.6	0.0	66.6	none
8919	68	0.0	0.0	0.0	0.0	0.2	0.2	8.1	30.9	39.0	23.9	14.8	18.2	4.0	0.0	60.9	gravel; shell hash
8909	73	0.0	0.0	0.0	0.0	3.6	3.6	16.4	25.3	41.7	15.8	13.0	20.7	5.2	0.0	54.7	shell hash
8931	74	0.0	0.0	0.0	0.0	0.1	0.1	5.3	28.8	34.1	28.3	16.9	17.4	3.2	0.0	65.8	none
8933	80	0.0	0.0	0.0	0.0	0.1	0.1	4.9	26.4	31.3	27.7	17.6	19.3	3.9	0.0	68.5	none
8930	83	0.0	0.0	0.0	0.0	0.1	0.1	4.2	22.5	26.7	26.8	19.7	22.4	4.4	0.0	73.3	none
8949	83	0.0	0.0	0.0	0.0	0.1	0.1	4.5	24.3	28.8	25.7	17.9	22.5	5.0	0.0	71.1	none
8924	85	0.0	0.0	0.0	0.0	0.1	0.1	5.0	30.2	35.2	26.6	14.3	19.1	4.7	0.0	64.7	organic debris
8926	87	0.0	0.0	0.0	0.0	0.2	0.2	7.7	35.3	43.0	28.5	12.7	12.9	2.8	0.0	56.9	none
8932	89	0.0	0.0	0.0	0.0	0.1	0.1	5.3	25.9	31.2	24.6	16.7	22.3	5.2	0.0	68.8	gravel; organic debris
8940	108	2.9	11.3	14.2	29.8	4.8	34.6	5.0	14.0	19.0	9.4	7.5	11.9	3.4	0.0	32.2	gravel
8921	116	0.0	0.0	0.0	0.0	0.2	0.2	11.3	40.1	51.4	18.6	9.9	15.8	4.2	0.0	48.5	none

Appendix B.5 *continued*

	Depth	Coarse Particles			Med-Coarse Sands			Fine Sands			Fine Particles						
Station	(m)	Gran	VCS	Total	CS	MS	Total	FS	VFS	Total	CSi	MSi	FSi	VFSi	Clay	Total	Visual Observations
Outer Shelf																	
8905	134	0.0	0.0	0.0	0.0	0.2	0.2	9.0	31.5	40.5	19.3	13.2	21.3	5.6	0.0	59.4	shell hash
8937	137	0.0	0.0	0.0	0.0	0.6	0.6	9.3	34.2	43.5	22.0	12.3	17.3	4.4	0.0	56.0	cobble; worm tubes
8910	169	0.0	0.0	0.0	0.0	5.8	5.8	17.5	21.1	38.6	14.0	12.5	21.5	7.4	0.3	55.7	organic debris
8922	185	0.0	0.0	0.0	0.0	0.1	0.1	4.9	28.3	33.2	26.8	15.7	19.8	4.5	0.0	66.8	organic debris; worm tubes
8916	189	0.0	0.0	0.0	0.0	0.1	0.1	5.2	21.3	26.5	22.8	19.7	25.3	5.6	0.0	73.4	organic debris; worm tubes
8908	194	0.0	0.0	0.0	0.0	0.2	0.2	6.4	23.8	30.2	21.3	17.6	25.0	5.8	0.0	69.7	organic debris; shell hash
Upper Slope																	
8928	223	0.0	0.0	0.0	0.0	0.1	0.1	4.3	24.2	28.5	26.9	18.7	21.4	4.4	0.0	71.4	organic debris; shell hash
8920	270	0.0	0.0	0.0	0.0	0.1	0.1	4.0	19.0	23.0	24.8	22.3	25.1	4.8	0.0	77.0	none
8936	292	0.0	0.0	0.0	0.0	0.1	0.1	5.7	23.2	28.9	21.2	18.0	25.8	5.9	0.0	70.9	none
8927	460	0.0	0.0	0.0	0.0	0.1	0.1	3.8	13.1	16.9	17.4	24.2	34.6	6.8	0.0	83.0	none
8934	491	0.0	0.0	0.0	0.0	0.1	0.1	2.7	9.4	12.1	15.2	26.6	38.5	7.4	0.0	87.7	none
8923	523	0.0	0.0	0.0	0.0	0.5	0.5	6.8	15.0	21.8	12.8	19.6	36.7	8.5	0.1	77.8	none

Appendix B.6

Concentrations of organic loading indicators detected in sediments from PLOO stations sampled during winter and summer 2020. See Appendix B.1 for MDLs; ND = not detected; NR = not reportable.

	Winter					Summer				
	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	—	ND	0.113	2.27	NR	—	18.40	0.092	2.11	3.7
B8	—	2.67	0.078	0.80	NR	—	12.10	0.082	0.81	3.0
E19	—	2.87	0.057	0.59	NR	—	3.04	0.057	0.56	2.1
E7	—	1.85	0.052	0.51	NR	—	5.82	0.052	0.48	2.1
E1	—	ND	0.049	0.55	NR	—	1.80	0.054	0.51	2.1
98-m Depth Contour										
B12	426	5.58	0.059	3.49	NR	546	3.88	0.053	2.86	2.7
B9	240	5.41	0.063	0.83	2.5	297	2.37	0.058	0.81	2.7
E26	187	4.33	0.053	0.51	2.1	255	10.20	0.052	0.55	2.3
E25	202	4.98	0.044	0.53	1.9	251	ND	0.041	0.41	1.9
E23	204	1.71	0.052	0.53	1.9	254	ND	0.047	0.46	2.1
E20	204	1.98	0.043	0.43	1.8	233	1.65	0.045	0.43	1.8
E17[a]	212	3.62	0.042	0.40	1.6	271	7.08	0.034	0.28	1.5
E14[a]	371	5.27	0.032	0.33	1.2	200	30.80	0.035	0.34	1.4
E11[a]	213	1.70	0.039	0.43	1.9	314	1.64	0.041	0.46	1.9
E8	214	NA	0.034	0.39	1.7	216	3.42	0.041	0.46	2.0
E5	191	0.87	0.045	0.53	2.0	208	1.83	0.049	0.58	2.3
E2	396	3.00	0.062	0.76	NR	208	3.20	0.050	0.66	2.1
116-m Depth Contour										
B10	—	2.62	0.051	1.01	NR	—	10.90	0.048	0.99	2.4
E21	—	1.76	0.040	0.42	NR	—	7.49	0.043	0.43	1.7
E15[a]	—	3.90	0.037	0.45	NR	—	ND	0.044	0.49	1.8
E9	—	3.05	0.050	1.33	NR	—	6.30	0.051	1.19	2.3
E3	—	0.91	0.052	0.63	NR	—	ND	0.038	0.36	1.6
Detection Rate (%)	100	90	100	100	100	100	82	100	100	100

[a] Near-ZID station
[b] BOD only sampled at PLOO primary core stations

Appendix B.7

Concentrations of organic indicators detected in sediments from SBOO stations sampled during winter and summer 2020. See Appendix B.1 for MDLs; ND = not detected.

	Winter				Summer			
	Sulfides (ppm)	TN (% wt)	TOC (% wt)	TVS (% wt)	Sulfides (ppm)	TN (% wt)	TOC (% wt)	TVS (% wt)
19-m Stations								
I35	9.78	0.029	0.25	NR	4.25	0.032	0.28	1.3
I34	0.74	ND	1.15	NR	ND	ND	0.86	0.6
I31	1.66	ND	0.09	NR	8.15	0.020	0.14	0.8
I23	2.52	ND	0.10	NR	ND	0.022	0.14	0.9
I18	0.69	ND	0.08	NR	2.22	ND	0.11	0.8
I10	1.82	ND	0.09	NR	5.91	ND	0.11	0.8
I4	ND	ND	0.27	NR	ND	ND	0.09	0.4
28-m Stations								
I33	1.09	ND	0.25	NR	14.70	0.035	0.43	1.5
I30	1.78	0.024	0.18	NR	ND	0.027	0.20	1.3
I27	3.44	0.010	0.15	NR	1.57	0.026	0.19	1.0
I22	ND	ND	0.11	NR	5.07	0.023	0.16	0.9
I14 [a]	5.06	ND	0.18	NR	2.74	0.027	0.20	1.0
I16 [a]	ND	ND	ND	NR	ND	ND	0.10	0.7
I15	ND	ND	ND	NR	ND	ND	0.11	0.6
I12 [a]	ND	ND	ND	NR	28.90	0.026	0.20	1.0
I9	0.94	0.019	0.19	NR	8.72	0.026	0.19	1.5
I6	ND	0.021	0.17	NR	ND	ND	0.08	0.5
I2	ND	ND	ND	NR	ND	ND	0.08	0.5
I3	ND	ND	ND	NR	ND	ND	ND	0.4
38-m Stations								
I29	1.86	0.028	0.31	NR	18.10	0.041	0.44	1.7
I21	ND	ND	0.12	NR	ND	0.019	0.14	0.6
I13	ND	ND	ND	NR	ND	ND	ND	0.5
I8	ND	ND	0.12	NR	ND	ND	0.09	0.5
55-m Stations								
I28	3.31	0.052	0.86	NR	1.61	0.062	0.96	1.5
I20	ND	ND	0.17	NR	ND	0.023	0.15	0.5
I7	ND	ND	0.08	NR	ND	ND	ND	0.5
I1	ND	0.009	0.13	NR	ND	0.026	0.18	1.0
Detection Rate (%)	48	30	78	NR	44	56	89	100

[a] Near-ZID station

Appendix B.8

Concentrations of organic indicators detected in sediments from the San Diego regional benthic stations sampled during summer 2020. See Appendix B.1 for MDLs; ND=not detected.

	Station	Depth (m)	Sulfides (ppm)	TN (% wt)	TOC (% wt)	TVS (% wt)
Inner Shelf	8929	7	6.39	ND	0.30	0.9
	8944	7	8.97	0.027	0.20	1.0
	8918	8	ND	ND	0.07	0.5
	8946	15	16.40	ND	ND	0.8
	8915	16	1.58	ND	0.09	0.8
	8907	18	29.00	ND	0.10	0.6
	8943	19	7.21	ND	0.11	0.6
	8914	20	28.90	0.034	0.27	1.7
	8911	24	30.30	0.022	0.17	1.0
	8938	28	7.02	0.022	0.13	0.7
	8901	29	28.30	0.026	0.19	1.2
Mid Shelf	8913	31	38.40	0.026	0.20	1.2
	8906	41	ND	0.018	0.15	0.6
	8939	65	37.10	0.039	0.32	1.6
	8903	66	8.07	0.037	0.34	1.1
	8912	67	10.90	0.058	0.66	2.6
	8925	67	4.20	0.073	0.80	3.1
	8919	68	1.68	0.067	0.70	2.8
	8909	73	2.95	0.055	0.56	2.1
	8931	74	1.59	0.080	0.79	2.9
	8933	80	1.59	0.080	0.77	2.9
	8930	83	17.60	0.086	0.89	3.2
	8949	83	6.73	0.072	0.75	3.1
	8924	85	8.43	0.068	0.69	2.8
	8926	87	2.66	0.050	0.51	2.2
	8932	89	5.63	0.078	0.83	3.2
	8940	108	8.16	0.057	0.96	1.3
	8921	116	1.75	0.038	0.40	1.7
Outer Shelf	8905	134	3.41	0.060	0.95	2.8
	8937	137	19.40	0.056	1.21	2.2
	8910	169	3.46	0.051	0.60	2.5
	8922	185	7.74	0.088	1.23	3.9
	8916	189	38.90	0.120	1.74	5.3
	8908	194	8.12	0.136	2.38	5.6
Upper Slope	8928	223	15.70	0.133	1.78	5.2
	8920	270	42.90	0.187	2.64	7.1
	8936	292	20.50	0.137	1.86	5.5
	8927	460	18.00	0.211	2.78	8.7
	8934	491	12.10	0.270	3.33	9.5
	8923	523	3.75	0.196	3.39	7.6
	Detection Rate (%)		95	85	98	100

Appendix B.9

Concentrations of trace metals (ppm) detected in sediments from PLOO stations sampled during winter 2020. See Appendix B.1 for MDLs and translation of periodic table symbols; DR = detection rate; ND = not detected.

	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Ti	Sn	Zn
88-m Depth Contour																		
B11	9360	1.4	4.78	49.7	0.28	ND	22.3	9.1	18000	4.1	134.0	0.032	7.8	0.54	ND	ND	1.0	39.1
B8	10700	1.4	3.58	39.5	0.24	ND	21.0	8.8	13800	4.7	114.0	0.035	9.1	0.33	ND	ND	1.2	36.4
E19	8910	1.1	2.61	35.9	0.19	ND	16.6	6.7	11100	3.0	96.7	0.022	7.2	0.34	ND	ND	0.9	27.3
E7	7910	1.0	2.94	29.6	0.17	ND	15.4	6.9	10200	3.6	87.6	0.027	6.5	ND	ND	ND	1.0	25.5
E1	7330	1.1	3.07	34.6	0.17	ND	14.6	17.0	10400	4.4	83.3	0.042	6.2	ND	ND	ND	1.0	26.2
98-m Depth Contour																		
B12	5540	1.2	5.72	16.4	0.28	ND	23.9	7.1	18900	2.5	133.0	0.014	5.3	ND	ND	ND	0.7	32.8
B9	7170	1.2	3.28	35.3	0.21	ND	18.6	6.1	12700	3.4	85.9	0.024	7.1	ND	ND	ND	0.8	29.7
E26	7790	1.1	2.84	27.7	0.18	ND	15.5	6.2	10300	3.6	85.4	0.025	6.6	0.28	ND	ND	1.0	25.3
E25	7000	1.0	2.14	26.4	0.16	ND	13.9	5.8	9280	3.0	79.0	0.019	5.7	0.31	ND	ND	0.8	23.7
E23	7310	1.1	2.92	29.7	0.17	ND	15.0	6.4	9840	3.3	84.8	0.023	6.6	ND	ND	ND	0.9	24.0
E20	6370	1.0	2.77	25.6	0.15	ND	13.4	5.3	8770	3.0	74.6	0.019	5.8	ND	ND	ND	0.7	20.9
E17 [a]	6130	1.0	2.70	23.9	0.14	ND	13.1	5.2	8500	2.8	71.4	0.016	5.5	ND	ND	ND	0.7	20.5
E14 [a]	4930	0.9	3.21	21.7	0.12	ND	14.6	5.0	7540	2.3	85.4	0.012	10.0	ND	ND	ND	0.6	18.4
E11 [a]	5490	0.8	2.71	20.5	0.13	ND	12.0	4.8	7850	2.5	64.5	0.016	5.0	ND	ND	ND	0.7	18.9
E8	5780	0.8	1.85	20.7	0.14	ND	12.4	4.8	7980	2.6	65.7	0.016	4.8	0.29	ND	ND	0.6	19.9
E5	6300	0.8	2.36	22.9	0.15	ND	12.7	5.4	8720	2.8	69.0	0.020	5.1	0.27	ND	ND	0.7	21.5
E2	8850	1.3	3.58	39.3	0.20	ND	17.2	9.1	12500	4.1	96.8	0.040	7.2	ND	ND	ND	1.1	30.0
116-m Depth Contour																		
B10	6190	0.9	2.39	20.2	0.19	ND	16.6	5.0	11200	2.6	64.9	0.016	4.9	0.28	ND	ND	0.6	26.2
E21	5300	0.9	2.27	16.8	0.13	ND	12.1	4.6	7680	2.7	61.5	0.009	4.9	ND	ND	ND	0.6	18.8
E15 [a]	5520	0.8	2.40	17.7	0.14	ND	12.2	4.7	7870	2.5	61.2	0.014	4.5	0.24	ND	ND	0.6	19.0
E9	5370	2.9	2.42	17.3	0.15	ND	15.0	7.8	10200	3.0	60.3	0.008	4.7	ND	ND	ND	0.7	32.5
E3	7350	1.2	2.28	42.4	0.15	ND	12.6	9.0	10700	5.3	86.9	0.057	5.1	ND	ND	ND	0.9	24.9
DR (%)	100	100	100	100	100	0	100	100	100	100	100	100	100	41	0	0	100	100
ERL [b]	—	—	8.2	—	—	1.2	81	34	—	46.7	—	0.15	20.9	—	1.0	—	—	150
ERM [b]	—	—	70.0	—	—	9.6	370	270	—	218.0	—	0.71	51.6	—	3.7	—	—	410

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.9 *continued*

Concentrations of trace metals (ppm) detected in sediments from PLOO stations sampled during summer 2020. See Appendix B.1 for MDLs and translation of periodic table symbols; DR = detection rate; nd = not detected.

	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Ti	Sn	Zn
88-m Depth Contour																		
B11	8960	1.3	3.68	33.8	0.28	0.08	20.9	8.8	16100	3.8	138.0	0.035	7.5	ND	ND	ND	0.9	35.8
B8	11000	1.6	3.92	43.3	0.24	0.07	21.1	9.2	13700	4.6	113.0	0.044	9.2	ND	ND	ND	1.1	34.6
E19	8300	1.3	3.11	34.1	0.18	0.07	15.9	6.8	10700	3.6	95.2	0.030	6.8	ND	ND	ND	1.0	25.9
E7	7660	1.1	2.77	30.5	0.16	0.07	14.7	6.5	9760	3.4	88.8	0.029	6.3	ND	ND	ND	0.9	23.8
E1	7230	1.0	2.89	28.8	0.15	0.06	13.7	7.0	9720	4.7	87.7	0.047	5.6	ND	ND	ND	1.5	25.1
98-m Depth Contour																		
B12	5940	1.3	5.20	13.1	0.28	0.07	23.4	6.0	18600	2.7	51.3	0.029	5.1	ND	ND	ND	0.6	32.5
B9	8220	1.5	3.48	54.1	0.24	0.05	19.8	6.3	13900	3.2	90.2	0.026	7.0	ND	ND	ND	0.7	31.4
E26	7680	1.3	2.69	29.0	0.17	0.06	14.8	5.9	9750	3.2	84.4	0.037	6.6	ND	ND	ND	0.7	24.5
E25	6280	1.0	2.53	23.5	0.14	0.07	12.7	4.8	8370	2.6	71.6	0.019	5.4	ND	ND	ND	0.5	20.3
E23	6750	1.0	2.74	26.7	0.15	0.05	13.7	5.5	9000	3.0	76.1	0.028	5.8	ND	ND	ND	0.7	22.5
E20	6010	0.9	2.50	21.5	0.14	0.07	12.4	4.9	8110	2.9	68.7	0.020	5.2	ND	ND	ND	0.6	20.0
E17 [a]	5480	0.8	2.47	19.6	0.13	0.06	11.4	5.0	7650	2.5	65.3	0.016	4.7	ND	ND	ND	0.6	18.4
E14 [a]	4440	0.8	2.08	16.3	0.11	0.08	10.0	4.2	6300	1.9	57.5	0.014	4.0	ND	ND	ND	0.6	16.8
E11 [a]	5710	1.2	2.48	18.8	0.13	0.07	11.7	4.7	7780	2.3	66.1	0.020	4.7	ND	ND	ND	0.7	18.6
E8	6330	1.7	2.13	22.8	0.15	0.06	12.8	5.1	8480	2.6	73.8	0.021	5.2	ND	ND	ND	0.8	20.3
E5	6490	1.1	2.94	25.6	0.16	0.08	13.4	6.3	9250	3.4	73.1	0.027	5.4	ND	ND	ND	1.1	23.0
E2	8060	1.1	2.92	33.4	0.17	0.04	14.5	7.7	11400	3.6	94.6	0.034	5.7	ND	ND	ND	1.4	27.4
116-m Depth Contour																		
B10	5700	1.0	2.37	19.5	0.17	0.08	14.7	4.8	9680	2.5	60.9	0.020	4.7	ND	ND	ND	0.5	22.6
E21	5430	0.9	2.29	19.2	0.13	0.07	11.6	4.5	7470	2.6	61.3	0.020	4.9	ND	ND	ND	0.5	18.8
E15 [a]	5450	0.8	2.20	17.7	0.13	0.07	11.8	4.4	7650	2.4	63.3	0.019	4.4	ND	ND	ND	0.6	18.6
E9	5490	0.9	3.41	17.8	0.15	0.07	15.2	7.5	9760	3.0	59.7	0.020	4.5	ND	ND	ND	0.8	34.8
E3	6070	1.2	1.79	33.5	0.13	0.04	12.3	12.8	9090	7.5	81.1	0.040	3.8	ND	ND	ND	0.9	52.5
DR (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	0	100	100
ERL [b]	—	—	8.2	—	—	1.2	81	34	—	46.7	—	0.15	20.9	—	1.0	—	—	150
ERM [b]	—	—	70.0	—	—	9.6	370	270	—	218.0	—	0.71	51.6	—	3.7	—	—	410

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.10

Concentrations of trace metals (ppm) detected in sediments from SBOO stations sampled during winter 2020. See Appendix B.1 for MDLs and translation of periodic table symbols; nd=not detected.

	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Ti	Sn	Zn
19-m Stations																		
I35	7110	1.3	1.83	38.9	0.13	ND	13.4	4.9	8820	2.9	96.9	0.016	4.5	ND	ND	ND	0.8	25.4
I34	1110	0.2	2.76	5.4	0.02	ND	2.8	2.4	2620	1.1	32.0	ND	0.6	ND	ND	ND	0.2	4.8
I31	3000	0.6	0.99	20.1	0.06	ND	7.0	1.4	3370	1.3	47.8	ND	1.5	ND	ND	ND	0.3	8.1
I23	4080	0.4	1.72	19.4	0.08	ND	8.3	ND	4710	1.5	53.2	ND	2.2	ND	ND	ND	0.3	10.9
I18	4200	0.4	1.29	34.9	0.09	ND	10.6	ND	6050	1.5	67.9	ND	2.2	ND	ND	ND	0.4	11.9
I10	4150	0.5	1.55	24.5	0.08	ND	9.8	ND	5660	1.5	61.6	ND	2.2	ND	ND	ND	0.4	11.5
I4	918	0.6	1.22	3.2	0.03	ND	5.2	ND	2650	1.6	42.3	ND	0.7	ND	ND	ND	0.3	3.4
28-m Stations																		
I33	4190	0.7	2.19	19.0	0.08	ND	8.0	2.8	5570	2.6	64.4	0.011	2.4	ND	ND	ND	0.6	14.2
I30	5840	0.9	1.93	27.1	0.10	ND	10.9	3.3	6260	1.8	62.5	0.006	3.4	ND	ND	ND	0.5	16.6
I27	6080	0.9	1.47	29.0	0.10	ND	10.3	1.5	6100	1.5	66.7	0.004	3.2	ND	ND	ND	0.5	15.8
I22	1620	0.3	1.48	4.5	0.05	ND	5.0	ND	2510	1.3	18.9	ND	0.9	ND	ND	ND	0.2	5.2
I14[a]	6100	0.9	1.37	30.6	0.11	ND	10.6	1.4	6320	1.4	72.1	ND	3.3	ND	ND	ND	0.5	16.2
I16[a]	2430	0.3	1.41	9.2	0.06	ND	6.3	ND	3990	1.3	40.6	ND	1.2	ND	ND	ND	0.2	9.2
I15	1760	0.4	2.39	5.5	0.06	ND	8.2	ND	4200	1.5	21.8	ND	0.9	ND	ND	ND	0.2	7.9
I12[a]	1970	0.3	1.55	9.8	0.05	ND	6.0	ND	3400	1.2	27.9	ND	1.0	ND	ND	ND	0.2	7.0
I9	7140	1.0	1.53	36.5	0.12	ND	11.9	1.7	7330	1.3	79.4	0.004	4.0	ND	ND	ND	0.5	19.3
I6	1320	0.5	5.55	3.4	0.05	ND	8.3	ND	4130	1.6	12.4	ND	1.1	ND	ND	ND	0.2	4.4
I2	1090	0.2	0.84	2.4	0.03	ND	5.5	ND	1310	0.9	10.9	ND	0.7	ND	ND	ND	0.1	2.5
I3	695	0.3	1.09	1.2	0.02	ND	5.2	ND	1220	0.8	6.1	ND	0.5	ND	ND	ND	0.1	1.7
38-m Stations																		
I29	7020	1.1	1.92	35.4	0.13	ND	12.9	4.8	7850	2.5	78.5	0.012	5.0	ND	ND	ND	0.7	20.7
I21	1220	0.7	7.69	1.9	0.07	ND	11.4	ND	7240	2.9	13.6	ND	0.7	ND	ND	ND	0.2	6.4
I13	862	0.6	6.32	1.7	0.06	ND	9.4	ND	5540	2.3	14.9	ND	0.5	ND	ND	ND	0.2	4.8
I8	1700	0.5	2.13	4.2	0.05	ND	8.3	ND	3820	1.1	20.6	ND	1.1	ND	ND	ND	0.2	6.7
55-m Stations																		
I28	5040	0.8	2.11	24.1	0.12	ND	9.7	4.6	6630	2.6	56.5	0.020	4.9	ND	ND	ND	0.6	16.8
I20	1400	0.4	3.08	3.0	0.06	ND	5.3	ND	4900	1.5	18.4	ND	0.9	ND	ND	ND	0.3	6.0
I7	1200	0.8	6.84	2.1	0.06	ND	8.6	ND	6780	2.3	20.5	ND	0.7	ND	ND	ND	0.2	5.9
I1	2430	0.3	0.97	9.0	0.06	0.04	6.6	ND	3350	1.5	36.3	0.005	2.3	ND	ND	ND	0.2	7.3
DR (%)	100	100	100	100	100	4	100	37	100	100	100	30	100	0	0	0	100	100
ERL[b]	—	—	8.2	—	—	1.2	81	34	—	46.7	—	0.15	20.9	—	1.0	—	—	150
ERM[b]	—	—	70.0	—	—	9.6	370	270	—	218.0	—	0.71	51.6	—	3.7	—	—	410

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.10 *continued*

Concentrations of trace metals (ppm) detected in sediments from SBOO stations sampled during summer 2020. See Appendix B.1 for MDLs and translation of periodic table symbols; nd=not detected; ns=not sampled.

	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Ti	Sn	Zn
19-m Stations																		
I35	6920	1.0	2.29	35.1	0.13	0.07	12.5	4.4	8600	2.7	101.0	0.019	4.1	ND	ND	ND	1.2	25.8
I34	1010	ND	2.70	3.0	0.02	0.03	2.3	1.6	2470	1.0	23.9	ND	0.5	ND	ND	ND	0.2	4.0
I31	3530	0.6	1.92	15.5	0.06	0.04	7.4	1.6	4090	1.2	62.7	ND	1.8	ND	ND	ND	0.6	9.3
I23	4660	0.7	2.01	24.8	0.08	0.04	8.6	2.3	5200	1.5	67.9	ND	2.5	ND	ND	ND	0.7	12.6
I18	4380	0.8	1.82	29.3	0.08	ND	10.9	2.2	5960	1.4	70.5	ND	2.4	ND	ND	ND	0.4	12.2
I10	4900	0.8	1.67	24.8	0.09	ND	9.4	2.4	5740	1.3	63.8	ND	2.6	ND	ND	ND	0.4	14.1
I4	738	0.2	1.45	1.9	0.03	ND	4.3	ND	1540	1.1	10.9	ND	0.6	ND	ND	ND	0.1	2.5
28-m Stations																		
I33	4540	0.8	2.15	17.5	0.09	0.04	8.5	4.0	6160	2.7	76.3	0.020	2.6	ND	ND	ND	0.9	16.0
I30	5810	0.7	1.71	26.0	0.10	0.05	10.3	2.9	6060	1.7	66.8	0.006	3.1	ND	ND	ND	0.8	18.0
I27	5510	0.8	1.83	27.3	0.10	ND	10.2	3.0	5820	1.6	61.1	0.005	3.2	ND	ND	ND	0.5	15.9
I22	4600	0.8	1.55	25.0	0.09	ND	9.5	2.5	4990	1.5	57.1	0.005	2.9	ND	ND	ND	0.4	41.3
I14[a]	5860	0.8	1.70	29.5	0.10	ND	10.4	3.0	6120	1.5	69.4	0.004	3.4	ND	ND	ND	0.5	16.6
I16[a]	3100	0.5	1.46	11.4	0.07	0.02	7.3	1.3	4130	1.2	43.6	0.004	1.6	ND	ND	ND	0.3	10.5
I15	2150	0.6	1.99	5.6	0.06	ND	8.5	ND	4020	1.4	28.7	0.004	1.2	ND	ND	ND	0.2	8.2
I12[a]	5540	0.8	1.84	31.5	0.10	ND	9.8	2.6	6320	1.3	69.1	0.004	3.0	ND	ND	ND	0.5	17.3
I9	7220	1.0	2.17	38.1	0.12	ND	12.2	3.9	7790	1.4	80.6	0.005	4.4	ND	ND	ND	0.5	21.5
I6	855	0.4	4.86	1.9	0.04	ND	7.6	ND	3560	1.5	7.5	ND	0.5	ND	ND	ND	0.1	3.4
I2	1010	0.2	0.93	2.2	0.02	ND	5.4	ND	1190	0.9	8.3	ND	0.7	ND	ND	ND	0.1	2.5
I3	597	ND	1.77	1.1	0.02	ND	4.7	ND	1610	0.8	25.8	ND	0.6	ND	ND	ND	0.1	2.0
38-m Stations																		
I29	5250	0.7	2.46	25.5	0.11	ND	11.2	3.8	6780	2.4	60.2	0.014	3.9	ND	ND	ND	0.6	17.5
I21	1260	0.7	8.95	0.3	0.07	0.06	11.3	ND	7660	3.2	15.8	ND	1.0	ND	ND	ND	0.2	7.1
I13	952	0.5	5.94	0.3	0.05	0.03	8.6	ND	5070	2.2	15.7	0.004	0.7	ND	ND	ND	0.2	5.1
I8	1590	0.4	2.47	4.3	0.05	ND	8.7	ND	3810	1.2	18.0	ND	1.0	ND	ND	ND	0.2	7.1
55-m Stations																		
I28	4540	0.6	2.50	16.9	0.11	0.06	8.1	3.7	6400	2.4	58.7	0.016	4.2	ND	ND	ND	0.8	14.6
I20	1310	0.4	3.24	1.6	0.06	0.04	5.2	ND	4810	1.6	15.9	ND	0.9	ND	ND	ND	0.2	5.6
I7	1140	0.5	5.19	2.7	0.05	ND	8.3	ND	5960	2.0	17.8	ND	0.9	ND	ND	ND	0.2	5.5
I1	2390	0.5	1.18	7.7	0.06	ND	6.6	1.4	3330	1.5	35.2	0.006	2.4	ND	ND	ND	0.3	8.3
DR (%)	100	93	100	100	100	41	100	63	100	100	100	52	100	0	0	0	100	100
ERL[b]	—	—	8.2	—	—	1.2	81	34	—	46.7	—	0.15	20.9	—	1.0	—	—	150
ERM[b]	—	—	70.0	—	—	9.6	370	270	—	218.0	—	0.71	51.6	—	3.7	—	—	410

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.11

Concentrations of trace metals (ppm) detected in sediments from the San Diego regional benthic stations sampled during summer 2020. See Appendix B.1 for MDLs; ND = not detected.

	Station	Depth (m)	Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe
Inner Shelf	8929	7	3920	0.3	0.83	30.6	ND	ND	8.2	2.0	6610
	8944	7	2280	ND	0.88	14.8	ND	ND	5.1	ND	3560
	8918	8	1700	ND	1.24	10.6	0.02	ND	4.2	ND	3130
	8946	15	2660	0.2	1.27	9.4	ND	ND	5.3	1.4	3490
	8915	16	2100	0.2	1.74	11.8	0.04	ND	6.2	2.6	4560
	8907	18	2790	0.3	1.15	12.1	0.02	0.04	7.2	1.6	3520
	8943	19	3010	0.3	0.96	12.1	ND	ND	7.1	1.5	3510
	8914	20	4910	0.4	1.78	29.2	0.08	ND	11.1	4.2	7300
	8911	24	4310	0.3	2.10	19.0	0.05	0.07	9.6	2.8	5250
	8938	28	2410	0.3	1.16	12.8	ND	ND	6.5	1.6	3930
	8901	29	5530	0.5	1.85	36.3	0.05	0.05	11.3	3.6	7150
Mid Shelf	8913	31	3480	0.2	1.62	17.5	0.06	ND	8.2	3.3	5510
	8906	41	1390	0.4	2.66	2.1	0.06	0.03	7.3	ND	4490
	8939	65	5860	0.6	1.68	30.0	ND	ND	12.8	4.0	9210
	8903	66	2570	0.4	1.83	9.4	0.05	0.05	6.8	2.3	4180
	8912	67	7990	0.8	3.29	39.7	0.12	0.12	17.1	9.8	12400
	8925	67	9390	0.6	2.73	48.1	ND	ND	19.9	9.1	13300
	8919	68	7330	0.6	3.09	43.2	0.14	ND	16.9	8.6	12700
	8909	73	5730	0.6	3.45	27.5	0.09	0.09	13.6	7.1	8990
	8931	74	9450	0.7	2.75	42.9	ND	ND	19.6	8.4	13400
	8933	80	9380	0.7	2.55	40.4	ND	ND	19.7	8.1	13400
	8930	83	10200	0.6	2.04	44.6	ND	ND	21.1	9.5	14100
	8949	83	9930	0.7	1.64	44.7	ND	ND	20.2	8.9	13300
	8924	85	8730	0.6	2.13	39.5	ND	ND	18.6	8.1	12600
	8926	87	6930	0.6	1.67	30.6	ND	ND	15.1	6.2	10200
	8932	89	9520	0.9	2.25	36.0	ND	ND	26.1	8.3	18500
	8940	108	3550	0.4	2.04	16.6	ND	ND	9.3	3.2	6540
	8921	116	3950	0.3	2.13	16.7	0.09	ND	10.5	4.2	7080
Outer Shelf	8905	134	6560	0.5	2.21	28.0	0.12	0.09	15.6	8.0	9790
	8937	137	6360	0.5	1.42	27.8	ND	ND	15.1	5.9	9830
	8910	169	10300	0.9	3.21	62.4	0.13	0.11	19.4	34.5	18000
	8922	185	7270	0.6	2.14	36.9	0.17	ND	19.0	9.6	12700
	8916	189	10100	0.8	2.50	57.7	0.24	ND	25.6	19.6	17600
	8908	194	10700	0.9	3.02	51.3	0.22	0.18	26.1	15.9	17300
Upper Slope	8928	223	11200	0.7	1.43	51.9	ND	ND	24.8	12.6	14400
	8920	270	10400	0.9	3.83	59.1	0.26	ND	27.1	15.5	17300
	8936	292	11600	1.0	1.23	53.9	ND	ND	27.3	13.4	15400
	8927	460	13400	0.9	1.36	91.3	ND	ND	33.1	18.0	16700
	8934	491	15700	1.4	1.49	120.0	ND	ND	38.0	21.5	18900
	8923	523	9750	1.3	3.55	87.6	0.38	ND	41.9	16.5	24100
	Detection Rate (%)		100	95	100	100	50	25	100	93	100
		ERL[a]:	—	—	8.2	—	—	1.2	81	34	—
		ERM[a]:	—	—	70.0	—	—	9.6	370	270	—

[a]From Long et al. 1995

Appendix B.11 *continued*

	Station	Depth (m)	Pb	Mn	Hg	Ni	Se	Ag	Tl	Sn	Zn
Inner Shelf	8929	7	1.5	87.5	ND	1.9	ND	ND	ND	0.3	18.2
	8944	7	0.9	56.2	ND	1.1	ND	ND	ND	ND	8.8
	8918	8	0.9	31.6	ND	0.9	ND	ND	ND	0.1	7.1
	8946	15	1.4	38.0	0.007	1.4	ND	ND	0.19	ND	8.8
	8915	16	2.7	43.1	0.010	1.5	ND	ND	ND	0.3	10.4
	8907	18	1.2	42.2	ND	1.6	ND	ND	ND	0.2	8.4
	8943	19	1.0	45.1	ND	1.5	ND	ND	0.14	ND	8.2
Mid Shelf	8914	20	2.9	71.9	0.018	3.6	ND	ND	ND	0.5	21.7
	8911	24	1.8	49.8	0.008	2.9	ND	ND	ND	0.3	13.9
	8938	28	1.0	51.0	ND	2.0	ND	ND	0.13	ND	9.2
	8901	29	1.5	72.2	0.004	3.6	ND	ND	ND	0.4	19.5
	8913	31	2.7	58.6	0.018	2.5	ND	ND	ND	0.6	15.8
	8906	41	1.5	13.2	ND	1.0	ND	ND	ND	0.1	7.9
	8939	65	2.5	80.3	0.009	4.2	ND	ND	0.22	ND	23.1
	8903	66	2.1	34.2	0.011	3.0	ND	ND	ND	0.3	9.6
	8912	67	5.6	97.1	0.056	7.4	ND	ND	ND	1.0	36.7
	8925	67	5.5	115.0	0.098	8.4	ND	ND	ND	1.2	35.0
	8919	68	4.3	106.0	0.041	7.0	ND	ND	ND	1.1	33.5
	8909	73	4.9	70.5	0.063	5.9	ND	ND	ND	0.8	23.8
	8931	74	5.2	110.0	0.041	7.9	ND	ND	ND	1.1	33.9
	8933	80	4.9	107.0	0.038	7.9	ND	ND	ND	1.1	33.1
Outer Shelf	8930	83	5.3	115.0	0.048	9.1	ND	ND	ND	1.2	36.5
	8949	83	4.3	113.0	0.075	8.6	ND	ND	0.18	ND	33.9
	8924	85	4.4	103.0	0.037	8.0	ND	ND	ND	1.0	31.7
	8926	87	3.8	82.9	0.027	6.4	0.29	ND	ND	0.7	25.2
	8932	89	5.1	102.0	0.039	8.5	ND	ND	ND	1.1	37.0
	8940	108	2.1	47.3	0.010	3.6	ND	ND	ND	ND	14.8
	8921	116	2.7	49.4	0.019	4.3	ND	ND	ND	0.4	17.9
	8905	134	72.7	75.9	0.041	7.5	ND	ND	ND	0.9	25.7
	8937	137	3.0	75.3	0.025	5.6	ND	ND	0.21	ND	24.3
	8910	169	7.8	128.0	0.081	6.7	ND	ND	ND	1.1	55.4
	8922	185	4.2	90.2	0.046	9.4	ND	ND	ND	0.8	33.1
	8916	189	7.6	121.0	0.107	12.5	0.38	ND	ND	2.8	79.2
	8908	194	5.0	112.0	0.079	13.6	0.51	ND	ND	1.3	42.3
Upper Slope	8928	223	4.6	119.0	0.057	12.8	0.42	ND	ND	1.1	42.0
	8920	270	4.8	121.0	0.066	16.2	0.64	ND	ND	1.0	47.8
	8936	292	4.4	123.0	0.053	12.8	ND	ND	0.17	ND	42.3
	8927	460	4.7	136.0	0.059	18.9	0.76	ND	ND	1.0	54.7
	8934	491	5.1	158.0	0.078	21.7	ND	ND	0.17	ND	62.6
	8923	523	4.4	92.6	0.053	15.8	0.87	ND	ND	0.9	52.0
	Detection Rate (%)		100	100	83	100	18	0	20	75	100
		ERL[a]:	46.7	—	0.15	20.9	—	1.0	—	—	150
		ERM[a]:	218.0	—	0.71	51.6	—	3.7	—	—	410

[a]From Long et al. 1995

Appendix B.12

Concentrations of pesticides (ppt) detected in sediments from PLOO stations sampled during 2020. See Appendix B.1 for MDLs and abbreviations; DR = detection rate; E = estimated; ND = not detected; NR = not reportable.

Winter	Chlordane									DDT							
2020	tChlord	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon	tDDT	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	1034.2	21.4 E	39	21.6 E	45.8 E	53.9	784	68.5
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	966.8	23.2 E	37.3	20.9 E	53	60.9	699	72.5
E19	9.93	ND	ND	ND	ND	ND	ND	ND	9.93 E	583.6	18.2 E	23.2	21 E	36.9 E	37.7 E	391	55.6
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	638.5	17.5 E	18	18 E	32.5 E	47.8	449	55.7
E1	116.5	25.4 E	13.8 E	45.9	ND	ND	ND	ND	31.4 E	723.5	19.1 E	16.4	18.6 E	39.4 E	58.6	518	53.4
98-m Depth Contour																	
B12	11.4	ND	ND	11.4 E	ND	ND	ND	ND	ND	485.9	ND	18.1	ND	20.3 E	20.5 E	408	19 E
B9	11.9	ND	ND	11.9 E	ND	ND	ND	ND	ND	704.1	14.1 E	22.2	18.4 E	36.2 E	39.3 E	527	46.9
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	1024.7	16.7 E	19.6	19.8 E	32.1 E	47.5	440	449
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	324.3	ND	10.9 E	ND	19.1 E	19.9 E	251	23.4 E
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	523.3	16.5 E	15.7 E	13.8 E	28.8 E	36.9 E	372	39.6
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	400.1	13.4 E	12.3 E	ND	20 E	25.3 E	299	30.1
E17[a]	9.96	ND	ND	9.96 E	ND	ND	ND	ND	ND	530.29	ND	9.79 E	29.5 E	18.5 E	24.5 E	297	151
E14[a]	14.4	14.4 E	ND	ND	ND	ND	ND	ND	ND	276.5	11 E	11.3 E	ND	20.3 E	17.9 E	216	ND
E11[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	382.02	12.4 E	15.5 E	9.82 E	22.9 E	25.4 E	268	28
E8	21.86	12 E	ND	9.86 E	ND	ND	ND	ND	ND	399.11	9.22 E	14.3 E	9.99 E	28 E	25 E	286	26.6
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	418.8	ND	13.7 E	ND	29.5 E	25 E	328	22.6 E
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	1120.7	25.3 E	27	65	43.8 E	60.6	678	221
116-m Depth Contour																	
B10	36.2	12.3 E	ND	11.4 E	ND	ND	ND	ND	12.5 E	578.2	13.3 E	26	11.7 E	31.1 E	28 E	439	29.1
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	340.24	9.14 E	11.9 E	ND	17.8 E	21.6 E	258	21.8 E
E15[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	358.2	10.8 E	12.2 E	ND	18.3 E	25.3 E	268	23.6 E
E9	20.78	11 E	ND	9.78 E	ND	ND	ND	ND	ND	380.6	11.8 E	17.4	ND	20.8 E	22 E	284	24.6
E3	195.6	44.9 E	27.2 E	81.7	ND	ND	ND	ND	41.8	606.2	27 E	11.1 E	13.5 E	29.1 E	128	311	86.5
DR (%)	45	27	9	36	0	0	0	0	18	100	82	100	64	100	100	100	95
ERL[b]	—	—	—	—	—	—	—	—	—	1580	—	—	—	—	—	2200	—
ERM[b]		—	—	—	—	—	—	—	—	46,100	—	—	—	—	—	2700	—

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.12 *continued*

Winter	HCH							Endosulfan						
2020	tHC	HCH-A	HCH-B	HCH-D	HCH-G	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	135	ND
B8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
E19	18.8	ND	18.8 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
E1	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.3 E	ND	ND	ND	ND
98-m Depth Contour														
B12	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	19.1 E	ND
E26	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	21.7 E	ND
E23	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
E17 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.7 E	ND
E14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
E11 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
E8	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
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
116-m Depth Contour														
B10	15.2	ND	15.2 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	167	ND
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
E15 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	8.88	ND	8.88 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	73.2	ND
E3	ND	ND	ND	ND	ND	ND	9.11 E	ND	ND	ND	ND	ND	ND	ND
DR (%)	14	0	14	0	0	0	5	0	0	5	0	0	40	0
ERL [b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ERM [b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.12 *continued*

Summer	Chlordane									DDT							
2020	tChlord	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon	tDDT	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	602.2	12.3 E	20.4 E	16 E	21.7 E	30.8 E	440	61
B8	34.9	13.2 E	ND	11.4 E	ND	ND	ND	ND	10.3 E	918.5	28.2 E	28.9 E	21 E	42.9 E	67.6	656	73.9 E
E19	ND	ND	ND	ND	ND	ND	ND	ND	ND	526.9	12.9 E	18 E	16.1 E	24.5 E	61.5	348	45.9
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	539.1	16.8 E	15.1 E	17.5 E	28.6 E	40.9 E	375	45.2 E
E1	248.4	84.6	29.4 E	77.1	ND	ND	ND	ND	57.3 E	1212.8	46.7 E	24.1 E	62.7 E	43.3 E	133	720	183
98-m Depth Contour																	
B12	17.3	ND	ND	17.3 E	ND	ND	ND	ND	ND	636.5	17.1 E	36.7 E	ND	25 E	36.7 E	415	106
B9	ND	ND	ND	ND	ND	ND	ND	ND	ND	749	23.8 E	25.7 E	20.6 E	32.8 E	72.6	489	84.5
E26	ND	ND	ND	ND	ND	ND	ND	ND	ND	434.5	12.8 E	14.9 E	ND	23.7 E	30.3 E	323	29.8 E
E25	ND	ND	ND	ND	ND	ND	ND	ND	ND	433.5	11 E	11.7 E	21.1 E	19.6 E	27.7 E	276	66.4 E
E23	ND	ND	ND	ND	ND	ND	ND	ND	ND	281.6	ND	10.6 E	11 E	ND	18.9 E	213	28.1 E
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	548.7	11.3 E	27 E	ND	28.4 E	110	320	52
E17[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	196.3	ND	ND	ND	12.9 E	13.3 E	152	18.1 E
E14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	93.4	ND	ND	ND	ND	ND	93.4	ND
E11[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	218	ND	ND	ND	11.8 E	12.2 E	171	23 E
E8	ND	ND	ND	ND	ND	ND	ND	ND	ND	381.1	12.8 E	12.2 E	12.8 E	19.7 E	33.7 E	252	37.9 E
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	588.5	16.9 E	17.7 E	18 E	28.5 E	43.2	403	61.2 E
E2	36.2	13 E	ND	11.6 E	ND	ND	ND	ND	11.6 E	626.6	20.2 E	18.1 E	17.6 E	32.4 E	56.6	429	52.7 E
116-m Depth Contour																	
B10	ND	ND	ND	ND	ND	ND	ND	ND	ND	313.6	ND	12.3 E	ND	14.3 E	12.5 E	258	16.5 E
E21	ND	ND	ND	ND	ND	ND	ND	ND	ND	190.2	ND	ND	ND	10.8 E	16 E	138	25.4 E
E15[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	307.47	9.47 E	ND	16.7 E	10.7 E	15.6 E	213	42
E9	ND	ND	ND	ND	ND	ND	ND	ND	ND	355.9	13.2 E	12.2 E	ND	17.3 E	40	251	22.2 E
E3	187.8	54.7 E	25.4 E	67.7 E	ND	ND	ND	ND	40 E	462.8	30.9 E	10.3 E	ND	23.5 E	147	224	27.1 E
DR (%)	23	18	9	23	0	0	0	0	18	100	73	77	55	91	95	100	95
ERL[b]	—	—	—	—	—	—	—	—	—	1580	—	—	—	—	—	2200	—
ERM[b]	—	—	—	—	—	—	—	—	—	46,100	—	—	—	—	—	2700	—

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.12 *continued*

Summer	HCH							Endosulfan						
2020	tHCH	HCH-A	HCH-B	HCH-D	HCH-G	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	ND
B8	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
E7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
E1	ND	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	NR	ND
B9	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	NR	ND
E25	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	NR	ND
E20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	98.2 E	ND
E17[a]	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
E11[a]	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
E5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
E2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
116-m Depth Contour														
B10	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
E15[a]	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
E3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
DR (%)	0	0	0	0	0	0	0	0	0	0	0	0	7	0
ERL[b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ERM[b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.13

Concentrations of pesticides (ppt) detected in sediments from SBOO stations sampled during 2020. See Appendix B.1 for MDLs and abbreviations; DR = detection rate; E = estimated; ND = not detected; NR = not reportable.

Winter 2020	Chlordane									DDT							
	tChlord	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon	tDDT	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	191.7	ND	ND	ND	18.1 E	16.7 E	140	16.9 E
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I31	28.17	ND	ND	ND	18.6 E	ND	ND	ND	9.57 E	10.6	ND	ND	ND	10.6 E	ND	NR	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	43.5	ND	ND	ND	ND	ND	43.5	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	35.88	ND	ND	ND	9.38 E	ND	26.5	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	26.4	ND	ND	ND	ND	ND	26.4	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.8	ND	ND	ND	ND	ND	10.8 E	ND
28-m Stations																	
I33	55.4	14.8 E	ND	13.4 E	16 E	ND	ND	ND	11.2 E	105.7	ND	12.2 E	ND	18.3 E	ND	75.2	ND
I30	10.1	ND	ND	10.1 E	ND	ND	ND	ND	ND	124.6	ND	ND	ND	ND	9.9 E	103	11.7 E
I27	9.16	ND	ND	9.16 E	ND	ND	ND	ND	ND	96.87	ND	ND	ND	10.9 E	ND	76.6	9.37 E
I22	99.6	29.8 E	ND	47.7	22.1 E	ND	ND	ND	ND	126.2	ND	ND	ND	ND	31.5 E	73.4	21.3 E
I14 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	422.5	32.3 E	10.5 E	ND	16.6 E	73.1	290	ND
I16 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	97.06	ND	8.36 E	ND	14.9 E	16.2 E	57.6	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.9	ND	ND	ND	ND	ND	13.9 E	ND
I12 [a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	15.6	ND	ND	ND	ND	ND	15.6 E	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	83.4	ND	ND	ND	ND	ND	70.8	12.6 E
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	13	ND	ND	ND	ND	ND	13 E	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.3	ND	ND	ND	ND	ND	12.3 E	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	ND	ND	ND	ND	ND	15 E	ND
38-m Stations																	
I29	24.3	13.4 E	ND	10.9 E	ND	ND	ND	ND	ND	3493.1	121	41.1	153	122	243	2200	613
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.6	ND	ND	ND	ND	ND	11.6 E	ND
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	18.5	ND	ND	ND	ND	ND	18.5	ND
55-m Stations																	
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	2183.5	58.7	31	182	68.8	136	1120	587
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I7	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.7	ND	ND	ND	ND	ND	14.7 E	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	54	ND	ND	ND	ND	ND	54	ND
DR (%)	22	11	0	19	11	0	0	0	7	89	11	19	7	33	26	100	26
ERL [b]	—	—	—	—	—	—	—	—	—	1580	—	—	—	—	—	2200	—
ERM [b]	—	—	—	—	—	—	—	—	—	46,100	—	—	—	—	—	2700	—

[a] Near-ZID station; [b] From Long et al. 1995

Appendix B.13 *continued*

Winter 2020	HCH							Endosulfan						
	tHCH	HCH-A	HCH-B	HCH-D	HCH-G	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	NR	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I31	47.2	23 E	NR	ND	24.2	ND	ND	ND	ND	ND	ND	ND	NR	ND
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	10.7	ND	10.7 E	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
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations														
I33	17.9	NR	NR	ND	17.9	ND	ND	ND	ND	ND	ND	ND	NR	ND
I30	11.2	ND	NR	ND	11.2 E	ND	ND	ND	ND	ND	ND	ND	NR	ND
I27	9.28	ND	ND	ND	9.28 E	ND	ND	ND	ND	ND	ND	ND	NR	ND
I22	217.7	34.5	150	ND	33.2	ND	ND	26.5 E	ND	ND	ND	ND	NR	ND
I14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I16[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I15	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	179	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	34.5 E	ND
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	9.07	ND	9.07 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	31.8	ND	15.7 E	16.1 E	ND	ND	9.96 E	ND	ND	ND	ND	ND	21.6 E	ND
38-m Stations														
I29	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	NR	ND
I13	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
55-m Stations														
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I7	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
DR (%)	30	8	17	4	19	0	4	4	0	0	0	0	20	0
ERL[b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ERM[b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[a] Near-ZID station; [b] From Long et al. 1995

Appendix B.13 *continued*

Summer 2020	Chlordane									DDT							
	tChlord	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon	tDDT	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	189.5	ND	ND	ND	15.1 E	23.3 E	134	17.1 E
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	43.95	ND	ND	ND	ND	35	NR	8.95 E
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	30.1	ND	ND	ND	ND	13.9 E	NR	16.2 E
I23	ND	ND	ND	ND	ND	ND	ND	ND	ND	94.37	ND	ND	ND	9.01 E	9.26 E	76.1 E	ND
I18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
28-m Stations																	
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	111.2	ND	ND	ND	10.4 E	ND	86.8	14 E
I30	169.3	30.9 E	33.1 E	26.2 E	ND	ND	52.1 E	ND	27 E	308.3	31.6 E	25.8 E	35.5 E	10.8 E	39.4 E	119	46.2 E
I27	33.43	11.5 E	ND	12 E	9.93 E	ND	ND	ND	ND	138.66	ND	9.31 E	ND	13.8 E	9.15 E	94.7	11.7 E
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	86.7	ND	ND	ND	ND	ND	86.7	ND
I14[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	167.82	ND	ND	9.48 E	9.44 E	15.5 E	101	32.4 E
I16[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I12[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND	45.6	ND	ND	ND	ND	ND	45.6 E	ND
I9	ND	ND	ND	ND	ND	ND	ND	ND	ND	131	ND	ND	ND	ND	10 E	106	15 E
I6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
38-m Stations																	
I29	ND	ND	ND	ND	ND	ND	ND	ND	ND	1903.6	75 E	38.2 E	25.3 E	109	182	1400	74.1 E
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.66	ND	ND	ND	ND	ND	NR	9.66 E
I13	ND	ND	ND	ND	ND	ND	ND	ND	ND	140.26	ND	10.3 E	ND	9.36 E	46	60.9 E	13.7 E
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
55-m Stations																	
I28	ND	ND	ND	ND	ND	ND	ND	ND	ND	568.3	16.1 E	12 E	18.1 E	25.1 E	43.9	403	50.1 E
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I7	9.49	ND	ND	9.49 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	68.4	ND	ND	ND	ND	ND	68.4 E	ND
DR (%)	11	7	4	11	4	0	4	0	4	59	11	19	15	33	41	100	44
ERL[b]	—	—	—	—	—	—	—	—	—	1580	—	—	—	—	—	2200	—
ERM[b]	—	—	—	—	—	—	—	—	—	46,100	—	—	—	—	—	2700	—

[a] Near-ZID station; [b] From Long et al. 1995

Appendix B.13 *continued*

Summer 2020	HCH							Endosulfan						
	tHCH	HCH-A	HCH-B	HCH-D	HCH-G	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	NR	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I23	8.74	8.74 E	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
I10	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	NR	ND
28-m Stations														
I33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND
I30	47.5	ND	26.4 E	21.1 E	ND	ND	ND	ND	ND	28.5 E	ND	ND	ND	28.8 E
I27	37.1	12.6 E	11.6 E	ND	12.9 E	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	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
I16[a]	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
I12[a]	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
I6	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
I3	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	222 E	ND	ND	ND	NR	ND
I21	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	NR	ND
I8	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
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	35.8	10.9 E	12.8 E	ND	12.1 E	ND	ND	ND	ND	ND	ND	ND	NR	ND
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	15	11	11	4	7	0	0	0	4	4	0	0	0	4
ERL[b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ERM[b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[a] Near-ZID station; [b] From Long et al. 1995

Appendix B.14

Concentrations of pesticides (ppt) detected in sediments from the San Diego regional benthic stations sampled during summer 2020. See Appendix B.1 for MDLs and abbreviations; E = estimated; ND = not detected; NR = not reportable.

	Station	Depth (m)	Chlordane								
			tChlord	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon
Inner Shelf	8929	7	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8944	7	11.5	5.65 E	ND	5.85 E	ND	ND	ND	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8946	15	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8915	16	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8907	18	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8943	19	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8914	20	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8911	24	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8938	28	150.7	34 E	ND	48.6	ND	34.9 E	ND	ND	33.2 E
	8901	29	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	8913	31	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8906	41	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8939	65	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8903	66	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8912	67	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8925	67	71.1	30.3 E	ND	28 E	ND	ND	ND	ND	12.8 E
	8919	68	44.9	16.2 E	ND	15.8 E	ND	ND	ND	ND	12.9 E
	8909	73	197.6	49.9 E	ND	115	ND	ND	ND	ND	32.7 E
	8931	74	25.6	ND	ND	13.6 E	ND	ND	ND	ND	12 E
	8933	80	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8930	83	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8949	83	159.7	ND	ND	72.6	ND	42.6 E	ND	ND	44.5 E
	8924	85	10.6	ND	ND	10.6 E	ND	ND	ND	ND	ND
	8926	87	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8932	89	51.1	18.5 E	ND	18.5 E	ND	ND	ND	ND	14.1 E
	8940	108	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8921	116	ND	ND	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	8905	134	10.6	ND	ND	10.6 E	ND	ND	ND	ND	ND
	8937	137	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8910	169	918	234	106	381	ND	ND	ND	ND	197
	8922	185	42.6	ND	10.1 E	16.5 E	ND	ND	ND	ND	16 E
	8916	189	48.7	ND	21.6 E	ND	ND	ND	ND	ND	27.1 E
	8908	194	37	ND	ND	37 E	ND	ND	ND	ND	ND
Upper Slope	8928	223	32.4	ND	ND	16 E	ND	ND	ND	ND	16.4 E
	8920	270	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8936	292	60.6	22.5 E	ND	19.1 E	ND	ND	ND	ND	19 E
	8927	460	63.7	25.9 E	ND	21 E	ND	ND	ND	ND	16.8 E
	8934	491	28.1	28.1 E	ND	ND	ND	ND	ND	ND	ND
	8923	523	59.1	19.1 E	ND	20.1 E	ND	ND	ND	ND	19.9 E
	Detection Rate (%)		48	28	8	43	0	5	0	0	35
		ERL[a]:	—	—	—	—	—	—	—	—	—
		ERM[a]:	—	—	—	—	—	—	—	—	—

[a]From Long et al. 1995

Appendix B.14 *continued*

	Station	Depth (m)	DDT							
			tDDT	o,p-DDD	o,p-DDE	o,p-DDT	p,-p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT
Inner Shelf	8929	7	16.9	ND	ND	ND	ND	ND	16.9 E	ND
	8944	7	13.5	ND	ND	ND	ND	ND	13.5 E	ND
	8918	8	44.43	ND	4.73 E	ND	ND	18.2 E	21.5 E	ND
	8946	15	24.4	ND	ND	ND	ND	ND	24.4 E	ND
	8915	16	ND	ND	ND	ND	ND	ND	NR	ND
	8907	18	89.5	ND	ND	ND	10.1 E	ND	79.4	ND
	8943	19	25.7	ND	ND	ND	ND	ND	25.7 E	ND
	8914	20	196.4	ND	ND	ND	10.2 E	17 E	108	61.2
	8911	24	93	ND	ND	ND	11.9 E	ND	81.1 E	ND
	8938	28	141.6	19.5 E	34.6 E	ND	ND	17.8 E	51.5 E	18.2 E
	8901	29	154.2	ND	ND	ND	10.7 E	15.6 E	115	12.9 E
Mid Shelf	8913	31	46.4	ND	ND	ND	ND	ND	46.4 E	ND
	8906	41	69.3	ND	ND	ND	ND	ND	69.3 E	ND
	8939	65	197.41	ND	10.1 E	ND	10.6 E	10.3 E	157	9.41 E
	8903	66	192.43	ND	ND	ND	8.83 E	ND	164	19.6 E
	8912	67	976.9	37.1 E	21.3 E	ND	46.9 E	124	674	73.6
	8925	67	662.9	23.8 E	17.7 E	18.6 E	34.2 E	56	455	57.6 E
	8919	68	761.9	34.2 E	21 E	25.1 E	46 E	85	482	68.6 E
	8909	73	1499	52.2	25.8 E	34.2 E	55.8	166	948	217
	8931	74	798.1	21.5 E	24.9 E	27 E	40.7 E	62.6	544	77.4 E
	8933	80	827.3	23.1 E	26.6 E	24.5 E	41 E	65.1	565	82 E
	8930	83	1096.5	29.1 E	46 E	40.2 E	52.3 E	71.9	731	126
	8949	83	955.9	37.2 E	63	52.5	35.1 E	56.5	623	88.6
	8924	85	828.4	25 E	24.7 E	20.8 E	45.8 E	76.9	571	64.2 E
	8926	87	468.5	14.1 E	13.4 E	17.1 E	23.2 E	36.7 E	317	47 E
	8932	89	1040.7	28.2 E	38.8 E	36.5 E	48.7 E	77.5	706	105
	8940	108	164	ND	ND	ND	9 E	ND	155	ND
	8921	116	251.85	ND	5.05 E	ND	15.1 E	19 E	196	16.7 E
Outer Shelf	8905	134	604.3	13.4 E	21.4 E	10.8 E	26.1 E	42.8	448	41.8 E
	8937	137	461	10.4 E	18.5 E	ND	23.3 E	25.9 E	356	26.9 E
	8910	169	1954.1	38.5 E	16.9 E	25 E	50.7 E	182	411	1230
	8922	185	1373.7	38.7 E	48.6 E	31.9 E	63.2	95.5	999	96.8
	8916	189	1639.3	35.5 E	57.6 E	ND	83.9	163	1210	89.3
	8908	194	1283.7	24.1 E	49.3 E	20.3 E	49.7 E	91.9	971	77.4
Upper Slope	8928	223	1794.1	46.9 E	66 E	36.1 E	74.1	143	1320	108
	8920	270	2486.9	54.9 E	99	112	113	138	1820	150
	8936	292	3448.7	73.7 E	120	192	109	187	2030	737
	8927	460	3123.5	95 E	178	33.7 E	113	203	2410	90.8 E
	8934	491	4231.2	110 E	284	49.2 E	206	253	3180	149
	8923	523	2618.9	78.9 E	141	36.7 E	98.3	170	1960	134
Detection Rate (%)			98	60	68	50	78	73	100	73
	ERL[a]:		1580	—	—	—	—	—	2200	—
	ERM[a]:		46,100	—	—	—	—	—	2700	—

[a] From Long et al. 1995

Appendix B.14 *continued*

	Station	Depth (m)	HCH					Aldrin	Dieldrin
			tHCH	HCH-A	HCH-B	HCH-D	HCH-G		
Inner Shelf	8929	7	ND	ND	ND	ND	ND	ND	ND
	8944	7	ND	ND	ND	ND	ND	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND	ND
	8946	15	ND	ND	ND	ND	ND	ND	ND
	8915	16	ND	ND	ND	ND	ND	ND	ND
	8907	18	ND	ND	ND	ND	ND	ND	ND
	8943	19	ND	ND	ND	ND	ND	ND	ND
	8914	20	ND	ND	ND	ND	ND	ND	ND
	8911	24	ND	ND	ND	ND	ND	ND	ND
	8938	28	88.6	ND	44.3 E	44.3 E	ND	ND	56.1 E
	8901	29	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	8913	31	ND	ND	ND	ND	ND	ND	ND
	8906	41	ND	ND	ND	ND	ND	ND	ND
	8939	65	ND	ND	ND	ND	ND	ND	ND
	8903	66	ND	ND	ND	ND	ND	ND	ND
	8912	67	ND	ND	ND	ND	ND	ND	ND
	8925	67	ND	ND	ND	ND	ND	ND	ND
	8919	68	ND	ND	ND	ND	ND	ND	ND
	8909	73	ND	ND	ND	ND	ND	ND	ND
	8931	74	ND	ND	ND	ND	ND	ND	ND
	8933	80	ND	ND	ND	ND	ND	ND	ND
	8930	83	ND	ND	ND	ND	ND	ND	ND
	8949	83	130.6	ND	60.9	47.4 E	22.3 E	ND	65.6 E
	8924	85	ND	ND	ND	ND	ND	ND	ND
	8926	87	ND	ND	ND	ND	ND	ND	ND
	8932	89	ND	ND	NR	ND	ND	ND	ND
	8940	108	ND	ND	ND	ND	ND	ND	ND
	8921	116	ND	ND	ND	ND	ND	ND	ND
Outer Shelf	8905	134	ND	ND	ND	ND	ND	ND	ND
	8937	137	ND	ND	ND	ND	ND	ND	ND
	8910	169	ND	ND	ND	ND	ND	ND	64.8 E
	8922	185	ND	ND	ND	ND	ND	ND	ND
	8916	189	ND	ND	ND	ND	ND	ND	ND
	8908	194	11.8	ND	11.8 E	ND	ND	ND	ND
Upper Slope	8928	223	ND	ND	NR	ND	ND	ND	ND
	8920	270	19.8	ND	19.8 E	ND	ND	ND	ND
	8936	292	ND	ND	ND	ND	ND	ND	ND
	8927	460	ND	ND	ND	ND	ND	ND	ND
	8934	491	ND	ND	ND	ND	ND	ND	ND
	8923	523	ND	ND	NR	ND	ND	ND	ND
Detection Rate (%)			10	0	11	5	3	0	8
		ERL[a]:	—	—	—	—	—	—	—
		ERM[a]:	—	—	—	—	—	—	—

[a]From Long et al. 1995

Appendix B.14 *continued*

	Station	Depth (m)	Endosulfan Alpha	Endosulfan Beta	Endosulfan Sulfate	Endrin	EndAld	HCB	Mirex
Inner Shelf	8929	7	ND	ND	ND	ND	ND	ND	ND
	8944	7	ND	ND	ND	ND	ND	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND	ND
	8946	15	ND	ND	ND	ND	ND	ND	ND
	8915	16	ND	ND	ND	ND	ND	ND	ND
	8907	18	ND	ND	ND	ND	ND	ND	ND
	8943	19	ND	ND	ND	ND	ND	ND	ND
	8914	20	ND	ND	ND	ND	ND	ND	ND
	8911	24	ND	ND	ND	ND	ND	ND	ND
	8938	28	ND	ND	ND	ND	ND	ND	20.8 E
	8901	29	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	8913	31	ND	ND	ND	ND	ND	ND	ND
	8906	41	ND	ND	ND	ND	ND	ND	ND
	8939	65	ND	ND	ND	ND	ND	ND	ND
	8903	66	ND	ND	ND	ND	ND	ND	ND
	8912	67	ND	ND	ND	ND	ND	ND	ND
	8925	67	ND	ND	ND	ND	ND	ND	ND
	8919	68	ND	ND	ND	ND	ND	ND	ND
	8909	73	ND	ND	ND	ND	ND	NR	ND
	8931	74	ND	ND	ND	ND	ND	50.9 E	ND
	8933	80	ND	ND	ND	ND	ND	ND	ND
	8930	83	ND	ND	ND	ND	ND	ND	ND
	8949	83	ND	ND	ND	ND	ND	ND	20.7 E
	8924	85	ND	ND	ND	ND	ND	38.3 E	ND
	8926	87	ND	ND	ND	ND	ND	ND	ND
	8932	89	ND	ND	ND	ND	ND	27.3 E	ND
	8940	108	ND	ND	ND	ND	ND	ND	ND
	8921	116	ND	ND	ND	ND	ND	44.6 E	ND
Outer Shelf	8905	134	ND	ND	ND	ND	ND	ND	ND
	8937	137	ND	ND	ND	ND	ND	ND	ND
	8910	169	ND	ND	ND	ND	ND	ND	ND
	8922	185	ND	ND	ND	ND	ND	NR	ND
	8916	189	ND	ND	ND	ND	ND	49.6 E	ND
	8908	194	ND	ND	ND	ND	ND	NR	ND
Upper Slope	8928	223	ND	ND	ND	ND	ND	37.4 E	ND
	8920	270	ND	ND	ND	ND	ND	NR	ND
	8936	292	ND	ND	ND	ND	ND	51 E	ND
	8927	460	ND	ND	ND	ND	ND	46.2 E	40.8 E
	8934	491	ND	ND	ND	ND	ND	ND	ND
	8923	523	ND	ND	ND	ND	ND	71.2 E	ND
Detection Rate (%)			0	0	0	0	0	25	8
		ERL[a]:	—	—	—	—	—	—	—
		ERM[a]:	—	—	—	—	—	—	—

[a]From Long et al. 1995

Appendix B.15

Concentrations of PCBs (ppt) detected in sediments from PLOO stations sampled during 2020. See Appendix B.1 for MDLs; DR = detection rate; E = estimated; ND = not detected; NR = not reportable.

Winter		PCB Congener																		
2020	tPCB	18	28	37	44	49	52	66	70	74	77	81	87	99	101	105	110	114	118	119
88-m Depth Contour																				
B11	1074	21.8 E	33 E	ND	20.7 E	26.2 E	33.3 E	29	26.7	12.7 E	ND	ND	22.4 E	43.5	61.1	27.7 E	56.1	ND	70.8	ND
B8	1097.8	14.4 E	22 E	ND	20.4 E	22.7 E	35.1	31.8	30.8	12.1 E	ND	ND	30.2 E	49.1	76.3	31.8 E	82.6	ND	82.4	ND
E19	751.4	11.3 E	22 E	15.1 E	16.4 E	22.3 E	20.5 E	26.8	21.6 E	15.3 E	ND	ND	17.7 E	34.2	43.2 E	19.1 E	39.6 E	ND	47.4	11.8 E
E7	832.6	ND	13 E	ND	ND	17.4 E	NR	23.4 E	16.9 E	ND	ND	ND	17.7 E	43.6	48.4 E	21 E	54.9	ND	63	ND
E1	2716.26	ND	20.1 E	ND	30.3	45.2	61.4	51.4	49.6	18.8	9.46 E	ND	58.6	89	170	69.7	160	ND	180	13.9 E
98-m Depth Contour																				
B12	301.81	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.2 E	16.6 E	10.7 E	18 E	ND	25.6	ND
B9	475.65	ND	ND	ND	ND	ND	11.1 E	14.4 E	11.3 E	ND	ND	ND	12.8 E	21.2 E	24.4 E	15.1 E	29.2 E	ND	38	ND
E26	1026.1	ND	10.5 E	ND	ND	13.3 E	NR	19.4 E	14.2 E	ND	ND	ND	13 E	30.3	43.8 E	15.8 E	39.4 E	ND	47.4	ND
E25	231.81	ND	ND	ND	ND	ND	ND	10.4 E	ND	ND	ND	ND	ND	14.8 E	16.5 E	ND	19.1 E	ND	23.7	ND
E23	629.6	ND	ND	ND	ND	13.7 E	NR	18.8 E	16.6 E	ND	ND	ND	14.8 E	31.3	42.7 E	20.8 E	45.5	ND	52.8	ND
E20	358.27	ND	ND	ND	ND	9.77 E	ND	12.5 E	ND	ND	ND	ND	ND	20 E	23.5 E	13.3 E	26.6 E	ND	32.2	ND
E17 [a]	449.9	ND	9.2 E	ND	ND	ND	15.1 E	11.8 E	12.3 E	ND	ND	ND	16.4 E	19.4 E	32.8 E	15 E	36.8 E	ND	37.6	ND
E14 [a]	279	ND	ND	ND	ND	ND	NR	11.3 E	ND	ND	ND	ND	ND	17.9 E	20.3 E	ND	21.1 E	ND	27	ND
E11 [a]	453.65	ND	ND	ND	ND	ND	NR	13.8 E	9.91 E	ND	ND	ND	11.2 E	25	30.2 E	14 E	28.7 E	ND	35.8	ND
E8	596.07	ND	ND	ND	ND	9.07 E	16 E	14 E	13.7 E	ND	ND	ND	20 E	26.7	44.5 E	22 E	50.1	ND	52.2	ND
E5	639.9	ND	ND	ND	ND	11.2 E	12.1 E	17.4 E	12.4 E	ND	ND	ND	12.2 E	29.9	35.8 E	21.9 E	44.4	ND	49	ND
E2	2123.8	14.5 E	23.6 E	ND	26.3	51.2	56.5	54.5	45	13.6 E	ND	ND	45.9	110	150	51.8	150	ND	170	ND
116-m Depth Contour																				
B10	809.7	ND	15.1 E	13.6 E	17.6 E	19.8 E	27 E	22.8 E	24.6	14.9 E	ND	ND	28.6 E	45.7	59.8	23.8 E	55.7	ND	59.2	ND
E21	481.2	ND	ND	ND	ND	10.3 E	NR	14.2 E	13.5 E	ND	ND	ND	15.9 E	22.4 E	36.8 E	17.5 E	39.6 E	ND	43.3	ND
E15 [a]	549.7	9.3 E	ND	ND	ND	12 E	NR	14 E	11 E	ND	ND	ND	12 E	28	33 E	15 E	33 E	ND	39	ND
E9	1191.6	11 E	16.1 E	10 E	25	25.9 E	41.2	27.4	33.1	15.6	ND	ND	38.2	57.4	90	35.5 E	89	ND	84.8	8.8 E
E3	4437.76	39.6 E	56.5	13.7 E	94	110	200	140	160	56.8	17 E	ND	130	180	330	140	430	ND	370	20.4 E
DR (%)	100	32	50	18	36	73	80	95	82	36	9	0	82	100	100	91	100	0	100	18

[a] Near-ZID station

Appendix B.15 *continued*

Winter 2020	PCB Congener 123	126	128	138	149	151	153/168	156	157	158	167	169	170	177	180	183	187	189	194	201	206
88-m Depth Contour																					
B11	ND	ND	30.4 E	98.6	65.9	15 E	141	14.3 E	ND	ND	ND	ND	34.4 E	24.2 E	63.9	16.2 E	57.7	ND	27.4 E	ND	NR
B8	ND	ND	30.1 E	95.8	76.5	17.6 E	120	13.5 E	ND	11.1 E	ND	ND	28.8 E	19.9 E	51.6	16.7 E	49	ND	25.5 E	ND	NR
E19	ND	ND	19.7 E	54.2 E	46.9	14.6 E	90.6 E	ND	ND	ND	ND	ND	20.2 E	14.9 E	41.6 E	12.9 E	34.8 E	ND	16.7 E	ND	NR
E7	ND	ND	24.6 E	79.5	63.6	14.3 E	129	11.3 E	ND	ND	ND	ND	27.5 E	20 E	55.9	16.2 E	48.3	ND	23.1 E	ND	NR
E1	18 E	ND	59.1	240	220	58.7	380	43	ND	23.2 E	13.6 E	ND	100	70.6	200	51.3	160	ND	51.3	ND	NR
98-m Depth Contour																					
B12	ND	ND	12.5 E	40.8 E	30	ND	49.8 E	ND	ND	ND	ND	ND	10.9 E	14.7 E	18.7 E	ND	27.8 E	ND	9.51 E	ND	NR
B9	ND	ND	16.1 E	49.7 E	38.1	ND	63.7 E	ND	ND	ND	ND	ND	18.6 E	16.9 E	35.7 E	9.65 E	33.8 E	ND	15.9 E	ND	NR
E26	ND	ND	20.9 E	79.1	70.1	19 E	138	10.1 E	ND	ND	ND	ND	62	38.4	160	37	85.3	ND	59.1	ND	NR
E25	ND	ND	ND	31.6 E	24.5	ND	37.7 E	ND	ND	ND	ND	ND	10.7 E	11.8 E	ND	ND	21.7 E	ND	9.31 E	ND	NR
E23	ND	ND	17.3 E	65.9	43.2	10 E	91.9 E	ND	ND	ND	ND	ND	19.5 E	14.1 E	44.5 E	12.4 E	35 E	ND	18.8 E	ND	NR
E20	ND	ND	12.7 E	45.3 E	32	ND	63.7 E	ND	ND	ND	ND	ND	ND	10.7 E	28.5 E	ND	27.5 E	ND	ND	ND	NR
E17[a]	ND	ND	16.1 E	49.3 E	37.4	ND	56.3 E	ND	ND	ND	ND	ND	12.2 E	12.5 E	28.6 E	ND	20.6 E	ND	10.5 E	ND	NR
E14[a]	ND	ND	9.3 E	32.2 E	24.2	ND	49.2 E	ND	ND	ND	ND	ND	11.1 E	ND	22.1 E	ND	22.5 E	ND	10.8 E	ND	NR
E11[a]	ND	ND	14.3 E	53.1 E	36.8	ND	72.4 E	ND	ND	ND	ND	ND	15.8 E	12.7 E	28.8 E	9.64 E	28.3 E	ND	13.2 E	ND	NR
E8	ND	ND	19.7 E	68.1	47.3	10.4 E	76.9 E	ND	ND	ND	ND	ND	16.3 E	14.9 E	32.3 E	ND	30.7 E	ND	11.2 E	ND	NR
E5	ND	ND	20.1 E	71.9	55.4	10.6 E	82.4 E	ND	ND	ND	ND	ND	20.6 E	21.9 E	41.6 E	13.6 E	39.7	ND	15.8 E	ND	NR
E2	19.9 E	ND	53.2	190	160	39.9 E	290	22 E	ND	19.5 E	10.5 E	ND	51.5	38.9	100	31.8	97	ND	36.7	ND	NR
116-m Depth Contour																					
B10	ND	ND	21.1 E	68.6	54.7	16.6 E	87.9 E	9.6 E	ND	ND	ND	ND	15.4 E	15.5 E	32.7 E	10.3 E	34.3 E	ND	14.8 E	ND	NR
E21	ND	ND	14.5 E	51.7 E	36.2	ND	73.2 E	ND	ND	ND	ND	ND	14.8 E	10.4 E	26.6 E	ND	26.6 E	ND	13.7 E	ND	NR
E15[a]	ND	ND	15 E	53 E	39	9.4 E	76 E	ND	ND	ND	ND	ND	18 E	14 E	41 E	11 E	35 E	ND	32	ND	NR
E9	11.1 E	ND	32 E	100	79.4	19.4 E	150	15.2 E	ND	11.4 E	ND	ND	27.4 E	20.5 E	53.5	14.9 E	47.8	ND	ND	ND	NR
E3	37.9	ND	89	330	310	66.5	440	41.5	8.84 E	36.5	18.4 E	ND	72.1	63.9	190	46.4	140	ND	50	8.72 E	NR
DR (%)	18	0	95	100	100	64	100	41	5	23	14	0	95	95	95	68	100	0	91	5	NR

[a] Near-ZID station

Appendix B.15 *continued*

Summer 2020	tPCB	PCB Congener 18	28	37	44	49	52	66	70	74	77	81	87	99	101	105	110	114	118	119
88-m Depth Contour																				
B11	421.1	ND	ND	ND	ND	ND	11.9 E	14.4 E	10.7 E	ND	ND	ND	11.2 E	19.5 E	24.3 E	15.9 E	26.8 E	ND	37.2 E	ND
B8	976.22	ND	ND	ND	10.4 E	19 E	18.3 E	30.8 E	22.1 E	9.82 E	ND	ND	17.2 E	40.8 E	54.6	30.5 E	56.6 E	ND	65.2 E	ND
E19	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
E7	943.4	ND	ND	ND	12.3 E	19.1 E	27.2 E	25.8 E	23.1 E	ND	ND	ND	22.6 E	41.6 E	67.6	31.2 E	67.2 E	ND	68.5 E	ND
E1	4027	12.8 E	ND	ND	54.8 E	76.9 E	130	92	96	34.3 E	ND	ND	120	170	340	130 E	320	ND	300	24.3 E
98-m Depth Contour																				
B12	318.3	ND	ND	ND	ND	ND	ND	11.2 E	ND	ND	ND	ND	ND	15.8 E	23.7 E	11.3 E	22.5 E	ND	27.5 E	ND
B9	492.85	ND	ND	ND	ND	13.3 E	NA	18.5 E	10.7 E	ND	ND	ND	10.2 E	25.9 E	34.2 E	16.5 E	31.2 E	ND	39.8 E	ND
E26	664.6	ND	ND	ND	ND	ND	13.3 E	18.3 E	13.4 E	ND	ND	ND	14.9 E	28.4 E	45.1 E	18.5 E	45.3 E	ND	49.7 E	ND
E25	310.69	ND	ND	ND	ND	11.8 E	11.6 E	15.1 E	9.99 E	ND	ND	ND	ND	16.6 E	25 E	11.2 E	21.7 E	ND	30.4 E	ND
E23	215.7	ND	ND	ND	ND	ND	ND	10.6 E	ND	ND	ND	ND	ND	12.9 E	16.6 E	ND	15.6 E	ND	22.6 E	ND
E20	276.8	ND	11.9 E	ND	ND	ND	ND	ND	13.5 E	ND	ND	ND	ND	14.3 E	17.8 E	ND	20.3 E	ND	26.8 E	ND
E17[a]	177.68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.54 E	14 E	ND	13.9 E	ND	19.9 E	ND
E14[a]	94.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.4 E	ND	9.5 E	ND	13.7 E	ND
E11[a]	262.7	ND	ND	ND	ND	ND	10.6 E	ND	ND	ND	ND	ND	ND	13.1 E	21.1 E	11.1 E	22.2 E	ND	27.1 E	ND
E8	490	ND	ND	ND	ND	11.1 E	NA	16.4 E	10.5 E	ND	ND	ND	ND	25.4 E	33.1 E	17.1 E	33.4 E	ND	41.7 E	ND
E5	1148.53	ND	ND	ND	14.4 E	25.7 E	31 E	28.7 E	24.1 E	ND	ND	ND	24.5 E	57.1 E	79.2	30.4 E	73.6 E	ND	79.3 E	ND
E2	2404.8	10.8 E	20.2 E	ND	30.5 E	51.9 E	67.4 E	59 E	51 E	17.3 E	ND	ND	59 E	110	190	70.9 E	190	ND	180	16.7 E
116-m Depth Contour																				
B10	167.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3 E	12.8 E	ND	13.5 E	ND	19.4 E	ND
E21	789.4	ND	ND	ND	26.2 E	ND	57.5 E	18.1 E	34.2 E	ND	ND	ND	38.5	34.3 E	82.7	35.7 E	87.1	ND	80.5	ND
E15[a]	342.2	ND	ND	ND	ND	ND	15.7 E	11 E	10.5 E	ND	ND	ND	10.8 E	14.7 E	30.5 E	13.1 E	30.6 E	ND	29.8 E	ND
E9	1402.34	9.14 E	ND	ND	30.3 E	33.1 E	59.1 E	37.4 E	44.5 E	17.4 E	ND	ND	42.8 E	60.1	120	58.1 E	110	ND	100	ND
E3	4563.3	49.2 E	61.3 E	13.1 E	120	120	220	150	170	64.2 E	13.6 E	ND	140	180	390	140	410	ND	330	24.1 E
DR (%)	100	19	14	5	38	48	68	76	71	24	5	0	57	95	100	76	100	0	100	14

[a] Near-ZID station

Appendix B.15 *continued*

Summer	PCB Congener																				
2020	**123**	**126**	**128**	**138**	**149**	**151**	**153/168**	**156**	**157**	**158**	**167**	**169**	**170**	**177**	**180**	**183**	**187**	**189**	**194**	**201**	**206**
88-m Depth Contour																					
B11	ND	ND	ND	55.3 E	33.8 E	ND	67.6 E	ND	ND	ND	ND	ND	16.7 E	12.1 E	25.1 E	ND	25.9 E	ND	12.7 E	ND	ND
B8	ND	ND	29.9 E	89.2	56.8 E	15.3 E	133 E	11.4 E	ND	ND	ND	ND	31 E	22.6 E	57.1	17.4 E	51.4	ND	26.6 E	ND	59.2 E
E19	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
E7	ND	ND	25.7 E	89.4	58.2 E	14.9 E	125 E	10.9 E	ND	10 E	ND	ND	29.6 E	19.9 E	62.7	18.9 E	45.9	ND	26.1 E	ND	NR
E1	28.2 E	ND	96	370	260	69.7	520	43.9 E	10.2 E	42 E	20.5 E	ND	87.9	58	190	59.9	140	ND	55.8 E	10 E	63.8 E
98-m Depth Contour																					
B12	ND	ND	ND	41.8 E	35.2 E	12 E	56.5 E	ND	ND	ND	ND	ND	10.7 E	12.5 E	15.5 E	ND	22.1 E	ND	ND	ND	NR
B9	ND	ND	17.9 E	58 E	37 E	ND	72.7 E	ND	ND	ND	ND	ND	15.5 E	13.4 E	28.7 E	9.65 E	26.7 E	ND	13 E	ND	NR
E26	ND	ND	22.6 E	72.8	52.5 E	11.7 E	101 E	9.6 E	ND	ND	ND	ND	24 E	15 E	49.8	11.7 E	29.4 E	ND	17.6 E	ND	NR
E25	ND	ND	12.4 E	40.9 E	24.6 E	ND	35 E	ND	ND	ND	ND	ND	ND	ND	23.6 E	ND	20.8 E	ND	ND	ND	NR
E23	ND	ND	ND	31.3 E	22.1 E	ND	38.4 E	ND	ND	ND	ND	ND	11.8 E	ND	17.2 E	ND	16.6 E	ND	ND	ND	NR
E20	ND	ND	ND	32.8 E	24 E	ND	43.4 E	ND	ND	ND	ND	ND	13.3 E	ND	27.1 E	ND	17.5 E	ND	14.1 E	ND	ND
E17 [a]	ND	ND	9.13 E	25.3 E	17.3 E	ND	33.2 E	ND	ND	ND	ND	ND	9.41 E	ND	14.2 E	ND	11.8 E	ND	ND	ND	ND
E14 [a]	ND	ND	ND	17.1 E	12.3 E	ND	21.4 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	9.2 E	ND	ND	ND	ND
E11 [a]	ND	ND	10.1 E	34.1 E	22.7 E	ND	45.1 E	ND	ND	ND	ND	ND	11.8 E	ND	15.9 E	ND	17.8 E	ND	ND	ND	ND
E8	ND	ND	17.8 E	58.7 E	38.6 E	9.3 E	79.7 E	ND	ND	ND	ND	ND	ND	13.4 E	29.6 E	10.4 E	30 E	ND	13.8 E	ND	NR
E5	9.83 E	ND	30.7 E	100	91.2 E	19.7 E	162 E	11.7 E	ND	11.2 E	ND	ND	31 E	24.6 E	73.6	22.2 E	63.2	ND	29.6 E	ND	NR
E2	21 E	ND	63.5	220	150	37.9 E	310	25.8 E	ND	24.8 E	13.2 E	ND	51.9	39.4 E	110	35.2	95	ND	34.3 E	ND	48.1 E
116-m Depth Contour																					
B10	ND	ND	ND	30.6 E	19.3 E	ND	35.7 E	ND	ND	ND	ND	ND	ND	ND	9.46 E	ND	16.2 E	ND	ND	ND	ND
E21	ND	ND	19 E	67.1 E	50.3 E	12.1 E	76.4 E	11.7 E	ND	11.9 E	ND	ND	11.6 E	ND	21.3 E	ND	13.2 E	ND	ND	ND	ND
E15 [a]	ND	ND	14 E	40 E	29.3 E	ND	50.5 E	ND	ND	ND	ND	ND	10.3 E	ND	15.8 E	ND	15.6 E	ND	ND	ND	ND
E9	10.9 E	ND	34.9 E	120	84.7 E	21.9 E	165 E	14.6 E	ND	13.8 E	ND	ND	34.9 E	22.5 E	60.4	19.6 E	53.1	ND	24.1 E	ND	NR
E3	31.2 E	ND	96	360	280	67.6	470	40.2 E	10.1 E	39.6 E	19.6 E	ND	76.5	51.8 E	160	45	120	ND	48.4 E	ND	51.8 E
DR (%)	24	0	71	100	100	52	100	43	10	33	14	0	81	57	95	48	100	0	57	5	33

[a] Near-ZID station

Appendix B.16

Concentrations of PCBs (ppt) detected in sediments from SBOO stations sampled during 2020. See Appendix B.1 for MDLs; DR = detection rate; E = estimated; ND = not detected; NR = not reportable.

Winter 2020	tPCB	PCB Congener 18	28	37	44	49	52	66	70	74	77	81	87	99	101	105	110	114	118	119
19-m Stations																				
I35	490.9	ND	ND	ND	11 E	10.1 E	22 E	12.4 E	17 E	ND	ND	ND	19.9 E	27.2	45.7 E	24.4 E	49.2	ND	46	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	163.85	16.6 E	17.9 E	18.1 E	12.1 E	11.8 E	13.7 E	11.5 E	10.3 E	11.1 E	ND	ND	ND	ND	9.95 E	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	9.43	ND	ND	ND	ND	ND	ND	9.43 E	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	494.17	14.1 E	16.6 E	16.7 E	14.3 E	15.9 E	16.8 E	18 E	14.8 E	14 E	9.11 E	ND	11.4 E	18.6 E	21.7 E	ND	16.8 E	ND	17.8 E	10.1 E
I30	30.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	131.14	12.3 E	ND	10.4 E	14.5 E	13.6 E	16.8 E	11.7 E	11.6 E	ND	ND	ND	ND	ND	9.51 E	ND	ND	ND	ND	ND
I22	59.21	12.2 E	ND	9.04 E	9.1 E	9.63 E	10.7 E	8.54 E	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]	350.86	10.5 E	13.8 E	9.29 E	14 E	13 E	17.6 E	13.4 E	15 E	10.4 E	ND	ND	14.5 E	14.6 E	26.1 E	10.4 E	26 E	ND	22.9	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	25.63	ND	ND	ND	8.83 E	ND	8.42 E	8.38 E	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	455.1	13.7 E	15.5 E	ND	ND	14.8 E	15.1 E	14.2 E	10.5 E	ND	ND	ND	ND	20.5 E	26.9 E	ND	22.7 E	ND	27.7	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	1211.22	ND	ND	9.72 E	13.8 E	35.7	27 E	30.7	21.8	11.4 E	ND	ND	20.6 E	70.3	69.1	34.7 E	62.3	ND	77.5	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 (%)	41	22	15	22	30	30	33	37	26	15	4	0	15	19	26	11	19	0	19	4

[a] Near-ZID station

Appendix B.16 *continued*

Winter 2020	PCB Congener																				
	123	126	128	138	149	151	153/168	156	157	158	167	169	170	177	180	183	187	189	194	201	206
19-m Stations																					
I35	ND	ND	14 E	44.5 E	43.7	ND	86.2 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	17.6 E	ND	ND	ND	NR
I34	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	10 E	ND	20.8 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR
I23	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	NR
I10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR
I4	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	9.46 E	23.8 E	28.6	11.3 E	65.8 E	ND	ND	ND	ND	ND	ND	11.6 E	26.7 E	10.1 E	30.6 E	ND	29.5	ND	NR
I30	ND	ND	ND	ND	10.1 E	ND	20.7 E	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	ND	9.93 E	ND	20.8 E	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
I14[a]	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	27.3 E	22	9.94 E	35.1 E	ND	ND	ND	ND	ND	ND	ND	15.3 E	ND	9.73 E	ND	ND	ND	NR
I15	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
I9	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
I2	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
38-m Stations																					
I29	ND	ND	13.6 E	40 E	40.4	ND	91.6 E	ND	ND	ND	ND	ND	12.9 E	12.8 E	25.7 E	ND	24.3 E	ND	12.2 E	ND	NR
I21	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
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR
55-m Stations																					
I28	14.4 E	ND	32.4 E	92	120	18.4 E	230	16.8 E	ND	16.9 E	9.6 E	ND	24.4 E	21.5 E	47.5	17 E	45.3	ND	20.4 E	ND	NR
I20	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	NR
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	4	0	15	19	30	11	30	4	0	4	4	0	7	11	15	7	19	0	11	0	0

[a] Near-ZID station

Appendix B.16 *continued*

Summer 2020	tPCB	PCB Congener																	
		18	28	37	44	49	52	66	70	74	77	81	87	99	101	105	110	114	118	119
19-m Stations																				
I35	619.5	ND	ND	ND	NR	16.2 E	36.1 E	18.7 E	22.5 E	ND	ND	ND	26.9 E	28.5 E	63.1	20.3 E	59.4 E	ND	59.5 E	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	18.59	ND	ND	ND	ND	9.13 E	NR	ND	ND	ND	ND	ND	ND	ND	9.46 E	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	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations																				
I33	399.45	ND	11.7 E	ND	NR	14 E	NR	18 E	NR	ND	ND	ND	10.1 E	18.4 E	28.2 E	ND	21.5 E	ND	24.3 E	ND
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	130.5	NR	13.9 E	9.9 E	NR	13.1 E	NR	12.5 E	NR	ND	ND	ND	ND	12.6 E	18.3 E	ND	10.8 E	ND	10.8 E	ND
I22	48.31	ND	ND	ND	ND	9.91 E	13.5 E	11.2 E	13.7 E	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	472.7	ND	ND	ND	NR	14.9 E	NR	17.1 E	NR	ND	ND	ND	12 E	21 E	34 E	10.9 E	27 E	ND	33.6 E	ND
I21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	18.28	ND	9.34 E	ND	8.94 E	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	1880.76	ND	ND	ND	30.7 E	32.1 E	77.8 E	26 E	43.3 E	10.9 E	ND	ND	61.8 E	65.6	140	50.5 E	150	ND	130	ND
I20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	19.24	NR	ND	ND	NR	10.8 E	NR	8.44 E	NR	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 (%)	33	0	11	4	9	30	14	26	13	4	0	0	15	19	22	11	19	0	19	0

[a] Near-ZID station

Appendix B.16 *continued*

Summer 2020	PCB Congener																				
	123	126	128	138	149	151	153/168	156	157	158	167	169	170	177	180	183	187	189	194	201	206
19-m Stations																					
I35	ND	ND	12.1 E	58.7 E	44.6 E	NR	77 E	ND	ND	ND	ND	ND	13.4 E	9.5 E	23.4 E	ND	18.5 E	ND	11.1 E	ND	ND
I34	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
I23	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
I10	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
28-m Stations																					
I33	ND	ND	ND	ND	NR	ND	51.6 E	ND	ND	ND	ND	ND	10.3 E	9.65 E	53.4	10.9 E	33 E	ND	38.6 E	ND	45.8 E
I30	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	10.4 E	NR	ND	18.2 E	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
I14[a]	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
I15	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
I9	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
I2	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
38-m Stations																					
I29	ND	ND	11.7 E	48.5 E	36 E	10.7 E	74.1 E	ND	ND	ND	ND	ND	17.2 E	12.3 E	37.8 E	11.1 E	26.5 E	ND	16.3 E	ND	ND
I21	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
I8	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	12.3 E	ND	35.6 E	130	150	43.8	189 E	16.6 E	ND	16.9 E	8.86 E	ND	62.2	43 E	160	41.4	100	ND	52.4 E	ND	NR
I20	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	NR	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
DR (%)	4	0	11	15	13	8	19	4	0	4	4	0	15	15	15	11	15	0	15	0	4

[a] Near-ZID station

Appendix B.17

Concentrations of PCBs (ppt) detected in sediments from the San Diego regional benthic stations sampled during summer 2020. See Appendix B.1 for MDLs; E = estimated; ND = not detected; NR = not reportable.

	Station	Depth (m)	tPCB	PCB Congener										
				8	18	28	37	44	49	52	66	70	74	77
Inner Shelf	8929	7	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8944	7	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8946	15	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8915	16	180.8	ND	ND	ND	ND	ND	ND	8.7 E	10.4 E	ND	ND	ND
	8907	18	ND	ND	NR	ND	ND	ND	ND	NR	ND	ND	ND	ND
	8943	19	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8914	20	137	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8911	24	29.21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8938	28	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8901	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	8913	31	38.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8906	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8939	65	87.68	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8903	66	148.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8912	67	13650.8	ND	37.5 E	43.4	10.8 E	290	370	800	250	420	77.9	23.9 E
	8925	67	1100.1	NR	ND	20.1 E	ND	12.4 E	23.9 E	22.7 E	35.7 E	20.9 E	12 E	ND
	8919	68	1612.2	NR	18 E	31.4 E	ND	23.6 E	42.6 E	40.3 E	52.8 E	33.3 E	16.6 E	ND
	8909	73	4005.7	ND	12.9 E	23.1 E	ND	48.4 E	92	130	88.9	84.9	25.3 E	12.1 E
	8931	74	816.9	NR	ND	18 E	ND	10.8 E	22.1 E	19.6 E	32.2 E	20.1 E	ND	ND
	8933	80	775.2	NR	ND	ND	ND	ND	19 E	18.3 E	28.8 E	19.3 E	ND	ND
	8930	83	901.6	NR	ND	19.2 E	ND	ND	ND	26.9 E	35.1 E	27.9 E	11.8 E	ND
	8949	83	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	8924	85	943.67	NR	ND	15.5 E	ND	11.6 E	24.5 E	23.9 E	33 E	20.2 E	ND	ND
	8926	87	493.04	NR	ND	ND	ND	ND	10.9 E	NR	18.4 E	9.84 E	ND	ND
	8932	89	1050.5	NR	ND	18.7 E	10.7 E	15 E	27.3 E	28 E	37 E	25.9 E	13.3 E	12.5 E
	8940	108	57.43	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8921	116	311	NR	ND	ND	ND	ND	ND	ND	12 E	4.5 E	ND	ND
Outer Shelf	8905	134	1460.32	ND	ND	14 E	ND	18 E	29 E	34.5 E	33 E	24 E	10.4 E	ND
	8937	137	608.93	NR	ND	ND	ND	9.33 E	10.7 E	19.8 E	16.2 E	15 E	ND	ND
	8910	169	8336.7	NR	29 E	62.7	ND	140	190	330	220	210	68.6	21.9 E
	8922	185	1754.9	NR	ND	16.1 E	ND	18.9 E	33.2 E	38 E	41.4 E	34.1 E	14.4 E	ND
	8916	189	6152.3	NR	ND	38.4 E	17.5 E	51 E	97.8	110	120	97.5	42.9 E	25.3 E
	8908	194	3047.9	ND	ND	25.5 E	11.4 E	39.5 E	53.6	82.4 E	61.6 E	66.6 E	23.6 E	14.4 E
Upper Slope	8928	223	1807	NR	ND	19.2 E	ND	20.2 E	39 E	46.4 E	47.7 E	40.3 E	15.4 E	ND
	8920	270	1392.2	NR	ND	19.4 E	ND	ND	ND	34.7 E	46 E	32.8 E	15.8 E	12.4 E
	8936	292	1381	NR	ND	ND	ND	17.4 E	27.1 E	30.1 E	42.6 E	32.2 E	17.6 E	ND
	8927	460	1224.7	NR	ND	19.2 E	ND	23.9 E	35.4 E	40.2 E	47.2 E	35.5 E	18.7 E	ND
	8934	491	1650	NR	ND	ND	ND	31.9 E	45.7 E	52.2 E	55.3 E	46.5 E	21.9 E	ND
	8923	523	1113.6	NR	ND	17.4 E	ND	18.7 E	33.2 E	34.4 E	38.7 E	28.9 E	14.7 E	ND
Detection Rate (%)			77	0	11	44	10	46	51	59	62	59	44	18

Appendix B.17 *continued*

	Station	Depth (m)	PCB Congener									
			81	87	99	101	105	110	114	118	119	123
Inner Shelf	8929	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8944	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8946	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8915	16	ND	ND	14.2 E	18.6 E	ND	16.4 E	ND	14.3 E	ND	ND
	8907	18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8943	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8914	20	ND	ND	11.1 E	13.6 E	ND	12.9 E	ND	16.4 E	ND	ND
	8911	24	ND	ND	ND	ND	ND	ND	ND	9.61 E	ND	ND
	8938	28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8901	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	8913	31	ND	ND	ND	ND	ND	ND	ND	9.51 E	ND	ND
	8906	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8939	65	ND	ND	ND	12.9 E	ND	9.18 E	ND	12.7 E	ND	ND
	8903	66	ND	ND	ND	10.5 E	ND	9.68 E	ND	13.2 E	ND	ND
	8912	67	ND	500	600	1400	430	1600	22.6 E	1300	71.4	100
	8925	67	ND	19 E	52.3 E	63	32.8 E	65.2 E	ND	73.5 E	ND	ND
	8919	68	ND	30.8 E	78.5	100	43.1 E	100	ND	120	ND	11.3 E
	8909	73	ND	110	180	340	110	370	ND	360	22.1 E	33.4 E
	8931	74	ND	ND	36.7 E	44.6 E	24.3 E	44.7 E	ND	68.3 E	ND	ND
	8933	80	ND	17.8 E	37 E	44.9 E	24.8 E	44.6 E	ND	60.6 E	ND	ND
	8930	83	ND	19.8 E	32.6 E	53.2 E	28.5 E	60	ND	71.6 E	ND	11.1 E
	8949	83	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	8924	85	ND	17.3 E	44.5 E	60.9	27.7 E	59.3 E	ND	76.6 E	ND	ND
	8926	87	ND	ND	28 E	25.9 E	15.1 E	30.9 E	ND	39.3 E	ND	ND
	8932	89	ND	24.2 E	47.6 E	60	33.3 E	59.2 E	ND	78.2 E	ND	12.4 E
	8940	108	ND	ND	ND	9.12 E	ND	ND	ND	10.3 E	ND	ND
	8921	116	ND	4.9 E	19 E	25 E	11 E	22 E	ND	29 E	ND	ND
Outer Shelf	8905	134	ND	29.6 E	63.7	88.3	41.9 E	110	ND	110	ND	12.5 E
	8937	137	ND	21.2 E	29 E	54.7	23.1 E	57.8 E	ND	52.7 E	ND	ND
	8910	169	ND	200	420	710	190	700	ND	670	38.4 E	58.5 E
	8922	185	ND	38.1 E	75.3	110	55.3 E	120	ND	120	ND	12.5 E
	8916	189	ND	140	230	390	180	440	ND	490	25.4 E	46.5 E
	8908	194	ND	82.1	120	210	97.5	250	ND	260	ND	25.7 E
Upper Slope	8928	223	ND	40.1 E	72.2	120	60.9 E	110	ND	140	ND	15.3 E
	8920	270	ND	27.4 E	52.4 E	81.8	48.5 E	89.8	ND	116	ND	14.6 E
	8936	292	ND	30.2 E	60.7 E	89.3	46.7 E	84.2 E	ND	100	ND	11.3 E
	8927	460	ND	34.6 E	54.6 E	90.2	48 E	88.2 E	ND	97.8 E	ND	ND
	8934	491	ND	45.4 E	78.9 E	122	60.6 E	124 E	ND	127 E	ND	ND
	8923	523	ND	28 E	45.1 E	72.7	45.8 E	72.3 E	ND	90.4 E	ND	ND
Detection Rate (%)			0	54	64	72	59	69	3	77	10	33

Appendix B.17 *continued*

	Station	Depth (m)	PCB Congener									
			126	128	138	149	151	153/168	156	157	158	167
Inner Shelf	8929	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8944	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8946	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8915	16	ND	ND	20.5 E	19.4 E	ND	32.5 E	ND	ND	ND	ND
	8907	18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8943	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8914	20	ND	ND	23.6 E	16.1 E	ND	30.1 E	ND	ND	ND	ND
	8911	24	ND	ND	ND	NR	ND	19.6 E	ND	ND	ND	ND
	8938	28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8901	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	8913	31	ND	ND	ND	10.2 E	ND	18.4 E	ND	ND	ND	ND
	8906	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8939	65	ND	ND	16.7 E	12.5 E	ND	23.7 E	ND	ND	ND	ND
	8903	66	ND	ND	23 E	17.4 E	ND	29.3 E	ND	ND	ND	ND
	8912	67	ND	310	1100	930	180	1300	150	38.3 E	140	57 E
	8925	67	ND	31 E	100	80.2 E	18.2 E	149 E	12.1 E	ND	10.7 E	ND
	8919	68	ND	41 E	140	94.8 E	21.7 E	194 E	16.7 E	ND	14.8 E	ND
	8909	73	ND	110	380	300	66.9	490	48.4 E	ND	41.6 E	20.5 E
	8931	74	ND	27.1 E	87.2	53.4 E	12.3 E	83.9 E	ND	ND	ND	ND
	8933	80	ND	26.1 E	89	53.1 E	12.1 E	78.2 E	ND	ND	ND	ND
	8930	83	ND	ND	82	62.8 E	17.1 E	112 E	13.3 E	ND	12 E	ND
	8949	83	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	8924	85	ND	29.4 E	91.1	69.3 E	15 E	89.4 E	9.59 E	ND	9.58 E	ND
	8926	87	ND	14.7 E	53.6 E	34 E	ND	76.1 E	ND	ND	ND	ND
	8932	89	ND	34.2 E	100	71.8 E	18.9 E	103 E	11 E	ND	ND	ND
	8940	108	ND	ND	9.61 E	10.2 E	ND	18.2 E	ND	ND	ND	ND
	8921	116	ND	12 E	38 E	27 E	ND	50 E	ND	ND	ND	ND
Outer Shelf	8905	134	ND	49.7 E	160	140	31.8 E	210 E	13.9 E	ND	11 E	9.62 E
	8937	137	ND	22 E	70.8	49.2 E	10.5 E	81.8 E	ND	ND	ND	ND
	8910	169	ND	180	680	640	120	1100	69.7 E	ND	66 E	34.4 E
	8922	185	ND	48.6 E	180	118 E	29.6 E	249 E	19.7 E	ND	13.4 E	ND
	8916	189	ND	190	630	530	120	870	71.5 E	ND	ND	36.6 E
	8908	194	ND	82.4	290	250	56.3 E	400	30.4 E	11.7 E	20.7 E	17.3 E
Upper Slope	8928	223	ND	51 E	180	128 E	35 E	165 E	18.4 E	ND	13.7 E	11.7 E
	8920	270	ND	45 E	150	113 E	30.6 E	186	ND	ND	ND	ND
	8936	292	ND	45.3 E	140	94.2 E	22.6 E	183 E	13.5 E	ND	ND	ND
	8927	460	ND	34.9 E	126	91.4 E	20.8 E	93.7 E	ND	ND	ND	ND
	8934	491	ND	43.5 E	160	109 E	26.5 E	202 E	ND	ND	ND	ND
	8923	523	ND	32.3 E	114	80.8 E	18.6 E	83.6 E	ND	ND	ND	ND
Detection Rate (%)			0	56	72	76	54	77	36	5	28	18

Appendix B.17 *continued*

	Station	Depth (m)	PCB Congener										
			169	170	177	180	183	187	189	194	195	201	206
Inner Shelf	8929	7	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
	8944	7	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8946	15	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
	8915	16	ND	ND	ND	14.2 E	ND	11.6 E	ND	ND	ND	ND	ND
	8907	18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8943	19	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
	8914	20	ND	ND	ND	ND	ND	13.2 E	ND	ND	ND	ND	ND
	8911	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8938	28	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
	8901	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mid Shelf	8913	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8906	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8939	65	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
	8903	66	ND	9.22 E	ND	20.1 E	ND	16.1 E	ND	ND	ND	ND	ND
	8912	67	ND	180	130	320	92.6	210	ND	85	ND	NR	80.4 E
	8925	67	ND	35.2 E	24.7 E	73.9	22.2 E	58.6	ND	30.8 E	NR	ND	NR
	8919	68	ND	38.2 E	27.1 E	72.3	23.6 E	63	ND	29.1 E	NR	ND	93.6
	8909	73	ND	83.6	49.4 E	170	42.4	110	ND	NR	ND	ND	49.8 E
	8931	74	ND	33.2 E	22.7 E	60.4	18.4 E	46.3	ND	30.6 E	NR	ND	NR
	8933	80	ND	31.5 E	23 E	55.5	16.6 E	48.4	ND	26.6 E	NR	ND	NR
	8930	83	ND	30.6 E	22.5 E	57.1 E	20.2 E	49.2 E	ND	25.1 E	NR	ND	NR
	8949	83	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	8924	85	ND	32.6 E	22.9 E	66.2	19.4 E	49.3	ND	24.9 E	NR	ND	NR
	8926	87	ND	20.5 E	13.9 E	40.9 E	12 E	32.5 E	ND	16.5 E	NR	ND	NR
	8932	89	ND	32 E	26.8 E	51.4	18.9 E	53	ND	26.2 E	NR	ND	NR
	8940	108	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND
	8921	116	ND	11 E	ND	22 E	ND	19 E	ND	4.6 E	NR	ND	ND
Outer Shelf	8905	134	ND	36.1 E	29.5 E	65.4	14.2 E	70.2	ND	NR	ND	ND	NR
	8937	137	ND	12.1 E	11.8 E	16.8 E	ND	24.4 E	ND	ND	NR	ND	ND
	8910	169	ND	180	120	350	86.7	310	11.5 E	110	NR	19.3 E	NR
	8922	185	ND	44.9 E	39.2 E	76.3	24.7 E	92.7	ND	36.9 E	NR	ND	54.6 E
	8916	189	ND	170	120	340	81.4	310	ND	120	NR	20.5 E	NR
	8908	194	ND	65.3	56.5 E	110	29.9 E	130	ND	NR	ND	ND	73.5 E
Upper Slope	8928	223	ND	52.2	40.6 E	98.4	24.6 E	94.5	ND	40.7 E	NR	ND	66.5 E
	8920	270	ND	44.5 E	31.9 E	67.7 E	20.7 E	79	ND	32.2 E	NR	ND	NR
	8936	292	ND	32.1 E	32.9 E	65.1	14.4 E	76.6	ND	27.6 E	NR	ND	44.3 E
	8927	460	ND	28.3 E	26.1 E	42.9 E	ND	57 E	ND	20.7 E	NR	ND	49.4 E
	8934	491	ND	28.7 E	29.4 E	55.7 E	16.5 E	71.4	ND	34.9 E	NR	ND	61 E
	8923	523	ND	27.9 E	26.2 E	54.6 E	13.3 E	55.5	ND	25.1 E	NR	ND	41.4 E
Detection Rate (%)			0	62	56	64	51	67	3	53	0	5	36

Appendix B.18

Concentrations of PAHs (ppb) detected in sediments from PLOO stations sampled during 2020. See Appendix B.1 for MDLs; DR = detection rate; E = estimated; ND = not detected; NR = not reportable.

Winter 2020	tPAH	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	57.96	ND	ND	ND	ND	6.84 E	ND	ND	ND	ND	ND	ND
B8	31.16	ND	ND	ND	ND	6.1 E	ND	ND	ND	ND	ND	ND
E19	10.73	ND	ND	ND	ND	4.21 E	ND	ND	ND	ND	ND	ND
E7	22.86	ND	ND	ND	ND	6.98 E	ND	ND	ND	ND	ND	ND
E1	111.35	ND	ND	ND	ND	6.56 E	18.9	ND	ND	ND	ND	16.2
98-m Depth Contour												
B12	11.01	ND	ND	ND	ND	3.94 E	ND	ND	ND	ND	ND	ND
B9	32.5	ND	2.87 E	3.05 E	ND	8.35 E	ND	ND	2.45 E	ND	ND	ND
E26	15.61	ND	ND	ND	ND	6.68 E	ND	ND	ND	ND	ND	ND
E25	12.94	ND	ND	ND	ND	6.64 E	ND	ND	ND	ND	ND	ND
E23	15.95	ND	ND	ND	ND	6.1 E	ND	ND	ND	ND	ND	ND
E20	13.2	ND	ND	ND	ND	5.95 E	ND	ND	ND	ND	ND	ND
E17 [a]	13.81	ND	ND	ND	ND	5.74 E	ND	ND	ND	ND	ND	ND
E14 [a]	13.75	ND	ND	ND	ND	4.45 E	ND	ND	ND	ND	ND	ND
E11 [a]	10.76	ND	ND	ND	ND	5.37 E	ND	ND	ND	ND	ND	ND
E8	12.35	ND	ND	ND	ND	5.48 E	ND	ND	ND	ND	ND	ND
E5	26.59	ND	ND	ND	ND	6.96 E	ND	ND	ND	ND	ND	ND
E2	199.14	ND	ND	ND	ND	7.01 E	32.6	ND	5.59 E	ND	ND	26.5
116-m Depth Contour												
B10	11.02	ND	ND	ND	ND	5.11 E	ND	ND	ND	ND	ND	ND
E21	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
E9	13.88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
E3	146.73	ND	ND	ND	ND	4.41 E	25	ND	2.98 E	ND	ND	17.6
DR (%)	91	0	5	5	0	86	14	0	14	0	0	14
ERL [b]	4022	—	—	70	—	—	—	16	44	85.3	261	430
ERM [b]	44,792	—	—	670	—	—	—	500	640	1100	1600	1600

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.18 *continued*

Winter 2020	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	8.1	11.2	ND	NR	4.22 E	ND	6.92 E	ND	9.64	3.49 E	ND	ND	7.55 E
B8	ND	6.3 E	ND	NR	3.96 E	ND	7.13 E	ND	ND	ND	ND	ND	7.67 E
E19	ND	ND	ND	NR	ND	ND	2.7 E	ND	ND	ND	ND	ND	3.82 E
E7	ND	ND	ND	NR	ND	ND	4.87 E	ND	5 E	ND	ND	ND	6.01 E
E1	10.8	12.5	7.42	NR	ND	ND	10.9	ND	9.53	ND	ND	7.04 E	11.5
98-m Depth Contour													
B12	ND	ND	ND	NR	ND	ND	2.97 E	ND	ND	ND	ND	ND	4.1 E
B9	ND	ND	ND	NR	ND	ND	5.49 E	ND	ND	5.06 E	ND	ND	5.23 E
E26	ND	ND	ND	NR	ND	ND	4.21 E	ND	ND	ND	ND	ND	4.72 E
E25	ND	ND	ND	NR	ND	ND	2.92 E	ND	ND	ND	ND	ND	3.38 E
E23	ND	ND	ND	NR	ND	ND	4.85 E	ND	ND	ND	ND	ND	5 E
E20	ND	ND	ND	NR	ND	ND	3.85 E	ND	ND	ND	ND	ND	3.4 E
E17[a]	ND	ND	ND	NR	ND	ND	4.07 E	ND	ND	ND	ND	ND	4 E
E14[a]	ND	ND	ND	NR	ND	ND	5.18 E	ND	ND	ND	ND	ND	4.12 E
E11[a]	ND	ND	ND	NR	ND	ND	1.88 E	ND	ND	ND	ND	ND	3.51 E
E8	ND	ND	ND	NR	ND	ND	3.36 E	ND	ND	ND	ND	ND	3.51 E
E5	5.73	ND	4.61 E	NR	5 E	ND	ND	ND	ND	ND	ND	ND	4.29 E
E2	16.3	16.7	12	NR	16	ND	17	ND	13.9	3.94 E	7.52	6.38 E	17.7
116-m Depth Contour													
B10	ND	ND	ND	NR	ND	ND	2.82 E	ND	ND	ND	ND	ND	3.09 E
E21	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
E15[a]	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
E9	ND	ND	ND	NR	4.05 E	ND	3.67 E	ND	ND	ND	ND	ND	6.16 E
E3	14.4	13.9	10.2	NR	9.81	ND	12.8	ND	11.7	ND	ND	9.73	14.2
DR (%)	23	23	18	NR	27	0	86	0	23	14	5	14	91
ERL[b]	—	—	—	—	384	63.4	600	19	—	160	—	240	665
ERM[b]	—	—	—	—	2800	260	5100	540	—	2100	—	1500	2600

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.18 *continued*

Summer 2020	tPAH	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	25.43	ND	ND	ND	ND	8.21 E	ND	ND	ND	ND	ND	ND
B8	29.56	ND	ND	ND	ND	9.11 E	ND	ND	ND	ND	ND	ND
E19	75.71	3.61 E	6.27 E	7.24	ND	17.1	ND	8.46 E	8.27 E	ND	ND	ND
E7	141.28	5.34 E	ND	ND	ND	9.02	13.5	5.98 E	5.01 E	7.24 E	ND	11.5
E1	93.41	ND	ND	ND	ND	9	16.7	ND	ND	ND	ND	12.8
98-m Depth Contour												
B12	38.61	ND	6.6	6.23 E	ND	8.11 E	ND	3 E	2.57 E	ND	ND	ND
B9	23.08	ND	ND	ND	ND	7.36 E	ND	ND	ND	ND	ND	ND
E26	134.93	5.22 E	ND	ND	ND	8.45 E	12.1	ND	4.26 E	5.7 E	ND	11
E25	12.78	ND	ND	ND	ND	5.86 E	ND	ND	ND	ND	ND	ND
E23	11.03	ND	ND	ND	ND	6.67 E	ND	ND	ND	ND	ND	ND
E20	44.78	ND	ND	ND	ND	8.07 E	ND	ND	2.73 E	ND	ND	ND
E17 [a]	14.05	ND	ND	ND	ND	9.4	ND	ND	ND	ND	ND	ND
E14 [a]	15.37	ND	ND	ND	ND	7.82 E	ND	ND	ND	ND	ND	ND
E11 [a]	26.4	ND	ND	ND	ND	8.03 E	ND	1.73 E	ND	ND	ND	ND
E8	9.92	ND	ND	ND	ND	5.91 E	ND	ND	ND	ND	ND	ND
E5	16.88	ND	ND	ND	ND	6.9 E	ND	ND	ND	ND	ND	ND
E2	111.13	ND	ND	ND	ND	8.79	17.4	ND	4.14 E	6.81 E	ND	11.7
116-m Depth Contour												
B10	21.43	ND	ND	ND	ND	8.18 E	ND	ND	ND	ND	ND	ND
E21	20.04	ND	ND	ND	ND	9.58	ND	ND	ND	ND	ND	ND
E15 [a]	17.36	ND	ND	ND	ND	8.51	ND	ND	ND	ND	ND	ND
E9	22.2	ND	ND	ND	ND	4.24 E	ND	ND	ND	ND	ND	ND
E3	103.65	ND	ND	ND	ND	4.93 E	18.6	ND	ND	4.45 E	ND	13.1
DR (%)	100	14	9	9	0	100	23	18	27	18	0	23
ERL [b]	4022	—	—	70	—	—	—	16	44	85.3	261	430
ERM [b]	44,792	—	—	670	—	—	—	500	640	1100	1600	1600

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.18 *continued*

Summer 2020	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	6.32 E	ND	NR	ND	ND	5.15 E	ND	ND	ND	ND	ND	5.75 E
B8	ND	5.99 E	ND	NR	ND	ND	6.62 E	ND	ND	ND	ND	ND	7.84 E
E19	ND	ND	ND	NR	ND	ND	6.87 E	ND	ND	9.32	ND	ND	8.57
E7	10.1	11.8	11.7	NR	8.18	9.59	9.82	ND	10.7	ND	ND	ND	11.8
E1	9.35	12.2	ND	NR	6.58	ND	7.9	ND	9.07	ND	ND	ND	9.81
98-m Depth Contour													
B12	ND	ND	ND	NR	ND	ND	ND	ND	ND	9.06	ND	ND	3.04 E
B9	ND	ND	ND	NR	ND	ND	4.14 E	ND	ND	5.99 E	ND	ND	5.59 E
E26	11	13.4	9.84	NR	8.44	10.8	9.11	ND	11.7	3.97 E	ND	ND	9.94
E25	ND	ND	ND	NR	ND	ND	3.27 E	ND	ND	ND	ND	ND	3.65 E
E23	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	4.36 E
E20	ND	9.76	ND	NR	4.16 E	ND	4.77 E	ND	9.05	ND	ND	ND	6.24 E
E17 [a]	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	4.65 E
E14 [a]	ND	ND	ND	NR	ND	ND	3.28 E	ND	ND	ND	ND	ND	4.27 E
E11 [a]	ND	5.72 E	ND	NR	2.83 E	ND	3.58 E	ND	ND	ND	ND	ND	4.51 E
E8	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	4.01 E
E5	ND	ND	ND	NR	ND	ND	4.67 E	ND	ND	ND	ND	ND	5.31 E
E2	ND	9.47	9.11	NR	6.85	ND	12.3	ND	7.68	4.48 E	ND	ND	12.4
116-m Depth Contour													
B10	ND	ND	ND	NR	ND	ND	5.96 E	ND	ND	ND	ND	ND	7.29 E
E21	ND	ND	ND	NR	ND	ND	ND	ND	ND	5.99 E	ND	ND	4.47 E
E15 [a]	ND	ND	ND	NR	ND	ND	4.26 E	ND	ND	ND	ND	ND	4.59 E
E9	ND	5.94 E	ND	NR	ND	ND	3.64 E	ND	4.39 E	ND	ND	ND	3.99 E
E3	9.39	12.4	ND	NR	6.73 E	ND	8.9 E	ND	9.79	ND	ND	3.36 E	12
DR (%)	18	45	14	NR	32	9	77	0	32	27	0	5	100
ERL [b]	—	—	—	—	384	63.4	600	19	—	160	—	240	665
ERM [b]	—	—	—	—	2800	260	5100	540	—	2100	—	1500	2600

[a] Near-ZID station
[b] From Long et al. 1995

Appendix B.19

Concentrations of PAHs (ppb) detected in sediments from SBOO stations sampled during 2020. See Appendix B.1 for MDLs; DR = detection rate; E = estimated; ND = not detected; NR = not reportable.

Winter 2020	tPAH	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	17.82	ND	ND	ND	ND	6.01 E	ND	ND	ND	ND	ND	ND
I34	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
I23	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
I10	1.56	ND	ND	ND	ND	1.56 E	ND	ND	ND	ND	ND	ND
I4	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
I30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	24.62	ND	3.49 E	3.81 E	ND	5.56 E	ND	3.85 E	3.95 E	ND	ND	ND
I22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14[a]	3.1	ND	ND	ND	ND	3.1 E	ND	ND	ND	ND	ND	ND
I16[a]	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
I12[a]	5.91	ND	ND	ND	ND	ND	ND	1.51 E	1.65 E	ND	ND	ND
I9	3.38	ND	ND	ND	ND	3.38 E	ND	ND	ND	ND	ND	ND
I6	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
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations												
I29	16.67	ND	ND	ND	ND	8.67	ND	ND	ND	ND	ND	ND
I21	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
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations												
I28	16.27	ND	ND	ND	ND	7.97	ND	ND	ND	ND	ND	ND
I20	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
I1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	30	0	4	4	0	26	0	7	7	0	0	0
ERL[b]	4022	—	—	70	—	—	—	16	44	85.3	261	430
ERM[b]	44,792	—	—	670	—	—	—	500	640	1100	1600	1600

[a] Near-ZID station; [b] From Long et al. 1995

Appendix B.19 *continued*

Winter 2020	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	NR	ND	ND	5.99 E	ND	ND	ND	ND	ND	5.82 E
I34	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I18	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations													
I33	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	NR	ND	ND	ND	ND	ND	3.96 E	ND	ND	ND
I22	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I14[a]	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I16[a]	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12[a]	ND	ND	ND	NR	ND	ND	ND	ND	ND	2.75 E	ND	ND	ND
I9	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations													
I29	ND	ND	ND	NR	ND	ND	3.89 E	ND	ND	ND	ND	ND	4.11 E
I21	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations													
I28	ND	ND	ND	NR	ND	ND	4.31 E	ND	ND	ND	ND	ND	3.99 E
I20	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	NR	0	0	11	0	0	7	0	0	11
ERL[b]	—	—	—	—	384	63.4	600	19	—	160	—	240	665
ERM[b]	—	—	—	—	2800	260	5100	540	—	2100	—	1500	2600

[a] Near-ZID station; [b] From Long et al. 1995

Appendix B.19 *continued*

Summer 2020	tPAH	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	23.07	ND	ND	ND	ND	13.2	ND	ND	ND	ND	ND	ND
I34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	4.03	ND	ND	ND	ND	4.03 E	ND	ND	ND	ND	ND	ND
I23	10.88	ND	ND	ND	ND	7.34 E	ND	ND	ND	ND	ND	ND
I18	4.88	ND	ND	ND	ND	4.88 E	ND	ND	ND	ND	ND	ND
I10	3.49	ND	ND	ND	ND	3.49 E	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations												
I33	10.73	ND	ND	ND	ND	8.26 E	ND	ND	ND	ND	ND	ND
I30	10.8	ND	ND	ND	ND	10.8	ND	ND	ND	ND	ND	ND
I27	8.33	ND	ND	ND	ND	8.33 E	ND	ND	ND	ND	ND	ND
I22	23.39	ND	ND	ND	ND	9.2	ND	4.4 E	2.56 E	ND	ND	ND
I14 [a]	15.29	ND	ND	ND	ND	9.2	ND	ND	ND	ND	ND	ND
I16 [a]	7.83	ND	ND	ND	ND	7.83 E	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12 [a]	21.83	3.8 E	ND	ND	ND	8.34	ND	3.59 E	ND	ND	ND	ND
I9	12.4	ND	ND	ND	ND	12.4	ND	ND	ND	ND	ND	ND
I6	1.22	ND	ND	ND	ND	1.22 E	ND	ND	ND	ND	ND	ND
I2	11.27	ND	ND	ND	ND	2.84 E	ND	ND	ND	ND	ND	ND
I3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations												
I29	12.6	ND	ND	ND	ND	12.6	ND	ND	ND	ND	ND	ND
I21	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
I8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations												
I28	53.02	ND	5.86	5.47 E	ND	11.4	ND	6.87 E	4.84 E	ND	ND	ND
I20	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
I1	9.32	ND	ND	ND	ND	2.95 E	ND	ND	ND	ND	ND	ND
DR (%)	67	4	4	4	0	67	0	11	7	0	0	0
ERL [b]	4022	—	—	70	—	—	—	16	44	85.3	261	430
ERM [b]	44,792	—	—	670	—	—	—	500	640	1100	1600	1600

[a] Near-ZID station; [b] From Long et al. 1995

Appendix B.19 *continued*

Summer 2020	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	NR	ND	ND	4.19 E	ND	ND	5.68 E	ND	ND	ND
I34	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I31	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I23	ND	ND	ND	NR	ND	ND	2.3 E	ND	ND	ND	ND	1.24 E	ND
I18	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I10	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I4	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
28-m Stations													
I33	ND	ND	ND	NR	ND	ND	2.47 E	ND	ND	ND	ND	ND	ND
I30	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I27	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I22	ND	ND	ND	NR	ND	ND	2.96 E	ND	ND	4.27 E	ND	ND	ND
I14[a]	ND	ND	ND	NR	ND	ND	2.71 E	ND	ND	ND	ND	ND	3.38 E
I16[a]	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I15	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I12[a]	ND	ND	ND	NR	ND	ND	2.77 E	ND	ND	ND	ND	ND	3.33 E
I9	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I6	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I2	ND	ND	ND	NR	ND	ND	3.95 E	ND	ND	ND	ND	ND	4.48 E
I3	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
38-m Stations													
I29	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I21	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I13	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I8	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
55-m Stations													
I28	ND	ND	ND	NR	ND	ND	6.21 E	ND	ND	7.23	ND	ND	5.14 E
I20	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I7	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
I1	ND	ND	ND	6.37 E	ND	ND	ND	ND	ND	ND	ND	ND	ND
DR (%)	0	0	0	100	0	0	30	0	0	11	0	4	15
ERL[b]	—	—	—	—	384	63.4	600	19	—	160	—	240	665
ERM[b]	—	—	—	—	2800	260	5100	540	—	2100	—	1500	2600

[a] Near-ZID station; [b] From Long et al. 1995

Appendix B.20

Concentrations of PAHs (ppb) detected in sediments from the San Diego regional benthic stations sampled during summer 2020. See Appendix B.1 for MDLs; E = estimated; ND = not detected; NR = not reportable.

	Station	Depth (m)	tPAH	1-methyl naphthalene	1-methyl phenanthrene	2-methyl naphthalene	2,3,5-trimethyl naphthalene	2,6-dimethyl naphthalene	3,4-benzo(B) fluoranthene
Inner Shelf	8929	7	55.41	2.41 E	ND	ND	ND	ND	5.84 E
	8944	7	5.12	ND	ND	ND	ND	5.12 E	ND
	8918	8	ND	ND	ND	ND	ND	ND	ND
	8946	15	3.9	ND	ND	ND	ND	3.9 E	ND
	8915	16	ND	ND	ND	ND	ND	ND	ND
	8907	18	2.86	ND	ND	ND	ND	2.86 E	ND
	8943	19	ND	ND	ND	ND	ND	ND	ND
	8914	20	22.64	ND	ND	ND	ND	10.8	ND
	8911	24	9.27	ND	ND	ND	ND	9.27	ND
	8938	28	1.56	ND	ND	ND	ND	1.56 E	ND
	8901	29	15.19	ND	ND	ND	ND	8.24 E	ND
Mid Shelf	8913	31	27.88	ND	ND	ND	ND	7.04 E	ND
	8906	41	ND	ND	ND	ND	ND	ND	ND
	8939	65	14.9	ND	ND	ND	ND	14.9	ND
	8903	66	4.32	ND	ND	ND	ND	4.32 E	ND
	8912	67	41.02	ND	ND	ND	ND	14.8	ND
	8925	67	30.39	ND	ND	ND	ND	15.3	ND
	8919	68	37.98	ND	ND	ND	ND	13.1	ND
	8909	73	50.67	ND	ND	ND	ND	16.2	ND
	8931	74	42.75	ND	ND	ND	ND	9.38 E	ND
	8933	80	28.22	ND	ND	ND	ND	10	ND
	8930	83	23.01	ND	ND	ND	ND	7.2 E	ND
	8949	83	20.07	ND	ND	ND	ND	6.96 E	ND
	8924	85	50.33	ND	ND	ND	ND	13.3	ND
	8926	87	111.7	ND	7.35	8.43	ND	17.1	ND
	8932	89	18.19	ND	ND	ND	ND	6.29 E	ND
	8940	108	21.98	ND	3.12 E	3.45 E	ND	7.66	ND
	8921	116	22.1	ND	ND	4.65 E	ND	10.9	ND
Outer Shelf	8905	134	41.3	ND	ND	ND	ND	8.34 E	ND
	8937	137	10.7	ND	ND	ND	ND	10.7	ND
	8910	169	318.33	ND	ND	ND	ND	5.23 E	66.8
	8922	185	57.21	ND	ND	ND	ND	14.3	ND
	8916	189	269.84	ND	ND	ND	ND	11.6	46.6
	8908	194	140.58	ND	ND	ND	ND	7.97 E	27.2
Upper Slope	8928	223	114.43	ND	ND	ND	ND	11.6	16.4
	8920	270	277.87	ND	ND	ND	ND	10.9 E	27
	8936	292	132.49	ND	ND	ND	ND	11.4	18.2
	8927	460	51.28	ND	ND	ND	ND	6.73 E	10.9
	8934	491	23.22	ND	ND	ND	ND	ND	ND
	8923	523	125.42	ND	ND	ND	ND	12.7	11.2
Detection Rate (%)			90	3	5	8	0	85	23
		ERL[a]:	4022	—	—	70	—	—	—
		ERM[a]:	44,792	—	—	670	—	—	—

[a] From Long et al. 1995

Appendix B.20 *continued*

	Station	Depth (m)	Acenaphthene	Acenaphthylene	Anthracene	Benzo[A] anthracene	Benzo[A] pyrene	Benzo[e]pyrene
Inner Shelf	8929	7	4.38 E	ND	4.5 E	ND	5.06 E	4.93 E
	8944	7	ND	ND	ND	ND	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND
	8946	15	ND	ND	ND	ND	ND	ND
	8915	16	ND	ND	ND	ND	ND	ND
	8907	18	ND	ND	ND	ND	ND	ND
	8943	19	ND	ND	ND	ND	ND	ND
	8914	20	ND	ND	ND	ND	ND	ND
	8911	24	ND	ND	ND	ND	ND	ND
	8938	28	ND	ND	ND	ND	ND	ND
	8901	29	ND	ND	ND	ND	ND	ND
Mid Shelf	8913	31	ND	ND	ND	ND	7.95	ND
	8906	41	ND	ND	ND	ND	ND	ND
	8939	65	ND	ND	ND	ND	ND	ND
	8903	66	ND	ND	ND	ND	ND	ND
	8912	67	ND	ND	ND	ND	ND	ND
	8925	67	ND	ND	ND	ND	ND	ND
	8919	68	ND	ND	ND	ND	ND	ND
	8909	73	ND	ND	ND	ND	ND	ND
	8931	74	ND	ND	ND	ND	ND	ND
	8933	80	ND	ND	ND	ND	ND	ND
	8930	83	ND	ND	ND	ND	ND	ND
	8949	83	ND	ND	ND	ND	ND	ND
	8924	85	ND	ND	ND	ND	ND	ND
	8926	87	ND	9.07	9.55 E	ND	ND	ND
	8932	89	ND	ND	ND	ND	ND	ND
	8940	108	ND	2.96 E	ND	ND	ND	ND
	8921	116	ND	ND	ND	ND	ND	ND
Outer Shelf	8905	134	ND	ND	ND	ND	ND	ND
	8937	137	ND	ND	ND	ND	ND	ND
	8910	169	ND	5.79 E	9.77 E	ND	40.8	27
	8922	185	ND	ND	ND	ND	ND	ND
	8916	189	ND	5.15 E	8.45 E	ND	33.8	24.9
	8908	194	ND	ND	ND	ND	17.2	13.4
Upper Slope	8928	223	ND	ND	ND	ND	12.7	10.8
	8920	270	ND	8.14 E	12.4 E	ND	22.1	13.4
	8936	292	ND	ND	ND	ND	14.6	13.5
	8927	460	ND	ND	ND	ND	ND	ND
	8934	491	ND	ND	ND	ND	ND	ND
	8923	523	ND	ND	ND	ND	10.2	10.4
Detection Rate (%)			3	13	13	0	23	20
		ERL[a]:	16	44	85.3	261	430	—
		ERM[a]:	500	640	1100	1600	1600	—

[a] From Long et al. 1995

Appendix B.20 *continued*

	Station	Depth (m)	Benzo[G,H,I] perylene	Benzo[K] fluoranthene	Biphenyl	Chrysene	Dibenzo(A,H) anthracene	Fluoranthene
Inner Shelf	8929	7	ND	ND	NR	3.42 E	ND	3.77 E
	8944	7	ND	ND	NR	ND	ND	ND
	8918	8	ND	ND	NR	ND	ND	ND
	8946	15	ND	ND	NR	ND	ND	ND
	8915	16	ND	ND	NR	ND	ND	ND
	8907	18	ND	ND	NR	ND	ND	ND
	8943	19	ND	ND	NR	ND	ND	ND
	8914	20	ND	ND	NR	ND	ND	5.98 E
	8911	24	ND	ND	NR	ND	ND	ND
	8938	28	ND	ND	NR	ND	ND	ND
	8901	29	ND	ND	NR	ND	ND	3.71 E
Mid Shelf	8913	31	6.15	ND	6.74 E	ND	ND	ND
	8906	41	ND	ND	NR	ND	ND	ND
	8939	65	ND	ND	NR	ND	ND	ND
	8903	66	ND	ND	NR	ND	ND	ND
	8912	67	ND	ND	NR	5.22 E	ND	10.1
	8925	67	ND	ND	NR	ND	ND	7.52 E
	8919	68	8.38	ND	NR	ND	ND	6.6 E
	8909	73	ND	ND	8.59 E	5.28 E	ND	10.5
	8931	74	ND	ND	NR	4.62 E	ND	8.1
	8933	80	ND	ND	NR	ND	ND	6.66 E
	8930	83	ND	ND	NR	ND	ND	5.8 E
	8949	83	ND	ND	NR	ND	ND	5.77 E
	8924	85	10.3	ND	NR	5.94 E	ND	5.91 E
	8926	87	9.35	ND	NR	10.2	ND	7.46
	8932	89	ND	ND	NR	ND	ND	5.25 E
	8940	108	ND	ND	NR	ND	ND	2.36 E
	8921	116	ND	ND	NR	ND	ND	ND
Outer Shelf	8905	134	10.5	ND	NR	7.4	ND	7.23
	8937	137	ND	ND	NR	ND	ND	ND
	8910	169	32.8	24.4	NR	17.8	ND	24.9
	8922	185	11.3	ND	NR	6.75	ND	7.34 E
	8916	189	29.1	18.2	NR	18.8	ND	21.3
	8908	194	15.4	6.11 E	NR	13.2	ND	13.6
Upper Slope	8928	223	12.5	8.74	NR	6.11 E	ND	10
	8920	270	18.2	10.1	NR	19.4	ND	41.9
	8936	292	15.9	ND	NR	8.25	16.5	6.54 E
	8927	460	ND	ND	NR	6.01 E	ND	9.92 E
	8934	491	ND	ND	NR	ND	ND	9.12 E
	8923	523	12.5	8.61	NR	7.5 E	ND	9.29 E
Detection Rate (%)			33	15	100	40	3	65
		ERL[a]:	—	—	—	384	63.4	600
		ERM[a]:	—	—	—	2800	260	5100

[a] From Long et al. 1995

Appendix B.20 *continued*

	Station	Depth (m)	Fluorene	Indeno(1,2,3-CD) pyrene	Naphthalene	Perylene	Phenanthrene	Pyrene
Inner Shelf	8929	7	ND	6.36 E	3 E	2.19 E	5.26 E	4.29 E
	8944	7	ND	ND	ND	ND	ND	ND
	8918	8	ND	ND	ND	ND	ND	ND
	8946	15	ND	ND	ND	ND	ND	ND
	8915	16	ND	ND	ND	ND	ND	ND
	8907	18	ND	ND	ND	ND	ND	ND
	8943	19	ND	ND	ND	ND	ND	ND
	8914	20	ND	ND	ND	ND	ND	5.86 E
	8911	24	ND	ND	ND	ND	ND	ND
	8938	28	ND	ND	ND	ND	ND	ND
	8901	29	ND	ND	ND	ND	ND	3.24 E
Mid Shelf	8913	31	ND	ND	ND	ND	ND	ND
	8906	41	ND	ND	ND	ND	ND	ND
	8939	65	ND	ND	ND	ND	ND	ND
	8903	66	ND	ND	ND	ND	ND	ND
	8912	67	ND	ND	ND	ND	ND	10.9
	8925	67	ND	ND	ND	ND	ND	7.57 E
	8919	68	ND	ND	ND	ND	ND	9.9
	8909	73	ND	ND	ND	ND	ND	10.1
	8931	74	ND	ND	6.21 E	ND	4.88 E	9.56
	8933	80	ND	ND	4.08 E	ND	ND	7.48 E
	8930	83	ND	ND	2.72 E	ND	ND	7.29 E
	8949	83	ND	ND	ND	ND	ND	7.34 E
	8924	85	ND	7.87	ND	ND	ND	7.01 E
	8926	87	ND	8.12	10	ND	7.76 E	7.31 E
	8932	89	ND	ND	ND	ND	ND	6.65 E
	8940	108	ND	ND	ND	ND	ND	2.43 E
	8921	116	ND	ND	6.55 E	ND	ND	ND
Outer Shelf	8905	134	ND	ND	ND	ND	ND	7.83
	8937	137	ND	ND	ND	ND	ND	ND
	8910	169	ND	25.9	ND	ND	7.54 E	29.6
	8922	185	ND	9.05	ND	ND	ND	8.47
	8916	189	ND	21.4	4.64 E	ND	ND	25.9
	8908	194	ND	12.5	ND	ND	ND	14
Upper Slope	8928	223	ND	11.1	ND	ND	4.18 E	10.3
	8920	270	ND	13.6	5.83 E	ND	30.9	44
	8936	292	ND	14.4	ND	ND	ND	13.2
	8927	460	ND	ND	ND	ND	5.72 E	12
	8934	491	ND	ND	ND	ND	ND	14.1
	8923	523	ND	12.2	5.05 E	9.96	4.81 E	11
Detection Rate (%)			0	28	23	5	20	65
		ERL[a]:	19	—	160	—	240	665
		ERM[a]:	540	—	2100	—	1500	2600

[a]From Long et al. 1995

Appendix B.21

Macrofaunal community parameters by grab for PLOO benthic stations sampled during 2020. SR = species richness; Abun = abundance; H' = Shannon diversity index; J' = Pielou's evenness; Dom = Swartz dominance; BRI = benthic response index.

Depth Contour	Station	Survey	SR	Abun	H'	J'	Dom	BRI
88-m	B11	winter	74	284	3.8	0.87	25	18
		summer	104	294	4.2	0.90	41	9
	B8	winter	75	407	3.3	0.75	17	10
		summer	87	373	3.7	0.82	23	9
	E19	winter	70	477	3.3	0.78	14	10
		summer	79	575	3.3	0.75	18	13
	E7	winter	70	438	3.5	0.82	21	8
		summer	86	619	3.6	0.82	22	12
	E1	winter	80	450	3.5	0.80	21	8
		summer	101	549	3.7	0.81	27	12
98-m	B12	winter	94	422	3.9	0.85	30	9
		summer	109	354	4.2	0.89	41	9
	B9	winter	85	380	3.8	0.85	25	14
		summer	93	318	3.9	0.87	35	12
	E26	winter	72	397	3.4	0.80	20	11
		summer	89	359	3.6	0.81	25	14
	E25	winter	68	393	3.4	0.80	18	8
		summer	77	550	3.4	0.79	20	11
	E23	winter	70	471	3.4	0.79	18	13
		summer	91	578	3.4	0.74	18	12
	E20	winter	64	377	3.2	0.76	13	15
		summer	66	414	3.0	0.72	14	12
	E17 [a]	winter	65	457	3.1	0.73	15	19
		summer	91	536	3.4	0.75	19	18
	E14 [a]	winter	72	558	3.4	0.80	15	33
		summer	61	322	3.3	0.81	16	31
	E11 [a]	winter	54	456	3.1	0.76	12	18
		summer	69	337	3.2	0.76	17	16
	E8	winter	67	318	3.5	0.83	20	12
		summer	81	470	3.7	0.84	25	13
	E5	winter	79	399	3.6	0.83	23	8
		summer	85	337	3.7	0.83	26	12
	E2	winter	109	468	3.9	0.84	32	15
		summer	101	488	3.8	0.83	29	12

[a] Near-ZID station

Appendix B.21 *continued*

Depth Contour	Station	Survey	SR	Abun	H'	J'	Dom	BRI
116-m	B10	winter	70	284	3.6	0.85	22	16
		summer	86	241	3.9	0.88	33	14
	E21	winter	58	394	3.0	0.75	12	17
		summer	60	407	2.9	0.70	11	16
	E15[a]	winter	62	329	3.1	0.76	12	17
		summer	80	636	3.2	0.73	14	15
	E9	winter	111	420	4.1	0.87	41	12
		summer	115	505	3.9	0.81	33	11
	E3	winter	105	373	4.2	0.89	38	15
		summer	102	325	4.1	0.90	39	9

[a] Near-ZID station

Appendix B.22

Macrofaunal community parameters by grab for SBOO benthic stations sampled during 2020. SR = species richness; Abun = abundance; H' = Shannon diversity index; J' = Pielou's evenness; Dom = Swartz dominance; BRI = benthic response index.

Depth Contour	Station	Survey	SR	Abun	H'	J'	Dom	BRI
19-m	I35	winter	71	186	3.9	0.91	30	28
		summer	99	390	3.9	0.84	32	27
	I34	winter	49	764	2.5	0.64	6	24
		summer	64	875	3.1	0.74	10	21
	I31	winter	37	121	3.0	0.84	13	14
		summer	60	213	3.5	0.87	22	16
	I23	winter	46	109	3.2	0.85	19	21
		summer	96	352	3.8	0.83	28	17
	I18	winter	46	87	3.5	0.91	25	15
		summer	48	178	3.4	0.88	19	17
	I10	winter	60	169	3.4	0.83	22	15
		summer	57	136	3.7	0.91	25	20
	I4	winter	20	44	2.6	0.86	10	2
		summer	29	70	3.1	0.91	13	5
28-m	I33	winter	74	171	3.9	0.91	32	26
		summer	88	225	4.0	0.90	36	24
	I30	winter	59	129	3.6	0.89	27	23
		summer	70	246	3.6	0.84	23	23
	I27	winter	30	73	2.8	0.83	12	18
		summer	73	281	3.5	0.82	24	20
	I22	winter	29	92	2.7	0.79	10	18
		summer	64	145	3.7	0.90	29	23
	I14[a]	winter	69	174	3.8	0.89	30	24
		summer	86	241	3.9	0.88	34	20
	I16[a]	winter	28	109	2.3	0.70	7	13
		summer	67	301	3.0	0.71	16	16
	I15	winter	17	30	2.5	0.89	10	8
		summer	48	128	2.9	0.75	17	22
	I12[a]	winter	26	80	2.3	0.71	10	1
		summer	93	245	4.1	0.91	40	20
	I9	winter	61	141	3.7	0.90	27	26
		summer	59	141	3.6	0.89	25	24
	I6	winter	31	108	2.8	0.81	10	6
		summer	35	226	2.7	0.75	9	7
	I2	winter	31	104	2.9	0.84	11	14
		summer	41	173	2.6	0.69	8	18
	I3	winter	26	119	2.4	0.75	6	7
		summer	60	277	3.1	0.76	14	19

[a] Near-ZID station

Appendix B.22 *continued*

Depth Contour	Station	Survey	SR	Abun	H'	J'	Dom	BRI
38-m	I29	winter	105	366	3.9	0.83	31	14
		summer	120	424	4.2	0.87	43	15
	I21	winter	40	87	3.3	0.90	19	10
		summer	63	238	3.5	0.85	20	11
	I13	winter	40	95	3.3	0.89	17	11
		summer	46	200	3.1	0.82	15	6
	I8	winter	35	86	3.2	0.90	16	19
		summer	39	131	2.8	0.77	15	17
55-m	I28	winter	160	575	4.3	0.85	52	16
		summer	116	434	4.1	0.87	37	15
	I20	winter	91	890	3.2	0.72	16	11
		summer	77	291	3.4	0.77	22	8
	I7	winter	47	130	3.2	0.84	18	1
		summer	57	145	3.7	0.92	26	4
	I1	winter	72	271	3.5	0.83	24	18
		summer	73	194	3.7	0.85	29	14

Appendix B.23

Macrofaunal community parameters by grab for the San Diego regional benthic stations sampled during summer 2020. SR = species richness; Abun = abundance; H' = Shannon diversity index; J' = Pielou's evenness; Dom = Swartz dominance; BRI = benthic response index.

	Station	Depth (m)	SR	Abun	H'	J'	Dom	BRI [a]
Inner Shelf	8929	7	39	248	2.9	0.78	10	—
	8944	7	32	108	3.2	0.92	15	—
	8918	8	21	645	0.4	0.12	1	—
	8946	15	42	140	3.3	0.88	18	26
	8915	16	59	145	3.8	0.93	27	14
	8907	18	44	116	3.5	0.92	22	15
	8943	19	41	87	3.3	0.90	20	19
	8914	20	113	413	4.0	0.84	37	28
	8911	24	64	216	3.5	0.85	23	23
	8938	28	46	150	3.5	0.91	21	27
	8901	29	64	162	3.8	0.91	28	19
Mid Shelf	8913	31	105	329	4.1	0.88	37	25
	8906	41	63	172	3.6	0.86	24	16
	8939	65	53	220	2.9	0.73	15	20
	8903	66	105	323	4.0	0.86	40	12
	8912	67	83	329	3.7	0.83	24	14
	8925	67	80	423	3.4	0.77	18	15
	8919	68	82	398	3.5	0.79	21	17
	8909	73	86	413	3.6	0.81	22	8
	8931	74	72	389	3.3	0.77	18	9
	8933	80	85	442	3.5	0.80	22	13
	8930	83	76	302	3.5	0.81	21	8
	8949	83	89	402	3.5	0.78	20	12
	8924	85	88	531	3.5	0.78	20	10
	8926	87	82	541	3.4	0.78	18	11
	8932	89	66	233	3.5	0.84	22	10
	8940	108	66	332	3.5	0.82	20	21
	8921	116	58	466	2.8	0.68	10	19
Outer Shelf	8905	134	67	238	3.5	0.82	19	15
	8937	137	84	290	3.8	0.85	28	19
	8910	169	64	348	3.3	0.79	18	22
	8922	185	39	220	2.5	0.69	7	24
	8916	189	33	215	2.3	0.65	5	25
	8908	194	54	172	3.4	0.86	19	16
Upper Slope	8928	223	31	79	3.0	0.87	14	—
	8920	270	20	69	2.0	0.68	5	—
	8936	292	32	88	2.9	0.85	12	—
	8927	460	26	48	3.1	0.94	15	—
	8934	491	36	90	2.9	0.80	14	—
	8923	523	25	51	3.0	0.94	13	—

[a] BRI statistic not calculated for stations located at depths <10 m or >200 m

Appendix B.24

Summary taxonomic listing of benthic infauna taxa identified from PLOO stations during 2020. Data are total number of individuals (n). Taxonomic arrangement follows SCAMIT (2018). ** indicates taxon is not within previous family

Phylum	Class	Family	Taxon	n
Cnidaria	Hydrozoa	Corymorphidae	*Corymorpha bigelowi*	3
			Euphysa sp A	5
	Anthozoa	Virgulariidae		1
			Stylatula sp A	1
			Stylatula sp	2
		**	Actiniaria	1
		Edwardsiidae		25
			Edwardsia olguini	1
			Scolanthus triangulus	72
		Halcampidae	*Halianthella* sp A	8
Platyhelminthes	Rhabditophora	Plehniidae	*Diplehnia caeca*	2
Nemertea	Anopla			1
			Palaeonemertea	6
		Carinomidae	*Carinoma mutabilis*	3
		Tubulanidae		7
			Tubulanus cingulatus	10
			Tubulanus polymorphus	49
			Tubulanus sp A	3
			Tubulanidae sp D	4
		**	Heteronemertea	3
		Lineidae		32
			Cerebratulus californiensis	2
			Lineidae sp SD1	3
			Lineus bilineatus	29
			Maculaura alaskensis Cmplx	1
			Zygeupolia rubens	3
		**	Heteronemertea sp SD2	164
	Enopla		Hoplonemertea	2
		Emplectonematidae	*Paranemertes californica*	7
		Amphiporidae	*Amphiporus flavescens*	1
		**	Hoplonemertea sp A	1
			Hoplonemertea sp B	1
			Hoplonemertea sp SD3	1
Mollusca	Caudofoveata		Chaetodermatida	1
		Chaetodermatidae	*Falcidens longus*	1
	Gastropoda			1
		Solariellidae	*Solariella peramabilis*	10
		Cerithiidae	*Lirobittium rugatum* Cmplx	3
		Naticidae	*Neverita draconis*	1
		Caecidae	*Caecum crebricinctum*	10
		Nassariidae	*Caesia perpinguis*	1
		Muricidae	*Boreotrophon* sp	1
		Mangeliidae	*Kurtzia arteaga*	2
			Kurtzina beta	5
		Acteonidae	*Rictaxis punctocaelatus*	1
		Pyramidellidae	*Odostomia* sp	16
			Turbonilla chocolata	2
			Turbonilla santarosana	4

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
			Turbonilla sp A	8
			Turbonilla sp SD5	4
			Turbonilla sp SD6	1
		Dotoidae	*Doto* sp	1
		Rhizoridae	*Volvulella californica*	9
			Volvulella cylindrica	1
			Volvulella panamica	1
			Volvulella sp	2
		Acteocinidae	*Acteocina cerealis*	3
		Philinidae	*Philine auriformis*	13
		Aglajidae	*Aglaja ocelligera*	1
		Gastropteridae	*Gastropteron pacificum*	3
		Cylichnidae	*Cylichna diegensis*	8
		**	Bullomorpha sp A	1
	Bivalvia			11
		Nuculidae	*Acila castrensis*	1
			Ennucula tenuis	31
		Solemyidae	*Solemya pervernicosa*	3
		Nucinellidae	*Huxleyia munita*	2
		Nuculanidae	*Nuculana hamata*	8
			Nuculana sp A	155
		Mytilidae	*Amygdalum pallidulum*	1
		Limidae	*Limatula saturna*	1
		Carditidae	*Cyclocardia ventricosa*	1
		Lucinidae	*Parvilucina tenuisculpta*	85
			Lucinoma annulatum	23
		Thyasiridae	*Adontorhina cyclia*	12
			Axinopsida serricata	1902
			Thyasira flexuosa	11
		Lasaeidae	*Kurtiella tumida*	2
			Kurtiella sp D	1
		Cardiidae	*Keenaea centifilosum*	27
		Tellinidae	*Tellina carpenteri*	164
			Tellina sp B	383
			Tellina sp	5
			Macoma sp	5
		Hiatellidae	*Saxicavella nybakkeni*	6
			Saxicavella pacifica	1
		Veneridae	*Nutricola ovalis*	2
		Lyonsiidae		1
		Thraciidae	*Thracia trapezoides*	1
		Cuspidariidae		1
			Cuspidaria parapodema	2
	Scaphopoda			2
		Dentaliidae	*Dentalium vallicolens*	3
		Gadilidae	*Polyschides quadrifissatus*	18
			Gadila aberrans	1
		**	*Compressidens stearnsii*	1
Sipuncula				1
	Sipunculidea	Golfingiidae	*Nephasoma diaphanes*	5

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
			Thysanocardia nigra	1
		Phascolionidae	*Phascolion* sp A	30
Annelida	Polychaeta	Thalassematidae	*Listriolobus pelodes*	2
		Amphinomidae	*Chloeia pinnata*	25
		Lumbrineridae	*Eranno bicirrata*	3
			Eranno lagunae	4
			Lumbrineris cruzensis	26
			Lumbrineris index	1
			Lumbrineris latreilli	7
			Lumbrineris ligulata	5
			Lumbrineris sp Group I	24
			Lumbrineris sp Group II	1
			Lumbrineris sp	2
			Scoletoma tetraura Cmplx	33
			Scoletoma sp	1
		Oenonidae	*Drilonereis falcata*	16
			Drilonereis sp A	1
			Drilonereis sp	13
			Notocirrus californiensis	6
		Onuphidae		24
			Mooreonuphis exigua	5
			Mooreonuphis nebulosa	8
			Mooreonuphis segmentispadix	12
			Mooreonuphis sp SD1	7
			Mooreonuphis sp SD2	3
			Mooreonuphis sp	32
			Nothria occidentalis	3
			Nothria sp	8
			Onuphis eremita parva	2
			Onuphis iridescens	1
			Onuphis sp A	15
			Onuphis sp	2
			Paradiopatra parva	544
		Acoetidae	*Acoetes pacifica*	2
		Aphroditidae		1
			Aphrodita sp	2
		Polynoidae	*Malmgreniella baschi*	4
			Malmgreniella liei	1
			Malmgreniella sanpedroensis	5
			Malmgreniella sp A	9
			Subadyte mexicana	5
			Tenonia priops	11
		Pholoidae		1
			Pholoe glabra	62
		Sigalionidae	*Pholoides asperus*	2
			Sigalion spinosus	35
			Sthenelais tertiaglabra	20
			Sthenelais sp	1
			Sthenelanella uniformis	21
		Glyceridae		1

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
			Glycera americana	6
			Glycera nana	153
			Glycera sp	1
		Goniadidae	*Glycinde armigera*	23
			Goniada brunnea	13
			Goniada maculata	84
		Hesionidae	*Podarkeopsis glabrus*	7
			Podarkeopsis sp A	1
		Nereididae	*Nereis* sp A	14
			Platynereis bicanaliculata	1
		Pilargidae	*Sigambra setosa*	1
		Syllidae	*Eusyllis blomstrandi* Cmplx	4
			Eusyllis habei	1
			Paraehlersia articulata	5
			Exogone dwisula	1
			Exogone lourei	23
			Syllis heterochaeta	6
		Nephtyidae		1
			Aglaophamus verrilli	8
			Nephtys caecoides	5
			Nephtys ferruginea	63
		Phyllodocidae	*Eteone brigitteae*	1
			Eteone pigmentata	1
			Eulalia sp SD4	1
			Eumida longicornuta	1
			Sige sp A	16
			Nereiphylla sp 2	1
			Nereiphylla sp SD1	1
			Paranaitis polynoides	4
			Phyllodoce cuspidata	1
			Phyllodoce groenlandica	2
			Phyllodoce hartmanae	34
			Phyllodoce longipes	13
			Phyllodoce pettiboneae	12
		Oweniidae		1
			Galathowenia pygidialis	18
			Myriochele gracilis	18
			Myriochele olgae	1
			Myriochele striolata	3
			Myriowenia californiensis	1
		Sabellariidae	*Neosabellaria cementarium*	1
		Sabellidae		1
			Acromegalomma pigmentum	1
			Acromegalomma splendidum	3
			Dialychone albocincta	56
			Dialychone trilineata	129
			Dialychone veleronis	5
			Euchone arenae	2
			Euchone hancocki	14
			Euchone incolor	73

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
			Euchone sp A	12
			Euchone sp	1
			Jasmineira sp B	7
			Myxicola sp	5
			Paradialychone ecaudata	1
			Paradialychone harrisae	3
			Paradialychone paramollis	4
			Potamethus sp A	8
		Apistobranchidae	*Apistobranchus ornatus*	1
		Longosomatidae	*Heterospio catalinensis*	4
		Magelonidae		10
			Magelona berkeleyi	3
			Magelona hartmanae	1
			Magelona hobsonae	1
			Magelona sp B	5
		Spionidae	*Dipolydora giardi*	1
			Dipolydora socialis	2
			Laonice cirrata	27
			Laonice nuchala	37
			Microspio pigmentata	130
			Paraprionospio alata	95
			Prionospio dubia	342
			Prionospio jubata	653
			Prionospio lighti	6
			Prionospio sp	1
			Scolelepis (Parascolelepis) texana	1
			Spio filicornis	1
			Spio maculata	12
			Spiophanes berkeleyorum	41
			Spiophanes duplex	2527
			Spiophanes kimballi	641
			Spiophanes norrisi	4
			Spiophanes wigleyi	12
			Spiophanes sp	1
		Cirratulidae	*Aphelochaeta glandaria* Cmplx	306
			Aphelochaeta monilaris	64
			Aphelochaeta phillipsi	50
			Aphelochaeta tigrina	23
			Aphelochaeta williamsae	5
			Aphelochaeta sp HYP2	3
			Aphelochaeta sp LA1	22
			Aphelochaeta sp SD3	3
			Aphelochaeta sp SD18	1
			Aphelochaeta sp	22
			Chaetozone hartmanae	152
			Chaetozone setosa Cmplx	2
			Chaetozone sp SD1	1
			Chaetozone sp SD3	2
			Chaetozone sp SD5	3
			Chaetozone sp SD7	27

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
			Chaetozone sp	12
			Kirkegaardia cryptica	10
			Kirkegaardia serratiseta	3
			Kirkegaardia siblina	109
			Kirkegaardia tesselata	55
			Kirkegaardia sp SD9	6
			Kirkegaardia sp	4
		Fauveliopsidae	*Fauveliopsis* sp SD1	35
		Flabelligeridae	*Brada pluribranchiata*	1
			Pherusa neopapillata	1
		Sternaspidae	*Sternaspis affinis*	119
		Ampharetidae		5
			Amage anops	4
			Amage scutata	15
			Ampharete finmarchica	18
			Ampharete labrops	4
			Ampharete sp	1
			Ampharetidae sp SD1	8
			Amphicteis scaphobranchiata	10
			Amphisamytha bioculata	1
			Anobothrus gracilis	29
			Eclysippe trilobata	373
			Lysippe sp A	25
			Lysippe sp B	46
			Sabellides manriquei	1
			Samytha californiensis	1
			Sosane occidentalis	9
			Melinna oculata	1
		Pectinariidae	*Pectinaria californiensis*	131
		Terebellidae		1
			Polycirrus californicus	30
			Polycirrus sp A	96
			Polycirrus sp OC1	113
			Polycirrus sp SD3	2
			Polycirrus sp	83
			Lanassa venusta venusta	134
			Phisidia sanctaemariae	282
			Pista brevibranchiata	6
			Pista estevanica	36
			Pista wui	4
			Pista sp	2
			Proclea sp A	27
		Trichobranchidae	*Terebellides californica*	5
		Chaetopteridae	*Phyllochaetopterus limicolus*	5
			Phyllochaetopterus sp	1
			Spiochaetopterus costarum Cmplx	65
		Capitellidae		1
			Capitella teleta	29
			Decamastus gracilis	33
			Decamastus sp	2

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
			Mediomastus sp	863
			Notomastus hemipodus	75
			Notomastus latericeus	3
			Notomastus sp	13
		Cossuridae	*Cossura bansei*	1
			Cossura candida	9
			Cossura sp A	3
		Maldanidae		215
			Euclymeninae	38
			Axiothella sp	6
			Clymenella complanata	1
			Clymenura gracilis	137
			Euclymeninae sp A	313
			Isocirrus longiceps	2
			Petaloclymene pacifica	57
			Praxillella gracilis	1
			Praxillella pacifica	338
			Notoproctus pacificus	24
			Maldaninae	4
			Maldane sarsi	90
			Metasychis disparidentatus	10
			Petaloproctus neoborealis	1
			Rhodine bitorquata	153
		Opheliidae	*Armandia brevis*	3
			Ophelina acuminata	1
			Ophelina sp SD1	2
			Scoloplos acmeceps	1
			Scoloplos armiger Cmplx	335
		Paraonidae		1
			Aricidea (Acmira) catherinae	47
			Aricidea (Acmira) lopezi	14
			Aricidea (Acmira) rubra	1
			Aricidea (Acmira) simplex	30
			Aricidea (Acmira) sp SD1	1
			Aricidea (Aricidea) pseudoarticulata	1
			Aricidea (Aricidea) wassi	9
			Aricidea (Aricidea) sp	4
			Aricidea (Strelzovia) antennata	63
			Aricidea (Strelzovia) hartleyi	2
			Aricidea (Strelzovia) sp A	21
			Cirrophorus furcatus	1
			Levinsenia gracilis	21
			Levinsenia kirbyae	4
			Paradoneis sp SD1	1
			Paradoneis sp	3
		Scalibregmatidae	*Scalibregma californicum*	16
		Travisiidae	*Travisia brevis*	131
Arthropoda	Ostracoda	Cylindroleberididae	*Xenoleberis californica*	1
		Philomedidae	*Euphilomedes carcharodonta*	5
			Euphilomedes producta	24

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
	Malacostraca	Nebaliidae	*Nebalia pugettensis* Cmplx	1
		Caprellidae	*Caprella kennerlyi*	1
			Mayerella banksia	1
		Ischyroceridae	*Ericthonius brasiliensis*	9
		Photidae	*Photis bifurcata*	3
			Photis californica	9
			Photis lacia	5
			Photis sp	2
			Podoceropsis ociosa	4
		Aoridae	*Aoroides* sp A	3
			Aoroides sp	3
		Corophiidae	*Protomedeia articulata* Cmplx	12
		Oedicerotidae		1
			Americhelidium shoemakeri	12
			Bathymedon pumilus	13
			Deflexilodes norvegicus	9
			Monoculodes emarginatus	9
			Westwoodilla tone	8
		Eusiridae	*Rhachotropis* sp A	1
		Liljeborgiidae	*Listriella goleta*	2
			Listriella melanica	1
		Pleustidae	*Dactylopleustes* sp A	1
		Pardaliscidae	*Halicoides synopiae*	4
			Nicippe tumida	2
			Pardaliscella symmetrica	1
		Ampeliscidae	*Ampelisca agassizi*	6
			Ampelisca brevisimulata	59
			Ampelisca cf *brevisimulata*	6
			Ampelisca careyi	98
			Ampelisca hancocki	14
			Ampelisca indentata	2
			Ampelisca lobata	1
			Ampelisca pacifica	45
			Ampelisca pugetica	91
			Ampelisca sp	1
			Byblis millsi	4
		Argissidae	*Argissa hamatipes*	1
		Urothoidae	*Urothoe elegans* Cmplx	8
		Phoxocephalidae	*Foxiphalus similis*	2
			Rhepoxynius bicuspidatus	274
			Rhepoxynius menziesi	52
			Rhepoxynius stenodes	1
			Eyakia robusta	19
			Heterophoxus oculatus	34
		**	Lysianassoidea	1
		Lysianassidae	*Aruga holmesi*	1
			Aruga oculata	1
		Tryphosidae	*Hippomedon* sp A	2
		Acidostomatidae	*Acidostoma hancocki*	1
		Pakynidae	*Pachynus barnardi*	3

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
		Gnathiidae	*Caecognathia crenulatifrons*	26
		Anthuridae	*Haliophasma geminata*	14
		Serolidae	*Heteroserolis carinata*	2
		**	Tanaidacea	2
		Akanthophoreidae	*Chauliopleona dentata*	3
		Anarthruridae	*Siphonolabrum californiensis*	1
		Leptocheliidae	*Chondrochelia dubia* Cmplx	32
		Tanaellidae	*Araphura breviaria*	33
			Araphura sp SD1	10
			Tanaella propinquus	10
		Typhlotanaidae	*Typhlotanais williamsae*	3
		Tanaopsidae	*Tanaopsis cadieni*	12
		Leuconidae	*Eudorella pacifica*	1
		Nannastacidae	*Campylaspis canaliculata*	1
			Procampylaspis caenosa	14
		Diastylidae	*Diastylis crenellata*	14
			Leptostylis abditis	1
		**	Paguroidea	1
		Paguridae	*Pylopagurus holmesi*	1
		Cyclodorippidae	*Deilocerus planus*	1
		Pinnotheridae	*Pinnixa occidentalis Cmplx*	1
			Pinnixa sp	1
Nematoda				21
Echinodermata	Asteroidea			12
		Astropectinidae	*Astropecten californicus*	2
	Ophiuroidea			18
		Ophiuridae	*Ophiura luetkenii*	18
		Amphiuridae		415
			Amphichondrius granulatus	36
			Amphiodia digitata	39
			Amphiodia urtica	841
			Amphiodia sp	292
			Amphioplus sp	2
			Amphiura arcystata	11
			Dougaloplus amphacanthus	4
			Dougaloplus sp A	5
	Echinoidea			3
		Toxopneustidae	*Lytechinus pictus*	2
		**	Spatangoida	1
		Brissidae	*Brissopsis pacifica*	1
	Holothuroidea	Phyllophoridae		1
		Synaptidae	*Leptosynapta* sp	10
		Chiridotidae	*Chiridota* sp	11
Phoronida				11
		Phoronidae	*Phoronis* sp SD1	4
			Phoronis sp	15
Chordata	Enteropneusta			4
		Ptychoderidae	*Balanoglossus* sp	1
		Spengeliidae	*Schizocardium* sp	1

Appendix B.24 *continued*

Phylum	Class	Family	Taxon	n
		Harrimaniidae	*Saccoglossus* sp	2
			Stereobalanus sp	13
	Ascidiacea	Molgulidae	*Molgula pugetiensis*	1

Appendix B.25

Summary taxonomic listing of benthic infauna taxa identified from SBOO stations during 2020. Data are total number of individuals (n). Taxonomic arrangement follows SCAMIT (2018).** indicates taxon is not within previous family

Phylum	Class	Family	Taxon	n
Cnidaria	Hydrozoa	Corymorphidae	*Corymorpha bigelowi*	2
			Euphysa sp A	5
		Campanulariidae	*Laomedea calceolifera*	5
	Anthozoa		Pennatulacea	1
		Virgulariidae	*Stylatula* sp A	1
			Virgularia sp	1
		**	Ceriantharia	8
		Arachnactidae	*Arachnanthus* sp A	2
		**	Actiniaria	5
		Edwardsiidae		32
			Edwardsia juliae	14
			Edwardsia olguini	7
			Scolanthus triangulus	21
			Edwardsiidae sp SD1	1
		Halcampidae	*Halcampa decemtentaculata*	10
		Isanthidae	*Zaolutus actius*	8
		Limnactiniidae	Limnactiniidae sp A	5
		Haloclavidae	*Anemonactis* sp A	2
Platyhelminthes	Rhabditophora	Callioplanidae	*Koinostylochus burchami*	1
		Stylochidae	*Stylochus exiguus*	3
		Cryptocelidae	*Cryptocelis occidentalis*	4
		Plehniidae	*Diplehnia caeca*	2
		**	Rhabditophora sp A	1
			Rhabditophora sp C	3
Nemertea				3
	Anopla			5
		Cephalotrichidae	*Cephalothrix* sp	38
		**	Palaeonemertea	20
		Carinomidae	*Carinoma mutabilis*	57
		Tubulanidae	Tubulanidae	6
			Tubulanus cingulatus	13
			Tubulanus polymorphus	91
			Tubulanus sp A	1
		**	*Heteronemertea*	1
		Lineidae		57
			Cerebratulus californiensis	2
			Cerebratulus sp	3
			Lineidae sp SD1	9
			Lineus bilineatus	19
			Maculaura alaskensis Cmplx	12
			Micrura wilsoni	1
			Zygeupolia rubens	1
		**	Heteronemertea sp SD2	39
	Enopla			3
			Hoplonemertea	19
		Emplectonematidae	*Cryptonemertes actinophila*	1
			Paranemertes californica	8

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
		Prosorhochmidae	*Prosorhochmus albidus*	3
		Oerstediidae	*Oerstedia dorsalis* Cmplx	17
		Amphiporidae	*Amphiporus flavescens*	5
		Tetrastemmatidae	*Quasitetrastemma nigrifrons*	2
			Tetrastemma candidum	4
		**	Hoplonemertea sp A	1
			Hoplonemertea sp D	3
			Hoplonemertea sp SD3	1
Mollusca	Caudofoveata		Chaetodermatida	2
		Chaetodermatidae	*Chaetoderma pacificum*	1
			Falcidens longus	3
	Gastropoda	Trochidae	*Halistylus pupoideus*	2
		Cerithiidae	*Lirobittium rugatum* Cmplx	4
			Lirobittium sp	1
		Calyptraeidae		1
			Calyptraea fastigiata	1
		Naticidae	*Neverita recluziana*	1
		Rissoidae	*Alvania compacta*	1
		Barleeiidae	*Lirobarleeia kelseyi*	5
		Caecidae	*Caecum crebricinctum*	42
		Bursidae	*Crossata ventricosa*	1
		Epitoniidae	*Epitonium bellastriatum*	1
			Epitonium sawinae	2
		Eulimidae	*Balcis oldroydae*	15
			Eulima raymondi	1
			Polygireulima rutila	26
		Nassariidae	*Caesia perpinguis*	1
		Olivellidae	*Callianax baetica*	17
		Borsoniidae	*Ophiodermella inermis*	2
		Mangeliidae	*Kurtzia arteaga*	7
			Kurtziella plumbea	2
			Kurtzina beta	2
		Pseudomelatomidae	*Crassispira semiinflata*	3
		Terebridae	*Terebra pedroana*	5
		Acteonidae	*Rictaxis punctocaelatus*	1
		Pyramidellidae	*Odostomia* sp	2
			Turbonilla chocolata	1
			Turbonilla santarosana	1
			Turbonilla sp SD5	1
			Turbonilla sp SD7	3
			Turbonilla sp	1
		Onchidorididae	*Acanthodoris rhodoceras*	1
		Rhizoridae	*Volvulella cylindrica*	1
			Volvulella sp	1
		Acteocinidae	*Acteocina cerealis*	2
			Acteocina culcitella	2
			Acteocina harpa	2
		Philinidae	*Philine auriformis*	36
		Gastropteridae	*Gastropteron pacificum*	5

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
		Philinoglossidae	*Philinoglossa* sp A	3
		Cylichnidae	*Cylichna diegensis*	8
		Diaphanidae	*Diaphana californica*	4
	Bivalvia			3
		Nuculidae	*Ennucula tenuis*	1
		Solemyidae	*Solemya pervernicosa*	3
		Nuculanidae	*Nuculana hamata*	1
			Nuculana taphria	12
		Glycymerididae	*Glycymeris septentrionalis*	1
		Mytilidae	*Crenella decussata*	43
			Solamen columbianum	1
			Modiolinae	8
			Amygdalum pallidulum	4
		Pectinidae		5
			Leptopecten latiauratus	30
		Carditidae	*Cyclocardia ventricosa*	1
			Cyclocardia sp	2
		Lucinidae	*Lucinisca nuttalli*	1
			Parvilucina tenuisculpta	28
			Lucinoma annulatum	5
		Thyasiridae	*Axinopsida serricata*	5
			Thyasira flexuosa	4
		Lasaeidae	*Kurtiella grippi*	5
			Kurtiella tumida	31
		Cardiidae	*Keenaea centifilosum*	23
			Trachycardium quadragenarium	1
		Tellinidae		2
			Tellina bodegensis	3
			Tellina carpenteri	1
			Tellina meropsis	1
			Tellina modesta	99
			Tellina sp B	25
			Macoma yoldiformis	45
			Macoma sp	3
		Semelidae	*Semele venusta*	1
		**	Solenoidea	2
		Solenidae	*Solen sicarius*	5
		Pharidae	*Ensis myrae*	4
		Veneridae	Venerinae	1
			Compsomyax subdiaphana	6
		Petricolidae	*Cooperella subdiaphana*	14
		Mactridae	*Simomactra falcata*	16
		Lyonsiidae		10
			Lyonsia californica	6
		Thraciidae		2
		Periplomatidae	*Periploma discus*	1
		Cuspidariidae	*Cardiomya pectinata*	2
	Scaphopoda			7
		Dentaliidae	*Dentalium vallicolens*	1
		Gadilidae	*Polyschides quadrifissatus*	35

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Gadila aberrans	135
Sipuncula				14
	Sipunculidea	Golfingiidae	*Thysanocardia nigra*	24
		Phascolionidae	*Phascolion* sp A	16
		Sipunculidae	*Siphonosoma ingens*	2
			Sipunculus nudus	1
	Phascolosomatidea	Phascolosomatidae	*Apionsoma misakianum*	51
Annelida	Polychaeta	Amphinomidae	*Chloeia pinnata*	12
			Paramphinome sp	280
			Pareurythoe californica	44
		Dorvilleidae		2
			Dorvillea (Dorvillea) sp	1
			Meiodorvillea sp SD1	1
			Ophryotrocha sp	2
			Parougia caeca	5
			Protodorvillea gracilis	293
		Eunicidae		6
			Leodice americana	6
			Marphysa disjuncta	4
			Marphysa sp	1
		Lumbrineridae		2
			Lumbrineridae Group III	1
			Lumbrinerides platypygos	33
			Lumbrineris cruzensis	12
			Lumbrineris japonica	1
			Lumbrineris latreilli	40
			Lumbrineris ligulata	31
			Lumbrineris limicola	1
			Lumbrineris sp Group I	3
			Lumbrineris sp	2
			Scoletoma tetraura Cmplx	11
		Oenonidae	*Arabella iricolor* Cmplx	1
			Drilonereis falcata	2
			Drilonereis sp	3
		Onuphidae		125
			Diopatra ornata	6
			Diopatra splendidissima	5
			Diopatra tridentata	7
			Diopatra sp	28
			Mooreonuphis exigua	2
			Mooreonuphis nebulosa	18
			Mooreonuphis sp SD1	51
			Mooreonuphis sp SD2	9
			Mooreonuphis sp	87
			Nothria occidentalis	1
			Nothria sp	5
			Onuphis affinis	1
			Onuphis elegans	2
			Onuphis eremita parva	8
			Onuphis iridescens	9

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Onuphis sp A	40
			Onuphis sp	5
			Paradiopatra parva	61
			Rhamphobrachium longisetosum	1
		Aphroditidae		5
			Aphrodita sp	2
		Polynoidae	*Lepidasthenia longicirrata*	1
			Lepidonotus cf *squamatus*	1
			Malmgreniella macginitiei	2
			Malmgreniella scriptoria	1
			Malmgreniella sp A	1
			Malmgreniella sp	1
			Tenonia priops	14
		Sigalionidae	*Pholoides asperus*	1
			Pisione sp	198
			Sigalion spinosus	180
			Sthenelais tertiaglabra	4
			Sthenelais verruculosa	3
			Sthenelanella uniformis	123
		Glyceridae	*Glycera americana*	3
			Glycera nana	20
			Glycera oxycephala	87
			Glycera tesselata	2
			Glycera sp	30
			Hemipodia borealis	3
		Goniadidae	*Glycinde armigera*	68
			Goniada acicula	1
			Goniada littorea	14
			Goniada maculata	12
			Goniada sp	1
		Chrysopetalidae	*Chrysopetalum occidentale*	1
		Hesionidae	*Gyptis brunnea*	6
			Heteropodarke heteromorpha	3
			Microphthalmus hystrix	22
			Micropodarke dubia	26
			Oxydromus pugettensis	14
			Podarkeopsis glabrus	1
		Nereididae	*Nereis* sp A	39
			Platynereis bicanaliculata	38
		Pilargidae	*Ancistrosyllis groenlandica*	1
			Hermundura fauveli	1
			Hermundura ocularis	1
		Syllidae	*Epigamia-Myrianida* Cmplx	3
			Eusyllis blomstrandi Cmplx	3
			Eusyllis habei	20
			Eusyllis transecta	11
			Eusyllis sp SD2	29
			Eusyllis sp	5
			Odontosyllis phosphorea	33
			Opisthodonta sp SD2	1

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Paraehlersia articulata	1
			Exogone dwisula	3
			Exogone lourei	25
			Parexogone acutipalpa	2
			Parexogone breviseta	2
			Parexogone molesta	1
			Salvatoria mediodentata	1
			Sphaerosyllis californiensis	11
			Syllis farallonensis	4
			Syllis heterochaeta	23
			Syllis sp SD1	10
			Syllis sp SD2	14
			Xenosyllis sp	1
		Nephtyidae	*Bipalponephtys cornuta*	3
			Nephtys caecoides	13
			Nephtys ferruginea	4
			Nephtys simoni	19
			Nephtys sp SD2	9
			Nephtys sp	1
		Sphaerodoridae	*Sphaerodoropsis biserialis*	1
		Phyllodocidae		1
			Eteone brigitteae	1
			Eteone pigmentata	1
			Eulalia californiensis	2
			Eulalia levicornuta Cmplx	1
			Eulalia sp SD1	34
			Eumida longicornuta	9
			Hesionura coineaui difficilis	264
			Sige sp A	19
			Nereiphylla ferruginea Cmplx	1
			Nereiphylla sp 2	3
			Nereiphylla sp SD1	2
			Nereiphylla sp	1
			Phyllodoce groenlandica	1
			Phyllodoce hartmanae	29
			Phyllodoce longipes	27
			Phyllodoce medipapillata	19
			Phyllodoce pettiboneae	27
		Fabriciidae	*Pseudofabriciola californica*	9
		Oweniidae	*Galathowenia pygidialis*	6
			Myriochele gracilis	22
			Myriochele olgae	1
			Myriochele striolata	21
			Owenia collaris	8
		Sabellidae		1
			Acromegalomma pigmentum	7
			Acromegalomma splendidum	1
			Bispira sp	1
			Dialychone albocincta	7
			Dialychone trilineata	11

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Dialychone veleronis	37
			Euchone arenae	41
			Euchone hancocki	4
			Euchone incolor	53
			Euchone sp	2
			Jasmineira sp B	347
			Paradialychone bimaculata	10
			Paradialychone ecaudata	5
			Paradialychone harrisae	45
			Paradialychone paramollis	8
			Potamethus sp A	1
		Magelonidae	*Magelona hartmanae*	10
			Magelona pitelkai	2
		Poecilochaetidae	*Poecilochaetus johnsoni*	17
			Poecilochaetus sp	1
		Spionidae		3
			Aonides sp	11
			Dipolydora socialis	15
			Dispio sp SD1	23
			Laonice cirrata	9
			Laonice nuchala	1
			Laonice sp	1
			Malacoceros indicus	1
			Microspio pigmentata	13
			Paraprionospio alata	75
			Polydora cirrosa	1
			Prionospio dubia	29
			Prionospio jubata	75
			Prionospio lighti	3
			Prionospio pygmaeus	71
			Scolelepis (Scolelepis) occidentalis	7
			Spio maculata	25
			Spiophanes berkeleyorum	37
			Spiophanes duplex	867
			Spiophanes kimballi	42
			Spiophanes norrisi	850
			Spiophanes wigleyi	1
			Spiophanes sp	1
		Acrocirridae	*Macrochaeta* sp A	3
		Cirratulidae	*Aphelochaeta glandaria* Cmplx	9
			Aphelochaeta monilaris	5
			Aphelochaeta tigrina	6
			Aphelochaeta williamsae	3
			Aphelochaeta sp LA1	9
			Aphelochaeta sp	4
			Caulleriella hamata	1
			Caulleriella pacifica	11
			Caulleriella sp SD2	3
			Caulleriella sp	12
			Chaetozone armata	7

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Chaetozone bansei	1
			Chaetozone columbiana	4
			Chaetozone commonalis	1
			Chaetozone corona	39
			Chaetozone hartmanae	40
			Chaetozone lunula	2
			Chaetozone sp SD2	8
			Chaetozone sp SD5	13
			Chaetozone sp SD7	2
			Chaetozone sp	9
			Cirratulus sp	3
			Kirkegaardia cryptica	7
			Kirkegaardia siblina	77
			Kirkegaardia tesselata	21
		Fauveliopsidae	*Fauveliopsis* sp SD1	1
		Flabelligeridae		1
			Pherusa neopapillata	6
			Piromis sp	2
		Sternaspidae	*Sternaspis affinis*	6
		Ampharetidae		8
			Amage anops	6
			Amage scutata	4
			Ampharete acutifrons	1
			Ampharete finmarchica	7
			Ampharete labrops	70
			Ampharete sp	1
			Ampharetidae sp SD1	7
			Amphicteis scaphobranchiata	16
			Anobothrus gracilis	9
			Asabellides lineata	6
			Eclysippe trilobata	23
			Lysippe sp A	9
			Lysippe sp B	3
			Lysippe sp	1
			Sabellides manriquei	51
			Samytha californiensis	3
			Schistocomus sp A	1
			Schistocomus sp	6
			Melinna oculata	48
		Pectinariidae	*Pectinaria californiensis*	12
		Terebellidae		2
			Amaeana occidentalis	11
			Polycirrus californicus	1
			Polycirrus sp I	5
			Polycirrus sp A	49
			Polycirrus sp SD3	58
			Polycirrus sp	41
			Artacama coniferi	2
			Eupolymnia heterobranchia	1
			Lanassa venusta venusta	190

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Phisidia sanctaemariae	9
			Pista brevibranchiata	6
			Pista estevanica	55
			Pista wui	43
			Pista sp	3
			Streblosoma crassibranchia	7
			Streblosoma sp B	7
			Streblosoma sp C	33
			Streblosoma sp	8
		Trichobranchidae	*Terebellides californica*	1
		Chaetopteridae	*Chaetopterus variopedatus* Cmplx	1
			Mesochaetopterus sp	1
			Phyllochaetopterus prolifica	3
			Spiochaetopterus costarum Cmplx	160
		Capitellidae		3
			Capitella teleta	13
			Decamastus gracilis	1
			Mediomastus acutus	3
			Mediomastus sp	341
			Notomastus hemipodus	6
			Notomastus latericeus	12
			Notomastus lineatus	8
		Cossuridae	*Cossura* sp A	2
		Maldanidae		57
			Euclymeninae	25
			Axiothella sp	3
			Clymenella complanata	1
			Clymenella sp A	1
			Clymenella sp	2
			Clymenura gracilis	1
			Euclymeninae sp A	98
			Petaloclymene pacifica	53
			Praxillella pacifica	68
			Maldane sarsi	11
			Metasychis disparidentatus	34
			Praxillura maculata	5
			Rhodine bitorquata	1
		Opheliidae		2
			Armandia brevis	1
			Ophelia pulchella	23
		Orbiniidae		3
			Leitoscoloplos pugettensis	10
			Naineris uncinata	6
			Naineris sp	1
			Scoloplos acmeceps	11
			Scoloplos armiger Cmplx	67
		Paraonidae	*Aricidea (Acmira) catherinae*	7
			Aricidea (Acmira) cerrutii	12
			Aricidea (Acmira) lopezi	1
			Aricidea (Acmira) rubra	1

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Aricidea (Acmira) simplex	16
			Aricidea (Aedicira) pacifica	1
			Aricidea (Aricidea) wassi	5
			Aricidea (Aricidea) sp	2
			Aricidea (Strelzovia) antennata	3
			Aricidea (Strelzovia) hartleyi	2
			Cirrophorus furcatus	5
			Levinsenia gracilis	12
			Levinsenia kirbyae	2
			Paradoneis sp SD1	23
			Paradoneis sp	2
		Scalibregmatidae	*Scalibregma californicum*	64
		Travisiidae	*Travisia brevis*	6
			Travisia gigas	7
			Travisia pupa	4
		Polygordiidae	*Polygordius* sp	9
		Saccocirridae	*Saccocirrus* sp	1
	Clitellata		Oligochaeta	4
Arthropoda	Pycnogonida	Phoxichilidiidae	*Anoplodactylus erectus*	1
	Ostracoda	Cylindroleberididae	*Leuroleberis sharpei*	2
			Xenoleberis californica	1
		Philomedidae	*Euphilomedes carcharodonta*	85
		Sarsiellidae	*Eusarsiella thominx*	2
	Malacostraca	Nebaliidae	*Nebalia daytoni*	14
			Nebalia pugettensis Cmplx	7
		Mysidae		1
			Neomysis kadiakensis	3
			Metamysidopsis elongata	9
		Caprellidae		3
			Caprella mendax	13
			Hemiproto sp A	1
		Ischyroceridae	*Notopoma* sp A	72
		Kamakidae	*Amphideutopus oculatus*	18
		Photidae	*Ampelisciphotis podophthalma*	14
			Gammaropsis thompsoni	13
			Photis bifurcata	6
			Photis brevipes	19
			Photis californica	43
			Photis lacia	5
			Photis macinerneyi	1
			Photis sp C	5
			Photis sp OC1	42
			Photis sp	9
		Aoridae	*Aoroides intermedia*	1
			Aoroides sp	2
		Unciolidae	*Rudilemboides stenopropodus*	5
		Corophiidae	*Laticorophium baconi*	16
		Megaluropidae	*Gibberosus myersi*	8
			Megaluropidae sp A	9
		Oedicerotidae	*Americhelidium shoemakeri*	5

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Americhelidium sp SD1	10
			Americhelidium sp SD4	1
			Deflexilodes norvegicus	3
			Hartmanodes hartmanae	5
			Westwoodilla tone	1
		Liljeborgiidae	*Listriella albina*	1
			Listriella goleta	2
		Stenothoidae	*Metopa dawsoni*	1
		Melphidippidae	*Melphisana bola* Cmplx	1
		Ampeliscidae	*Ampelisca agassizi*	23
			Ampelisca brachycladus	64
			Ampelisca brevisimulata	71
			Ampelisca cf *brevisimulata*	2
			Ampelisca careyi	28
			Ampelisca cristata cristata	63
			Ampelisca cristata microdentata	83
			Ampelisca hancocki	2
			Ampelisca milleri	1
			Ampelisca pugetica	40
			Ampelisca sp	20
			Byblis millsi	20
		Synopiidae	*Tiron biocellata*	2
		Argissidae	*Argissa hamatipes*	6
		Platyischnopidae	*Tiburonella viscana*	2
		Urothoidae	*Urothoe elegans* Cmplx	5
		Phoxocephalidae	*Foxiphalus golfensis*	8
			Foxiphalus obtusidens	45
			Rhepoxynius fatigans	2
			Rhepoxynius heterocuspidatus	156
			Rhepoxynius lucubrans	13
			Rhepoxynius menziesi	89
			Rhepoxynius stenodes	31
			Rhepoxynius variatus	2
			Rhepoxynius sp	2
			Eyakia robusta	1
			Metaphoxus frequens	1
		Lysianassidae	*Aruga holmesi*	1
			Aruga oculata	4
		Tryphosidae	*Hippomedon columbianus*	1
			Hippomedon zetesimus	7
			Lepidepecreum serraculum	1
			Orchomenella pinguis	1
		Acidostomatidae	*Acidostoma hancocki*	3
		Pakynidae	*Pachynus barnardi*	1
		Cirolanidae	*Eurydice caudata*	15
		Gnathiidae	*Caecognathia crenulatifrons*	22
		Anthuridae	*Haliophasma geminata*	18
		Idoteidae	*Edotia sublittoralis*	12
			Edotia sp B	3
		Sphaeromatidae	*Exosphaeroma* sp	1

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
		Joeropsididae	*Joeropsis dubia*	1
		Leptocheliidae	*Chondrochelia dubia* Cmplx	260
		Bodotriidae	*Cyclaspis nubila*	10
		Nannastacidae	*Campylaspis canaliculata*	5
			Campylaspis maculinodulosa	2
			Procampylaspis caenosa	5
		Lampropidae	*Hemilamprops californicus*	40
			Mesolamprops bispinosus	5
		Diastylidae	*Anchicolurus occidentalis*	2
			Diastylis californica	5
			Diastylopsis tenuis	3
			Oxyurostylis pacifica	15
		**	Decapoda	1
		Crangonidae	*Crangon alaskensis*	7
		Diogenidae	*Paguristes turgidus*	1
			Paguristes ulreyi	1
		Paguridae	*Pylopagurus holmesi*	1
		Albuneidae	*Lepidopa californica*	2
		Cyclodorippidae	*Deilocerus planus*	1
		Cancridae		1
		Pinnotheridae	*Pinnixa franciscana*	2
			Pinnixa longipes	5
			Pinnixa sp	65
Nematoda				158
Echinodermata	Asteroidea			14
		Astropectinidae	*Astropecten armatus*	1
			Astropecten californicus	9
			Astropecten sp	5
	Ophiuroidea			5
		Ophiuridae	*Ophiura luetkenii*	41
		Ophioscolecidae	*Ophiuroconis bispinosa*	41
		Amphiuridae		56
			Amphiodia digitata	6
			Amphiodia psara	5
			Amphiodia urtica	4
			Amphiodia sp	23
			Amphioplus sp A	1
			Amphipholis squamata	27
			Dougaloplus sp A	3
		Ophiotrichidae	*Ophiothrix spiculata*	1
	Echinoidea			10
		Toxopneustidae	*Lytechinus pictus*	1
		Dendrasteridae	*Dendraster terminalis*	184
		**	Spatangoida	2
		Maretiidae	*Nacospatangus laevis*	1
		Loveniidae	*Lovenia cordiformis*	13
	Holothuroidea	Phyllophoridae		4
		Synaptidae	*Leptosynapta* sp	1
Phoronida				3
		Phoronidae	*Phoronis* sp SD1	8

Appendix B.25 *continued*

Phylum	Class	Family	Taxon	n
			Phoronis sp	50
			Phoronopsis sp	7
Brachiopoda	Lingulata	Lingulidae	*Glottidia albida*	30
Chordata	Enteropneusta			2
		Spengeliidae	*Schizocardium* sp	12
		Harrimaniidae	*Saccoglossus* sp	3
			Stereobalanus sp	4
	Ascidiacea			1
		Agneziidae	*Agnezia septentrionalis*	1
		**	Stolidobranchiata	1
		Styelidae	*Cnemidocarpa rhizopus*	14
		Molgulidae	*Eugyra glutinans*	2
	Leptocardii	Branchiostomatidae	*Branchiostoma californiense*	14

Appendix B.26

Summary taxonomic listing of benthic infauna taxa identified from the San Diego regional benthic stations sampled during summer 2020. Data are total number of individuals (n). Taxonomic arrangement follows SCAMIT (2018).** indicates taxon is not within previous family

Phylum	Class	Family	Taxon	n
Cnidaria	Hydrozoa	Corymorphidae	*Euphysa* sp A	3
	Anthozoa	Virgulariidae	*Stylatula* sp A	2
			Stylatula sp	1
		**	Ceriantharia	2
			Actiniaria	6
		Edwardsiidae		30
			Edwardsia juliae	17
			Edwardsia olguini	6
			Edwardsia profunda	1
			Scolanthus triangulus	39
		Halcampidae	*Halcampa decemtentaculata*	1
			Halianthella sp A	3
		Isanthidae	*Zaolutus actius*	23
		Limnactiniidae	Limnactiniidae sp A	1
Platyhelminthes	Rhabditophora	Stylochidae	*Stylochus exiguus*	4
			Stylochus sp	1
		Plehniidae	*Diplehnia caeca*	5
		**	Leptoplanoidea	1
Nemertea	Anopla		*Palaeonemertea*	10
		Carinomidae	*Carinoma mutabilis*	39
		Tubulanidae		5
			Tubulanus cingulatus	8
			Tubulanus polymorphus	58
			Tubulanus sp A	5
		**	Heteronemertea	2
		Lineidae		33
			Cerebratulus californiensis	2
			Cerebratulus sp	1
			Lineidae sp SD1	11
			Lineus bilineatus	8
			Maculaura alaskensis Cmplx	2
			Zygeupolia rubens	5
		**	Heteronemertea sp SD2	41
	Enopla		Hoplonemertea	5
		Emplectonematidae	*Paranemertes californica*	9
		Prosorhochmidae	*Prosorhochmus albidus*	1
		Oerstediidae	*Oerstedia dorsalis* Cmplx	1
		Tetrastemmatidae	*Tetrastemma candidum*	1
		**	Hoplonemertea sp A	1
			Hoplonemertea sp D	1
Mollusca	Caudofoveata	Chaetodermatidae	*Chaetoderma marinelli*	3
			Chaetoderma nanulum	1
			Chaetoderma pacificum	5
			Falcidens longus	5
		Limifossoridae	*Limifossor fratula*	1
	Polyplacophora	Leptochitonidae	*Leptochiton rugatus*	11

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
	Gastropoda			1
		Solariellidae	*Solariella peramabilis*	2
		Calyptraeidae	*Calyptraea fastigiata*	1
		Naticidae	*Neverita recluziana*	2
		Eulimidae	*Balcis oldroydae*	2
			Eulima raymondi	1
			Polygireulima rutila	1
		Nassariidae	*Tritia insculpta*	2
		Muricidae		1
		Olivellidae	*Callianax baetica*	38
		Mangeliidae	*Kurtziella plumbea*	3
			Kurtzina beta	2
		Terebridae	*Terebra pedroana*	1
		Acteonidae	*Rictaxis punctocaelatus*	1
		Pyramidellidae	*Odostomia* sp	6
			Turbonilla santarosana	1
			Turbonilla sp A	6
			Turbonilla sp SD5	1
			Turbonilla sp SD9	2
		Rhizoridae	*Volvulella californica*	3
			Volvulella cylindrica	4
			Volvulella panamica	3
		Philinidae	*Philine auriformis*	24
		Gastropteridae	*Gastropteron pacificum*	4
		Cylichnidae	*Cylichna diegensis*	6
		Diaphanidae	*Diaphana californica*	1
	Bivalvia			6
		Nuculidae	*Acila castrensis*	2
			Ennucula tenuis	14
		**	Nuculanida	1
		Nuculanidae	*Nuculana conceptionis*	2
			Nuculana hamata	5
			Nuculana taphria	10
			Nuculana sp A	65
			Nuculana sp B	1
			Nuculana sp	1
		Yoldiidae	*Yoldiella nana*	8
		Mytilidae	*Solamen columbianum*	1
			Dacrydium pacificum	1
			Modiolinae	6
			Amygdalum pallidulum	4
		Pectinidae	*Delectopecten vancouverensis*	3
			Leptopecten latiauratus	1
		Lucinidae	*Parvilucina tenuisculpta*	63
			Lucinoma annulatum	7
		Thyasiridae	*Adontorhina cyclia*	12
			Axinopsida serricata	577
			Thyasira flexuosa	7
		Galeommatidae	*Waldo arthuri*	1

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
		Lasaeidae	*Kurtiella grippi*	3
			Kurtiella tumida	5
		Cardiidae	*Keenaea centifilosum*	8
		Tellinidae		2
			Tellina carpenteri	36
			Tellina modesta	38
			Tellina sp B	98
			Tellina sp	1
			Macoma carlottensis	5
			Macoma yoldiformis	21
			Macoma sp	1
		Solenidae	*Solen sicarius*	1
		Pharidae	*Ensis myrae*	2
		Hiatellidae	*Saxicavella pacifica*	4
		Veneridae	*Compsomyax subdiaphana*	2
		Petricolidae	*Cooperella subdiaphana*	11
		Mactridae	*Simomactra falcata*	3
		Lyonsiidae	*Lyonsia californica*	1
		**	Thracioidea	2
		Periplomatidae	*Periploma* sp	1
		Cuspidariidae	*Cuspidaria parapodema*	5
Mollusca	Scaphopoda			3
		Dentaliidae	*Dentalium vallicolens*	2
		Rhabdidae	*Rhabdus rectius*	4
		Gadilidae	*Polyschides quadrifissatus*	20
			Cadulus californicus	3
			Gadila aberrans	69
		**	*Compressidens stearnsii*	2
Sipuncula	Sipunculidea	Golfingiidae	*Nephasoma diaphanes*	2
			Thysanocardia nigra	2
		Phascolionidae	*Phascolion* sp A	32
		Sipunculidae	*Siphonosoma ingens*	4
Annelida	Polychaeta		Echiura	1
		Thalassematidae	*Listriolobus hexamyotus*	1
			Listriolobus pelodes	1
		Amphinomidae	*Chloeia pinnata*	4
			Pareurythoe californica	1
		Dorvilleidae	*Meiodorvillea* sp SD1	1
		Eunicidae		1
			Leodice americana	1
			Marphysa disjuncta	1
		Lumbrineridae	*Eranno lagunae*	1
			Lumbrinerides platypygos	1
			Lumbrineris cruzensis	18
			Lumbrineris latreilli	3
			Lumbrineris ligulata	3
			Lumbrineris sp Group I	9
			Lumbrineris sp Group II	3
			Lumbrineris sp	3

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
			Ninoe tridentata	2
			Scoletoma tetraura Cmplx	62
			Scoletoma sp	21
		Oenonidae		2
			Drilonereis falcata	2
			Drilonereis sp	3
		Onuphidae		4
			Diopatra ornata	3
			Diopatra splendidissima	4
			Diopatra tridentata	1
			Diopatra sp	12
			Mooreonuphis exigua	2
			Mooreonuphis nebulosa	6
			Mooreonuphis sp SD1	3
			Mooreonuphis sp SD2	1
			Mooreonuphis sp	12
			Nothria occidentalis	11
			Onuphis affinis	4
			Onuphis eremita parva	3
			Onuphis iridescens	6
			Onuphis sp A	21
			Paradiopatra parva	245
		Acoetidae	*Acoetes pacifica*	3
		Polynoidae		1
			Eucranta anoculata	2
			Malmgreniella bansei	1
			Malmgreniella baschi	4
			Malmgreniella macginitiei	3
			Malmgreniella nigralba	2
			Malmgreniella sanpedroensis	1
			Malmgreniella scriptoria	2
			Malmgreniella sp A	5
			Subadyte mexicana	5
			Tenonia priops	12
		Pholoidae	*Pholoe glabra*	58
		Sigalionidae	*Pholoides asperus*	2
			Pisione sp	1
			Sigalion spinosus	49
			Sthenelais tertiaglabra	4
			Sthenelais verruculosa	5
			Sthenelanella uniformis	15
		Glyceridae	*Glycera americana*	3
			Glycera macrobranchia	7
			Glycera nana	53
			Glycera oxycephala	15
		Goniadidae	*Glycinde armigera*	35
			Goniada brunnea	5
			Goniada littorea	12
			Goniada maculata	63

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
		Hesionidae	*Heteropodarke heteromorpha*	1
			Micropodarke dubia	1
			Podarkeopsis glabrus	6
		Nereididae	*Ceratocephale loveni*	1
			Nereis sp A	18
			Nicon moniloceras	1
			Platynereis bicanaliculata	4
		Pilargidae	*Ancistrosyllis groenlandica*	3
			Hermundura fauveli	1
			Hermundura ocularis	1
			Sigambra bassi	1
			Sigambra setosa	1
		Syllidae	*Epigamia-Myrianida* Cmplx	1
			Eusyllis habei	1
			Eusyllis longicirrata	12
			Eusyllis transecta	1
			Odontosyllis phosphorea	2
			Paraehlersia articulata	1
			Exogone lourei	3
			Parexogone molesta	1
			Syllis heterochaeta	8
		Nephtyidae	*Aglaophamus erectans*	1
			Aglaophamus verrilli	5
			Bipalponephtys cornuta	12
			Nephtys caecoides	9
			Nephtys ferruginea	23
			Nephtys sp SD2	5
		Phyllodocidae	*Eteone brigitteae*	1
			Eteone leptotes	1
			Eteone pigmentata	1
			Eulalia levicornuta Cmplx	2
			Eumida longicornuta	10
			Sige sp A	6
			Nereiphylla ferruginea Cmplx	1
			Nereiphylla sp 2	1
			Paranaitis polynoides	1
			Phyllodoce groenlandica	1
			Phyllodoce hartmanae	36
			Phyllodoce longipes	17
			Phyllodoce pettiboneae	10
		Oweniidae	*Myriochele gracilis*	3
			Myriochele olgae	2
			Myriochele striolata	3
			Owenia collaris	55
		Sabellariidae	*Neosabellaria cementarium*	1
		Sabellidae	*Acromegalomma pigmentum*	3
			Acromegalomma splendidum	2
			Bispira sp	1
			Dialychone albocincta	11

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
			Dialychone trilineata	16
			Dialychone veleronis	12
			Euchone arenae	2
			Euchone hancocki	6
			Euchone incolor	14
			Euchone sp A	10
			Euchone sp	1
			Jasmineira sp B	9
			Myxicola sp	2
			Paradialychone bimaculata	2
			Paradialychone harrisae	1
			Potamethus sp A	24
		Longosomatidae	*Heterospio catalinensis*	1
		Magelonidae	*Magelona berkeleyi*	2
			Magelona hartmanae	1
			Magelona sp B	2
		Poecilochaetidae	*Poecilochaetus johnsoni*	3
			Poecilochaetus martini	2
		Spionidae		1
			Carazziella sp A	6
			Dipolydora socialis	10
			Dispio sp SD1	2
			Laonice cirrata	18
			Laonice nuchala	46
			Malacoceros indicus	1
			Microspio pigmentata	42
			Paraprionospio alata	191
			Polydora cirrosa	1
			Polydora sp	2
			Prionospio dubia	123
			Prionospio ehlersi	33
			Prionospio jubata	219
			Prionospio lighti	8
			Prionospio pygmaeus	668
			Pseudopolydora paucibranchiata	1
			Spiophanes anoculata	1
			Spiophanes berkeleyorum	18
			Spiophanes duplex	1037
			Spiophanes fimbriata	3
			Spiophanes kimballi	205
			Spiophanes norrisi	123
			Spiophanes wigleyi	2
		Cirratulidae	*Aphelochaeta elongata*	1
			Aphelochaeta glandaria Cmplx	46
			Aphelochaeta monilaris	42
			Aphelochaeta phillipsi	5
			Aphelochaeta tigrina	25
			Aphelochaeta sp LA1	1
			Aphelochaeta sp	2

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
			Caulleriella lajolla	1
			Chaetozone corona	16
			Chaetozone hartmanae	25
			Chaetozone senticosa	1
			Chaetozone sp SD2	6
			Chaetozone sp SD3	1
			Chaetozone sp SD4	1
			Chaetozone sp SD5	10
			Chaetozone sp	1
			Kirkegaardia cryptica	32
			Kirkegaardia serratiseta	1
			Kirkegaardia siblina	77
			Kirkegaardia tesselata	23
			Kirkegaardia sp SD9	3
		Fauveliopsidae	*Fauveliopsis glabra*	1
			Fauveliopsis sp SD1	6
			Fauveliopsis sp	2
		Flabelligeridae	*Brada pilosa*	4
			Brada pluribranchiata	2
			Pherusa neopapillata	2
		Sternaspidae	*Sternaspis affinis*	55
		Ampharetidae		16
			Amage anops	4
			Amage scutata	4
			Ampharete acutifrons	1
			Ampharete finmarchica	2
			Ampharete labrops	26
			Ampharetidae sp SD1	3
			Amphicteis scaphobranchiata	9
			Anobothrus gracilis	9
			Eclysippe trilobata	90
			Lysippe sp A	4
			Lysippe sp B	19
			Sabellides manriquei	2
			Samytha californiensis	1
			Sosane occidentalis	3
			Melinna heterodonta	2
			Melinna oculata	14
		Pectinariidae	*Cistenides granulata*	9
			Pectinaria californiensis	64
		Terebellidae	*Amaeana occidentalis*	4
			Polycirrus californicus	2
			Polycirrus sp A	11
			Polycirrus sp OC1	11
			Polycirrus sp	9
			Lanassa venusta venusta	6
			Phisidia sanctaemariae	69
			Pista brevibranchiata	3
			Pista estevanica	54

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
			Pista moorei	1
			Pista wui	8
			Proclea sp A	2
			Streblosoma sp B	3
			Streblosoma sp SF1	6
			Streblosoma sp	1
		Trichobranchidae	*Terebellides californica*	9
		Chaetopteridae		1
			Phyllochaetopterus limicolus	223
			Spiochaetopterus costarum Cmplx	103
		Capitellidae		1
			Capitella teleta	81
			Decamastus gracilis	13
			Mediomastus acutus	1
			Mediomastus sp	520
			Notomastus hemipodus	16
			Notomastus latericeus	7
			Notomastus sp	2
		Cossuridae	*Cossura bansei*	9
			Cossura candida	11
			Cossura sp A	4
		Maldanidae		50
			Euclymeninae	16
			Axiothella sp	1
			Clymenella complanata	3
			Clymenella sp A	1
			Clymenura gracilis	25
			Euclymeninae sp A	166
			Petaloclymene pacifica	60
			Praxillella pacifica	118
			Maldane sarsi	73
			Metasychis disparidentatus	23
			Petaloproctus neoborealis	1
			Rhodine bitorquata	51
		Opheliidae	*Armandia brevis*	8
		Orbiniidae	*Leitoscoloplos pugettensis*	9
			Scoloplos acmeceps	2
			Scoloplos armiger Cmplx	122
		Paraonidae		1
			Aricidea (Acmira) catherinae	33
			Aricidea (Acmira) cerrutii	4
			Aricidea (Acmira) horikoshii	1
			Aricidea (Acmira) lopezi	15
			Aricidea (Acmira) rubra	2
			Aricidea (Acmira) simplex	12
			Aricidea (Aricidea) wassi	4
			Aricidea (Strelzovia) antennata	13
			Aricidea (Strelzovia) hartleyi	2
			Aricidea (Strelzovia) sp A	17

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
			Cirrophorus branchiatus	4
			Cirrophorus furcatus	1
			Levinsenia gracilis	31
			Levinsenia oculata	1
			Levinsenia kirbyae	6
			Paradoneis sp SD1	1
			Paradoneis sp	1
			Paraonides platybranchia	3
		Scalibregmatidae	*Scalibregma californicum*	21
		Travisiidae	*Travisia brevis*	62
Arthropoda	Pycnogonida	Callipallenidae	*Anoropallene palpida*	23
		Phoxichilidiidae	*Anoplodactylus erectus*	1
	Ostracoda	Cypridinidae	*Vargula tsujii*	1
		Cylindroleberididae	*Xenoleberis californica*	3
		Philomedidae	*Euphilomedes carcharodonta*	12
			Euphilomedes producta	3
		Sarsiellidae	*Eusarsiella thominx*	1
	Malacostraca	Nebaliidae	*Nebalia daytoni*	1
			Nebalia pugettensis Cmplx	2
		Mysidae	*Alienacanthomysis macropsis*	1
		Caprellidae		3
			Mayerella banksia	2
		Ischyroceridae	*Notopoma* sp A	12
		Kamakidae	*Amphideutopus oculatus*	8
		Photidae	*Gammaropsis thompsoni*	2
			Photis brevipes	2
			Photis californica	1
			Photis lacia	1
			Photis macinerneyi	5
			Photis sp OC1	8
			Photis sp	1
		Aoridae	*Aoroides exilis*	1
			Aoroides sp A	1
			Aoroides sp	1
		Unciolidae	*Rudilemboides stenopropodus*	1
			Rudilemboides sp	8
		Corophiidae		8
			Protomedeia articulata Cmplx	2
		Maeridae	*Maera jerrica*	12
		Megaluropidae	*Gibberosus myersi*	16
			Megaluropidae sp A	1
		Oedicerotidae	*Americhelidium shoemakeri*	15
			Americhelidium sp SD4	1
			Bathymedon pumilus	15
			Deflexilodes norvegicus	3
			Hartmanodes hartmanae	3
			Monoculodes latissimanus	1
			Westwoodilla tone	3
		Eusiridae	*Rhachotropis* sp SD1	1

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
		Liljeborgiidae	*Listriella diffusa*	1
			Listriella goleta	1
		Pardaliscidae	*Nicippe tumida*	3
		Ampeliscidae	*Ampelisca agassizi*	5
			Ampelisca brachycladus	3
			Ampelisca brevisimulata	31
			Ampelisca cf brevisimulata	4
			Ampelisca careyi	60
			Ampelisca cristata cristata	8
			Ampelisca cristata microdentata	13
			Ampelisca hancocki	9
			Ampelisca indentata	3
			Ampelisca pacifica	22
			Ampelisca pugetica	56
			Ampelisca romigi	6
			Ampelisca unsocalae	2
			Ampelisca sp	6
			Byblis millsi	1
		Argissidae	*Argissa hamatipes*	2
		Urothoidae	*Urothoe elegans* Cmplx	1
		Phoxocephalidae	*Foxiphalus obtusidens*	5
			Rhepoxynius bicuspidatus	125
			Rhepoxynius fatigans	1
			Rhepoxynius heterocuspidatus	3
			Rhepoxynius lucubrans	9
			Rhepoxynius menziesi	24
			Rhepoxynius stenodes	5
			Rhepoxynius variatus	11
			Eyakia robusta	5
			Harpiniopsis fulgens	1
			Heterophoxus ellisi	2
			Heterophoxus oculatus	23
			Heterophoxus sp	3
		Lysianassidae	*Aruga oculata*	3
		Tryphosidae	*Orchomenella decipiens*	1
		Gnathiidae	*Caecognathia crenulatifrons*	10
		Anthuridae	*Haliophasma geminata*	7
		Idoteidae	*Edotia sublittoralis*	6
		Munnopsidae	*Ilyarachna profunda*	3
		Anarthruridae	*Siphonolabrum californiensis*	1
		Leptocheliidae	*Chondrochelia dubia* Cmplx	18
		Tanaellidae	*Araphura breviaria*	12
			Araphura sp SD1	3
			Araphura sp	1
		Tanaopsidae	*Tanaopsis cadieni*	1
		Bodotriidae	*Leptocuma forsmani*	6
		Leuconidae	*Eudorella pacifica*	4
			Leucon declivis	1
		Nannastacidae	*Campylaspis rubromaculata*	1

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
			Procampylaspis caenosa	3
		Lampropidae	*Hemilamprops californicus*	23
			Hemilamprops sp A	1
			Mesolamprops bispinosus	5
		Diastylidae	*Anchicolurus occidentalis*	3
			Diastylis crenellata	6
			Diastylis pellucida	1
			Diastylopsis tenuis	7
			Oxyurostylis pacifica	1
		Crangonidae	*Crangon alaskensis*	1
		Upogebiidae	*Upogebia lepta*	2
		Hippidae	*Emerita analoga*	3
		Cancridae	*Romaleon jordani*	2
		Pinnotheridae	*Pinnixa franciscana*	1
			Pinnixa longipes	4
			Pinnixa occidentalis Cmplx	7
			Pinnixa sp	24
	Hexanauplia	Scalpellidae	*Hamatoscalpellum californicum*	1
Nematoda				16
Echinodermata	Asteroidea			4
		Astropectinidae	*Astropecten californicus*	2
	Ophiuroidea			10
		Ophiuridae	*Ophiura luetkenii*	6
		Amphiuridae		234
			Amphichondrius granulatus	6
			Amphiodia digitata	9
			Amphiodia urtica	596
			Amphiodia sp	150
			Amphioplus strongyloplax	4
			Amphipholis squamata	1
			Amphiura arcystata	8
			Dougaloplus amphacanthus	9
			Dougaloplus sp	1
	Echinoidea			4
			Spatangoida	2
		Schizasteridae	*Brisaster latifrons*	2
			Brisaster townsendi	1
			Brisaster sp	1
		Brissidae	*Brissopsis pacifica*	3
	Holothuroidea		Dendrochirotida	1
		Phyllophoridae	*Thyone benti*	1
		Ypsilothuriidae	*Ypsilothuria bitentaculata*	1
		Synaptidae	*Leptosynapta* sp	8
		Chiridotidae	*Chiridota* sp	8
Phoronida				10
		Phoronidae	*Phoronis* sp SD1	11
			Phoronis sp	35
Brachiopoda	Lingulata	Lingulidae	*Glottidia albida*	9
Chordata	Enteropneusta			1

Appendix B.26 *continued*

Phylum	Class	Family	Taxon	n
		Spengeliidae	*Schizocardium* sp	3
		Harrimaniidae	*Saccoglossus* sp	8
			Stereobalanus sp	29
	Ascidiacea	Molgulidae	*Molgula regularis*	1

Appendix C

Demersal Fishes and Megabenthic Invertebrates

2020 Raw Data Summaries

Appendix C.1

Taxonomic listing of demersal fish species captured at PLOO trawl stations during 2020. 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).

						Length (cm)		
Taxonomic Classification			**Common Name**	**n**	**BM**	**Min**	**Max**	**Mean**
RAJIFORMES								
	Rajidae	*Raja inornata*	California Skate [a]	3	1.9	24	55	38
ARGENTINIFORMES								
	Argentinidae	*Argentina sialis*	Pacific Argentine	10	0.2	5	8	7
AULOPIFORMES								
	Synodontidae	*Synodus lucioceps*	California Lizardfish	12	1.1	17	34	22
OPHIDIIFORMES								
	Ophidiidae	*Chilara taylori*	Spotted Cusk-eel	8	0.8	11	18	15
BATRACHOIDIFORMES								
	Batrachoididae	*Porichthys myriaster*	Specklefin Midshipman	10	0.1	4	12	8
		Porichthys notatus	Plainfin Midshipman	62	1.5	8	15	11
SCORPAENIFORMES								
	Scorpaenidae	*Scorpaena guttata*	California Scorpionfish	17	2.7	10	21	16
	Sebastidae	*Sebastes elongatus*	Greenstriped Rockfish	3	0.2	9	10	10
		Sebastes helvomaculatus	Rosethorn Rockfish	1	0.1	8	8	8
		Sebastes hopkinsi	Squarespot Rockfish	17	0.6	9	12	11
		Sebastes miniatus	Vermilion Rockfish	3	0.5	15	20	17
		Sebastes saxicola	Stripetail Rockfish	33	0.8	6	10	8
		Sebastes semicinctus	Halfbanded Rockfish	752	16.4	5	18	10
		Sebastes sp	Rockfish Unidentified	8	0.5	3	5	4
	Hexagrammidae	*Zaniolepis frenata*	Shortspine Combfish	119	1.6	8	18	11
		Zaniolepis latipinnis	Longspine Combfish	105	1.7	7	15	11
	Cottidae	*Icelinus quadriseriatus*	Yellowchin Sculpin	23	0.3	3	7	6
		Icelinus tenuis	Spotfin Sculpin	1	0.1	3	3	3
	Agonidae	*Xeneretmus latifrons*	Blacktip Poacher	1	0.1	14	14	14
PERCIFORMES								
	Sciaenidae	*Genyonemus lineatus*	White Croaker	4	0.1	16	18	16
	Embiotocidae	*Zalembius rosaceus*	Pink Seaperch	30	0.9	5	12	9
	Bathymasteridae	*Rathbunella alleni*	Stripefin Ronquil	1	0.1	10	10	10
	Zoarcidae	*Lycodes pacificus*	Blackbelly Eelpout	1	0.1	18	18	18
	Uranoscopidae	*Kathetostoma averruncus*	Smooth Stargazer	1	0.1	8	8	8
PLEURONECIFORMES								
	Paralichthyidae	*Citharichthys sordidus*	Pacific Sanddab	1333	30.9	3	26	10
		Citharichthys xanthostigma	Longfin Sanddab	115	3.6	4	24	13
		Hippoglossina stomata	Bigmouth Sole	18	1.6	11	23	15
		Paralichthys californicus	California Halibut	1	1.8	52	52	52
		Xystreurys liolepis	Fantail Sole	1	1.0	35	35	35
	Pleuronectidae	*Lyopsetta exilis*	Slender Sole	24	0.5	9	17	14
		Microstomus pacificus	Dover Sole	308	8.1	6	19	12
		Parophrys vetulus	English Sole	142	9.0	11	23	16
		Pleuronichthys decurrens	Curlfin Sole	3	0.2	11	16	14
		Pleuronichthys verticalis	Hornyhead Turbot	42	1.4	10	19	13
	Cynoglossidae	*Symphurus atricaudus*	California Tonguefish	26	0.8	9	16	13

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

Appendix C.2

Taxonomic listing of demersal fish species captured at SBOO trawl stations during 2020. 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 (cm)		
						Min	Max	Mean
RAJIFORMES								
	Rhinobatidae	*Rhinobatos productus*	Shovelnose Guitarfish[a]	2	0.5	32	41	37
MYLIOBATIFORNES								
	Urolophidae	*Urobatis halleri*	Round Stingray[a]	2	0.5	24	33	29
CLUPEIFORMES								
	Clupeidae	*Sardinops sagax*	Pacific Sardine	62	1.0	11	14	12
AULOPIFORMES								
	Synodontidae	*Synodus lucioceps*	California Lizardfish	158	3.0	9	27	13
BATRACHOIDIFORMES								
	Batrachoididae	*Porichthys myriaster*	Specklefin Midshipman	14	1.0	6	29	10
		Porichthys notatus	Plainfin Midshipman	16	0.4	4	6	5
GASTEROSTEIFORMES								
	Syngnathidae	*Syngnathus exilis*	Barcheek Pipefish	4	0.2	13	18	17
		Syngnathus sp	Pipefish Unidentified	3	0.1	13	20	16
SCORPAENIFORMES								
	Scorpaenidae	*Scorpaena guttata*	California Scorpionfish	1	0.1	18	18	18
	Hexagrammidae	*Zaniolepis latipinnis*	Longspine Combfish	1	0.1	16	16	16
	Cottidae	*Chitonotus pugetensis*	Roughback Sculpin	11	0.6	7	9	8
		Icelinus quadriseriatus	Yellowchin Sculpin	46	0.4	6	7	7
PERCIFORMES								
	Sciaenidae	*Genyonemus lineatus*	White Croaker	58	3.0	12	18	14
		Seriphus politus	Queenfish	3	0.2	14	14	14
	Clinidae	*Heterostichus rostratus*	Giant Kelpfish	1	0.1	12	12	12
	Stromateidae	*Peprilus simillimus*	Pacific Pompano	1	0.1	9	9	9
PLEURONECTIFORMES								
	Paralichthyidae	*Citharichthys sordidus*	Pacific Sanddab	33	0.6	3	10	5
		Citharichthys stigmaeus	Speckled Sanddab	882	5.5	4	12	8
		Citharichthys xanthostigma	Longfin Sanddab	291	10.6	4	20	12
		Hippoglossina stomata	Bigmouth Sole	4	0.3	17	24	21
		Paralichthys californicus	California Halibut	10	9.2	25	63	35
		Xystreurys liolepis	Fantail Sole	6	0.7	10	22	18
	Pleuronectidae	*Parophrys vetulus*	English Sole	11	1.0	16	23	19
		Pleuronichthys ritteri	Spotted Turbot	6	0.7	13	19	17
		Pleuronichthys verticalis	Hornyhead Turbot	26	1.3	7	18	11
	Cynoglossidae	*Symphurus atricaudus*	California Tonguefish	80	1.3	5	15	11
		Paralichthys californicus	California Halibut	1	1.8	52	52	52
		Xystreurys liolepis	Fantail Sole	1	1.0	35	35	35
	Pleuronectidae	*Lyopsetta exilis*	Slender Sole	24	0.5	9	17	14
		Microstomus pacificus	Dover Sole	308	8.1	6	19	12
		Parophrys vetulus	English Sole	142	9.0	11	23	16
		Pleuronichthys decurrens	Curlfin Sole	3	0.2	11	16	14
		Pleuronichthys verticalis	Hornyhead Turbot	42	1.4	10	19	13
	Cynoglossidae	*Symphurus atricaudus*	California Tonguefish	26	0.8	9	16	13

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

Appendix C.3

Total abundance by species and station for demersal fish collected at PLOO trawl stations during 2020.

Species	Winter 2020						Species Abundance by Survey
	SD7	SD8	SD10	SD12	SD13	SD14	
Pacific Sanddab	99	207	106	33	91	64	600
Halfbanded Rockfish	7	112	2	5			126
Dover Sole	25	23	17	8	6	4	83
Longfin Sanddab	6	9	28		15	15	73
Shortspine Combfish	14	37	4	2	4	4	65
English Sole	12	22	2		12	4	52
Longspine Combfish	7	7	8		13		35
Yellowchin Sculpin	15	7					22
Stripetail Rockfish	2	6			1	10	19
Hornyhead Turbot	1	1	9		4	4	19
California Scorpionfish		2	2	2	2	6	14
California Tonguefish	9	2					11
Specklefin Midshipman	10						10
Pink Seaperch	2	1	2		1	3	9
Pacific Argentine	9						9
California Lizardfish	1	2	1		1	3	8
Bigmouth Sole	1	4			1		6
White Croaker		4					4
Spotted Cusk-eel	1		1	1			3
Plainfin Midshipman		2				1	3
Squarespot Rockfish		1					1
Smooth Stargazer			1				1
Rockfish Unidentified						1	1
Greenstriped Rockfish		1					1
Fantail Sole		1					1
California Skate		1					1
California Halibut			1				1
Blacktip Poacher		1					1
Survey Total	221	453	184	51	151	119	1179

Appendix C.3 *continued*

Species	SD7	SD8	SD10	SD12	SD13	SD14	Species Abundance by Survey
	Summer 2020						
Pacific Sanddab	63	144	126	76	153	171	733
Halfbanded Rockfish		6	47		571	2	626
Dover Sole	27	41	54	35	41	27	225
English Sole	1	1	27	15	35	11	90
Longspine Combfish	4		21	10	23	12	70
Plainfin Midshipman	1	1	4	1	25	27	59
Shortspine Combfish	13	14	10	3	7	7	54
Longfin Sanddab	6	9		4	22	1	42
Slender Sole			2	15	4	3	24
Hornyhead Turbot		1	9	4	6	3	23
Pink Seaperch	4		8	3	6		21
Squarespot Rockfish					16		16
California Tonguefish	2	6	4	1	1	1	15
Stripetail Rockfish	1		8	1		4	14
Bigmouth Sole	1	1	1	1	7	1	12
Rockfish Unidentified		3	1		1	2	7
Spotted Cusk-eel	1	1	1	1	1		5
California Lizardfish				1	3		4
Vermilion Rockfish					3		3
Curlfin Sole			1		2		3
California Scorpionfish			1		1	1	3
Greenstriped Rockfish				2			2
California Skate				1	1		2
Yellowchin Sculpin	1						1
Stripefin Ronquil			1				1
Spotfin Sculpin		1					1
Rosethorn Rockfish			1				1
Pacific Argentine	1						1
Blackbelly Eelpout						1	1
Survey Total	126	229	327	174	929	274	2059
Annual Total	347	682	511	225	1080	393	3238

Appendix C.4

Total abundance by species and station for demersal fish collected at SBOO trawl stations during 2020.

	Winter 2020							Species Abundance
Species	**SD15**	**SD16**	**SD17**	**SD18**	**SD19**	**SD20**	**SD21**	**by Survey**
Speckled Sanddab	43	52	58	37	70	38	42	340
California Lizardfish	1	5	19	5	41	32	34	137
Pacific Sardine						62		62
White Croaker				2		26	30	58
California Tonguefish		5	1	4	9	1	15	35
Longfin Sanddab			18	10	3		3	34
Plainfin Midshipman	1	1			13		1	16
Specklefin Midshipman		1	2	3	5	1	1	13
Hornyhead Turbot			1		8	1	3	13
California Halibut				3			4	7
Roughback Sculpin		3		1				4
Barcheek Pipefish					3	1		4
Spotted Turbot	2		1					3
Queenfish							3	3
Pipefish Unidentified							3	3
Fantail Sole		1					2	3
Shovelnose Guitarfish					1		1	2
Round Stingray	1			1				2
Pacific Pompano							1	1
Giant Kelpfish							1	1
Survey Total	48	68	100	66	153	162	144	741

Appendix C.4 *continued*

Species	Summer 2020							Species Abundance by Survey
	SD15	SD16	SD17	SD18	SD19	SD20	SD21	
Speckled Sanddab	32	119	7	62	120	159	43	542
Longfin Sanddab		27	5	8	49	88	80	257
Yellowchin Sculpin		4			3	26	13	46
California Tonguefish	2	5	2	3	7	7	19	45
Pacific Sanddab		22	4	2	2	1	2	33
California Lizardfish		3	1	1	1	6	9	21
Hornyhead Turbot	1			2	2		8	13
English Sole				1	4	5	1	11
Roughback Sculpin	2	1			1	3		7
Bigmouth Sole					3	1		4
Spotted Turbot	1			1			1	3
Fantail Sole						1	2	3
California Halibut		1				2		3
Specklefin Midshipman		1						1
Longspine Combfish					1			1
California Scorpionfish					1			1
Survey Total	38	183	19	80	194	299	178	991
Annual Total	86	251	119	146	347	461	322	1732

Appendix C.5

Biomass (kg) by species and station for demersal fish collected at PLOO trawl stations during 2020.

	Winter 2020						Species Biomass
Species	**SD7**	**SD8**	**SD10**	**SD12**	**SD13**	**SD14**	**by Survey**
Pacific Sanddab	0.8	1.2	5.3	0.1	3.0	2.3	12.7
English Sole	0.7	1.2	0.2		0.9	0.2	3.2
Longfin Sanddab	0.2	0.1	0.8		0.4	0.7	2.2
California Scorpionfish		0.4	0.1	0.1	0.1	1.5	2.2
Halfbanded Rockfish	0.1	1.5	0.1	0.1			1.8
California Halibut			1.8				1.8
Shortspine Combfish	0.3	0.3	0.1	0.1	0.1	0.1	1.0
Fantail Sole		1.0					1.0
California Lizardfish	0.1	0.1	0.1		0.1	0.5	0.9
Dover Sole	0.2	0.1	0.2	0.1	0.1	0.1	0.8
Hornyhead Turbot	0.1	0.1	0.1		0.2	0.1	0.6
Pink Seaperch	0.1	0.1	0.1		0.1	0.1	0.5
Stripetail Rockfish	0.1	0.1			0.1	0.1	0.4
Longspine Combfish	0.1	0.1	0.1		0.1		0.4
Spotted Cusk-eel	0.1		0.1	0.1			0.3
Bigmouth Sole	0.1	0.1			0.1		0.3
Yellowchin Sculpin	0.1	0.1					0.2
Plainfin Midshipman		0.1				0.1	0.2
California Tonguefish	0.1	0.1					0.2
White Croaker		0.1					0.1
Squarespot Rockfish		0.1					0.1
Specklefin Midshipman	0.1						0.1
Smooth Stargazer			0.1				0.1
Rockfish Unidentified						0.1	0.1
Pacific Argentine	0.1						0.1
Greenstriped Rockfish		0.1					0.1
California Skate		0.1					0.1
Blacktip Poacher		0.1					0.1
Survey Total	3.4	7.2	9.2	0.6	5.3	5.9	31.6

Appendix C.5 *continued*

Species	SD7	SD8	SD10	SD12	SD13	SD14	Species Biomass by Survey
	Summer 2020						
Pacific Sanddab	0.7	1.2	2.3	4.0	5.8	4.2	18.2
Halfbanded Rockfish		0.1	0.7		13.7	0.1	14.6
Dover Sole	1.0	1.2	1.3	0.9	1.8	1.1	7.3
English Sole	0.1	0.1	1.5	1.2	2.3	0.6	5.8
California Skate				1.0	0.8		1.8
Longfin Sanddab	0.1	0.2		0.1	0.9	0.1	1.4
Plainfin Midshipman	0.1	0.1	0.1	0.1	0.5	0.4	1.3
Longspine Combfish	0.1		0.4	0.1	0.5	0.2	1.3
Bigmouth Sole	0.1	0.1	0.1	0.1	0.8	0.1	1.3
Hornyhead Turbot		0.1	0.4	0.1	0.1	0.1	0.8
Shortspine Combfish	0.1	0.1	0.1	0.1	0.1	0.1	0.6
California Tonguefish	0.1	0.1	0.1	0.1	0.1	0.1	0.6
Vermilion Rockfish					0.5		0.5
Squarespot Rockfish					0.5		0.5
Spotted Cusk-eel	0.1	0.1	0.1	0.1	0.1		0.5
Slender Sole			0.1	0.2	0.1	0.1	0.5
California Scorpionfish			0.2		0.1	0.2	0.5
Stripetail Rockfish	0.1		0.1	0.1		0.1	0.4
Rockfish Unidentified		0.1	0.1		0.1	0.1	0.4
Pink Seaperch	0.1		0.1	0.1	0.1		0.4
Curlfin Sole			0.1		0.1		0.2
California Lizardfish				0.1	0.1		0.2
Yellowchin Sculpin	0.1						0.1
Stripefin Ronquil			0.1				0.1
Spotfin Sculpin		0.1					0.1
Rosethorn Rockfish			0.1				0.1
Pacific Argentine	0.1						0.1
Greenstriped Rockfish				0.1			0.1
Blackbelly Eelpout						0.1	0.1
Survey Total	2.9	3.6	8.0	8.5	29.1	7.7	59.8
Annual Total	6.3	10.8	17.2	9.1	34.4	13.6	91.4

Appendix C.6

Biomass (kg) by species and station for demersal fish collected at SBOO trawl stations during 2020.

	Winter 2020							Species Biomass
Species	**SD15**	**SD16**	**SD17**	**SD18**	**SD19**	**SD20**	**SD21**	**by Survey**
California Halibut				4.5			2.2	6.7
White Croaker				0.3		1.0	1.7	3.0
Speckled Sanddab	0.3	0.4	0.5	0.4	0.7	0.3	0.4	3.0
California Lizardfish	0.1	0.1	0.2	0.1	0.4	0.4	0.9	2.2
Pacific Sardine						1.0		1.0
Longfin Sanddab			0.1	0.6	0.2		0.1	1.0
Specklefin Midshipman		0.1	0.1	0.1	0.1	0.1	0.4	0.9
Hornyhead Turbot			0.1		0.2	0.1	0.2	0.6
California Tonguefish		0.1	0.1	0.1	0.1	0.1	0.1	0.6
Shovelnose Guitarfish					0.3		0.2	0.5
Round Stingray	0.4			0.1				0.5
Fantail Sole		0.1					0.4	0.5
Spotted Turbot	0.3		0.1					0.4
Plainfin Midshipman	0.1	0.1			0.1		0.1	0.4
Roughback Sculpin		0.1		0.1				0.2
Queenfish							0.2	0.2
Barcheek Pipefish					0.1	0.1		0.2
Pipefish Unidentified							0.1	0.1
Pacific Pompano							0.1	0.1
Giant Kelpfish							0.1	0.1
Survey Total	1.2	1.0	1.2	6.3	2.2	3.1	7.2	22.2

Appendix C.6 *continued*

Species	Summer 2020							Species Biomass by Survey
	SD15	SD16	SD17	SD18	SD19	SD20	SD21	
Longfin Sanddab		0.6	0.1	0.1	1.8	3.7	3.3	9.6
Speckled Sanddab	0.1	0.7	0.1	0.1	0.4	0.8	0.3	2.5
California Halibut		2.0				0.5		2.5
English Sole				0.1	0.4	0.4	0.1	1.0
California Lizardfish		0.1	0.1	0.1	0.1	0.1	0.3	0.8
Hornyhead Turbot	0.1			0.1	0.1		0.4	0.7
California Tonguefish	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.7
Pacific Sanddab		0.1	0.1	0.1	0.1	0.1	0.1	0.6
Yellowchin Sculpin		0.1			0.1	0.1	0.1	0.4
Roughback Sculpin	0.1	0.1			0.1	0.1		0.4
Spotted Turbot	0.1			0.1			0.1	0.3
Bigmouth Sole					0.2	0.1		0.3
Fantail Sole						0.1	0.1	0.2
Specklefin Midshipman		0.1						0.1
Longspine Combfish					0.1			0.1
California Scorpionfish					0.1			0.1
Survey Total	0.5	3.9	0.5	0.8	3.6	6.1	4.9	20.3
Annual Total	1.7	4.9	1.7	7.1	5.8	9.2	12.1	42.5

Appendix C.7

Summary of demersal fish abnormalities and parasites at trawl stations sampled during 2020. PE = eye parasite; PG = gill parasite; PL = leech; D = skeletal deformity; O = other; T = tumor.

Region	Survey	Station	Species	Size Class	Count	Type	Abnormalities/Parasite
PLOO	winter	SD7	Pacific Sanddab	8	1	PE	*Phrixocephalus cininnatus*
PLOO	winter	SD8	Pacific Sanddab	6	2	PE	*Phrixocephalus cininnatus*
PLOO	winter	SD8	Fantail Sole	35	1	PE	*Phrixocephalus cininnatus*
PLOO	winter	SD8	Pacific Sanddab	9	1	PE	*Phrixocephalus cininnatus*
PLOO	winter	SD8	Pacific Sanddab	8	1	PE	*Phrixocephalus cininnatus*
PLOO	winter	SD8	Pacific Sanddab	7	1	PE	*Phrixocephalus cininnatus*
PLOO	summer	SD8	Dover Sole	8	1	PE	*Phrixocephalus cininnatus*
PLOO	winter	SD12	Pacific Sanddab	13	1	PE	*Phrixocephalus cininnatus*
PLOO	winter	SD10	Pacific Sanddab	13	1	PE	*Phrixocephalus cininnatus*
PLOO	summer	SD12	Pacific Sanddab	11	1	PG	*Elthusa vulgaris*
PLOO	summer	SD13	Pacific Sanddab	6	1	PE	*Phrixocephalus cininnatus*
PLOO	summer	SD14	Pacific Sanddab	9	1	PE	*Phrixocephalus cininnatus*
PLOO	summer	SD14	Pacific Sanddab	16	1	PE	*Phrixocephalus cininnatus*
SBOO	winter	SD17	Speckled Sanddab	9	1	PG	*Elthusa vulgaris*
SBOO	winter	SD18	California Halibut	63	1	PL	Leech
SBOO	winter	SD21	Speckled Sanddab	7	1	D	Spinal deformity
SBOO	summer	SD19	California Tonguefish	10	1	O	Dent on body, ventral eyeside
SBOO	summer	SD20	Speckled Sanddab	9	1	T	Tumor

Appendix C.8

Taxonomic listing of megabenthic invertebrate taxa captured at PLOO trawl stations during 2020. Data are number of individuals (n). Taxonomic arrangement follows SCAMIT (2018).

Taxonomic Classification				n
SILICEA				
	Demospongiae	Halichondriidae	*Halichondria* sp	1
CNIDARIA				
	Anthozoa	Virgulariidae	*Acanthoptilum* sp	1
MOLLUSCA				
	Gastropoda	Calliostomatidae	*Calliostoma turbinum*	1
		Nassariidae	*Tritia insculpta*	1
		Muricidae	*Austrotrophon catalinensis*	1
	Cephalopoda	Octopodidae	*Octopus rubescens*	1
ANNELIDA				
	Polychaeta	Aphroditidae	*Aphrodita refulgida*	2
ARTHROPODA				
	Malacostraca	Sicyoniidae	*Sicyonia ingentis*	1120
		(no family)	Paguroidea	32
		Diogenidae	*Paguristes bakeri*	13
		Paguridae	*Pagurus armatus*	1
			Phimochirus californiensis	2
		Munididae	*Pleuroncodes planipes*	151,616
		Calappidae	*Platymera gaudichaudii*	452
		Epialtidae	*Loxorhynchus crispatus*	2
			Loxorhynchus grandis	1
ECHINODERMATA				
	Asteroidea	Luidiidae	*Luidia armata*	5
			Luidia asthenosoma	1
			Luidia foliolata	24
		Astropectinidae	*Astropecten californicus*	18
	Ophiuroidea	Ophiuridae	*Ophiura luetkenii*	3
		Amphiuridae	*Amphichondrius granulatus*	1
		Ophiopholidae	*Ophiopholis bakeri*	4
		Ophiotrichidae	*Ophiothrix spiculata*	4
	Echinoidea	Toxopneustidae	*Lytechinus pictus*	3519
		Strongylocentrotidae	*Strongylocentrotus fragilis*	2
	Holothuroidea	Stichopodidae	*Apostichopus californicus*	10

Appendix C.9

Taxonomic listing of megabenthic invertebrate taxa captured at SBOO trawl stations during 2020. Data are number of individuals (n). Taxonomic arrangement follows SCAMIT (2018).

Taxonomic Classification				n
SILICEA				
	Demospongiae	Suberitidae	*Suberites* sp	5
CNIDARIA				
	Anthozoa	Virgulariidae	*Stylatula elongata*	3
MOLLUSCA				
	Gastropoda	Naticidae	*Neverita recluziana*	1
			Sinum scopulosum	2
		Bursidae	*Crossata ventricosa*	6
		Buccinidae	*Kelletia kelletii*	4
		Muricidae	*Pteropurpura festiva*	1
		Pseudomelatomidae	*Crassispira semiinflata*	1
		Onchidorididae	*Acanthodoris brunnea*	2
			Acanthodoris rhodoceras	2
		Arminidae	*Armina californica*	3
		Philinidae	*Philine auriformis*	131
	Cephalopoda	Octopodidae	*Octopus rubescens*	1
ARTHROPODA				
	Malacostraca	Hemisquillidae	*Hemisquilla californiensis*	2
		Penaeidae	*Farfantepenaeus californiensis*	1
		Sicyoniidae	*Sicyonia penicillata*	43
		Crangonidae	*Crangon alba*	1
			Crangon nigromaculata	123
		Diogenidae	*Paguristes bakeri*	1
		Paguridae	*Pagurus spilocarpus*	1
		Munididae	*Pleuroncodes planipes*	1
		Dromiidae	*Moreiradromia sarraburei*	1
		Calappidae	*Platymera gaudichaudii*	2
		Epialtidae	*Loxorhynchus grandis*	4
		Inachoididae	*Pyromaia tuberculata*	6
		Parthenopidae	*Latulambrus occidentalis*	1
		Portunidae	*Portunus xantusii*	28
ECHINODERMATA				
	Asteroidea	Luidiidae	*Luidia armata*	12
		Astropectinidae	*Astropecten californicus*	145
	Ophiuroidea	Ophiotrichidae	*Ophiothrix spiculata*	5
	Echinoidea	Toxopneustidae	*Lytechinus pictus*	25
		Dendrasteridae	*Dendraster terminalis*	13
		Loveniidae	*Lovenia cordiformis*	39

Appendix C.10

Total abundance by species and station for megabenthic invertebrates captured at PLOO trawl stations during 2020.

	Winter 2020						Species Abundance by Survey
Species	**SD7**	**SD8**	**SD10**	**SD12**	**SD13**	**SD14**	
Pleuroncodes planipes			23,890	45,712	34,238	35,763	139,603
Lytechinus pictus	6	1026	1	429	7	6	1475
Sicyonia ingentis	3	4	341	86	76	336	846
Platymera gaudichaudii		2	3	23	47	9	84
Paguroidea		32					32
Luidia foliolata	5	4	1	5		2	17
Paguristes bakeri		13					13
Astropecten californicus	4	2	2		1	1	10
Apostichopus californicus	1		2		1	1	5
Ophiura luetkenii	3						3
Ophiothrix spiculata		3					3
Phimochirus californiensis		2					2
Luidia armata	2						2
Strongylocentrotus fragilis					1		1
Octopus rubescens		1					1
Luidia asthenosoma		1					1
Loxorhynchus grandis			1				1
Austrotrophon catalinensis		1					1
Aphrodita refulgida			1				1
Acanthoptilum sp		1					1
Survey Total	24	1092	24,242	46,255	34,371	36,118	142,102

Appendix C.10 *continued*

Species	Summer 2020						Species Abundance by Survey
	SD7	SD8	SD10	SD12	SD13	SD14	
Pleuroncodes planipes		1	3	10,925		1084	12,013
Lytechinus pictus	12	997	832	2	124	77	2044
Platymera gaudichaudii	1			366		1	368
Sicyonia ingentis	1	1		265	6	1	274
Astropecten californicus	3	3	1			1	8
Luidia foliolata	5	2					7
Apostichopus californicus	1	2			2		5
Ophiopholis bakeri			1		3		4
Luidia armata	3						3
Loxorhynchus crispatus		2					2
Tritia insculpta					1		1
Strongylocentrotus fragilis			1				1
Pagurus armatus			1				1
Ophiothrix spiculata	1						1
Halichondria sp					1		1
Calliostoma turbinum	1						1
Aphrodita refulgida		1					1
Amphichondrius granulatus		1					1
Survey Total	28	1010	839	11,558	137	1164	14,736
Annual Total	52	2102	25,081	57,813	34,508	37,282	156,838

Appendix C.11

Total abundance by species and station for megabenthic invertebrates captured at SBOO trawl stations during 2020.

Species	Winter 2020							Species Abundance by Survey
	SD15	SD16	SD17	SD18	SD19	SD20	SD21	
Crangon nigromaculata	1	19	8	11	34	19	28	120
Sicyonia penicillata		4	7	1	9	7	13	41
Portunus xantusii	1	4	3	2	12	4	2	28
Lovenia cordiformis	23							23
Astropecten californicus	5		1	1	6	2		15
Lytechinus pictus	7		1	5				13
Philine auriformis			4	2				6
Suberites sp	1	2	1					4
Ophiothrix spiculata		2	2					4
Dendraster terminalis	4							4
Loxorhynchus grandis			3					3
Stylatula elongata	1		1					2
Sinum scopulosum	1		1					2
Pyromaia tuberculata		1	1					2
Hemisquilla californiensis				1			1	2
Pagurus spilocarpus					1			1
Paguristes bakeri							1	1
Octopus rubescens					1			1
Moreiradromia sarraburei		1						1
Luidia armata						1		1
Kelletia kelletii					1			1
Farfantepenaeus californiensis							1	1
Crossata ventricosa			1					1
Crangon alba	1							1
Survey Total	45	33	34	23	64	33	46	278

Appendix C.11 *continued*

Species	Summer 2020							Species Abundance by Survey
	SD15	SD16	SD17	SD18	SD19	SD20	SD21	
Astropecten californicus	16	8		1	42	36	27	130
Philine auriformis		31	61	27	6			125
Lovenia cordiformis	13		1	1		1		16
Lytechinus pictus	3		1	8				12
Luidia armata		1	6	2		1	1	11
Dendraster terminalis	9							9
Crossata ventricosa			1	2		1	1	5
Pyromaia tuberculata		2	1			1		4
Kelletia kelletii				3				3
Crangon nigromaculata		2		1				3
Armina californica	1	2						3
Sicyonia penicillata							2	2
Platymera gaudichaudii	1					1		2
Acanthodoris rhodoceras	1	1						2
Acanthodoris brunnea				2				2
Suberites sp		1						1
Stylatula elongata			1					1
Pteropurpura festiva	1							1
Pleuroncodes planipes							1	1
Ophiothrix spiculata		1						1
Neverita recluziana	1							1
Loxorhynchus grandis			1					1
Latulambrus occidentalis			1					1
Crassispira semiinflata			1					1
Survey Total	46	49	75	47	48	41	32	338
Annual Total	91	82	109	70	112	74	78	616

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Appendix D

Contaminants in Marine Fishes

2020 Raw Data Summaries

Appendix D.1

Constituents and method detection limits (MDL) used for the analysis of liver and muscle tissues of fishes collected during 2020; NA = not applicable.

	MDL			MDL	
Parameter	**Liver**	**Muscle**	**Parameter**	**Liver**	**Muscle**
			Metals (ppm)		
Aluminum (Al)	5.02-5.02	1.67-1.67	Lead (Pb)	0.277-0.277	0.092-0.092
Antimony (Sb)	0.531-0.531	0.177-0.177	Manganese (Mn)	0.526-0.526	0.142-0.142
Arsenic (As)	0.579-0.579	0.193-0.193	Mercury (Hg)	0.002-0.008	0.003-0.003
Barium (Ba)	1.07-1.07	0.357-0.357	Nickel (Ni)	0.109-0.109	0.036-0.036
Beryllium (Be)	0.011-0.011	0.004-0.004	Selenium (Se)	2.35-2.35	0.176-0.176
Cadmium (Cd)	0.053-0.053	0.018-0.018	Silver (Ag)	0.524-0.524	0.175-0.175
Chromium (Cr)	0.449-0.449	0.15-0.15	Tin (Sn)	7.96-7.96	2.65-2.65
Copper (Cu)	0.287-0.287	0.096-0.096	Zinc (Zn)	1.74-1.74	0.581-0.581
Iron (Fe)	2.96-2.96	0.988-0.988			
			Chlorinated Pesticides (ppb)		
			Hexachlorocyclohexane (HCH)		
HCH, Alpha isomer	2.26-2.68	0.26-0.27	HCH, Delta isomer	4.03-4.93	0.48-0.5
HCH, Beta isomer	5.6-6.11	0.59-0.61	HCH, Gamma isomer	2.26-2.77	0.27-0.28
			Total Chlordane		
Alpha (cis) chlordane	3.11-3.45	0.33-0.35	Heptachlor epoxide	2.09-2.56	0.25-0.26
Cis nonachlor	2.68-3.14	0.3-0.32	Methoxychlor	1.88-2.3	0.22-0.23
Gamma (trans) chlordane	2.52-3.08	0.3-0.31	Oxychlordane	2.66-3.26	0.32-0.33
Heptachlor	3.22-3.93	0.38-0.4	Trans nonachlor	1.95-2.39	0.23-0.24
			Total Dichlorodiphenyltrichloroethane (DDT)		
o,p-DDD	4.81-5.7	0.55-0.57	p,p-DDD	6.86-7.45	0.73-0.75
o,p-DDE	3.49-3.78	0.37-0.38	p,p-DDE	12.4-14.9	1.47-1.52
o,p-DDT	2.87-3.51	0.34-0.35	p,p-DDT	5.81-6.34	0.62-0.63
p,-p-DDMU	2.76-3.38	0.33-0.33			
			Miscellaneous Pesticides		
Aldrin	4.97-6.07	0.59-0.61	Endrin	4.15-5.08	0.49-0.51
AlphaEndosulfan	3.45-4.22	0.41-0.42	Endrin aldehyde	7.57-9.26	0.9-0.93
BetaEndosulfan	7.93-9.7	0.94-0.97	Hexachlorobenzene (HCB)	429-466	46-46.6
Dieldrin	1.14-1.39	0.14-0.14	Mirex	6.59-8.07	0.78-0.81
EndosulfanSulfate	2.39-2.92	0.28-0.29			

Appendix D.1 *continued*

Parameter	MDL Liver	MDL Muscle	Parameter	MDL Liver	MDL Muscle
Polychlorinated Biphenyls Congeners (PCBs) (ppb)					
PCB 18	5.26-6.43	0.62-0.64	PCB 126	1.76-2.15	0.21-0.22
PCB 28	2.68-3.13	0.3-0.31	PCB 128	4.93-5.94	0.58-0.6
PCB 37	2.12-2.59	0.25-0.26	PCB 138	5.32-6.4	0.64-0.65
PCB 44	2.56-3.13	0.3-0.31	PCB 149	4.31-5.02	0.5-0.51
PCB 49	2.51-2.98	0.29-0.3	PCB 151	6.83-7.53	0.74-0.75
PCB 52	2.52-3.04	0.29-0.3	PCB 153/168	12.6-15.1	1.54-1.54
PCB 66	4.23-5.1	0.49-0.51	PCB 156	2.23-2.69	0.26-0.27
PCB 70	4.58-5	0.48-0.5	PCB 157	2.67-2.96	0.29-0.3
PCB 74	4.59-5.01	0.49-0.5	PCB 158	5.85-6.44	0.62-0.65
PCB 77	2.56-3.13	0.3-0.31	PCB 167	3.87-4.59	0.44-0.46
PCB 81	3.61-4.41	0.43-0.44	PCB 169	2.65-3.25	0.31-0.33
PCB 87	2.06-2.44	0.24-0.24	PCB 170	2.77-3.34	0.33-0.34
PCB 99	4.54-5.55	0.56-0.56	PCB 177	5.03-5.96	0.59-0.6
PCB 101	2.19-2.63	0.27-0.27	PCB 180	5.41-6.5	0.66-0.66
PCB 105	3.72-4.48	0.44-0.45	PCB 183	5.89-6.98	0.69-0.7
PCB 110	4.19-5.06	0.5-0.5	PCB 187	5.98-7.19	NA
PCB 114	4.7-5.75	0.56-0.58	PCB 189	3.66-4.47	0.43-0.45
PCB 118	5.19-6.24	0.64-0.64	PCB 194	6.47-7.67	0.75-0.77
PCB 119	4.19-5.13	0.5-0.51	PCB 201	8.11-9.48	0.92-0.95
PCB 123	5.22-6.18	0.61-0.62	PCB 206	6.16-7.3	0.71-0.73
Polycyclic Aromatic Hydrocarbons (PAHs) (ppb)					
1-methylnaphthalene	227-232	224-231	Benzo[G,H,I]perylene	431-441	425-440
1-methylphenanthrene	295-299	297-301	Benzo[K]fluoranthene	426-436	420-435
2,3,5-trimethylnaphthalene	318-326	314-325	Biphenyl	NA	220-220
2,6-dimethylnaphthalene	244-250	241-249	Chrysene	188-192	185-192
2-methylnaphthalene	189-189	184-190	Dibenzo(A,H)anthracene	376-384	370-383
3,4-benzo(B)fluoranthene	451-461	444-460	Fluoranthene	243-249	240-248
Acenaphthene	200-204	197-203	Fluorene	120-122	118-122
Acenaphthylene	183-187	180-187	Indeno(1,2,3-CD)pyrene	349-356	344-355
Anthracene	212-217	209-216	Naphthalene	NA	NA
Benzo[A]anthracene	232-237	228-236	Perylene	324-332	320-330
Benzo[A]pyrene	358-366	353-365	Phenanthrene	427-437	421-436
Benzo[e]pyrene	437-447	431-446	Pyrene	230-235	226-234

Appendix D.2

Lengths and weights of fishes used for each composite (Comp) tissue sample from PLOO trawl and rig fishing zones during 2020. Data are summarized as number of individuals (n), minimum, maximum, and mean values.

				Length (cm, size class)			Weight (g)		
Zone	**Comp**	**Species**	**n**	**Min**	**Max**	**Mean**	**Min**	**Max**	**Mean**
RF1	1	Vermilion Rockfish	3	22	26	24	282	479	358
RF1	2	Vermilion Rockfish	3	24	27	26	360	629	525
RF1	3	Vermilion Rockfish	3	24	27	25	372	545	438
RF2	1	Starry Rockfish	3	18	26	21	197	595	331
RF2	2	Starry Rockfish	3	22	24	23	224	377	326
RF2	3	Mixed Rockfish[a]	3	21	28	25	242	574	423
TZ1	1	Pacific Sanddab	4	16	24	20	74	252	168
TZ1	2	Pacific Sanddab	6	17	20	19	74	134	105
TZ1	3	Pacific Sanddab	10	14	20	16	33	123	60
TZ2	1	Pacific Sanddab	7	13	21	17	30	155	88
TZ2	2	Pacific Sanddab	8	13	21	18	22	155	84
TZ2	3	Pacific Sanddab	6	16	24	19	51	211	118
TZ3	1	Pacific Sanddab	6	11	20	16	26	177	90
TZ3	2	Pacific Sanddab	7	12	19	16	23	121	69
TZ3	3	Pacific Sanddab	7	14	21	17	41	131	77
TZ4	1	Pacific Sanddab	5	14	20	17	46	163	99
TZ4	2	Pacific Sanddab	7	14	21	16	30	135	62
TZ4	3	Longfin Sanddab	6	13	18	16	32	125	76

[a] Includes Flag, Speckled, and Starry Rockfish

Appendix D.3

Lengths and weights of fishes used for each composite (Comp) tissue sample from SBOO trawl and rig fishing stations during 2020. Data are summarized as number of individuals (n), minimum, maximum, and mean values.

				Length (cm, size class)			Weight (g)		
Zone	Comp	Species	n	Min	Max	Mean	Min	Max	Mean
RF3	1	California Scorpionfish	3	26	27	26	587	705	642
RF3	2	Mixed Rockfish[a]	3	22	26	25	287	585	484
RF3	3	Mixed Rockfish[b]	3	18	27	21	172	458	268
RF4	1	Mixed Rockfish[c]	3	21	26	23	252	390	326
RF4	2	California Scorpionfish	3	25	29	27	567	812	686
RF4	3	California Scorpionfish	3	24	26	25	424	571	521
TZ5	1	Longfin Sanddab	11	12	20	14	26	145	50
TZ5	2	Hornyhead Turbot	6	14	20	17	51	177	130
TZ5	3	Spotted Turbot	12	15	20	16	57	169	94
TZ6	1	Longfin Sanddab	7	12	16	14	26	91	52
TZ6	2	Longfin Sanddab	7	12	16	14	35	94	58
TZ6	3	Longfin Sanddab	11	12	14	13	28	62	40
TZ7	1	Longfin Sanddab	10	12	15	13	29	70	40
TZ7	2	Longfin Sanddab	9	12	15	13	24	67	37
TZ7	3	Longfin Sanddab	10	11	15	13	24	71	37
TZ8	1	Hornyhead Turbot	8	13	19	14	60	178	94
TZ8	2	Longfin Sanddab	9	11	15	12	32	85	47
TZ8	3	California Scorpionfish	3	20	23	22	278	320	299
TZ9	1	Spotted Turbot	5	12	23	17	40	335	137
TZ9	2	No sample	—	—	—	—	—	—	—
TZ9	3	No sample	—	—	—	—	—	—	—

[a]Includes Gopher Rockfish and Treefish; [b]Includes Brown and Olive Rockfish; [c]Includes Gopher Rockfish and Treefish

Appendix D.4

Concentrations of metals (ppm) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2020. See Appendix D.1 for MDLs; ND = not detected; NR = not reportable.

	Zone	Comp	Species	Trace Metals																	
				Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Tl	Sn	Zn
PLOO	TZ1	1	Pacific Sanddab	ND	ND	8.44	ND	ND	2.11	ND	4.89	82.7	ND	ND	0.131	ND	ND	ND	ND	7.96	24.4
		2	Pacific Sanddab	ND	ND	6.41	ND	ND	2.61	ND	5.71	98.7	ND	0.842	0.166	ND	ND	ND	ND	7.96	26.5
		3	Pacific Sanddab	ND	ND	9.11	ND	ND	2.11	ND	5.54	112	ND	0.749	0.099	ND	2.35	ND	ND	7.96	26.1
	TZ2	1	Pacific Sanddab	ND	ND	10.8	ND	ND	3.24	ND	8.19	101	ND	0.806	0.154	0.121	2.35	ND	ND	7.96	32.1
		2	Pacific Sanddab	ND	ND	8.89	ND	ND	3.06	ND	5.79	136	ND	0.926	0.129	ND	2.35	ND	ND	7.96	32
		3	Pacific Sanddab	ND	ND	10.5	ND	ND	4.6	ND	7.43	100	ND	0.923	0.195	ND	2.35	ND	ND	7.96	30.9
	TZ3	1	Pacific Sanddab	ND	ND	4.28	ND	ND	3.61	ND	7.08	81.4	ND	0.825	0.149	ND	ND	ND	ND	7.96	26.4
		2	Pacific Sanddab	ND	ND	4.7	ND	ND	2.26	ND	4.32	96.1	ND	0.767	0.097	ND	2.35	ND	ND	7.96	26.9
		3	Pacific Sanddab	ND	ND	6.02	ND	ND	2.48	ND	4.45	118	ND	0.716	0.131	ND	2.35	ND	ND	7.96	35.1
	TZ4	1	Pacific Sanddab	ND	ND	4.67	ND	ND	2.83	ND	7.14	94.6	ND	0.657	0.146	ND	2.35	ND	ND	7.96	31.8
		2	Pacific Sanddab	ND	ND	4.39	ND	ND	2.2	ND	4.79	92.5	ND	0.526	0.126	ND	ND	ND	ND	ND	27.3
		3	Longfin Sanddab	ND	ND	11.1	ND	ND	3.36	ND	7.82	135	ND	0.606	0.175	ND	ND	ND	ND	ND	34.6
			Detection Rate (%)	0	0	100	0	0	100	0	100	100	0	92	100	8	58	0	0	83	100
SBOO	TZ5	1	Longfin Sanddab	ND	ND	12.1	ND	ND	2.97	ND	8.42	117	ND	0.843	0.092	ND	ND	ND	ND	ND	25
		2	Hornyhead Turbot	ND	ND	3.93	ND	ND	5.04	ND	6.21	78.9	ND	0.914	0.095	ND	ND	ND	ND	ND	75.5
		3	Spotted Turbot	ND	ND	11.4	ND	ND	4.2	ND	12.5	149	ND	1.49	0.076	ND	ND	ND	ND	ND	57.4
	TZ6	1	Longfin Sanddab	ND	ND	7.16	ND	ND	0.766	ND	6.74	84.6	ND	1.18	0.055	ND	ND	ND	ND	ND	27
		2	Longfin Sanddab	ND	ND	5.98	ND	ND	0.837	ND	6.47	84.8	ND	0.88	0.065	ND	ND	ND	ND	ND	21.8
		3	Longfin Sanddab	ND	ND	3.81	ND	ND	0.606	ND	4.83	75.1	ND	0.786	0.031	ND	ND	ND	ND	ND	18.8
	TZ7	1	Longfin Sanddab	ND	ND	5.23	ND	ND	0.638	ND	5.96	78.5	ND	0.608	0.049	ND	ND	ND	ND	ND	25.1
		2	Longfin Sanddab	ND	ND	3.44	ND	ND	0.45	ND	3.12	44.4	ND	ND	0.028	ND	ND	ND	ND	ND	13.5
		3	Longfin Sanddab	ND	ND	4.39	ND	ND	0.504	ND	5.22	71	ND	0.576	0.036	ND	ND	ND	ND	ND	20.8
	TZ8	1	Hornyhead Turbot	ND	ND	3.4	ND	ND	3.77	ND	7.56	67.6	ND	1.06	0.108	ND	ND	ND	ND	ND	65.1
		2	Longfin Sanddab	ND	ND	5.45	ND	ND	0.732	ND	6.07	84.7	ND	1.19	0.045	ND	ND	ND	ND	ND	24.5
		3	CA Scorpionfish	ND	ND	1.75	ND	ND	4.3	ND	30.1	154	ND	0.67	0.174	ND	ND	ND	ND	ND	141
	TZ9	1	Spotted Turbot	ND	ND	21.2	ND	ND	2	ND	19.5	133	0.288	1.58	0.093	ND	ND	ND	ND	ND	73.6
		2	No sample	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	0	0	100	0	0	100	0	100	100	8	92	100	0	0	0	0	0	100

Appendix D.5

Concentrations of pesticides (ppb) and lipids (% weight) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2020. See Appendix D.1 for MDLs and abbreviations; E = estimated; ND = not detected; NR = not reportable.

				Chlordane								
	Zone	Comp	Species	tChlordane	A(c)C	cNon	G(t)C	Hept	HeptEpox	Methoxy	Oxychlor	tNon
PLOO	TZ1	1	Pacific Sanddab	11.79	2.87 E	1.43 E	ND	ND	ND	ND	ND	7.49
		2	Pacific Sanddab	11.66	2.39 E	1.46 E	ND	ND	ND	ND	ND	7.81
		3	Pacific Sanddab	18.41	2.93 E	2.48 E	ND	ND	ND	ND	ND	13.00
	TZ2	1	Pacific Sanddab	10.77	1.91 E	1.73 E	ND	ND	ND	ND	ND	7.13
		2	Pacific Sanddab	8.64	1.29 E	1.51 E	ND	ND	ND	ND	ND	5.84
		3	Pacific Sanddab	13.68	3.18	ND	0.4 E	ND	ND	ND	ND	10.10
	TZ3	1	Pacific Sanddab	11.47	1.81 E	2.36 E	ND	ND	ND	ND	ND	7.30
		2	Pacific Sanddab	10.99	1.67 E	2.58 E	ND	ND	ND	ND	ND	6.74
		3	Pacific Sanddab	12.67	2.16 E	2.77 E	ND	ND	ND	ND	ND	7.74
	TZ4	1	Pacific Sanddab	8.09	1.92 E	1.4 E	ND	ND	ND	ND	ND	4.77
		2	Pacific Sanddab	10.12	2.15 E	1.9 E	0.47 E	ND	ND	ND	ND	5.60
		3	Longfin Sanddab	8.39	2.27 E	1.83 E	ND	ND	ND	ND	ND	4.29
			Detection Rate (%)	100	100	92	17	0	0	0	0	100
SBOO	TZ5	1	Longfin Sanddab	7.58	2.04 E	1.42 E	ND	ND	ND	ND	ND	4.12
		2	Hornyhead Turbot	0.47	ND	ND	ND	ND	ND	ND	ND	0.47 E
		3	Spotted Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	3.68	1.39 E	ND	ND	ND	ND	ND	ND	2.29 E
		2	Longfin Sanddab	4.41	1.51 E	ND	ND	ND	ND	ND	ND	2.90
		3	Longfin Sanddab	3.54	1.34 E	ND	ND	ND	ND	ND	ND	2.20
	TZ7	1	Longfin Sanddab	5.09	1.7 E	0.93 E	ND	ND	ND	ND	ND	2.46
		2	Longfin Sanddab	3.64	1.6 E	ND	ND	ND	ND	ND	ND	2.04 E
		3	Longfin Sanddab	4.07	1.62 E	ND	ND	ND	ND	ND	ND	2.45
	TZ8	1	Hornyhead Turbot	0.55	ND	ND	ND	ND	ND	ND	ND	0.55 E
		2	Longfin Sanddab	4.04	1.36 E	0.7 E	ND	ND	ND	ND	ND	1.98 E
		3	California Scorpionfish	3.06	ND	ND	ND	ND	ND	ND	ND	3.06
	TZ9	1	Spotted Turbot	0.41	ND	ND	ND	ND	ND	ND	ND	0.41 E
		2	No sample	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	92	62	23	0	0	0	0	0	92

Appendix D.5 *continued*

	Zone	Comp	Species	DDT								Endosulfan		
				tDDT	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	555.21	ND	1.29 E	0.73 E	15.4	3.91 E	531	2.88 E	ND	ND	ND
		2	Pacific Sanddab	540.055	ND	1.05 E	0.545 E	12.4	2.59 E	521	2.47 E	ND	ND	ND
		3	Pacific Sanddab	761.93	ND	1.99 E	1.37 E	15.3	3.27 E	736	4 E	ND	ND	ND
	TZ2	1	Pacific Sanddab	512.82	ND	1.3 E	ND	10.9	2.41 E	495	3.21 E	ND	ND	ND
		2	Pacific Sanddab	352.56	ND	0.96 E	ND	8.17	1.59 E	340	1.84 E	ND	ND	ND
		3	Pacific Sanddab	619.24	ND	2.1 E	ND	15.2	6.03 E	592	3.91 E	ND	ND	ND
	TZ3	1	Pacific Sanddab	455.99	ND	2.1 E	ND	10.3	2.71 E	438	2.88 E	ND	ND	ND
		2	Pacific Sanddab	460.28	ND	2.13 E	ND	10.2	2.9 E	442	3.05 E	ND	ND	ND
		3	Pacific Sanddab	471.49	ND	1.66 E	ND	14.3	2.7 E	450	2.83 E	ND	ND	ND
	TZ4	1	Pacific Sanddab	329.87	ND	0.87 E	ND	NR	NR	327	2 E	ND	ND	ND
		2	Pacific Sanddab	355.75	ND	1.54 E	ND	NR	NR	352	2.21 E	ND	ND	ND
		3	Longfin Sanddab	362.08	0.88 E	6.44	ND	NR	NR	352	2.76 E	ND	ND	ND
			Detection Rate (%)	100	8	100	25	100	100	100	100	0	0	0
SBOO	TZ5	1	Longfin Sanddab	256.77	0.58 E	3.07 E	ND	7.91	3.57 E	239	2.64 E	ND	ND	ND
		2	Hornyhead Turbot	32.23	ND	0.39 E	ND	1.73 E	0.41 E	29.7	ND	ND	ND	ND
		3	Spotted Turbot	9.79	ND	ND	ND	ND	ND	9.79 E	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	200.34	0.63 E	3.45 E	ND	7.9	2.46 E	184	1.9 E	ND	ND	ND
		2	Longfin Sanddab	228.525	0.655 E	4	ND	8.37	2.68 E	211	1.82 E	ND	ND	ND
		3	Longfin Sanddab	173.83	0.53 E	2.55 E	ND	6.27	2.02 E	161	1.46 E	ND	ND	ND
	TZ7	1	Longfin Sanddab	156.87	0.55 E	2.85 E	ND	6.28	2.75 E	143	1.44 E	ND	ND	ND
		2	Longfin Sanddab	133.99	0.52 E	2.29 E	ND	5.22	2.16 E	122	1.8 E	ND	ND	ND
		3	Longfin Sanddab	175.59	0.6 E	3.25 E	ND	6.92	2.49 E	161	1.33 E	ND	ND	ND
	TZ8	1	Hornyhead Turbot	33.89	ND	0.52 E	ND	2.14 E	0.53 E	30.7	ND	ND	ND	ND
		2	Longfin Sanddab	216.76	0.49 E	3.01 E	ND	6.59	2 E	203	1.67 E	ND	ND	ND
		3	California Scorpionfish	153.5	ND	ND	ND	1.55 E	0.95 E	151	ND	ND	ND	ND
	TZ9	1	Spotted Turbot	17.94	ND	ND	ND	0.54 E	ND	17.4	ND	ND	ND	ND
		2	No sample	—	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	100	62	77	0	92	85	100	62	0	0	0

Appendix D.5 *continued*

	Zone	Comp	Species	HCH											
				tHCH	Alpha	Beta	Delta	Gamma	Aldrin	Dieldrin	Endrin	EndAld	HCB	Mirex	Lipids
PLOO	TZ1	1	Pacific Sanddab	2.63	0.64 E	1.61 E	ND	0.38 E	ND	ND	ND	ND	NR	ND	33.7
		2	Pacific Sanddab	2.05	0.485 E	1.16 E	ND	0.405 E	ND	ND	ND	ND	NR	ND	31.1
		3	Pacific Sanddab	1.09	ND	1.09 E	ND	ND	ND	ND	ND	ND	NR	1.76 E	28.4
	TZ2	1	Pacific Sanddab	1.55	ND	1.09 E	ND	0.46 E	ND	ND	ND	ND	14.1 E	1.19 E	30.9
		2	Pacific Sanddab	0.71	ND	0.71 E	ND	ND	ND	ND	ND	ND	27.2 E	ND	19.5
		3	Pacific Sanddab	1.04	ND	1.04 E	ND	ND	ND	ND	ND	ND	NR	5.8 E	26.5
	TZ3	1	Pacific Sanddab	0.83	ND	0.83 E	ND	ND	ND	ND	ND	ND	NR	1.32 E	28.4
		2	Pacific Sanddab	0.9	ND	0.9 E	ND	ND	ND	ND	ND	ND	41.5 E	1.4 E	35.5
		3	Pacific Sanddab	1.32	ND	1.32 E	ND	ND	ND	ND	ND	ND	126 E	ND	37.4
	TZ4	1	Pacific Sanddab	ND	ND	NR	ND	ND	ND	ND	ND	ND	NR	ND	36.1
		2	Pacific Sanddab	ND	ND	NR	ND	ND	ND	ND	ND	ND	NR	ND	38.1
		3	Longfin Sanddab	0.52	ND	NR	ND	0.52 E	ND	ND	ND	ND	NR	ND	35.2
			Detection Rate (%)	83	17	100	0	33	0	0	0	0	100	42	100
SBOO	TZ5	1	Longfin Sanddab	1.49	0.54 E	0.95 E	ND	ND	ND	ND	ND	ND	NR	ND	33
		2	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	5.08
		3	Spotted Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5
	TZ6	1	Longfin Sanddab	1.54	0.53 E	1.01 E	ND	ND	ND	ND	ND	ND	NR	ND	38.7
		2	Longfin Sanddab	1.49	0.51 E	0.98 E	ND	ND	ND	ND	ND	ND	NR	ND	40.4
		3	Longfin Sanddab	1.28	0.38 E	0.9 E	ND	ND	ND	ND	ND	ND	NR	ND	32.8
	TZ7	1	Longfin Sanddab	1.65	0.49 E	1.16 E	ND	ND	ND	ND	ND	ND	NR	ND	34.7
		2	Longfin Sanddab	1.52	0.5 E	1.02 E	ND	ND	ND	ND	ND	ND	NR	ND	29.5
		3	Longfin Sanddab	1.61	0.57 E	1.04 E	ND	ND	ND	ND	ND	ND	NR	ND	35.7
	TZ8	1	Hornyhead Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	6.78
		2	Longfin Sanddab	1.04	ND	1.04 E	ND	ND	ND	ND	ND	ND	NR	2.37 E	35.4
		3	California Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	9.02
	TZ9	1	Spotted Turbot	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.69
		2	No sample	—	—	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	62	54	62	0	0	0	0	0	0	0	8	100

Appendix D.6

Concentrations of PCBs (ppb) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2020. See Appendix D.1 for MDLs; E = estimated; ND = not detected; NR = not reportable.

					PCB Congener								
	Zone	Comp	Species	tPCB	18	28	37	44	49	52	66	70	74
PLOO	TZ1	1	Pacific Sanddab	566.43	ND	1.7 E	ND	0.58 E	2.52 E	2.81	7.93	1.59 E	1.99 E
		2	Pacific Sanddab	550.245	0.36 E	1.34 E	ND	0.595 E	2.08 E	2.41 E	6.04	1.51 E	1.8 E
		3	Pacific Sanddab	890.49	ND	1.69 E	ND	0.63 E	2.38 E	3.05	8.71	1.85 E	2.76 E
	TZ2	1	Pacific Sanddab	660.47	ND	1.02 E	ND	0.54 E	1.8 E	2.07 E	4.98	1.37 E	2.18 E
		2	Pacific Sanddab	630.23	ND	0.7 E	ND	0.43 E	1.31 E	1.77 E	3.12 E	1.22 E	1.3 E
		3	Pacific Sanddab	743.2	0.39 E	2.12 E	ND	1.98 E	7.3	9.93	8.41	3.03 E	2.99 E
	TZ3	1	Pacific Sanddab	770.11	0.57 E	1.65 E	ND	1.37 E	5.51	6.96	9.01	2.93 E	3.47 E
		2	Pacific Sanddab	801.09	0.55 E	1.58 E	ND	1.35 E	5.62	6.92	8.92	3.06 E	3.58 E
		3	Pacific Sanddab	703.99	0.37 E	1.48 E	ND	1.13 E	4.5	6.28	6.96	3.21 E	3 E
	TZ4	1	Pacific Sanddab	495.45	ND	0.86 E	ND	0.72 E	3.87	4.38	4.36 E	1.68 E	1.66 E
		2	Pacific Sanddab	561.81	0.38 E	1.33 E	ND	1.37 E	4.32	5.94	5.6	3.18 E	2.44 E
		3	Longfin Sanddab	604.9	0.65 E	1.86 E	ND	1.41 E	6.79	9.81	7.77	3.52 E	2.97 E
			Detection Rate (%)	100	58	100	0	100	100	100	100	100	100
SBOO	TZ5	1	Longfin Sanddab	127.12	ND	0.6 E	ND	ND	0.71 E	1.38 E	1.81 E	0.61 E	0.95 E
		2	Hornyhead Turbot	11.48	ND	ND	ND	ND	0.38 E	0.5 E	0.33 E	ND	ND
		3	Spotted Turbot	5.74	ND	ND	ND	ND	ND	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	114.53	ND	0.74 E	ND	ND	0.8 E	1.3 E	1.75 E	0.65 E	0.87 E
		2	Longfin Sanddab	113.155	ND	ND	ND	ND	0.83 E	1.52 E	1.81 E	0.52 E	0.905 E
		3	Longfin Sanddab	93.04	ND	0.58 E	ND	ND	0.83 E	1.15 E	1.6 E	0.55 E	0.76 E
	TZ7	1	Longfin Sanddab	245.07	ND	2.1 E	ND	0.51 E	2.1 E	2.98	4.32	1.3 E	1.83 E
		2	Longfin Sanddab	170.75	ND	1.4 E	ND	0.48 E	1.59 E	2.02 E	3.16 E	1.17 E	1.52 E
		3	Longfin Sanddab	200.26	ND	1.78 E	ND	0.52 E	2.05 E	2.89	3.95 E	1.18 E	1.79 E
	TZ8	1	Hornyhead Turbot	15.41	ND	ND	ND	ND	0.41 E	0.49 E	0.53 E	ND	ND
		2	Longfin Sanddab	99.97	ND	0.6 E	ND	ND	0.67 E	1.21 E	1.52 E	0.48 E	0.89 E
		3	California Scorpionfish	85.84	ND	ND	ND	ND	0.52 E	0.68 E	1.32 E	0.33 E	0.51 E
	TZ9	1	Spotted Turbot	29.87	ND	ND	ND	ND	0.47 E	0.58 E	0.56 E	0.37 E	ND
		2	No sample	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	100	0	54	0	23	92	92	92	77	69

Appendix D.6 *continued*

	Zone	Comp	Species	PCB Congener									
				77	81	87	99	101	105	110	114	118	119
PLOO	TZ1	1	Pacific Sanddab	0.31 E	ND	1.45 E	27.6	9.97	17.8	6.11	1.09 E	52.3	1.62 E
		2	Pacific Sanddab	ND	ND	1.25 E	24.1	8.64	14.6	5.01	0.85 E	41.8	1.39 E
		3	Pacific Sanddab	ND	ND	1.69 E	39.8	11.6	26.5	7.57	1.8 E	77.2	2.06 E
	TZ2	1	Pacific Sanddab	ND	ND	1.14 E	28.5	8.18	21.8	4.29 E	1.33 E	64.2	1.02 E
		2	Pacific Sanddab	ND	ND	1.09 E	19	6.65	11.3	4.41 E	0.72 E	34.1	0.87 E
		3	Pacific Sanddab	ND	ND	3.38	38.2	23.5	19.9	13	1.27 E	62.6	2.33 E
	TZ3	1	Pacific Sanddab	ND	ND	3.64	41.1	22.5	20.2	16.8	1.36 E	67.2	2.29 E
		2	Pacific Sanddab	ND	ND	3.74	43.4	22.4	22.3	17.5	1.43 E	70.5	2.38 E
		3	Pacific Sanddab	ND	ND	4.06	35.5	18.2	19.6	17.5	1.22 E	66	2.27 E
	TZ4	1	Pacific Sanddab	ND	ND	1.8 E	26.2	13.7	12.9	8.02	0.97 E	38.7	2.06 E
		2	Pacific Sanddab	ND	ND	3.88	29.8	17.3	15.2	15.1	1.09 E	48.8	1.97 E
		3	Longfin Sanddab	ND	ND	3.95	34.2	23.8	15.8	19	1.05 E	53.8	1.66 E
			Detection Rate (%)	8	0	100	100	100	100	100	100	100	100
SBOO	TZ5	1	Longfin Sanddab	ND	ND	0.72 E	7.69	4.41	2.74 E	1.91 E	ND	10.9	ND
		2	Hornyhead Turbot	ND	ND	ND	1.27 E	0.99 E	ND	ND	ND	1.32 E	ND
		3	Spotted Turbot	ND	ND	ND	ND	0.6 E	ND	ND	ND	0.79 E	ND
	TZ6	1	Longfin Sanddab	ND	ND	0.62 E	7.14	3.84	2.49 E	2.05 E	ND	9.46	ND
		2	Longfin Sanddab	ND	ND	0.61 E	7.83	4.54	2.73 E	1.92 E	ND	9.97	ND
		3	Longfin Sanddab	ND	ND	0.72 E	6.8	3.81	2.24 E	1.44 E	ND	8.97	ND
	TZ7	1	Longfin Sanddab	ND	ND	1.23 E	16.2	8.48	5.54	5.22	0.55 E	23.2	0.59 E
		2	Longfin Sanddab	0.33 E	ND	1.04 E	10.2	5.89	3.74 E	3.1 E	0.47 E	15.6	0.55 E
		3	Longfin Sanddab	ND	ND	1.41 E	13.5	8.04	3.97	4.26 E	0.41 E	17.6	0.73 E
	TZ8	1	Hornyhead Turbot	ND	ND	ND	1.44 E	1.3 E	ND	0.46 E	ND	1.82 E	ND
		2	Longfin Sanddab	ND	ND	0.62 E	6.59	3.41	2.32 E	1.77 E	ND	8.87	ND
		3	California Scorpionfish	ND	ND	ND	5.54	3.4	2.24 E	1.23 E	ND	8.63	ND
	TZ9	1	Spotted Turbot	ND	ND	ND	2.2 E	1.68 E	0.71 E	ND	ND	3.86 E	ND
		2	No sample	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	8	0	62	92	100	77	77	23	100	23

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	6.98	ND	17	79.3	3.43 E	2.08 E	125	9.21	2.54 E	3.79 E
		2	Pacific Sanddab	5.72 E	ND	15.8	73.2	3.5 E	1.84 E	131	8.07	2.28 E	3.43 E
		3	Pacific Sanddab	11.5	ND	29.1	134	5.35	2.99 E	216	15.9	4.22	6
	TZ2	1	Pacific Sanddab	6.47	ND	20.1	95.6	2.74 E	1.9 E	143	11.4	3.09	5.05 E
		2	Pacific Sanddab	4.16 E	ND	13.3	72	2.63 E	2.54 E	138	7.47	1.74 E	4.78 E
		3	Pacific Sanddab	7.63	ND	21.1	99.8	9.6	5.97 E	164	10.5	3	3.85 E
	TZ3	1	Pacific Sanddab	7.75	ND	20.3	106	11.8	6.8 E	177	10.7	2.81 E	6.07 E
		2	Pacific Sanddab	8.2	ND	21.8	110	11.6	7.26	180	11	3.05	6.37
		3	Pacific Sanddab	7.07	ND	20.4	99.6	8.38	6.31 E	152	10.2	2.56 E	6.28
	TZ4	1	Pacific Sanddab	5.07 E	ND	12.7	59.3	4.91 E	3.44 E	117	6.74	1.84 E	3.71 E
		2	Pacific Sanddab	5.51	ND	15.6	76	10.2	6.21 E	118	8.44	2.05 E	5.12 E
		3	Longfin Sanddab	6.03	ND	15.8	78.3	16.3	8.97	120	8.24	2.17 E	5.86 E
			Detection Rate (%)	100	0	100	100	100	100	100	100	100	100
SBOO	TZ5	1	Longfin Sanddab	1.27 E	ND	3.13 E	17.9	NR	NR	31.5	1.37 E	0.43 E	0.99 E
		2	Hornyhead Turbot	ND	ND	ND	2 E	NR	NR	3.77 E	ND	ND	ND
		3	Spotted Turbot	ND	ND	ND	1.59 E	NR	ND	2.76 E	ND	ND	ND
	TZ6	1	Longfin Sanddab	1.08 E	ND	2.91 E	15.1	NR	NR	25.9	1.27 E	ND	0.83 E
		2	Longfin Sanddab	1.14 E	ND	3.3 E	17.8	NR	NR	30.6	1.27 E	0.44 E	0.96 E
		3	Longfin Sanddab	1.01 E	ND	2.46 E	15.4	NR	NR	23.2	1.08 E	0.33 E	0.78 E
	TZ7	1	Longfin Sanddab	2.45 E	ND	6.54	33.4	NR	3.62 E	54.1	3	0.84 E	2.11 E
		2	Longfin Sanddab	1.85 E	ND	4.46 E	22.9	NR	NR	37	1.81 E	0.63 E	1.34 E
		3	Longfin Sanddab	2.35 E	ND	4.99 E	26.5	NR	3.67 E	43.5	2.04 E	0.71 E	1.57 E
	TZ8	1	Hornyhead Turbot	ND	ND	0.45 E	2.7 E	NR	NR	4.73 E	ND	ND	ND
		2	Longfin Sanddab	0.8 E	ND	2.71 E	15.3	NR	NR	26	1.16 E	0.42 E	0.91 E
		3	California Scorpionfish	1.14 E	ND	2.53 E	13.8	NR	NR	23	1.21 E	0.47 E	0.72 E
	TZ9	1	Spotted Turbot	0.38 E	ND	0.47 E	5.81 E	NR	NR	9.25 E	0.42 E	ND	ND
		2	No sample	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	77	0	85	100	NR	67	100	77	62	69

Appendix D.6 *continued*

	Zone	Comp	Species	167	169	170	177	180	183	187	189	194	201	206
				PCB Congener										
PLOO	TZ1	1	Pacific Sanddab	6.09	ND	22	6.02	53.6	14.6	36.3	1.64 E	20.7	1.18 E	17.6
		2	Pacific Sanddab	5.52	ND	24.1	6.66	60.7	15.5	38.4	1.59 E	22	1.26 E	15.9
		3	Pacific Sanddab	9.64	ND	37.5	9.01	84.1	21.9	55.6	2.43 E	30.9	1.96 E	23.1
	TZ2	1	Pacific Sanddab	6.31	ND	26.8	5.5 E	78.6	17.5	41.9	1.67 E	28.7	1.42 E	18.3
		2	Pacific Sanddab	4.44	ND	34.4	11.1	109	27.1	58.6	1.71 E	32.6	2.57 E	14.1
		3	Pacific Sanddab	7.35	ND	27.1	8.21	65	17.3	50	1.71 E	22.9	1.85 E	16
	TZ3	1	Pacific Sanddab	7.13	ND	25.9	9.21	65	17.5	49.5	1.76 E	21.3	2.12 E	14.9
		2	Pacific Sanddab	7.79	ND	27.2	9.56	67.5	18.4	53.4	1.81 E	22.2	2.22 E	16.5
		3	Pacific Sanddab	6.83	ND	23.5	8.41	59.8	16.1	45.7	1.59 E	20.9	2.08 E	15
	TZ4	1	Pacific Sanddab	4.53	ND	17.8	5.05 E	46.7	12.9	39.7	1.35 E	17.8	1.33 E	11.7
		2	Pacific Sanddab	5.26	ND	18.7	6.28	49	13.2	35.8	1.17 E	15.3	1.57 E	10.7
		3	Longfin Sanddab	5.49	ND	18.6	7.22	48	13.5	36	1.29 E	14.2	1.56 E	9.33
			Detection Rate (%)	100	0	100	100	100	100	100	100	100	100	100
SBOO	TZ5	1	Longfin Sanddab	1.07 E	ND	NR	2.61 E	8.93	3.37 E	15.1	ND	2.78 E	0.51 E	1.73 E
		2	Hornyhead Turbot	ND	ND	NR	ND	NR	0.47 E	NR	ND	0.45 E	ND	ND
		3	Spotted Turbot	ND	ND	ND	ND	NR	ND	NR	ND	ND	ND	ND
	TZ6	1	Longfin Sanddab	1 E	ND	NR	2.45 E	11.2	2.81 E	12.4	ND	3.77 E	ND	2.1 E
		2	Longfin Sanddab	0.95 E	ND	NR	2.67 E	NR	2.57 E	13.8	ND	2.68 E	ND	1.79 E
		3	Longfin Sanddab	0.82 E	ND	NR	2.16 E	NR	2.13 E	10.7	ND	2.08 E	ND	1.44 E
	TZ7	1	Longfin Sanddab	2.35 E	ND	7.3	4.51 E	14.1	4.63 E	21.8	ND	4.44 E	0.64 E	3.09 E
		2	Longfin Sanddab	1.73 E	ND	5.23	3.48 E	10.8	3.62 E	16.8	ND	3.64 E	0.72 E	2.48 E
		3	Longfin Sanddab	1.66 E	ND	5.79	3.76 E	11	3.65 E	17.4	ND	4.14 E	0.67 E	2.78 E
	TZ8	1	Hornyhead Turbot	ND	ND	NR	ND	NR	0.62 E	NR	ND	0.46 E	ND	ND
		2	Longfin Sanddab	0.9 E	ND	NR	2.25 E	NR	2.91 E	12.5	ND	3.01 E	0.48 E	1.67 E
		3	California Scorpionfish	0.89 E	ND	NR	1.93 E	NR	2.34 E	8.55	ND	2.78 E	0.31 E	1.77 E
	TZ9	1	Spotted Turbot	ND	ND	NR	0.43 E	NR	0.94 E	NR	ND	1.06 E	ND	0.68 E
		2	No sample	—	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	69	0	75	77	100	92	100	0	92	46	77

Appendix D.7

Concentrations of PAHs (ppb) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2020. See Appendix D.1 for MDLs; E = estimated; ND = not detected; NR = not reportable.

	Zone	Comp	Species	tPAH	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	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ2	1	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ3	1	Pacific Sanddab	35.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	41.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3	Pacific Sanddab	67.2	ND	ND	20.3 E	ND	ND	ND	ND	ND	ND	ND	ND
	TZ4	1	Pacific Sanddab	55.6	ND	ND	14.6 E	ND	ND	ND	ND	ND	ND	ND	ND
		2	Pacific Sanddab	132.6	ND	25.2 E	36.2 E	ND	ND	ND	ND	ND	ND	ND	ND
		3	Longfin Sanddab	67.5	ND	ND	17.9 E	ND	ND	ND	ND	ND	ND	ND	ND
			Detection Rate (%)	100	0	17	67	0	0	0	0	0	0	0	0
SBOO	TZ5	1	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Hornyhead Turbot	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Spotted Turbot	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ6	1	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ7	1	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ8	1	Hornyhead Turbot	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	California Scorpionfish	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ9	1	Spotted Turbot	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	No sample	—	—	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

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	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ2	1	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Pacific Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ3	1	Pacific Sanddab	ND	ND	ND	NR	ND	ND	ND	ND	ND	35.8 E	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	NR	ND	ND	ND	ND	ND	41.2 E	ND	ND	ND
		3	Pacific Sanddab	ND	ND	ND	NR	ND	ND	ND	ND	ND	46.9 E	ND	ND	ND
	TZ4	1	Pacific Sanddab	ND	ND	ND	NR	ND	ND	ND	ND	ND	41 E	ND	ND	ND
		2	Pacific Sanddab	ND	ND	ND	NR	ND	ND	ND	ND	ND	71.2 E	ND	ND	ND
		3	Longfin Sanddab	ND	ND	ND	NR	ND	ND	ND	ND	ND	49.6 E	ND	ND	ND
			Detection Rate (%)	0	0	0	NR	0	0	0	0	0	100	0	0	0
SBOO	TZ5	1	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Hornyhead Turbot	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Spotted Turbot	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ6	1	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ7	1	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ8	1	Hornyhead Turbot	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	Longfin Sanddab	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		3	California Scorpionfish	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	TZ9	1	Spotted Turbot	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		2	No sample	—	—	—	—	—	—	—	—	—	—	—	—	—
		3	No sample	—	—	—	—	—	—	—	—	—	—	—	—	—
			Detection Rate (%)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Appendix D.8

Concentrations of metals (ppm) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2020. See Appendix D.1 for MDLs; ND = not detected.

	Zone	Comp	Species	Trace Metals																	
				Al	Sb	As	Ba	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Tl	Sn	Zn
PLOO	RF1	1	Vermilion Rockfish	ND	ND	3.53	ND	ND	0.018	ND	0.22	2.67	ND	ND	0.077	ND	ND	ND	ND	ND	3.51
		2	Vermilion Rockfish	ND	ND	3.82	ND	ND	ND	ND	0.283	2.82	ND	ND	0.066	ND	0.817	ND	ND	ND	4.28
		3	Vermilion Rockfish	ND	ND	4	ND	ND	ND	ND	0.446	3.08	ND	ND	0.062	ND	ND	ND	ND	ND	4.05
	RF2	1	Starry Rockfish	ND	ND	1.04	ND	ND	ND	ND	0.299	1.79	ND	ND	0.233	ND	ND	ND	ND	ND	3.01
		2	Starry Rockfish	ND	ND	1.1	ND	ND	ND	ND	0.269	1.02	ND	ND	0.132	ND	ND	ND	ND	ND	2.87
		3	Mixed Rockfish	ND	ND	1.28	ND	ND	ND	ND	0.213	4.51	ND	ND	0.122	ND	0.878	ND	ND	ND	3.02
			Detection Rate (%)	0	0	100	0	0	17	0	100	100	0	0	100	0	33	0	0	0	100
SBOO	RF3	1	California Scorpionfish	ND	ND	1.73	ND	ND	ND	ND	0.241	4.74	ND	ND	0.218	ND	ND	ND	ND	ND	3.9
		2	Mixed Rockfish	ND	ND	1.87	ND	ND	ND	ND	0.203	1.29	ND	ND	0.137	ND	ND	ND	ND	ND	4.42
		3	Mixed Rockfish	2.05	ND	1.14	ND	ND	ND	ND	0.182	1.91	ND	ND	0.059	ND	ND	ND	ND	ND	4.2
	RF4	1	Mixed Rockfish	ND	ND	1.29	ND	ND	ND	ND	0.602	1.75	ND	ND	0.132	ND	ND	ND	ND	ND	4.5
		2	California Scorpionfish	ND	ND	2.26	ND	ND	ND	ND	0.602	2.7	ND	ND	0.175	ND	ND	ND	ND	ND	4.59
		3	California Scorpionfish	ND	ND	2.65	ND	ND	ND	ND	0.446	1.87	ND	ND	0.164	ND	ND	ND	ND	ND	4.29
			Detection Rate (%)	17	0	100	0	0	0	0	100	100	0	0	100	0	0	0	0	0	100
OEHHA[a]				—	—	—	—	—	—	—	—	—	—	—	0.22	—	7.4	—	—	—	—
USFDA Action Limit[b]				—	—	—	—	—	—	—	—	—	—	—	1.0	—	—	—	—	—	—
Median IS[b]				—	—	1.4	—	—	1.0	1.0	20	—	2.0	—	0.50	—	0.3	—	—	175	70

[a] From the California OEHHA (Klasing and Brodberg 2008)

[b] From Mearns et al. 1991. USFDA action limits for mercury and all international standards are for shellfish, but are often applied to fish

Appendix D.9

Concentrations of pesticides (ppb) and lipids (% weight) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2020. See Appendix D.1 for MDLs and abbreviations; E = estimated; ND = not detected; na = not available.

				Chlordane								
	Zone	Comp	Species	tChlordane	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	ND
PLOO	RF1	2	Vermilion Rockfish	0.12	ND	ND	ND	ND	ND	ND	ND	0.12 E
PLOO	RF1	3	Vermilion Rockfish	0.22	0.06 E	0.05 E	ND	ND	ND	ND	ND	0.11 E
PLOO	RF2	1	Starry Rockfish	0.04	ND	ND	ND	ND	ND	ND	ND	0.04 E
PLOO	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND
PLOO	RF2	3	Mixed Rockfish	0.22	0.06 E	ND	0.07 E	ND	ND	ND	ND	0.09 E
			Detection Rate (%)	67	33	17	17	0	0	0	0	67
SBOO	RF3	1	California Scorpionfish	0.22	0.04 E	ND	0.04 E	ND	0.04 E	ND	ND	0.1 E
SBOO	RF3	2	Mixed Rockfish	0.64	0.12 E	ND	0.3 E	0.05 E	0.17 E	ND	ND	ND
SBOO	RF3	3	Mixed Rockfish	0.13	ND	ND	0.09 E	ND	ND	ND	0.04 E	ND
SBOO	RF4	1	Mixed Rockfish	0.1	ND	ND	0.05 E	ND	ND	ND	ND	0.05 E
SBOO	RF4	2	California Scorpionfish	0.04	ND	ND	ND	ND	ND	ND	ND	0.04 E
SBOO	RF4	3	California Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND
			Detection Rate (%)	83	33	0	67	17	33	0	17	50
OEHHA[a]				5.6	—	—	—	—	—	—	—	—
USFDA Action Limit[b]				300	—	—	—	—	—	—	—	—
Median IS[b]				100	—	—	—	—	—	—	—	—

[a] From the California OEHHA (Klasing and Brodberg 2008)

[b] From Mearns et al. 1991. USFDA action limits for mercury and all international standards are for shellfish, but are often applied to fish

Appendix D.9 *continued*

	Zone	Comp	Species	tDDT	o,p-DDD	o,p-DDE	o,p-DDT	p,p-DDMU	p,p-DDD	p,p-DDE	p,p-DDT	Alpha	Beta	Sulfate
				DDT								Endosulfan		
PLOO	RF1	1	Vermilion Rockfish	4.3	ND	ND	ND	0.15 E	0.04 E	4.07	0.04 E	ND	ND	ND
	RF1	2	Vermilion Rockfish	6.77	ND	0.05 E	ND	0.225 E	ND	6.42	0.075 E	ND	ND	ND
	RF1	3	Vermilion Rockfish	5.58	ND	0.07 E	0.03 E	0.23 E	0.07 E	5.12	0.06 E	ND	ND	ND
	RF2	1	Starry Rockfish	4.63	ND	ND	ND	0.13 E	0.05 E	4.4	0.05 E	ND	ND	ND
	RF2	2	Starry Rockfish	1.74	ND	ND	ND	0.05 E	ND	1.69	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	4.81	ND	0.06 E	ND	0.11 E	0.04 E	4.6	ND	ND	0.05 E	ND
			Detection Rate (%)	100	0	50	17	100	67	100	67	0	17	0
SBOO	RF3	1	California Scorpionfish	13.43	ND	0.04 E	ND	0.15 E	0.1 E	13.1	0.04 E	ND	ND	ND
	RF3	2	Mixed Rockfish	1.74	ND	ND	ND	0.04 E	0.1 E	1.51 E	0.09 E	0.18 E	ND	0.06 E
	RF3	3	Mixed Rockfish	1.57	ND	0.07 E	0.04 E	0.11 E	0.04 E	1.27 E	0.04 E	ND	ND	ND
	RF4	1	Mixed Rockfish	2.79	ND	ND	ND	0.04 E	0.05 E	2.7	ND	ND	0.05 E	ND
	RF4	2	California Scorpionfish	2.73	ND	ND	ND	0.04 E	0.04 E	2.65	ND	ND	0.05 E	ND
	RF4	3	California Scorpionfish	1.44	ND	ND	ND	ND	ND	1.44 E	ND	ND	ND	ND
			Detection Rate (%)	100	0	33	17	83	83	100	50	17	33	17
OEHHA[a]				21	—	—	—	—	—	—	—	—	—	—
USFDA Action Limit[b]				5000	—	—	—	—	—	—	—	—	—	—
Median IS[b]				5000	—	—	—	—	—	—	—	—	—	—

[a] From the California OEHHA (Klasing and Brodberg 2008)

[b] From Mearns et al. 1991. USFDA action limits for mercury and all international standards are for shellfish, but are often applied to fish

Appendix D.9 *continued*

	Zone	Comp	Species	HCH tHCH	HCH Alpha	HCH Beta	HCH Delta	HCH Gamma	Aldrin	Dieldrin	Endrin	EndAld	HCB	Mirex	Lipids
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11 E	ND	0.21
PLOO	RF1	2	Vermilion Rockfish	0.05	ND	0.05 E	ND	ND	ND	ND	ND	ND	0.17 E	ND	0.35
PLOO	RF1	3	Vermilion Rockfish	0.04	ND	0.04 E	ND	ND	ND	0.08 E	ND	ND	0.16 E	ND	0.39
PLOO	RF2	1	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.09 E	ND	0.19
PLOO	RF2	2	Starry Rockfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11 E	ND	0.15
PLOO	RF2	3	Mixed Rockfish	0.14	0.04 E	0.06 E	0.04 E	ND	ND	ND	ND	ND	0.14 E	ND	0.22
			Detection Rate (%)	50	17	50	17	0	0	17	0	0	100	0	100
SBOO	RF3	1	California Scorpionfish	0.04	ND	0.04 E	ND	ND	ND	ND	ND	ND	0.19 E	ND	0.2
SBOO	RF3	2	Mixed Rockfish	0.33	0.07 E	0.18 E	ND	0.08 E	ND	0.26	0.67	ND	ND	ND	0.12
SBOO	RF3	3	Mixed Rockfish	0.12	ND	0.07 E	ND	0.05 E	ND	0.06 E	ND	ND	0.1 E	ND	0.18
SBOO	RF4	1	Mixed Rockfish	ND	ND	ND	ND	ND	ND	0.04 E	ND	ND	ND	ND	0.15
SBOO	RF4	2	California Scorpionfish	ND	ND	ND	ND	ND	ND	ND	0.05 E	ND	ND	ND	0.16
SBOO	RF4	3	California Scorpionfish	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.14 E	ND	0.09
			Detection Rate (%)	50	17	50	0	33	0	50	33	0	50	0	100
OEHHA[a]				na	—	—	—	—	—	0.46	na	—	na	—	—
USFDA Action Limit[b]				na	—	—	—	—	—	300	300	—	300	100	—
Median IS[b]				na	—	—	—	—	—	na	na	—	100	—	—

[a] From the California OEHHA (Klasing and Brodberg 2008)

[b] From Mearns et al. 1991. USFDA action limits for mercury and all international standards are for shellfish, but are often applied to fish

Appendix D.10

Concentrations of PCBs (ppb) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2020. See Appendix D.1 for MDLs; E = estimated; ND = not detected; na = not available.

	Zone	Comp	Species	tPCB	PCB Congener 18	28	37	44	49	52	66	70	74
PLOO	RF1	1	Vermilion Rockfish	3.94	ND	ND	ND	ND	ND	0.05 E	0.07 E	ND	ND
	RF1	2	Vermilion Rockfish	10.145	ND	ND	ND	ND	ND	0.085 E	ND	ND	ND
	RF1	3	Vermilion Rockfish	4.54	ND	ND	ND	ND	ND	ND	0.09 E	0.04 E	ND
	RF2	1	Starry Rockfish	2.93	ND	0.05 E	ND	0.06 E	ND	0.08 E	ND	ND	ND
	RF2	2	Starry Rockfish	0.81	ND	ND	ND	ND	ND	0.04 E	ND	ND	ND
	RF2	3	Mixed Rockfish	3.03	0.04 E	0.06 E	0.04 E	ND	ND	0.08 E	0.08 E	0.06 E	ND
			Detection Rate (%)	100	17	33	17	17	0	83	50	33	0
SBOO	RF3	1	California Scorpionfish	6.56	ND	0.05 E	0.03 E	0.05 E	ND	0.09 E	0.12 E	ND	0.07 E
	RF3	2	Mixed Rockfish	1.25	0.04 E	0.06 E	0.04 E	0.05 E	ND	0.06 E	0.06 E	0.04 E	ND
	RF3	3	Mixed Rockfish	1.88	0.05 E	0.07 E	0.07 E	0.07 E	ND	0.08 E	0.08 E	0.07 E	0.07 E
	RF4	1	Mixed Rockfish	0.71	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	2	California Scorpionfish	0.79	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	California Scorpionfish	0.57	ND	ND	ND	ND	ND	ND	ND	ND	ND
			Detection Rate (%)	100	33	50	50	50	0	50	50	33	33
OEHHA[a]				3.6	—	—	—	—	—	—	—	—	—
USFDA Action Limit[b]				na	—	—	—	—	—	—	—	—	—
Median IS[b]				na	—	—	—	—	—	—	—	—	—

[a] From the California OEHHA (Klasing and Brodberg 2008)

[b] From Mearns et al. 1991. USFDA action limits for mercury and all international standards are for shellfish, but are often applied to fish

Appendix D.10 *continued*

	Zone	Comp	Species	PCB Congener									
				77	81	87	99	101	105	110	114	118	119
PLOO	RF1	1	Vermilion Rockfish	ND	ND	ND	0.21 E	0.18 E	0.1 E	0.1 E	ND	0.34 E	ND
PLOO	RF1	2	Vermilion Rockfish	ND	ND	0.05 E	0.56	0.27	0.45	0.32 E	ND	1.29	ND
PLOO	RF1	3	Vermilion Rockfish	ND	ND	0.06 E	0.24 E	0.23 E	0.13 E	0.14 E	ND	0.42 E	ND
PLOO	RF2	1	Starry Rockfish	ND	ND	0.05 E	0.13 E	0.21 E	0.07 E	0.12 E	ND	0.21 E	ND
PLOO	RF2	2	Starry Rockfish	ND	ND	ND	0.05 E	0.08 E	0.04 E	0.04 E	ND	0.09 E	ND
PLOO	RF2	3	Mixed Rockfish	ND	ND	0.06 E	0.17 E	0.17 E	0.09 E	0.09 E	ND	0.25 E	ND
			Detection Rate (%)	0	0	67	100	100	100	100	0	100	0
SBOO	RF3	1	California Scorpionfish	ND	ND	0.06 E	0.3 E	0.23 E	0.16 E	0.13 E	ND	0.55 E	ND
SBOO	RF3	2	Mixed Rockfish	ND	ND	ND	0.08 E	0.06 E	0.05 E	0.03 E	ND	0.12 E	ND
SBOO	RF3	3	Mixed Rockfish	0.05 E	0.04 E	0.05 E	0.1 E	0.1 E	0.05 E	0.06 E	ND	0.11 E	0.04 E
SBOO	RF4	1	Mixed Rockfish	ND	ND	ND	0.06 E	0.05 E	ND	ND	ND	0.1 E	ND
SBOO	RF4	2	California Scorpionfish	ND	ND	ND	0.06 E	0.06 E	ND	ND	ND	0.11 E	ND
SBOO	RF4	3	California Scorpionfish	ND	ND	ND	0.04 E	0.04 E	ND	ND	ND	0.08 E	ND
			Detection Rate (%)	17	17	33	100	100	50	50	0	100	17
OEHHA[a]				—	—	—	—	—	—	—	—	—	—
USFDA Action Limit[b]				—	—	—	—	—	—	—	—	—	—
Median IS[b]				—	—	—	—	—	—	—	—	—	—

[a] From the California OEHHA (Klasing and Brodberg 2008)
[b] From Mearns et al. 1991. USFDA action limits for mercury and all international standards are for shellfish, but are often applied to fish

Appendix D.10 *continued*

	Zone	Comp	Species	PCB Congener									
				123	126	128	138	149	151	153/168	156	157	158
PLOO	RF1	1	Vermilion Rockfish	0.04 E	ND	0.12 E	0.51 E	0.15 E	0.04 E	0.89 E	0.04 E	ND	ND
PLOO	RF1	2	Vermilion Rockfish	0.095 E	ND	0.35 E	1.55	0.2 E	0.065 E	2.15	0.2 E	ND	0.145 E
PLOO	RF1	3	Vermilion Rockfish	0.05 E	ND	0.12 E	0.55 E	0.2 E	0.06 E	0.95 E	0.06 E	ND	ND
PLOO	RF2	1	Starry Rockfish	ND	ND	0.07 E	0.33 E	0.26 E	0.09 E	0.59 E	ND	ND	ND
PLOO	RF2	2	Starry Rockfish	ND	ND	ND	0.12 E	0.06 E	ND	0.19 E	ND	ND	ND
PLOO	RF2	3	Mixed Rockfish	0.04 E	ND	0.08 E	0.34 E	0.14 E	0.05 E	0.58 E	0.03 E	ND	ND
			Detection Rate (%)	67	0	83	100	100	83	100	67	0	17
SBOO	RF3	1	California Scorpionfish	0.08 E	ND	0.14 E	0.72	0.13 E	0.09 E	1.29 E	0.06 E	ND	0.63 E
SBOO	RF3	2	Mixed Rockfish	ND	ND	ND	0.13 E	0.05 E	ND	0.25 E	ND	ND	ND
SBOO	RF3	3	Mixed Rockfish	0.04 E	ND	0.05 E	0.13 E	0.07 E	0.04 E	0.24 E	ND	ND	ND
SBOO	RF4	1	Mixed Rockfish	ND	ND	ND	0.13 E	ND	ND	0.23 E	ND	ND	ND
SBOO	RF4	2	California Scorpionfish	ND	ND	ND	0.14 E	ND	ND	0.24 E	ND	ND	ND
SBOO	RF4	3	California Scorpionfish	ND	ND	ND	0.09 E	ND	ND	0.19 E	ND	ND	ND
			Detection Rate (%)	33	0	33	100	50	33	100	17	0	17
OEHHA[a]				—	—	—	—	—	—	—	—	—	—
USFDA Action Limit[b]				—	—	—	—	—	—	—	—	—	—
Median IS[b]				—	—	—	—	—	—	—	—	—	—

[a] From the California OEHHA (Klasing and Brodberg 2008)
[b] From Mearns et al. 1991. USFDA action limits for mercury and all international standards are for shellfish, but are often applied to fish

Appendix D.10 *continued*

	Zone	Comp	Species	PCB Congener 167	169	170	177	180	183	187	189	194	201	206
PLOO	RF1	1	Vermilion Rockfish	ND	ND	0.14 E	0.06 E	0.31 E	0.1 E	0.29 E	ND	0.1 E	ND	0.1 E
	RF1	2	Vermilion Rockfish	0.1 E	ND	0.33 E	0.105 E	0.75 E	0.18 E	0.56 E	ND	0.2 E	ND	0.14 E
	RF1	3	Vermilion Rockfish	0.04 E	ND	0.15 E	0.07 E	0.34 E	0.1 E	0.32 E	ND	0.1 E	ND	0.08 E
	RF2	1	Starry Rockfish	ND	ND	0.07 E	0.06 E	0.15 E	0.06 E	0.23 E	ND	0.04 E	ND	ND
	RF2	2	Starry Rockfish	ND	ND	ND	ND	0.04 E	ND	0.06 E	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	ND	ND	0.08 E	0.03 E	0.2 E	0.05 E	0.17 E	ND	0.05 E	ND	ND
			Detection Rate (%)	33	0	83	83	100	83	100	0	83	0	50
SBOO	RF3	1	California Scorpionfish	0.05 E	ND	0.19 E	0.12 E	0.44 E	0.12 E	0.45 E	ND	0.12 E	ND	0.09 E
	RF3	2	Mixed Rockfish	ND	ND	0.03 E	ND	0.05 E	ND	0.05 E	ND	ND	ND	ND
	RF3	3	Mixed Rockfish	ND	ND	ND	ND	0.06 E	ND	0.09 E	ND	ND	ND	ND
	RF4	1	Mixed Rockfish	ND	ND	ND	ND	0.08 E	ND	0.06 E	ND	ND	ND	ND
	RF4	2	California Scorpionfish	ND	ND	0.03 E	ND	0.08 E	ND	0.07 E	ND	ND	ND	ND
	RF4	3	California Scorpionfish	ND	ND	ND	ND	0.06 E	ND	0.07 E	ND	ND	ND	ND
			Detection Rate (%)	17	0	50	17	100	17	100	0	17	0	17
OEHHA[a]				—	—	—	—	—	—	—	—	—	—	—
USFDA Action Limit[b]				—	—	—	—	—	—	—	—	—	—	—
Median IS[b]				—	—	—	—	—	—	—	—	—	—	—

[a] From the California OEHHA (Klasing and Brodberg 2008)
[b] From Mearns et al. 1991. USFDA action limits for mercury and all international standards are for shellfish, but are often applied to fish

Appendix D.11

Concentrations of PAHs (ppb) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2020. See Appendix D.1 for MDLs; E = estimated; ND = not detected; NR = not reportable.

	Zone	Comp	Species	tPAH	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	299	ND	299	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	2	Vermilion Rockfish	27.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF1	3	Vermilion Rockfish	21.6	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	1	Starry Rockfish	41.4	ND	10.3 E	NR	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	2	Starry Rockfish	21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF2	3	Mixed Rockfish	340	ND	153 E	NR	ND	NR	ND	ND	ND	ND	ND	ND
			Detection Rate (%)	100	0	50	0	0	0	0	0	0	0	0	0
SBOO	RF3	1	California Scorpionfish	16.2	ND	16.2 E	NR	ND	ND	ND	ND	ND	ND	ND	ND
	RF3	2	Mixed Rockfish	485.9	ND	81.5 E	NR	ND	52.2 E	ND	ND	ND	20.7 E	ND	ND
	RF3	3	Mixed Rockfish	36.25	ND	8.85 E	ND	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	1	Mixed Rockfish	34.2	ND	21.6 E	NR	ND	12.6 E	ND	ND	ND	ND	ND	ND
	RF4	2	California Scorpionfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND
	RF4	3	California Scorpionfish	63.2	ND	35.9 E	NR	ND	27.3 E	ND	ND	ND	ND	ND	ND
			Detection Rate (%)	83	0	83	0	0	50	0	0	0	17	0	0

Appendix D.11 *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	NR	ND	ND	ND	ND	ND	NR	ND	ND	ND
	RF1	2	Vermilion Rockfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	27.2 E	ND	ND	ND
	RF1	3	Vermilion Rockfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	21.6 E	ND	ND	ND
	RF2	1	Starry Rockfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	31.1 E	ND	ND	ND
	RF2	2	Starry Rockfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	21 E	ND	ND	ND
	RF2	3	Mixed Rockfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	187 E	ND	ND	ND
			Detection Rate (%)	0	0	0	NR	0	0	0	0	0	100	0	0	0
SBOO	RF3	1	California Scorpionfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	NR	ND	ND	ND
	RF3	2	Mixed Rockfish	ND	ND	ND	227	ND	ND	ND	40 E	ND	NR	ND	42.3 E	22.2 E
	RF3	3	Mixed Rockfish	ND	ND	ND	NR	ND	27.4 E	ND	ND	ND	NR	ND	ND	ND
	RF4	1	Mixed Rockfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	NR	ND	ND	ND
	RF4	2	California Scorpionfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	NR	ND	ND	ND
	RF4	3	California Scorpionfish	ND	ND	ND	NR	ND	ND	ND	ND	ND	NR	ND	ND	ND
			Detection Rate (%)	0	0	0	100	0	17	0	17	0	NR	0	17	17