SD Public Utilities

# Annual Receiving Waters Monitoring Report for the Point Loma Ocean Outfall and South Bay Ocean Outfall

# 2016

City of San Diego Ocean Monitoring Program
Environmental Monitoring & Technical Services Division

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

June 30, 2017

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 2016 Annual Receiving Waters Monitoring Report for the Point Loma Ocean Outfall and South Bay Ocean Outfall as per requirements set forth in Order No. R9-2009-0001 for the City of San Diego's Point Loma Wastewater Treatment Plant (NPDES No. CA0107409), Order No. R9-2013-0006 as amended by Order No. R9-2014-0071 for the City of San Diego's South Bay Water Reclamation Plant (NPDES No. CA0109045), and Order No. R9-2014-0009 as amended by Order No. R9-2014-0094 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 approved by the San Diego Water Board and USEPA contains data summaries, analyses, and preliminary assessments of all main portions of the ocean monitoring program conducted during calendar year 2016, including water quality monitoring, benthic condition monitoring, and fish and invertebrate monitoring.

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.

Sincerely,

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

TS/akl

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

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# Annual Receiving Waters Monitoring Report for the Point Loma Ocean Outfall and South Bay Ocean Outfall, 2016

**Point Loma Wastewater Treatment Plant**
(Order No. R9-2009-0001; NPDES Permit No. CA0107409)

**South Bay Water Reclamation Plant**
(Order No. R9-2013-0006; NPDES Permit No. CA0109045)

**South Bay International Wastewater Treatment Plant**
(Order No. R9-2014-0009; NPDES Permit No. CA0108928)


Prepared by:

City of San Diego Ocean Monitoring Program

Environmental Monitoring & Technical Services Division

Timothy D. Stebbins, Editor

Ami K. Latker, Managing Editor


**June 2016**

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City of San Diego Marine Biology Laboratory crew sorting large haul of the pelagic red crab, *Pleuroncodes planipes*, trawled off Point Loma, San Diego, California during summer 2016. GoPro image courtesy of Greg Welch.

**Acknowledgments:**
We are grateful to the personnel of the City's Marine Biology, Marine Microbiology, and Environmental Chemistry Services Laboratories for their assistance in the collection and/or processing of all samples, and for discussions of the results. The completion of this report would not have been possible without their continued efforts and contributions. Complete staff listings for the above labs and additional details concerning relevant QA/QC activities for the receiving waters monitoring data reported herein are available online in the 2016 Annual Receiving Waters Monitoring & Toxicity Testing Quality Assurance Report (www.sandiego.gov/mwwd/environment/reports.shtml).

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# *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). The data collected are used to determine compliance with receiving water conditions as specified in the NPDES permits and associated orders issued by the U.S. Environmental Protection Agency (USEPA) and San Diego Regional Water Quality Control Board (San Diego Water Board) for the City's Point Loma Wastewater Treatment Plant (NPDES No. CA0107409, Order No. R9-2009-0001) and South Bay Water Reclamation Plant (NPDES No. CA0109045, Order No. R9-2013-0006), as well as the South Bay International Wastewater Treatment Plant (NPDES No. CA0108928, Order No. R9-2014-0009) operated by the U.S. Section of the International Boundary and Water Commission. Since treated effluent from the two South Bay facilities commingle before discharge to the ocean via the SBOO, a single monitoring and reporting program approved by the San Diego Water Board 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:

- Measure and document compliance with NPDES permit requirements and California Ocean Plan (Ocean Plan) water quality objectives.
- Monitor changes in ocean conditions and the health and status of the San Diego marine ecosystem over space and time.
- Assess any impact of wastewater discharge or other anthropogenic or natural influences on the local marine environment, including effects on coastal water quality, seafloor sediments, and marine life.

Overall, the state of San Diego's coastal ocean waters remains in good condition based on the comprehensive scientific assessment of the Point Loma and South Bay outfall monitoring regions. Although governed by three separate NPDES permits as described above, this combined annual report approved by the San Diego Water Board and USEPA summarizes the purpose, scope, methods and findings of all ocean monitoring activities conducted in both regions during calendar year 2016.

Regular (core) monitoring was conducted on a weekly, quarterly, semiannual or annual basis at a total of 142 discrete sites that are arranged in grids surrounding the Point Loma and South Bay ocean outfalls. The PLOO terminates at a discharge depth of about 100 m located approximately 7.2 km west of the Point Loma Wastewater Treatment Plant on the Point Loma peninsula, whereas the SBOO terminates at a discharge depth of about 27 m located approximately 5.6 km offshore of southern San Diego and just north of the USA/Mexico border. Core monitoring in the PLOO region extends from Mission Beach southward to the tip of Point Loma along the shore, and in nearshore to offshore waters overlying the continental shelf at depths of about 9 to 116 m. Core monitoring in the SBOO region extends from Coronado, San Diego southward to Playa Blanca in northern Baja California at the shore stations, while offshore monitoring occurs in waters overlying the continental shelf at depths of about 9 to 55 m. In addition to monitoring at the permanent core stations, an annual survey of benthic conditions (sediment quality, macrobenthic communities) is typically conducted each year at 40 randomly selected stations that range from near the international border to northern San Diego County and that extend further offshore to continental slope depths as deep as 500 m. These broader geographic surveys are useful for evaluating patterns over the entire San Diego region and provide information important for distinguishing reference areas from those impacted by human activities. Additional information on background conditions for San Diego's coastal marine environment is also available from pre-discharge baseline studies conducted by the City for the PLOO region (1991–1994) and SBOO region (1995–1998).

Details of the results of all receiving waters monitoring activities conducted for the PLOO and SBOO regions from January through December 2016 are presented in the following six chapters, while tabular and graphical summaries and supplemental data are presented in Appendices A–F. Chapter 1 represents a general introduction and overview of the combined ocean monitoring program, while chapters 2–6 include results of the different monitoring components conducted at the core and regional stations. Chapter 2 presents data characterizing the results of shoreline (beach) and offshore water quality monitoring at 103 different core stations, including measurements of fecal indicator bacteria and 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 and the status of macrobenthic invertebrate communities at 49 core benthic stations are presented in Chapter 3, while results for the 2016 summer survey of 40 randomly selected benthic stations are presented in Chapter 6. Chapter 4 presents the results of trawling activities conducted at 15 trawl stations in order to monitor communities of bottom dwelling (demersal) fishes and large (megabenthic) invertebrates. Finally, the results of bioaccumulation assessments to measure contaminant levels in the tissues of San Diego marine fishes collected from nine trawl and four rig fishing zones are presented in Chapter 5. A summary of the main findings for each of the main monitoring components is included below.

## Ocean Water Quality

Oceanographic conditions off San Diego in 2016 in terms of ocean temperatures, salinity, dissolved oxygen (DO) concentrations, pH, transmissivity (water clarity), and concentrations of chlorophyll *a* were generally within historical ranges reported for the PLOO and SBOO monitoring regions. Conditions typically indicative of coastal upwelling were most evident during the spring 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, or the presence of phytoplankton blooms.

Ocean water quality was excellent in both the PLOO and SBOO regions during 2016. Overall compliance with Ocean Plan single sample maximum (SSM) and geometric mean standards for fecal indicator bacteria (i.e., total coliforms, fecal coliforms, *Enterococcus*) was 98% for all shore, kelp bed and other offshore stations located within California State waters. Compliance with both the SSM and geometric mean standards was typically a little higher at the PLOO stations than at the SBOO stations. Compliance rates also tended to be higher at the nearshore kelp bed and other offshore stations compared to the shore stations. Reduced compliance with the various water contact standards tended to occur during the wet season. This relatively common pattern of higher contamination during or following seasonal storm events, especially at some of the shore stations located nearer the Tijuana River, is likely due to coastal runoff from both point and non-point sources.

Compliance was also very high with Ocean Plan narrative objectives for natural light (i.e., transmissivity), pH, and DO in coastal waters where the plumes are most likely to occur. For example, potential plume signatures were detected in fewer than 17% of the CTD casts performed during the year (i.e., n = 43). Results from only nine of these CTD casts (3 PLOO, 6 SBOO) showed any significant depression of natural light levels, while only four casts (2 PLOO, 2 SBOO) showed any depression of DO concentrations at stations located within State waters. Although about 67% of the potential PLOO plume detections corresponded to elevated *Enterococcus* densities, these samples were all collected from depths ≥ 60 m. In contrast, none of the potential plume signals for the SBOO region were coincident with elevated bacterial levels.

## Benthic Sediment Quality

Ocean sediments varied throughout the San Diego region during 2016 in terms of both particle (grain) size composition and the presence of different types of contaminants. Sediments sampled off Point Loma during the year were composed primarily of fine silts and clays (percent fines) and fine sands. In contrast, particle size composition was much more diverse in sediments across the SBOO region. Overall, there were no changes in the amount of fine sediments that could be attributed to wastewater discharge, nor was there any other apparent relationship between particle size distributions and proximity to either outfall. Instead, most spatial differences observed between the PLOO and SBOO core monitoring sites are probably due to factors such as the offshore disposal of dredged sediments, the deposition of detrital materials, the presence of residual construction materials near the outfalls, and the geological origin of different sediment types.

As in previous years, sediment quality was very high at the PLOO and SBOO stations, with overall contaminant loads remaining relatively low compared to available effects-range low (ERL) or effects-range median (ERM) thresholds and levels present in other southern California coastal sediments. Only five trace metals were detected at concentrations greater than their respective ERLs at a few stations, including cadmium at PLOO station B10, copper and lead at PLOO station E1, and silver at PLOO station E11 during the summer survey, and arsenic at SBOO station I21 during both the winter and summer surveys. There was no evidence of contaminant accumulation associated with wastewater discharge. Concentrations of the above and other metals, as well as various organic loading indicators (e.g., BOD, TOC, sulfides), pesticides (e.g., DDT), PCBs and PAHs varied widely throughout both regions, and there were no patterns that could be attributed to either outfall or other point sources. The only evidence of possible organic enrichment was slightly higher sulfide and BOD levels at a few stations located within about 200 m of the PLOO discharge site.

The composition of sediments at the 40 randomly selected benthic stations sampled in July 2016 was also typical for continental shelf and upper slope benthic habitats off southern California, and consistent with the findings from previous regional surveys off San Diego as well as at the core PLOO and SBOO monitoring stations. Overall, San Diego sediments varied between the inner shelf, mid-shelf, outer shelf and upper slope strata as expected, and there was no evidence of habitat degradation. While various indicators of organic loading, trace metals, pesticides, PCBs and PAHs were detected, concentrations of most were relatively low compared to many other areas of the Southern California Bight. Almost all contaminants detected in these regional sediments occurred at levels below available ERL and ERM thresholds. Furthermore, there was no evidence of disturbance at any of the regional sites that could be attributed to wastewater discharges from either the PLOO or SBOO. Instead, concentrations of several chemical parameters increased with depth along with corresponding increases in percent fines. For example, the highest levels of most contaminants occurred in sediments along the upper slope where some of the finest sediments were present.

## Benthic Macrofaunal Communities

Benthic macrofaunal communities surrounding the PLOO and SBOO were similar in 2016 to those observed in previous years. The benthic communities present off Point Loma remained dominated by polychaete worm and ophiuroid (brittle star) assemblages that are common in similar southern California mid-shelf habitats. Specifically, the brittle star *Amphiodia urtica* was the most abundant species off Point Loma in 2016, although its populations have shown a region-wide decrease over the past 25 years. In contrast, the SBOO assemblages present in 2016 were dominated by polychaete worm species that occur in shallower, often sandier shelf sediments off southern California. For example, the spionid polychaete *Spiophanes norrisi* was again the most abundant and most widely distributed species recorded in the South Bay region, which is similar to patterns observed since 2007. Benthic communities inhabiting both outfall regions appear to be in good condition, remain structurally similar to those observed prior to outfall operations, and are representative of natural indigenous communities. For example, values for important community metrics such as species richness, abundance, diversity, and dominance were within historical ranges and representative of those occurring in similar habitats throughout the Southern California Bight. Additionally, benthic response index (BRI) values for 95% of the PLOO samples and 80% of the SBOO samples remained characteristic of undisturbed habitats. In the PLOO region, only the BRI values for the two samples collected at near-ZID station E14 were indicative of a possible minor deviation from reference condition. In contrast, a total of 11 samples from eight of the SBOO stations had BRI values that may correspond to a similar minor deviation. However, none of these slightly higher BRI values occurred at the SBOO near-ZID stations, which suggests that factors other than wastewater discharge may be affecting these few assemblages. Overall, there was no evidence that wastewater discharge has caused degradation of the marine benthos at any of the PLOO or SBOO core monitoring stations.

Results of the summer 2016 regional survey of randomly selected benthic sites off San Diego continue support the findings from previous years that the major macrofaunal assemblages segregate by habitat characteristics such as depth and sediment type. For example, the inner to mid-shelf assemblages present off San Diego in July 2016 were similar to those found in other shallow, sandy habitats across the Southern California Bight, and were characterized by species of polychaete worms such as *Spiophanes norrisi*, *S. duplex*, and *Mediomastus* sp. Assemblages occurring in somewhat finer, but more mixed sediments along the outer shelf, were dominated by the bivalves *Axinopsida serricata*, *Nuculana* sp A, and *Tellina carpenteri*, as well as the polychaetes *Spiophanes kimballi*, *Petaloclymene pacifica*, and *Mediomastus* sp. Similar to patterns described in previous monitoring reports, upper slope habitats off San Diego were characterized by a high percentage of fine sediments with associated species assemblages distinct from those at most shelf stations. These upper slope assemblages were dominated by the polychaete *Maldane sarsi*, the scaphopod *Cadulus californicus*, and the gastropod *Lirobittium calenum*. Although benthic communities off San Diego vary across depth and sediment gradients, there was no evidence of disturbance during the 2016 regional surveys that could be attributed to wastewater discharges, offshore dredged materials disposal sites, or other point sources. Benthic habitats appear to be in good condition overall, with 100% of the shelf sites being classified in reference condition based on assessments using the BRI. This pattern is consistent with recent findings for the entire Southern California Bight mainland shelf.

## Demersal Fishes & Megabenthic Invertebrates

Results for the demersal fish and megabenthic invertebrate communities trawled off San Diego in 2016 were difficult to compare to previous years due to the presence of exceptionally large populations of pelagic red crabs (*Pleuroncodes planipes*) that had invaded the region and impacted trawling operations at many stations. The impact was most pronounced off Point Loma where total trawling time had to be reduced from 10 minutes to one minute at most stations in order to limit the red crab catch so that the trawl net could be safely retrieved and brought onboard ship for processing. Consequently, it was not possible to determine if observed differences or changes in trawl-caught fish and invertebrate populations off San Diego during the year were due to unequal trawling times, direct impacts caused by the pelagic red crabs, or other factors.  In spite of these limitations, some patterns could still be identified. For example, although reduced in total numbers Pacific Sanddabs continued to dominate the demersal fish assemblages surrounding the PLOO. In contrast, the SBOO fish assemblages were dominated by species such as the California Lizardfish and Speckled Sanddab that are more common at those shallower depths. The dominant trawl-caught invertebrate at the SBOO stations in 2016 was the shrimp *Sicyonia penicillata*, while the pelagic red crab accounted for about 99% of invertebrate catch at the PLOO stations. Where comparisons could be made to previous surveys, the findings indicated that demersal fish and megabenthic invertebrate communities in both the PLOO and SBOO regions remain unaffected by wastewater discharge. Although highly variable, spatial patterns in the abundance and distribution of individual species were similar at stations located near the outfalls and farther away. Finally, external examinations of the fish captured during the year indicated that fish populations remain healthy off San Diego, with less than 1% of all fish having external parasites or showing any evidence of disease or other abnormalities.

## Contaminant Bioaccumulation in Fishes

The accumulation of chemical contaminants in San Diego marine fishes was assessed by analyzing liver tissues from flatfish collected from trawl zones and muscle tissues from rockfish collected at rig fishing zones. Results from both analyses indicated no evidence that contaminant loads in fishes from the PLOO or SBOO regions were affected by wastewater discharge in 2016. Although several metals, pesticides, and PCB congeners were detected in both tissue types, these contaminants occurred in fishes distributed throughout the region with no patterns that could be attributed to wastewater discharge. While all of the rockfish muscle samples exceeded international standards for arsenic and selenium, all samples were within state and federal (USFDA) action limits. Furthermore, concentrations of all contaminants were within ranges reported previously for southern California fishes. Consequently, the occurrence of some metals and chlorinated hydrocarbons in some local fishes is likely due or related to other factors such as the widespread distribution of many contaminants in southern California sediments, differences in the physiology and life history traits of various species of fish, different exposure pathways, and differences in the migration habits of various species. For example, an individual fish may be exposed to contaminants at a polluted site but then migrate to an area that is less contaminated. This is of particular concern for fishes collected in the vicinity of the PLOO and the SBOO, as there are many other potential point and non-point sources of contamination.

## Conclusions

The findings and conclusions for the ocean monitoring efforts conducted for the Point Loma and South Bay ocean outfall monitoring regions during calendar year 2016 were consistent with previous years. Overall, 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 outfalls were transported shoreward 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 generally good condition similar to reference conditions for much of the Southern California Bight. Finally, the low level of contaminant bioaccumulation 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.

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# *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 Point Loma Wastewater Treatment Plant (PLWTP: NPDES No. CA0107409), South Bay Water Reclamation Plant (SBWRP: NPDES No. CA0109045), and South Bay International Wastewater Treatment Plant (SBIWTP: NPDES No. CA0108928) (see Table A.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 the 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, including 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.

Overall, the City's combined Ocean Monitoring Program is designed to assess the impact of 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 California Ocean Plan (Ocean Plan) water-contact standards in state waters, 3) track movement and dispersion of the wastewater fields or plumes discharged via the outfalls, and 4) identify any biological or chemical changes that may be associated with wastewater discharge. These data are then used to evaluate and document any effects of wastewater discharge, other man-made influences (e.g., storm water discharge, urban runoff), or natural factors (e.g., climate changes) 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 offshore of the facility at a depth of about 60 m. The plant operated as a primary treatment facility from 1963 to 1985, after which it was upgraded to full 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, treatment has been further enhanced over the years 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% required by the NPDES permit.

The physical structure of the PLOO was modified in the early 1990s when it was extended approximately 3.3 km farther offshore 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. The present "deep-water" PLOO extends approximately 7.2 km west of the PLWTP to a depth of about 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 was about 136 million gallons per day (mgd) in 2016.

### South Bay Ocean Outfall

The SBOO is located just north of the border between the United States and Mexico where it terminates approximately 5.6 km offshore and west of Imperial Beach at a depth of about 27 m. Unlike all other southern California 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, and then continues beneath the seabed to a distance of about 4.3 km offshore. From there, the pipe connects to a vertical riser assembly that conveys effluent to a pipeline buried just beneath the surface of the seafloor. This subsurface outfall pipe 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 and south. The outfall was originally designed to discharge wastewater through 165 diffuser ports and risers, which included one riser at the center of the wye and 82 others 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 was about 28.3 mgd in 2016, including about 3.3 mgd of tertiary treated effluent from the SBWRP and about 25 mgd of secondary treated effluent from the SBIWTP.

## Receiving Waters Monitoring

The total monitoring area for the PLOO and SBOO programs combined spans about 881 km$^2$ of coastal marine waters from Northern San Diego County to Northern Baja California. Core monitoring for the Point Loma region is conducted at 82 different stations located from the shore seaward to a depth of about 116 m, while core monitoring for the South Bay region is conducted at 53 stations ranging from along the shore to offshore depths of about 61 m (Figure A.1). Each of the core monitoring stations is sampled for specific parameters as specified in the appropriate MRPs. A summary of the results for all quality assurance procedures performed during calendar year (CY) 2016 in support of these requirements for both regions can be found in City of San Diego (2017). Data files, detailed methodologies, completed reports, and other pertinent information submitted to the California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) and the U.S. Environmental Protection Agency (USEPA), Region IX during the year are available online at the City's website (www.sandiego.gov/mwwd/environment/oceanmonitor.shtml).

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 referenced 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 monitoring for the South Bay region has similarly 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 2015 and the SBOO from 1999 to 2015 are available in previous annual receiving waters monitoring reports (e.g., City of San Diego 2016a, b).

In addition, the City has conducted annual region-wide surveys off the coast of San Diego since 1994 either as part of regular South Bay outfall monitoring requirements (e.g., City of San Diego 1999, 2016b) 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 and Bight'13 programs in 1998, 2003, 2008 and 2013 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). These large-scale surveys are useful for characterizing the ecological health of diverse coastal areas and in distinguishing 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 2016).

## Special Studies

The City has been actively working on or supporting a number of important special projects or enhanced ocean monitoring studies over the past 10 years or more. Many of these projects were identified as the result a scientific review of the City's Ocean Monitoring Program and environmental monitoring needs for the region that was conducted by a team of scientists from the Scripps Institution of Oceanography (SIO) and other institutions (SIO 2004), as well as in consultation with staff from the San Diego Water Board, USEPA, Southern California Coastal Water Research Project (SCCWRP) and others. Examples of special projects or enhanced monitoring efforts that have been recently completed, are presently underway, or that are just being initiated include:

- Point Loma Ocean Outfall Plume Behavior Study: This project was designed to determine the characteristic fates of the PLOO wastewater plume in the coastal waters off Point Loma using a combination of observational and modeling approaches. The study was successfully completed in 2012 and resulted in several important conclusions and recommendations (see Rogowski et al. 2012a, b, 2013, and Appendix F in City of San Diego 2015a). The City is currently in the process of implementing the major recommendations of this study (see next project below).

- Real-Time Observing Systems for the Point Loma and South Bay Ocean Outfalls: This project addresses the primary recommendation of the Point Loma plume behavior study described above, as well as a similar study completed several years ago for the South Bay outfall region (Terrill et al. 2009). The study involves installation of a new real-time ocean observing system that will span both outfall regions. The project began in late 2015 with initial deployment of the SBOO mooring system completed in December 2016 and deployment of the PLOO mooring scheduled for Fall 2017. This project is being conducted in partnership between the City and the Ocean Time Series Group of SIO who presently operates 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.

- Deep Benthic Habitat Assessment Study: This project represents an ongoing, long-term project designed to assess the condition of deeper (>200 m) continental slope habitats off San Diego. A summary report of the current status of this project for data collected from 2003 through 2013 is included in Appendix C.5 of City of San Diego (2015a).

- Remote Sensing of the San Diego / Tijuana Coastal Region: This project represents a long-term effort funded by the City and the International Boundary and Water Commission 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 (Solana Beach, CA), 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. Results from this project for CY2016 are available in Svejkovsky (2017), while a comprehensive multi-year report and peer-reviewed publication are expected to be completed in 2017.

- San Diego Kelp Forest Ecosystem Monitoring Project: This project represents continuation of a long-term commitment by the City to support this important research conducted by SIO. Overall, this work is essential to assessing the health of San Diego's kelp forests and to monitoring the effects of wastewater discharge on the local coastal ecosystem relative to other factors. The final project report for the most recent 4-year agreement (2010–2014) with SIO is available in Parnell et al. (2014), while work on a new 5-year agreement through June 2019 is currently underway.

## Report Components & Organization

This report presents summaries and preliminary assessments of the results of all receiving waters monitoring activities conducted during CY2016 (January–December 2016) 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 first Biennial Receiving Waters Monitoring and Assessment Report for calendar years 2016–2017 to be submitted to the San Diego Water Board and USEPA by July 1, 2018. Included herein are results from all regular core stations that comprise the fixed-site monitoring grids surrounding the two outfalls (Figure A.1), as well as results from the summer 2016 benthic survey of randomly selected sites that range from near the USA/Mexico border to northern San Diego County (Figure A.2). The major components of the combined monitoring program are covered in the following chapters and associated appendices: Executive Summary; General Introduction (Chapter 1, Appendix A); Water Quality (Chapter 2, Appendix B); Benthic Conditions (Chapter 3, Appendix C); Demersal Fishes and Megabenthic Invertebrates (Chapter 4, Appendix D); Contaminants in Fish Tissues (Chapter 5, Appendix E); Regional Benthic Conditions (Chapter 6, Appendix F). Not included in this report are results from the summer 2016 (Year 1) sediment toxicity testing activities for the Point Loma and South Bay outfall regions; these results will be presented following completion of the Year 3 survey as described in the approved Sediment Toxicity Monitoring Plan (City of San Diego 2015b).

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# *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. A comprehensive suite of oceanographic data is collected, including measurements of sea temperatures, salinity, light transmittance or water clarity, dissolved oxygen, pH, chlorophyll *a*, and colored dissolved organic material. Densities of several types of fecal indicator bacteria are also measured to provide information useful to monitoring the dispersion of wastewater discharged into the ocean through each outfall and to assess effects associated with coastal runoff from local watersheds during storm events. 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) in order to protect the beneficial uses of California's ocean waters (SWRCB 2012).

This chapter presents a summary of the purpose, materials and methods, and results of the oceanographic and microbiological data collected during calendar year 2016 at a total of 103 water quality monitoring stations surrounding the PLOO and SBOO. Detailed figures and tables supporting these results are presented in Appendix B.

## 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 B.1). Sixteen of these stations are located in California State waters and are therefore subject to Ocean Plan water contact standards (Table B.1, SWRCB 2012). These include eight PLOO stations (D4, D5, D7, D8/D8-A, D9–D12) located from Mission Beach southward to the tip of Point Loma and eight SBOO stations (S4–S6, S8–S12) located between the USA/Mexico border and Coronado. The other three SBOO shore stations (S0, S2, S3) are located south of the border and are not subject to Ocean Plan requirements.

Seawater samples were collected from the surf zone at each shore station in sterile 250-mL bottles, transported on blue ice to the City of San Diego Marine Microbiology Laboratory, and analyzed to determine concentrations of three types of FIB, including total coliform, fecal coliform, and *Enterococcus* bacteria. In addition, weather conditions and visual observations of water color, surf height, and human or animal activity were recorded at the time of collection.

***Kelp Bed and Other Offshore Stations***

Fifteen stations located in relatively shallow waters within or near the Point Loma or Imperial Beach kelp beds (i.e., referred to as "kelp" stations herein) were monitored five times each month 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 B.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 Point Loma kelp forest, SBOO stations I25, I26 and I39 located at depths of 9–18 m contiguous to the Imperial Beach kelp bed, and SBOO stations I19, I24, I32 and I40 located in other nearshore waters along the 9-m depth contour.

An additional 69 offshore stations were sampled quarterly to monitor water quality and to estimate dispersion of the PLOO and SBOO wastewater plumes. These stations were monitored during February, May, August and November in 2016 with the 36 PLOO and 33 SBOO stations sampled over four and three consecutive days, respectively, during each survey (Table B.2). Stations F1–F36 are arranged in a grid surrounding the PLOO along or adjacent to the 18, 60, 80 and 100-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 B.1). Of these, 15 of the PLOO stations (i.e., F01–F03, F06–F14, F18–F20) and 15 of the SBOO stations (i.e., I12, I14, I16–I18, I22–I23, I27, I31, I33–I38) are located within State jurisdictional waters (i.e., within 3 nautical miles of shore) and therefore subject to the Ocean Plan compliance standards.

Seawater samples for analyses of total coliform, fecal coliform, and *Enterococcus* bacteria were collected from three discrete depths at all PLOO and SBOO kelp stations and 21 other SBOO offshore stations using a rosette sampler fitted with Niskin bottles (Table B.3). Seawater samples for FIB analysis were also collected from three discrete depths at the 18-m and 60-m offshore PLOO stations, four depths at the 80-m offshore PLOO stations, and five depths at the 100-m offshore PLOO stations. These offshore PLOO samples were analyzed for *Enterococcus* bacteria only. During the quarterly sampling surveys, additional aliquots for analysis of ammonium, total suspended solids (TSS), and oil and grease (O&G) were collected with FIB samples. Ammonium samples were collected from all depths at the PLOO kelp and offshore stations located within State waters. TSS samples were collected from all depths at the SBOO kelp and other offshore stations, while O&G samples were collected from surface waters only at these same stations. All FIB and ammonium samples were refrigerated at sea onboard the City monitoring vessel and then transported on blue ice to the City's Marine Microbiology and Toxicology Labs for processing and analysis, respectively. TSS and O&G samples were analyzed at the City's Environmental Chemistry Services Laboratory.

Oceanographic data were collected at all kelp and other offshore stations using a Sea-Bird conductivity, temperature, and depth instrument (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 (proxy for water clarity), chlorophyll *a* (proxy for phytoplankton), and colored dissolved organic material (CDOM). Vertical water column profiles of each parameter were constructed for each station by averaging the data values recorded within each 1-m depth bin. This data reduction ensured that physical measurements used in subsequent analyses would correspond to the discrete sampling depths required for FIB assessments. Visual observations of weather and water conditions were recorded at each station just prior to each CTD cast.

## Laboratory Analyses

The City 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) Environmental Laboratory Accreditation Program (ELAP) with respect to sampling and analytical procedures (Bordner et al. 1978, APHA 2005, CDPH 2000, USEPA 2006). All bacterial analyses were performed within eight hours of sample collection and conformed to standard membrane filtration techniques (APHA 2005).

FIB densities were determined and validated in accordance with USEPA and APHA guidelines (Bordner et al. 1978, APHA 2005, USEPA 2006). Plates with FIB counts above or below the ideal counting range were given greater than (>), greater than or equal to (≥), less than (<), or estimated (e) qualifiers. However, these qualifiers were dropped and the counts treated as discrete values when calculating means and in 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. Bacteriological laboratory and field duplicate samples were processed according to method requirements to measure analyst precision and variability between samples, respectively. Results of these procedures were reported under separate cover (City of San Diego 2017).

Ammonium (nitrogen) samples were analyzed by the City's Toxicology Laboratory using a Hach DR850 colorimeter and the Salicylate Method (Bower and Holm-Hansen 1980). Quality assurance tests for these analyses were performed using sample blanks.

## Data Analyses

***Oceanographic Conditions***

Water column parameters measured in 2016 were summarized as quarterly means pooled over all "F", "I" and kelp stations (collected within one week of the quarterly 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. The top depth layer is herein referred to as surface waters while the subsurface layers account for mid and bottom waters. Unless otherwise noted, analyses were performed using R (R Core Team, 2016) and various functions within the dplyr, fields, Hmisc, mixOmics, oce, reshape2, Rmisc, RODBC, and zoo packages (Zeileis and Grothendieck 2005, Wickham 2007, Hope 2013, Harrell et al. 2015, Kelley and Richards 2015, Nychka et al. 2015, Ripley and Lapsley 2015, Le Cao et al. 2016, Wickham and Francois 2016).

***Water Quality***

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 B.1, SWRCB 2012). Ammonium, TSS, and O&G concentrations were summarized by quarter for the kelp and other offshore stations. These analyses were performed using R (R Core Team, 2016) and various functions within the gtools, Hmisc, psych, reshape2, RODBC, and tidyr packages (Wickham 2007, 2017, Harrell et al. 2015, Ripley and Lapsley 2015, Warnes et al. 2015, Revelle 2015).

***Wastewater Plume Dispersion***

Presence or absence of the wastewater plume was estimated at the offshore PLOO and SBOO stations 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 wastewater plume dispersion from the outfalls. Previous monitoring has consistently found that the PLOO plume remains trapped below the pycnocline with no evidence of surfacing throughout the year (City of San Diego 2010a–2016a, Rogowski et al. 2012a, b, 2013), while the SBOO plume stays trapped below the pycnocline during seasonal periods of water column stratification, but may rise to the surface when stratification breaks down (City of San Diego 2010b–2016b, Terrill et al. 2009). Water column stratification and pycnocline depth were quantified using buoyancy frequency (BF, cycles$^2$/min$^2$) 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:

$$BF^2 = g/\rho * (d\rho/dz)$$

where g is the acceleration due to gravity, ρ is the seawater density, and dρ/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 >32 cycles$^2$/min$^2$), subsequent analyses were limited to depths below the pycnocline.

Identification of potential plume signal at each monitoring station was based 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, 2016) and the various functions within the oce, reshape2, Rmisc, and RODBC packages (Wickham 2007, Hope 2013, Kelley and Richards 2015, Ripley and Lapsley 2015).

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. Any station where all its CDOM values were below the 85$^{th}$ percentile for a given survey were considered outside the plume and therefore used as a reference station (Table B.4). Individual 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 B.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).

# Results

## Oceanographic Conditions in 2016

Ocean temperatures, salinity, DO, pH, transmissivity, and chlorophyll *a* recorded in 2016 for the PLOO and SBOO monitoring regions are summarized in Tables B.5 and B.6, respectively. These same parameters are plotted by depth and survey for all outfall discharge depth stations associated with each outfall (i.e., 100-m stations for the PLOO, 28-m stations for the SBOO) (Figures B.2–B.13). All water quality data and associated visual observations have been previously reported in the 2016 monthly receiving waters monitoring reports submitted to the San Diego Regional Water Board (see City of San Diego 2016-2017 a, b).

Values for all parameters were generally within historical ranges reported for the PLOO and SBOO monitoring regions (e.g., City of SanDiego 2016a, b). During 2016, ocean temperatures ranged from 9.7 to 24.0°C across the PLOO region, and from 10.6 to 23.1°C across the SBOO region. Temperatures and thermal stratification varied seasonally as expected, with maximum surface temperatures and the greatest difference between surface and bottom waters occurring in August. Salinity ranged from 33.20 to 33.97 ppt at the PLOO stations and from 33.16 to 33.62 ppt at the SBOO stations. As with ocean temperatures, salinity varied seasonally. For example, the highest salinity values occurred in May at bottom depths for both regions. These relatively high salinity values corresponded with the lowest water temperatures recorded during the year and may be indicative of local coastal upwelling (see Jackson 1986).

DO concentrations ranged from 3.1 to 10.0 mg/L at the PLOO stations and from 3.7 to 9.4 at the SBOO stations, while pH ranged from 7.7 to 8.4 in both areas. Changes in pH and DO were closely linked since both parameters reflect fluctuations in dissolved carbon dioxide associated with biological activity in coastal waters (Skirrow 1975). As with ocean temperatures, the lowest DO and pH values occurred in May at both the PLOO and SBOO stations, which was likely due to the upwelling of cold, saline, oxygen poor water in these regions. Conversely, higher DO and pH values during the year were often associated with phytoplankton blooms that were evident from relatively high chlorophyll *a* concentrations.

Transmissivity ranged from 1 to 91% at the PLOO stations and from 7 to 89% at the SBOO stations. The lowest transmissivity values recorded during 2016 were found at a depth of 11 m at PLOO station C4 in November, and at a depth of 14 m at SBOO station I5 in February (City of San Diego 2016-2017 a, b). Reduced transmissivity in these regions has historically been associated with coastal runoff and sediment resuspension due to nearshore wave activity or the presence of phytoplankton blooms (e.g., City of San Diego 2016a, b). Concentrations of chlorophyll *a* ranged from 0.1 to 11.9 µg/L at the PLOO stations, and from 0.4 to 17.3 µg/L at the SBOO stations. The highest chlorophyll *a* values were recorded at a depth of 11 m at PLOO station C4 in November (coinciding with the low transmissivity mentioned above), and at a depth of 4 m from SBOO station I26 in May.

## Water Quality in 2016

### *Bacteriological Compliance*

All seawater samples collected from the PLOO and SBOO water quality stations that contained elevated FIB densities are listed in Tables B.7 and B.8. Compliance rates for the three geometric mean and four single sample maximum (SSM) Ocean Plan water contact standards (see Table B.1) are summarized in Figures B.14–B.16. All water quality data and associated visual observations have been previously reported in 2016 monthly receiving waters monitoring reports submitted to the San Diego Regional Water Board (see City of San Diego 2016-2017 a, b).

Water quality conditions in the PLOO and SBOO regions were excellent in 2016. Of the 4483 seawater samples analyzed during the year, only 3% (n = 132) had elevated FIB, which translates to an overall 98% compliance with Ocean Plan water contact standards at these stations. Compliance with the 30-day geometric mean standards at the eight SBOO shore stations located in California State waters ranged from 79 to 100% for total coliforms, 88 to 100% for fecal coliforms, and 31 to 100% for *Enterococcus.* In contrast, compliance with these geometric mean standards was ≥92% at the eight PLOO shore stations. Compliance with the SSM standards at the eight SBOO shore stations in State waters ranged from 71 to 100% for total coliforms, 76 to 100% for fecal coliforms, 52 to 100% for *Enterococcus,* and from 73 to

100% for the fecal:total coliform (FTR) criterion. As with the geometric mean standards, compliance with the SSM standards was higher at the PLOO shore stations at ≥93%. Compliance rates also tended to be higher at the kelp and other offshore stations compared to the shore stations. For example, compliance with the geometric mean standards at the PLOO and SBOO "kelp" stations was 100%, while compliance with the SSM standards was ≥92% at the PLOO kelp stations and ≥94% at the SBOO kelp stations. Additionally, compliance with the SSM standards was 100% at the 10 offshore SBOO stations and ≥92% at the 15 offshore PLOO stations located within State waters. Reduced compliance with the various standards tended to occur during the wet season (e.g., January–April, October–December) when 73% (n=97) of the seawater samples with elevated FIB were collected. This pattern of higher contamination occurring during or following rain events is similar to that observed during previous years and is likely due to runoff from terrestrial point and non-point sources (e.g., City of San Diego 2016a, b).

***Ammonium***

Ammonium concentrations measured in the coastal waters off Point Loma in 2016 are summarized in Table B.9. This parameter is not measured at any of the SBOO stations. Overall, ammonium was detected in only about 7% of the 288 samples collected during the year from the 23 kelp or other offshore PLOO stations located within State waters. Additionally, all concentrations were ≤0.05 mg/L, which is two orders of magnitude lower than the water quality objectives for ammonium as defined in the Ocean Plan (i.e., instant maximum of 6.0 mg/L, daily maximum of 2.4 mg/L; SWRCB 2012).

***Total Suspended Solids and Oil and Grease***

Total suspended solids (TSS) and oil and grease results for 2016 are summarized in Table B.10 for the SBOO region (i.e., this parameter is not measured at any of the PLOO stations). Of the 112 samples collected from the various SBOO kelp and other offshore stations in 2016, none contained detectable levels of oil and grease. In contrast, detection rates for TSS samples collected from the SBOO kelp stations ranged from 67% in August to 100% in February, with concentrations ≤24.8 mg/L. Detection rates for TSS samples collected from other SBOO offshore stations ranged from 22% in November to 92% in February, with concentrations ≤9.6 mg/L. Overall, 16 of the 368 samples collected contained elevated TSS concentrations ≥8.0 mg/L; 10 of these elevated TSS samples were collected from SBOO kelp stations, while the remaining six were collected from other SBOO offshore stations. Two of these elevated TSS samples were also associated with elevated FIB samples collected February 9–10, including one sample collected from a depth of 11 m at station I5 and one sample collected from a depth of 9 m at station I25.

## Wastewater Plume Dispersion and Effects

The dispersion of wastewater plumes in 2016 and their effects on natural light, DO and pH levels in local ocean waters off San Diego were assessed by evaluating the results of 144 CTD profile casts performed at the PLOO offshore stations and another 112 CTD casts performed at the SBOO offshore stations (n=256 casts total). These results are summarized in Tables B.4, and B.11–B.12, and Figures B.17–B.18. Although 67 of these 256 casts were found to have CDOM in exceedance of the 95$^{th}$ percentile, only 43 (~17% of all CTD casts) were subsequently considered possible indicators of the PLOO or SBOO plumes using the criteria described previously (see Materials and Methods section). These potential plume signals included: a) 30 signals from 21 different PLOO stations; b) 13 signals from seven different SBOO stations.

About 27% of the possible PLOO plume detections (n=8) occurred at the three nearfield stations located along the 100-m depth contour and closest to the outfall's discharge zone (i.e., stations F29, F30, and F31). The remaining 22 possible PLOO plume detections occurred at other offshore monitoring stations located further away north or south along the 100-m depth contour as well as towards shore along the 60-m and 80-m depth contours. A total of 20 (~67%) of the potential PLOO plume detections corresponded with elevated *Enterococcus* densities; these samples were all collected from depths ≥60 m (see Table B.7).

For each of the above possible plume detections at the PLOO stations, mean values for natural light (% transmissivity), DO and pH within the estimated plume were compared to thresholds calculated for similar depths at non-plume reference stations. Based on these comparisons, a total of 18 out-of-range (OOR) events were identified for the PLOO region. These included 11 OOR events for natural light, seven OOR events for DO, and no OOR events for pH. Only three of the OOR events for natural light and two of the OOR events for DO occurred at stations located within State jurisdictional waters where Ocean Plan compliance standards apply.

In the SBOO region, nine of the potential plume detections occurred at the four stations located nearest the primary discharge zone (i.e., stations I12, I14, I15, and I16). Three of these possible plume detections occurred at a depth of 2 m during February, which corresponded with near-surface dispersion patterns observed by satellite imagery (Svejkovsky 2017). None of the potential plume signals for the SBOO were coincident with elevated *Enterococcus* levels (see Table B.8). Additionally, the four potential plume signals that occurred at other offshore stations were likely spurious due to their greater distance from the outfall and/or proximity to other known sources of organic matter. For example, station I34 is located within the possible influence of outflows from San Diego Bay, while stations I27 and I39 are located within the possible influence of the Tijuana River. A total of 10 OOR events were identified for the SBOO region, including eight OOR events for transmissivity and two OOR events for DO. There were no OOR events for pH at the SBOO stations. Six of the OOR events for natural light and each of the OOR events for DO occurred at stations located within State jurisdictional waters where Ocean Plan compliance standards apply.

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# *Chapter 3. Benthic Conditions*

## Introduction

The City of San Diego conducts extensive monitoring of benthic sediments and associated communities of small macrobenthic invertebrates (macrofauna) surrounding the Point Loma Ocean Outfall (PLOO) and South Bay Ocean Outfalls (SBOO) in order to characterize regional conditions and to identify possible effects of anthropogenic inputs such as wastewater discharge on the marine environment. Benthic macrofauna are targeted for monitoring because these organisms play important ecological roles in coastal marine ecosystems off southern California and throughout the world (e.g., Fauchald and Jones 1979, Thompson et al. 1993, Snelgrove et al. 1997). Additionally, because many benthic species live relatively long and stationary lives, they may integrate the effects of pollution or other disturbances over time (Hartley 1982, Bilyard 1987). The response of many of these species to environmental stressors is also well documented, and therefore monitoring changes in discrete populations or more complex communities can help identify locations impacted by anthropogenic inputs (Pearson and Rosenberg 1978, Bilyard 1987, Warwick 1993, Smith et al. 2001). Physical and chemical characteristics of benthic sediments (i.e., sediment quality) are analyzed because together they define the primary microhabitats for benthic invertebrates that live within or on the seafloor, and therefore can directly influence the distribution and presence of various species. Additionally, analyses of various sediment contaminants are conducted because anthropogenic inputs to the marine ecosystem, including municipal wastewater, can lead to increased concentrations of pollutants within the local environment. The relative percentages of sand, silt, clay, and other particle size parameters are examined because concentrations of some compounds are known to be directly linked to sediment composition (Emery 1960, Eganhouse and Venkatesan 1993).

This chapter presents a summary of the purpose, materials and methods, and results of the sediment particle size, sediment chemistry, and macrofaunal data collected during calendar year 2016 at a total of 49 core benthic monitoring stations surrounding the PLOO and SBOO. Detailed figures and tables supporting these results are presented in Appendix C. Results for the separate summer 2016 survey of 40 additional randomly selected benthic stations distributed throughout the entire San Diego region are summarized in Chapter 6.

## Materials and Methods

### Collection and Processing of Samples

Benthic samples were collected at 49 different core monitoring stations surrounding the Point Loma or South Bay outfalls during both the winter (January) and summer (July) of 2016 in order to monitor sediment quality and macrofaunal community condition off San Diego (Figure C.1). These included 22 PLOO stations at depths of about 88–116 m and 27 SBOO stations at depths of about 19–55 m. The PLOO monitoring sites comprise 12 primary stations located along the 98-m depth contour (i.e., PLOO discharge depth) and 10 secondary stations located along or adjacent to the shallower 88-m or deeper 116-m depth contours. The SBOO monitoring sites comprise 12 primary stations located along the 28-m depth contour (i.e., SBOO discharge depth) and 15 secondary stations located along or adjacent to the 19, 38, or 55-m depth contours. The three stations located within 200 m of the boundary of the zone of initial dilution (ZID) for each outfall (i.e., ~100m for PLOO and ~30m for SBOO) are considered to represent near-ZID conditions. These include PLOO stations E11, E14 and E17, and SBOO stations I12, I14 and I16. while the next closet nearfield station to each outfall include station E15 located about 751 m west of the PLOO wye diffuser structure (i.e., ~651 m beyond the ZID), and station I15 located about 502 m west of the SBOO wye (i.e., ~472 m beyond the ZID).

Samples for benthic analyses were collected using a double 0.1-$m^2$ Van Veen grab, with one grab per cast used for sediment quality analysis and one grab per cast used for benthic community analysis. Sub-samples of the sediment grab for chemical and particle size analysis (see 'Laboratory Analyses' section below) were taken from the top 2 cm of the sediment surface and handled according to standard guidelines available in USEPA (1987). The other grab from the same cast was used for macrofaunal community analysis. A second replicate grab sample for community analysis was taken on a subsequent cast at just the PLOO stations and archived for future analysis if necessary following preservation and sorting of the animals.

Criteria established by the U.S. Environmental Protection Agency (USEPA) to ensure consistency of samples for benthic community analysis were followed with regard to sample disturbance and depth of penetration (USEPA 1987). All samples were brought aboard ship, the sediments and benthic organisms transferred to a wash table and rinsed with seawater, and then sieved through a 1.0-mm mesh screen. The macrobenthic invertebrates (macrofauna or infauna) retained on the screen were then collected, transferred to sample jars, and relaxed for 30 minutes in a magnesium sulfate solution before being fixed with buffered formalin. After a minimum of 72 hours in formalin, each sample was thoroughly rinsed with fresh water and transferred to 70% ethanol for final preservation. All macrofaunal organisms were separated from the raw material and sorted into the following major taxonomic groups by an external contract lab: Annelida, Arthropoda, Mollusca, non-ophiuroid Echinodermata, Ophiuroidea, and miscellaneous other taxa or phyla (e.g., flatworms, nemerteans, cnidarians). The sorted samples were then returned to the City's Marine Biology Laboratory where the animals were identified to species or the lowest taxon possible and enumerated by staff marine biologists. All identifications followed nomenclatural standards established by the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT 2014).

## Laboratory Analyses

All sediment chemistry and particle size analyses were performed at the City's Environmental Chemistry Services Laboratory. A detailed description of the analytical protocols can be found in City of San Diego (2017). Briefly, sediment sub-samples were analyzed on a dry weight basis to determine concentrations of biochemical oxygen demand (BOD; PLOO stations only), total organic carbon (TOC), total nitrogen (TN), total sulfides, total volatile solids, 18 trace metals, nine chlorinated pesticides (e.g., DDT), 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 (see Table C.1). However, concentrations below MDLs were included as estimated values if the presence of a specific constituent was verified by mass-spectrometry.

Particle size analysis was performed using either a Horiba LA-950V2 laser scattering particle 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 Table C.2). When a sample contained substantial amounts of coarse sand, gravel, or shell hash that could damage the Horiba analyzer and/or where the general distribution of sediments would be poorly represented by laser analysis, a set of nested sieves with mesh sizes of 2000 µm, 1000 µm, 500 µm, 250 µm, 125 µm, and 63 µm was used to divide the samples into seven sub-fractions.

## Data Analyses

### *Sediments*

Data summaries for the various sediment parameters included detection rate, minimum, maximum, and mean values for all samples combined. All means were calculated using detected values only; no substitutions were made for non-detects in the data (i.e., analyte concentrations < MDL). Total chlordane, total DDT (tDDT), total endosulfan, total endrin, total hexachlorocyclohexane (tHCH), total PCB (tPCB), and total PAH (tPAH) were calculated for each sample as the sum of all constituents with reported values. These analyses were performed using R (R Core Team 2016) and various functions within the dplyr, plyr, reshape2, tidyr, and zoo packages (Zeileis and Grothendieck 2005, Wickham 2007, 2011, 2016b, Wickham and Francios 2016). 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. The ERLs represent chemical concentrations below which adverse biological effects are rarely observed, while values above the ERL but below the ERM represent levels at which effects occasionally occur. Concentrations above the ERM indicate likely biological effects, although these are not always validated by toxicity testing (Schiff and Gossett 1998).

### *Macrobenthic Communities*

The following community structure parameters were determined for each station per 0.1-$m^2$ grab: species richness (number of taxa), abundance (number of individuals), Shannon diversity index (H'), Pielou's evenness index (J'), Swartz dominance (see Swartz et al. 1986, Ferraro et al. 1994), and benthic response index (BRI; see Smith et al. 2001). Unless otherwise noted, analyses were performed using R (R Core Team 2016) and various functions within the plyr, reshape2, Rmisc, RODBC, stringr, and vegan packages (Wickham 2007, 2011, 2016a, Hope 2013, Oksanen et al. 2015, Ripley and Lapsley 2015).

To examine spatial and temporal patterns among benthic habitats and communities in the PLOO and SBOO regions, multivariate analyses were performed on sediment particle size and macrofaunal abundance data using methods available in PRIMER v7 (see Clarke et al. 2008, 2014). These methods included hierarchical agglomerative clustering (cluster analysis) with group-average linking and similarity profile analysis (SIMPROF) to confirm the non-random structure of resultant cluster dendrograms. For particle size data, the proportions of silt and clay sub-fractions were combined as percent fines to accommodate sieved samples, and Euclidean distance was used as the basis for cluster analysis. For macrofaunal abundance data, the Bray-Curtis measure of similarity was used as the basis for clustering, and data were square-root transformed prior to analysis to lessen the influence of overly abundant species and to increase the importance of rare species. Major ecologically-relevant clusters receiving SIMPROF support were retained. A RELATE test was used to compare patterns of rank abundance in the macrofauna Bray-Curtis similarity matrices with rank percentages in the sediment Euclidean distance matrices. A BEST test using the BIO-ENV procedure was conducted to determine which subset of sediment sub-fractions was the best explanatory variable for similarity between the sediment and macrofaunal resemblance matrices.

# Results

## Sediment Quality in 2016

***Particle Size Distribution***
The composition of ocean sediments found during 2016 for the PLOO and SBOO monitoring regions are summarized in Tables C.3–C.6. Sediments sampled off Point Loma during the year were composed primarily of fine silt and clay particles (i.e., percent fines) and fine sands. More specifically, PLOO sediments were comprised of 20–66 percent fines per sample, 33–71% fine sands, 0.1–29% medium-coarse sands, and 0–21% coarse particles. The coarser sediments often included shell hash, rock, black sand, and/or gravel. Overall, there were no spatial patterns in sediment composition relative to the PLOO discharge site. Sediments collected from the three near-ZID PLOO stations ranged from 27 to 36% fines and 51 to 71% fine sands per sample, while sediments located farther away from the outfall ranged from 20 to 66% fines and 33 to 71% fine sands per sample. These results are consistent with the findings from long term analyses reported previously through calendar year 2015 (e.g., City of San Diego 2014a, 2015a, c, 2016a).

In contrast to the Point Loma region, seafloor sediments were much more diverse across the SBOO region during 2016. Percent fines ranged from 0 to 39% per sample at the SBOO stations, while fine sands ranged from 2 to 92%, medium-coarse sands ranged from 1 to 91%, and coarse particles ranged from 0 to 42%. Coarser particles at the SBOO stations often comprised red relict sands, black sands, and/or shell hash. During 2016, sediments from near-ZID stations I12 and I14 were composed predominantly of fine sands and were similar to sediments found at stations located to the north. In contrast, sediments from near-ZID station I16 and station I15 were predominantly a mixture of fine and medium-coarse sands, which more closely resembled sediments from stations located south and west of the outfall. These results are somewhat consistent with the findings from calendar year 2015 (City of San Diego 2016b). Historical analysis of particle size data revealed considerable temporal variability at some SBOO stations and relative stability at others, with no clear patterns evident relative to depth or proximity to the outfall or other sediment plume sources (e.g., San Diego Bay, Tijuana River) (City of San Diego 2014b).

***Indicators of Organic Loading***
Concentrations of biochemical oxygen demand (BOD), sulfides, total nitrogen (TN), total organic carbon (TOC), and total volatile solids found in sediments during 2016 for the PLOO and SBOO regions are summarized in Tables C.3–C.4 and C.7–C.8. Each of these five organic loading indicators was detected in 100% of the sediment samples collected from the PLOO region during the year, while only TVS was detected in all SBOO sediment samples (i.e., BOD is not analyzed for SBOO sediments). Detection rates for sulfides, TN and TOC were lower in the SBOO region, ranging from 54 to 98%.

Sediments off of Point Loma had concentrations of BOD ranging from 146 to 592 ppm, while sulfides ranged from 2.3 to 50.9 ppm, TN ranged from 0.023 to 0.90% weight, TOC ranged from 0.13 to 2.46% weight, and TVS ranged from 1.4 to 3.8% weight. Sediments surrounding the SBOO had concentrations of sulfides ranging from non-detected to 48.2 ppm, while TN ranged from non-detected to 0.061% weight, TOC ranged from non-detected to 0.56% weight, and TVS ranged from 0.2 to 8.2% weight. Overall, there was little evidence of any significant organic enrichment near either discharge site, with the highest concentrations of most organic loading indicators being widely distributed throughout each survey area. Exceptions included slightly higher values of BOD and sulfides at PLOO station E14, a pattern which is consistent with previous findings of possible minor organic enrichment at this near-ZID station (see City of San Diego 2014a, 2015a, c, 2016a). In contrast, levels of all the measured organic indicators have been fairly consistent at the primary core SBOO stations, with no patterns indicative of organic enrichment evident since discharge began in 1999 (e.g., City of San Diego 2014b, 2015d, 2016b).

### *Trace Metals*

Concentrations of the 18 trace metals analyzed in the PLOO and SBOO sediment samples collected during 2016 are summarized in Tables C.3–C.4 and C.9–C.10. Ten of these metals were detected in all PLOO sediment samples analyzed, including aluminum, arsenic, barium, chromium, iron, lead, manganese, mercury, nickel, and zinc. Four of the remaining metals (antimony, copper, selenium, and tin) were detected at lower rates between 61–98% in PLOO sediments, while beryllium, cadmium, and silver were detected rarely in ≤5% of the samples. Thallium was not detected in any of the PLOO sediment samples collected during the year. Of the nine metals that have published ERLs and ERMs (see Long et al. 1995), only four from three different stations sampled during the summer in 2016 exceeded any of these limits. These included cadmium at station B10, copper and lead at station E1, and silver at station E11. As in previous surveys (City of San Diego 2014a, 2015a, c, 2016a), there were no discernible patterns relative to the PLOO, and all sediment samples from this region had metal concentrations within ranges reported elsewhere off southern California (Dodder et al. 2016).

Nine trace metals were detected in all sediment samples collected from the SBOO region during 2016, including aluminum, arsenic, barium, chromium, iron, lead, manganese, nickel, and zinc. Antimony, copper, and mercury were detected at rates between 41–67%, while cadmium, selenium, silver and tin were each detected in ≤19% of the samples. Beryllium and thallium were not detected in any of the SBOO sediment samples during the year. Of the metals that have published ERLs and ERMs (Long et al. 1995), only arsenic was reported at levels above its ERL threshold. As in previous years, elevated arsenic was found at station I21 during both the winter and summer surveys. There were no discernible patterns relative to the SBOO, and all sediment samples had metal concentrations within ranges reported elsewhere in southern California (Dodder et al. 2016). These results are consistent with long term analyses reported previously (City of San Diego 2014b, 2015d, 2016b).

### *Pesticides, PCBs, and PAHs*

Concentrations of chlorinated pesticides, PCBs, and PAHs found in sediments during 2016 for the PLOO and SBOO regions are summarized in Tables C.3–C.4 and C.11–C.14. A total of five chlorinated pesticides were detected in these sediments during the year, including DDT, hexachlorobenzene (HCB), chlordane, hexachlorocyclohexane (HCH), and mirex. Total DDT (primarily p,p-DDE) was detected in 100% of the PLOO samples and 74% of the SBOO samples at concentrations up to 1320 ppt, all of which were below the ERL for this pesticide (see Long et al. 1995). Total chlordane was detected at concentrations up to 985 ppt in 21% of the PLOO sediment samples and 7% of the SBOO sediment samples. Total DDT and total chlordane concentrations were well within ranges reported elsewhere in the SCB (Dodder et al. 2016). HCB was detected at concentrations up to 6200 ppt in 78% of the PLOO sediment samples and 61% of the SBOO sediment samples. Total HCH was detected at concentrations up to 179 ppt in 5 and 6% of the PLOO and SBOO sediment samples, respectively. Mirex was detected in only one sample collected from SBOO station I18 during summer 2016, at a concentration of 17 ppt. Four other pesticides analyzed for during the year (i.e., aldrin, dieldrin, endosulfan, and endrin) were not detected in any of the PLOO or SBOO sediment samples collected. As in previous surveys (City of San Diego 2014a, b, 2015a, c, d, 2016a, b), there were no discernible patterns relative to the PLOO or the SBOO discharge sites. Instead, several of the highest concentrations of DDT, HCH, and chlordane were found at PLOO stations E1 or E3 located relatively near the LA-5 dredged material disposal site.

PCBs were detected in 81% of the sediment samples collected around the PLOO in 2016 at concentrations up to 18,226 ppt. In contrast, PCBs were detected in only 48% of the SBOO sediment samples collected during the year, at concentrations up to 3607 ppt. The highest total PCB values reported during the year were found at PLOO station E3 near the LA-5 dumpsite. Although no ERL or ERM thresholds exist for PCB congeners, all PCB values recorded during the year were within ranges reported elsewhere in the SCB (Dodder et al. 2016), with no discernable patterns relative to either outfall. These results are consistent with the findings from long term analyses reported previously (City of San Diego 2014a, b, 2015a, c, d, 2016a, b).

PAHs were found in 74% of the PLOO sediment samples and 19% of the SBOO sediment samples during 2016. Concentrations of total PAH reached 400 ppb during the past year, which is well below the ERL threshold of 4022 ppb (Long et al. 1995) as well as the Bight'13 maximum of 2900 ppb (Dodder et al. 2016). The highest values of total PAH reported during the year were found at PLOO stations E1 and E3 during winter and summer surveys. Historically, detection rates for total PAH at both PLOO and SBOO stations have been low with all reported values less than the ERL, and no patterns indicative of a wastewater impact have been evident (City of San Diego 2014a, b, 2015a, c, d, 2016a, b).

## Macrobenthic Communities in 2016

***Community Parameters***

Benthic community parameters, including species richness, abundance, diversity (H'), Pielou's evenness (J') and Swartz dominance, are summarized for each PLOO and SBOO benthic station by survey in Table C.15 and Table C.16, respectively. A total of 23,499 macrobenthic invertebrates were identified during the 2016 winter and summer surveys combined for both regions. Of the 712 taxa represented, 82% (n=584) were identified to species, while the rest could only be identified to higher taxonomic levels. Most taxa occurred at multiple stations, although 21% (n=149) were recorded only once. Two taxa not previously reported by the City's Ocean Monitoring Program were encountered during the year. These included the amphinomid polychaete *Paramphinome* sp and the nemertean Heteronemertea sp SD3, both of which were collected in the SBOO region.

For all the PLOO benthic stations sampled in 2016, species richness ranged from 28 to 102 taxa per grab, abundance ranged from 56 to 337 individuals per grab, diversity (H') ranged from 2.5 to 4.3 per grab, evenness (J') ranged from 0.71 to 0.94 per grab, and dominance ranged from 9 to 45 species per grab. For each of these metrics, no clear patterns relative to the PLOO discharge site, depth, or sediment particle size were evident. These results are consistent with long term analyses reported previously for the region (City of San Diego 2015a, b, 2016a) and those reported elsewhere in the SCB (Gillette et al. 2017).

For all SBOO benthic stations sampled in 2016, species richness ranged from 15 to 103 taxa per grab, abundance ranged from 27 to 866 individuals per grab, diversity (H') ranged from 0.6 to 4.0 per grab, evenness (J') ranged from 0.18 to 0.96 per grab, and dominance ranged from 1 to 36 species per grab. For each of these metrics, no clear patterns relative to the SBOO discharge site, depth, or sediment particle size were evident. These results are consistent with long term analyses reported previously within the SBOO region (City of San Diego 2016b) and those reported elsewhere in the SCB (Gillette et al. 2017).

***Benthic Response Index***

The benthic response index (BRI) is an important tool for gauging anthropogenic impacts to coastal seafloor habitats throughout the SCB. BRI values below 25 are considered indicative of reference conditions, while values above 34 represent increasing levels of disturbance or environmental degradation (Smith et al. 2001). In 2016, 95% of the individual benthic samples collected off Point Loma were characteristic of reference conditions (Table C.15). Only the two samples collected at near-ZID station E14 had BRI scores indicative of a possible minor deviation in benthic condition (BRI = 28−33). Historically, changes in BRI values at station E14 have been largely driven by a long-term decline in resident brittle star populations (i.e., *Amphiodia urtica*) as well as temporary increases in populations of opportunistic species such as *Capitella teleta*. Although these results are consistent with an outfall related pattern, the effect appears minor, restricted to this near-ZID site, and not linked to changes in organics or sediment particle size (see City of San Diego 2015a, b, 2016a).

Within the SBOO region, about 80% of the samples had BRI values < 25 that may be considered characteristic of reference conditions (Table C.16). A total of 11 samples from eight different stations had BRI values in the range of 25–29 that may correspond to a minor deviation from reference condition. However, none of these slightly higher BRI values occurred at the near-ZID stations which suggests that factors other than wastewater discharge may be affecting these assemblages. Instead, six of these higher-BRI stations (i.e., I9, I14, I15, I22, I27, I30) are located along the 28-m outfall discharge depth contour from 2.3 km south to 6.5 north of the outfall, one (i.e., station I8) is located along the 38-m depth contour about 2.4 km southwest of the outfall, and one (i.e., station I35) is located along the 19-m depth contour located about 10.4 km north of the outfall. The slightly higher BRI values at the 19 and 28-m stations are not unexpected because of the higher levels of organic matter that may occur naturally at depths < 30 m (Smith et al. 2001). However, there were no clear patterns in BRI results relative to wastewater discharge via the SBOO, depth, or sediment type. These results are consistent with long term analyses reported previously for the region (City of San Diego 2016b).

***Dominant Taxa***

The 25 most abundant taxa collected during 2016 at PLOO and SBOO benthic stations are summarized in Tables C.17 and C.18, respectively. The most abundant species collected from the PLOO stations included 18 polychaetes, one crustacean, two echinoderms, and four molluscs. Together these species accounted for about 61% of all invertebrates identified from these sites during the year. The brittle star *Amphiodia urtica* was the most abundant species collected off Point Loma during the year, accounting for ~10% of all invertebrates collected, and occurring in 91% of grabs with a mean abundance of ~20 individuals per grab. The bivalve *Nuculana* sp A was ubiquitous in this region, occurring in all samples from all PLOO sites; in addition, this bivalve accounted for 7% of all macrobenthic invertebrates collected during the year with an average abundance of ~13 individuals per grab. The remaining 23 species occurred in 48 to 95% of the grabs collected at the PLOO stations and averaged ≤ 8 individuals per grab.

The most abundant species collected from the SBOO stations included 20 polychaetes, one crustacean, two molluscs, one nemertean, and probably a mixed-species group of nematodes. Together these species accounted for about 64% of all invertebrates identified from these sites during the year. The spionid polychaete *Spiophanes norrisi* was by far the most abundant species during the year, accounting for 40% of invertebrates collected. This species occurred in 85% of grabs with a mean abundance of ~110 individuals per grab. Overall, *S. norrisi* has been the most abundant species recorded in the SBOO region since 2007, with up to 3009 individuals found in a single grab from station I6 during the summer of 2010 (City of San Diego 2011, 2016b). The terebellid polychaete *Pista wui* and another spionid, *Spiophanes duplex*, were the next two most abundant species, averaging about 9 and 8 individuals per grab, respectively. All other species averaged ≤ 3 individuals per grab.

***Classification of Macrobenthic Assemblages***

Classification (cluster) analysis was used to discriminate between macrofaunal assemblages from a total of 44 grab samples collected at 22 PLOO benthic monitoring stations in 2016, resulting in six ecologically relevant SIMPROF-supported groups (Figure C.2). These assemblages (referred to herein as cluster groups A–F) represented 1–34 grabs each and varied in terms of the specific species present, as well as their relative abundances, and occurred at sites distinguished by different sediment microhabitats. For example, similar patterns of variation occurred in the benthic macrofaunal similarity matrix and sediment dissimilarity matrix used to generate the cluster dendrograms, thus confirming that the local PLOO assemblages were somewhat correlated to sediment composition (RELATE $\rho = 0.59$, $p = 0.001$). The sediment sub-fractions that were most highly correlated to the PLOO macrofaunal assemblages included percent fines, very fine sand, medium sand, and very coarse sand (BEST $\rho = 0.597$, $p = 0.001$). Mean species richness ranged from 28 to 84 taxa per grab for these different cluster groups, while mean abundance ranged from 56 to 259 individuals per grab. Cluster group A represented the two macrofaunal assemblages sampled during the winter and summer surveys at near-ZID station E14 in 2016. Cluster group B represented a single, unique assemblage collected at farfield "reference" station B8 during the winter survey. Cluster group C represented a second unique assemblage sampled during the winter at farfield station E21. Cluster group D represented the main group of 34 macrofaunal assemblages present in the PLOO region during 2016, comprising about 77% of the samples analyzed during the year from 18 different stations. Cluster group E represented the two assemblages found during the winter and summer surveys at southern farfield station E3. Cluster group F represented the four assemblages found during the winter and summer surveys at northern farfield "reference" stations B10 and B12.

Classification analysis was also used to discriminate between macrofaunal assemblages from a total of 54 grab samples collected at the 27 SBOO benthic monitoring stations in 2016, resulting in six ecologically relevant groups that were SIMPROF-supported (Figure C.3). These assemblages (referred to herein as cluster groups A–F) represented 1–28 grabs each and varied in terms of the specific taxa present, as well as their relative abundances, and occurred at sites separated by different depth and/or sediment microhabitats. For example, similar patterns of variation occurred in the benthic macrofaunal and sediment similarity/dissimilarity matrices used to generate cluster dendrograms (RELATE $\rho = 0.613$, $p = 0.001$). The sediment sub-fractions that were most highly correlated to the SBOO macrofaunal communities included percent fines, coarse sand, and very coarse sand (BEST $\rho = 0.698$, $p = 0.001$). Mean species richness ranged from 25 to 71 taxa per grab for these groups, while mean abundance ranged from 110 to 365 individuals per grab. Cluster group A represented a single, unique macrofaunal assemblage collected at northern farfield station I34 during the winter survey. Cluster group B represented 13 assemblages from eight different stations sampled in 2016 (i.e., 24% of samples); these included samples taken from southern farfield stations I2, I3, I4, I6 and I8 during both winter and summer, nearfield station I15 in summer, near-ZID station I16 in winter, and farfield staion I34 in summer. Cluster groups C, D, and E represented a combined total of 12 macrofaunal assemblages found during the winter and/or summer at farfield stations I1, I7, I13, I20, I21 and I28 located offshore of the SBOO along the 38 and 55-m depth contours. Cluster group F represented the main group of 28 macrofaunal assemblages present in the SBOO region during 2016, comprising about 52% of the samples analyzed during the year from 15 different stations, including six of the eight samples collected from near-ZID stations I12, I14 and I16 plus nearfield station I15.

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# Chapter 4. Demersal Fishes and Megabenthic Invertebrates

## Introduction

The City of San Diego (City) collects bottom dwelling (demersal) fishes and large (megabenthic) mobile invertebrates by otter trawl to examine the 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). These fish and invertebrate communities are targeted for monitoring because they are known to play critical ecological roles on the southern California coastal shelf (e.g., Allen et al. 2006, Thompson et al. 1993a, b). Because trawled species live on or near the seafloor, they may be impacted by sediment conditions affected by both point and non-point sources such as discharges from ocean outfalls, runoff from watersheds, outflows from rivers and bays, or the disposal of dredged sediments. For these reasons, assessment of fish and invertebrate communities has become an important focus of ocean monitoring programs throughout the world, but especially in the Southern California Bight (SCB) where they have been sampled extensively on the mainland shelf for the past four decades (e.g., Stein and Cadien 2009).

This chapter presents a summary of the purpose, materials and methods, and results of the demersal fish and megabenthic invertebrate data collected during calendar year 2016 at a total of 13 trawl stations surrounding the PLOO and SBOO. Detailed figures and tables supporting these results are presented in Appendix D.

## Materials and Methods

### Field Sampling

Trawls were conducted at 13 stations to monitor demersal fishes and megabenthic invertebrates during winter and summer of 2016 (Figure D.1, Table D.1). These included six PLOO stations located along the 100-m depth contour (i.e., PLOO discharge depth) ranging from 9 km south to 8 km north of the PLOO, and seven SBOO stations located along the 28-m depth contour (i.e., SBOO discharge depth) ranging from 7 km south to 8.5 km north of the SBOO. The two PLOO stations (i.e., SD10, SD12) and two SBOO stations (i.e., SD17, 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. Although standard procedures require towing the net for a total of 10 minutes bottom time per trawl at a speed of about 2 knots, this was not possible at many of the PLOO stations in 2016 when exceptionally large hauls of the pelagic red crab *Pleuroncodes planipes* proved too heavy to be brought onboard ship. In these cases, only one minute trawls were able to be successfully conducted (see Table D.1). 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 (i.e., Eschmeyer and Herald 1998, Lawrence et al. 2013, SCAMIT 2014). If an animal could not be accurately identified to species in the field, it was returned to the laboratory for further identification. The total number of individuals and total biomass (kg, wet weight) were recorded for each species of fish. Additionally, each fish was inspected for the presence of physical anomalies (e.g., tumors, lesions, fin erosion, discoloration) or external parasites (e.g., copepods, cymothoid isopods, leeches). The length of each individual fish was measured to the nearest centimeter to determine size class distributions; total length (TL) was measured for cartilaginous fishes and standard length (SL) was measured for bony fishes (SCCWRP 2013). For trawl-caught invertebrates, only the total number of individuals was recorded for each species.

### Data Analyses

The following community structure parameters were calculated per trawl for both fishes and invertebrates captured during the PLOO and SBOO surveys: species richness (number of species), total abundance (number of individuals), and Shannon diversity index (H'). Total biomass was also calculated for each fish species captured. These analyses were performed using R (R Core Team 2015) and various functions within the gtools, plyr, reshape2, RODBC, sqldf, and vegan packages (Wickham 2007, 2011, Grothendieck 2014, Oksanen et al. 2015, Ripley and Lapsley 2015, Warnes et al. 2015).

Multivariate analyses were performed using PRIMER v7 software to determine spatial patterns in the demersal fish and megabenthic invertebrate data collected only at the SBOO stations in 2016 (see Clarke 1993, Warwick 1993, Clarke et al. 2014). Similar analyses could not be performed for data collected at the PLOO stations due to lack of comparability between 10-minute and 1-minute trawls as described above under ‘Field Sampling.’ 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 similarity was used as the basis for the cluster analysis, and abundance data were square-root transformed to lessen the influence of the most abundant species and increase the importance of rare species.

## Results

### Demersal Fishes

***Community Parameters***

Results for the demersal fish communities sampled in the PLOO and SBOO monitoring regions during 2016 are summarized in Tables D.2–D.9. A total of 5284 fishes were captured from the 26 trawls conducted during the year (i.e., 13 trawls/survey), representing at least 53 different species from 27 families. The total catch of 928 fishes at the PLOO stations in 2016 represented about 82% fewer fish than reported for the same number of trawls at the same sites in 2015 (see City of San Diego 2016a). However, this large reduction in fish catch off Point Loma was related to significantly less total trawling time in 2016 compared to 2015 (i.e., 39 minutes vs. 120 minutes; Table D.1) caused by the necessity to limit bottom time to only one minute for most PLOO trawls due to the presence of excessive populations of pelagic red crabs (see Materials & Methods).

Despite the above decrease in total fish numbers, Pacific Sanddabs continued to dominate PLOO fish assemblages in 2016, occurring in almost every haul and accounting for ~45% of the fishes collected. In contrast to the pattern described for PLOO fishes, the total catch of 4356 fishes at the SBOO stations in 2016 was about 127% larger than the catch reported for 2015 (City of San Diego 2016b). As in most previous years, SBOO fish assemblages were dominated by California Lizardfish and Speckled Sanddabs, each of which occurred in at least 93% of the hauls, and with lizardfish accounting for ~37% (n = 1611) and sanddabs ~32% (n = 1391) of the fishes collected from this region.

More than 99% of the fishes collected in the PLOO and SBOO monitoring regions were <30 cm in length. Larger fishes included four species of cartilaginous fish and five species of bony fish. The cartilaginous fishes included three Shovelnose Guitarfish measuring 37–74 cm total length, two California Skate measuring 34–38 cm total length, two Round Stingray measuring 34–36 cm total length, and one Horn Shark measuring 56 cm total length. The large bony fishes included four California Halibut measuring 31–48 cm standard length, one Fantail Sole measuring 30 cm standard length, one Petrale Sole measuring 36 cm standard length, one Spotted Ratfish measuring 34 cm standard length, and one unidentified Pipefish measuring 30 cm standard length.

As with total catch as indicated above, species richness, abundance, diversity (H') and biomass values for the demersal fish assemblages sampled off Point Loma in 2016 were not fully comparable to each other because of the differences in trawling time (i.e., 10-minute vs. 1-minute trawls) and therefore area of coverage at the different PLOO stations. Consequently, the results presented in Table D.7 are summarized separately below for the regular 10-minute trawls and reduced 1-minute trawls. The three 10 minute trawls conducted at the southernmost PLOO station SD7 during both winter and summer, and at the next most southern PLOO station SD8 in winter only, had species richness ranging from 11 to 16 species per haul, total abundance ranging from 157 to 277 fish per haul, diversity (H') ranging from 1.4 to 1.9, and total fish biomass ranging from 4.6 to 6.7 kg per haul. In contrast, the nine 1-minute trawls conducted at station SD8 in the summer and all other PLOO stations (i.e., SD10, SD12, SD13, SD14) during both winter and summer had species richness ranging from 1 to 9 species per haul, abundance ranging from 1 to 65 individuals per haul, diversity (H') ranging from 0 to 1.7, and total biomass ranging from 0.1 to 1.4 kg per haul. Overall, there were no spatial patterns in the demersal fish community metrics relative to the PLOO discharge site. Additionally, results from the regular 10-minute trawls are consistent with the findings from long term analyses reported previously within the PLOO region (City of San Diego 2016a) and elsewhere in the SCB (Walther et al. 2017).

In contrast to the PLOO surveys, all 14 of the SBOO trawls were conducted for 10 minutes bottom time and are therefore directly comparable to each other as well as to historical values. Species richness ranged from 4 to 15 species per haul for the SBOO stations in 2016, abundance ranged from 59 to 710 individuals per haul, diversity (H') ranged from 0.6 to 1.7, and total biomass ranged from 0.6 to 15.1 kg per haul. Overall, there were no spatial patterns in the demersal fish community metrics relative to the SBOO discharge site. These results are consistent with the findings from long term analyses reported previously within the SBOO region (City of San Diego 2016b) and elsewhere in the SCB (Walther et al. 2017).

***Classification of Demersal Fish Assemblages***

As described previously in the Materials and Methods section, classification analysis of the 2016 fish assemblages off San Diego was limited to the SBOO region due to the incomparability of 1-minute versus 10-minute trawls at the PLOO stations. Results of the subsequent cluster analysis discriminated between three main types of fish assemblages (cluster groups) present in the South Bay outfall region during 2016 (Figure D.2). Cluster groups A (n=1) and B (n=6) comprised all seven of the winter survey trawls, while cluster group C comprised all seven of the summer survey trawls. This pattern is consistent with the natural seasonal variation evident in previous studies (e.g., City of San Diego 1997, 2013), with there being no discernible effects associated with proximity to the SBOO or wastewater discharge.

***Physical Abnormalities and Parasitism***

Demersal fish populations appeared healthy in the PLOO and SBOO regions during 2016. There were no incidences of fin rot, skin lesions, or tumors on any fish sampled during the year, while other recorded abnormalities were limited to two instances of ambicoloration, one on a Spotted Turbot and one on a Speckled Sanddab (Table D.9). Both of these fishes were collected from SBOO station SD17 during the summer.

Evidence of parasitism was also very low (0.15%) for trawl-caught fishes from these regions. The copepod eye parasite *Phrixocephalus cincinnatus* infested two Pacific Sanddabs collected at PLOO station SD8 in the winter and one Longfin Sanddab captured at SBOO station SD18 in the summer. An unidentified species of leech (Phylum Annelida, Class Clitellata, Subclass Hirudinea) was found on a Hornyhead Turbot collected from station SD17 during the winter. The cymothoid isopod *Elthusa vulgaris* (a gill parasite of fishes) was reported from four different fish, including one Speckled Sanddab collected from SBOO station SD18 in the winter, two Pacific Sanddabs collected from SBOO station SD15 in the summer, and one Speckled Sanddab collected from SBOO station SD18 in the summer. Additionally, another 111 individuals of *E. vulgaris* were identified as part of the trawl invertebrate catches during the year. Since *E. vulgaris* often become detached from their hosts during retrieval and sorting of the trawl catch, it is unknown which fishes were actually parasitized by these isopods. However, *E. vulgaris* is known to be especially common on Sanddab and California Lizardfish in southern California waters, where it may reach infestation rates of 3% and 80%, respectively (see Brusca 1978, 1981).

## Megabenthic Invertebrates

### *Community Parameters*

The megabenthic invertebrate communities sampled in the PLOO and SBOO monitoring regions during 2016 are summarized in Tables D.10–D.14. A total of 76,584 invertebrates, representing 49–50 species from five different phyla (i.e., Arthropoda, Echinodermata, Mollusca, Cnidaria, and Silicea), were captured during the 26 trawls conducted during the year. This total catch for 2016 comprised 75,341 trawled invertebrates collected from PLOO stations, 99% of which were the pelagic red crab *Pleuroncodes planipes.* This marks a 373% increase in total megabenthic invertebrates at PLOO stations in 2016 verses 2015, despite significantly less total trawling time in 2016 (i.e., 39 minutes vs. 120 minutes; Table D.1). In contrast, the total catch of 1243 invertebrates from the SBOO stations was about 28% smaller than the catch for 2015 (City of San Diego 2016b). The dominant trawled invertebrate at the SBOO stations was the shrimp *Sicyonia penicillata*, which occurred in all 14 trawls during both surveys and accounted for 46% of the total invertebrate catch for the year.

As described for demersal fishes, species richness, abundance, diversity (H') and biomass values for the trawl-caught invertebrates at the PLOO stations in 2016 were not comparable to each other because of the reduced trawling times required at most PLOO stations due to the presence of excessively large numbers of pelagic red crabs (*Pleuroncodes planipes*). Consequently, the results presented in Table D.13 are summarized again here for the few regular 10-minute trawls and separately for the reduced 1-minute trawls. The three 10 minute trawls conducted at the southernmost PLOO station SD7 during both surveys, and at the next most southern station SD8 during only the winter had species richness ranging from 4 to 7 species per haul, abundance ranging from 192 to 310 individuals per haul, and diversity (H') ranging from 0.82 to 0.94 per haul. In contrast, the nine 1-minute trawls conducted at all the remaining PLOO stations had species richness ranging from 1 to 6 species per haul, abundance ranging from 2389 to 18,641 individuals per haul, and very low diversity (H') ranging from 0 to 0.07 per haul. These reduced trawls were almost entire dominated by pelagic red crabs.

In contrast to the PLOO surveys, all of the SBOO trawls were conducted for 10 minutes bottom time and were therefor directly comparable to each other as well to previous surveys. Species richness ranged from 4 to 13 species per haul, abundance ranged from 21 to 228 individuals per haul, and diversity (H') ranged from 0.6 to 2.0 per haul.

Overall, there were no spatial patterns in the megabenthic invertebrate community metrics relative to either the PLOO or SBOO discharge sites. Additionally, results from the 10-minute trawls are consistent with the findings from long term analyses reported previously within the PLOO and SBOO regions (City of San Diego 2016a, b) and elsewhere throughout the SCB (Walther et al. 2017).

***Classification Analysis of Invertebrate Assemblages***

Classification (cluster) analysis of the 2016 megabenthic invertebrate assemblages was also limited to the SBOO region because of the incomparability of the 1-minute vs. 10-minute trawls at the PLOO stations as described in the Materials and Methods section and in the demersal fish results. Results of the subsequent cluster analysis discriminated between three main types (cluster groups) of trawled invertebrate assemblages present in the South Bay outfall region during 2016 (Figure D.3). Cluster groups A (n = 1) and B (n = 6) included all seven of the winter trawls, while cluster group C included all seven of the summer trawls. This pattern is consistent with the natural seasonal variation evident in previous studies (e.g., City of San Diego 1997, 2013), with there being no discernible effects due to wastewater discharge or with proximity to the outfall.

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# *Chapter 5. Bioaccumulation of Contaminants in Fish Tissues*

## Introduction

Bottom dwelling (demersal) fishes are collected as part of the City of San Diego's (City) Ocean Monitoring Program to evaluate if contaminants in wastewater discharged from the Point Loma and South Bay ocean outfalls (PLOO and SBOO, respectively) are bioaccumulating in their tissues. This portion of the City's monitoring program consists of two components: (1) analyzing liver tissues from mostly trawl-caught fishes; (2) analyzing muscle tissues from fishes collected by more traditional hook and line techniques (rig fishing). Species targeted by trawling activities are considered representative of the general demersal fish community, and the chemical analysis of liver tissues in these fishes is important for assessing population level effects since this is the organ where contaminants typically bioaccumulate. In contrast, fish targeted for capture by rig fishing represent species that are more characteristic of a typical sport fisher's catch, and are therefore considered more directly relevant to seafood safety and public health issues. Consequently, muscle samples are analyzed from these fishes because it is the tissue most often consumed by humans. All fish tissue samples collected during the year are analyzed for contaminants as specified in the NPDES permits that govern monitoring requirements for the PLOO and SBOO (see Chapter 1). Most of these contaminants are also sampled for NOAA's National Status and Trends Program, which was initiated to detect and monitor changes in the environmental quality of the nation's estuarine and coastal waters by tracking contaminants of environmental concern (Lauenstein and Cantillo 1993).

This chapter presents a summary of the purpose, materials and methods, and results of all chemical analyses performed on the tissues of fishes collected during calendar year 2016 from the PLOO and SBOO monitoring regions. Detailed figures and tables summarizing these results are presented in Appendix E.

## Materials and Methods

### Field Collection

Fishes were collected during October 2016 from a total of nine trawl zones (TZ1–TZ9) and four rig fishing zones (RF1–RF4) spanning the PLOO or SBOO discharge sites (Figure E.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 located just south and north of the outfall discharge site, respectively. Trawl Zone 2 includes the area within a 1-km radius surrounding northern "farfield" PLOO stations SD13 and SD14. Trawl Zone 3 represents the area within a 1-km radius surrounding "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 "farfield" PLOO station SD7 located several kilometers south of the outfall near the non-active LA-4 disposal site. Trawl Zone 5 includes the area located within a 1-km radius of SBOO stations SD17 and SD18 located just south and north of the outfall discharge site, respectively. Trawl Zone 6 includes the area within 1-km radius surrounding northern SBOO stations SD19 and SD20, while Trawl Zone

7 includes the area within a 1-km radius of northern SBOO station SD21. Trawl Zone 8 represents the area within a 1-km radius surrounding southern SBOO station SD16, while Trawl Zone 9 represents the area within a 1-km radius surrounding 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 about 11 km northwest of the PLOO, while station RF4 is located about 13.2 km southeast of the SBOO. These two stations are considered "farfield" for the analyses herein.

A total of 16 species of fish were collected for analysis of liver and muscle tissues at the PLOO and SBOO stations during 2016 (Table E.1). Five 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*), Fantail Sole (*Xystreurys liolepis*), Hornyhead Turbot (*Pleuronichthys verticalis*), and Spotted Turbot (*Pleuronichthrys ritteri*). In contrast, 11 different species of rockfish were collected for the analysis of muscle tissues at the rig fishing stations. These species included California Scorpionfish (*Scorpaena guttata*), Brown Rockfish (*Sebastes auriculatus*), Copper Rockfish (*Sebastes caurinus*), Flag Rockfish (*Sebastes rubrivinctus*), Greenstriped Rockfish (*Sebastes elongatus*), Olive Rockfish (*Sebastes serranoides*), Rosy Rockfish (*Sebastes rosaceus*), 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 in order to facilitate collection of sufficient tissue for analysis. 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 (in prep) 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 (Tables E.2 and E.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 Services Laboratory. A detailed description of the analytical protocols can be found in City of San Diego (2017). Briefly, fish tissue samples were analyzed on a wet weight basis to determine the concentrations of total lipids, 18 trace metals, nine chlorinated pesticides, 40 polychlorinated biphenyl compound congeners (PCBs), and 24 polycyclic aromatic hydrocarbons (PAHs); only SBOO fish tissue samples were analyzed for PAHs due to different regulatory requirements. Data were generally limited to values above the method detection limit (MDL) for each parameter (Table E.4). However, concentrations below MDLs were included as estimated values if the presence of the specific constituent was verified by mass-spectrometry.

## Data Analyses

Total chlordane, total DDT, total endosulfan, total endrin, total hexachlorocyclohexane (HCH), total PCB, and total PAH were calculated for each sample as the sum of all constituents with reported values.

Detection rates were calculated as the number of samples with detected values/total number of samples analyzed. Non-reportable values were not included in the total number of samples. All data analyses were performed using SAS software v9.3.

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 is to be sold for human consumption, 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

### *Trace Metals*

Concentrations of trace metals detected in liver tissues of flatfishes collected in the PLOO and SBOO regions in 2016 are listed by trawl zone in Table E.5. Ten metals were detected in all liver tissues sampled from PLOO fish during the year, including arsenic, cadmium, chromium, copper, iron, manganese, mercury, selenium, tin, and zinc. Aluminum and nickel were also detected but in only 8–17% of the samples. Six other metals targeted for analysis, including antimony, barium, beryllium, lead, silver and thallium were not detected in any liver tissue samples collected in the PLOO region during the year. A total of eight metals were detected in all liver tissue samples of flatfishes collected in the SBOO region during 2016. These included arsenic, cadmium, copper, iron, manganese, mercury, selenium and zinc. Barium, chromium, nickel, silver and tin were also detected, but in only 7–87% of the samples, while aluminum, antimony, beryllium, lead and thallium lead were not detected in any liver tissue samples collected at these sites during the year. The different metals were found at variable concentrations in fishes sampled across the PLOO and SBOO trawl zones, with no discernable patterns relative to either outfall. These results are consistent with findings of other assessments of bioaccumulation in fishes off San Diego (City of San Diego 2007, 2015, 2016a, b, Parnell et al. 2008).

### *Pesticides, PCBs, PAHs, and Lipids*

Concentrations of six different types of pesticides (total chlordane, total DDT, total endosulfan, total HCH, HCB, and mirex), total PCBs, and lipids analyzed for and detected in liver tissues of flatfishes collected in the PLOO and SBOO regions during 2016 are summarized by trawl zone in Table E.6, while values for the individual constituents of each of these contaminants are listed in Table E.9. Although tissues were also analyzed for the pesticides aldrin, dieldrin and endrin, as well as for PAHs (at the SBOO stations only), these contaminants were either not detected in any samples (i.e., aldrin and PAHs) or the results were determined to be not reportable (i.e., dieldrin and endrin).

Total DDT was detected in all liver tissue samples from the PLOO and SBOO trawl zones during the year, with concentrations ranging from about 9 to 932 ppb. Although HCB was analyzed in all samples, only about 37% of these results were determined to be reportable at concentrations ranging from 0.3 to 21.5 ppb. Total HCH was detected in about 93% of the samples at concentrations ranging from ~0.8 to 5.3 ppb. Total chlordane was detected in about 59% of the liver tissue samples at concentrations ranging from ~0.1 to 9.8 ppb. Mirex was detected in about 37% of the samples at concentrations ranging from

~0.4 to 1.2 ppb. Finally, total endosulfan was detected in only two samples from two different SBOO trawl zones at concentrations of 0.08–0.19 ppb. Overall, there did not appear to be any significant pattern between pesticide concentrations in local fishes and proximity to either outfall.

PCBs were detected in all liver tissue samples collected from the PLOO and SBOO regions during 2016 at concentrations ranging from about 10 to 471 ppb. There did not appear to be any significant relationship between proximity to the outfalls and PCB levels in San Diego fishes, Similar to the results presented above for pesticides, the findings for PCBs in 2016 was consistent with those of other bioaccumulation assessments for fishes off San Diego (City of San Diego 2007, 2015, 2016a, b, Parnell et al. 2008). Total lipids occurred at levels of 3.5 to 56.8 % weight.

## Contaminants in Fish Muscle Tissues

Concentrations of trace metals, pesticides, PCBs, PAHs and lipids detected in muscle tissue samples from the 11 different species of rockfishes collected at the PLOO and SBOO rig fishing zones in 2016 are listed in Tables E.7 and E.8, while Table E.9 includes values for the individual constituents. Only six trace metals were found in all muscle tissue samples during the year, including arsenic, iron, mercury, selenium, tin and zinc. Manganese was also detected in all PLOO muscle tissue samples but in only 33% of the SBOO muscle tissue samples. Chromium was detected in 33 and 50% of the PLOO and SBOO muscle tissues, respectively. Barium was detected in 50% of the PLOO samples, but was not detected in any SBOO sample. Finally, aluminum, antimony, beryllium, cadmium, copper, lead, nickel, silver and thallium were not detected in any of the muscle tissue samples collected during the year. Overall, the different metals were found at variable concentrations in fishes collected at the PLOO and SBOO rig fishing stations and with no discernable patterns relative to either outfall. These results are consistent with findings of previous assessments of bioaccumulation in fishes off San Diego (City of San Diego 2007, 2015, 2016a, b, Parnell et al. 2008).

Only three pesticides were detected with reportable values for muscle tissues collected from rockfishes in the PLOO and SBOO regions during 2016. Total DDT was detected in all samples, but at fairly low concentrations of 0.29─1.69 ppb. Total HCH was detected in about 67% of the samples at concentrations of 0.02─0.14 ppb. Total chlordane was found in only two (~17%) of the samples at concentrations of 0.07─0.13 ppb. Although muscle tissues were also analyzed for levels of aldrin, dieldrin, endosulfan, endrin, HCB and mirex, these six pesticides were either not detected in any samples (i.e., aldrin, endosulfan, mirex) or the results were determined to be not reportable (i.e., dieldrin, endrin, HCB).

Similar to the results for liver tissues, PCBs were detected in all muscle tissues collected from the PLOO and SBOO stations in 2016, whereas PAHs, analyzed for only at the SBOO stations, were not detected in any sample. Total PCBs were detected at low concentrations ranging from about 0.2 to 1.6 ppb. There did not appear to be any distinct relationship between proximity to the outfalls and PCB levels in San Diego fishes. These results are consistent with findings of other assessments of bioaccumulation in fishes off San Diego (City of San Diego 2007, 2015, 2016a, b, Parnell et al. 2008). Lipids occurred at low levels of 0.17–0.68 % weight for all but one composite muscle sample of Starry Rockfish that had a lipid level ~38 % weight.

Most contaminants detected in fish muscle tissues during 2016 occurred at concentrations below state, national, and international limits and standards (Tables E.7 and E.8). Exceptions included arsenic and selenium, which occurred at levels higher than the median international standard in every muscle sample from all four rig fishing zones. These results are also consistent with previous findings for fishes off San Diego (City of San Diego 2007, 2015, 2016a, b, Parnell et al. 2008).

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# Chapter 6. San Diego Regional Survey Benthic Conditions

## Introduction

The City of San Diego has conducted annual surveys of randomly selected benthic stations off the coast of San Diego since 1994 (see Chapter 1). The primary objectives of these regional surveys, which typically range from offshore of Del Mar in northern San Diego County southward to the USA/Mexico border, are to: (1) describe the overall condition and quality of the diverse benthic habitats that occur in the offshore coastal waters off San Diego; (2) characterize the ecological health of the soft-bottom marine benthos in the region; (3) gain a better understanding of regional variation in order to distinguish between changes due to anthropogenic influences or natural factors. These surveys typically occur at an array of 40 stations selected each year using a probability-based, random stratified sampling design as described in Bergen (1996), Stevens (1997), and Stevens and Olsen (2004). During 1995–1997, 1999–2002 and 2005–2007, the surveys off San Diego were restricted to continental shelf depths <200 m. Beginning in 2009, however, the survey region was expanded to include deeper habitats along the upper continental slope (i.e., 200–500 m). No separate San Diego regional survey of randomly selected sites was conducted in 2004 due to sampling for a special sediment mapping project (Stebbins et al. 2004), while the regional surveys in 1994, 1998, 2003, 2008, and 2013 were conducted as part of the larger, multi-agency Southern California Bight (SCB) Regional Monitoring Program (Bergen et al. 1998, 2001, Schiff and Gossett 1998, Noblet et al. 2002, Schiff et al. 2006, 2011, Maruya and Schiff 2009, Ranasinghe et al. 2003, 2007, 2010, 2012, Dodder et al. 2016, Gillett et al. 2017).

This chapter presents a summary of the purpose, materials and methods, and results of the sediment particle size, sediment chemistry, and benthic macrofaunal data collected during the 2016 regional survey of the continental shelf and upper slope off San Diego. Detailed figures and tables summarizing these results are presented in Appendix F.

## Materials and Methods

### Collection and Processing of Samples

The July 2016 regional benthic survey covered an area ranging from north of La Jolla southward to the USA/Mexico border (Figure F.1). A total of 40 stations were sampled at depths ranging from 5 to 437 m spanning four distinct depth strata characterized by the SCB Regional Monitoring Program. These included six stations along the inner shelf (5–30 m), 19 stations along the mid-shelf (30–120 m), 10 stations along the outer shelf (120–200 m), and five stations on the upper slope (200–500 m). Samples for sediment quality and benthic community analyses were collected using a double 0.1-$m^2$ Van Veen grab. Sub-samples for the various sediment particle size and chemistry parameters were taken from the top 2 cm of the sediment surface of one grab and handled according to standard guidelines available in USEPA (1987). The second grab sample from each cast was used for analysis of the benthic macrofaunal community.

Criteria established by the USEPA to ensure consistency of grab samples were followed with regard to sample disturbance and depth of penetration (USEPA 1987). All samples were brought aboard ship, washed with seawater, and sieved through a 1.0-mm mesh screen. The organisms retained on the screen were then collected, transferred to sample jars, and relaxed for 30 minutes in a magnesium sulfate solution before being fixed with buffered formalin. After a minimum of 72 hours, each sample was rinsed with fresh water and transferred to 70% ethanol for final preservation. All macrofaunal organisms were separated from the raw material and sorted into six higher taxonomic groups (see Chapter 3) by a subcontract lab. The sorted samples were then returned to the City's Marine Biology Laboratory where the animals were identified to species or the lowest taxon possible and enumerated by staff marine biologists. All identifications followed nomenclatural standards established by the Southern California Association of Marine Invertebrate Taxonomists (e.g., SCAMIT 2014).

## Laboratory Analyses

All sediment chemistry and particle size analyses were performed at the City of San Diego's Environmental Chemistry Services Laboratory. A detailed description of the analytical protocols can be found in City of San Diego (2017). Briefly, sediment sub-samples were analyzed on a dry weight basis to determine concentrations of various indicators of organic loading (i.e., biochemical oxygen demand, total organic carbon, total nitrogen, total sulfides, total volatile solids), 18 trace metals, nine chlorinated pesticides (e.g., DDT), 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 (see Table C.1). However, concentrations below MDLs were included as estimated values if the presence of a specific constituent was verified by mass-spectrometry.

Particle size analysis was performed using either a Horiba LA-950V2 laser scattering particle 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 Table C.2). When a sample contained substantial amounts of coarse sand, gravel, or shell hash that could damage the Horiba analyzer and/or where the general distribution of sediments would be poorly represented by laser analysis, a set of nested sieves with mesh sizes of 2000 μm, 1000 μm, 500 μm, 250 μm, 125 μm, and 63 μm was used to divide the samples into seven sub-fractions.

## Data Analyses

### *Sediments*

Data summaries for the various sediment parameters included detection rate, minimum, maximum, and mean values for all samples combined. Average values were also calculated for each depth stratum. All means were calculated using detected values only; no substitutions were made for non-detects in the data (i.e., analyte concentrations <MDL). Total chlordane, total DDT (tDDT), total endosulfan, total endrin, total hexachlorocyclohexane (tHCH), total PCB (tPCB), and total PAH (tPAH) were calculated for each sample as the sum of all constituents with reported values. These analyses were performed using R (R Core Team 2016) and various functions within the dplyr, plyr, reshape2, tidyr, and zoo packages (Zeileis and Grothendieck 2005, Wickham 2007, 2011, 2016b, Wickham and Francios 2016). 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. The ERLs represent chemical concentrations below which adverse biological effects are rarely observed, while values above the ERL but below the ERM represent levels at which effects

occasionally occur. Concentrations above the ERM indicate likely biological effects, although these are not always validated by toxicity testing (Schiff and Gossett 1998).

***Macrobenthic Communities***

The following community structure parameters were determined for each station per 0.1-$m^2$ grab: species richness (number of taxa), abundance (number of individuals), Shannon diversity index (H'), Pielou's evenness index (J'), Swartz dominance (see Swartz et al. 1986, Ferraro et al. 1994), and benthic response index (BRI) (see Smith et al. 2001). Unless otherwise noted, analyses were performed using R (R Core Team 2016) and various functions within the plyr, reshape2, Rmisc, RODBC, stringr, and vegan packages (Wickham 2007, 2011, 2016a, Hope 2013, Oksanen et al. 2015, Ripley and Lapsley 2015).

To examine spatial patterns among benthic communities in the San Diego region, multivariate analyses were performed on sediment particle size and macrofaunal abundance data using methods available in PRIMER v7, which included hierarchical agglomerative clustering (cluster analysis) with group-average linking and similarity profile analysis (SIMPROF) to confirm the non-random structure of resultant cluster dendrograms (see Clarke et al. 2008, 2014). For sediment particle size data, proportions of silt and clay sub-fractions were combined as percent fines to accommodate sieved samples and Euclidean distance was used as the basis for the cluster analysis. For macrofaunal abundance data, 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 presence) of rare species. Major ecologically-relevant clusters receiving SIMPROF support were retained. A RELATE test was used to compare patterns of rank abundance in the macrofauna Bray-Curtis similarity matrices with rank percentages in the sediment Euclidean distance matrices. A BEST test using the BIO-ENV procedure was conducted to determine which subset of sediment sub-fractions was the best explanatory variable for similarity between the sediment and macrofaunal resemblance matrices.

# Results

## Regional Sediment Quality in 2016

***Particle Size Distribution***

The composition of seafloor sediments at the 40 San Diego regional benthic stations in 2016 is summarized in Tables F.1 and F.2. Overall, the distribution of fine silts and clays (i.e., percent fines), sands, and coarser sediments (e.g., gravel, black sands, shell fragments) varied widely across the region. For example, percent fines ranged from 2.2% to 87% per station, fine sands from 1.8% to 89.9%, medium-coarse sands from 0.1% to 84.4%, and coarse particles from 0 to 22%. Although variable, sediment composition did show some expected patterns between the different depth strata. For example, percent fines increased from about 9% per sample along the inner shelf, to 34% on the mid-shelf, to 48% on the outer shelf, to 75% on the upper slope. In contrast, percentages of fine and medium-coarse sands decreased from 67% and 20% per station on the inner shelf to 25% and <1% on the upper slope, respectively. Coarser particles were found at only seven of the stations sampled off San Diego. These included one station on the inner shelf, four stations on the mid-shelf and two stations on the outer shelf. No coarse particles were present in sediments sampled along the upper slope.

***Indicators of Organic Loading***

Concentrations of sulfides, total nitrogen (TN), total organic carbon (TOC), and total volatile solids found in sediments from the regional benthic stations in 2016 are summarized in Tables F.1 and F.3. Sulfides were detected in all of the regional sediment samples at concentrations ranging from about 0.2 to 31.9 ppm.

Sulfide concentrations generally increased with depth, averaging 2.05 ppm on the inner shelf, 5.71 ppm on the mid-shelf, 8.37 ppm on the outer shelf, and 19.11 on the upper slope. TVS was also detected in all samples at concentrations ranging from about 0.4 to 9.2 weight. TN was detected in ~93% of the sediment samples at concentrations of about "0" (not detected) to 0.24 weight. TOC was detected in ~98% of the samples at concentrations of about "0" (not detected) to 5.07 weight. Similar to sulfides, TN, TOC, and TVS values tended to increase with depth from the inner shelf to the upper slope, a pattern likely due to differences in sediment particle composition since all of these parameters are known to co-vary with percent fines (e.g., City of San Diego 2014). Finally, concentrations of TN and TOC were within ranges reported elsewhere in the SCB (Dodder et al. 2016).

***Trace Metals***

Concentrations of trace metals found in sediments from the regional stations in 2016 are summarized in Tables F.1 and F.4. Nine metals were detected in sediments from all stations sampled during the year, including aluminum, arsenic, barium, chromium, iron, lead, manganese, nickel, and zinc. Antimony, copper, mercury, and tin were detected at 83–95% of the stations, while beryllium, cadmium, selenium, and silver were detected at only 3–28% of the stations. Thallium was not detected at any of the regional sites. Concentrations of most metals were within ranges previously reported from elsewhere in the SCB (Dodder et al. 2016); exceptions included antimony, beryllium, and lead. Mean values of aluminum, antimony, barium, chromium, copper, iron, manganese, mercury, nickel, and zinc increased with depth from the inner shelf to the upper slope, which was likely associated with similar increases in percent fines since these parameters are known to co-vary (e.g., City of San Diego 2014). Only three of the nine metals that have published Effects Range Low (ERL) and Effects Range Median (ERM) sediment quality guidelines (see Long et al. 1995) exceeded either of these thresholds, and these exceedances were limited to only two of the regional stations as follows: (1) lead exceeded both its ERL and ERM at station 8542 located at a depth of 147 m at the bottom of the Coronado Bank; (2) silver also exceeded its ERL at station 8542; (3) mercury exceeded its ERL at station 8516 located northwest of the LA-5 dredged material dumpsite at a depth of 200 m. Additionally, the lead value of 534 ppm found in the sediments from station 8542 is the highest value ever recorded off San Diego by the City's Ocean Monitoring Program (City of San Diego 2014a, b, 2015a, b, c, 2016a, b).

***Pesticides, PCBs, and PAHs***

Concentrations of chlorinated pesticides, PCBs, and PAHs detected in the regional benthic sediments are summarized in Tables F.1, F.5 and F.6. Only three chlorinated pesticides, DDT, chlordane and hexachlorobenze (HCB), were detected during the 2016 survey, while Aldrin, Dieldrin, Endosulfan, Endrin, HCH and Mirex were not detected in any samples. Total DDT, composed primarily of p,p-DDE, was detected at all stations at concentrations of 47–2164 ppt. Mean values of DDT were lowest on the inner shelf and increased across the mid-shelf, outer shelf, and upper slope. DDT concentrations exceeded the ERL of 1580 ppt at three stations, including station 8519 on the outer shelf and stations 8537 and 8540 on the upper slope. However, all values were well within ranges reported elsewhere in the SCB (Dodder et al. 2016). Detectable levels of chlordane were found at 23% of the regional stations at concentrations up to 258 ppt. HCB was detected at station 8536 at a concentration of 140 ppt. Concentrations of total DDT and total chlordane were within ranges previously reported from elsewhere in the SCB (Dodder et al. 2016)

PCBs were detected in 97% of the regional sediment samples at total PCB concentrations up to 24,314 ppt. No ERL or ERM thresholds exist for PCBs measured as congeners; however, PCB values reported for the 2016 survey were within ranges of those reported from elsewhere in the SCB (Dodder et al. 2016). No clear patterns were evident in terms of PCB distributions with average PCB concentrations lowest on the inner shelf at ~280 ppt and highest on the mid-shelf at ~2493 ppt.

However, the five highest PCB values of 2,117–24,314 ppt were all found at stations located in the southwest region of the survey area and not too far from the LA-5 dredged material disposal site (i.e., stations 8507, 8509, 8512, 8510, and 8504).

PAHs were detected in sediments from 87% of the 2016 regional stations. All concentrations were ≤365 ppb and well below threshold values of ~4022 ppb and within the range of values reported elsewhere in the SCB (Dodder et al. 2016). Mean PAH concentrations increased from 27 ppb on the inner shelf, to 46 ppb on the mid-shelf, to 78 ppb on the outer shelf, to 95 ppb per station on the upper slope.

## Regional Macrobenthic Communities in 2016

### *Community Parameters*

Species richness, total macrofaunal abundance, Shannon diversity (H'), Pielou's evenness (J'), and Swartz dominance, are summarized for each of the 2016 regional benthic stations in Table F.7 and by stratum in Figure F.2. A total of 8,836 macrobenthic invertebrates were identified during the 2016 survey. Of the 571 taxa represented, 475 (~83%) were identified to species, while the rest could only be identified to higher taxonomic levels. Most taxa occurred at multiple stations, although 29% (n = 163) were recorded only once. Four species not previously reported by the City's Ocean Monitoring Program were encountered during this survey, including the polychaete *Aglaophamus paucilamellata*, the cumacean *Eudorella redacticruris*, the scaphopod *Antalis pretiosa*, and the nemertean *Tetrastemma* sp HYP1.

Species richness ranged from 14 to 133 species per grab across the survey area in 2016 (Table F.7). Such a wide variation in species richness is common for the region and is consistent with values observed during previous regional surveys (City of San Diego 2015a, c, 2016). Species richness also varied between the major depth strata during this survey (Figure F.2). For example, mean species richness was highest along the mid-shelf at about 71 species per grab, followed by 58 species per grab on the outer shelf, 42 species per grab on the inner shelf, and 28 species per grab on the upper slope. This variation by depth strata corresponds to similar patterns reported previously for the region (City of San Diego 2015a, c, 2016) and elsewhere throughout the SCB (Gillett et al. 2017).

Total macrofaunal abundance ranged from 40 to 830 individuals per grab at the regional benthic stations in 2016 (Table F.7), which was within the range of values reported historically for the region (e.g., City of San Diego 2015a, c, 2016). As with species richness, abundance varied between depth strata with the lowest average values of 58 individuals per grab occurring on the upper slope. In contrast, abundance averaged 178 individuals per grab at the inner shelf stations, 287 individuals per grab at the mid-shelf stations, and 203 individuals per grab at the outer shelf stations. This variation between strata generally corresponds with what has been reported previously for the San Diego region (City of San Diego 2015a, c, 2016).

Shannon diversity index (H'), Pielou's evenness index (J'), and Swartz dominance index values for the 2016 regional stations were generally within historical ranges (City of San Diego 2015a, c, 2016). H' ranged from 1.9 to 4.2, with 80% of the stations sampled having H' values of 3.0–4.0. J' ranged from 0.61 to 0.96, and Swartz dominance index values ranged from 3 to 42 taxa per grab. Mean values for all three indices were lowest along the inner shelf, while diversity and dominance values were typically highest at mid-shelf stations.

### *Benthic response index (BRI)*

The benthic response index (BRI) is an important tool for gauging anthropogenic impacts to coastal seafloor habitats at depths ranging from about 5–200 m throughout the SCB. BRI values below 25 at these depths are considered indicative of reference conditions (Smith et al. 2001). During 2016, all 34 of the regional stations that occurred at BRI-validated depths had BRI values indicative of reference conditions, with values ranging from -3 to 24 (Table F.7). Average BRI values varied slightly with depth, ranging from about 14 on the mid-shelf to 17 on the inner shelf.

***Dominant Taxa***

The most abundant (dominant) species collected from each depth stratum during the 2016 regional survey are summarized in Table F.8. As expected, the numerically dominant species characteristic of the benthic assemblages off San Diego varied between strata. For example, the 10 most abundant species along the inner shelf included four polychaete worms, one amphipod, four gastropod molluscs, and one echinoderm. Of these, the spionid polychaete *Spiophanes norrisi* was clearly dominant, accounting for 28% of all animals collected on the inner shelf and averaging 74 animals per occurrence. The remaining numerical dominants on the inner shelf accounted for ≤6% of the total abundance and averaged ≤11 individuals per grab. The most widely distributed species at these depths included *S. norrisi*, the capitellid polychaete *Mediomastus* sp, the phoxocephalid amphipod *Rhepoxynius menziesi*, and the ampharetid polychaete *Ampharete labrops*, all four species which occurred at 67% of the sites.

The 10 most abundant species along the mid-shelf included eight polychaetes, one ophiuroid, and one bivalve. The spionid polychaete *Spiophanes duplex* was both the most abundant and widely distributed species at mid-shelf depths, accounting for 10% of the total abundance and occurring at 95% of the mid-shelf sites. In contrast, *Spiophanes norrisi* occurred at fewer (42%) of the mid-shelf stations but in higher numbers of 64 animals per occurrence compared to *S. duplex*. Each of the remaining accounted for ≤5% of the total abundance at an average of ≤14 individuals per grab.

The top 10 species along the outer shelf included five polychaetes, four bivalves, and one ophiuroid. Densities of these species were relatively low overall with none exceeding 11% of the total abundance. The bivalves *Axinopsida serricata* and *Tellina carpenteri* occurred at all 10 outer shelf stations and averaged 22 and 12 individuals per grab, respectively. The spionid polychaete *Spiophanes kimballi*, the bivalve *Nuculana* sp A, the maldanid polychaete *Petaloclymene pacifica*, and the capitellid polychaete *Mediomastus* sp each occurred at 80% of the stations with averages of 9–19 animals per occurrence. All other species at these depths occurred at ≤70% of the outer shelf stations and averaged ≤5 individuals per grab.

Total macrofaunal abundances were relatively low on the upper slope with only six species being represented by at least 10 individuals each. The maldanid polychaete *Maldane sarsi* and the chaetopterid polychaete *Phyllochaetopterus limicolus* were the two most abundant species at these depths, accounting for 10% and 8% of the macrofauna, respectively. The other four most abundant species that accounted for about 3–5% of the total abundance each included the gastropods *Lirobittium calenum* and *L. paganicum*, the cirratulid polychaete *Aphelochaeta monilaris*, and the capitellid polychaete *Mediomastsus* sp. All other species collected along the upper slope occurred at densities ≤6 individual per grab.

***Classification of Regional Shelf and Slope Assemblages***

Classification (cluster) analysis of the macrofaunal abundance data collected from the 40 regional benthic stations in 2016 resulted in seven ecologically-relevant SIMPROF-supported groups (Figures F.3 and F.4). These assemblages (referred to herein as cluster groups A–G) represented between 1 and 21 grabs (stations) each and varied in terms of the specific species present, as well as the relative abundance of each species, and occurred at sites separated by different depth and/or sediment microhabitats. For example, similar patterns of variation occurred in the benthic macrofaunal and sediment similarity/dissimilarity matrices used to generate the cluster dendrograms (RELATE $\rho = 0.752$, $p = 0.001$). The sediment subfractions that were most highly correlated to macrofaunal communities included granules, very coarse sand, fine sand, very fine sand, and percent fines (BEST $\rho = 0.771$, $p = 0.001$). Mean species richness ranged from 14 to 92 species per grab for these cluster groups, while mean abundance ranged from 51 to 441 individuals per grab. Cluster group A represented macrofaunal assemblages from two relatively shallow (22–36 m) inner to mid-shelf stations located off of Point Loma and La Jolla; this group had an average species richness of 23 species and an average abundance of 137 animals per grab. Cluster group B represented the assemblage from the single shallowest station (5 m) located west of the southern end of San Diego Bay; this group had the lowest species richness of 14 species and the second lowest abundance of 73 animals per grab. Cluster group C represented the assemblages from four of the five upper slope stations located at depths of 340–437 m; this group had an average species richness of 26 species and the lowest average abundance of 51 animals per grab. Cluster group D represented the assemblages from a total of 21 mid-shelf to outer shelf stations (81–240 m) distributed from near the USA/Mexico border to northern La Jolla; this group averaged the second highest species richness of 60 species and second highest abundance of 200 animals per grab. Cluster group E represented a single assemblage from a mid-shelf (48 m) station located offshore and northwest of the SBOO discharge area; this group had a species richness of 39 species and an abundance of 94 animals per grab. Cluster group F represented the assemblages from three shallow inner shelf stations (17–20 m) located between the SBOO and the mouth of San Diego Bay; this group averaged the third highest species richness of 46 species and third highest abundance of 151 animals per grab. Cluster group G represented the assemblages from four inner shelf to mid-shelf stations (26–57 m) located southwest of the tip of Point Loma to northwest of Mission Bay; this group averaged the highest species richness of 92 species and the highest abundance of 441 animals per grab.

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# Appendices

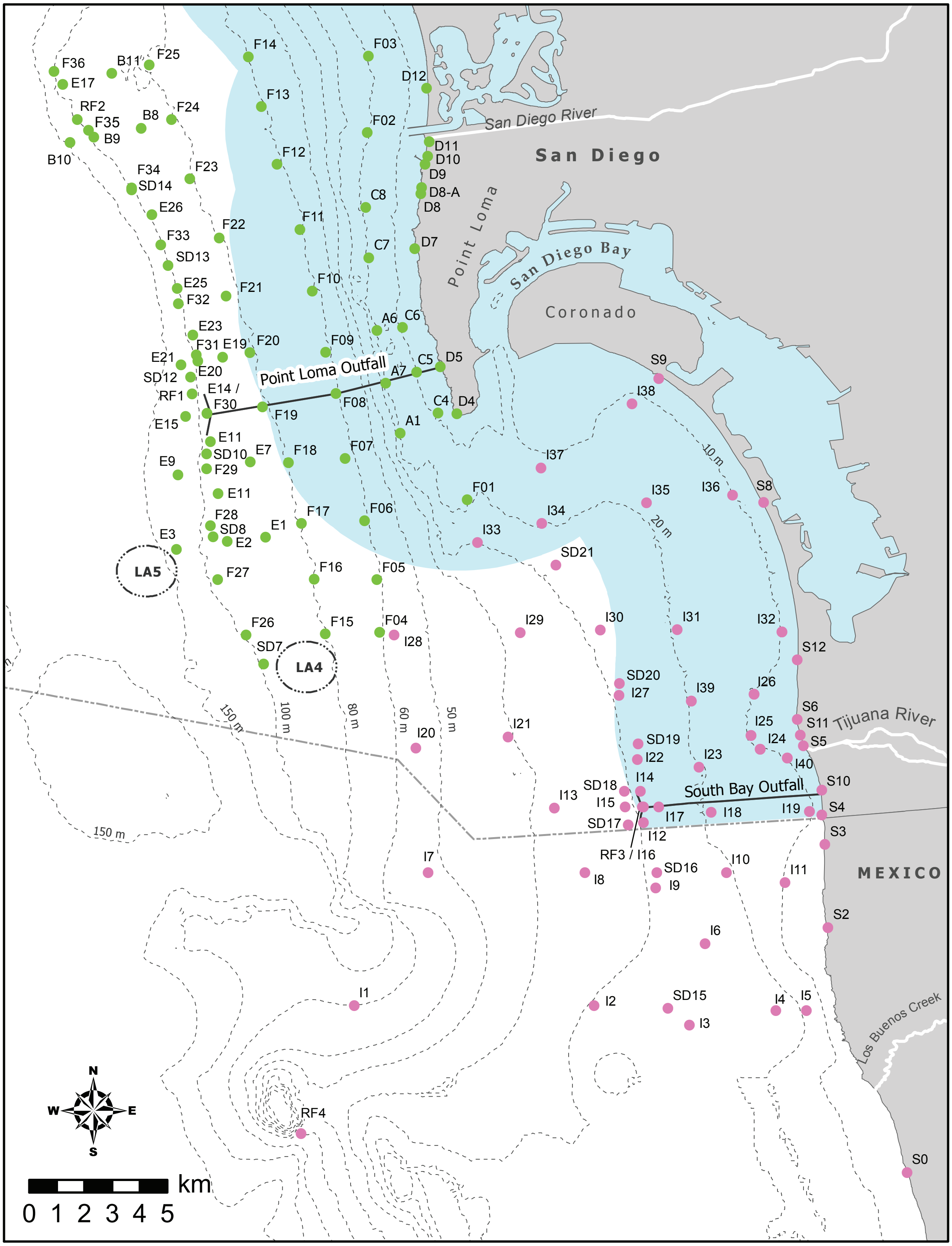
# Appendix A

# Chapter 1. General Introduction

# Figures & Tables

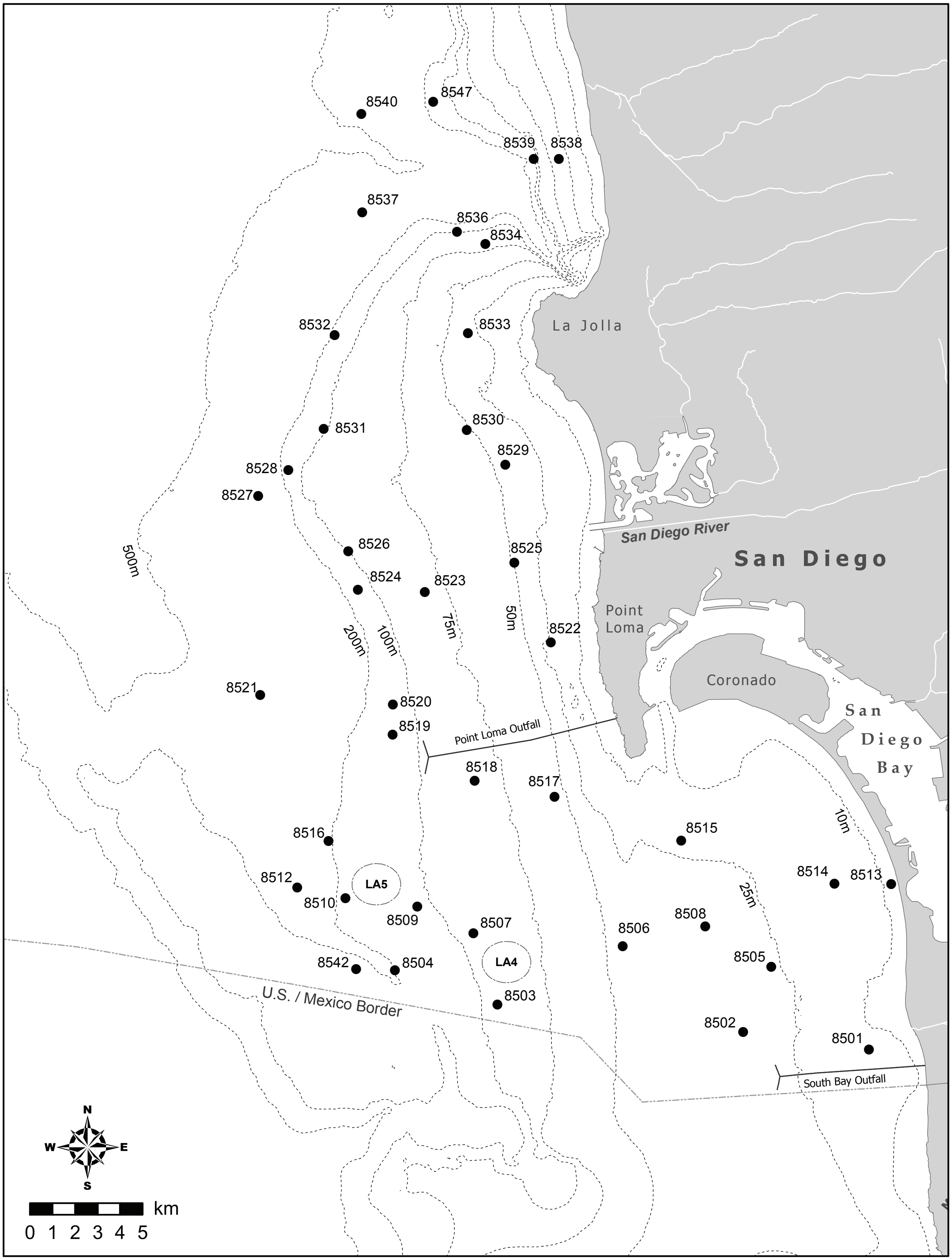
# Appendix A

# FIGURES




## Figure A.1

Receiving waters monitoring stations sampled around the Point Loma Ocean Outfall (green) and South Bay Ocean Outfall (pink) as part of the City of San Diego's Ocean Monitoring Program. Light blue shading represents State jurisdictional waters.




## Figure A.2
Regional random benthic survey stations sampled during July 2016 as part of the City of San Diego's Ocean Monitoring Program.

# Appendix A

# TABLES

## Table A.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 Point Loma Ocean Outfall (PLOO) and South Bay Ocean Outfall (SBOO).

| Facility | Outfall | NPDES Permit No. | Order No. | Effective Dates |
|---|---|---|---|---|
| PLWTP | PLOO | CA0107409 | R9-2009-0001 | August 1, 2010–July 31, 2015 [a] |
| SBWRP | SBOO | CA0109045 | R9-2013-0006 [b] | April 4, 2013–April 3, 2018 |
| SBIWTP | SBOO | CA0108928 | R9-2014-0009 [c] | August 1, 2014–July 31, 2019 |

[a] Order R9-2009-0001 administratively extended by San Diego Water Board effective February 19, 2015

[b] Order R9-2013-0006 amended November 12, 2014 by Order R9-2014-0071

[c] Order R9-2014-0009 amended November 12, 2014 by Order R9-2014-0094

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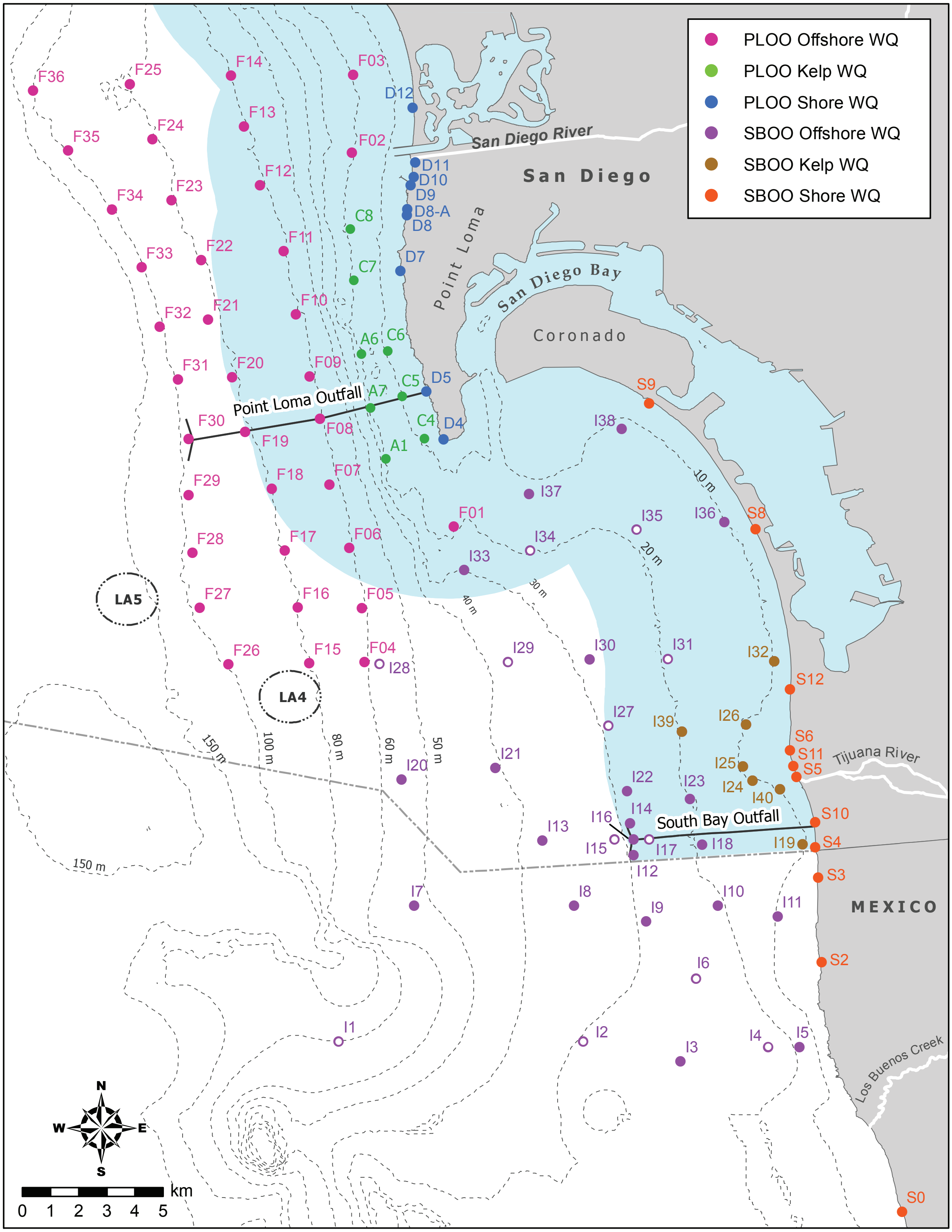
# Appendix B

## Chapter 2. Water Quality

## Figures & Tables

# Appendix B

# FIGURES




# Figure B.1

Water quality (WQ) monitoring station locations sampled around the Point Loma and South Bay Ocean Outfalls as part of the City of San Diego's Ocean Monitoring Program. Light blue shading represents State jurisdictional waters. Open circles are sampled by CTD only.

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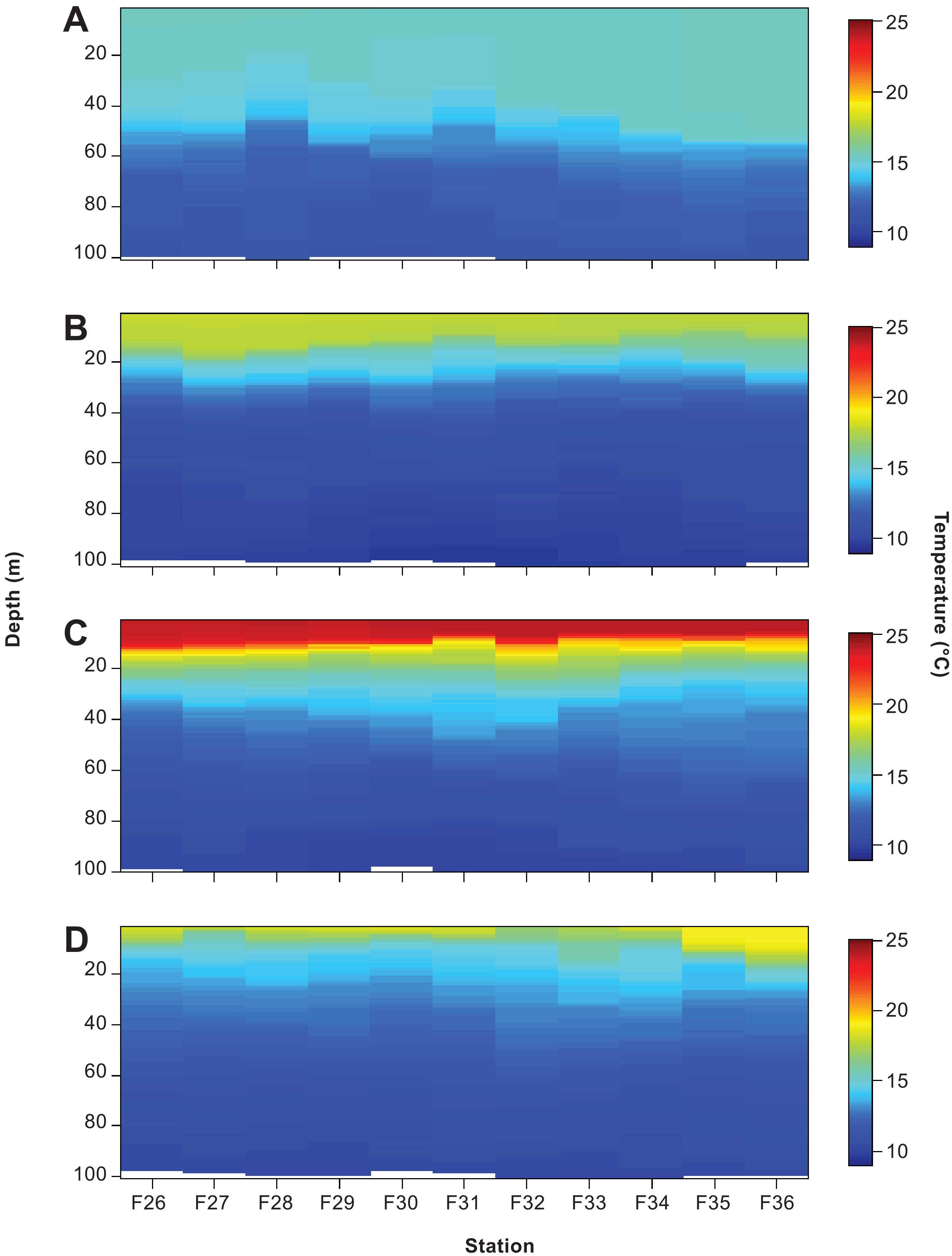


**Figure B.2**
Ocean temperatures recorded in the PLOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November in 2016. Data were collected on the same day during each survey.

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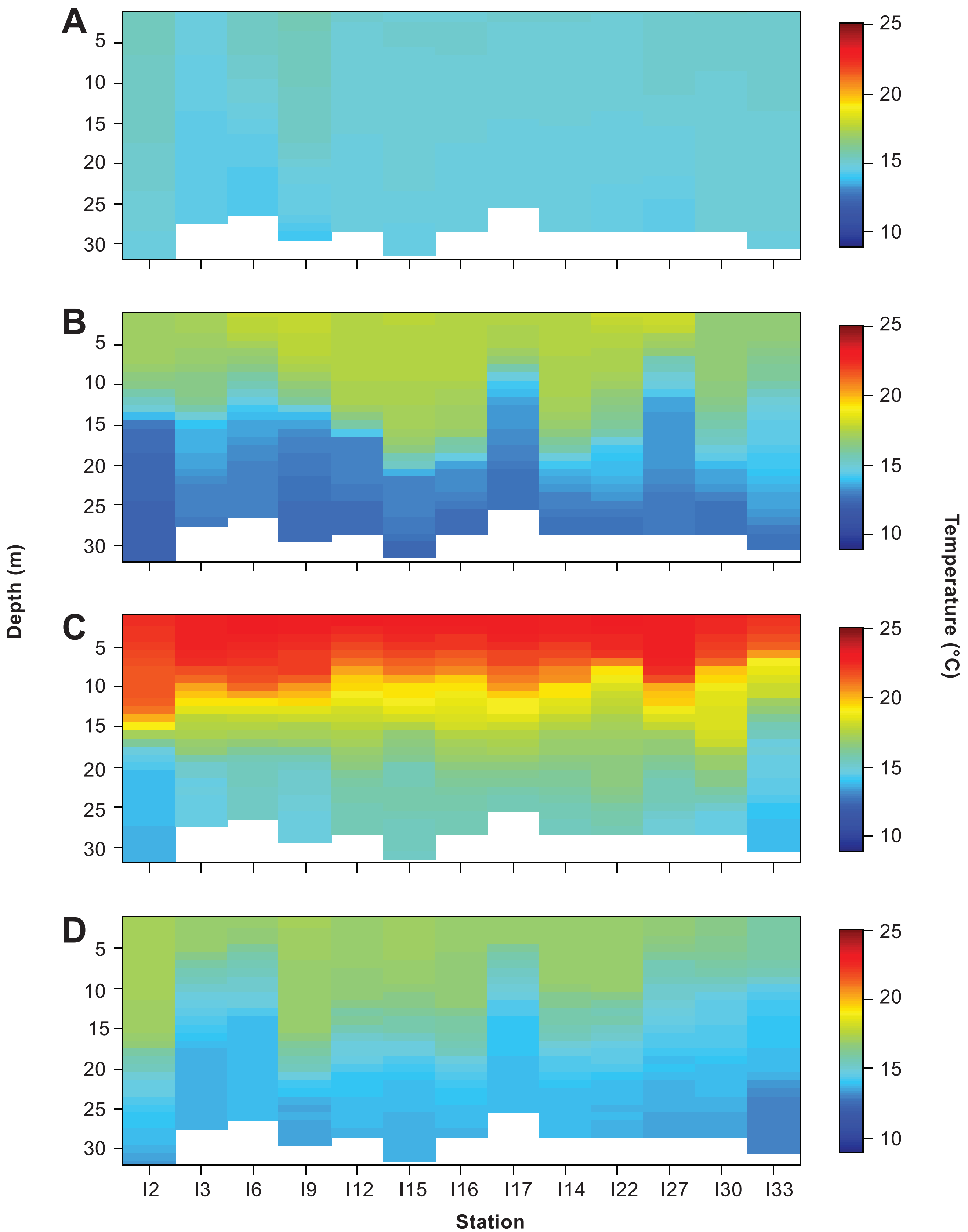


**Figure B.3**
Ocean temperatures recorded in the SBOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November. Data were collected over 3 days during each survey.

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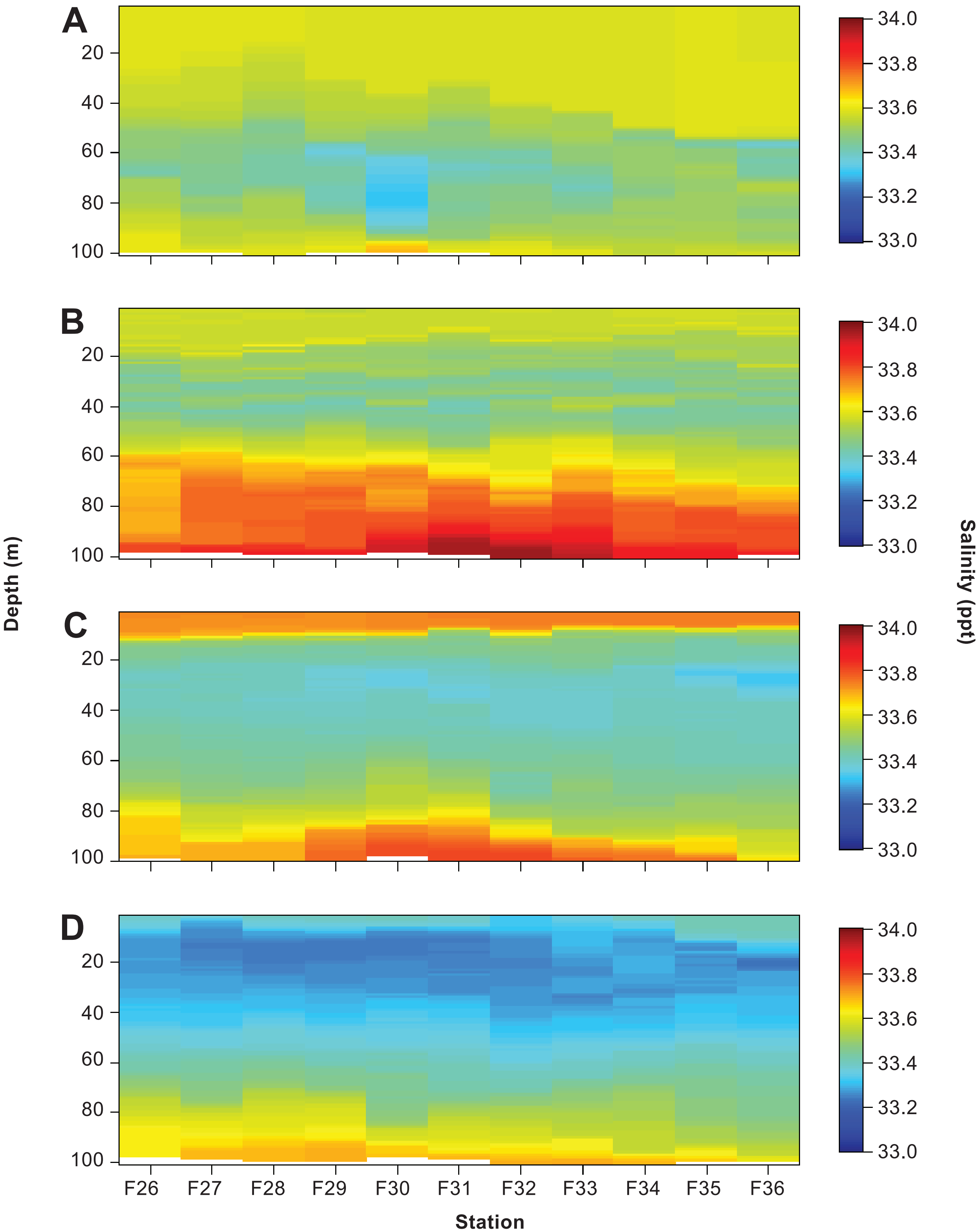


**Figure B.4**
Ocean salinity recorded in the PLOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November in 2016. Data were collected on the same day during each survey.

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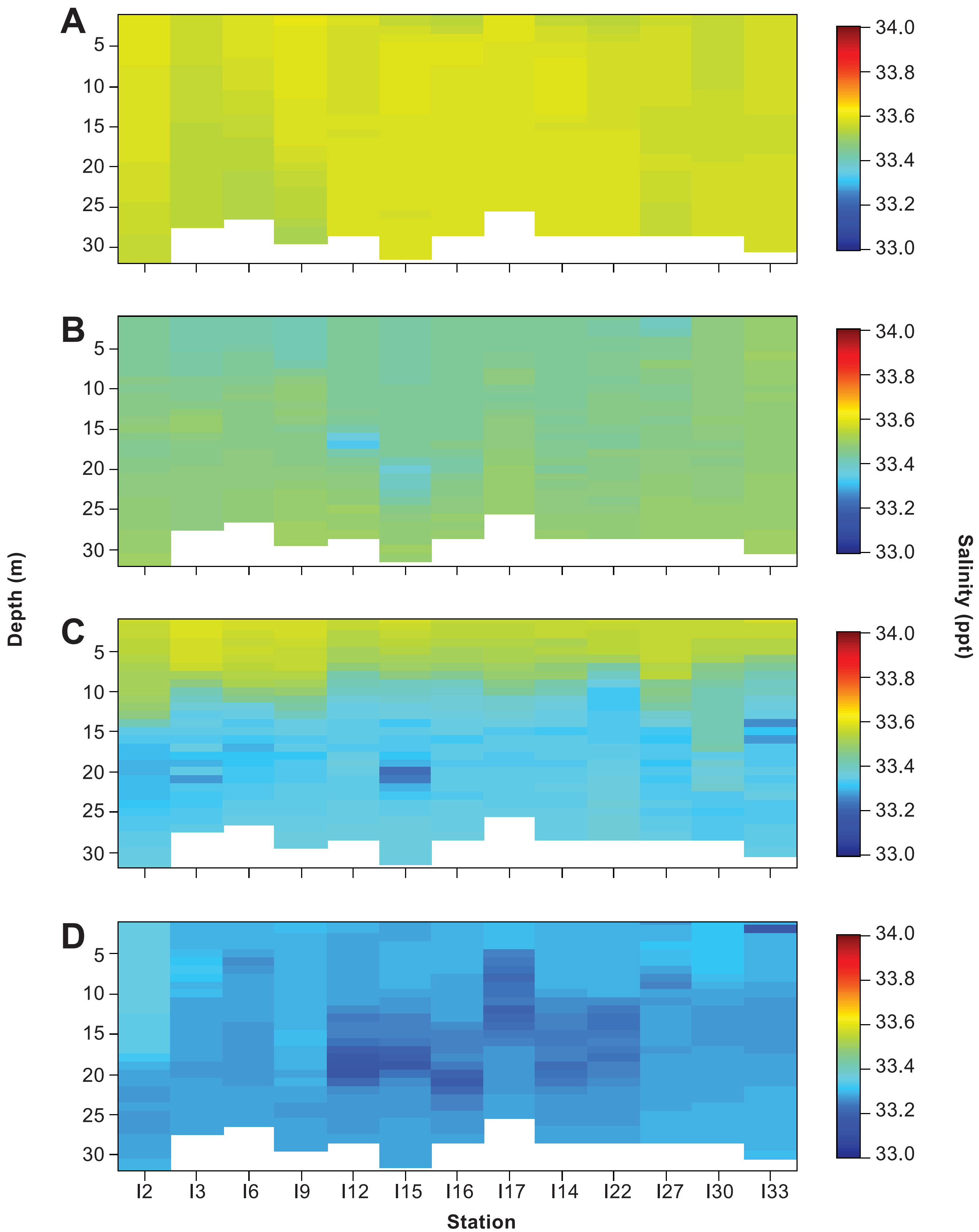


**Figure B.5**
Ocean salinity recorded in the SBOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November. Data were collected over 3 days during each survey.

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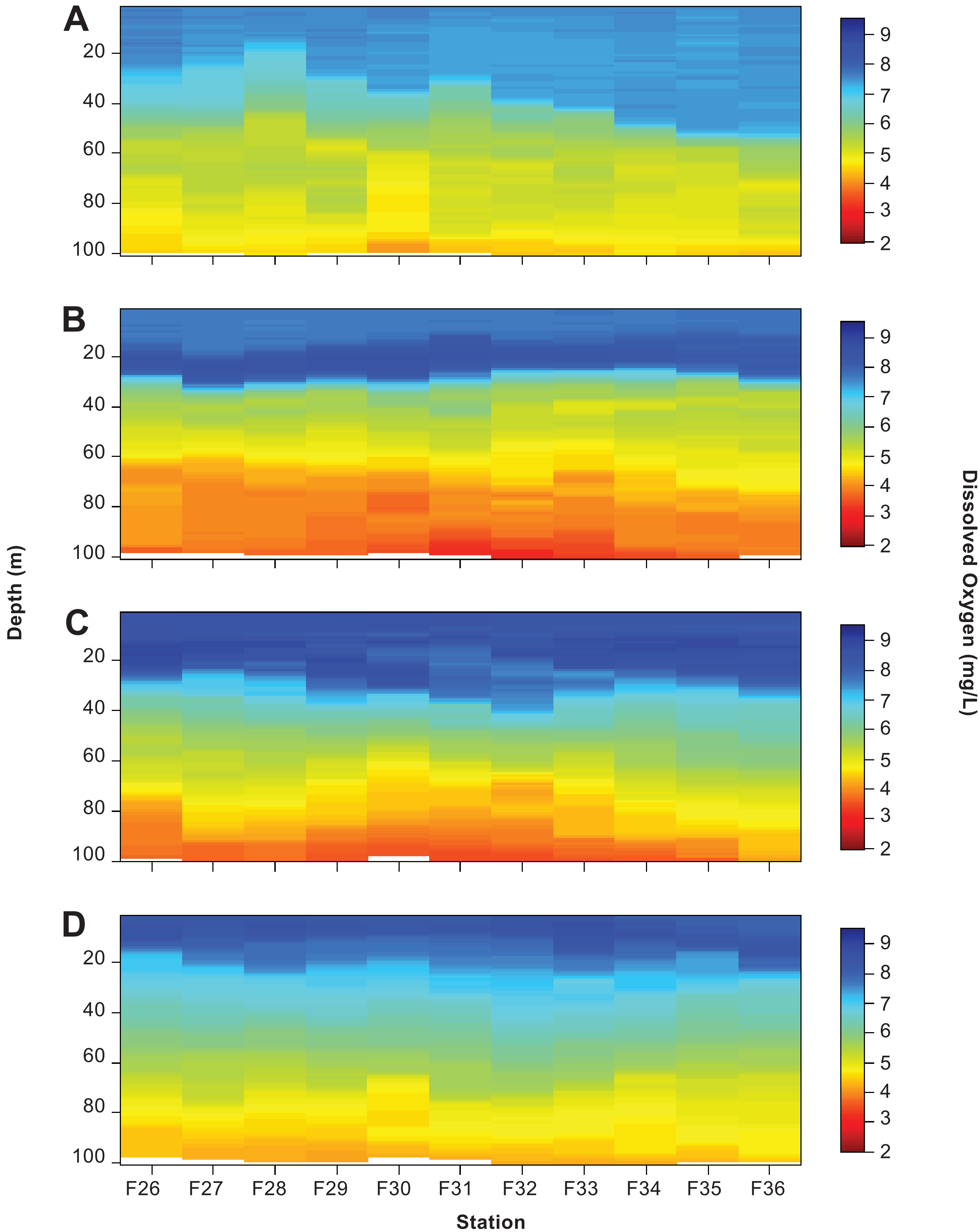


**Figure B.6**
Dissolved oxygen recorded in the PLOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November in 2016. Data were collected on the same day during each survey.

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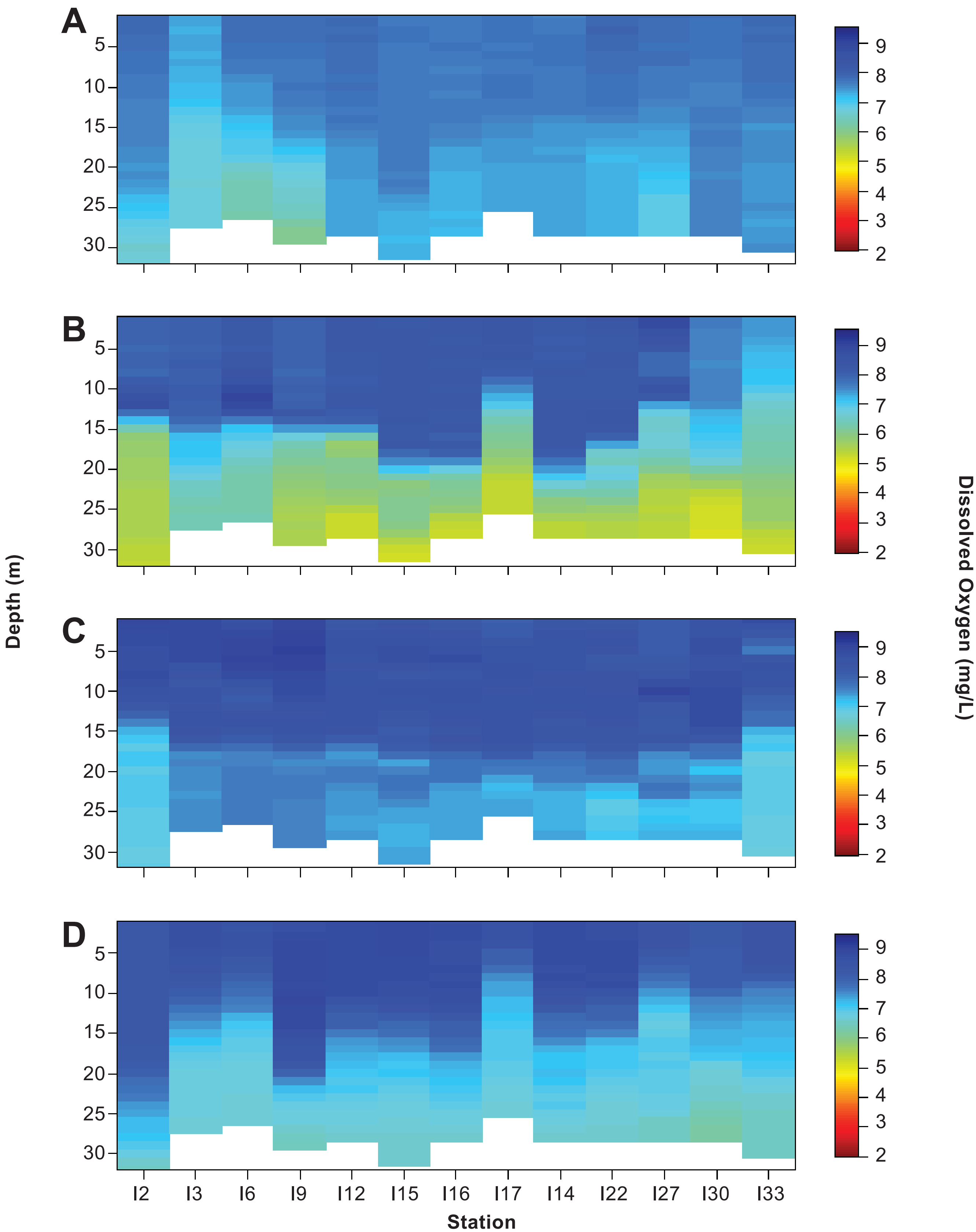


**Figure B.7**
Dissolved oxygen recorded in the SBOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November. Data were collected over 3 days during each survey.

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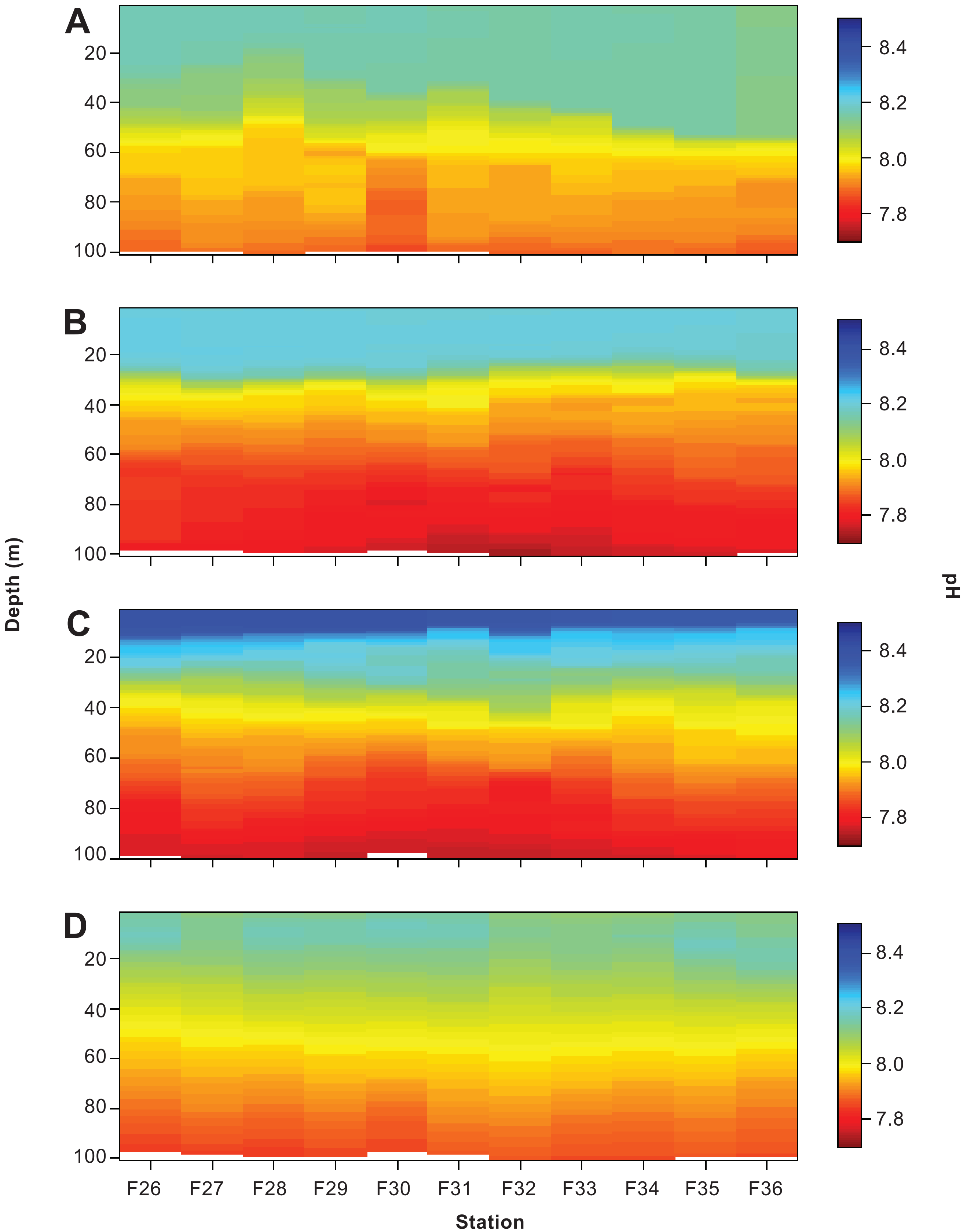


**Figure B.8**
Measurements of pH recorded in the PLOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November in 2016. Data were collected on the same day during each survey.

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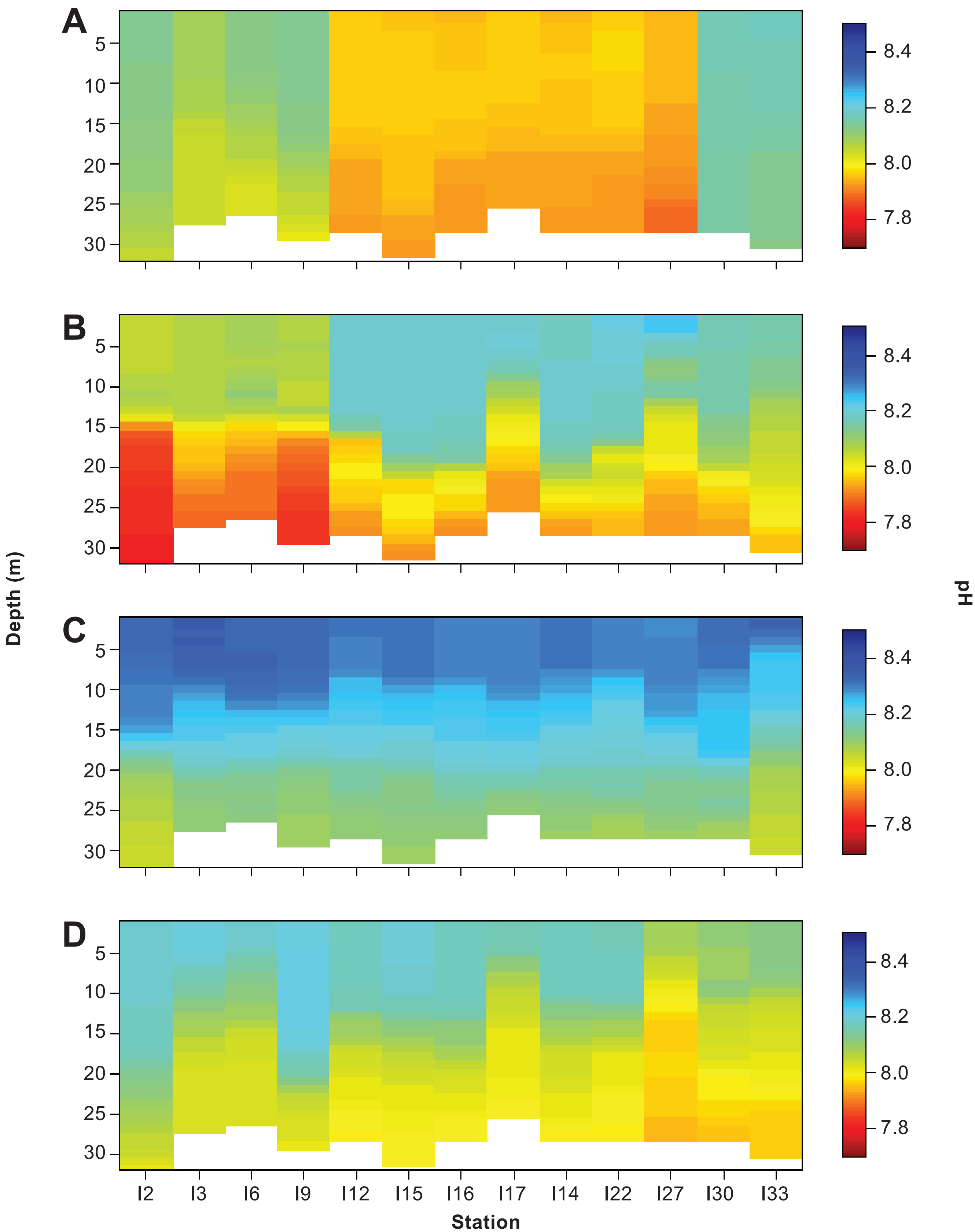


**Figure B.9**
Measurements of pH recorded in the SBOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November. Data were collected over 3 days during each survey.

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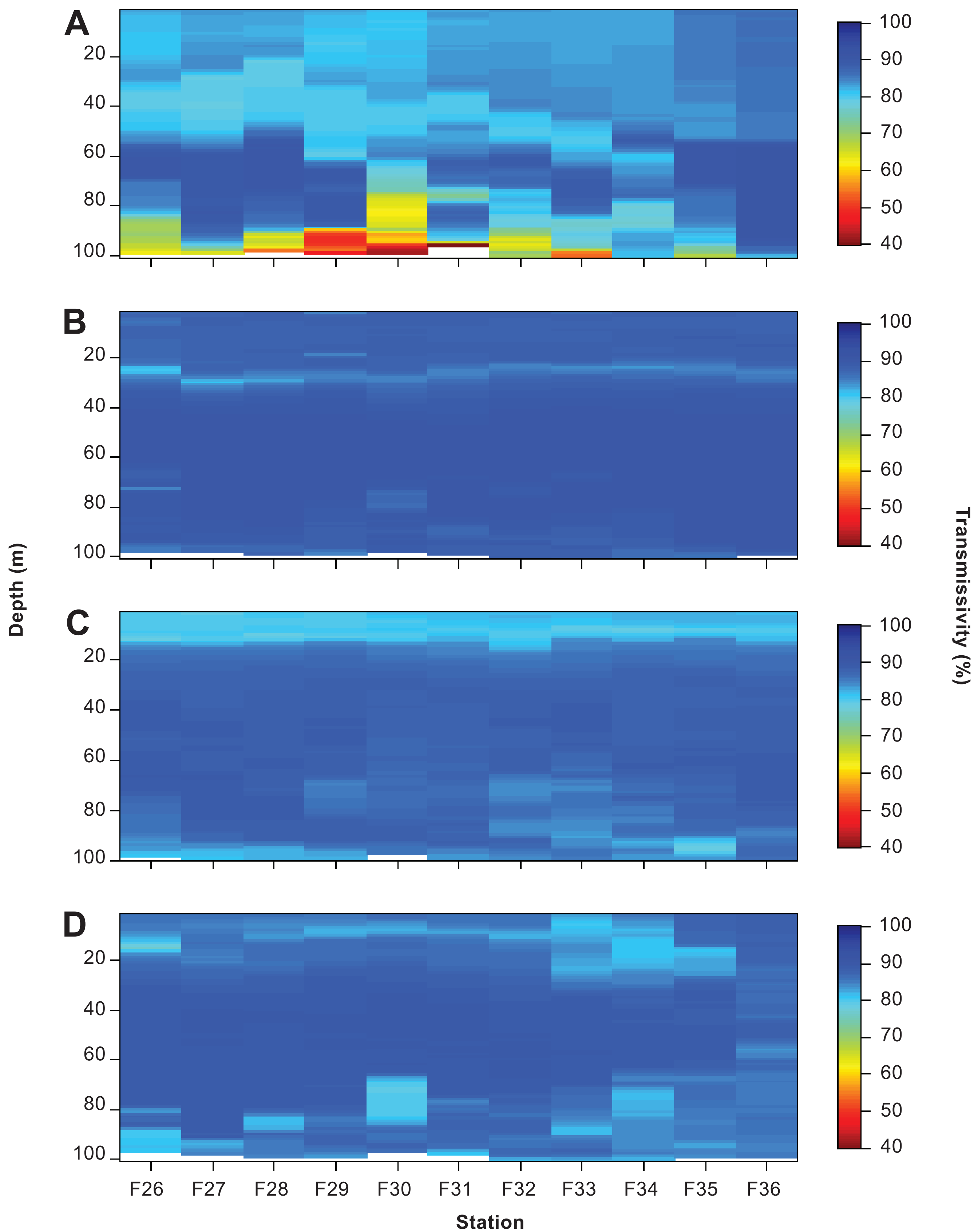


**Figure B.10**
Transmissivity recorded in the PLOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November in 2016. Data were collected on the same day during each survey.

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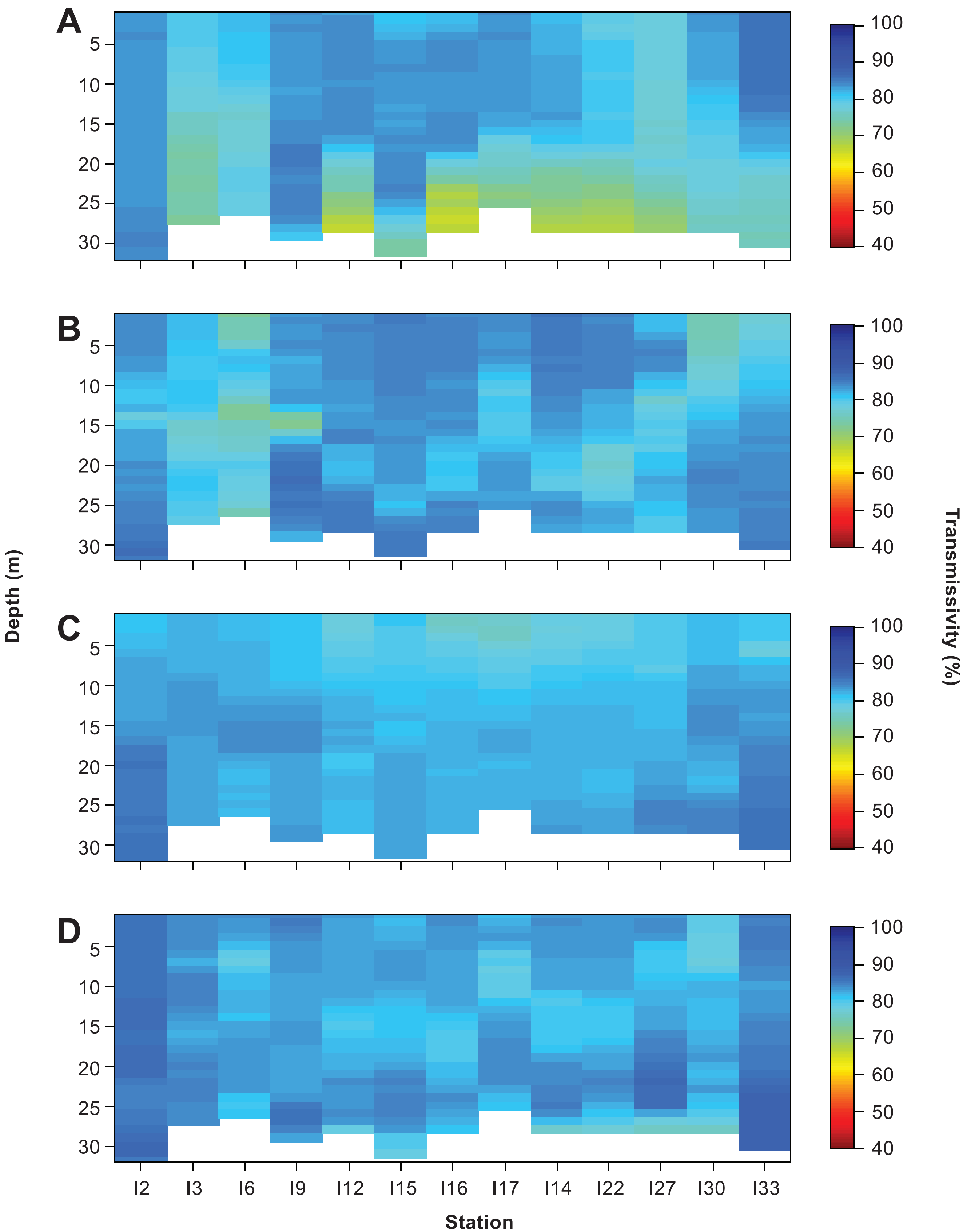


**Figure B.11**
Transmissivity recorded in the SBOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November. Data were collected over 3 days during each survey.

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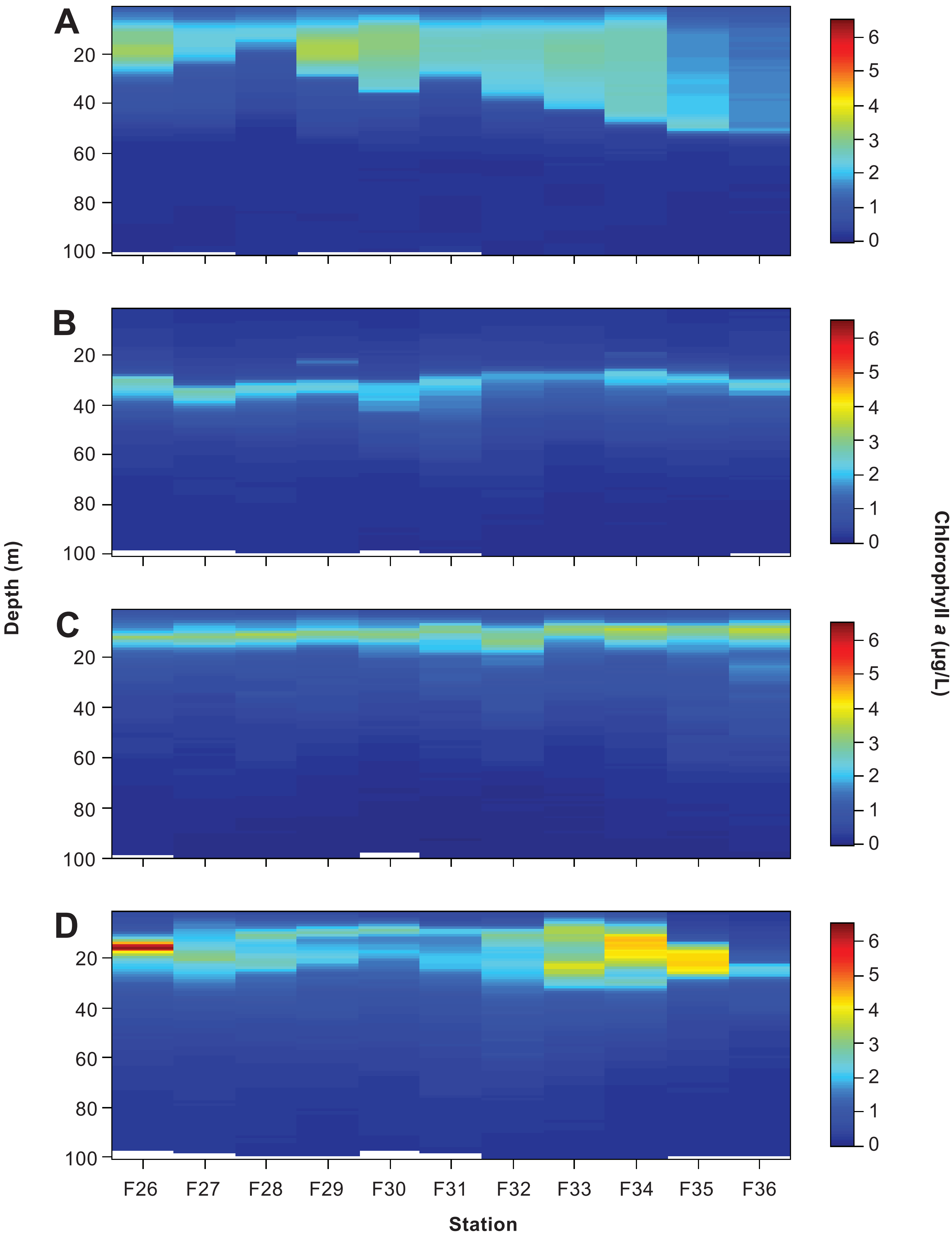


**Figure B.12**

Concentrations of chlorophyll *a* in the PLOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November in 2016. Data were collected on the same day during each survey.

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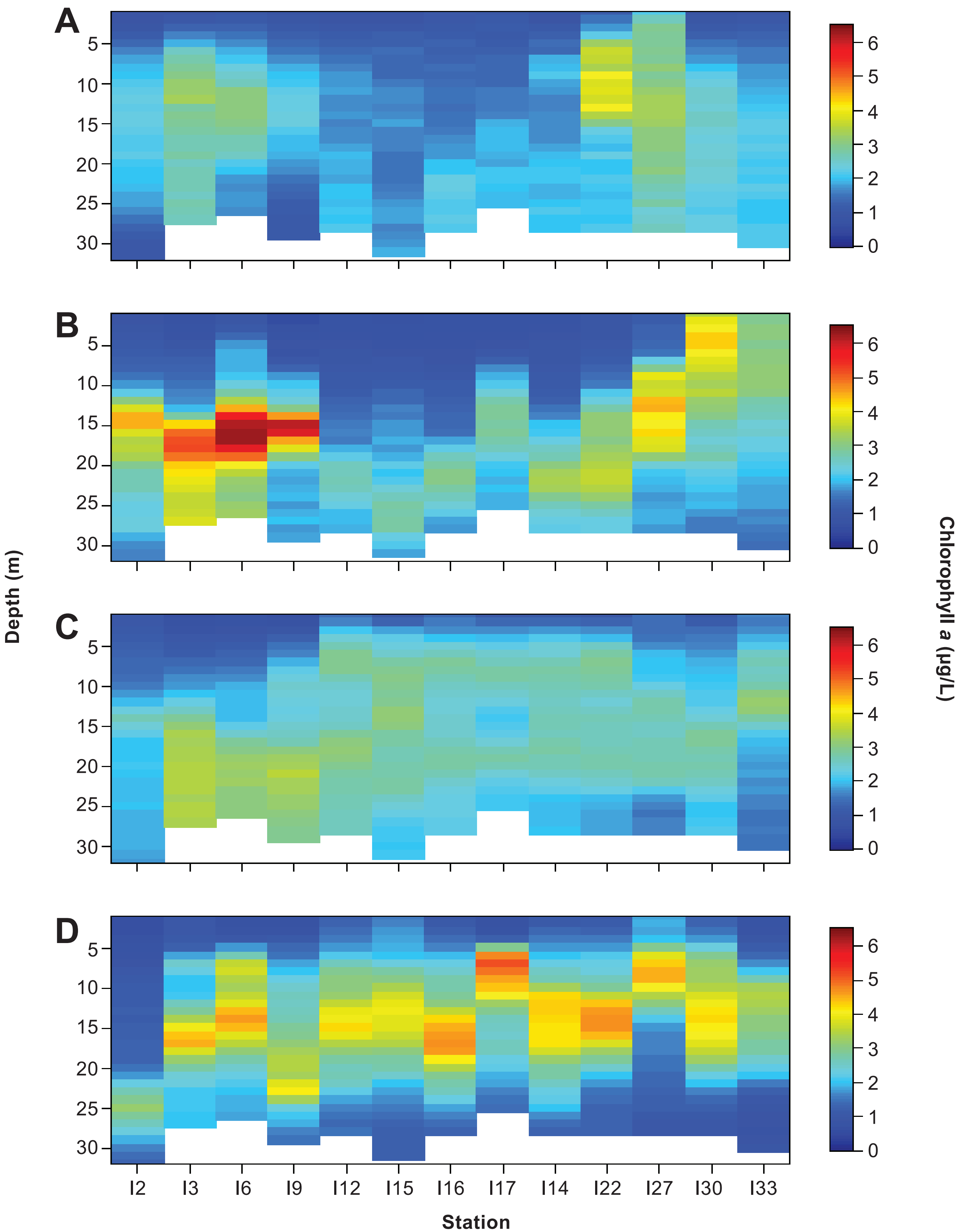


**Figure B.13**
Concentrations of chlorophyll *a* recorded in the SBOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November. Data were collected over 3 days during each survey.

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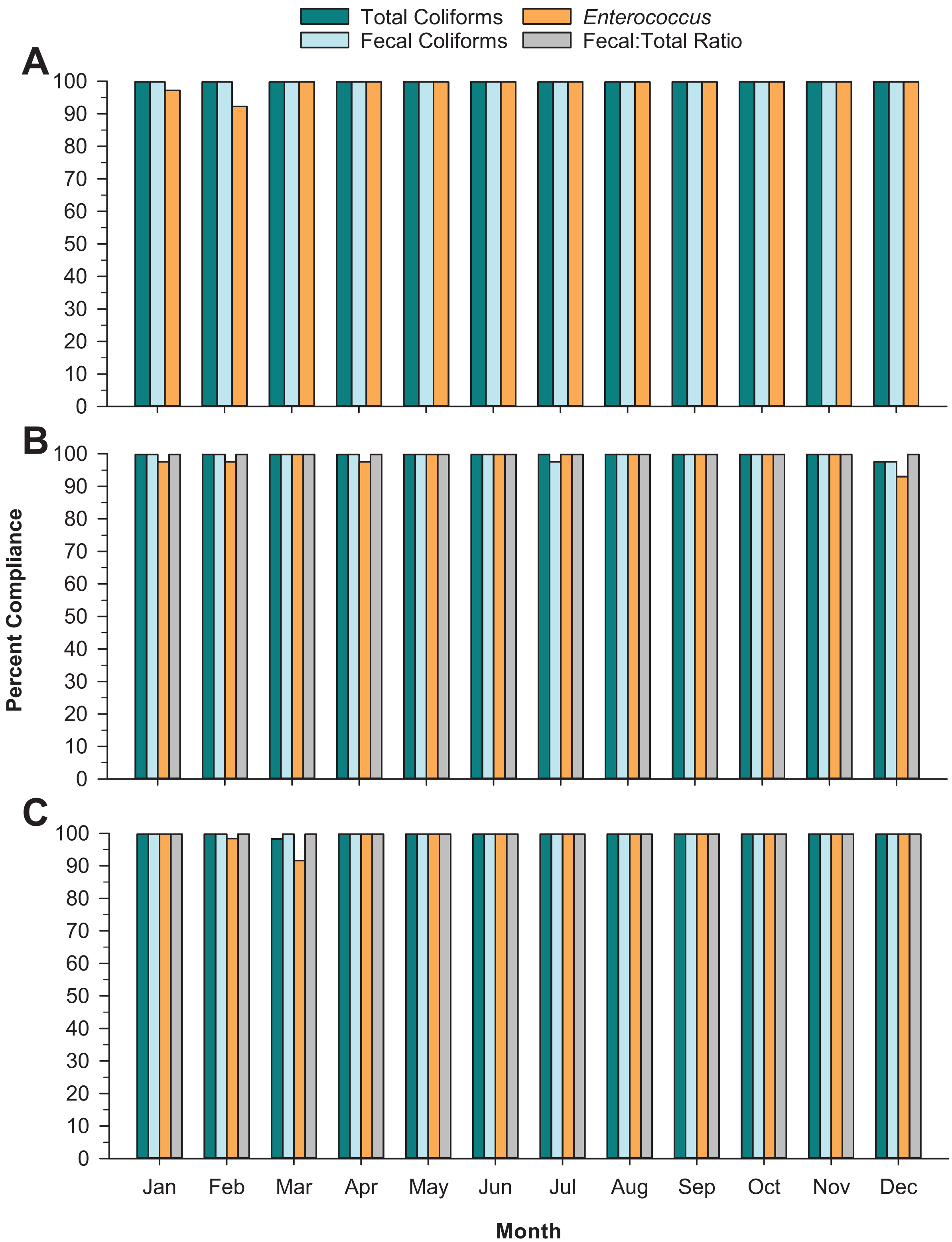


**Figure B.14**
Compliance rates for (A) the three geometric mean water contact standards at the PLOO shore stations, and for the four single sample maximum water contact standards from (B) the PLOO shore stations, and (C) the PLOO kelp stations. Compliance was 100% for the three geometric mean standards at the kelp stations.

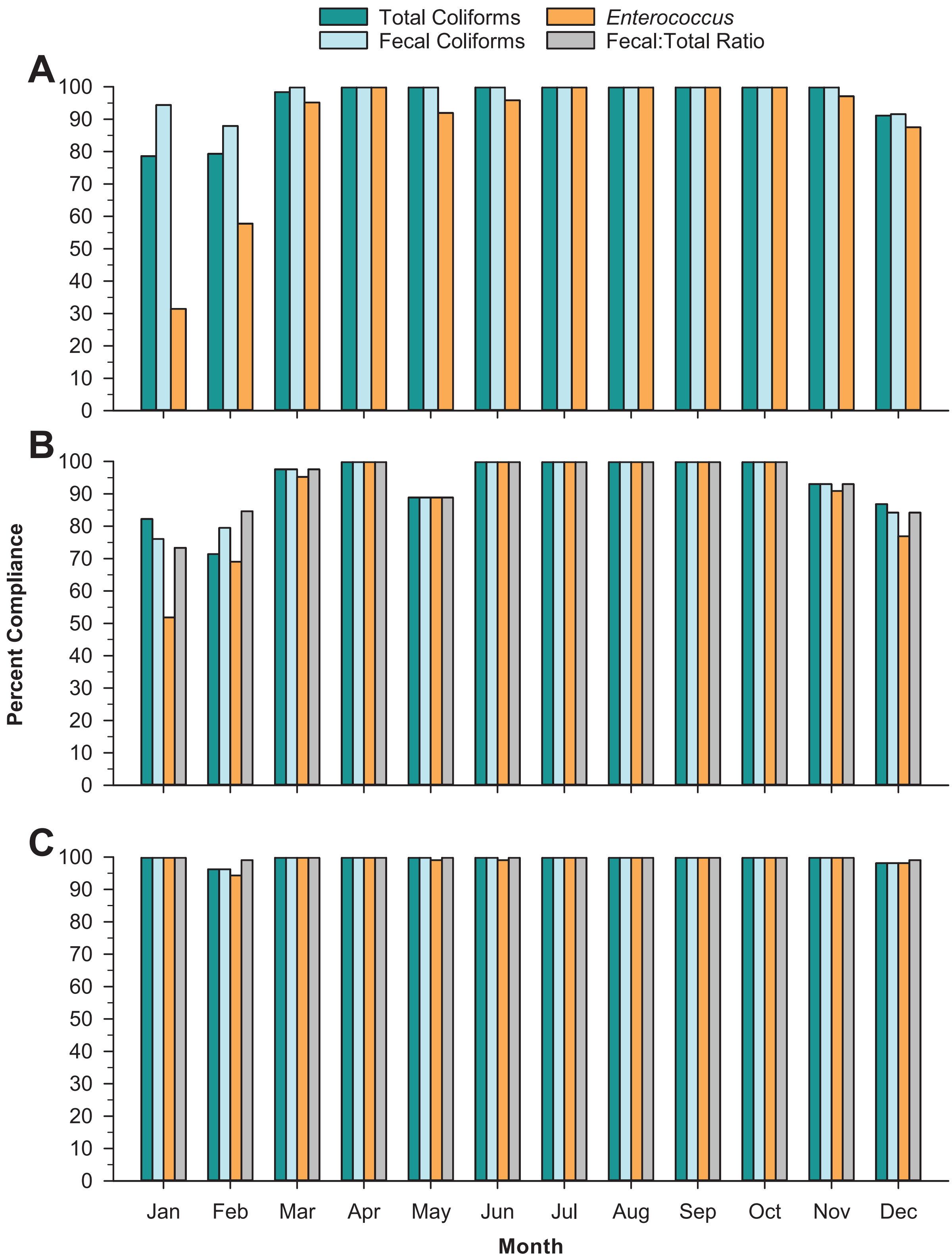


**Figure B.15**
Compliance rates for (A) the three geometric mean water contact standards at the SBOO shore stations, and for the four single sample maximum water contact standards from (B) the SBOO shore stations, and (C) the SBOO kelp stations. Compliance was 100% for the three geometric mean standards at the kelp stations.

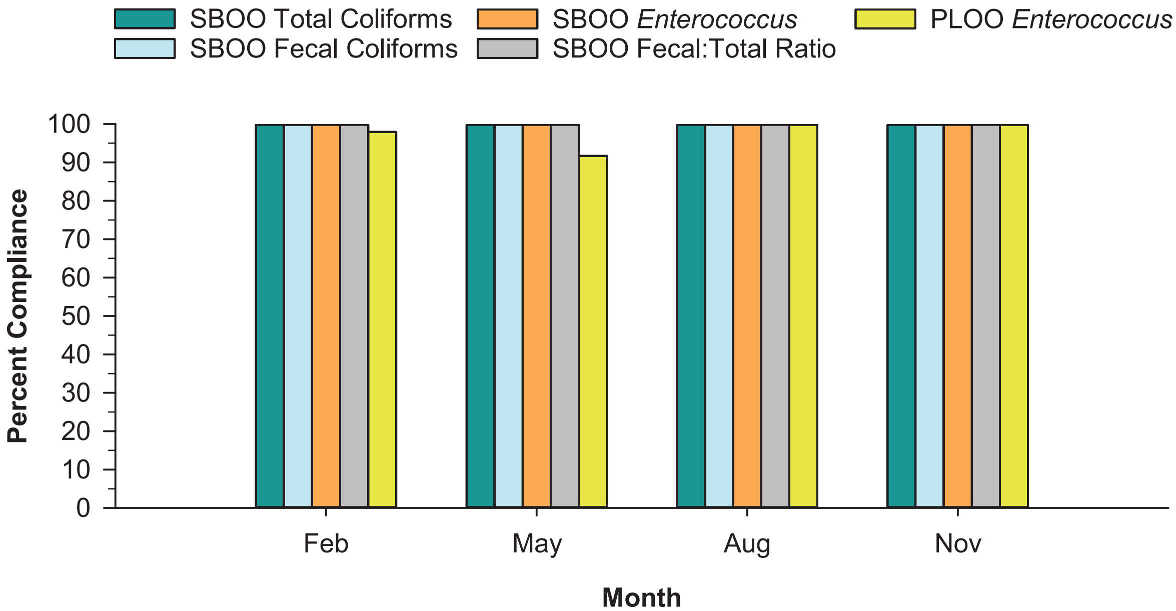


**Figure B.16**
Compliance rates for the four single sample maximum water contact standards at PLOO and SBOO offshore stations during 2016. Total and fecal coliform bacteria are not sampled at the PLOO offshore stations.

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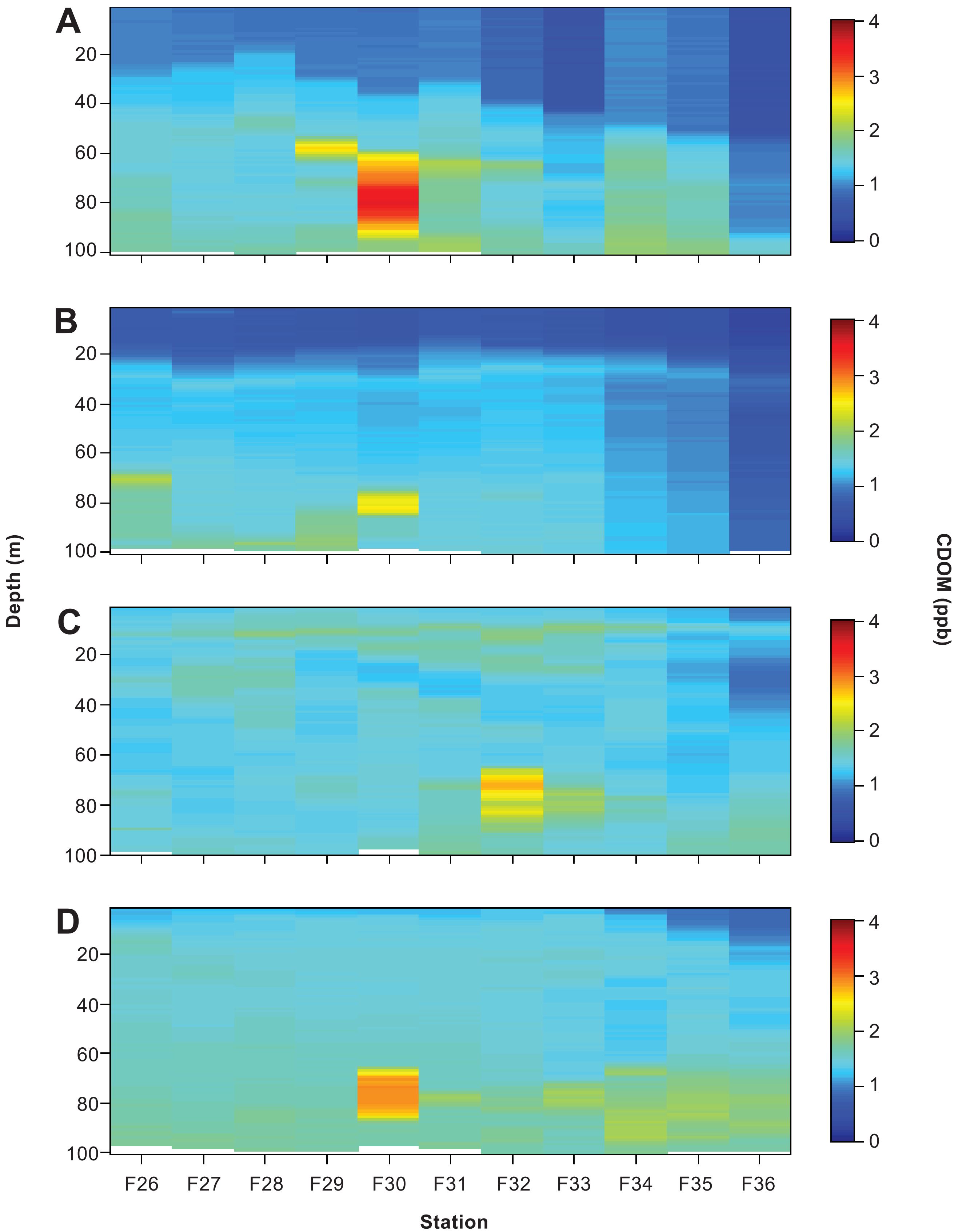


**Figure B.17**
Concentrations of CDOM recorded in the PLOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November in 2016. Data were collected on the same day during each survey.

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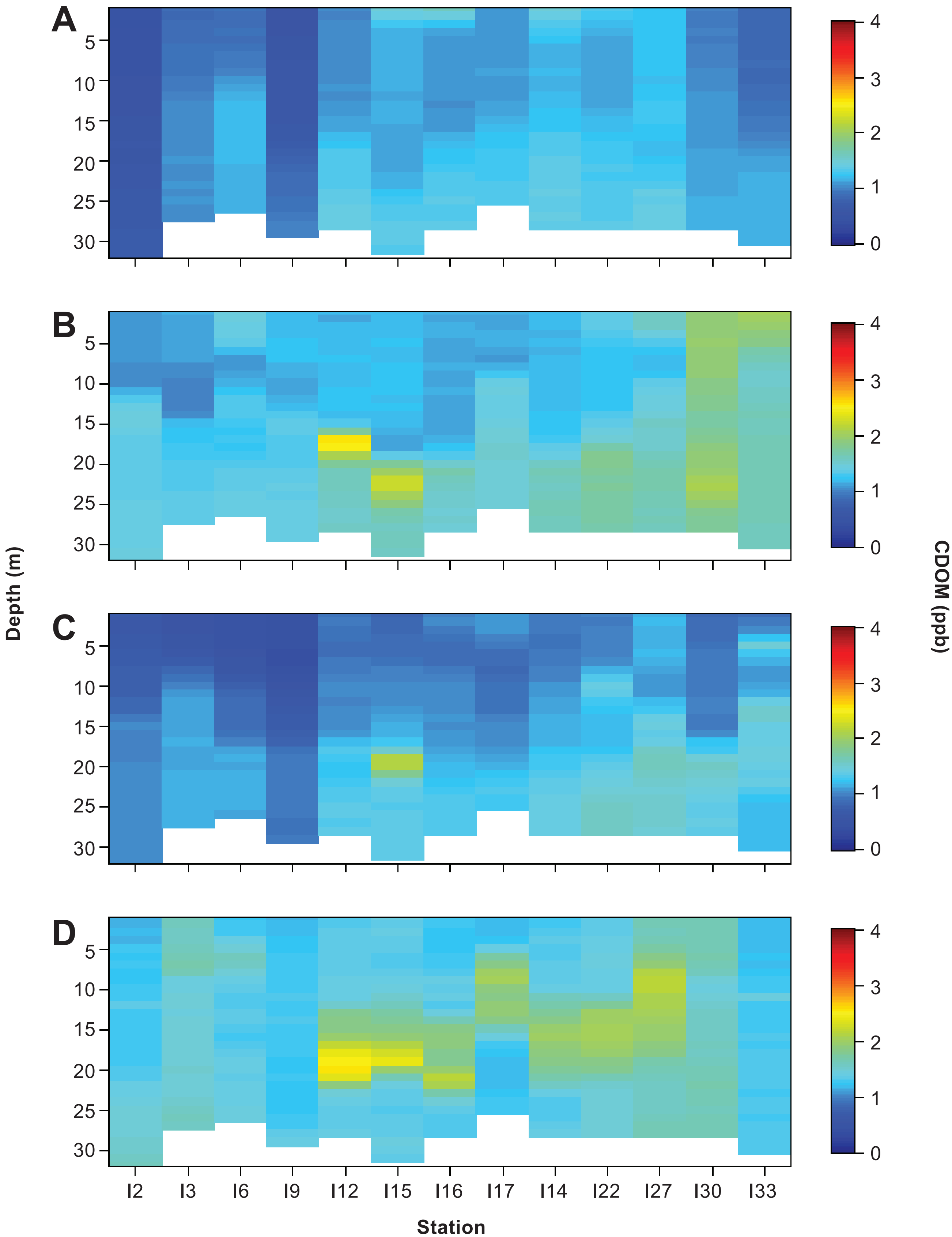


**Figure B.18**
Concentrations of CDOM recorded in the SBOO region at outfall depth stations during (A) February, (B) May, (C) August, and (D) November. Data were collected over 3 days during each survey.

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# Appendix B

# TABLES

**Table B.1**
Water quality objectives for water contact areas, California Ocean Plan (SWRCB 2012).

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 B.2

Sample dates for quarterly oceanographic surveys conducted during 2016. All stations in each station group were sampled on a single day (see Figure B.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 | 4 | 5 | 11 | 10 | North WQ | 11 | 11 | 3 | 3 |
| 18 & 60-m WQ | 3 | 3 | 8 | 8 | Mid WQ[a] | 10 | 10 | 4 | 1 |
| 80-m WQ | 2 | 4 | 9 | 9 | South WQ | 9 | 9 | 2 | 2 |
| 100-m WQ | 5 | 2 | 10 | 7 | | | | | |

[a]Includes kelp stations

## Table B.3

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

| Station Contour | PLOO Sample Depth (m) | | | | | | | | | Station Contour | SBOO Sample Depth (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3 | 9 | 12 | 18 | 25 | 60 | 80 | 98 | | 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 | | |
| 100-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 B.4
Summary of PLOO and SBOO reference stations used during 2016 to calculate out-of-range thresholds (see text for details).

| Month | Stations |
|---|---|
| **February** | |
| PLOO | F01, F02, F03, F04, F05, F06, F07, F25, F27, F28, F33, F36 |
| SBOO | I1, I2, I3, I6, I7, I8, I9, I10, I13, I20, I21, I28, I29, I30, I31, I33, I34, I35 |
| **May** | |
| PLOO | F02, F03, F11, F13, F14, F34, F35, F36 |
| SBOO | I1, I2, I3, I6, I7, I8, I9, I10, I13, I14, I16, I17, I18, I20, I21, I22, I23, I27, I28, I29 |
| **August** | |
| PLOO | F04, F05, F15, F16, F21 |
| SBOO | I1, I2, I3, I6, I7, I8, I9, I10, I12, I13, I16, I17, I20, I21, I28, I29 |
| **November** | |
| PLOO | F02, F03, F04, F05, F06, F07, F08, F09, F10, F11, F12, F13, F14, F15, F16, F17, F18, F20, F21, F22, F23, F24, F25 |
| SBOO | I1, I2, I3, I6, I7, I8, I9, I13, I18, I20, I21, I28, I29, I30, I31, I33, I34, I35 |

## Table B.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 2016. For each quarter: n ≥ 834 (1–20 m), n = 1320 (21–60 m), n ≥ 448 (61–80 m), n ≥ 220 (81–100 m). Sample sizes differed due to variations in bottom depth at individual stations.

| | | Depth (m) | | | | |
|---|---|---|---|---|---|---|
| **Temperature (°C)** | | **1–20** | **21–60** | **61–80** | **81–100** | **1–100** |
| *February* | min | 14.2 | 11.8 | 11.5 | 11.3 | 11.3 |
| | max | 15.7 | 15.6 | 13.3 | 12.3 | 15.7 |
| | mean | 15.2 | 14.0 | 12.1 | 11.8 | 13.9 |
| *May* | min | 11.8 | 10.2 | 10.0 | 9.7 | 9.7 |
| | max | 18.6 | 15.5 | 10.8 | 10.6 | 18.6 |
| | mean | 16.5 | 11.7 | 10.4 | 10.0 | 12.8 |
| *August* | min | 14.7 | 11.4 | 10.5 | 10.1 | 10.1 |
| | max | 24.0 | 16.9 | 12.5 | 11.5 | 24.0 |
| | mean | 19.8 | 13.4 | 11.4 | 10.6 | 14.8 |
| *November* | min | 13.0 | 11.4 | 10.7 | 10.3 | 10.3 |
| | max | 19.1 | 15.0 | 12.6 | 11.5 | 19.1 |
| | mean | 15.8 | 12.6 | 11.4 | 10.7 | 13.2 |
| **Annual** | min | 11.8 | 10.2 | 10.0 | 9.7 | 9.7 |
| | max | 24.0 | 16.9 | 13.3 | 12.3 | 24.0 |
| | mean | 16.8 | 12.9 | 11.3 | 10.8 | 13.7 |
| **Salinity (ppt)** | | | | | | |
| *February* | min | 33.52 | 33.37 | 33.31 | 33.32 | 33.31 |
| | max | 33.64 | 33.60 | 33.68 | 33.68 | 33.68 |
| | mean | 33.59 | 33.52 | 33.51 | 33.53 | 33.54 |
| *May* | min | 33.37 | 33.41 | 33.55 | 33.70 | 33.37 |
| | max | 33.65 | 33.79 | 33.81 | 33.97 | 33.97 |
| | mean | 33.55 | 33.53 | 33.71 | 33.81 | 33.59 |
| *August* | min | 33.26 | 33.26 | 33.41 | 33.47 | 33.26 |
| | max | 33.79 | 33.48 | 33.64 | 33.80 | 33.80 |
| | mean | 33.51 | 33.39 | 33.48 | 33.64 | 33.46 |
| *November* | min | 33.20 | 33.20 | 33.35 | 33.46 | 33.20 |
| | max | 33.42 | 33.44 | 33.59 | 33.70 | 33.70 |
| | mean | 33.30 | 33.33 | 33.45 | 33.59 | 33.36 |
| **Annual** | min | 33.20 | 33.20 | 33.31 | 33.32 | 33.20 |
| | max | 33.79 | 33.79 | 33.81 | 33.97 | 33.97 |
| | mean | 33.49 | 33.44 | 33.54 | 33.64 | 33.49 |

## Table B.5 *continued*

| DO (mg/L) | | Depth (m) 1–20 | 21–60 | 61–80 | 81–100 | 1–100 |
|---|---|---|---|---|---|---|
| *February* | min | 5.9 | 4.6 | 4.3 | 4.2 | 4.2 |
| | max | 7.7 | 7.5 | 5.7 | 5.4 | 7.7 |
| | mean | 7.3 | 6.2 | 5.0 | 4.8 | 6.2 |
| *May* | min | 4.2 | 3.5 | 3.6 | 3.1 | 3.1 |
| | max | 8.7 | 8.6 | 5.0 | 4.3 | 8.7 |
| | mean | 7.6 | 5.4 | 4.2 | 3.8 | 5.7 |
| *August* | min | 5.1 | 4.8 | 4.2 | 3.5 | 3.5 |
| | max | 9.2 | 8.9 | 5.9 | 4.8 | 9.2 |
| | mean | 8.0 | 6.6 | 5.0 | 4.1 | 6.6 |
| *November* | min | 6.1 | 5.4 | 4.6 | 4.2 | 4.2 |
| | max | 10.0 | 7.9 | 6.2 | 5.3 | 10.0 |
| | mean | 8.1 | 6.3 | 5.4 | 4.6 | 6.6 |
| **Annual** | min | 4.2 | 3.5 | 3.6 | 3.1 | 3.1 |
| | max | 10.0 | 8.9 | 6.2 | 5.4 | 10.0 |
| | mean | 7.8 | 6.1 | 4.9 | 4.4 | 6.3 |

| pH | | | | | | |
|---|---|---|---|---|---|---|
| *February* | min | 8.1 | 7.9 | 7.9 | 7.9 | 7.9 |
| | max | 8.2 | 8.2 | 8.0 | 8.0 | 8.2 |
| | mean | 8.2 | 8.1 | 7.9 | 7.9 | 8.1 |
| *May* | min | 7.9 | 7.8 | 7.7 | 7.7 | 7.7 |
| | max | 8.2 | 8.2 | 7.9 | 7.8 | 8.2 |
| | mean | 8.2 | 7.9 | 7.8 | 7.8 | 8.0 |
| *August* | min | 8.1 | 7.9 | 7.8 | 7.8 | 7.8 |
| | max | 8.4 | 8.2 | 8.0 | 7.9 | 8.4 |
| | mean | 8.3 | 8.0 | 7.9 | 7.8 | 8.1 |
| *November* | min | 8.0 | 8.0 | 7.9 | 7.8 | 7.8 |
| | max | 8.3 | 8.2 | 8.0 | 8.0 | 8.3 |
| | mean | 8.2 | 8.1 | 8.0 | 7.9 | 8.1 |
| **Annual** | min | 7.9 | 7.8 | 7.7 | 7.7 | 7.7 |
| | max | 8.4 | 8.2 | 8.0 | 8.0 | 8.4 |
| | mean | 8.2 | 8.0 | 7.9 | 7.8 | 8.0 |

## Table B.5 *continued*

| Transmissivity (%) | | Depth (m) 1–20 | 21–60 | 61–80 | 81–100 | 1–100 |
|---|---|---|---|---|---|---|
| *February* | min | 56 | 63 | 58 | 28 | 28 |
| | max | 87 | 91 | 91 | 91 | 91 |
| | mean | 79 | 82 | 85 | 75 | 81 |
| *May* | min | 61 | 59 | 46 | 23 | 23 |
| | max | 89 | 90 | 90 | 90 | 90 |
| | mean | 85 | 87 | 88 | 88 | 87 |
| *August* | min | 70 | 75 | 77 | 74 | 70 |
| | max | 87 | 89 | 89 | 89 | 89 |
| | mean | 82 | 88 | 87 | 85 | 86 |
| *November* | min | 1 | 66 | 72 | 70 | 1 |
| | max | 88 | 89 | 89 | 89 | 89 |
| | mean | 82 | 87 | 87 | 85 | 85 |
| **Annual** | min | 1 | 59 | 46 | 23 | 1 |
| | max | 89 | 91 | 91 | 91 | 91 |
| | mean | 82 | 86 | 87 | 83 | 85 |

| Chlorophyll *a* (μg/L) | | 1–20 | 21–60 | 61–80 | 81–100 | 1–100 |
|---|---|---|---|---|---|---|
| *February* | min | 0.3 | 0.2 | 0.1 | 0.2 | 0.1 |
| | max | 3.4 | 3.4 | 0.5 | 0.3 | 3.4 |
| | mean | 1.5 | 0.8 | 0.2 | 0.2 | 0.9 |
| *May* | min | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| | max | 8.9 | 10.2 | 0.5 | 0.3 | 10.2 |
| | mean | 0.9 | 1.3 | 0.3 | 0.2 | 0.9 |
| *August* | min | 0.6 | 0.2 | 0.1 | 0.1 | 0.1 |
| | max | 6.1 | 3.4 | 0.7 | 0.3 | 6.1 |
| | mean | 2.1 | 0.8 | 0.2 | 0.1 | 1.1 |
| *November* | min | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 |
| | max | 11.9 | 7.0 | 0.7 | 0.4 | 11.9 |
| | mean | 2.0 | 1.0 | 0.4 | 0.3 | 1.2 |
| Annual | min | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| | max | 11.9 | 10.2 | 0.7 | 0.4 | 11.9 |
| | mean | 1.6 | 1.0 | 0.3 | 0.2 | 1.0 |

## Table B.6

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 2016. For each quarter: n = 360 (1–9 m), n ≥ 307 (10–19 m), n = 185 (20–28 m), n ≥ 87 (29–38 m), n ≥ 72 (39–55 m). Sample sizes differed due to slight variations in depth at individual stations.

| | | Depth (m) | | | | | |
|---|---|---|---|---|---|---|---|
| **Temperature (°C)** | | **1–9** | **10–19** | **20–28** | **29–38** | **39–55** | **1–55** |
| *February* | min | 14.5 | 14.4 | 14.3 | 14.3 | 13.8 | 13.8 |
| | max | 16.0 | 15.7 | 15.6 | 15.5 | 15.5 | 16.0 |
| | mean | 15.2 | 15.1 | 15.0 | 15.1 | 14.9 | 15.1 |
| *May* | min | 13.8 | 12.1 | 11.6 | 11.2 | 10.6 | 10.6 |
| | max | 18.1 | 17.5 | 15.3 | 12.8 | 11.8 | 18.1 |
| | mean | 16.6 | 14.8 | 12.8 | 11.9 | 11.0 | 14.6 |
| *August* | min | 16.8 | 14.4 | 13.3 | 12.7 | 11.9 | 11.9 |
| | max | 23.1 | 21.6 | 17.0 | 15.4 | 13.2 | 23.1 |
| | mean | 21.1 | 17.5 | 14.9 | 13.4 | 12.4 | 17.6 |
| *November* | min | 14.2 | 13.8 | 13.0 | 12.5 | 11.8 | 11.8 |
| | max | 18.0 | 17.2 | 15.5 | 13.8 | 13.2 | 18.0 |
| | mean | 16.2 | 15.0 | 13.9 | 13.2 | 12.5 | 14.9 |
| **Annual** | min | 13.8 | 12.1 | 11.6 | 11.2 | 10.6 | 10.6 |
| | max | 23.1 | 21.6 | 17.0 | 15.5 | 15.5 | 23.1 |
| | mean | 17.3 | 15.6 | 14.1 | 13.4 | 12.7 | 15.5 |
| **Salinity (ppt)** | | | | | | | |
| *February* | min | 33.51 | 33.54 | 33.53 | 33.52 | 33.54 | 33.51 |
| | max | 33.60 | 33.60 | 33.60 | 33.60 | 33.59 | 33.60 |
| | mean | 33.58 | 33.58 | 33.57 | 33.57 | 33.56 | 33.58 |
| *May* | min | 33.20 | 33.34 | 33.37 | 33.49 | 33.52 | 33.20 |
| | max | 33.51 | 33.53 | 33.51 | 33.54 | 33.62 | 33.62 |
| | mean | 33.46 | 33.47 | 33.48 | 33.51 | 33.57 | 33.48 |
| *August* | min | 33.30 | 33.26 | 33.22 | 33.33 | 33.37 | 33.22 |
| | max | 33.59 | 33.52 | 33.38 | 33.39 | 33.44 | 33.59 |
| | mean | 33.50 | 33.37 | 33.34 | 33.36 | 33.40 | 33.41 |
| *November* | min | 33.18 | 33.17 | 33.16 | 33.27 | 33.30 | 33.16 |
| | max | 33.49 | 33.39 | 33.30 | 33.33 | 33.41 | 33.49 |
| | mean | 33.30 | 33.28 | 33.28 | 33.30 | 33.34 | 33.29 |
| **Annual** | min | 33.18 | 33.17 | 33.16 | 33.27 | 33.30 | 33.16 |
| | max | 33.60 | 33.60 | 33.60 | 33.60 | 33.62 | 33.62 |
| | mean | 33.46 | 33.43 | 33.42 | 33.44 | 33.47 | 33.44 |

## Table B.6 *continued*

| DO (mg/L) | | 1–9 | 10–19 | 20–28 | 29–38 | 39–55 | 1–55 |
|---|---|---|---|---|---|---|---|
| | | **Depth (m)** | | | | | |
| *February* | min | 7.0 | 6.2 | 6.1 | 6.1 | 5.9 | 5.9 |
| | max | 8.4 | 8.3 | 7.8 | 7.6 | 7.4 | 8.4 |
| | mean | 7.7 | 7.5 | 7.3 | 7.1 | 7.0 | 7.5 |
| *May* | min | 4.8 | 3.7 | 4.9 | 4.7 | 4.3 | 3.7 |
| | max | 8.9 | 9.0 | 7.4 | 5.5 | 4.9 | 9.0 |
| | mean | 7.7 | 7.0 | 5.8 | 5.0 | 4.6 | 6.7 |
| *August* | min | 5.3 | 5.2 | 6.4 | 6.0 | 5.3 | 5.2 |
| | max | 9.4 | 9.2 | 8.7 | 7.6 | 6.5 | 9.4 |
| | mean | 8.2 | 7.9 | 7.3 | 6.6 | 5.8 | 7.6 |
| *November* | min | 6.1 | 5.8 | 6.2 | 6.1 | 5.7 | 5.7 |
| | max | 8.9 | 8.9 | 8.0 | 7.0 | 6.7 | 8.9 |
| | mean | 8.2 | 7.5 | 6.9 | 6.5 | 6.2 | 7.5 |
| **Annual** | min | 4.8 | 3.7 | 4.9 | 4.7 | 4.3 | 3.7 |
| | max | 9.4 | 9.2 | 8.7 | 7.6 | 7.4 | 9.4 |
| | mean | 7.9 | 7.5 | 6.8 | 6.3 | 5.9 | 7.3 |

| pH | | | | | | | |
|---|---|---|---|---|---|---|---|
| *February* | min | 7.9 | 7.9 | 7.9 | 7.9 | 8.0 | 7.9 |
| | max | 8.2 | 8.2 | 8.2 | 8.1 | 8.1 | 8.2 |
| | mean | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 |
| *May* | min | 7.9 | 7.8 | 7.8 | 7.7 | 7.7 | 7.7 |
| | max | 8.3 | 8.2 | 8.1 | 8.0 | 7.9 | 8.3 |
| | mean | 8.1 | 8.0 | 7.9 | 7.8 | 7.8 | 8.0 |
| *August* | min | 8.1 | 8.0 | 8.0 | 8.0 | 7.9 | 7.9 |
| | max | 8.4 | 8.3 | 8.2 | 8.1 | 8.0 | 8.4 |
| | mean | 8.3 | 8.2 | 8.1 | 8.0 | 8.0 | 8.2 |
| *November* | min | 7.9 | 7.9 | 8.0 | 8.0 | 7.9 | 7.9 |
| | max | 8.2 | 8.2 | 8.2 | 8.1 | 8.0 | 8.2 |
| | mean | 8.1 | 8.1 | 8.0 | 8.0 | 8.0 | 8.1 |
| **Annual** | min | 7.9 | 7.8 | 7.8 | 7.7 | 7.7 | 7.7 |
| | max | 8.4 | 8.3 | 8.2 | 8.1 | 8.1 | 8.4 |
| | mean | 8.1 | 8.1 | 8.0 | 8.0 | 7.9 | 8.1 |

## Table B.6 *continued*

| Transmissivity (%) | | Depth (m) 1–9 | 10–19 | 20–28 | 29–38 | 39–55 | 1–55 |
|---|---|---|---|---|---|---|---|
| *February* | min | 49 | 7 | 66 | 74 | 84 | 7 |
| | max | 86 | 86 | 87 | 88 | 88 | 88 |
| | mean | 78 | 78 | 80 | 85 | 85 | 79 |
| *May* | min | 41 | 39 | 73 | 81 | 85 | 39 |
| | max | 88 | 89 | 89 | 89 | 89 | 89 |
| | mean | 77 | 80 | 84 | 87 | 87 | 81 |
| *August* | min | 69 | 66 | 80 | 82 | 87 | 66 |
| | max | 84 | 86 | 87 | 88 | 88 | 88 |
| | mean | 79 | 82 | 84 | 86 | 87 | 82 |
| *November* | min | 60 | 59 | 73 | 78 | 86 | 59 |
| | max | 88 | 88 | 88 | 89 | 89 | 89 |
| | mean | 81 | 81 | 84 | 87 | 88 | 83 |
| **Annual** | min | 41 | 7 | 66 | 74 | 84 | 7 |
| | max | 88 | 89 | 89 | 89 | 89 | 89 |
| | mean | 79 | 80 | 83 | 86 | 87 | 81 |

| Chlorophyll *a* (µg/L) | | 1–9 | 10–19 | 20–28 | 29–38 | 39–55 | 1–55 |
|---|---|---|---|---|---|---|---|
| *February* | min | 0.7 | 1.4 | 1.1 | 0.8 | 0.6 | 0.6 |
| | max | 5.8 | 7.9 | 3.1 | 2.5 | 1.6 | 7.9 |
| | mean | 2.0 | 2.6 | 2.1 | 1.5 | 1.2 | 2.1 |
| *May* | min | 0.5 | 0.7 | 0.9 | 1.0 | 0.5 | 0.5 |
| | max | 17.3 | 6.3 | 4.3 | 2.3 | 2.1 | 17.3 |
| | mean | 2.5 | 2.7 | 2.2 | 1.4 | 0.9 | 2.3 |
| *August* | min | 0.7 | 1.5 | 1.4 | 0.9 | 0.5 | 0.5 |
| | max | 4.3 | 4.5 | 4.3 | 3.5 | 1.3 | 4.5 |
| | mean | 2.1 | 2.7 | 2.5 | 1.7 | 0.8 | 2.2 |
| *November* | min | 0.4 | 0.6 | 0.9 | 0.7 | 0.4 | 0.4 |
| | max | 7.7 | 8.1 | 5.2 | 1.9 | 0.9 | 8.1 |
| | mean | 2.1 | 3.4 | 2.1 | 1.1 | 0.7 | 2.3 |
| **Annual** | min | 0.4 | 0.6 | 0.9 | 0.7 | 0.4 | 0.4 |
| | max | 17.3 | 8.1 | 5.2 | 3.5 | 2.1 | 17.3 |
| | mean | 2.2 | 2.8 | 2.2 | 1.4 | 0.9 | 2.2 |

## Table B.7

Summary of elevated bacteria densities in samples collected from PLOO shore, kelp, and offshore stations during 2016. Bold values exceed benchmarks for total coliform (> 10,000 CFU/100 mL), fecal coliform (> 400 CFU/100 mL), *Enterococcus* (> 104 CFU/100 mL), and/or the FTR criterion (total coliforms > 1000 CFU/100 mL and F:T > 0.10).

| Station Group | Date | Depth (m) | Total | Fecal | Entero | F:T |
|---|---|---|---|---|---|---|
| *Shore Stations* | | | | | | |
| D8 | 28 Jan 16 | — | 660 | 130 | **7000** | 0.20 |
| D8 | 9 Feb 16 | — | 20 | 4 | **6200** | 0.20 |
| D11 | 3 Apr 16 | — | 180 | 6 | **500** | 0.03 |
| D8-A | 21 Jul 16 | — | 960 | **800** | 4 | 0.83 |
| D10 | 12 Dec 16 | — | 740 | **500** | 30 | 0.68 |
| D10 | 24 Dec 16 | — | 680 | 40 | **220** | 0.06 |
| D11 | 24 Dec 16 | — | **16,000** | 400 | **2000** | 0.03 |
| D12 | 24 Dec 16 | — | 400 | 60 | **120** | 0.15 |
| *Kelp Stations* | | | | | | |
| A1 | 20 Feb 16 | 1 | 2 | 2 | **1200** | 1.00 |
| A1 | 20 Feb 16 | 18 | 360 | 36 | **2200** | 0.10 |
| A1 | 10 Mar 16 | 12 | 720 | 32 | **340** | 0.04 |
| A1 | 10 Mar 16 | 18 | **13,000** | 76 | **960** | 0.01 |
| A6 | 10 Mar 16 | 18 | **14,000** | 82 | **700** | 0.01 |
| A7 | 10 Mar 16 | 12 | 260 | 10 | **120** | 0.04 |
| A7 | 10 Mar 16 | 18 | 1000 | 46 | **720** | 0.05 |
| A1 [a] | 12 Mar 16 | 18 | 220 | — | **120** | — |
| A7 [a] | 12 Mar 16 | 18 | — | — | **180** | — |
| A6 | 14 Mar 16 | 18 | 120 | 10 | **160** | 0.08 |
| A7 | 14 Mar 16 | 12 | 280 | 2 | **130** | 0.01 |
| A7 | 14 Mar 16 | 18 | 160 | 10 | **110** | 0.06 |
| *Offshore Stations* | | | | | | |
| F20 | 2 Feb 16 | 60 | — | — | **320** | — |
| F21 | 2 Feb 16 | 60 | — | — | **320** | — |
| F29 | 5 Feb 16 | 60 | — | — | **880** | — |
| F30 | 5 Feb 16 | 80 | — | — | **760** | — |
| F31 | 5 Feb 16 | 80 | — | — | **110** | — |
| F33 | 5 Feb 16 | 80 | — | — | **280** | — |
| F26 | 2 May 16 | 80 | — | — | **160** | — |
| F26 | 2 May 16 | 98 | — | — | **110** | — |
| F27 | 2 May 16 | 98 | — | — | **260** | — |

[a] Resample

**Table B.7** *continued*

| Station Group | Date | Depth (m) | Total | Fecal | Entero | F:T |
|---|---|---|---|---|---|---|
| F28 | 2 May 16 | 98 | — | — | **120** | — |
| F29 | 2 May 16 | 80 | — | — | **320** | — |
| F29 | 2 May 16 | 98 | — | — | **420** | — |
| F30 | 2 May 16 | 80 | — | — | **820** | — |
| F05 | 3 May 16 | 60 | — | — | **120** | — |
| F06 | 3 May 16 | 60 | — | — | **960** | — |
| F15 | 4 May 16 | 80 | — | — | **520** | — |
| F16 | 4 May 16 | 80 | — | — | **520** | — |
| F17 | 4 May 16 | 80 | — | — | **500** | — |
| F18 | 4 May 16 | 80 | — | — | **420** | — |
| F19 | 4 May 16 | 80 | — | — | **380** | — |
| F20 | 4 May 16 | 80 | — | — | **220** | — |
| F32 | 10 Aug 16 | 80 | — | — | **1200** | — |
| F33 | 10 Aug 16 | 80 | — | — | **240** | — |
| F34 | 10 Aug 16 | 80 | — | — | **110** | — |
| F31 | 7 Nov 16 | 80 | — | — | **110** | — |
| F32 | 7 Nov 16 | 80 | — | — | **110** | — |
| F33 | 7 Nov 16 | 80 | — | — | **340** | — |
| F34 | 7 Nov 16 | 80 | — | — | **200** | — |
| F35 | 7 Nov 16 | 80 | — | — | **120** | — |

**Table B.8**

Summary of elevated bacteria densities in samples collected from SBOO shore, kelp, and offshore stations during 2016. Bold values exceed benchmarks for total coliform (> 10,000 CFU/100 mL), fecal coliform (> 400 CFU/100 mL), *Enterococcus* (> 104 CFU/100 mL), and/or the FTR criterion (total coliforms > 1000 CFU/100 mL and F:T > 0.10).

| Station Group | Date | Depth (m) | Total | Fecal | Entero | F:T |
|---|---|---|---|---|---|---|
| *Shore Stations South of USA/Mexico Border* | | | | | | |
| S0 | 5 Jan 16 | — | 1800 | 180 | **580** | 0.10 |
| S2 | 5 Jan 16 | — | **15,000** | **2200** | **4200** | **0.15** |
| S3 | 5 Jan 16 | — | **16,000** | **3200** | **3400** | **0.20** |
| S0 | 12 Jan 16 | — | 400 | 34 | **120** | 0.09 |
| S0 | 19 Jan 16 | — | 800 | 36 | **240** | 0.05 |
| S0 | 2 Feb 16 | — | 10,000 | 360 | **560** | 0.04 |
| S3 | 2 Feb 16 | — | **16,000** | **1800** | **2600** | **0.11** |
| S0 | 9 Feb 16 | — | 4200 | 320 | **760** | 0.08 |
| S3 | 9 Feb 16 | — | 9400 | **440** | **160** | 0.05 |
| S0 | 23 Feb 16 | — | 200 | 290 | **200** | 1.45 |
| S0 | 1 Mar 16 | — | 1800 | 380 | **860** | **0.21** |
| S0 | 8 Mar 16 | — | 2800 | 180 | **800** | 0.06 |
| S2 | 8 Mar 16 | — | 1400 | 120 | **180** | 0.09 |
| S0 | 15 Mar 16 | — | 2800 | 140 | **740** | 0.05 |
| S0 | 29 Mar 16 | — | 4000 | 220 | **260** | 0.06 |
| S0 | 5 Apr 16 | — | 960 | 72 | **180** | 0.08 |
| S0 | 26 Apr 16 | — | 4800 | 120 | **1400** | 0.03 |
| S2 | 17 May 16 | — | 320 | 22 | **420** | 0.07 |
| S0 | 24 May 16 | — | 2200 | 160 | **700** | 0.07 |
| S0 | 21 Jun 16 | — | 320 | 100 | **240** | 0.31 |
| S0 | 5 Jul 16 | — | **16,000** | **2400** | **4000** | **0.15** |
| S2 | 19 Jul 16 | — | 64 | 32 | **340** | 0.50 |
| S3 | 19 Jul 16 | — | 2 | 2 | **260** | 1.00 |
| S0 | 2 Aug 16 | — | 5400 | **560** | **1200** | 0.10 |
| S0 | 16 Aug 16 | — | 8200 | 80 | **3200** | 0.01 |

**Table B.8** *continued*

| Station Group | Date | Depth (m) | Total | Fecal | Entero | F:T |
|---|---|---|---|---|---|---|
| S2 | 20 Sep 16 | — | 3000 | 180 | **2400** | 0.06 |
| S3 | 20 Sep 16 | — | **16,000** | **5600** | **9600** | **0.35** |
| S0 | 27 Sep 16 | — | 4800 | 120 | **440** | 0.03 |
| S0 | 4 Oct 16 | — | 7600 | 220 | **780** | 0.03 |
| S0 | 11 Oct 16 | — | 6200 | 100 | **380** | 0.02 |
| S2 | 11 Oct 16 | — | 240 | 12 | **110** | 0.05 |
| S0 | 18 Oct 16 | — | 4000 | 240 | **120** | 0.06 |
| S2 | 18 Oct 16 | — | 200 | 96 | **320** | 0.48 |
| S3 | 18 Oct 16 | — | 1000 | 96 | **560** | 0.10 |
| S0 | 25 Oct 16 | — | 380 | 120 | **160** | 0.32 |
| S0 | 1 Nov 16 | — | 200 | 100 | **190** | 0.50 |
| S3 | 8 Nov 16 | — | 1500 | 110 | **140** | 0.07 |
| S0 | 15 Nov 16 | — | 2800 | 120 | **240** | 0.04 |
| S0 | 22 Nov 16 | — | 1600 | 20 | **130** | 0.01 |
| S3 | 22 Nov 16 | — | 5200 | 240 | **200** | 0.05 |
| S0 | 29 Nov 16 | — | 1800 | 60 | **120** | 0.03 |
| S0 | 6 Dec 16 | — | 800 | 62 | **110** | 0.08 |
| S0 | 27 Dec 16 | — | 740 | 62 | **320** | 0.08 |
| S3 | 27 Dec 16 | — | 120 | 20 | **120** | 0.17 |
| *Shore Stations North of USA/Mexico Border* | | | | | | |
| S10 | 5 Jan 16 | — | 6200 | **1000** | **780** | **0.16** |
| S11 | 5 Jan 16 | — | **16,000** | **12,000** | **12,000** | **0.75** |
| S12 | 5 Jan 16 | — | **16,000** | **8200** | **5400** | **0.51** |
| S4 | 5 Jan 16 | — | **16,000** | **1400** | **2400** | 0.09 |
| S5 | 5 Jan 16 | — | **16,000** | **12,000** | **12,000** | **0.75** |
| S6 | 5 Jan 16 | — | **16,000** | **12,000** | **7600** | **0.75** |
| S8 | 5 Jan 16 | — | 2600 | 360 | **180** | **0.14** |
| S9 | 5 Jan 16 | — | 3600 | **520** | **360** | **0.14** |
| S10[a] | 7 Jan 16 | — | **16,000** | **8200** | **12,000** | **0.51** |
| S11[a] | 7 Jan 16 | — | 3200 | 340 | **1600** | **0.11** |
| S12[a] | 7 Jan 16 | — | **16,000** | **1600** | **5200** | 0.10 |
| S4[a] | 7 Jan 16 | — | 2800 | 120 | **980** | 0.04 |

[a]Resample

**Table B.8** *continued*

| Station Group | Date | Depth (m) | Total | Fecal | Entero | F:T |
|---|---|---|---|---|---|---|
| S5[a] | 7 Jan 16 | — | 4000 | 60 | **1200** | 0.02 |
| S6[a] | 7 Jan 16 | — | 4400 | 220 | **800** | 0.05 |
| S8[a] | 7 Jan 16 | — | 7600 | **580** | **1400** | 0.08 |
| | | | | | | |
| S10[a] | 8 Jan 16 | — | **16,000** | **12,000** | **12,000** | **0.75** |
| S11[a] | 8 Jan 16 | — | 1000 | 200 | **460** | 0.20 |
| S12[a] | 8 Jan 16 | — | 1800 | 160 | **760** | 0.09 |
| S4[a] | 8 Jan 16 | — | — | — | **12,000** | — |
| S5[a] | 8 Jan 16 | — | — | — | **160** | — |
| S6[a] | 8 Jan 16 | — | — | — | **480** | — |
| | | | | | | |
| S10[a] | 10 Jan 16 | — | 1200 | 320 | **160** | **0.27** |
| S11[a] | 10 Jan 16 | — | 1800 | 320 | 100 | **0.18** |
| S12[a] | 10 Jan 16 | — | — | — | **120** | — |
| S5[a] | 10 Jan 16 | — | — | — | **280** | — |
| S6[a] | 10 Jan 16 | — | — | — | **140** | — |
| | | | | | | |
| S5 | 19 Jan 16 | — | 5600 | 160 | **140** | 0.03 |
| | | | | | | |
| S10 | 2 Feb 16 | — | **16,000** | **3000** | **16,000** | **0.19** |
| S4 | 2 Feb 16 | — | **16,000** | **4000** | **3400** | **0.25** |
| S5 | 2 Feb 16 | — | **16,000** | **5000** | **13,000** | **0.31** |
| | | | | | | |
| S10[a] | 4 Feb 16 | — | **16,000** | **3200** | **3000** | **0.20** |
| S4[a] | 4 Feb 16 | — | 5800 | 80 | **360** | 0.01 |
| S5[a] | 4 Feb 16 | — | **16,000** | **12,000** | **12,000** | **0.75** |
| | | | | | | |
| S10[a] | 5 Feb 16 | — | **16,000** | **420** | **720** | 0.03 |
| S4[a] | 5 Feb 16 | — | — | — | **620** | — |
| S5[a] | 5 Feb 16 | — | **16,000** | **8200** | **12,000** | **0.51** |
| | | | | | | |
| S10[a] | 7 Feb 16 | — | **16,000** | 240 | **400** | 0.02 |
| S4[a] | 7 Feb 16 | — | — | — | **140** | — |
| S5[a] | 7 Feb 16 | — | **16,000** | **540** | **880** | 0.03 |
| | | | | | | |
| S10 | 9 Feb 16 | — | **16,000** | 400 | **680** | 0.03 |
| | | | | | | |
| S10[a] | 11 Feb 16 | — | **16,000** | — | 40 | — |
| | | | | | | |
| S10[a] | 12 Feb 16 | — | **16,000** | — | — | — |
| | | | | | | |
| S4 | 8 Mar 16 | — | 1000 | 72 | **110** | 0.07 |
| | | | | | | |
| S5 | 15 Mar 16 | — | **16,000** | **2600** | **600** | **0.16** |
| | | | | | | |
| S11 | 10 May 16 | — | **16,000** | **11,000** | **10,000** | **0.69** |

[a]Resample

**Table B.8** *continued*

| Station Group | Date | Depth (m) | Total | Fecal | Entero | F:T |
|---|---|---|---|---|---|---|
| S5 | 10 May 16 | — | **16,000** | **12,000** | **12,000** | **0.75** |
| S6 | 10 May 16 | — | **16,000** | **1800** | **880** | **0.11** |
| S5[a] | 12 May 16 | — | **16,000** | **7000** | **8800** | **0.44** |
| S5[a] | 13 May 16 | — | **16,000** | **6400** | **1800** | **0.40** |
| S10 | 22 Nov 16 | — | **16,000** | **4600** | **3000** | **0.29** |
| S4 | 22 Nov 16 | — | 9200 | 400 | **380** | 0.04 |
| S5 | 22 Nov 16 | — | **16,000** | **12,000** | **12,000** | **0.75** |
| S5[a] | 23 Nov 16 | — | **16,000** | **12,000** | **6600** | **0.75** |
| S5 | 6 Dec 16 | — | **16,000** | **2400** | **600** | **0.15** |
| S5[a] | 8 Dec 16 | — | 2600 | 300 | 30 | **0.12** |
| S5 | 20 Dec 16 | — | **12,000** | **540** | **120** | 0.05 |
| S5[a] | 22 Dec 16 | — | **16,000** | **12,000** | **12,000** | **0.75** |
| S5[a] | 24 Dec 16 | — | 5200 | **580** | **1300** | **0.11** |
| S5[a] | 26 Dec 16 | — | **16,000** | **8400** | **12,000** | **0.53** |
| S5 | 27 Dec 16 | — | **16,000** | **4400** | **5000** | **0.28** |
| S6 | 27 Dec 16 | — | 280 | 32 | **110** | 0.11 |
| S5[a] | 29 Dec 16 | — | 1800 | 140 | **130** | 0.08 |
| S5[a] | 30 Dec 16 | — | — | — | **2800** | — |
| Kelp Stations | | | | | | |
| I24 | 10 Feb 16 | 2 | **16,000** | **1200** | **360** | 0.08 |
| I24 | 10 Feb 16 | 6 | **13,000** | **760** | 80 | 0.06 |
| I25 | 10 Feb 16 | 2 | **16,000** | **960** | **280** | 0.06 |
| I25 | 10 Feb 16 | 6 | 5200 | 240 | **120** | 0.05 |
| I25 | 10 Feb 16 | 9 | 1500 | 140 | **120** | 0.09 |
| I39 | 10 Feb 16 | 2 | 1200 | 160 | 66 | **0.13** |
| I40 | 10 Feb 16 | 2 | **17,000** | **1200** | **220** | 0.07 |
| I40 | 10 Feb 16 | 6 | 2600 | 200 | **130** | 0.08 |
| I24 | 10 May 16 | 2 | 2800 | 82 | **120** | 0.03 |
| I19 | 4 Jun 16 | 6 | 660 | 54 | **120** | 0.08 |

[a]Resample

**Table B.8** *continued*

| Station Group | Date | Depth (m) | Total | Fecal | Entero | F:T |
|---|---|---|---|---|---|---|
| I25 | 1 Dec 16 | 6 | **11,000** | **500** | **110** | 0.05 |
| I25 | 1 Dec 16 | 9 | 1800 | 240 | 48 | **0.13** |
| | | | | | | |
| I19 | 17 Dec 16 | 2 | **14,000** | **600** | 340 | 0.04 |
| | | | | | | |
| Offshore Stations | | | | | | |
| I5 | 9 Feb 16 | 2 | 700 | 70 | **110** | 0.10 |
| I5 | 9 Feb 16 | 6 | 1100 | 300 | 100 | **0.27** |
| I5 | 9 Feb 16 | 11 | 2000 | 240 | **300** | **0.12** |

## Table B.9

Summary of ammonia concentrations in samples collected from the 23 PLOO kelp bed and offshore stations located within State jurisdictional waters during 2016. Data include the number of samples per month (n) and detection rate, as well as the minimum, maximum, and mean[a] detected concentrations for each month. The method detection limit for ammonia = 0.01 mg/L; nd = not detected.

| | Feb | May | Aug | Nov |
|---|---|---|---|---|
| *9-m Depth Contour* (n = 9) | | | | |
| Detection Rate (%) | 0 | 22 | 22 | 0 |
| Min | — | nd | nd | — |
| Max | — | 0.02 | 0.01 | — |
| Mean | — | 0.02 | 0.01 | — |
| *18-m Depth Contour* (n = 24) | | | | |
| Detection Rate (%) | 4 | 0 | 4 | 4 |
| Min | nd | — | nd | nd |
| Max | 0.01 | — | 0.01 | 0.02 |
| Mean | 0.01 | — | 0.01 | 0.02 |
| *60-m Depth Contour* (n = 27) | | | | |
| Detection Rate (%) | 15 | 4 | 0 | 0 |
| Min | nd | nd | — | — |
| Max | 0.04 | 0.02 | — | — |
| Mean | 0.02 | 0.02 | — | — |
| *80-m Depth Contour* (n = 12) | | | | |
| Detection Rate (%) | 42 | 8 | 25 | 0 |
| Min | nd | nd | nd | — |
| Max | 0.05 | 0.01 | 0.02 | — |
| Mean | 0.02 | 0.01 | 0.01 | — |

[a]Minimum and maximum values were based on all samples whereas means were calculated on detected values only

## Table B.10

Summary of total suspended solids (TSS) and oil and grease (O&G) concentrations in samples collected from the SBOO kelp bed and other offshore stations during 2016. Data include the number of samples per month (n) and detection rate, as well as the minimum, maximum, and mean[a] of detected concentrations for each month. The method detection limit = 0.2 mg/L for both TSS and O&G with the exception of O&G samples analyzed in August when the method detection limit was 5.1 mg/L; nd = not detected.

| | Feb | May | Aug | Nov |
|---|---|---|---|---|
| **Kelp Bed Stations** | | | | |
| *Total Suspended Solids* (n = 21) | | | | |
| Detection Rate (%) | 100 | 90 | 67 | 71 |
| Min | 3.5 | nd | nd | nd |
| Max | 24.8 | 11.3 | 7.3 | 10.0 |
| Mean | 7.1 | 5.0 | 2.4 | 3.5 |
| *Oil and Grease* (n = 7) | | | | |
| Detection Rate (%) | 0 | 0 | 0 | 0 |
| Min | — | — | — | — |
| Max | — | — | — | — |
| Mean | — | — | — | — |
| **Non-Kelp Bed Stations** | | | | |
| *Total Suspended Solids* (n = 63) | | | | |
| Detection Rate (%) | 92 | 73 | 30 | 22 |
| Min | nd | nd | nd | nd |
| Max | 9.6 | 8.7 | 3.6 | 5.5 |
| Mean | 4.3 | 3.0 | 1.0 | 0.9 |
| *Oil and Grease* (n = 21) | | | | |
| Detection Rate (%) | 0 | 0 | 0 | 0 |
| Min | — | — | — | — |
| Max | — | — | — | — |
| Mean | — | — | — | — |

[a]Minimum and maximum values were based on all samples whereas means were calculated on detected values only

## Table B.11

Summary of oceanographic data within potential detected plume at PLOO offshore stations and corresponding reference values during 2016. 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. MC = meets criteria ( = bold rows; see Materials and Methods); DO = dissolved oxygen; XMS = transmissivity; SD = standard deviation; CI = confidence interval.

| | | Potential Plume | | | | | | Reference | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station | Date | Depth (m) | Width (m) | MC | Mean DO | Mean pH | Mean XMS | DO (Mean - SD) | pH (Mean) | XMS (Mean - 95% CI) |
| **F19[a]** | **2-Feb-16** | **50** | **8** | **Y** | **5.1** | **8.0** | **87** | **5.2** | **8.0** | **78** |
| **F20[a]** | **2-Feb-16** | **53** | **14** | **Y** | **4.8** | **7.9** | **86** | **5.2** | **8.0** | **81** |
| **F21** | **2-Feb-16** | **44** | **23** | **Y** | **4.7** | **7.9** | **84** | **5.1** | **8.0** | **83** |
| **F22** | **2-Feb-16** | **48** | **19** | **Y** | **4.8** | **8.0** | **84** | **5.1** | **8.0** | **80** |
| **F23** | **2-Feb-16** | **54** | **2** | **Y** | **5.0** | **8.0** | **85** | **5.2** | **8.0** | **77** |
| | | | | | | | | | | |
| **F29** | **5-Feb-16** | **55** | **8** | **Y** | **5.2** | **8.0** | **81** | **5.3** | **8.0** | **80** |
| **F30** | **5-Feb-16** | **60** | **37** | **Y** | **4.8** | **7.9** | **69*** | **5.0** | **7.9** | **80** |
| **F31** | **5-Feb-16** | **63** | **11** | **Y** | **5.1** | **8.0** | **80** | **5.0** | **8.0** | **80** |
| **F34** | **5-Feb-16** | **94** | **5** | **Y** | **4.7** | **7.9** | **83** | **4.7** | **7.9** | **61** |
| | | | | | | | | | | |
| **F26** | **2-May-16** | **68** | **28** | **Y** | **4.2** | **7.8** | **89** | **4.1** | **7.8** | **89** |
| **F27** | **2-May-16** | **93** | **3** | **Y** | **3.9** | **7.8** | **89** | **3.9** | **7.8** | **87** |
| **F28** | **2-May-16** | **94** | **3** | **Y** | **3.9** | **7.8** | **88** | **3.9** | **7.8** | **87** |
| **F29** | **2-May-16** | **84** | **13** | **Y** | **3.8** | **7.8** | **88** | **3.9** | **7.8** | **88** |
| **F30** | **2-May-16** | **75** | **13** | **Y** | **3.8** | **7.8** | **88*** | **4.1** | **7.8** | **89** |
| | | | | | | | | | | |
| **F06[a]** | **3-May-16** | **48** | **4** | **Y** | **3.6** | **7.8** | **77*** | **3.9** | **7.9** | **86** |
| | | | | | | | | | | |
| **F15** | **4-May-16** | **71** | **9** | **Y** | **3.9*** | **7.8** | **87*** | **4.3** | **7.8** | **90** |
| **F16** | **4-May-16** | **65** | **15** | **Y** | **3.8*** | **7.8** | **82*** | **4.4** | **7.9** | **90** |
| **F17** | **4-May-16** | **70** | **10** | **Y** | **3.8*** | **7.8** | **88*** | **4.4** | **7.9** | **90** |
| **F18[a]** | **4-May-16** | **76** | **5** | **Y** | **3.8*** | **7.8** | **88*** | **4.2** | **7.8** | **90** |
| **F19[a]** | **4-May-16** | **80** | **1** | **Y** | **3.7*** | **7.8** | **87*** | **4.1** | **7.8** | **90** |
| **F23** | **4-May-16** | **68** | **1** | **Y** | **4.0*** | **7.8** | **89*** | **4.5** | **7.9** | **90** |
| F25 | 4-May-16 | 55 | 1 | N | 4.9 | 7.9 | 90 | 3.8 | 7.9 | 82 |

[a]Station located within State jurisdictional waters

## Table B.11 *continued*

| | | Potential Plume | | | | | | Reference | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Station** | **Date** | **Depth (m)** | **Width (m)** | **MC** | **Mean DO** | **Mean pH** | **Mean XMS** | **DO (Mean-SD)** | **pH (Mean)** | **XMS (Mean-95% CI)** |
| F01 [a] | 8-Aug-16 | 10 | 6 | N | 7.0 | 8.1 | 85 | 8.4 | 8.3 | 83 |
| F02 [a] | 8-Aug-16 | 14 | 3 | N | 6.7 | 8.1 | 83 | 8.4 | 8.2 | 84 |
| F03 [a] | 8-Aug-16 | 10 | 7 | N | 7.1 | 8.1 | 83 | 8.4 | 8.3 | 83 |
| F06 [a] | 8-Aug-16 | 12 | 2 | N | 7.4 | 8.2 | 85 | 8.4 | 8.3 | 84 |
| F07 [a] | 8-Aug-16 | 10 | 8 | N | 7.2 | 8.1 | 86 | 8.5 | 8.3 | 84 |
| F08 [a] | 8-Aug-16 | 10 | 10 | N | 7.3 | 8.1 | 86 | 8.5 | 8.2 | 84 |
| F09 [a] | 8-Aug-16 | 14 | 3 | N | 7.2 | 8.2 | 86 | 8.4 | 8.2 | 84 |
| F10 [a] | 8-Aug-16 | 10 | 3 | N | 7.5 | 8.2 | 84 | 8.5 | 8.3 | 82 |
| F11 [a] | 8-Aug-16 | 13 | 3 | N | 7.4 | 8.2 | 84 | 8.3 | 8.2 | 84 |
| F14 [a] | 8-Aug-16 | 11 | 2 | N | 7.5 | 8.2 | 83 | 8.5 | 8.3 | 83 |
| F23 | 9-Aug-16 | 15 | 3 | N | 7.8 | 8.2 | 85 | 8.5 | 8.2 | 85 |
| F24 | 9-Aug-16 | 18 | 1 | N | 7.4 | 8.2 | 87 | 8.6 | 8.2 | 85 |
| F28 | 10-Aug-16 | 11 | 3 | N | 8.5 | 8.3 | 80 | 8.4 | 8.3 | 83 |
| F29 | 10-Aug-16 | 10 | 3 | N | 8.3 | 8.3 | 80 | 8.5 | 8.3 | 82 |
| F30 | 10-Aug-16 | 10 | 4 | N | 8.0 | 8.3 | 83 | 8.6 | 8.3 | 83 |
| **F31 [b]** | **10-Aug-16** | **nr** | **nr** | **Y** | **5.8** | **8.0** | **85** | **6.5** | **8.1** | **82** |
| **F32 [b]** | **10-Aug-16** | **nr** | **nr** | **Y** | **5.0*** | **7.9** | **84** | **6.3** | **8.0** | **84** |
| **F33 [b]** | **10-Aug-16** | **nr** | **nr** | **Y** | **4.9** | **7.9** | **85** | **6.1** | **8.0** | **84** |
| **F30** | **7-Nov-16** | **66** | **23** | **Y** | **4.7** | **7.9** | **81*** | **5.2** | **8.0** | **85** |
| **F31** | **7-Nov-16** | **76** | **6** | **Y** | **5.0** | **7.9** | **86** | **5.1** | **7.9** | **83** |
| **F33** | **7-Nov-16** | **73** | **11** | **Y** | **4.9** | **7.9** | **86** | **5.1** | **8.0** | **84** |
| **F34** | **7-Nov-16** | **66** | **25** | **Y** | **4.8** | **7.9** | **84** | **5.2** | **8.0** | **84** |
| **F35** | **7-Nov-16** | **70** | **27** | **Y** | **4.9** | **7.9** | **85** | **5.1** | **8.0** | **84** |
| **F36** | **7-Nov-16** | **74** | **20** | **Y** | **4.9** | **7.9** | **86** | **5.1** | **8.0** | **83** |

[a] Station located within State jurisdictional waters; [b] nr = not reportable, confounding CDOM signals; plume signal evident below 60 m

## Table B.12

Summary of oceanographic data within potential detected plume at SBOO offshore stations and corresponding reference values during 2016. Plume depth is the minimum depth at which CDOM exceeds the 95$^{th}$ percentile while plume width is the number of meters across which that exceedance occurs. Out-of-range values are indicated with an asterisk. MC = meets criteria (= bold rows; see Materials and Methods); DO = dissolved oxygen; XMS = transmissivity; SD = standard deviation; CI = confidence interval.

| | | Potential Plume | | | | | | Reference | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station | Date | Depth (m) | Width (m) | MC | Mean DO | Mean pH | Mean XMS | DO (Mean - SD) | pH (Mean) | XMS (Mean - 95% CI) |
| I12[a] | 10-Feb-16 | 23 | 3 | N | 7.4 | 7.9 | 73 | 7.0 | 8.1 | 81 |
| **I14[a]** | **10-Feb-16** | **2** | **8** | **Y** | **7.4** | **7.9** | **75*** | **7.1** | **8.1** | **81** |
| **I15** | **10-Feb-16** | **2** | **2** | **Y** | **7.5** | **8.0** | **79*** | **7.5** | **8.1** | **83** |
| **I16[a]** | **10-Feb-16** | **2** | **3** | **Y** | **7.4** | **7.9** | **74*** | **7.3** | **8.1** | **82** |
| **I27[a]** | **10-Feb-16** | **23** | **3** | **Y** | **7.0** | **7.9** | **74*** | **7.0** | **8.1** | **81** |
| I39[a] | 10-Feb-16 | 2 | 14 | N | 7.6 | 7.9 | 64 | 7.4 | 8.1 | 82 |
| | | | | | | | | | | |
| **I12[a]** | **10-May-16** | **18** | **1** | **Y** | **5.9** | **8.0** | **83** | **5.9** | **8.0** | **81** |
| **I15** | **10-May-16** | **22** | **2** | **Y** | **6.0** | **8.0** | **83** | **5.4** | **7.9** | **82** |
| I39[a] | 10-May-16 | 13 | 1 | N | 6.0 | 8.0 | 78 | 6.9 | 8.1 | 80 |
| I34[a] | 11-May-16 | 5 | 12 | N | 6.2 | 8.1 | 71 | 7.2 | 8.1 | 80 |
| | | | | | | | | | | |
| **I15** | **4-Aug-16** | **19** | **3** | **Y** | **7.6** | **8.2** | **83** | **7.1** | **8.2** | **83** |
| I31[a] | 3-Aug-16 | 15 | 2 | N | 7.1 | 8.2 | 81 | 7.7 | 8.2 | 83 |
| **I34[a]** | **3-Aug-16** | **10** | **7** | **Y** | **7.1*** | **8.2** | **81*** | **8.1** | **8.3** | **82** |
| I35[a] | 3-Aug-16 | 10 | 3 | N | 7.0 | 8.2 | 79 | 8.1 | 8.3 | 82 |
| **I27[a]** | **4-Aug-16** | **19** | **2** | **Y** | **7.5** | **8.2** | **83** | **7.1** | **8.2** | **83** |
| **I39[a]** | **4-Aug-16** | **11** | **5** | **Y** | **7.2*** | **8.1** | **82** | **8.2** | **8.3** | **82** |
| | | | | | | | | | | |
| **I12[a]** | **1-Nov-16** | **18** | **4** | **Y** | **7.1** | **8.0** | **82*** | **6.9** | **8.1** | **83** |
| **I15** | **1-Nov-16** | **18** | **2** | **Y** | **7.2** | **8.1** | **82*** | **6.9** | **8.1** | **83** |
| **I16[a]** | **1-Nov-16** | **21** | **2** | **Y** | **7.1** | **8.0** | **82*** | **6.7** | **8.1** | **84** |
| I23[a] | 1-Nov-16 | 11 | 1 | N | 7.0 | 8.0 | 77 | 7.6 | 8.1 | 82 |
| I39[a] | 1-Nov-16 | 13 | 3 | N | 6.8 | 7.9 | 79 | 7.2 | 8.1 | 81 |

[a]Station located within State jurisdictional waters

# Appendix C

# Chapter 3. Benthic Conditions

# Figures & Tables

# Appendix C

# FIGURES

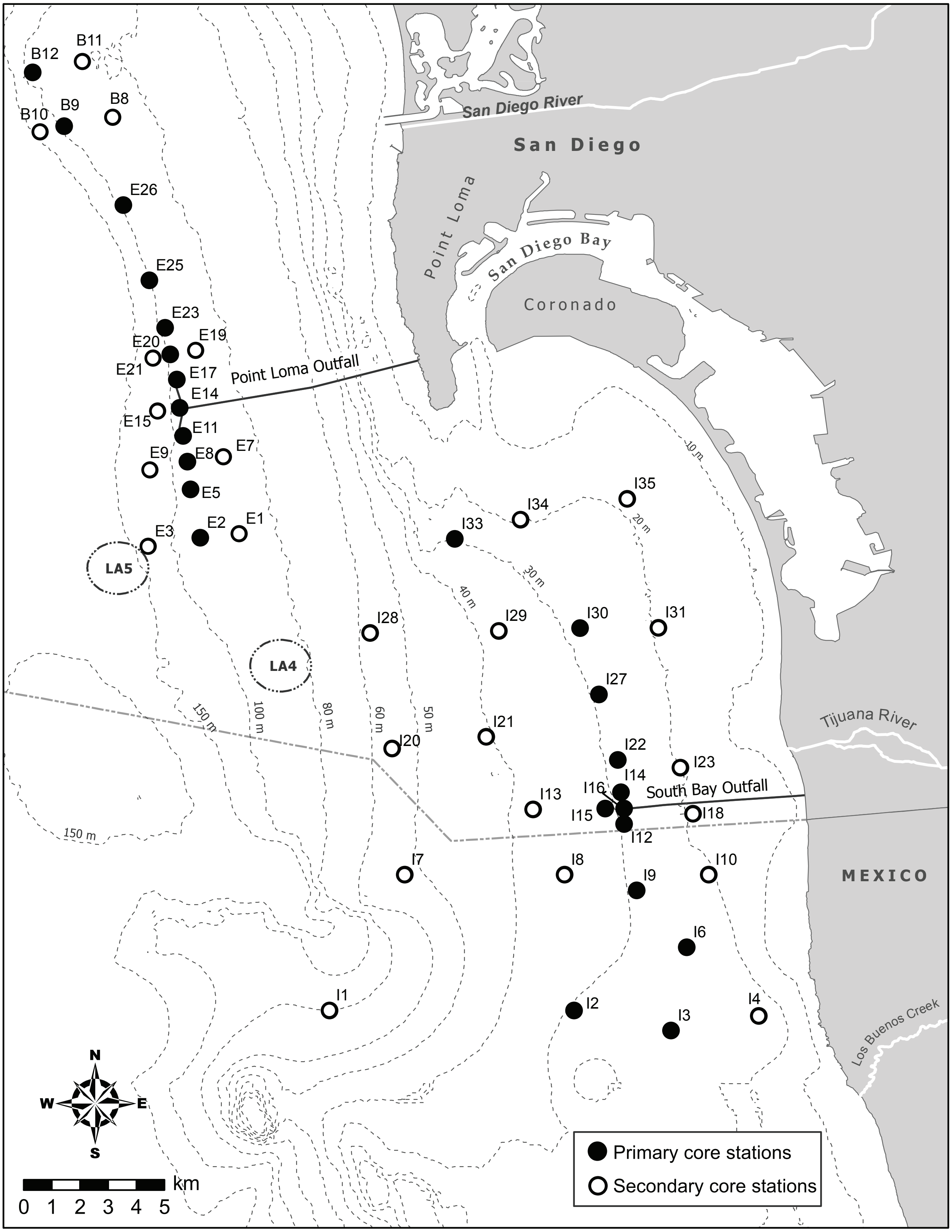
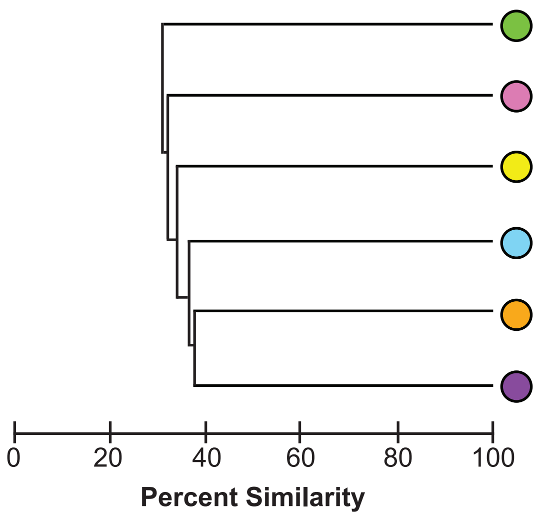


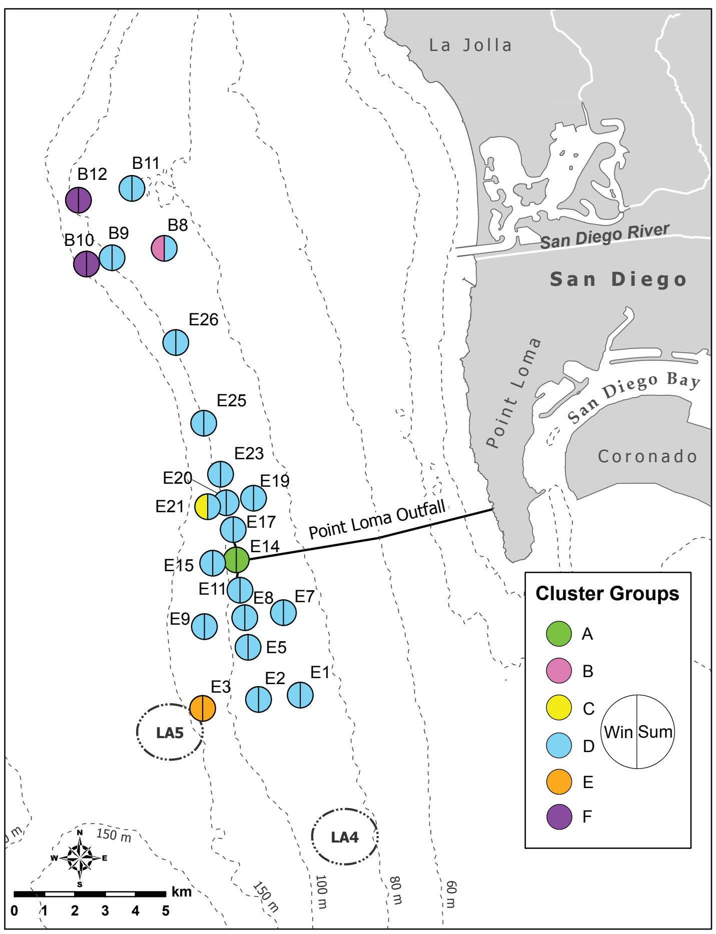

**Figure C.1**
Benthic station locations sampled around the Point Loma and South Bay Ocean Outfalls as part of the City of San Diego's Ocean Monitoring Program.

**A**



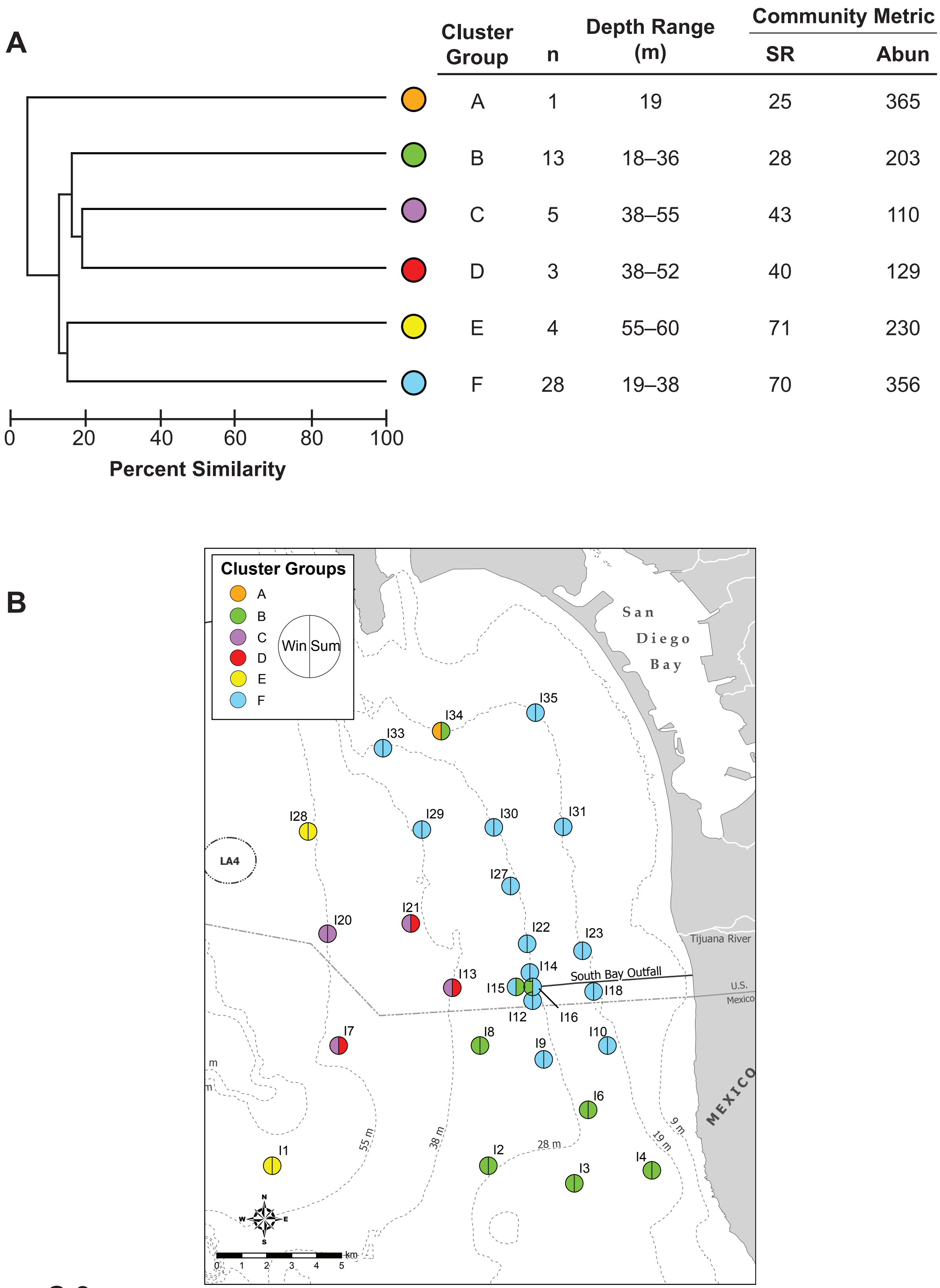

| Cluster Group | n | Depth Range (m) | Community Metric SR | Community Metric Abun |
|---|---|---|---|---|
| A | 2 | 98–98 | 50 | 161 |
| B | 1 | 88 | 34 | 120 |
| C | 1 | 116 | 28 | 56 |
| D | 34 | 88–116 | 61 | 199 |
| E | 2 | 116–116 | 84 | 184 |
| F | 4 | 98–116 | 82 | 259 |

**B**




## Figure C.2

Results of cluster analysis of macrofaunal assemblages at PLOO benthic stations sampled during 2016. Data are presented as: (A) dendrogram of main cluster groups with community metrics presented as means across all stations within a cluster group (n) and (B) distribution of cluster groups in the PLOO region. SR = species richness; Abun = abundance.




| Cluster Group | n | Depth Range (m) | Community Metric SR | Community Metric Abun |
|---|---|---|---|---|
| A | 1 | 19 | 25 | 365 |
| B | 13 | 18–36 | 28 | 203 |
| C | 5 | 38–55 | 43 | 110 |
| D | 3 | 38–52 | 40 | 129 |
| E | 4 | 55–60 | 71 | 230 |
| F | 28 | 19–38 | 70 | 356 |

## Figure C.3

Results of cluster analysis of macrofaunal assemblages at SBOO benthic stations sampled during 2016. Data are presented as: (A) dendrogram of main cluster groups with community metrics presented as means across all stations within a cluster group (n) and (B) distribution of cluster groups in the SBOO region. SR = species richness; Abun = abundance.

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# Appendix C

# TABLES

## Table C.1

Constituents and method detection limits (MDL) used for the analysis of sediments during 2016.

| Parameter | MDL | Parameter | MDL |
|---|---|---|---|
| **Organic Indicators** | | | |
| Biological Oxygen Demand (BOD, ppm) | 2 | Total Sulfides (ppm) | 0.14 |
| Total Nitrogen (TN, % wt.) | 0.01 | Total Volatile Solids (TVS, % wt.) | 0.11 |
| Total Organic Carbon (TOC, % wt.) | 0.04 | | |
| **Metals (ppm)** | | | |
| Aluminum (Al)[a] | 2, 2.4 | Lead (Pb)[a] | 0.8, 0.3 |
| Antimony (Sb)[a] | 0.3, 0.79 | Manganese (Mn)[a] | 0.08, 0.19 |
| Arsenic (As)[a] | 0.33, 0.308 | Mercury (Hg) | 0.004 |
| Barium (Ba)[a] | 0.02, 0.08 | Nickel (Ni)[a] | 0.1,0.3 |
| Beryllium (Be)[a] | 0.01, 0.02 | Selenium (Se) | 0.24 |
| Cadmium (Cd)[a] | 0.06, 0.13 | Silver (Ag)[a] | 0.04, 0.206 |
| Chromium (Cr)[a] | 0.1, 0.136 | Thallium (Tl)[a] | 0.5, 0.43 |
| Copper (Cu)[a] | 0.2, 0.695 | Tin (Sn)[a] | 0.3, 0.409 |
| Iron (Fe)[a] | 9, 2.88 | Zinc (Zn)[a] | 0.25, 1.45 |
| **Chlorinated Pesticides (ppt)** | | | |
| *Hexachlorocyclohexane (HCH)* | | | |
| HCH, Alpha isomer[a] | 730, 62.7 | HCH, Delta isomer[a] | 160, 47.1 |
| HCH, Beta isomer[a] | 50, 52.7 | HCH, Gamma isomer[a] | 500, 40.1 |
| *Total Chlordane* | | | |
| Alpha (cis) Chlordane[a] | 170, 49.7 | Heptachlor epoxide[a] | 76, 29.6 |
| Cis Nonachlor[a] | 210, 81.9 | Methoxychlor[a] | 250, 66 |
| Gamma (trans) Chlordane[a] | 61, 52.2 | Oxychlordane[a] | 210, 78.2 |
| Heptachlor[a] | 76, 29.6 | Trans Nonachlor[a] | 150, 25.3 |
| *Total Dichlorodiphenyltrichloroethane (DDT)* | | | |
| o,p-DDD[a] | 90, 31.2 | p,p-DDE[a] | 90, 31.4 |
| o,p-DDE[a] | 110, 31.8 | p,p-DDMU[a] | 46, 15.4 |
| o,p-DDT[a] | 73, 43.3 | p,p-DDT[a] | 52, 47.7 |
| p,p-DDD[a] | 120, 53.3 | | |
| *Miscellaneous Pesticides* | | | |
| Aldrin[a] | 300, 41.6 | Endrin[a] | 1000, 128 |
| Alpha Endosulfan[a] | 380, 53.6 | Endrin aldehyde[a] | 1800, 72.9 |
| Beta Endosulfan[a] | 230, 138 | Hexachlorobenzene (HCB)[a] | 64, 90.7 |
| Dieldrin[a] | 370, 103 | Mirex[a] | 61, 25.8 |
| Endosulfan Sulfate[a] | 570, 75.5 | | |

[a]MDL differed between winter and summer samples for this parameter

**Table C.1** *continued*

| Parameter | MDL | Parameter | MDL |
|---|---|---|---|
| **Polychlorinated Biphenyl Congeners (PCBs) (ppt)** | | | |
| PCB 18[a] | 90, 53.8 | PCB 126[a] | 98, 25.5 |
| PCB 28[a] | 96, 40.3 | PCB 128[a] | 110, 34.3 |
| PCB 37[a] | 47, 16.9 | PCB 138[a] | 39, 45.5 |
| PCB 44[a] | 37, 38.8 | PCB 149[a] | 54, 59.6 |
| PCB 49[a] | 32, 34.4 | PCB 151[a] | 81, 56.2 |
| PCB 52[a] | 37, 36.6 | PCB 153/168[a] | 100, 104 |
| PCB 66[a] | 72, 16.5 | PCB 156[a] | 57, 28.6 |
| PCB 70[a] | 58, 21.8 | PCB 157[a] | 62, 23.0 |
| PCB 74[a] | 51, 17.9 | PCB 158[a] | 57, 26.7 |
| PCB 77[a] | 110, 23.9 | PCB 167[a] | 37, 23.2 |
| PCB 81[a] | 18, 22.3 | PCB 169[a] | 58, 17.3 |
| PCB 87[a] | 44, 30.7 | PCB 170[a] | 72, 44.2 |
| PCB 99[a] | 80, 31.0 | PCB 177[a] | 37, 25.8 |
| PCB 101[a] | 50, 30.0 | PCB 180[a] | 100, 56.7 |
| PCB 105[a] | 37, 23.4 | PCB 183[a] | 55, 28.5 |
| PCB 110[a] | 48, 53.6 | PCB 187[a] | 96, 36.6 |
| PCB 114[a] | 78, 33.0 | PCB 189[a] | 26, 17.8 |
| PCB 118[a] | 110, 30.8 | PCB 194[a] | 110, 31.0 |
| PCB 119[a] | 59, 27.3 | PCB 201[a] | 51, 21.4 |
| PCB 123[a] | 79, 31.3 | PCB 206[a] | 68, 26.1 |
| **Polycyclic Aromatic Hydrocarbons (PAHs) (ppb)** | | | |
| 1-methylnaphthalene[a] | 20, 14.1 | Benzo[G,H,I]perylene[a] | 20, 16.4 |
| 1-methylphenanthrene[a] | 20, 22.5 | Benzo[K]fluoranthene[a] | 20, 13.9 |
| 2,3,5-trimethylnaphthalene[a] | 20, 17.7 | Biphenyl[a] | 30, 21.3 |
| 2,6-dimethylnaphthalene[a] | 20, 20.2 | Chrysene[a] | 40, 14.8 |
| 2-methylnaphthalene[a] | 20, 23.2 | Dibenzo(A,H)anthracene[a] | 20, 12.0 |
| 3,4-benzo(B)fluoranthene[a] | 20, 9.93 | Fluoranthene[a] | 20, 13.6 |
| Acenaphthene[a] | 20, 17.6 | Fluorene[a] | 20, 17.9 |
| Acenaphthylene[a] | 30, 15.7 | Indeno(1,2,3-CD)pyrene[a] | 20, 11.7 |
| Anthracene[a] | 20, 16.2 | Naphthalene[a] | 30, 32.9 |
| Benzo[A]anthracene[a] | 20, 13.5 | Perylene[a] | 30, 14.6 |
| Benzo[A]pyrene[a] | 20, 12.5 | Phenanthrene[a] | 30, 14.3 |
| Benzo[e]pyrene[a] | 20, 11.4 | Pyrene[a] | 20, 15.4 |

[a]MDL differed between winter and summer samples for this parameter

## Table C.2

Particle size classification schemes (based on Folk 1980) used in the analysis of sediments during 2016. 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 | 1100 | 2000 | SIEVE_1000 | Very coarse sand | Coarse Particles |
| 1 | 590 | 1000 | SIEVE_500 | Coarse sand | Med-Coarse Sands |
| 2 | 300 | 500 | SIEVE_250 | Medium sand | Med-Coarse Sands |
| 3 | 149 | 250 | SIEVE_125 | Fine sand | Fine Sands |
| 4 | 64 | 125 | SIEVE_63 | Very fine sand | Fine Sands |
| 5 | 32 | 62.5 | SIEVE_0[b] | Coarse silt | Fine Particles[c] |
| 6 | 16 | 31 | — | Medium silt | Fine Particles[c] |
| 7 | 8 | 15.6 | — | Fine silt | Fine Particles[c] |
| 8 | 4 | 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

## Table C.3

Summary of particle sizes and chemistry concentrations in sediments from PLOO benthic stations sampled during 2016. Data include the detection rate (DR), mean, minimum, and maximum values for the entire survey area. The maximum value from the pre-discharge period (i.e., 1991–1993) is also presented. ERL = Effects Range Low threshold; ERM = Effects Range Median threshold; na = not available; nd = not detected.

| | 2016 Summary [a] | | | | Pre-discharge | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **DR (%)** | **Mean** | **Min** | **Max** | **Max** | **ERL [b]** | **ERM [b]** |
| ***Particle Size*** | | | | | | | |
| Coarse Particles(%) | 23 | 1.5 | 0.0 | 20.5 | 26.4 | na | na |
| Med-Coarse Sands (%) | 100 | 4.9 | 0.1 | 28.6 | 41.6 | na | na |
| Fine sands (%) | 100 | 54.2 | 32.9 | 71.4 | 72.6 | na | na |
| Fines (%) | 100 | 39.4 | 19.8 | 65.6 | 74.4 | na | na |
| ***Organic Indicators*** | | | | | | | |
| BOD (ppm) | 100 | 295 | 146 | 592 | 656 | na | na |
| Sulfides (ppm) | 100 | 9.51 | 2.27 | 50.90 | 20.0 | na | na |
| TN (% weight) | 100 | 0.052 | 0.023 | 0.090 | 0.158 | na | na |
| TOC (% weight) | 100 | 0.53 | 0.13 | 2.46 | 1.57 | na | na |
| TVS (% weight) | 100 | 2.10 | 1.40 | 3.80 | 5.0 | na | na |
| ***Trace Metals (ppm)*** | | | | | | | |
| Aluminum | 100 | 8334 | 5500 | 12,600 | na | na | na |
| Antimony | 93 | 0.9 | nd | 1.7 | 8.0 | na | na |
| Arsenic | 100 | 2.55 | 1.02 | 5.95 | 6.6 | 8.2 | 70 |
| Barium | 100 | 35.1 | 18.6 | 61.3 | na | na | na |
| Beryllium | 5 | 0.03 | nd | 0.03 | 2.01 | na | na |
| Cadmium | 5 | 1.38 | nd | 2.67 | 6.80 | 1.2 | 9.6 |
| Chromium | 100 | 19.0 | 12.2 | 32.1 | 51.0 | 81 | 370 |
| Copper | 98 | 7.4 | nd | 72.7 | 34.0 | 34 | 270 |
| Iron | 100 | 12,023 | 7090 | 21,300 | 26,200 | na | na |
| Lead | 100 | 6.6 | 2.2 | 107.0 | 18.0 | 46.7 | 218 |
| Manganese | 100 | 94.1 | 57.9 | 136.0 | na | na | na |
| Mercury | 100 | 0.024 | 0.011 | 0.050 | 0.096 | 0.15 | 0.71 |
| Nickel | 100 | 6.1 | 3.1 | 9.7 | 14.0 | 20.9 | 51.6 |
| Selenium | 61 | 0.35 | nd | 0.82 | 0.90 | na | na |
| Silver | 2 | 3.2 | nd | 3.2 | 7.00 | 1.0 | 3.7 |
| Tin | 98 | 0.7 | nd | 3.2 | na | na | na |
| Zinc | 100 | 28.2 | 18.0 | 42.3 | 67.0 | 150 | 410 |
| ***Pesticides (ppt)*** | | | | | | | |
| Total DDT | 100 | 561 | 204 | 1300 | 13,200 | 1580 | 46,100 |
| Total HCH | 5 | 169 | nd | 179 | na | na | na |
| Total Chlordane | 21 | 240 | nd | 985 | na | na | na |
| HCB | 78 | 453 | nd | 1650 | na | na | na |
| ***Total PCB (ppt)*** | 81 | 1947 | nd | 18,226 | na | na | na |
| ***Total PAH (ppb)*** | 74 | 50 | nd | 400 | na | 4022 | 44,792 |

[a] Minimum and maximum values were based on all samples (n = 44), whereas means were calculated on detected values only (n ≤ 44)

[b] From Long et al. 1995

## Table C.4

Summary of particle sizes and chemistry concentrations in sediments from SBOO benthic stations sampled during 2016. Data include the detection rate (DR), mean, minimum and maximum values for the entire survey area. The maximum value from the pre-discharge period (i.e., 1995–1998) is also presented. ERL = Effects Range Low threshold; ERM = Effects Range Median threshold; na = not available; nd = not detected.

| | 2016 Summary [a] | | | | Pre-discharge | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **DR (%)** | **Mean** | **Min** | **Max** | **Max** | **ERL [b]** | **ERM [b]** |
| ***Particle Size*** | | | | | | | |
| Coarse Particles (%) | 46 | 2.9 | 0.0 | 41.9 | 52.5 | na | na |
| Med-Coarse sands (%) | 100 | 37.2 | 0.6 | 91.3 | 99.8 | na | na |
| Fine Sands (%) | 100 | 50.3 | 1.6 | 91.5 | 97.4 | na | na |
| Fines (%) | 85 | 9.6 | 0.0 | 39.1 | 47.2 | na | na |
| ***Organic Indicators*** | | | | | | | |
| Sulfides (ppm) | 98 | 3.88 | nd | 48.20 | 222.0 | na | na |
| TN (% weight) | 54 | 0.030 | nd | 0.061 | 0.077 | na | na |
| TOC (% weight) | 78 | 0.15 | nd | 0.56 | 0.64 | na | na |
| TVS (% weight) | 100 | 0.87 | 0.20 | 8.20 | 9.20 | na | na |
| ***Trace Metals (ppm)*** | | | | | | | |
| Aluminum | 100 | 3730 | 564 | 12,000 | 15,800 | na | na |
| Antimony | 50 | 0.6 | nd | 1.5 | 5.6 | na | na |
| Arsenic | 100 | 2.51 | 0.79 | 10.50 | 10.9 | 8.2 | 70 |
| Barium | 100 | 19.3 | 1.2 | 56.4 | 54.3 | na | na |
| Cadmium | 11 | 0.07 | nd | 0.08 | 0.41 | 1.2 | 9.6 |
| Chromium | 100 | 9.8 | 2.9 | 28.7 | 33.8 | 81 | 370 |
| Copper | 67 | 2.5 | nd | 9.2 | 11.1 | 34 | 270 |
| Iron | 100 | 5910 | 1200 | 16,900 | 17,100 | na | na |
| Lead | 100 | 2.1 | 0.9 | 5.8 | 6.8 | 46.7 | 218 |
| Manganese | 100 | 49.8 | 5.4 | 134.0 | 162.0 | na | na |
| Mercury | 41 | 0.008 | nd | 0.017 | 0.078 | 0.15 | 0.71 |
| Nickel | 100 | 2.7 | 0.7 | 9.3 | 13.6 | 20.9 | 51.6 |
| Selenium | 2 | 0.24 | nd | 0.24 | 0.6 | na | na |
| Silver | 6 | 0.18 | nd | 0.29 | na | 1.0 | 3.7 |
| Tin | 19 | 0.7 | nd | 1.1 | na | na | na |
| Zinc | 100 | 12.3 | 2.2 | 40.9 | 46.9 | 150 | 410 |
| ***Pesticides (ppt)*** | | | | | | | |
| Total DDT | 74 | 180 | nd | 1320 | 23,380 | 1580 | 46,100 |
| Total HCH | 6 | 64 | nd | 134 | 3880 | na | na |
| Total Chlordane | 7 | 28 | nd | 38 | 1260 | na | na |
| HCB | 61 | 838 | nd | 6200 | na | na | na |
| Mirex | 2 | 17 | nd | 16.8 | na | na | na |
| ***Total PCB (ppt)*** | 48 | 370 | nd | 3607 | na | na | na |
| ***Total PAH (ppb)*** | 19 | 27 | nd | 121 | 1942 | 4022 | 44,792 |

[a] Minimum and maximum values were based on all samples (n = 54), whereas means were calculated on detected values only (n ≤ 54)

[b] From Long et al. 1995

## Table C.5

Summary of particle size parameters (%) for each PLOO station sampled during winter 2016. 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[s] | 19.5 | 1.0 | 20.5 | 1.7 | 5.1 | 6.8 | 13.9 | 25.6 | 39.5 | 33.2 | — | — | — | — | 33.2 | pea gravel, rock |
| | B8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 6.3 | 31.8 | 38.1 | 29.0 | 13.1 | 14.7 | 4.8 | 0.2 | 61.8 | |
| | E19 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 7.1 | 39.0 | 46.1 | 29.8 | 9.7 | 10.6 | 3.6 | 0.1 | 53.8 | |
| | E7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 9.9 | 41.1 | 51.0 | 26.5 | 8.6 | 9.6 | 3.8 | 0.3 | 48.8 | shell hash, organic debris |
| | E1 | 0.0 | 0.0 | 0.0 | 0.0 | 5.4 | 5.4 | 20.3 | 30.6 | 50.9 | 18.9 | 9.2 | 11.4 | 4.1 | 0.2 | 43.7 | gravel, rock, shell hash |
| *98-m Stations* | B12[s] | 0.3 | 1.3 | 1.6 | 4.3 | 20.5 | 24.8 | 25.5 | 28.3 | 53.8 | 19.8 | — | — | — | — | 19.8 | gravel, shell hash |
| | B9 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 1.6 | 15.1 | 38.5 | 53.6 | 19.1 | 8.4 | 12.5 | 4.6 | 0.2 | 44.8 | pea gravel, shell hash |
| | E26 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 10.2 | 40.3 | 50.5 | 23.9 | 8.7 | 11.0 | 5.1 | 0.7 | 49.3 | shell hash, pea gravel |
| | E25[s] | 0.2 | 0.1 | 0.3 | 0.2 | 0.4 | 0.6 | 3.8 | 50.0 | 53.8 | 45.3 | — | — | — | — | 45.3 | shell hash, organic debris |
| | E23 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 10.9 | 44.6 | 55.5 | 24.2 | 7.5 | 9.1 | 3.4 | 0.1 | 44.3 | shell hash |
| | E20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.5 | 12.6 | 46.5 | 59.1 | 22.0 | 6.5 | 8.2 | 3.4 | 0.2 | 40.3 | shell hash, organic debris |
| | E17[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 17.3 | 51.1 | 68.4 | 17.7 | 4.5 | 6.0 | 2.5 | 0.1 | 30.8 | |
| | E14[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 17.4 | 53.5 | 70.9 | 14.2 | 3.5 | 6.6 | 3.8 | 0.2 | 28.3 | black sand, shell hash, org deb |
| | E11[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 15.6 | 47.8 | 63.4 | 19.9 | 5.6 | 7.4 | 2.9 | 0.1 | 35.9 | |
| | E8 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 1.5 | 17.5 | 45.0 | 62.5 | 19.3 | 6.0 | 7.4 | 3.1 | 0.2 | 36.0 | shell hash, organic debris |
| | E5 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 1.2 | 17.0 | 44.3 | 61.3 | 18.6 | 6.6 | 8.9 | 3.4 | 0.1 | 37.5 | |
| | E2 | 0.0 | 0.0 | 0.0 | 0.0 | 4.7 | 4.7 | 19.2 | 34.6 | 53.8 | 18.4 | 8.0 | 11.0 | 4.1 | 0.1 | 41.6 | gravel, shell hash |
| *116-m Stations* | B10[s] | 0.5 | 0.3 | 0.8 | 0.4 | 2.1 | 2.4 | 10.2 | 61.2 | 71.4 | 25.5 | — | — | — | — | 25.5 | shell hash |
| | E21 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 14.9 | 49.3 | 64.2 | 18.2 | 5.5 | 8.1 | 3.4 | 0.1 | 35.3 | |
| | E15 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 17.8 | 50.3 | 68.1 | 16.2 | 4.5 | 6.7 | 3.4 | 0.3 | 31.1 | gravel, shell hash |
| | E9[s] | 1.7 | 13.2 | 14.9 | 14.4 | 3.6 | 18.0 | 5.2 | 27.7 | 32.9 | 34.2 | — | — | — | — | 34.2 | black sand |
| | E3[s] | 0.7 | 2.2 | 2.8 | 5.7 | 13.3 | 19.0 | 39.1 | 18.8 | 57.9 | 20.2 | — | — | — | — | 20.2 | gravel, shell hash, org debris |

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

## Table C.5 *continued*

Summary of particle size parameters (%) for each PLOO station sampled during summer 2016. 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 | 4.7 | 4.7 | 5.8 | 7.8 | 13.5 | 13.1 | 21.5 | 34.6 | 13.8 | 9.7 | 15.6 | 6.8 | 0.7 | 46.5 | pea gravel, shell hash |
| | B8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 5.4 | 28.8 | 34.2 | 28.3 | 13.8 | 15.9 | 6.6 | 1.0 | 65.6 | |
| | E19 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 7.8 | 38.5 | 46.3 | 28.1 | 9.6 | 11.0 | 4.4 | 0.4 | 53.5 | |
| | E7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.5 | 10.2 | 38.8 | 49.0 | 25.0 | 9.3 | 11.3 | 4.6 | 0.4 | 50.6 | shell hash, worm tubes |
| | E1 | 0.0 | 0.0 | 0.0 | 0.0 | 5.2 | 5.2 | 19.6 | 29.7 | 49.3 | 18.0 | 9.3 | 12.5 | 5.2 | 0.5 | 45.5 | pea gravel, rock, shell hash |
| *98-m Stations* | B12 | 0.0 | 0.5 | 0.5 | 9.9 | 18.7 | 28.6 | 23.4 | 19.4 | 42.8 | 10.3 | 4.9 | 7.1 | 5.1 | 0.8 | 28.1 | pea gravel, shell hash |
| | B9 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 1.5 | 13.7 | 37.4 | 51.1 | 20.0 | 8.9 | 12.6 | 5.4 | 0.5 | 47.4 | pea gravel |
| | E26 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 10.3 | 40.0 | 50.3 | 23.4 | 9.1 | 11.9 | 4.9 | 0.4 | 49.6 | shell hash |
| | E25 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 10.6 | 40.3 | 50.9 | 24.4 | 8.5 | 10.8 | 4.4 | 0.3 | 48.5 | shell hash, worm tubes |
| | E23 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.5 | 11.3 | 44.2 | 55.5 | 23.8 | 7.2 | 8.7 | 3.9 | 0.4 | 44.0 | |
| | E20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 13.3 | 47.3 | 60.6 | 21.0 | 6.2 | 8.1 | 3.3 | 0.1 | 38.8 | |
| | E17[a] | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 16.0 | 49.7 | 65.7 | 18.8 | 5.2 | 6.8 | 2.7 | 0.1 | 33.6 | |
| | E14[a] | 0.0 | 10.3 | 10.3 | 9.3 | 2.6 | 11.9 | 10.6 | 40.2 | 50.8 | 13.5 | 3.1 | 5.8 | 4.3 | 0.4 | 27.0 | black sand, shell hash |
| | E11[a] | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 1.3 | 17.0 | 46.8 | 63.8 | 17.8 | 5.8 | 7.9 | 3.2 | 0.1 | 34.9 | shell hash |
| | E8 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 1.3 | 17.1 | 46.0 | 63.1 | 18.4 | 5.7 | 7.8 | 3.4 | 0.3 | 35.6 | worm tubes |
| | E5 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 1.7 | 18.7 | 44.4 | 63.1 | 17.5 | 5.9 | 8.2 | 3.4 | 0.2 | 35.2 | shell hash |
| | E2 | 0.0 | 0.0 | 0.0 | 0.0 | 3.2 | 3.2 | 18.0 | 34.0 | 52.0 | 18.7 | 9.0 | 12.6 | 4.4 | 0.1 | 44.8 | pea gravel, rock, shell hash |
| *116-m Stations* | B10 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 2.6 | 23.4 | 47.1 | 70.5 | 12.7 | 3.2 | 6.1 | 4.6 | 0.4 | 26.9 | shell hash |
| | E21 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 14.7 | 50.7 | 65.4 | 18.9 | 5.1 | 6.8 | 3.1 | 0.2 | 34.1 | |
| | E15 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 14.5 | 44.9 | 59.4 | 18.6 | 7.1 | 9.8 | 4.0 | 0.3 | 39.8 | black sand, shell hash |
| | E9 | 0.0 | 10.0 | 10.0 | 17.7 | 3.8 | 21.5 | 7.9 | 27.1 | 35.0 | 17.7 | 4.3 | 6.0 | 4.9 | 0.7 | 33.6 | black sand |
| | E3 | 0.0 | 0.0 | 0.0 | 5.6 | 20.4 | 26.0 | 28.2 | 16.3 | 44.5 | 10.3 | 6.2 | 8.2 | 4.5 | 0.4 | 29.6 | pea gravel, shell hash |

[a] Near-ZID station

## Table C.6

Summary of particle size parameters (%) for each SBOO station sampled during winter 2016. 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 | 2.0 | 2.0 | 17.4 | 41.5 | 58.9 | 22.6 | 7.7 | 6.4 | 2.3 | 0.1 | 39.1 | organic debris[b] |
| | I34[s] | 18.0 | 23.9 | 41.9 | 27.7 | 22.1 | 49.8 | 7.1 | 0.2 | 7.3 | 0.9 | — | — | — | — | 0.9 | shell hash |
| | I31 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 1.2 | 19.8 | 71.7 | 91.5 | 4.8 | 0.0 | 0.7 | 1.6 | 0.2 | 7.3 | |
| | I23[s] | 0.2 | 0.5 | 0.7 | 1.4 | 3.6 | 5.0 | 4.0 | 79.0 | 83.0 | 11.4 | — | — | — | — | 11.4 | shell hash, organic debris[b] |
| | I18 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 18.4 | 72.0 | 90.4 | 7.1 | 0.0 | 0.4 | 1.1 | 0.3 | 8.8 | black sand, organic debris[b] |
| | I10 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.0 | 25.6 | 63.9 | 89.5 | 5.2 | 0.0 | 1.3 | 1.8 | 0.1 | 8.5 | |
| | I4[s] | 1.7 | 0.9 | 2.6 | 33.5 | 53.6 | 87.1 | 8.9 | 1.0 | 9.9 | 0.4 | — | — | — | — | 0.4 | shell hash |
| *28-m Stations* | I33 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 | 2.1 | 35.0 | 52.9 | 87.9 | 3.7 | 0.8 | 2.8 | 2.6 | 0.1 | 10.0 | organic debris[b] |
| | I30 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 13.8 | 67.4 | 81.2 | 13.0 | 0.8 | 1.9 | 2.2 | 0.3 | 18.2 | |
| | I27 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 14.1 | 70.0 | 84.1 | 11.4 | 0.2 | 1.3 | 2.0 | 0.3 | 15.2 | organic debris[c] |
| | I22 | 0.0 | 0.0 | 0.0 | 1.2 | 13.7 | 14.9 | 35.4 | 38.1 | 73.5 | 7.2 | 1.0 | 1.9 | 1.5 | 0.0 | 11.6 | fouling hydroids |
| | I14[a] | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 | 2.1 | 20.7 | 60.0 | 80.7 | 11.9 | 0.9 | 2.1 | 2.2 | 0.1 | 17.3 | organic debris[b] |
| | I16[a,s] | 0.4 | 0.4 | 0.8 | 18.9 | 58.9 | 77.8 | 18.7 | 1.2 | 19.9 | 1.4 | — | — | — | — | 1.4 | shell hash |
| | I15 | 0.0 | 0.0 | 0.0 | 5.7 | 39.8 | 45.5 | 34.0 | 14.5 | 48.5 | 3.4 | 0.9 | 1.3 | 0.5 | 0.0 | 6.0 | organic debris[b] |
| | I12[a] | 0.0 | 0.0 | 0.0 | 2.4 | 17.5 | 19.9 | 32.8 | 37.5 | 70.3 | 6.7 | 0.7 | 1.2 | 1.1 | 0.0 | 9.7 | |
| | I9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 14.6 | 65.0 | 79.6 | 15.3 | 1.1 | 1.7 | 1.5 | 0.1 | 19.7 | |
| | I6[s] | 0.1 | 0.2 | 0.3 | 20.5 | 62.4 | 82.9 | 12.2 | 1.4 | 13.6 | 3.3 | — | — | — | — | 3.3 | Shell hash |
| | I2 | 0.0 | 0.1 | 0.1 | 12.2 | 57.5 | 69.7 | 27.8 | 2.4 | 30.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | |
| | I3 | 0.0 | 2.7 | 2.7 | 32.1 | 54.6 | 86.7 | 10.2 | 0.4 | 10.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| *38-m Stations* | I29 | 0.0 | 0.2 | 0.2 | 4.6 | 9.3 | 13.9 | 15.9 | 41.6 | 57.5 | 20.9 | 2.9 | 2.8 | 1.8 | 0.1 | 28.5 | organic debris[b] |
| | I21 | 0.0 | 5.1 | 5.1 | 47.7 | 41.9 | 89.6 | 5.1 | 0.2 | 5.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | red relict sand, shell hash, org debris[c] |
| | I13 | 1.4 | 4.4 | 5.8 | 41.5 | 46.5 | 88.0 | 5.7 | 0.4 | 6.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | red relict sand, shell hash, org debris[c] |
| | I8 | 0.0 | 0.9 | 0.9 | 20.6 | 58.3 | 78.9 | 17.0 | 2.2 | 19.2 | 0.2 | 0.2 | 0.6 | 0.0 | 0.0 | 0.9 | |
| *55-m Stations* | I28[s] | 5.5 | 10.7 | 16.2 | 22.4 | 13.2 | 35.6 | 4.1 | 22.0 | 26.1 | 22.1 | — | — | — | — | 22.1 | black sand |
| | I20 | 0.0 | 18.0 | 18.0 | 64.2 | 13.6 | 77.8 | 3.1 | 0.4 | 3.5 | 0.0 | 0.0 | 0.6 | 0.1 | 0.0 | 0.7 | red relict sand |
| | I7 | 0.0 | 7.9 | 7.9 | 70.6 | 20.0 | 90.6 | 1.6 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | red relict sand |
| | I1 | 0.0 | 0.0 | 0.0 | 0.0 | 4.7 | 4.7 | 46.7 | 40.3 | 87.0 | 3.1 | 0.8 | 2.4 | 2.0 | 0.1 | 8.4 | |

[a] Near-ZID station; [b] contained worm tubes; [c] *Spiochaetopterus* tubes; [s] measured by sieve (not Horiba; silt and clay fractions are indistinguishable)

**Table C.6** *continued*

Summary of particle size parameters (%) for each SBOO station sampled during summer 2016. 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 | 2.6 | 2.6 | 18.2 | 42.4 | 60.6 | 21.3 | 6.9 | 6.4 | 2.2 | 0.0 | 36.8 | algae, organic debris[b] |
| | I34 | 0.0 | 0.0 | 0.0 | 5.4 | 49.0 | 54.4 | 42.5 | 3.0 | 45.5 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | shell hash |
| | I31 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 18.6 | 72.9 | 91.5 | 5.3 | 0.0 | 0.8 | 1.6 | 0.1 | 7.8 | organic debris[b] |
| | I23 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 1.4 | 20.8 | 67.5 | 88.3 | 6.5 | 0.1 | 1.6 | 2.0 | 0.1 | 10.3 | shell hash, organic debris[b] |
| | I18 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 1.2 | 18.7 | 70.9 | 89.6 | 6.9 | 0.0 | 0.8 | 1.4 | 0.1 | 9.2 | |
| | I10 | 0.0 | 0.0 | 0.0 | 0.0 | 1.8 | 1.8 | 24.7 | 65.1 | 89.8 | 5.3 | 0.0 | 1.3 | 1.7 | 0.1 | 8.4 | shell hash, algae |
| | I4 | 0.0 | 4.6 | 4.6 | 49.9 | 41.4 | 91.3 | 3.8 | 0.4 | 4.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | shell hash, pea gravel, rock |
| *28-m Stations* | I33 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 3.3 | 35.5 | 47.8 | 83.3 | 4.4 | 1.5 | 4.4 | 3.1 | 0.1 | 13.5 | shell hash, organic debris[b] |
| | I30 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 13.4 | 66.5 | 79.9 | 14.1 | 1.2 | 2.2 | 1.9 | 0.1 | 19.5 | |
| | I27 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 14.0 | 68.4 | 82.4 | 11.7 | 0.7 | 1.9 | 2.3 | 0.3 | 16.9 | organic debris[b] |
| | I22 | 0.0 | 0.0 | 0.0 | 0.0 | 3.4 | 3.4 | 23.3 | 57.6 | 80.9 | 10.4 | 0.9 | 2.1 | 2.1 | 0.1 | 15.6 | organic debris[b] |
| | I14[a] | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 1.7 | 17.2 | 63.2 | 80.4 | 12.5 | 0.8 | 2.0 | 2.5 | 0.2 | 18.0 | organic debris[b] |
| | I16[a] | 0.0 | 0.0 | 0.0 | 1.6 | 21.7 | 23.3 | 45.3 | 25.1 | 70.4 | 3.4 | 0.8 | 1.4 | 0.6 | 0.0 | 6.2 | organic debris[b] |
| | I15 | 0.0 | 0.5 | 0.5 | 15.9 | 60.4 | 76.3 | 16.9 | 3.3 | 20.2 | 1.2 | 0.7 | 0.9 | 0.1 | 0.0 | 2.9 | organic debris[b] |
| | I12[a] | 0.0 | 0.0 | 0.0 | 1.9 | 20.1 | 22.0 | 37.9 | 31.0 | 68.9 | 5.7 | 0.9 | 1.5 | 1.2 | 0.0 | 9.3 | shell hash, organic debris[b] |
| | I9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 14.6 | 62.6 | 77.2 | 15.3 | 1.7 | 2.9 | 2.1 | 0.1 | 22.1 | |
| | I6 | 0.0 | 1.6 | 1.6 | 27.6 | 57.3 | 84.9 | 11.8 | 1.5 | 13.3 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | red relict sand, shell hash |
| | I2 | 0.0 | 0.0 | 0.0 | 8.9 | 56.2 | 65.1 | 30.7 | 2.5 | 33.2 | 0.2 | 0.5 | 0.9 | 0.1 | 0.0 | 1.7 | |
| | I3 | 0.0 | 0.4 | 0.4 | 14.7 | 64.5 | 79.2 | 19.6 | 0.7 | 20.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | algae |
| *38-m Stations* | I29 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 1.6 | 16.7 | 53.1 | 69.8 | 21.0 | 3.3 | 3.6 | 1.8 | 0.0 | 29.7 | organic debris[b] |
| | I21 | 0.0 | 6.6 | 6.6 | 55.4 | 31.7 | 87.1 | 3.4 | 1.0 | 4.4 | 0.3 | 0.4 | 1.0 | 0.3 | 0.0 | 2.0 | red relict sand, shell hash |
| | I13 | 0.0 | 6.7 | 6.7 | 53.1 | 37.2 | 90.3 | 2.9 | 0.0 | 2.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | red relict sand, shell hash |
| | I8 | 0.0 | 1.2 | 1.2 | 21.2 | 57.2 | 78.4 | 17.1 | 1.9 | 19.0 | 0.2 | 0.4 | 0.9 | 0.1 | 0.0 | 1.6 | urchin spines, organic debris[b] |
| *55-m Stations* | I28 | 0.0 | 7.7 | 7.7 | 27.3 | 8.6 | 35.9 | 7.8 | 24.1 | 31.9 | 13.5 | 2.8 | 4.4 | 3.5 | 0.4 | 24.6 | black sand |
| | I20 | 0.0 | 9.8 | 9.8 | 62.8 | 21.1 | 83.9 | 5.6 | 0.7 | 6.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | red relict sand |
| | I7 | 0.0 | 15.3 | 15.3 | 62.8 | 15.8 | 78.6 | 2.7 | 1.0 | 3.7 | 0.4 | 0.6 | 1.0 | 0.3 | 0.0 | 2.3 | red relict sand |
| | I1 | 0.0 | 0.0 | 0.0 | 0.1 | 8.3 | 8.4 | 51.0 | 32.3 | 83.3 | 3.0 | 1.0 | 2.5 | 1.9 | 0.0 | 8.4 | |

[a] Near-ZID station; [b] contained worm tubes

## Table C.7

Concentrations of organic loading indicators detected in sediments from PLOO stations sampled during winter and summer 2016. See Table C.1 for MDLs; na = not analyzed.

| | Winter | | | | | Summer | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | BOD (ppm) | Sulfides (ppm) | TN (% wt) | TOC (% wt) | TVS (% wt) | BOD (ppm) | Sulfides (ppm) | TN (% wt) | TOC (% wt) | TVS (% wt) |
| *88-m Depth Contour* | | | | | | | | | | |
| B11 | 476 | 16.10 | 0.073 | 0.65 | 3.1 | 476 | 3.02 | 0.090 | 1.80 | 3.8 |
| B8 | 460 | 9.23 | 0.078 | 0.71 | 3.0 | 378 | 2.94 | 0.070 | 0.65 | 2.9 |
| E19 | 390 | 50.90 | 0.060 | 0.57 | 2.2 | 350 | 3.16 | 0.050 | 0.46 | 2.3 |
| E7 | 424 | 3.43 | 0.055 | 0.49 | 2.0 | 261 | 8.21 | 0.059 | 0.50 | 2.1 |
| E1 | 252 | 3.28 | 0.059 | 0.53 | 2.1 | 240 | 3.86 | 0.057 | 0.51 | 2.0 |
| *98-m Depth Contour* | | | | | | | | | | |
| B12 | 469 | 7.23 | 0.052 | 0.51 | 2.5 | 433 | 4.69 | 0.060 | 2.46 | 2.7 |
| B9 | 302 | 2.69 | 0.058 | 0.54 | 2.6 | 298 | 2.69 | 0.060 | 0.58 | 2.6 |
| E26 | 290 | 13.70 | 0.055 | 0.50 | 2.2 | 317 | 2.80 | 0.060 | 0.50 | 2.1 |
| E25 | 193 | 14.90 | 0.048 | 0.40 | 1.8 | 262 | 3.08 | 0.060 | 0.46 | 2.2 |
| E23 | 301 | 11.80 | 0.023 | 0.13 | 2.2 | 264 | 2.47 | 0.044 | 0.39 | 2.0 |
| E20 | 189 | 3.29 | 0.049 | 0.41 | 1.8 | 225 | 7.12 | 0.050 | 0.40 | 1.8 |
| E17[a] | 252 | 10.20 | 0.040 | 0.33 | 1.5 | na | 8.05 | 0.042 | 0.34 | 1.6 |
| E14[a] | 592 | 9.34 | 0.040 | 0.29 | 1.4 | 393 | 36.00 | 0.040 | 0.33 | 1.7 |
| E11[a] | 246 | 6.45 | 0.044 | 0.34 | 1.7 | 328 | 9.21 | 0.039 | 0.28 | 1.8 |
| E8 | 218 | 5.71 | 0.043 | 0.37 | 1.6 | 213 | 4.11 | 0.037 | 0.31 | 1.9 |
| E5 | 229 | 15.20 | 0.045 | 0.39 | 1.8 | 194 | 3.02 | 0.044 | 0.39 | 1.8 |
| E2 | 294 | 29.50 | 0.062 | 0.54 | 2.4 | 228 | 5.03 | 0.069 | 0.56 | 2.4 |
| *116-m Depth Contour* | | | | | | | | | | |
| B10 | 200 | 7.66 | 0.044 | 0.39 | 2.1 | 269 | 3.26 | 0.041 | 0.59 | 2.0 |
| E21 | 235 | 4.49 | 0.045 | 0.37 | 1.6 | 173 | 2.27 | 0.047 | 0.39 | na |
| E15 | 239 | 43.20 | 0.042 | 0.35 | 1.6 | 226 | 2.95 | 0.039 | 0.31 | 1.9 |
| E9 | 287 | 6.83 | 0.058 | 0.58 | 2.0 | 202 | 3.40 | 0.055 | 0.91 | 2.0 |
| E3 | 290 | 18.80 | 0.051 | 0.47 | 1.8 | 146 | 3.10 | 0.050 | 0.45 | 1.6 |
| Detection Rate (%) | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

[a] Near-ZID station

## Table C.8

Concentrations of organic indicators detected in sediments from SBOO stations sampled during winter and summer 2016. See Table C.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 | 48.20 | 0.033 | 0.31 | 1.4 | 3.58 | 0.042 | 0.29 | 1.3 |
| I34 | 0.80 | nd | nd | 0.7 | 0.69 | nd | nd | 0.4 |
| I31 | 5.55 | nd | 0.10 | 0.7 | 1.64 | nd | 0.07 | 0.7 |
| I23 | 3.86 | 0.022 | 0.08 | 0.8 | 1.89 | 0.030 | 0.12 | 0.8 |
| I18 | 10.60 | nd | 0.07 | 0.6 | 2.05 | nd | 0.07 | 0.7 |
| I10 | 7.19 | 0.011 | 0.09 | 0.7 | 1.60 | nd | 0.09 | 0.7 |
| I4 | 0.38 | nd | nd | 0.3 | 0.05 | nd | nd | 0.2 |
| *28-m Stations* | | | | | | | | |
| I33 | 5.09 | 0.024 | 0.13 | 1.2 | 2.61 | 0.029 | 0.14 | 1.1 |
| I30 | 5.19 | 0.028 | 0.18 | 0.9 | 2.43 | 0.029 | 0.15 | 1.2 |
| I27 | 4.78 | 0.024 | 0.12 | 8.2 | 2.73 | 0.025 | 0.13 | 0.9 |
| I22 | 12.20 | 0.034 | 0.30 | 0.7 | 3.31 | 0.032 | 0.19 | 0.9 |
| I14[a] | 21.60 | 0.029 | 0.14 | 1.1 | 1.72 | 0.035 | 0.20 | 0.9 |
| I16[a] | 1.34 | nd | nd | 0.4 | 1.61 | nd | 0.09 | 0.5 |
| I15 | 5.30 | 0.025 | 0.11 | 0.8 | 0.64 | 0.022 | 0.11 | 0.4 |
| I12[a] | 5.10 | nd | 0.08 | 0.7 | 2.03 | 0.025 | 0.14 | 0.8 |
| I9 | 4.95 | 0.025 | 0.14 | 1.1 | 4.63 | 0.029 | 0.14 | 1.2 |
| I6 | 0.35 | nd | 0.07 | 0.5 | 0.20 | nd | 0.05 | 0.4 |
| I2 | 0.54 | nd | nd | 0.4 | 0.52 | 0.028 | 0.08 | 0.4 |
| I3 | 0.25 | nd | nd | 0.4 | 0.19 | nd | 0.04 | 0.4 |
| *38-m Stations* | | | | | | | | |
| I29 | 5.84 | 0.030 | 0.20 | 1.4 | 2.94 | 0.034 | 0.21 | 1.5 |
| I21 | 0.23 | nd | nd | 0.5 | 0.22 | nd | nd | 0.5 |
| I13 | 0.22 | nd | nd | 0.5 | 0.20 | nd | nd | 0.4 |
| I8 | 0.92 | nd | 0.07 | 0.4 | 0.57 | 0.024 | 0.10 | 0.5 |
| *55-m Stations* | | | | | | | | |
| I28 | 10.30 | 0.061 | 0.56 | 1.5 | 3.26 | 0.057 | 0.46 | 1.2 |
| I20 | 0.42 | 0.023 | 0.10 | 0.4 | 0.27 | nd | 0.10 | 0.2 |
| I7 | nd | nd | nd | 0.4 | 0.18 | nd | 0.07 | 0.5 |
| I1 | 1.84 | 0.029 | 0.13 | 0.9 | 1.05 | 0.026 | 0.14 | 0.9 |
| Detection Rate (%) | 96 | 52 | 70 | 100 | 100 | 56 | 85 | 100 |

[a] Near-ZID station

## Table C.9

Concentrations of trace metals (ppm) detected in sediments from PLOO stations sampled during winter 2016. See Table C.1 for MDLs and translation of periodic table symbols; nd = not detected; nr = not reportable; na = not available.

| | Al | Sb | As | Ba | Be | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Se | Sn | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *88-m Depth Contour* | | | | | | | | | | | | | | | | |
| B11 | 6730 | 0.5 | 5.55 | 23.8 | nd | nd | 17.4 | 3.5 | 12,700 | 3.1 | 75.5 | nr | 4.9 | 0.43 | 0.5 | 24.9 |
| B8 | 10,900 | 0.9 | 3.52 | 53.6 | nd | nd | 21.4 | 8.6 | 14,700 | 6.7 | 127.0 | nr | 9.7 | 0.33 | 3.2 | 34.5 |
| E19 | 12,600 | 0.8 | 2.60 | 56.5 | nd | nd | 20.6 | 8.3 | 14,400 | 4.9 | 136.0 | 0.031 | 9.1 | 0.24 | 0.8 | 35.4 |
| E7 | 10,200 | 0.6 | 3.00 | 44.0 | nd | nd | 16.7 | 6.8 | 11,800 | 4.0 | 114.0 | 0.027 | 7.3 | 0.29 | 0.8 | 28.9 |
| E1 | 10,600 | 0.6 | 3.17 | 48.8 | nd | nd | 17.0 | 8.8 | 13,300 | 6.7 | 115.0 | nr | 7.1 | 0.25 | 0.9 | 31.6 |
| *98-m Depth Contour* | | | | | | | | | | | | | | | | |
| B12 | 7050 | 0.8 | 5.95 | 21.0 | 0.02 | nd | 27.3 | 2.5 | 20,500 | 3.9 | 76.5 | nr | 5.4 | 0.39 | 0.6 | 31.2 |
| B9 | 7830 | 0.8 | 2.59 | 61.3 | nd | nd | 20.4 | 5.0 | 14,200 | 4.3 | 98.0 | nr | 7.1 | 0.27 | 0.7 | 30.7 |
| E26 | 9600 | 0.7 | 3.11 | 36.2 | nd | nd | 16.2 | 5.4 | 11,800 | 3.7 | 108.0 | nr | 7.0 | 0.28 | 0.6 | 26.9 |
| E25 | 9010 | 0.6 | 2.32 | 33.4 | nd | nd | 15.3 | 5.1 | 10,900 | 3.3 | 102.0 | nr | 6.5 | nd | 0.6 | 25.3 |
| E23 | 9610 | 0.7 | 2.61 | 37.4 | nd | nd | 16.2 | 5.9 | 11,500 | 3.8 | 107.0 | nr | 7.1 | 0.32 | 0.7 | 27.4 |
| E20 | 8660 | 0.6 | 2.29 | 32.0 | nd | nd | 14.5 | 4.8 | 10,600 | 3.3 | 96.9 | nr | 6.6 | nd | 0.4 | 24.5 |
| E17 [a] | 7320 | 0.6 | 2.39 | 24.6 | nd | nd | 12.7 | 4.1 | 9200 | 2.9 | 85.4 | 0.015 | 5.5 | nd | 0.5 | 21.5 |
| E14 [a] | 6270 | 0.5 | 2.05 | 22.9 | nd | 0.09 | 12.2 | 4.7 | 8010 | 2.5 | 76.3 | 0.015 | 5.2 | nd | 0.5 | 21.2 |
| E11 [a] | 7360 | 0.5 | 2.54 | 24.5 | nd | nd | 13.1 | 4.1 | 9400 | 2.7 | 84.1 | nr | 5.3 | nd | 0.4 | 21.7 |
| E8 | 8140 | 0.6 | 2.75 | 28.2 | nd | nd | 13.8 | 4.6 | 10,100 | 3.0 | 92.3 | 0.017 | 5.7 | 0.26 | 0.4 | 23.3 |
| E5 | 8130 | 0.7 | 2.48 | 30.7 | nd | nd | 13.7 | 5.0 | 10,000 | 3.4 | 91.0 | 0.050 | 5.7 | 0.26 | 0.5 | 23.7 |
| E2 | 11,500 | 0.8 | 2.63 | 54.1 | nd | nd | 18.5 | 9.6 | 14,500 | 5.0 | 126.0 | nr | 7.5 | 0.27 | 0.7 | 34.1 |
| *116-m Depth Contour* | | | | | | | | | | | | | | | | |
| B10 | 9050 | 0.8 | 3.41 | 39.0 | nd | nd | 23.9 | 4.3 | 20,200 | 4.8 | 111.0 | nr | 6.9 | 0.28 | 0.7 | 33.9 |
| E21 | 7560 | 0.4 | 2.43 | 25.6 | nd | nd | 13.3 | 4.1 | 9500 | 3.1 | 85.1 | nr | 5.8 | nd | 0.5 | 21.7 |
| E15 | 6960 | 0.5 | 1.67 | 22.8 | nd | nd | 12.8 | 4.9 | 8730 | 2.8 | 79.1 | 0.016 | 5.1 | nd | 0.4 | 21.0 |
| E9 | 7610 | 0.7 | 2.48 | 26.6 | nd | nd | 17.6 | 11.8 | 12,000 | 4.8 | 85.8 | 0.019 | 5.8 | 0.29 | 0.7 | 40.5 |
| E3 | 8750 | 0.7 | 2.45 | 53.4 | nd | nd | 13.3 | 10.0 | 11,600 | 26.0 | 101.0 | 0.043 | 5.3 | nd | 0.7 | 36.1 |
| Detection Rate (%) | 100 | 100 | 100 | 100 | 5 | 5 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 64 | 100 | 100 |
| ERL [b] | na | na | 8.2 | na | na | 1.2 | 81 | 34 | na | 46.7 | na | 0.15 | 20.9 | na | na | 150 |
| ERM [b] | na | na | 70.0 | na | na | 9.6 | 370 | 270 | na | 218 | na | 0.71 | 51.6 | na | na | 410 |

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

**Table C.9** *continued*

Concentrations of trace metals (ppm) detected in sediments from PLOO stations sampled during summer 2016. See Table C.1 for MDLs and translation of periodic table symbols; nd = not detected; na = not available.

| | Al | Sb | As | Ba | Be | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Se | Ag | Sn | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *88-m Depth Contour* | | | | | | | | | | | | | | | | | |
| B11 | 9860 | 1.5 | 2.34 | 39.7 | nd | nd | 26.2 | 5.5 | 17,000 | 4.5 | 98.6 | 0.048 | 7.2 | 0.82 | nd | 0.8 | 38.3 |
| B8 | 6420 | nd | 1.02 | 32.0 | nd | nd | 13.6 | 2.6 | 7090 | 2.2 | 69.4 | 0.031 | 3.1 | 0.55 | nd | nd | 18.0 |
| E19 | 10,200 | 1.1 | 2.25 | 44.1 | nd | nd | 27.0 | 6.0 | 12,800 | 4.2 | 114.0 | 0.026 | 7.4 | 0.43 | nd | 0.8 | 30.1 |
| E7 | 9060 | 1.0 | 1.67 | 41.7 | nd | nd | 22.9 | 5.6 | 11,200 | 3.7 | 101.0 | 0.026 | 6.9 | 0.19 | nd | 0.6 | 28.5 |
| E1 | 10,200 | 1.1 | 2.24 | 49.6 | nd | nd | 25.1 | 72.7 | 13,400 | 107.0 | 109.0 | 0.035 | 6.6 | nd | nd | 1.1 | 32.3 |
| *98-m Depth Contour* | | | | | | | | | | | | | | | | | |
| B12 | 6200 | 1.7 | 4.59 | 18.6 | 0.03 | nd | 29.0 | nd | 21,300 | 3.2 | 57.9 | 0.011 | 4.5 | 0.43 | nd | 0.5 | 35.6 |
| B9 | 9750 | 1.7 | 2.17 | 46.8 | nd | nd | 32.1 | 4.8 | 17,600 | 5.5 | 113.0 | 0.028 | 7.6 | 0.53 | nd | 0.9 | 39.2 |
| E26 | 8750 | 1.2 | 1.99 | 35.8 | nd | nd | 19.3 | 5.0 | 11,800 | 3.9 | 95.7 | 0.031 | 6.6 | 0.22 | nd | 0.7 | 28.7 |
| E25 | 9000 | 1.0 | 1.90 | 36.6 | nd | nd | 23.0 | 4.8 | 11,400 | 4.1 | 99.8 | 0.020 | 6.5 | 0.37 | nd | 0.6 | 27.2 |
| E23 | 8400 | 1.0 | 1.99 | 34.5 | nd | nd | 21.6 | 4.7 | 10,800 | 3.4 | 96.3 | 0.022 | 6.2 | 0.26 | nd | 0.6 | 25.0 |
| E20 | 7800 | 0.9 | 2.01 | 29.9 | nd | nd | 19.4 | 4.2 | 10,100 | 3.0 | 89.3 | 0.016 | 5.8 | 0.37 | nd | 0.5 | 23.3 |
| E17[a] | 7080 | 0.8 | 2.04 | 27.6 | nd | nd | 18.2 | 11.0 | 9280 | 2.9 | 91.4 | 0.024 | 5.4 | nd | nd | 0.5 | 21.9 |
| E14[a] | 5500 | 0.8 | 1.63 | 21.0 | nd | nd | 14.7 | 4.4 | 7750 | 2.4 | 70.5 | 0.013 | 4.8 | nd | nd | 0.5 | 21.3 |
| E11[a] | 6030 | nd | 1.96 | 22.7 | nd | nd | 15.3 | 3.2 | 8400 | 2.4 | 68.9 | 0.015 | 4.5 | nd | 3.15 | 0.4 | 20.2 |
| E8 | 7000 | 0.9 | 1.45 | 28.6 | nd | nd | 17.5 | 4.2 | 9400 | 3.1 | 79.4 | 0.017 | 5.4 | 0.26 | nd | 0.6 | 23.5 |
| E5 | 6880 | 0.9 | 1.86 | 28.0 | nd | nd | 17.3 | 4.0 | 9620 | 3.1 | 78.7 | 0.018 | 4.9 | nd | nd | 0.6 | 23.1 |
| E2 | 9990 | 1.2 | 1.72 | 49.3 | nd | nd | 25.2 | 7.5 | 13,300 | 4.6 | 105.0 | 0.037 | 6.5 | nd | nd | 0.8 | 33.6 |
| *116-m Depth Contour* | | | | | | | | | | | | | | | | | |
| B10 | 6480 | nd | 5.21 | 22.3 | nd | 2.67 | 19.5 | 7.4 | 12,900 | 3.1 | 74.1 | 0.014 | 4.7 | 0.42 | nd | 0.4 | 31.4 |
| E21 | 7190 | 0.8 | 2.07 | 27.8 | nd | nd | 18.4 | 4.1 | 9690 | 3.2 | 83.3 | 0.017 | 5.6 | nd | nd | 0.5 | 22.3 |
| E15 | 6630 | 0.8 | 2.23 | 23.7 | nd | nd | 17.5 | 3.6 | 9460 | 2.7 | 76.9 | 0.014 | 4.9 | nd | nd | 0.5 | 21.3 |
| E9 | 7370 | 1.2 | 2.26 | 29.5 | nd | nd | 22.7 | 9.9 | 11,700 | 5.1 | 77.0 | 0.023 | 5.6 | 0.40 | nd | 0.6 | 42.3 |
| E3 | 9450 | 1.2 | 1.48 | 55.2 | nd | nd | 22.1 | 9.9 | 13,400 | 6.7 | 119.0 | 0.037 | 5.1 | nd | nd | 0.7 | 34.8 |
| Detection Rate (%) | 100 | 86 | 100 | 100 | 5 | 14 | 100 | 95 | 100 | 100 | 100 | 100 | 100 | 59 | 5 | 95 | 100 |
| ERL[b] | na | na | 8.2 | na | na | 1.2 | 81 | 34 | na | 46.7 | na | 0.15 | 20.9 | na | 1.0 | na | 150 |
| ERM[b] | na | na | 70.0 | na | na | 9.6 | 370 | 270 | na | 218 | na | 0.71 | 51.6 | na | 3.7 | na | 410 |

[a] Near-ZID station

[b] From Long et al. 1995

## Table C.10

Concentrations of trace metals (ppm) detected in sediments from SBOO stations sampled during winter 2016. See Table C.1 for MDLs and translation of periodic table symbols; nd=not detected; na=not available.

| | Al | Sb | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Ni | Ag | Sn | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *19-m Stations* | | | | | | | | | | | | | | |
| I35 | 9890 | 0.8 | 2.63 | 56.4 | 0.07 | 17.4 | 6.5 | 12,100 | 4.2 | 131.0 | 6.6 | nd | 0.6 | 32.9 |
| I34 | 1040 | nd | 2.44 | 3.6 | nd | 2.9 | 0.7 | 3000 | 1.4 | 23.4 | 1.1 | nd | nd | 5.6 |
| I31 | 3230 | 0.5 | 1.22 | 18.5 | 0.07 | 7.4 | 1.0 | 3750 | 1.3 | 57.4 | 2.1 | nd | nd | 8.6 |
| I23 | 4720 | 0.6 | 1.54 | 31.5 | nd | 9.7 | 2.6 | 5460 | 1.7 | 69.0 | 3.0 | nd | nd | 13.8 |
| I18 | 4740 | 0.5 | 1.57 | 48.9 | nd | 12.9 | 1.6 | 7190 | 1.9 | 84.6 | 3.3 | nd | nd | 14.5 |
| I10 | 4990 | 0.5 | 1.52 | 29.4 | nd | 9.9 | 1.8 | 6310 | 1.6 | 71.4 | 3.1 | nd | nd | 14.6 |
| I4 | 729 | nd | 1.03 | 2.1 | nd | 4.3 | 0.3 | 1590 | 1.1 | 14.7 | 0.9 | nd | nd | 4.3 |
| *28-m Stations* | | | | | | | | | | | | | | |
| I33 | 4270 | 0.4 | 1.83 | 21.1 | nd | 8.1 | 2.2 | 5810 | 2.9 | 70.8 | 3.0 | nd | 0.5 | 14.5 |
| I30 | 6140 | 0.5 | 1.64 | 33.4 | 0.06 | 11.3 | 2.7 | 6520 | 2.0 | 68.5 | 4.0 | nd | nd | 17.4 |
| I27 | 6020 | 0.5 | 1.65 | 32.3 | nd | 10.8 | 2.8 | 6360 | 1.7 | 68.9 | 4.0 | nd | nd | 16.8 |
| I22 | 4130 | 0.3 | 1.45 | 18.7 | nd | 8.8 | 1.6 | 4760 | 1.6 | 50.5 | 3.2 | nd | nd | 11.5 |
| I14 [a] | 6750 | 0.6 | 1.41 | 39.0 | nd | 12.0 | 2.9 | 7380 | 2.0 | 83.7 | 4.4 | nd | 0.3 | 19.8 |
| I16 [a] | 1720 | nd | 1.56 | 5.8 | nd | 3.8 | 0.2 | 3080 | 0.9 | 29.2 | 1.2 | 0.19 | nd | 7.4 |
| I15 | 2290 | 0.5 | 2.09 | 7.6 | nd | 9.2 | 0.3 | 4670 | 1.9 | 32.2 | 1.8 | nd | nd | 8.9 |
| I12 [a] | 5310 | 0.5 | 1.43 | 35.4 | nd | 10.2 | 1.8 | 6470 | 1.6 | 73.2 | 3.3 | nd | nd | 16.6 |
| I9 | 7530 | 0.6 | 1.80 | 44.0 | nd | 12.5 | 3.2 | 8040 | 1.8 | 90.0 | 4.8 | nd | nd | 22.2 |
| I6 | 966 | 0.4 | 4.39 | 3.2 | nd | 8.1 | nd | 3920 | 1.7 | 13.3 | 1.0 | nd | nd | 4.4 |
| I2 | 1010 | 0.3 | 0.85 | 2.5 | nd | 5.7 | 0.3 | 1310 | 1.0 | 11.1 | 1.1 | 0.05 | nd | 4.7 |
| I3 | 671 | nd | 1.10 | 1.2 | nd | 5.4 | nd | 1280 | 0.9 | 5.5 | 1.0 | nd | nd | 4.1 |
| *38-m Stations* | | | | | | | | | | | | | | |
| I29 | 5610 | 0.5 | 2.09 | 27.8 | 0.08 | 11.2 | 2.9 | 6850 | 2.4 | 65.6 | 4.4 | nd | 0.4 | 15.7 |
| I21 | 1030 | 0.5 | 9.16 | 1.8 | nd | 11.7 | nd | 8620 | 3.5 | 13.7 | 1.3 | nd | nd | 6.5 |
| I13 | 882 | 0.5 | 6.54 | 1.7 | nd | 9.4 | nd | 5770 | 2.5 | 16.1 | 1.1 | nd | nd | 5.7 |
| I8 | 1540 | 0.4 | 2.27 | 3.4 | nd | 8.4 | nd | 3810 | 1.4 | 19.8 | 1.4 | nd | nd | 7.5 |
| *55-m Stations* | | | | | | | | | | | | | | |
| I28 | 5240 | 0.5 | 2.16 | 25.2 | 0.05 | 10.3 | 4.2 | 7100 | 3.4 | 60.5 | 5.7 | 0.29 | 0.5 | 15.1 |
| I20 | 1290 | 0.3 | 2.65 | 2.6 | nd | 5.8 | nd | 5290 | 1.9 | 18.9 | 1.2 | nd | nd | 6.6 |
| I7 | 875 | 0.5 | 6.56 | 1.8 | nd | 8.6 | nd | 7260 | 2.7 | 13.3 | 1.0 | nd | nd | 5.9 |
| I1 | 2510 | 0.4 | 1.08 | 7.7 | 0.06 | 6.8 | 1.0 | 3480 | 1.6 | 39.5 | 2.9 | nd | nd | 9.0 |
| Detection Rate (%) | 100 | 85 | 100 | 100 | 22 | 100 | 74 | 100 | 100 | 100 | 100 | 11 | 19 | 100 |
| ERL [b] | na | na | 8.2 | na | 1.2 | 81 | 34 | na | 46.7 | na | 20.9 | 1.0 | na | 150 |
| ERM [b] | na | na | 70.0 | na | 9.6 | 370 | 270 | na | 218 | na | 51.6 | 3.7 | na | 410 |

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

**Table C.10** *continued*

Concentrations of trace metals (ppm) detected in sediments from SBOO stations sampled during summer 2016. See Table C.1 for MDLs and translation of periodic table symbols; nd=not detected; na=not available.

| | Al | Sb | As | Ba | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Se | Sn | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *19-m Stations* | | | | | | | | | | | | | | |
| I35 | 12,000 | 1.5 | 2.02 | 55.4 | 28.7 | 9.2 | 16,900 | 5.8 | 134.0 | 0.017 | 9.3 | nd | 1.1 | 40.9 |
| I34 | 9520 | 1.3 | 2.07 | 51.6 | 25.9 | 5.8 | 16,600 | 5.3 | 125.0 | 0.005 | 6.3 | nd | 1.0 | 37.7 |
| I31 | 9060 | 1.0 | 1.56 | 49.5 | 21.1 | 5.9 | 12,100 | 3.9 | 121.0 | nd | 5.1 | nd | 0.7 | 33.5 |
| I23 | 4370 | nd | 1.60 | 24.9 | 8.8 | 1.3 | 5010 | 1.7 | 55.6 | 0.005 | 2.6 | nd | nd | 10.9 |
| I18 | 4540 | nd | 1.73 | 33.5 | 11.2 | 1.3 | 6410 | 1.7 | 66.1 | nd | 2.9 | nd | nd | 12.4 |
| I10 | 4790 | nd | 1.51 | 27.9 | 9.2 | 1.5 | 6010 | 1.7 | 66.7 | nd | 2.9 | nd | nd | 13.4 |
| I4 | 564 | nd | 1.77 | 1.3 | 3.7 | nd | 1520 | 1.3 | 11.3 | nd | 0.7 | nd | nd | 2.2 |
| *28-m Stations* | | | | | | | | | | | | | | |
| I33 | 9360 | 1.1 | 2.48 | 47.5 | 22.1 | 6.9 | 13,200 | 5.8 | 114.0 | 0.015 | 6.6 | nd | 1.1 | 33.2 |
| I30 | 1690 | nd | 1.13 | 6.7 | 4.8 | nd | 3820 | 1.9 | 31.9 | 0.005 | 0.7 | nd | nd | 6.2 |
| I27 | 5330 | nd | 1.72 | 26.6 | 9.8 | 2.0 | 5830 | 1.8 | 59.2 | nd | 3.1 | nd | nd | 14.1 |
| I22 | 4590 | nd | 1.53 | 23.3 | 9.8 | 1.9 | 5350 | 1.8 | 57.3 | 0.005 | 3.0 | nd | nd | 12.5 |
| I14[a] | 5730 | nd | 1.98 | 32.2 | 10.6 | 2.3 | 6480 | 1.8 | 67.3 | 0.004 | 3.6 | nd | nd | 15.9 |
| I16[a] | 3080 | nd | 1.34 | 14.9 | 7.7 | 0.8 | 4360 | 1.5 | 45.4 | nd | 2.0 | nd | nd | 9.7 |
| I15 | 1760 | nd | 2.67 | 9.1 | 7.9 | nd | 3970 | 1.7 | 20.6 | nd | 1.3 | nd | nd | 6.9 |
| I12[a] | 3910 | nd | 1.67 | 24.5 | 8.0 | 1.9 | 5300 | 1.5 | 55.7 | nd | 2.5 | nd | nd | 12.4 |
| I9 | 6820 | nd | 2.16 | 40.6 | 11.7 | 2.7 | 7810 | 1.8 | 83.3 | nd | 4.7 | nd | nd | 19.4 |
| I6 | 898 | nd | 4.55 | 2.3 | 7.5 | nd | 3550 | 1.7 | 10.6 | nd | 0.9 | nd | nd | 3.3 |
| I2 | 957 | nd | 1.15 | 2.1 | 5.3 | nd | 1200 | 0.9 | 9.6 | 0.004 | 1.0 | nd | nd | 2.4 |
| I3 | 683 | nd | 1.31 | 1.3 | 5.5 | nd | 1220 | 1.0 | 5.4 | nd | 0.8 | nd | nd | 2.2 |
| *38-m Stations* | | | | | | | | | | | | | | |
| I29 | 4800 | nd | 1.37 | 20.4 | 10.3 | 2.6 | 6830 | 3.4 | 76.3 | 0.010 | 2.4 | nd | 0.5 | 17.4 |
| I21 | 900 | nd | 10.50 | 2.0 | 10.7 | nd | 8410 | 3.3 | 14.8 | nd | 1.1 | nd | nd | 5.5 |
| I13 | 873 | nd | 7.27 | 1.9 | 9.0 | nd | 5750 | 2.4 | 14.4 | nd | 0.9 | nd | nd | 4.7 |
| I8 | 1560 | nd | 2.60 | 4.0 | 8.0 | nd | 3910 | 1.4 | 19.9 | nd | 1.3 | nd | nd | 6.7 |
| *55-m Stations* | | | | | | | | | | | | | | |
| I28 | 3710 | nd | 0.79 | 19.3 | 9.5 | 1.2 | 4310 | 1.5 | 54.9 | 0.013 | 1.7 | nd | nd | 9.7 |
| I20 | 1160 | nd | 3.48 | 2.1 | 5.0 | nd | 4990 | 1.7 | 15.3 | nd | 0.9 | nd | nd | 5.4 |
| I7 | 1370 | nd | 6.84 | 2.8 | 8.9 | nd | 7770 | 2.8 | 23.5 | nd | 1.2 | nd | nd | 6.1 |
| I1 | 2290 | nd | 1.28 | 6.6 | 6.3 | 1.0 | 3330 | 1.6 | 35.0 | 0.005 | 2.5 | 0.24 | nd | 6.8 |
| Detection Rate (%) | 100 | 15 | 100 | 100 | 100 | 59 | 100 | 100 | 100 | 41 | 100 | 4 | 19 | 100 |
| ERL[b] | na | na | 8.2 | na | 81 | 34 | na | 46.7 | na | 0.15 | 20.9 | na | na | 150 |
| ERM[b] | na | na | 70.0 | na | 370 | 270 | na | 218 | na | 0.71 | 51.6 | na | na | 410 |

[a] Near-ZID station

[b] From Long et al. 1995

## Table C.11

Concentrations of pesticides, PCB and PAH detected in sediments from PLOO stations sampled during winter and summer 2016. See Table C.1 for MDLs; tChlor = total chlordane; nd = not detected; nr = not reportable; ns = not sampled; DR = detection rate; na = not available.

| | Winter | | | | | Summer | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | tChlor (ppt) | tDDT (ppt) | HCB (ppt) | tPCB (ppt) | tPAH (ppb) | tChlor (ppt) | tDDT (ppt) | tHCH (ppt) | HCB (ppt) | tPCB (ppt) | tPAH (ppb) |
| *88-m Stations* | | | | | | | | | | | |
| B11 | nd | 650 | nd | 104 | nd | 211 | 1189 | nd | nr | 1102 | 25 |
| B8 | nd | 213 | 31 | 26 | 7 | nd | 1275 | nd | nr | 1228 | 29 |
| E19 | nd | 470 | 1650 | 157 | nd | 77 | 869 | nd | nr | 1179 | 28 |
| E7 | nd | 360 | 1200 | 888 | 30 | nd | 553 | nd | nr | 2809 | 17 |
| E1 | 62 | 1300 | 60 | 2083 | 149 | 210 | 702 | nd | nr | 5007 | 249 |
| *98-m Stations* | | | | | | | | | | | |
| B12 | nd | 400 | 82 | nd | nd | 70 | 793 | nd | nr | 517 | 9 |
| B9 | nd | 580 | 1600 | nd | 3 | nd | 864 | nd | nr | 871 | 15 |
| E26 | nd | 400 | 180 | nd | 14 | nd | 799 | nd | nr | 1011 | 18 |
| E25 | nd | 590 | nd | nd | nd | nd | 754 | nd | nr | 633 | 12 |
| E23 | nd | 480 | 79 | 134 | 13 | nd | 690 | nd | nr | 700 | 12 |
| E20 | nd | 450 | 88 | 79 | nd | nd | 578 | nd | nr | 584 | 9 |
| E17 [a] | nd | 280 | 1100 | 261 | nd | ns | ns | ns | ns | ns | 7 |
| E14 [a] | nd | 260 | 110 | nd | nd | nd | 476 | nd | nr | 529 | 11 |
| E11 [a] | nd | 320 | 200 | 64 | 7 | nd | 275 | nd | nr | 393 | 9 |
| E8 | nd | 390 | 430 | nd | nd | nd | 491 | nd | nr | 921 | 9 |
| E5 | nd | 390 | 54 | 261 | 10 | nd | 376 | nd | nr | 762 | 7 |
| E2 | nd | 485 | 1000 | 1928 | 80 | 116 | 624 | 159 | nr | 3849 | 80 |
| *116-m Stations* | | | | | | | | | | | |
| B10 | nd | 570 | nd | nd | nd | 89 | 682 | nd | nr | 701 | 9 |
| E21 | nd | 300 | 77 | nd | nd | ns | ns | ns | ns | ns | ns |
| E15 | nd | 330 | nd | 47 | nd | nd | 313 | nd | nr | 591 | 7 |
| E9 | nd | 350 | nd | 1262 | 54 | nd | 204 | nd | nr | 4477 | 23 |
| E3 | 985 | 850 | 126 | 12,514 | 400 | 337 | 650 | 179 | 88 | 18,226 | 253 |
| DR (%) | 9 | 100 | 77 | 64 | 50 | 35 | 100 | 10 | 100 | 100 | 100 |
| ERL [b] | na | 1580 | na | na | 4022 | na | 1580 | na | na | na | 4022 |
| ERM [b] | na | 46,100 | na | na | 44,792 | na | 46,100 | na | na | na | 44,792 |

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

## Table C.12

Concentrations of pesticides, PCB and PAH detected in sediments from SBOO stations sampled during winter and summer 2016. See Table C.1 for MDLs; tChlor = chlordane; nd = not detected; nr = not reportable; DR = detection rate; na = not available.

| | Winter | | | | Summer | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | tDDT (ppt) | HCB (ppt) | tPCB (ppt) | tPAH (ppb) | tChlor (ppt) | tDDT (ppt) | tHCH (ppt) | HCB (ppt) | Mirex (ppt) | tPCB (ppt) | tPAH (ppb) |
| *19-m Stations* | | | | | | | | | | | |
| I35 | 170 | 360 | 48 | 33 | nd | 288 | nd | nr | nd | 384 | nd |
| I34 | nd | 82 | nd | nd | nd | nd | nd | nr | nd | nd | nd |
| I31 | nd | 160 | nd | nd | nd | 34 | nd | nr | nd | nd | nd |
| I23 | 130 | nd | nd | nd | nd | 101 | nd | nr | nd | 317 | nd |
| I18 | nd | 650 | nd | nd | 34 | 74 | nd | nr | 17 | 122 | nd |
| I10 | 69 | nd | nd | nd | nd | 73 | 134 | nr | nd | 57 | nd |
| I4 | nd | nd | nd | nd | nd | 17 | nd | nr | nd | 3607 | nd |
| *28-m Stations* | | | | | | | | | | | |
| I33 | 100 | 35 | nd | nd | nd | 75 | nd | nr | nd | 126 | 13 |
| I30 | 140 | nd | nd | 7 | nd | 146 | nd | nr | nd | 82 | 8 |
| I27 | 165 | 144 | nd | nd | 38 | 261 | 35 | nr | nd | 445 | nd |
| I22 | 99 | nd | nd | nd | nd | 223 | nd | nr | nd | 55 | 7 |
| I14[a] | 300 | nd | nd | nd | nd | 152 | nd | nr | nd | nd | nd |
| I16[a] | nd | 82 | nd | nd | 24 | 92 | nd | nr | nd | 147 | nd |
| I15 | 130 | nd | nd | nd | nd | 35 | nd | nr | nd | nd | nd |
| I12[a] | nd | nd | nd | 56 | nd | 76 | nd | nr | nd | 17 | nd |
| I9 | 140 | 650 | nd | nd | 15 | 216 | nd | nr | nd | 116 | nd |
| I6 | nd | 6200 | nd | nd | nd | 39 | nd | nr | nd | nd | nd |
| I2 | nd | 120 | 130 | nd | nd | 31 | nd | nr | nd | 132 | nd |
| I3 | nd | 75 | 70 | nd | nd | nd | nd | nr | nd | 18 | nd |
| *38-m Stations* | | | | | | | | | | | |
| I29 | 530 | nd | nd | 6 | nd | 1320 | nd | nr | nd | 445 | 6 |
| I21 | 76 | nd | nd | nd | nd | 38 | nd | nr | nd | nd | nd |
| I13 | nd | 2800 | nd | nd | nd | nd | nd | nr | nd | 7 | nd |
| I8 | nd | 55 | nd | nd | nd | 61 | nd | nr | nd | 59 | nd |
| *55-m Stations* | | | | | | | | | | | |
| I28 | 570 | 1100 | 485 | nd | nd | 849 | nd | nr | nd | 1256 | 8 |
| I20 | 42 | 1100 | nd | nd | nd | 32 | nd | nr | nd | 45 | nd |
| I7 | nd | 110 | nd | nd | nd | 29 | nd | nr | nd | 16 | nd |
| I1 | 56 | nd | 100 | nd | nd | 133 | 21 | 521 | nd | 1333 | 121 |
| DR (%) | 56 | 59 | 19 | 15 | 15 | 89 | 11 | 100 | 4 | 78 | 22 |
| ERL[b] | 1580 | na | na | 4022 | na | 1580 | na | na | na | na | 4022 |
| ERM[b] | 46,100 | na | na | 44,792 | na | 46,100 | na | na | na | na | 44,792 |

[a] Near-ZID station

[b] From Long et al. 1995

## Table C.13

Summary of the constituents that make up total chlordane, total DDT, total HCH, total PCB, and total PAH in sediments from the PLOO region during 2016; nd = not detected.

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| B8 | DDT | o,p-DDE | 23 | 47 | ppt |
| B8 | DDT | o,p-DDT | nd | 52 | ppt |
| B8 | DDT | p,-p-DDMU | nd | 72 | ppt |
| B8 | DDT | p,p-DDD | nd | 86 | ppt |
| B8 | DDT | p,p-DDE | 190 | 903 | ppt |
| B8 | DDT | p,p-DDT | nd | 115 | ppt |
| B8 | PAH | 2,6-dimethylnaphthalene | nd | 13 | ppb |
| B8 | PAH | Benzo[e]pyrene | nd | 4 | ppb |
| B8 | PAH | Benzo[G,H,I]perylene | nd | 4 | ppb |
| B8 | PAH | Pyrene | 7 | 8 | ppb |
| B8 | PCB | PCB 18 | nd | 11 | ppt |
| B8 | PCB | PCB 28 | nd | 36 | ppt |
| B8 | PCB | PCB 44 | nd | 19 | ppt |
| B8 | PCB | PCB 49 | 10 | 26 | ppt |
| B8 | PCB | PCB 52 | 16 | 26 | ppt |
| B8 | PCB | PCB 66 | nd | 45 | ppt |
| B8 | PCB | PCB 70 | nd | 37 | ppt |
| B8 | PCB | PCB 74 | nd | 18 | ppt |
| B8 | PCB | PCB 77 | nd | 11 | ppt |
| B8 | PCB | PCB 99 | nd | 57 | ppt |
| B8 | PCB | PCB 101 | nd | 50 | ppt |
| B8 | PCB | PCB 105 | nd | 37 | ppt |
| B8 | PCB | PCB 110 | nd | 69 | ppt |
| B8 | PCB | PCB 118 | nd | 98 | ppt |
| B8 | PCB | PCB 123 | nd | 14 | ppt |
| B8 | PCB | PCB 128 | nd | 48 | ppt |
| B8 | PCB | PCB 138 | nd | 121 | ppt |
| B8 | PCB | PCB 149 | nd | 90 | ppt |
| B8 | PCB | PCB 151 | nd | 21 | ppt |
| B8 | PCB | PCB 153/168 | nd | 167 | ppt |
| B8 | PCB | PCB 177 | nd | 22 | ppt |
| B8 | PCB | PCB 180 | nd | 67 | ppt |
| B8 | PCB | PCB 183 | nd | 26 | ppt |
| B8 | PCB | PCB 187 | nd | 69 | ppt |
| B8 | PCB | PCB 206 | nd | 42 | ppt |
| B9 | DDT | p,-p-DDMU | nd | 50 | ppt |
| B9 | DDT | p,p-DDD | nd | 73 | ppt |
| B9 | DDT | p,p-DDE | 580 | 658 | ppt |
| B9 | DDT | p,p-DDT | nd | 82 | ppt |
| B9 | PAH | 2,6-dimethylnaphthalene | 3 | 15 | ppb |
| B9 | PCB | PCB 18 | nd | 10 | ppt |
| B9 | PCB | PCB 28 | nd | 24 | ppt |
| B9 | PCB | PCB 44 | nd | 12 | ppt |
| B9 | PCB | PCB 49 | nd | 17 | ppt |
| B9 | PCB | PCB 52 | nd | 18 | ppt |
| B9 | PCB | PCB 66 | nd | 27 | ppt |
| B9 | PCB | PCB 70 | nd | 21 | ppt |
| B9 | PCB | PCB 74 | nd | 9 | ppt |
| B9 | PCB | PCB 99 | nd | 45 | ppt |
| B9 | PCB | PCB 101 | nd | 56 | ppt |
| B9 | PCB | PCB 105 | nd | 40 | ppt |

## Table C.13 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| B9 | PCB | PCB 110 | nd | 57 | ppt |
| B9 | PCB | PCB 118 | nd | 86 | ppt |
| B9 | PCB | PCB 123 | nd | 13 | ppt |
| B9 | PCB | PCB 138 | nd | 94 | ppt |
| B9 | PCB | PCB 149 | nd | 77 | ppt |
| B9 | PCB | PCB 153/168 | nd | 131 | ppt |
| B9 | PCB | PCB 180 | nd | 84 | ppt |
| B9 | PCB | PCB 187 | nd | 50 | ppt |
| | | | | | |
| B10 | Chlordane | Alpha(cis)Chlordane | nd | 51 | ppt |
| B10 | Chlordane | Gamma(trans)Chlordane | nd | 38 | ppt |
| B10 | DDT | o,p-DDD | nd | 23 | ppt |
| B10 | DDT | o,p-DDE | nd | 43 | ppt |
| B10 | DDT | p,-p-DDMU | nd | 44 | ppt |
| B10 | DDT | p,p-DDD | nd | 40 | ppt |
| B10 | DDT | p,p-DDE | 570 | 467 | ppt |
| B10 | DDT | p,p-DDT | nd | 65 | ppt |
| B10 | PAH | 2,6-dimethylnaphthalene | nd | 9 | ppb |
| B10 | PCB | PCB 18 | nd | 11 | ppt |
| B10 | PCB | PCB 28 | nd | 19 | ppt |
| B10 | PCB | PCB 44 | nd | 15 | ppt |
| B10 | PCB | PCB 49 | nd | 25 | ppt |
| B10 | PCB | PCB 52 | nd | 20 | ppt |
| B10 | PCB | PCB 66 | nd | 22 | ppt |
| B10 | PCB | PCB 70 | nd | 21 | ppt |
| B10 | PCB | PCB 74 | nd | 13 | ppt |
| B10 | PCB | PCB 77 | nd | 13 | ppt |
| B10 | PCB | PCB 81 | nd | 16 | ppt |
| B10 | PCB | PCB 99 | nd | 39 | ppt |
| B10 | PCB | PCB 101 | nd | 35 | ppt |
| B10 | PCB | PCB 105 | nd | 21 | ppt |
| B10 | PCB | PCB 110 | nd | 32 | ppt |
| B10 | PCB | PCB 118 | nd | 42 | ppt |
| B10 | PCB | PCB 119 | nd | 11 | ppt |
| B10 | PCB | PCB 128 | nd | 27 | ppt |
| B10 | PCB | PCB 138 | nd | 54 | ppt |
| B10 | PCB | PCB 149 | nd | 58 | ppt |
| B10 | PCB | PCB 151 | nd | 16 | ppt |
| B10 | PCB | PCB 153/168 | nd | 84 | ppt |
| B10 | PCB | PCB 158 | nd | 12 | ppt |
| B10 | PCB | PCB 183 | nd | 23 | ppt |
| B10 | PCB | PCB 187 | nd | 40 | ppt |
| B10 | PCB | PCB 206 | nd | 32 | ppt |
| | | | | | |
| B11 | Chlordane | Alpha(cis)Chlordane | nd | 60 | ppt |
| B11 | Chlordane | Gamma(trans)Chlordane | nd | 39 | ppt |
| B11 | Chlordane | Methoxychlor | nd | 112 | ppt |
| B11 | DDT | o,p-DDE | nd | 48 | ppt |
| B11 | DDT | o,p-DDT | nd | 52 | ppt |
| B11 | DDT | p,-p-DDMU | nd | 82 | ppt |
| B11 | DDT | p,p-DDD | nd | 56 | ppt |
| B11 | DDT | p,p-DDE | 650 | 850 | ppt |
| B11 | DDT | p,p-DDT | nd | 101 | ppt |
| B11 | PAH | 2,6-dimethylnaphthalene | nd | 16 | ppb |
| B11 | PAH | 3,4-benzo(B)fluoranthene | nd | 9 | ppb |

**Table C.13** *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| B11 | PCB | PCB 18 | nd | 13 | ppt |
| B11 | PCB | PCB 44 | nd | 21 | ppt |
| B11 | PCB | PCB 49 | nd | 24 | ppt |
| B11 | PCB | PCB 52 | nd | 27 | ppt |
| B11 | PCB | PCB 66 | 43 | 44 | ppt |
| B11 | PCB | PCB 70 | nd | 29 | ppt |
| B11 | PCB | PCB 74 | nd | 15 | ppt |
| B11 | PCB | PCB 99 | nd | 49 | ppt |
| B11 | PCB | PCB 101 | nd | 45 | ppt |
| B11 | PCB | PCB 105 | nd | 38 | ppt |
| B11 | PCB | PCB 110 | nd | 57 | ppt |
| B11 | PCB | PCB 118 | nd | 98 | ppt |
| B11 | PCB | PCB 128 | nd | 45 | ppt |
| B11 | PCB | PCB 138 | nd | 108 | ppt |
| B11 | PCB | PCB 149 | 61 | 72 | ppt |
| B11 | PCB | PCB 151 | nd | 27 | ppt |
| B11 | PCB | PCB 153/168 | nd | 159 | ppt |
| B11 | PCB | PCB 180 | nd | 88 | ppt |
| B11 | PCB | PCB 183 | nd | 28 | ppt |
| B11 | PCB | PCB 187 | nd | 74 | ppt |
| B11 | PCB | PCB 206 | nd | 41 | ppt |
| | | | | | |
| B12 | Chlordane | Gamma(trans)Chlordane | nd | 37 | ppt |
| B12 | Chlordane | Heptachlor | nd | 32 | ppt |
| B12 | DDT | o,p-DDE | nd | 56 | ppt |
| B12 | DDT | p,-p-DDMU | nd | 40 | ppt |
| B12 | DDT | p,p-DDE | 400 | 644 | ppt |
| B12 | DDT | p,p-DDT | nd | 54 | ppt |
| B12 | PAH | 2,6-dimethylnaphthalene | nd | 9 | ppb |
| B12 | PCB | PCB 18 | nd | 11 | ppt |
| B12 | PCB | PCB 44 | nd | 11 | ppt |
| B12 | PCB | PCB 49 | nd | 7 | ppt |
| B12 | PCB | PCB 52 | nd | 19 | ppt |
| B12 | PCB | PCB 66 | nd | 29 | ppt |
| B12 | PCB | PCB 70 | nd | 23 | ppt |
| B12 | PCB | PCB 74 | nd | 11 | ppt |
| B12 | PCB | PCB 99 | nd | 27 | ppt |
| B12 | PCB | PCB 101 | nd | 33 | ppt |
| B12 | PCB | PCB 110 | nd | 39 | ppt |
| B12 | PCB | PCB 118 | nd | 45 | ppt |
| B12 | PCB | PCB 138 | nd | 46 | ppt |
| B12 | PCB | PCB 149 | nd | 67 | ppt |
| B12 | PCB | PCB 153/168 | nd | 107 | ppt |
| B12 | PCB | PCB 187 | nd | 42 | ppt |
| | | | | | |
| E1 | Chlordane | Alpha(cis)Chlordane | 62 | 80 | ppt |
| E1 | Chlordane | Gamma(trans)Chlordane | nd | 70 | ppt |
| E1 | Chlordane | TransNonachlor | nd | 60 | ppt |
| E1 | DDT | o,p-DDD | nd | 24 | ppt |
| E1 | DDT | p,-p-DDMU | nd | 43 | ppt |
| E1 | DDT | p,p-DDD | nd | 102 | ppt |
| E1 | DDT | p,p-DDE | 700 | 433 | ppt |
| E1 | DDT | p,p-DDT | 600 | 99 | ppt |
| E1 | PAH | 2,6-dimethylnaphthalene | 7 | 11 | ppb |
| E1 | PAH | 3,4-benzo(B)fluoranthene | 23 | 37 | ppb |

**Table C.13** *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E1 | PAH | Anthracene | 7 | 3 | ppb |
| E1 | PAH | Benzo[A]pyrene | 18 | 29 | ppb |
| E1 | PAH | Benzo[e]pyrene | 13 | 21 | ppb |
| E1 | PAH | Benzo[G,H,I]perylene | 14 | 24 | ppb |
| E1 | PAH | Benzo[K]fluoranthene | 10 | 12 | ppb |
| E1 | PAH | Chrysene | 24 | 18 | ppb |
| E1 | PAH | Fluoranthene | 11 | 32 | ppb |
| E1 | PAH | Indeno(1,2,3-CD)pyrene | 10 | 18 | ppb |
| E1 | PAH | Phenanthrene | nd | 11 | ppb |
| E1 | PAH | Pyrene | 14 | 33 | ppb |
| E1 | PCB | PCB 18 | nd | 23 | ppt |
| E1 | PCB | PCB 28 | nd | 58 | ppt |
| E1 | PCB | PCB 44 | 50 | 93 | ppt |
| E1 | PCB | PCB 49 | 56 | 75 | ppt |
| E1 | PCB | PCB 52 | 73 | 166 | ppt |
| E1 | PCB | PCB 66 | 97 | 89 | ppt |
| E1 | PCB | PCB 70 | 84 | 118 | ppt |
| E1 | PCB | PCB 74 | 36 | 41 | ppt |
| E1 | PCB | PCB 87 | nd | 180 | ppt |
| E1 | PCB | PCB 99 | 90 | 165 | ppt |
| E1 | PCB | PCB 101 | 170 | 400 | ppt |
| E1 | PCB | PCB 105 | 77 | 146 | ppt |
| E1 | PCB | PCB 110 | 200 | 360 | ppt |
| E1 | PCB | PCB 118 | 270 | 370 | ppt |
| E1 | PCB | PCB 119 | nd | 28 | ppt |
| E1 | PCB | PCB 128 | nd | 132 | ppt |
| E1 | PCB | PCB 138 | 210 | 400 | ppt |
| E1 | PCB | PCB 149 | 220 | 400 | ppt |
| E1 | PCB | PCB 151 | nd | 98 | ppt |
| E1 | PCB | PCB 153/168 | 340 | 620 | ppt |
| E1 | PCB | PCB 156 | nd | 69 | ppt |
| E1 | PCB | PCB 158 | nd | 82 | ppt |
| E1 | PCB | PCB 167 | nd | 24 | ppt |
| E1 | PCB | PCB 170 | nd | 127 | ppt |
| E1 | PCB | PCB 177 | nd | 77 | ppt |
| E1 | PCB | PCB 180 | nd | 330 | ppt |
| E1 | PCB | PCB 183 | nd | 73 | ppt |
| E1 | PCB | PCB 187 | 110 | 190 | ppt |
| E1 | PCB | PCB 201 | nd | 18 | ppt |
| E1 | PCB | PCB 206 | nd | 56 | ppt |
| E2 | Chlordane | Alpha(cis)Chlordane | nd | 42 | ppt |
| E2 | Chlordane | Gamma(trans)Chlordane | nd | 44 | ppt |
| E2 | Chlordane | TransNonachlor | nd | 30 | ppt |
| E2 | DDT | p,-p-DDMU | 95 | 39 | ppt |
| E2 | DDT | p,p-DDE | 390 | 396 | ppt |
| E2 | DDT | p,p-DDT | nd | 189 | ppt |
| E2 | HCH | HCH, Beta isomer | nd | 159 | ppt |
| E2 | PAH | 2,6-dimethylnaphthalene | nd | 10 | ppb |
| E2 | PAH | 3,4-benzo(B)fluoranthene | nd | 19 | ppb |
| E2 | PAH | Anthracene | 15 | nd | ppb |
| E2 | PAH | Benzo[A]pyrene | 12 | 13 | ppb |
| E2 | PAH | Benzo[e]pyrene | 10 | 10 | ppb |
| E2 | PAH | Benzo[G,H,I]perylene | 11 | 9 | ppb |
| E2 | PAH | Biphenyl | 6 | nd | ppb |

## Table C.13 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E2 | PAH | Fluoranthene | 11 | 9 | ppb |
| E2 | PAH | Pyrene | 15 | 10 | ppb |
| E2 | PCB | PCB 18 | nd | 31 | ppt |
| E2 | PCB | PCB 28 | 49 | 50 | ppt |
| E2 | PCB | PCB 44 | 73 | 69 | ppt |
| E2 | PCB | PCB 49 | 54 | 55 | ppt |
| E2 | PCB | PCB 52 | 110 | 143 | ppt |
| E2 | PCB | PCB 66 | 86 | 65 | ppt |
| E2 | PCB | PCB 70 | 70 | 93 | ppt |
| E2 | PCB | PCB 74 | nd | 29 | ppt |
| E2 | PCB | PCB 77 | nd | 20 | ppt |
| E2 | PCB | PCB 87 | nd | 123 | ppt |
| E2 | PCB | PCB 99 | 110 | 116 | ppt |
| E2 | PCB | PCB 101 | 200 | 300 | ppt |
| E2 | PCB | PCB 105 | 76 | 118 | ppt |
| E2 | PCB | PCB 110 | 220 | 310 | ppt |
| E2 | PCB | PCB 118 | 270 | 310 | ppt |
| E2 | PCB | PCB 119 | nd | 17 | ppt |
| E2 | PCB | PCB 123 | nd | 40 | ppt |
| E2 | PCB | PCB 128 | nd | 102 | ppt |
| E2 | PCB | PCB 138 | 160 | 350 | ppt |
| E2 | PCB | PCB 149 | 170 | 300 | ppt |
| E2 | PCB | PCB 151 | nd | 72 | ppt |
| E2 | PCB | PCB 153/168 | 280 | 430 | ppt |
| E2 | PCB | PCB 156 | nd | 63 | ppt |
| E2 | PCB | PCB 157 | nd | 27 | ppt |
| E2 | PCB | PCB 158 | nd | 46 | ppt |
| E2 | PCB | PCB 167 | nd | 23 | ppt |
| E2 | PCB | PCB 170 | nd | 100 | ppt |
| E2 | PCB | PCB 177 | nd | 61 | ppt |
| E2 | PCB | PCB 180 | nd | 177 | ppt |
| E2 | PCB | PCB 183 | nd | 49 | ppt |
| E2 | PCB | PCB 187 | nd | 98 | ppt |
| E2 | PCB | PCB 206 | nd | 63 | ppt |
| E3 | Chlordane | Alpha(cis)Chlordane | 245 | 128 | ppt |
| E3 | Chlordane | CisNonachlor | 150 | nd | ppt |
| E3 | Chlordane | Gamma(trans)Chlordane | 405 | 123 | ppt |
| E3 | Chlordane | TransNonachlor | 185 | 86 | NA |
| E3 | DDT | o,p-DDE | nd | 18 | ppt |
| E3 | DDT | p,-p-DDMU | nd | 35 | ppt |
| E3 | DDT | p,p-DDD | nd | 169 | ppt |
| E3 | DDT | p,p-DDE | 850 | 309 | ppt |
| E3 | DDT | p,p-DDT | nd | 119 | ppt |
| E3 | HCH | HCH, Beta isomer | nd | 179 | ppt |
| E3 | PAH | 2,6-dimethylnaphthalene | 7 | 8 | ppb |
| E3 | PAH | 3,4-benzo(B)fluoranthene | 59 | 40 | ppb |
| E3 | PAH | Acenaphthylene | 6 | nd | ppb |
| E3 | PAH | Anthracene | 9 | 10 | ppb |
| E3 | PAH | Benzo[A]anthracene | 25 | 20 | ppb |
| E3 | PAH | Benzo[A]pyrene | 46 | 30 | ppb |
| E3 | PAH | Benzo[e]pyrene | 38 | 22 | ppb |
| E3 | PAH | Benzo[G,H,I]perylene | 46 | 15 | ppb |
| E3 | PAH | Benzo[K]fluoranthene | 20 | 17 | ppb |
| E3 | PAH | Chrysene | 20 | 22 | ppb |

**Table C.13** *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E3 | PAH | Fluoranthene | 31 | 17 | ppb |
| E3 | PAH | Indeno(1,2,3-CD)pyrene | 30 | 15 | ppb |
| E3 | PAH | Naphthalene | nd | 6 | ppb |
| E3 | PAH | Perylene | nd | 7 | ppb |
| E3 | PAH | Phenanthrene | 15 | 13 | ppb |
| E3 | PAH | Pyrene | 50 | 13 | ppb |
| E3 | PCB | PCB 18 | 130 | 170 | ppt |
| E3 | PCB | PCB 28 | 220 | 170 | ppt |
| E3 | PCB | PCB 37 | nd | 60 | ppt |
| E3 | PCB | PCB 44 | 390 | 440 | ppt |
| E3 | PCB | PCB 49 | 350 | 250 | ppt |
| E3 | PCB | PCB 52 | 520 | 870 | ppt |
| E3 | PCB | PCB 66 | 540 | 300 | ppt |
| E3 | PCB | PCB 70 | 490 | 650 | ppt |
| E3 | PCB | PCB 74 | 240 | 180 | ppt |
| E3 | PCB | PCB 77 | nd | 59 | ppt |
| E3 | PCB | PCB 87 | 360 | 740 | ppt |
| E3 | PCB | PCB 99 | 440 | 590 | ppt |
| E3 | PCB | PCB 101 | 910 | 1500 | ppt |
| E3 | PCB | PCB 105 | 360 | 620 | ppt |
| E3 | PCB | PCB 110 | 960 | 1700 | ppt |
| E3 | PCB | PCB 118 | 1200 | 1300 | ppt |
| E3 | PCB | PCB 119 | nd | 93 | ppt |
| E3 | PCB | PCB 123 | nd | 130 | ppt |
| E3 | PCB | PCB 126 | nd | 23 | ppt |
| E3 | PCB | PCB 128 | 260 | 370 | ppt |
| E3 | PCB | PCB 138 | 1000 | 1200 | ppt |
| E3 | PCB | PCB 149 | 820 | 1000 | ppt |
| E3 | PCB | PCB 151 | 120 | 250 | ppt |
| E3 | PCB | PCB 153/168 | 1400 | 1600 | ppt |
| E3 | PCB | PCB 156 | 70 | 250 | ppt |
| E3 | PCB | PCB 157 | nd | 65 | ppt |
| E3 | PCB | PCB 158 | 84 | 230 | ppt |
| E3 | PCB | PCB 167 | nd | 86 | ppt |
| E3 | PCB | PCB 170 | 220 | 270 | ppt |
| E3 | PCB | PCB 177 | nd | 190 | ppt |
| E3 | PCB | PCB 180 | 550 | 940 | ppt |
| E3 | PCB | PCB 183 | 240 | 230 | ppt |
| E3 | PCB | PCB 187 | 450 | 540 | ppt |
| E3 | PCB | PCB 194 | nd | 600 | ppt |
| E3 | PCB | PCB 201 | 190 | 111 | ppt |
| E3 | PCB | PCB 206 | nd | 450 | ppt |
| | | | | | |
| E5 | DDT | p,-p-DDMU | nd | 26 | ppt |
| E5 | DDT | p,p-DDD | nd | 40 | ppt |
| E5 | DDT | p,p-DDE | 390 | 256 | ppt |
| E5 | DDT | p,p-DDT | nd | 54 | ppt |
| E5 | PAH | 2,6-dimethylnaphthalene | nd | 7 | ppb |
| E5 | PAH | Chrysene | 7 | nd | ppb |
| E5 | PAH | Pyrene | 3 | nd | ppb |
| E5 | PCB | PCB 28 | nd | 18 | ppt |
| E5 | PCB | PCB 44 | nd | 12 | ppt |
| E5 | PCB | PCB 52 | nd | 18 | ppt |
| E5 | PCB | PCB 66 | 41 | 23 | ppt |
| E5 | PCB | PCB 70 | nd | 19 | ppt |

**Table C.13** *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E5 | PCB | PCB 74 | nd | 11 | ppt |
| E5 | PCB | PCB 87 | nd | 13 | ppt |
| E5 | PCB | PCB 99 | nd | 34 | ppt |
| E5 | PCB | PCB 101 | nd | 48 | ppt |
| E5 | PCB | PCB 105 | nd | 19 | ppt |
| E5 | PCB | PCB 110 | nd | 55 | ppt |
| E5 | PCB | PCB 118 | 110 | 49 | ppt |
| E5 | PCB | PCB 128 | nd | 28 | ppt |
| E5 | PCB | PCB 138 | nd | 75 | ppt |
| E5 | PCB | PCB 149 | nd | 64 | ppt |
| E5 | PCB | PCB 153/168 | 110 | 125 | ppt |
| E5 | PCB | PCB 156 | nd | 10 | ppt |
| E5 | PCB | PCB 180 | nd | 39 | ppt |
| E5 | PCB | PCB 183 | nd | 23 | ppt |
| E5 | PCB | PCB 187 | nd | 49 | ppt |
| E5 | PCB | PCB 206 | nd | 31 | ppt |
| | | | | | |
| E7 | DDT | o,p-DDE | nd | 26 | ppt |
| E7 | DDT | p,-p-DDMU | nd | 36 | ppt |
| E7 | DDT | p,p-DDD | nd | 42 | ppt |
| E7 | DDT | p,p-DDE | 360 | 393 | ppt |
| E7 | DDT | p,p-DDT | nd | 57 | ppt |
| E7 | PAH | 2,6-dimethylnaphthalene | 7 | 10 | ppb |
| E7 | PAH | 3,4-benzo(B)fluoranthene | 9 | 7 | ppb |
| E7 | PAH | Benzo[e]pyrene | 7 | nd | ppb |
| E7 | PAH | Pyrene | 7 | nd | ppb |
| E7 | PCB | PCB 18 | nd | 20 | ppt |
| E7 | PCB | PCB 28 | nd | 38 | ppt |
| E7 | PCB | PCB 44 | 23 | 73 | ppt |
| E7 | PCB | PCB 49 | 28 | 34 | ppt |
| E7 | PCB | PCB 52 | 51 | 152 | ppt |
| E7 | PCB | PCB 66 | 44 | 55 | ppt |
| E7 | PCB | PCB 70 | 48 | 111 | ppt |
| E7 | PCB | PCB 74 | nd | 27 | ppt |
| E7 | PCB | PCB 77 | nd | 10 | ppt |
| E7 | PCB | PCB 87 | nd | 144 | ppt |
| E7 | PCB | PCB 99 | nd | 99 | ppt |
| E7 | PCB | PCB 101 | 94 | 250 | ppt |
| E7 | PCB | PCB 105 | nd | 110 | ppt |
| E7 | PCB | PCB 110 | 120 | 330 | ppt |
| E7 | PCB | PCB 118 | 120 | 270 | ppt |
| E7 | PCB | PCB 128 | nd | 82 | ppt |
| E7 | PCB | PCB 138 | 140 | 240 | ppt |
| E7 | PCB | PCB 149 | 90 | 190 | ppt |
| E7 | PCB | PCB 153/168 | 130 | 267 | ppt |
| E7 | PCB | PCB 156 | nd | 28 | ppt |
| E7 | PCB | PCB 158 | nd | 36 | ppt |
| E7 | PCB | PCB 167 | nd | 18 | ppt |
| E7 | PCB | PCB 170 | nd | 65 | ppt |
| E7 | PCB | PCB 180 | nd | 86 | ppt |
| E7 | PCB | PCB 183 | nd | 22 | ppt |
| E7 | PCB | PCB 187 | nd | 52 | ppt |
| | | | | | |
| E8 | DDT | o,p-DDD | nd | 18 | ppt |
| E8 | DDT | o,p-DDE | nd | 33 | ppt |

**Table C.13** *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E8 | DDT | o,p-DDT | nd | 22 | ppt |
| E8 | DDT | p,-p-DDMU | nd | 45 | ppt |
| E8 | DDT | p,p-DDD | nd | 32 | ppt |
| E8 | DDT | p,p-DDE | 390 | 297 | ppt |
| E8 | DDT | p,p-DDT | nd | 44 | ppt |
| E8 | PAH | 2,6-dimethylnaphthalene | nd | 9 | ppb |
| E8 | PCB | PCB 18 | nd | 21 | ppt |
| E8 | PCB | PCB 44 | nd | 19 | ppt |
| E8 | PCB | PCB 49 | nd | 16 | ppt |
| E8 | PCB | PCB 52 | nd | 24 | ppt |
| E8 | PCB | PCB 66 | nd | 35 | ppt |
| E8 | PCB | PCB 70 | nd | 32 | ppt |
| E8 | PCB | PCB 74 | nd | 22 | ppt |
| E8 | PCB | PCB 77 | nd | 16 | ppt |
| E8 | PCB | PCB 81 | nd | 16 | ppt |
| E8 | PCB | PCB 99 | nd | 44 | ppt |
| E8 | PCB | PCB 101 | nd | 43 | ppt |
| E8 | PCB | PCB 105 | nd | 26 | ppt |
| E8 | PCB | PCB 110 | nd | 64 | ppt |
| E8 | PCB | PCB 118 | nd | 64 | ppt |
| E8 | PCB | PCB 128 | nd | 30 | ppt |
| E8 | PCB | PCB 138 | nd | 70 | ppt |
| E8 | PCB | PCB 149 | nd | 70 | ppt |
| E8 | PCB | PCB 153/168 | nd | 107 | ppt |
| E8 | PCB | PCB 158 | nd | 17 | ppt |
| E8 | PCB | PCB 170 | nd | 34 | ppt |
| E8 | PCB | PCB 180 | nd | 52 | ppt |
| E8 | PCB | PCB 183 | nd | 22 | ppt |
| E8 | PCB | PCB 187 | nd | 50 | ppt |
| E8 | PCB | PCB 206 | nd | 27 | ppt |
| E9 | DDT | p,-p-DDMU | nd | 21 | ppt |
| E9 | DDT | p,p-DDD | nd | 18 | ppt |
| E9 | DDT | p,p-DDE | 350 | 165 | ppt |
| E9 | PAH | 2-methylnaphthalene | nd | 7 | ppb |
| E9 | PAH | 2,6-dimethylnaphthalene | 7 | 7 | ppb |
| E9 | PAH | 3,4-benzo(B)fluoranthene | 15 | 9 | ppb |
| E9 | PAH | Benzo[A]pyrene | 9 | nd | ppb |
| E9 | PAH | Benzo[e]pyrene | 9 | nd | ppb |
| E9 | PAH | Benzo[G,H,I]perylene | 7 | nd | ppb |
| E9 | PAH | Pyrene | 7 | nd | ppb |
| E9 | PCB | PCB 18 | nd | 67 | ppt |
| E9 | PCB | PCB 28 | nd | 53 | ppt |
| E9 | PCB | PCB 44 | 35 | 161 | ppt |
| E9 | PCB | PCB 49 | 42 | 98 | ppt |
| E9 | PCB | PCB 52 | 79 | 270 | ppt |
| E9 | PCB | PCB 66 | 56 | 124 | ppt |
| E9 | PCB | PCB 70 | 50 | 210 | ppt |
| E9 | PCB | PCB 74 | nd | 78 | ppt |
| E9 | PCB | PCB 87 | nd | 153 | ppt |
| E9 | PCB | PCB 99 | 66 | 136 | ppt |
| E9 | PCB | PCB 101 | 120 | 300 | ppt |
| E9 | PCB | PCB 105 | 74 | 152 | ppt |
| E9 | PCB | PCB 110 | 150 | 350 | ppt |
| E9 | PCB | PCB 118 | 120 | 330 | ppt |

**Table C.13** *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E9 | PCB | PCB 119 | nd | 21 | ppt |
| E9 | PCB | PCB 128 | nd | 64 | ppt |
| E9 | PCB | PCB 138 | 190 | 300 | ppt |
| E9 | PCB | PCB 149 | 110 | 300 | ppt |
| E9 | PCB | PCB 151 | nd | 92 | ppt |
| E9 | PCB | PCB 153/168 | 170 | 410 | ppt |
| E9 | PCB | PCB 156 | nd | 50 | ppt |
| E9 | PCB | PCB 158 | nd | 60 | ppt |
| E9 | PCB | PCB 170 | nd | 118 | ppt |
| E9 | PCB | PCB 177 | nd | 84 | ppt |
| E9 | PCB | PCB 180 | nd | 250 | ppt |
| E9 | PCB | PCB 183 | nd | 58 | ppt |
| E9 | PCB | PCB 187 | nd | 149 | ppt |
| E9 | PCB | PCB 206 | nd | 38 | ppt |
| | | | | | |
| E11 | DDT | p,-p-DDMU | nd | 37 | ppt |
| E11 | DDT | p,p-DDE | 320 | 238 | ppt |
| E11 | PAH | 2,6-dimethylnaphthalene | 7 | 9 | ppb |
| E11 | PCB | PCB 44 | nd | 12 | ppt |
| E11 | PCB | PCB 49 | nd | 18 | ppt |
| E11 | PCB | PCB 52 | nd | 25 | ppt |
| E11 | PCB | PCB 66 | nd | 28 | ppt |
| E11 | PCB | PCB 70 | nd | 19 | ppt |
| E11 | PCB | PCB 99 | nd | 30 | ppt |
| E11 | PCB | PCB 101 | nd | 42 | ppt |
| E11 | PCB | PCB 110 | nd | 39 | ppt |
| E11 | PCB | PCB 138 | nd | 48 | ppt |
| E11 | PCB | PCB 149 | 64 | 41 | ppt |
| E11 | PCB | PCB 153/168 | nd | 56 | ppt |
| E11 | PCB | PCB 156 | nd | 13 | ppt |
| E11 | PCB | PCB 187 | nd | 24 | ppt |
| | | | | | |
| E14 | DDT | p,-p-DDMU | nd | 58 | ppt |
| E14 | DDT | p,p-DDD | nd | 52 | ppt |
| E14 | DDT | p,p-DDE | 260 | 366 | ppt |
| E14 | PAH | 2,6-dimethylnaphthalene | nd | 11 | ppb |
| E14 | PCB | PCB 18 | nd | 8 | ppt |
| E14 | PCB | PCB 28 | nd | 16 | ppt |
| E14 | PCB | PCB 44 | nd | 15 | ppt |
| E14 | PCB | PCB 49 | nd | 23 | ppt |
| E14 | PCB | PCB 52 | nd | 21 | ppt |
| E14 | PCB | PCB 66 | nd | 29 | ppt |
| E14 | PCB | PCB 70 | nd | 18 | ppt |
| E14 | PCB | PCB 99 | nd | 30 | ppt |
| E14 | PCB | PCB 101 | nd | 46 | ppt |
| E14 | PCB | PCB 105 | nd | 22 | ppt |
| E14 | PCB | PCB 118 | nd | 50 | ppt |
| E14 | PCB | PCB 128 | nd | 20 | ppt |
| E14 | PCB | PCB 138 | nd | 57 | ppt |
| E14 | PCB | PCB 151 | nd | 14 | ppt |
| E14 | PCB | PCB 153/168 | nd | 93 | ppt |
| E14 | PCB | PCB 158 | nd | 9 | ppt |
| E14 | PCB | PCB 183 | nd | 16 | ppt |
| E14 | PCB | PCB 187 | nd | 43 | ppt |

## Table C.13 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E15 | DDT | p,-p-DDMU | nd | 38 | ppt |
| E15 | DDT | p,p-DDE | 330 | 275 | ppt |
| E15 | PAH | 2,6-dimethylnaphthalene | nd | 7 | ppb |
| E15 | PCB | PCB 18 | nd | 18 | ppt |
| E15 | PCB | PCB 28 | nd | 37 | ppt |
| E15 | PCB | PCB 44 | nd | 30 | ppt |
| E15 | PCB | PCB 49 | nd | 27 | ppt |
| E15 | PCB | PCB 52 | nd | 32 | ppt |
| E15 | PCB | PCB 66 | nd | 28 | ppt |
| E15 | PCB | PCB 70 | nd | 29 | ppt |
| E15 | PCB | PCB 74 | nd | 15 | ppt |
| E15 | PCB | PCB 99 | nd | 39 | ppt |
| E15 | PCB | PCB 101 | nd | 40 | ppt |
| E15 | PCB | PCB 105 | nd | 20 | ppt |
| E15 | PCB | PCB 110 | nd | 35 | ppt |
| E15 | PCB | PCB 118 | nd | 59 | ppt |
| E15 | PCB | PCB 149 | 47 | 45 | ppt |
| E15 | PCB | PCB 153/168 | nd | 88 | ppt |
| E15 | PCB | PCB 183 | nd | 14 | ppt |
| E15 | PCB | PCB 187 | nd | 36 | ppt |
| | | | | | |
| E17 | DDT | p,p-DDE | 280 | nd | ppt |
| E17 | PAH | 2,6-dimethylnaphthalene | nd | 7 | ppb |
| E17 | PCB | PCB 66 | 53 | nd | ppt |
| E17 | PCB | PCB 118 | 70 | nd | ppt |
| E17 | PCB | PCB 149 | 44 | nd | ppt |
| E17 | PCB | PCB 153/168 | 94 | nd | ppt |
| | | | | | |
| E19 | Chlordane | Alpha(cis)Chlordane | nd | 50 | ppt |
| E19 | Chlordane | Gamma(trans)Chlordane | nd | 27 | ppt |
| E19 | DDT | o,p-DDD | nd | 26 | ppt |
| E19 | DDT | o,p-DDE | nd | 48 | ppt |
| E19 | DDT | p,-p-DDMU | nd | 65 | ppt |
| E19 | DDT | p,p-DDD | nd | 66 | ppt |
| E19 | DDT | p,p-DDE | 470 | 582 | ppt |
| E19 | DDT | p,p-DDT | nd | 83 | ppt |
| E19 | PAH | 2,6-dimethylnaphthalene | nd | 13 | ppb |
| E19 | PAH | 3,4-benzo(B)fluoranthene | nd | 8 | ppb |
| E19 | PAH | Pyrene | nd | 7 | ppb |
| E19 | PCB | PCB 44 | 26 | 23 | ppt |
| E19 | PCB | PCB 49 | 20 | 21 | ppt |
| E19 | PCB | PCB 52 | 34 | 33 | ppt |
| E19 | PCB | PCB 66 | 46 | 42 | ppt |
| E19 | PCB | PCB 70 | 28 | 39 | ppt |
| E19 | PCB | PCB 74 | 16 | 22 | ppt |
| E19 | PCB | PCB 77 | nd | 15 | ppt |
| E19 | PCB | PCB 99 | nd | 42 | ppt |
| E19 | PCB | PCB 101 | 67 | 54 | ppt |
| E19 | PCB | PCB 105 | nd | 45 | ppt |
| E19 | PCB | PCB 110 | 47 | 66 | ppt |
| E19 | PCB | PCB 118 | 75 | 87 | ppt |
| E19 | PCB | PCB 128 | nd | 33 | ppt |
| E19 | PCB | PCB 138 | nd | 100 | ppt |
| E19 | PCB | PCB 149 | 35 | 78 | ppt |
| E19 | PCB | PCB 151 | nd | 31 | ppt |

**Table C.13** *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E19 | PCB | PCB 153/168 | 70 | 144 | ppt |
| E19 | PCB | PCB 156 | nd | 19 | ppt |
| E19 | PCB | PCB 158 | nd | 15 | ppt |
| E19 | PCB | PCB 180 | nd | 91 | ppt |
| E19 | PCB | PCB 183 | nd | 21 | ppt |
| E19 | PCB | PCB 187 | nd | 75 | ppt |
| E19 | PCB | PCB 206 | nd | 85 | ppt |
| | | | | | |
| E20 | DDT | p,-p-DDMU | nd | 51 | ppt |
| E20 | DDT | p,p-DDD | nd | 39 | ppt |
| E20 | DDT | p,p-DDE | 450 | 406 | ppt |
| E20 | DDT | p,p-DDT | nd | 81 | ppt |
| E20 | PAH | 2,6-dimethylnaphthalene | nd | 9 | ppb |
| E20 | PCB | PCB 44 | nd | 9 | ppt |
| E20 | PCB | PCB 49 | nd | 16 | ppt |
| E20 | PCB | PCB 52 | nd | 12 | ppt |
| E20 | PCB | PCB 66 | nd | 31 | ppt |
| E20 | PCB | PCB 70 | nd | 18 | ppt |
| E20 | PCB | PCB 74 | nd | 7 | ppt |
| E20 | PCB | PCB 99 | nd | 25 | ppt |
| E20 | PCB | PCB 101 | nd | 27 | ppt |
| E20 | PCB | PCB 105 | nd | 21 | ppt |
| E20 | PCB | PCB 110 | nd | 38 | ppt |
| E20 | PCB | PCB 118 | nd | 45 | ppt |
| E20 | PCB | PCB 128 | nd | 23 | ppt |
| E20 | PCB | PCB 138 | nd | 59 | ppt |
| E20 | PCB | PCB 149 | nd | 46 | ppt |
| E20 | PCB | PCB 153/168 | 79 | 107 | ppt |
| E20 | PCB | PCB 180 | nd | 54 | ppt |
| E20 | PCB | PCB 183 | nd | 16 | ppt |
| E20 | PCB | PCB 187 | nd | 30 | ppt |
| | | | | | |
| E21 | DDT | p,p-DDE | 300 | nd | ppt |
| | | | | | |
| E23 | DDT | o,p-DDD | nd | 19 | ppt |
| E23 | DDT | p,-p-DDMU | nd | 51 | ppt |
| E23 | DDT | p,p-DDD | nd | 43 | ppt |
| E23 | DDT | p,p-DDE | 480 | 468 | ppt |
| E23 | DDT | p,p-DDT | nd | 109 | ppt |
| E23 | PAH | 2,6-dimethylnaphthalene | 6 | 12 | ppb |
| E23 | PAH | Pyrene | 7 | nd | ppb |
| E23 | PCB | PCB 18 | nd | 13 | ppt |
| E23 | PCB | PCB 44 | nd | 10 | ppt |
| E23 | PCB | PCB 49 | nd | 16 | ppt |
| E23 | PCB | PCB 52 | nd | 18 | ppt |
| E23 | PCB | PCB 66 | 49 | 28 | ppt |
| E23 | PCB | PCB 70 | nd | 20 | ppt |
| E23 | PCB | PCB 74 | nd | 9 | ppt |
| E23 | PCB | PCB 99 | nd | 39 | ppt |
| E23 | PCB | PCB 101 | nd | 35 | ppt |
| E23 | PCB | PCB 105 | nd | 33 | ppt |
| E23 | PCB | PCB 110 | nd | 37 | ppt |
| E23 | PCB | PCB 118 | nd | 46 | ppt |
| E23 | PCB | PCB 138 | 85 | 75 | ppt |
| E23 | PCB | PCB 149 | nd | 51 | ppt |

**Table C.13** *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E23 | PCB | PCB 153/168 | nd | 94 | ppt |
| E23 | PCB | PCB 158 | nd | 19 | ppt |
| E23 | PCB | PCB 177 | nd | 26 | ppt |
| E23 | PCB | PCB 180 | nd | 58 | ppt |
| E23 | PCB | PCB 187 | nd | 35 | ppt |
| E23 | PCB | PCB 206 | nd | 39 | ppt |
| | | | | | |
| E25 | DDT | o,p-DDD | nd | 18 | ppt |
| E25 | DDT | o,p-DDE | nd | 25 | ppt |
| E25 | DDT | o,p-DDT | nd | 23 | ppt |
| E25 | DDT | p,-p-DDMU | nd | 43 | ppt |
| E25 | DDT | p,p-DDD | nd | 51 | ppt |
| E25 | DDT | p,p-DDE | 590 | 512 | ppt |
| E25 | DDT | p,p-DDT | nd | 82 | ppt |
| E25 | PAH | 2,6-dimethylnaphthalene | nd | 12 | ppb |
| E25 | PCB | PCB 44 | nd | 11 | ppt |
| E25 | PCB | PCB 49 | nd | 17 | ppt |
| E25 | PCB | PCB 52 | nd | 15 | ppt |
| E25 | PCB | PCB 66 | nd | 20 | ppt |
| E25 | PCB | PCB 70 | nd | 19 | ppt |
| E25 | PCB | PCB 74 | nd | 10 | ppt |
| E25 | PCB | PCB 99 | nd | 25 | ppt |
| E25 | PCB | PCB 101 | nd | 31 | ppt |
| E25 | PCB | PCB 105 | nd | 29 | ppt |
| E25 | PCB | PCB 110 | nd | 53 | ppt |
| E25 | PCB | PCB 118 | nd | 51 | ppt |
| E25 | PCB | PCB 138 | nd | 68 | ppt |
| E25 | PCB | PCB 149 | nd | 72 | ppt |
| E25 | PCB | PCB 153/168 | nd | 94 | ppt |
| E25 | PCB | PCB 180 | nd | 47 | ppt |
| E25 | PCB | PCB 183 | nd | 20 | ppt |
| E25 | PCB | PCB 187 | nd | 53 | ppt |
| | | | | | |
| E26 | DDT | o,p-DDD | nd | 24 | ppt |
| E26 | DDT | o,p-DDE | nd | 35 | ppt |
| E26 | DDT | p,-p-DDMU | nd | 53 | ppt |
| E26 | DDT | p,p-DDD | nd | 44 | ppt |
| E26 | DDT | p,p-DDE | 400 | 574 | ppt |
| E26 | DDT | p,p-DDT | nd | 69 | ppt |
| E26 | PAH | 2,6-dimethylnaphthalene | 6 | 11 | ppb |
| E26 | PAH | 3,4-benzo(B)fluoranthene | 8 | 7 | ppb |
| E26 | PCB | PCB 18 | nd | 15 | ppt |
| E26 | PCB | PCB 28 | nd | 28 | ppt |
| E26 | PCB | PCB 44 | nd | 18 | ppt |
| E26 | PCB | PCB 49 | nd | 16 | ppt |
| E26 | PCB | PCB 52 | nd | 33 | ppt |
| E26 | PCB | PCB 66 | nd | 36 | ppt |
| E26 | PCB | PCB 70 | nd | 32 | ppt |
| E26 | PCB | PCB 74 | nd | 15 | ppt |
| E26 | PCB | PCB 77 | nd | 6 | ppt |
| E26 | PCB | PCB 99 | nd | 42 | ppt |
| E26 | PCB | PCB 101 | nd | 59 | ppt |
| E26 | PCB | PCB 105 | nd | 35 | ppt |
| E26 | PCB | PCB 110 | nd | 72 | ppt |
| E26 | PCB | PCB 118 | nd | 97 | ppt |

## Table C.13 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| E26 | PCB | PCB 123 | nd | 14 | ppt |
| E26 | PCB | PCB 128 | nd | 35 | ppt |
| E26 | PCB | PCB 138 | nd | 98 | ppt |
| E26 | PCB | PCB 149 | nd | 95 | ppt |
| E26 | PCB | PCB 153/168 | nd | 140 | ppt |
| E26 | PCB | PCB 180 | nd | 70 | ppt |
| E26 | PCB | PCB 187 | nd | 55 | ppt |

## Table C.14

Summary of the constituents that make up total chlordane, total DDT, total HCH, total PCB, and total PAH in sediments from the SBOO region during 2016; nd = not detected.

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| I1 | DDT | p,p-DDD | nd | 18 | ppt |
| I1 | DDT | p,p-DDE | 56 | 94 | ppt |
| I1 | DDT | p,p-DDT | nd | 21 | ppt |
| I1 | HCH | HCH, Beta isomer | nd | 21 | ppt |
| I1 | PAH | 1-methylnaphthalene | nd | 7 | ppb |
| I1 | PAH | 3,4-benzo(B)fluoranthene | nd | 10 | ppb |
| I1 | PAH | Anthracene | nd | 6 | ppb |
| I1 | PAH | Benzo[A]anthracene | nd | 16 | ppb |
| I1 | PAH | Benzo[A]pyrene | nd | 9 | ppb |
| I1 | PAH | Benzo[e]pyrene | nd | 8 | ppb |
| I1 | PAH | Benzo[K]fluoranthene | nd | 11 | ppb |
| I1 | PAH | Chrysene | nd | 15 | ppb |
| I1 | PAH | Fluoranthene | nd | 13 | ppb |
| I1 | PAH | Indeno(1,2,3-CD)pyrene | nd | 3 | ppb |
| I1 | PAH | Perylene | nd | 6 | ppb |
| I1 | PAH | Phenanthrene | nd | 5 | ppb |
| I1 | PAH | Pyrene | nd | 13 | ppb |
| I1 | PCB | PCB 18 | nd | 99 | ppt |
| I1 | PCB | PCB 28 | nd | 150 | ppt |
| I1 | PCB | PCB 37 | nd | 33 | ppt |
| I1 | PCB | PCB 44 | nd | 91 | ppt |
| I1 | PCB | PCB 49 | nd | 51 | ppt |
| I1 | PCB | PCB 52 | nd | 78 | ppt |
| I1 | PCB | PCB 66 | nd | 19 | ppt |
| I1 | PCB | PCB 70 | nd | 24 | ppt |
| I1 | PCB | PCB 74 | nd | 11 | ppt |
| I1 | PCB | PCB 101 | nd | 86 | ppt |
| I1 | PCB | PCB 110 | nd | 38 | ppt |
| I1 | PCB | PCB 128 | nd | 7 | ppt |
| I1 | PCB | PCB 138 | nd | 86 | ppt |
| I1 | PCB | PCB 149 | nd | 190 | ppt |
| I1 | PCB | PCB 151 | nd | 64 | ppt |
| I1 | PCB | PCB 153/168 | nd | 150 | ppt |
| I1 | PCB | PCB 177 | nd | 25 | ppt |
| I1 | PCB | PCB 180 | nd | 45 | ppt |
| I1 | PCB | PCB 183 | nd | 21 | ppt |
| I1 | PCB | PCB 187 | nd | 65 | ppt |
| I1 | PCB | PCB 206 | 100 | nd | ppt |
| I2 | DDT | p,p-DDE | nd | 31 | ppt |
| I2 | PCB | PCB 18 | nd | 10 | ppt |
| I2 | PCB | PCB 28 | nd | 11 | ppt |
| I2 | PCB | PCB 49 | nd | 6 | ppt |
| I2 | PCB | PCB 66 | nd | 10 | ppt |
| I2 | PCB | PCB 74 | nd | 13 | ppt |
| I2 | PCB | PCB 81 | nd | 11 | ppt |
| I2 | PCB | PCB 99 | nd | 9 | ppt |
| I2 | PCB | PCB 101 | nd | 8 | ppt |
| I2 | PCB | PCB 118 | nd | 21 | ppt |
| I2 | PCB | PCB 138 | nd | 7 | ppt |
| I2 | PCB | PCB 149 | nd | 10 | ppt |
| I2 | PCB | PCB 153/168 | nd | 18 | ppt |
| I2 | PCB | PCB 206 | 130 | nd | ppt |

## Table C.14 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| I3 | PCB | PCB 28 | nd | 7 | ppt |
| I3 | PCB | PCB 66 | nd | 4 | ppt |
| I3 | PCB | PCB 74 | nd | 7 | ppt |
| I3 | PCB | PCB 206 | 70 | nd | ppt |
| I4 | DDT | p,p-DDE | nd | 17 | ppt |
| I4 | PCB | PCB 18 | nd | 270 | ppt |
| I4 | PCB | PCB 28 | nd | 300 | ppt |
| I4 | PCB | PCB 37 | nd | 69 | ppt |
| I4 | PCB | PCB 44 | nd | 250 | ppt |
| I4 | PCB | PCB 49 | nd | 124 | ppt |
| I4 | PCB | PCB 52 | nd | 240 | ppt |
| I4 | PCB | PCB 66 | nd | 37 | ppt |
| I4 | PCB | PCB 74 | nd | 32 | ppt |
| I4 | PCB | PCB 101 | nd | 240 | ppt |
| I4 | PCB | PCB 110 | nd | 111 | ppt |
| I4 | PCB | PCB 118 | nd | 50 | ppt |
| I4 | PCB | PCB 128 | nd | 25 | ppt |
| I4 | PCB | PCB 138 | nd | 220 | ppt |
| I4 | PCB | PCB 149 | nd | 530 | ppt |
| I4 | PCB | PCB 151 | nd | 210 | ppt |
| I4 | PCB | PCB 153/168 | nd | 490 | ppt |
| I4 | PCB | PCB 156 | nd | 15 | ppt |
| I4 | PCB | PCB 158 | nd | 38 | ppt |
| I4 | PCB | PCB 170 | nd | 23 | ppt |
| I4 | PCB | PCB 177 | nd | 40 | ppt |
| I4 | PCB | PCB 180 | nd | 101 | ppt |
| I4 | PCB | PCB 183 | nd | 61 | ppt |
| I4 | PCB | PCB 187 | nd | 133 | ppt |
| I6 | DDT | p,p-DDE | nd | 39 | ppt |
| I7 | DDT | p,p-DDE | nd | 29 | ppt |
| I7 | PCB | PCB 180 | nd | 16 | ppt |
| I8 | DDT | o,p-DDE | nd | 12 | ppt |
| I8 | DDT | p,p-DDE | nd | 50 | ppt |
| I8 | PCB | PCB 18 | nd | 9 | ppt |
| I8 | PCB | PCB 28 | nd | 8 | ppt |
| I8 | PCB | PCB 52 | nd | 9 | ppt |
| I8 | PCB | PCB 66 | nd | 10 | ppt |
| I8 | PCB | PCB 70 | nd | 6 | ppt |
| I8 | PCB | PCB 74 | nd | 7 | ppt |
| I8 | PCB | PCB 138 | nd | 10 | ppt |
| I9 | Chlordane | TransNonachlor | nd | 15 | ppt |
| I9 | DDT | p,-p-DDMU | nd | 35 | ppt |
| I9 | DDT | p,p-DDE | 140 | 181 | ppt |
| I9 | PCB | PCB 18 | nd | 9 | ppt |
| I9 | PCB | PCB 37 | nd | 10 | ppt |
| I9 | PCB | PCB 49 | nd | 9 | ppt |
| I9 | PCB | PCB 52 | nd | 14 | ppt |
| I9 | PCB | PCB 66 | nd | 16 | ppt |
| I9 | PCB | PCB 70 | nd | 13 | ppt |
| I9 | PCB | PCB 74 | nd | 14 | ppt |

## Table C.14 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| I9 | PCB | PCB 77 | nd | 12 | ppt |
| I9 | PCB | PCB 187 | nd | 20 | ppt |
| | | | | | |
| I10 | DDT | p,-p-DDMU | nd | 13 | ppt |
| I10 | DDT | p,p-DDE | 69 | 59 | ppt |
| I10 | HCH | HCH, Delta isomer | nd | 134 | ppt |
| I10 | PCB | PCB 49 | nd | 7 | ppt |
| I10 | PCB | PCB 66 | nd | 5 | ppt |
| I10 | PCB | PCB 74 | nd | 6 | ppt |
| I10 | PCB | PCB 81 | nd | 9 | ppt |
| I10 | PCB | PCB 138 | nd | 10 | ppt |
| I10 | PCB | PCB 153/168 | nd | 19 | ppt |
| | | | | | |
| I12 | DDT | p,p-DDE | nd | 76 | ppt |
| I12 | PAH | 3,4-benzo(B)fluoranthene | 7 | nd | ppb |
| I12 | PAH | Benzo[A]anthracene | 16 | nd | ppb |
| I12 | PAH | Benzo[A]pyrene | 5 | nd | ppb |
| I12 | PAH | Benzo[K]fluoranthene | 8 | nd | ppb |
| I12 | PAH | Chrysene | 12 | nd | ppb |
| I12 | PAH | Fluoranthene | 3 | nd | ppb |
| I12 | PAH | Pyrene | 5 | nd | ppb |
| I12 | PCB | PCB 153/168 | nd | 17 | ppt |
| | | | | | |
| I13 | PCB | PCB 52 | nd | 7 | ppt |
| | | | | | |
| I14 | DDT | p,-p-DDMU | nd | 16 | ppt |
| I14 | DDT | p,p-DDD | nd | 15 | ppt |
| I14 | DDT | p,p-DDE | 300 | 121 | ppt |
| | | | | | |
| I15 | DDT | p,p-DDE | 130 | 35 | ppt |
| | | | | | |
| I16 | Chlordane | Gamma(trans)Chlordane | nd | 24 | ppt |
| I16 | DDT | p,-p-DDMU | nd | 19 | ppt |
| I16 | DDT | p,p-DDE | nd | 73 | ppt |
| I16 | PCB | PCB 49 | nd | 13 | ppt |
| I16 | PCB | PCB 52 | nd | 11 | ppt |
| I16 | PCB | PCB 66 | nd | 11 | ppt |
| I16 | PCB | PCB 74 | nd | 8 | ppt |
| I16 | PCB | PCB 77 | nd | 9 | ppt |
| I16 | PCB | PCB 138 | nd | 12 | ppt |
| I16 | PCB | PCB 149 | nd | 21 | ppt |
| I16 | PCB | PCB 151 | nd | 19 | ppt |
| I16 | PCB | PCB 153/168 | nd | 32 | ppt |
| I16 | PCB | PCB 158 | nd | 12 | ppt |
| | | | | | |
| I18 | Chlordane | Alpha(cis)Chlordane | nd | 19 | ppt |
| I18 | Chlordane | Gamma(trans)Chlordane | nd | 15 | ppt |
| I18 | DDT | p,-p-DDMU | nd | 10 | ppt |
| I18 | DDT | p,p-DDE | 80 | 64 | ppt |
| I18 | PCB | PCB 49 | nd | 5 | ppt |
| I18 | PCB | PCB 66 | nd | 12 | ppt |
| I18 | PCB | PCB 74 | nd | 9 | ppt |
| I18 | PCB | PCB 77 | nd | 8 | ppt |

## Table C.14 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| I18 | PCB | PCB 101 | nd | 13 | ppt |
| I18 | PCB | PCB 105 | nd | 9 | ppt |
| I18 | PCB | PCB 118 | nd | 16 | ppt |
| I18 | PCB | PCB 123 | nd | 9 | ppt |
| I18 | PCB | PCB 149 | nd | 13 | ppt |
| I18 | PCB | PCB 151 | nd | 9 | ppt |
| I18 | PCB | PCB 153/168 | nd | 20 | ppt |
| I20 | DDT | p,p-DDE | 42 | 32 | ppt |
| I20 | PCB | PCB 44 | nd | 6 | ppt |
| I20 | PCB | PCB 66 | nd | 7 | ppt |
| I20 | PCB | PCB 70 | nd | 9 | ppt |
| I20 | PCB | PCB 74 | nd | 6 | ppt |
| I20 | PCB | PCB 138 | nd | 7 | ppt |
| I20 | PCB | PCB 187 | nd | 11 | ppt |
| I21 | DDT | p,p-DDE | 76 | 38 | ppt |
| I22 | DDT | o,p-DDD | nd | 10 | ppt |
| I22 | DDT | p,-p-DDMU | nd | 17 | ppt |
| I22 | DDT | p,p-DDE | 99 | 196 | ppt |
| I22 | PAH | 2,6-dimethylnaphthalene | nd | 7 | ppb |
| I22 | PCB | PCB 138 | nd | 16 | ppt |
| I22 | PCB | PCB 149 | nd | 17 | ppt |
| I22 | PCB | PCB 153/168 | nd | 23 | ppt |
| I23 | DDT | p,p-DDE | 130 | 101 | ppt |
| I23 | PCB | PCB 28 | nd | 14 | ppt |
| I23 | PCB | PCB 44 | nd | 12 | ppt |
| I23 | PCB | PCB 52 | nd | 13 | ppt |
| I23 | PCB | PCB 66 | nd | 15 | ppt |
| I23 | PCB | PCB 70 | nd | 11 | ppt |
| I23 | PCB | PCB 110 | nd | 21 | ppt |
| I23 | PCB | PCB 118 | nd | 20 | ppt |
| I23 | PCB | PCB 123 | nd | 9 | ppt |
| I23 | PCB | PCB 138 | nd | 26 | ppt |
| I23 | PCB | PCB 149 | nd | 34 | ppt |
| I23 | PCB | PCB 151 | nd | 15 | ppt |
| I23 | PCB | PCB 153/168 | nd | 57 | ppt |
| I23 | PCB | PCB 180 | nd | 41 | ppt |
| I23 | PCB | PCB 187 | nd | 30 | ppt |
| I27 | Chlordane | Alpha(cis)Chlordane | nd | 17 | ppt |
| I27 | Chlordane | Gamma(trans)Chlordane | nd | 20 | ppt |
| I27 | DDT | o,p-DDD | nd | 15 | ppt |
| I27 | DDT | o,p-DDE | nd | 14 | ppt |
| I27 | DDT | o,p-DDT | nd | 16 | ppt |
| I27 | DDT | p,-p-DDMU | nd | 27 | ppt |
| I27 | DDT | p,p-DDD | nd | 9 | ppt |
| I27 | DDT | p,p-DDE | 165 | 157 | ppt |
| I27 | DDT | p,p-DDT | nd | 22 | ppt |
| I27 | HCH | HCH, Beta isomer | nd | 35 | ppt |
| I27 | PCB | PCB 18 | nd | 12 | ppt |
| I27 | PCB | PCB 28 | nd | 13 | ppt |
| I27 | PCB | PCB 49 | nd | 7 | ppt |

## Table C.14 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| I27 | PCB | PCB 52 | nd | 10 | ppt |
| I27 | PCB | PCB 66 | nd | 16 | ppt |
| I27 | PCB | PCB 74 | nd | 10 | ppt |
| I27 | PCB | PCB 77 | nd | 11 | ppt |
| I27 | PCB | PCB 81 | nd | 13 | ppt |
| I27 | PCB | PCB 99 | nd | 9 | ppt |
| I27 | PCB | PCB 101 | nd | 13 | ppt |
| I27 | PCB | PCB 105 | nd | 9 | ppt |
| I27 | PCB | PCB 110 | nd | 12 | ppt |
| I27 | PCB | PCB 118 | nd | 21 | ppt |
| I27 | PCB | PCB 119 | nd | 8 | ppt |
| I27 | PCB | PCB 126 | nd | 13 | ppt |
| I27 | PCB | PCB 128 | nd | 17 | ppt |
| I27 | PCB | PCB 138 | nd | 23 | ppt |
| I27 | PCB | PCB 149 | nd | 24 | ppt |
| I27 | PCB | PCB 151 | nd | 11 | ppt |
| I27 | PCB | PCB 153/168 | nd | 41 | ppt |
| I27 | PCB | PCB 156 | nd | 14 | ppt |
| I27 | PCB | PCB 157 | nd | 10 | ppt |
| I27 | PCB | PCB 158 | nd | 12 | ppt |
| I27 | PCB | PCB 167 | nd | 10 | ppt |
| I27 | PCB | PCB 177 | nd | 16 | ppt |
| I27 | PCB | PCB 180 | nd | 18 | ppt |
| I27 | PCB | PCB 183 | nd | 19 | ppt |
| I27 | PCB | PCB 187 | nd | 26 | ppt |
| I27 | PCB | PCB 201 | nd | 10 | ppt |
| I27 | PCB | PCB 206 | nd | 19 | ppt |
| I28 | DDT | p,-p-DDMU | nd | 72 | ppt |
| I28 | DDT | p,p-DDD | nd | 64 | ppt |
| I28 | DDT | p,p-DDE | 570 | 631 | ppt |
| I28 | DDT | p,p-DDT | nd | 82 | ppt |
| I28 | PAH | 2,6-dimethylnaphthalene | nd | 8 | ppb |
| I28 | PCB | PCB 18 | nd | 10 | ppt |
| I28 | PCB | PCB 28 | nd | 34 | ppt |
| I28 | PCB | PCB 49 | 40 | 24 | ppt |
| I28 | PCB | PCB 52 | 42 | 39 | ppt |
| I28 | PCB | PCB 66 | nd | 43 | ppt |
| I28 | PCB | PCB 70 | nd | 39 | ppt |
| I28 | PCB | PCB 77 | nd | 8 | ppt |
| I28 | PCB | PCB 99 | 65 | 64 | ppt |
| I28 | PCB | PCB 101 | 69 | 92 | ppt |
| I28 | PCB | PCB 105 | nd | 42 | ppt |
| I28 | PCB | PCB 110 | nd | 87 | ppt |
| I28 | PCB | PCB 118 | nd | 120 | ppt |
| I28 | PCB | PCB 128 | nd | 34 | ppt |
| I28 | PCB | PCB 138 | 92 | 116 | ppt |
| I28 | PCB | PCB 149 | 57 | 109 | ppt |
| I28 | PCB | PCB 151 | nd | 18 | ppt |
| I28 | PCB | PCB 153/168 | 120 | 147 | ppt |
| I28 | PCB | PCB 156 | nd | 23 | ppt |
| I28 | PCB | PCB 158 | nd | 17 | ppt |
| I28 | PCB | PCB 170 | nd | 42 | ppt |

## Table C.14 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| I28 | PCB | PCB 180 | nd | 58 | ppt |
| I28 | PCB | PCB 183 | nd | 22 | ppt |
| I28 | PCB | PCB 187 | nd | 68 | ppt |
| I29 | DDT | o,p-DDD | nd | 37 | ppt |
| I29 | DDT | p,-p-DDMU | nd | 115 | ppt |
| I29 | DDT | p,p-DDD | nd | 95 | ppt |
| I29 | DDT | p,p-DDE | 530 | 1020 | ppt |
| I29 | DDT | p,p-DDT | nd | 52 | ppt |
| I29 | PAH | 2,6-dimethylnaphthalene | nd | 6 | ppb |
| I29 | PAH | Pyrene | 6 | nd | ppb |
| I29 | PCB | PCB 49 | nd | 13 | ppt |
| I29 | PCB | PCB 52 | nd | 15 | ppt |
| I29 | PCB | PCB 99 | nd | 23 | ppt |
| I29 | PCB | PCB 101 | nd | 44 | ppt |
| I29 | PCB | PCB 105 | nd | 17 | ppt |
| I29 | PCB | PCB 110 | nd | 33 | ppt |
| I29 | PCB | PCB 118 | nd | 40 | ppt |
| I29 | PCB | PCB 128 | nd | 15 | ppt |
| I29 | PCB | PCB 138 | nd | 54 | ppt |
| I29 | PCB | PCB 149 | nd | 47 | ppt |
| I29 | PCB | PCB 153/168 | nd | 69 | ppt |
| I29 | PCB | PCB 180 | nd | 34 | ppt |
| I29 | PCB | PCB 183 | nd | 16 | ppt |
| I29 | PCB | PCB 187 | nd | 26 | ppt |
| I30 | DDT | p,p-DDE | 140 | 146 | ppt |
| I30 | PAH | 1-methylnaphthalene | nd | 8 | ppb |
| I30 | PAH | Biphenyl | 7 | nd | ppb |
| I30 | PCB | PCB 49 | nd | 9 | ppt |
| I30 | PCB | PCB 52 | nd | 10 | ppt |
| I30 | PCB | PCB 66 | nd | 11 | ppt |
| I30 | PCB | PCB 70 | nd | 8 | ppt |
| I30 | PCB | PCB 128 | nd | 10 | ppt |
| I30 | PCB | PCB 153/168 | nd | 28 | ppt |
| I30 | PCB | PCB 177 | nd | 7 | ppt |
| I31 | DDT | p,p-DDE | nd | 34 | ppt |
| I33 | DDT | p,p-DDE | 100 | 75 | ppt |
| I33 | PAH | 2,6-dimethylnaphthalene | nd | 7 | ppb |
| I33 | PAH | Benzo[e]pyrene | nd | 6 | ppb |
| I33 | PCB | PCB 66 | nd | 11 | ppt |
| I33 | PCB | PCB 99 | nd | 15 | ppt |
| I33 | PCB | PCB 101 | nd | 18 | ppt |
| I33 | PCB | PCB 118 | nd | 20 | ppt |
| I33 | PCB | PCB 153/168 | nd | 40 | ppt |
| I33 | PCB | PCB 187 | nd | 22 | ppt |
| I35 | DDT | p,p-DDE | 170 | 249 | ppt |
| I35 | DDT | p,p-DDT | nd | 39 | ppt |
| I35 | PAH | 3,4-benzo(B)fluoranthene | 7 | nd | ppb |
| I35 | PAH | Benzo[A]pyrene | 7 | nd | ppb |
| I35 | PAH | Fluoranthene | 7 | nd | ppb |
| I35 | PAH | Phenanthrene | 6 | nd | ppb |

## Table C.14 *continued*

| Station | Class | Constituent | Winter | Summer | Units |
|---|---|---|---|---|---|
| I35 | PAH | Pyrene | 7 | nd | ppb |
| I35 | PCB | PCB 49 | nd | 10 | ppt |
| I35 | PCB | PCB 52 | nd | 13 | ppt |
| I35 | PCB | PCB 66 | nd | 25 | ppt |
| I35 | PCB | PCB 101 | 48 | nd | ppt |
| I35 | PCB | PCB 105 | nd | 19 | ppt |
| I35 | PCB | PCB 118 | nd | 43 | ppt |
| I35 | PCB | PCB 128 | nd | 19 | ppt |
| I35 | PCB | PCB 138 | nd | 52 | ppt |
| I35 | PCB | PCB 149 | nd | 45 | ppt |
| I35 | PCB | PCB 153/168 | nd | 71 | ppt |
| I35 | PCB | PCB 180 | nd | 43 | ppt |
| I35 | PCB | PCB 187 | nd | 44 | ppt |

## Table C.15

Macrofaunal community parameters by grab for PLOO benthic stations sampled during 2016. SR = species richness; Abun = abundance; H' = Shannon diversity index; J' = Pielou's evenness; Dom = Swartz dominance; BRI = benthic response index. Stations are listed north to south from top to bottom for each depth contour.

| Depth Contour | Station | Survey | SR | Abun | H' | J' | Dom | BRI |
|---|---|---|---|---|---|---|---|---|
| *88-m* | B11 | winter | 66 | 147 | 3.8 | 0.90 | 30 | 10 |
| | | summer | 99 | 337 | 4.1 | 0.89 | 39 | 12 |
| | B8 | winter | 34 | 120 | 2.5 | 0.71 | 9 | 7 |
| | | summer | 59 | 214 | 3.3 | 0.80 | 18 | 7 |
| | E19 | winter | 53 | 197 | 3.2 | 0.81 | 18 | 8 |
| | | summer | 50 | 196 | 2.9 | 0.75 | 15 | 7 |
| | E7 | winter | 55 | 192 | 3.4 | 0.85 | 20 | 4 |
| | | summer | 49 | 135 | 3.4 | 0.88 | 21 | 12 |
| | E1 | winter | 68 | 287 | 3.4 | 0.81 | 22 | 6 |
| | | summer | 66 | 234 | 3.5 | 0.83 | 19 | 9 |
| *98-m* | B12 | winter | 77 | 184 | 3.9 | 0.90 | 33 | 13 |
| | | summer | 88 | 242 | 3.9 | 0.88 | 36 | 13 |
| | B9 | winter | 53 | 139 | 3.6 | 0.90 | 22 | 5 |
| | | summer | 73 | 226 | 3.7 | 0.86 | 27 | 5 |
| | E26 | winter | 61 | 157 | 3.6 | 0.87 | 27 | 5 |
| | | summer | 64 | 217 | 3.6 | 0.86 | 23 | 8 |
| | E25 | winter | 55 | 209 | 3.4 | 0.84 | 19 | 4 |
| | | summer | 66 | 292 | 3.5 | 0.85 | 22 | 7 |
| | E23 | winter | 57 | 167 | 3.5 | 0.87 | 23 | 8 |
| | | summer | 59 | 206 | 3.6 | 0.88 | 23 | 9 |
| | E20 | winter | 61 | 182 | 3.6 | 0.88 | 26 | 7 |
| | | summer | 56 | 176 | 3.6 | 0.89 | 22 | 9 |
| | E17[a] | winter | 73 | 239 | 3.7 | 0.87 | 25 | 9 |
| | | summer | 43 | 125 | 3.3 | 0.87 | 16 | 15 |
| | E14[a] | winter | 50 | 174 | 3.3 | 0.85 | 15 | 33 |
| | | summer | 50 | 147 | 3.4 | 0.88 | 19 | 28 |
| | E11[a] | winter | 64 | 188 | 3.6 | 0.88 | 25 | 9 |
| | | summer | 63 | 186 | 3.6 | 0.86 | 22 | 13 |
| | E8 | winter | 54 | 148 | 3.6 | 0.91 | 25 | 4 |
| | | summer | 62 | 192 | 3.6 | 0.88 | 23 | 6 |
| | E5 | winter | 43 | 94 | 3.2 | 0.86 | 20 | 6 |
| | | summer | 59 | 219 | 3.5 | 0.86 | 20 | 3 |
| | E2 | winter | 62 | 188 | 3.6 | 0.88 | 24 | 4 |
| | | summer | 64 | 169 | 3.7 | 0.89 | 26 | 7 |

[a] Near-ZID station

## Table C.15 *continued*

| Depth Contour | Station | Quarter | SR | Abun | H' | J' | Dom | BRI |
|---|---|---|---|---|---|---|---|---|
| *116-m* | B10 | winter | 78 | 283 | 3.8 | 0.87 | 26 | 15 |
| | | summer | 85 | 328 | 3.7 | 0.84 | 26 | 13 |
| | E21 | winter | 28 | 56 | 3.1 | 0.92 | 15 | 7 |
| | | summer | 51 | 137 | 3.4 | 0.88 | 19 | 8 |
| | E15 | winter | 62 | 218 | 3.5 | 0.84 | 20 | 12 |
| | | summer | 48 | 197 | 3.0 | 0.78 | 14 | 7 |
| | E9 | winter | 102 | 317 | 4.1 | 0.89 | 36 | 10 |
| | | summer | 64 | 244 | 3.7 | 0.88 | 24 | 10 |
| | E3 | winter | 66 | 138 | 3.9 | 0.94 | 32 | 10 |
| | | summer | 102 | 229 | 4.3 | 0.93 | 45 | 7 |
| | | **Mean** | 62 | 197 | 3.5 | 0.86 | 23 | 9 |
| | | **95% CI** | 5 | 18 | 0.1 | 0.01 | 2 | 2 |
| | | **Minimum** | 28 | 56 | 2.5 | 0.71 | 9 | 3 |
| | | **Maximum** | 102 | 337 | 4.3 | 0.94 | 45 | 33 |

## Table C.16

Macrofaunal community parameters by grab for SBOO benthic stations sampled during 2016. SR = species richness; Abun = abundance; H' = Shannon diversity index; J' = Pielou's evenness; Dom = Swartz dominance; BRI = benthic response index. Stations are listed north to south from top to bottom for each depth contour.

| Depth Contour | Station | Survey | SR | Abun | H' | J' | Dom | BRI |
|---|---|---|---|---|---|---|---|---|
| *19-m* | I35 | winter | 86 | 298 | 3.9 | 0.87 | 28 | 28 |
| | | summer | 82 | 336 | 3.7 | 0.84 | 25 | 27 |
| | I34 | winter | 25 | 365 | 2.2 | 0.69 | 5 | 9 |
| | | summer | 21 | 72 | 2.3 | 0.75 | 7 | 8 |
| | I31 | winter | 44 | 338 | 1.4 | 0.36 | 1 | 10 |
| | | summer | 59 | 298 | 2.6 | 0.63 | 8 | 21 |
| | I23 | winter | 51 | 170 | 2.5 | 0.64 | 15 | 21 |
| | | summer | 70 | 140 | 4.0 | 0.93 | 36 | 18 |
| | I18 | winter | 48 | 379 | 1.6 | 0.40 | 3 | 18 |
| | | summer | 45 | 142 | 3.3 | 0.86 | 16 | 24 |
| | I10 | winter | 36 | 149 | 2.1 | 0.58 | 9 | 21 |
| | | summer | 72 | 210 | 3.7 | 0.86 | 27 | 18 |
| | I4 | winter | 20 | 117 | 2.4 | 0.81 | 7 | 0 |
| | | summer | 15 | 27 | 2.5 | 0.93 | 9 | 0 |
| *28-m* | I33 | winter | 87 | 589 | 2.0 | 0.45 | 7 | 23 |
| | | summer | 99 | 659 | 2.8 | 0.61 | 16 | 24 |
| | I30 | winter | 64 | 269 | 2.7 | 0.65 | 14 | 26 |
| | | summer | 69 | 226 | 3.0 | 0.71 | 20 | 25 |
| | I27 | winter | 43 | 199 | 2.3 | 0.60 | 9 | 23 |
| | | summer | 56 | 269 | 2.6 | 0.64 | 13 | 29 |
| | I22 | winter | 72 | 386 | 2.3 | 0.53 | 9 | 22 |
| | | summer | 103 | 637 | 3.0 | 0.64 | 17 | 26 |
| | I14[a] | winter | 80 | 457 | 2.6 | 0.60 | 13 | 26 |
| | | summer | 90 | 570 | 2.6 | 0.58 | 13 | 24 |
| | I16[a] | winter | 24 | 225 | 1.6 | 0.49 | 3 | 13 |
| | | summer | 80 | 314 | 3.2 | 0.72 | 20 | 21 |
| | I15 | winter | 52 | 535 | 1.6 | 0.42 | 2 | 27 |
| | | summer | 36 | 369 | 1.5 | 0.42 | 2 | 18 |
| | I12[a] | winter | 53 | 219 | 2.3 | 0.57 | 9 | 22 |
| | | summer | 88 | 866 | 2.1 | 0.46 | 4 | 23 |
| | I9 | winter | 69 | 196 | 3.6 | 0.85 | 27 | 28 |
| | | summer | 85 | 454 | 3.3 | 0.74 | 19 | 21 |
| | I6 | winter | 33 | 141 | 2.1 | 0.60 | 5 | 7 |
| | | summer | 41 | 178 | 2.3 | 0.62 | 9 | 12 |
| | I2 | winter | 27 | 89 | 2.4 | 0.71 | 7 | 13 |
| | | summer | 30 | 712 | 0.6 | 0.18 | 1 | 13 |
| | I3 | winter | 23 | 96 | 2.1 | 0.67 | 6 | 10 |
| | | summer | 44 | 224 | 2.3 | 0.60 | 7 | 14 |

[a] Near-ZID station

## Table C.16 *continued*

| Depth Contour | Station | Quarter | SR | Abun | H' | J' | Dom | BRI |
|---|---|---|---|---|---|---|---|---|
| *38-m* | I29 | winter | 101 | 341 | 4.0 | 0.86 | 31 | 24 |
| | | summer | 88 | 327 | 3.8 | 0.85 | 29 | 19 |
| | I21 | winter | 48 | 124 | 3.4 | 0.89 | 20 | 10 |
| | | summer | 33 | 130 | 2.4 | 0.68 | 9 | 16 |
| | I13 | winter | 35 | 61 | 3.4 | 0.96 | 20 | 12 |
| | | summer | 46 | 174 | 2.6 | 0.69 | 12 | 9 |
| | I8 | winter | 23 | 156 | 2.4 | 0.78 | 7 | 25 |
| | | summer | 31 | 227 | 2.3 | 0.67 | 6 | 27 |
| *55-m* | I28 | winter | 91 | 239 | 4.0 | 0.89 | 36 | 15 |
| | | summer | 88 | 294 | 4.0 | 0.88 | 33 | 15 |
| | I20 | winter | 45 | 117 | 3.5 | 0.91 | 18 | 14 |
| | | summer | 24 | 40 | 3.0 | 0.96 | 15 | 3 |
| | I7 | winter | 61 | 209 | 3.4 | 0.83 | 19 | 5 |
| | | summer | 40 | 82 | 3.4 | 0.91 | 20 | 8 |
| | I1 | winter | 53 | 239 | 2.7 | 0.67 | 13 | 10 |
| | | summer | 52 | 147 | 3.4 | 0.85 | 21 | 21 |
| | | **Mean** | 55 | 275 | 2.7 | 0.69 | 14 | 18 |
| | | **95% CI** | 7 | 50 | 0.2 | 0.05 | 3 | 2 |
| | | **Minimum** | 15 | 27 | 0.6 | 0.18 | 1 | 0 |
| | | **Maximum** | 103 | 866 | 4.0 | 0.96 | 36 | 29 |

## Table C.17

The 25 most abundant macroinvertebrate taxa collected from PLOO benthic stations during 2016. Data are expressed 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 abundance per grab (mean number of individuals per grab, n = 44).

| Species | Taxonomic Classification | Percent Abundance | Frequency of Occurrence | Abundance per Grab |
|---|---|---|---|---|
| *Amphiodia urtica* | Echinodermata: Ophiuroidea | 10 | 91 | 20 |
| *Nuculana* sp A | Mollusca: Bivalvia | 7 | 100 | 13 |
| *Chaetozone hartmanae* | Annelida: Cirratulidae | 4 | 95 | 8 |
| *Praxillella pacifica* | Annelida: Maldanidae | 4 | 86 | 7 |
| *Eclysippe trilobata* | Annelida: Ampharetidae | 3 | 86 | 7 |
| *Axinopsida serricata* | Mollusca: Bivalvia | 3 | 82 | 6 |
| *Tellina carpenteri* | Mollusca: Bivalvia | 3 | 84 | 6 |
| *Prionospio (Prionospio) dubia* | Annelida: Spionidae | 3 | 93 | 6 |
| *Phisidia sanctaemariae* | Annelida: Terebellidae | 3 | 77 | 5 |
| *Sternaspis affinis* | Annelida: Sternaspidae | 2 | 91 | 5 |
| *Spiophanes duplex* | Annelida: Spionidae | 2 | 82 | 5 |
| *Ennucula tenuis* | Mollusca: Bivalvia | 2 | 93 | 4 |
| *Rhepoxynius bicuspidatus* | Arthropoda: Phoxocephalidae | 2 | 82 | 4 |
| *Amphiodia* sp | Echinodermata: Ophiuroidea | 2 | 84 | 3 |
| *Prionospio (Prionospio) jubata* | Annelida: Spionidae | 1 | 84 | 2 |
| *Scoloplos armiger* Cmplx | Annelida: Orbiniidae | 1 | 75 | 2 |
| *Lanassa venusta venusta* | Annelida: Terebellidae | 1 | 77 | 2 |
| *Clymenura gracilis* | Annelida: Maldanidae | 1 | 80 | 2 |
| *Mediomastus* sp | Annelida: Capitellidae | 1 | 61 | 2 |
| *Rhodine bitorquata* | Annelida: Maldanidae | 1 | 70 | 2 |
| *Anobothrus gracilis* | Annelida: Ampharetidae | 1 | 68 | 2 |
| *Lysippe* sp A | Annelida: Ampharetidae | 1 | 75 | 2 |
| *Lumbrineris cruzensis* | Annelida: Lumbrineridae | 1 | 59 | 2 |
| Euclymeninae | Annelida: Maldanidae | 1 | 48 | 2 |
| *Nephtys ferruginea* | Annelida: Nephtyidae | 1 | 70 | 2 |

## Table C.18

The 25 most abundant macroinvertebrate taxa collected from SBOO benthic stations during 2016. Data are expressed 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 abundance per grab (mean number of individuals per grab, n = 54).

| Species | Taxonomic Classification | Percent Abundance | Frequency of Occurrence | Abundance per Grab |
|---|---|---|---|---|
| *Spiophanes norrisi* | Annelida: Spionidae | 40 | 85 | 110 |
| *Pista wui* | Annelida: Terebellidae | 3 | 41 | 9 |
| *Spiophanes duplex* | Annelida: Spionidae | 3 | 59 | 8 |
| *Tellina modesta* | Mollusca: Bivalvia | 1 | 48 | 3 |
| *Notomastus latericeus* | Annelida: Capitellidae | 1 | 39 | 3 |
| *Praxillella pacifica* | Annelida: Maldanidae | 1 | 35 | 3 |
| *Glycera oxycephala* | Annelida: Glyceridae | 1 | 35 | 3 |
| *Pisione* sp | Annelida: Pisionidae | 1 | 6 | 3 |
| *Lumbrinerides platypygos* | Annelida: Lumbrineridae | 1 | 33 | 3 |
| *Mediomastus* sp | Annelida: Capitellidae | 1 | 48 | 3 |
| NEMATODA | Nematoda | 1 | 59 | 2 |
| *Ampharete labrops* | Annelida: Ampharetidae | 1 | 59 | 2 |
| *Monticellina siblina* | Annelida: Cirratulidae | 1 | 52 | 2 |
| *Metasychis disparidentatus* | Annelida: Maldanidae | 1 | 33 | 2 |
| *Pseudofabriciola californica* | Annelida: Fabriciidae | 1 | 4 | 2 |
| Euclymeninae sp B | Annelida: Maldanidae | 1 | 56 | 2 |
| *Carinoma mutabilis* | Nemertea: Anopla | 1 | 52 | 2 |
| *Rhepoxynius heterocuspidatus* | Arthropoda: Phoxocephalidae | 1 | 28 | 2 |
| *Paraprionospio alata* | Annelida: Spionidae | 1 | 50 | 2 |
| *Nuculana taphria* | Mollusca: Bivalvia | 1 | 46 | 2 |
| *Sigalion spinosus* | Annelida: Sigalionidae | 1 | 50 | 2 |
| *Sthenelanella uniformis* | Annelida: Sigalionidae | 1 | 28 | 2 |
| *Spiochaetopterus costarum* Cmplx | Annelida: Chaetopteridae | 1 | 35 | 2 |
| *Dialychone veleronis* | Annelida: Sabellidae | 1 | 35 | 2 |
| *Protodorvillea gracilis* | Annelida: Dorvilleidae | 1 | 28 | 2 |

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# Appendix D

# Chapter 4. Demersal Fishes and Megabenthic Invertebrates

# Figures & Tables

# Appendix D

# FIGURES

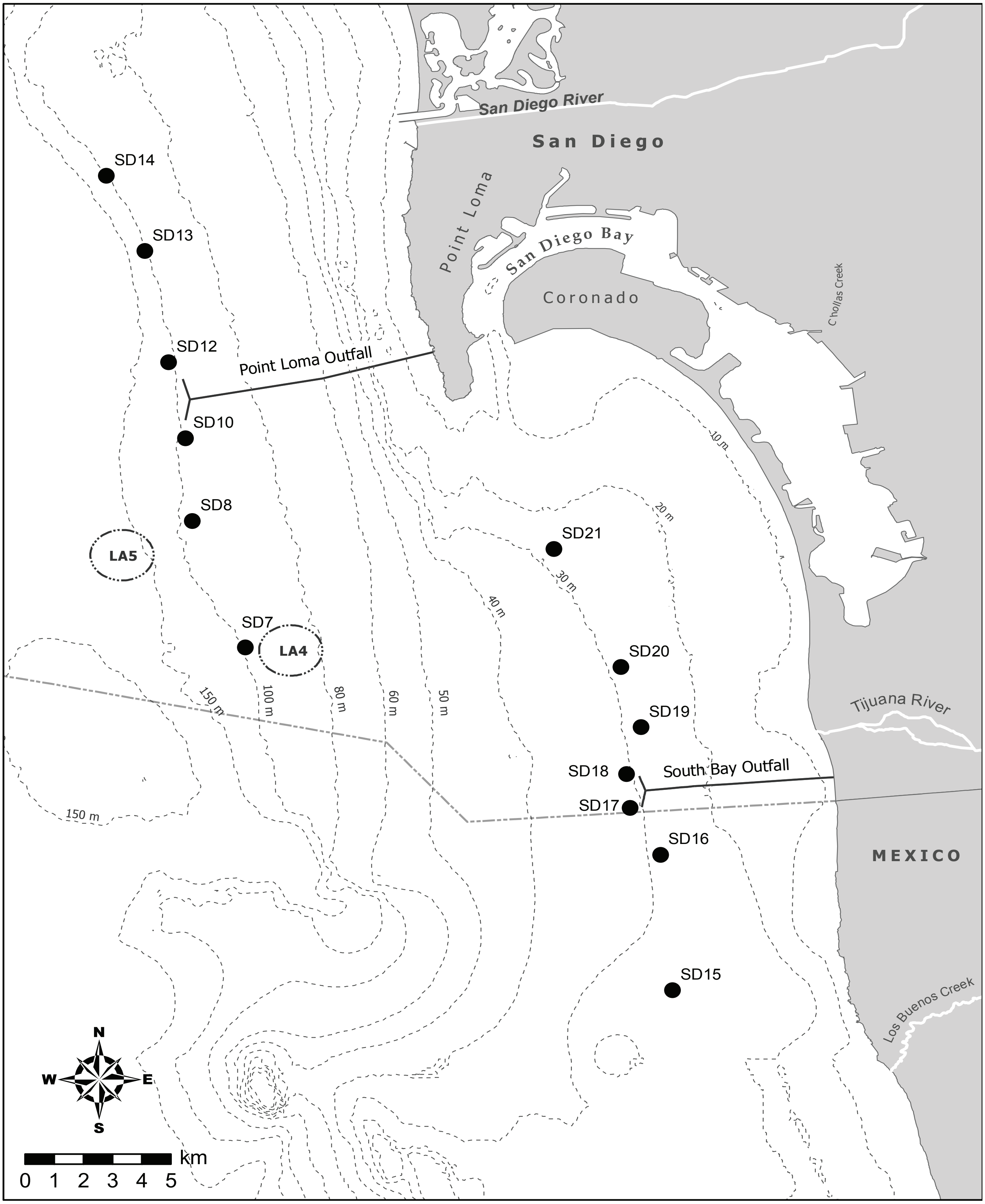
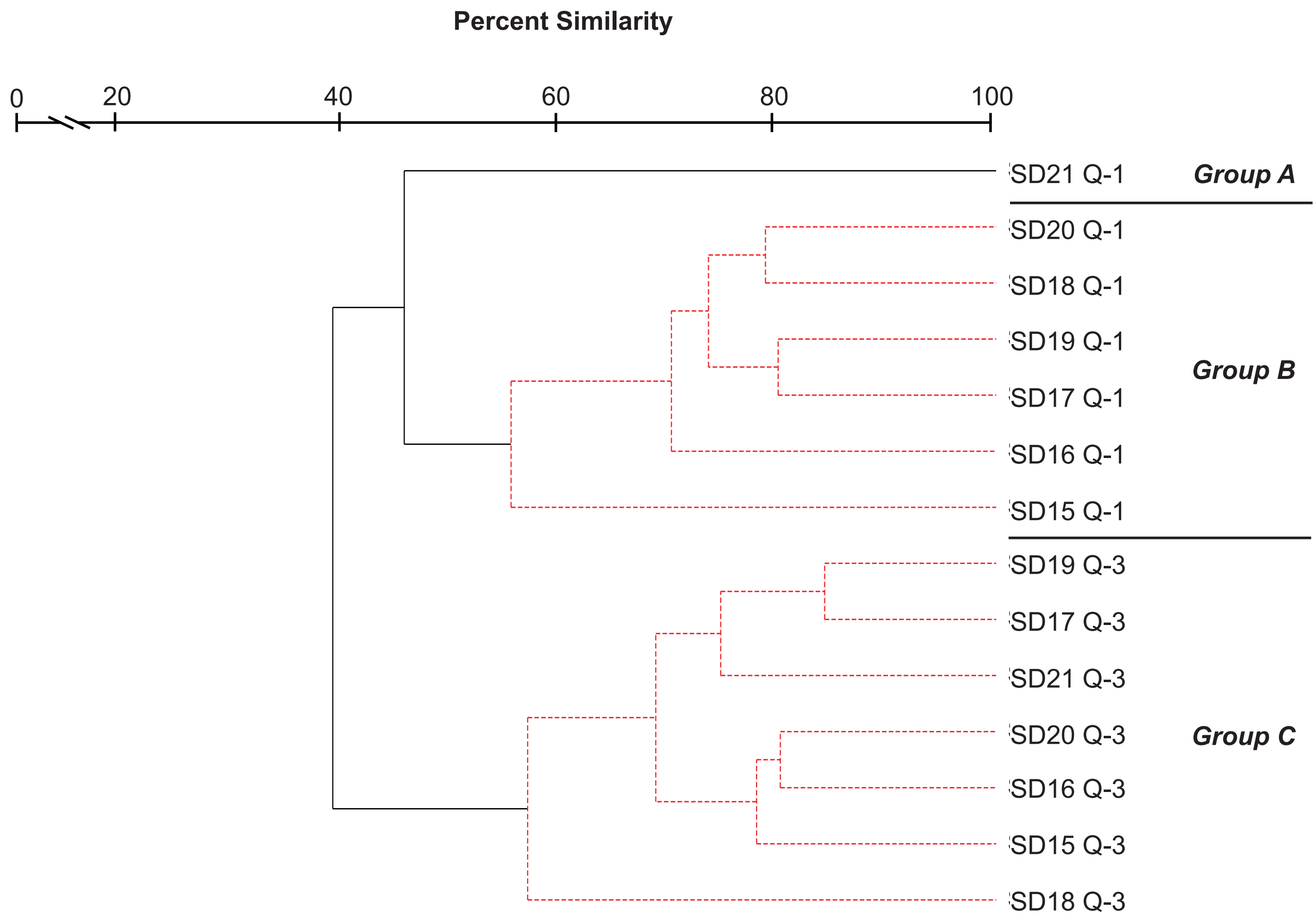



**Figure D.1**
Trawl station locations sampled around the Point Loma and South Bay Ocean Outfalls as part of the City of San Diego's Ocean Monitoring Program.




## Figure D.2

Results of cluster analysis of demersal fish assemblages from SBOO trawl stations sampled during 2016. Solid black lines indicate non-random structures of the dendrogram that have been confirmed by SIMPROF; Q-1 = winter survey, Q-3 = summer survey.

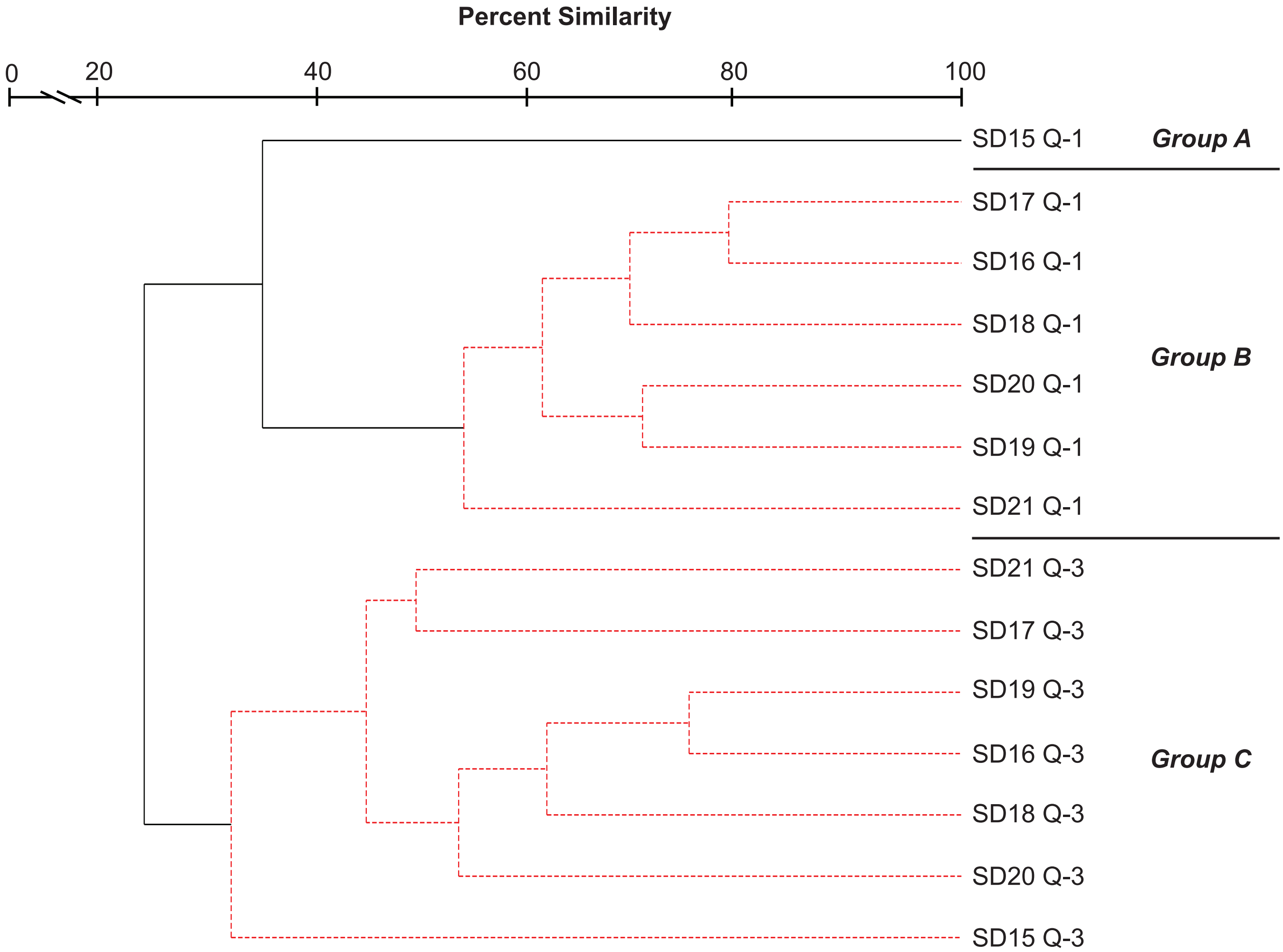



**Figure D.3**
Results of cluster analysis of megabenthic invertebrate assemblages from SBOO trawl stations sampled during 2016. Solid black lines indicate non-random structures of the dendrogram that have been confirmed by SIMPROF; Q-1 = winter survey, Q-3 = summer survey.

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# Appendix D

# TABLES

**Table D.1**
Trawl sample dates and sample duration for trawls conducted in the PLOO and SBOO regions during 2016.

| Trawl Station | Survey | Date Sampled | Trawl Duration |
|---|---|---|---|
| *PLOO Stations* | | | |
| SD7 | Winter | 21-Mar-2016 | 10 minutes |
| | Summer | 14-July-2016 | 10 minutes |
| SD8 | Winter | 21-Mar-2016 | 10 minutes |
| | Summer | 27-Sep-2016 | 1 minute |
| SD10 | Winter | 21-Mar-2016 | 1 minute |
| | Summer | 27-Sep-2016 | 1 minute |
| SD12 | Winter | 21-Mar-2016 | 1 minute |
| | Summer | 27-Sep-2016 | 1 minute |
| SD13 | Winter | 21-Mar-2016 | 1 minute |
| | Summer | 27-Sep-2016 | 1 minute |
| SD14 | Winter | 28-Mar-2016 | 1 minute |
| | Summer | 27-Sep-2016 | 1 minute |
| *SBOO Stations* | | | |
| SD15 | Winter | 25-Jan-2016 | 10 minutes |
| | Summer | 25-Aug-2016 | 10 minutes |
| SD16 | Winter | 25-Jan-2016 | 10 minutes |
| | Summer | 08-July-2016 | 10 minutes |
| SD17 | Winter | 25-Jan-2016 | 10 minutes |
| | Summer | 08-Jul-2016 | 10 minutes |
| SD18 | Winter | 25-Jan-2016 | 10 minutes |
| | Summer | 12-Jul-2016 | 10 minutes |
| SD19 | Winter | 26-Jan-2016 | 10 minutes |
| | Summer | 12-Jul-2016 | 10 minutes |
| SD20 | Winter | 26-Jan-2016 | 10 minutes |
| | Summer | 25-Aug-2016 | 10 minutes |
| SD21 | Winter | 20-Jan-2016 | 10 minutes |
| | Summer | 12-Jul-2016 | 10 minutes |

## Table D.2

Summary taxonomic listing of demersal fish species captured at all PLOO and SBOO trawl stations during 2016 (see Table D.1). Data are total number of fish (n), biomass (BM, wet weight, kg), minimum (Min), maximum (Max), and mean length (standard length, cm). Taxonomic arrangement and scientific names are of Eschmeyer and Herald (1998) and Lawrence et al. (2013).

| | | | | | | Length (cm) | | |
|---|---|---|---|---|---|---|---|---|
| **Order** | **Family** | **Scientific Name** | **Common Name** | **n** | **BM** | **Min** | **Max** | **Mean** |
| **CHIMAERIFORMES** | | | | | | | | |
| | Chimaeridae | | | | | | | |
| | | *Hydrolagus colliei* | Spotted Ratfish[a] | 1 | 0.2 | 34 | 34 | 34 |
| **HETERODONTIFORMES** | | | | | | | | |
| | Heterodontidae | | | | | | | |
| | | *Heterodontus francisci* | Horn Shark[a] | 1 | 1.4 | 56 | 56 | 56 |
| **RAJIFORMES** | | | | | | | | |
| | Rhinobatidae | | | | | | | |
| | | *Rhinobatos productus* | Shovelnose Guitarfish[a] | 3 | 2.4 | 37 | 74 | 50 |
| | Rajidae | | | | | | | |
| | | *Raja inornata* | California Skate[a] | 3 | 0.9 | 23 | 38 | 32 |
| **MYLIOBATIFORMES** | | | | | | | | |
| | Urolophidae | | | | | | | |
| | | *Urobatis halleri* | Round Stingray[a] | 2 | 1.0 | 34 | 36 | 35 |
| **ARGENTINIFORMES** | | | | | | | | |
| | Argentinidae | | | | | | | |
| | | *Argentina sialis* | Pacific Argentine | 2 | 0.1 | 5 | 7 | 6 |
| **AULOPIFORMES** | | | | | | | | |
| | Synodontidae | | | | | | | |
| | | *Synodus lucioceps* | California Lizardfish | 1623 | 18.8 | 7 | 25 | 11 |
| **OPHIDIIFORMES** | | | | | | | | |
| | Ophidiidae | | | | | | | |
| | | *Chilara taylori* | Spotted Cusk-eel | 4 | 0.2 | 11 | 16 | 13 |
| | | *Ophidion scrippsae* | Basketweave Cusk-eel | 5 | 0.2 | 10 | 14 | 11 |
| **BATRACHOIDIFORMES** | | | | | | | | |
| | Batrachoididae | | | | | | | |
| | | *Porichthys myriaster* | Specklefin Midshipman | 11 | 0.5 | 10 | 18 | 14 |
| | | *Porichthys notatus* | Plainfin Midshipman | 131 | 2.1 | 8 | 19 | 11 |
| **GASTEROSTEIFORMES** | | | | | | | | |
| | Syngnathidae | | | | | | | |
| | | *Syngnathus* sp | Unidentified Pipefish | 12 | 0.8 | 12 | 30 | 21 |
| | | *Hippocampus ingens* | Pacific Seahorse | 1 | 0.1 | 11 | 11 | 11 |
| **SCORPAENIFORMES** | | | | | | | | |
| | Scorpaenidae | | | | | | | |
| | | *Scorpaena guttata* | California Scorpionfish | 8 | 1.4 | 13 | 21 | 17 |
| | Sebastidae | | | | | | | |
| | | *Sebastes* sp | Unidentified Rockfish | 1 | 0.1 | 4 | 4 | 4 |
| | | *Sebastes auriculatus* | Brown Rockfish | 1 | 0.1 | 7 | 7 | 7 |
| | | *Sebastes elongatus* | Greenstriped Rockfish | 1 | 0.1 | 7 | 7 | 7 |
| | | *Sebastes miniatus* | Vermilion Rockfish | 6 | 0.3 | 3 | 11 | 8 |

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

**Table D.2** *continued*

| Order | Family | Scientific Name | Common Name | n | BM | Length (cm) Min | Max | Mean |
|---|---|---|---|---|---|---|---|---|
| | | *Sebastes roscues* | Rosy Rockfish | 1 | 0.1 | 8 | 8 | 8 |
| | | *Sebastes rubrivinctus* | Flag Rockfish | 1 | 0.1 | 7 | 7 | 7 |
| | | *Sebastes saxicola* | Stripetail Rockfish | 95 | 1.3 | 5 | 10 | 7 |
| | | *Sebastes semicinctus* | Halfbanded Rockfish | 24 | 0.8 | 7 | 13 | 10 |
| | Hexagrammidae | | | | | | | |
| | | *Zaniolepis frenata* | Shortspine Combfish | 12 | 0.6 | 13 | 17 | 15 |
| | | *Zaniolepis latipinnis* | Longspine Combfish | 110 | 2.3 | 8 | 15 | 11 |
| | Cottidae | | | | | | | |
| | | *Chitonotus pugetensis* | Roughback Sculpin | 13 | 0.5 | 6 | 10 | 8 |
| | | *Icelinus filamentosus* | Threadfin Sculpin | 3 | 0.1 | 10 | 11 | 11 |
| | | *Icelinus quadriseriatus* | Yellowchin Sculpin | 69 | 0.7 | 6 | 9 | 7 |
| | Agonidae | | | | | | | |
| | | *Odontopyxis trispinosa* | Pygmy Poacher | 3 | 0.2 | 8 | 13 | 11 |
| | | *Xeneretmus latifrons* | Blacktip Poacher | 1 | 0.1 | 13 | 13 | 13 |
| **PERCIFORMES** | | | | | | | | |
| | Malacanthidae | | | | | | | |
| | | *Caulolatilus princeps* | Ocean Whitefish | 1 | 0.1 | 6 | 6 | 6 |
| | Haemulidae | | | | | | | |
| | | *Haemulon californiensis* | Salema | 3 | 0.1 | 6 | 7 | 7 |
| | Sciaenidae | | | | | | | |
| | | *Genyonemus lineatus* | White Croaker | 83 | 2.8 | 7 | 20 | 12 |
| | | *Seriphus politus* | Queenfish | 47 | 0.3 | 6 | 19 | 8 |
| | Embiotocidae | | | | | | | |
| | | *Zalembius rosaceus* | Pink Seaperch | 37 | 0.5 | 5 | 11 | 7 |
| | Pomacentridae | | | | | | | |
| | | *Chromis punctipinnis* | Blacksmith | 1 | 0.1 | 7 | 7 | 7 |
| | Uranoscopidae | | | | | | | |
| | | *Kathetostoma averruncus* | Smooth Stargazer | 2 | 0.1 | 11 | 12 | 12 |
| | Clinidae | | | | | | | |
| | | *Heterostichus rostratus* | Giant Kelpfish | 1 | 0.1 | 14 | 14 | 14 |
| | Labrisomidae | | | | | | | |
| | | *Neoclinus blanchardi* | Sarcastic Fringehead | 1 | 0.1 | 9 | 9 | 9 |
| | Stromateidae | | | | | | | |
| | | *Peprilus simillimus* | Pacific Pompano | 1 | 0.1 | 14 | 14 | 14 |
| **PLEURONECTIFORMES** | | | | | | | | |
| | Paralichthyidae | | | | | | | |
| | | *Citharichthys sordidus* | Pacific Sanddab | 421 | 10.4 | 4 | 24 | 10 |
| | | *Citharichthys stigmaeus* | Speckled Sanddab | 1570 | 13.5 | 4 | 12 | 8 |
| | | *Citharichthys xanthostigma* | Longfin Sanddab | 593 | 10.1 | 4 | 20 | 8 |
| | | *Hippoglossina stomata* | Bigmouth Sole | 2 | 0.1 | 17 | 18 | 18 |
| | | *Paralichthys californicus* | California Halibut | 11 | 5.9 | 26 | 48 | 31 |
| | | *Xystreurys liolepis* | Fantail Sole | 9 | 3.0 | 16 | 30 | 21 |

## Table D.2 *continued*

| Order | Family | Scientific Name | Common Name | n | BM | Length (cm) Min | Max | Mean |
|---|---|---|---|---|---|---|---|---|
| | Pleuronectidae | | | | | | | |
| | | *Eopsetta jordani* | Petrale Sole | 1 | 0.1 | 36 | 36 | 36 |
| | | *Lyopsetta exilis* | Slender Sole | 6 | 0.3 | 5 | 19 | 11 |
| | | *Microstomus pacificus* | Dover Sole | 42 | 0.7 | 5 | 20 | 8 |
| | | *Parophrys vetulus* | English Sole | 9 | 1.0 | 15 | 24 | 19 |
| | | *Pleuronichthys decurrens* | Curlfin Sole | 1 | 0.1 | 4 | 4 | 4 |
| | | *Pleuronichthys guttulatus* | Diamond Turbot | 1 | 0.1 | 15 | 15 | 15 |
| | | *Pleuronichthys ritteri* | Spotted Turbot | 3 | 0.2 | 10 | 15 | 12 |
| | | *Pleuronichthys verticalis* | Hornyhead Turbot | 76 | 3.6 | 4 | 18 | 11 |
| | Cynoglossidae | | | | | | | |
| | | *Symphurus atricaudus* | California Tonguefish | 214 | 1.9 | 7 | 17 | 11 |

## Table D.3

Total abundance by species and station for demersal fish collected at PLOO trawl stations during 2016.

| Species | Winter 2016 SD7 | SD8 | SD10[a] | SD12[a] | SD13[a] | SD14[a] | Species Abundance by Survey |
|---|---|---|---|---|---|---|---|
| Pacific Sanddab | 93 | 97 | 13 | 1 | 8 | | 212 |
| Longspine Combfish | 4 | 65 | 2 | | | | 71 |
| Plainfin Midshipman | 16 | 26 | | | | | 42 |
| Pink Seaperch | 22 | 12 | 1 | | 1 | | 36 |
| Dover Sole | 2 | 26 | | | | | 28 |
| Yellowchin Sculpin | | 22 | | | | | 22 |
| Stripetail Rockfish | 6 | 2 | 4 | 4 | 2 | | 18 |
| Halfbanded Rockfish | 1 | 12 | 1 | | 1 | | 15 |
| Shortspine Combfish | 6 | 1 | | 1 | | | 8 |
| California Lizardfish | | 3 | | | 2 | 1 | 6 |
| California Scorpionfish | 4 | | | | | | 4 |
| English Sole | 2 | | | | | | 2 |
| California Tonguefish | | 2 | | | | | 2 |
| California Skate | | 2 | | | | | 2 |
| Bigmouth Sole | | 2 | | | | | 2 |
| Spotted Ratfish | | 1 | | | | | 1 |
| Specklefin Midshipman | 1 | | | | | | 1 |
| Slender Sole | | | | 1 | | | 1 |
| Greenstriped Rockfish | | 1 | | | | | 1 |
| Blacktip Poacher | | 1 | | | | | 1 |
| Survey Total | 157 | 275 | 21 | 7 | 14 | 1 | 475 |

[a] One minute trawl, see Table D.1

**Table D.3** *continued*

| Species | Summer 2016 | | | | | | Species Abundance by Survey |
|---|---|---|---|---|---|---|---|
| | SD7 | SD8[a] | SD10[a] | SD12[a] | SD13[a] | SD14[a] | |
| Pacific Sanddab | 137 | 17 | 30 | 10 | 9 | 2 | 205 |
| Stripetail Rockfish | 12 | 31 | 5 | 14 | 11 | 4 | 77 |
| Plainfin Midshipman | 76 | | | | 1 | | 77 |
| Longspine Combfish | 23 | 2 | 2 | | | | 27 |
| Dover Sole | 9 | 3 | 1 | 1 | | | 14 |
| Halfbanded Rockfish | | 7 | 1 | | 1 | | 9 |
| California Lizardfish | 2 | | | | 2 | 2 | 6 |
| Slender Sole | 4 | | | 1 | | | 5 |
| Shortspine Combfish | 2 | 1 | | 1 | | | 4 |
| Yellowchin Sculpin | 1 | 2 | | | | | 3 |
| Vermilion Rockfish | | | | | | 3 | 3 |
| Spotted Cusk-eel | | | | 3 | | | 3 |
| California Tonguefish | 3 | | | | | | 3 |
| California Scorpionfish | | 1 | 1 | | 1 | | 3 |
| Smooth Stargazer | 2 | | | | | | 2 |
| Pacific Argentine | 2 | | | | | | 2 |
| Hornyhead Turbot | 1 | | 1 | | | | 2 |
| English Sole | 2 | | | | | | 2 |
| Roughback Sculpin | | 1 | | | | | 1 |
| Rosy Rockfish | | | 1 | | | | 1 |
| Unidentified Rockfish | | | | | | 1 | 1 |
| Pink Seaperch | 1 | | | | | | 1 |
| Flag Rockfish | | | | | | 1 | 1 |
| Brown Rockfish | | | | 1 | | | 1 |
| Survey Total | 277 | 65 | 42 | 31 | 25 | 13 | 453 |
| **Annual Total** | **434** | **340** | **63** | **38** | **39** | **14** | **928** |

[a] One minute trawl, see Table D.1

## Table D.4

Total abundance by species and station for demersal fish collected at SBOO trawl stations during 2016.

| Species | Winter 2016 | | | | | | | Species Abundance by Survey |
|---|---|---|---|---|---|---|---|---|
| | SD15 | SD16 | SD17 | SD18 | SD19 | SD20 | SD21 | |
| Speckled Sanddab | 50 | 32 | 59 | 41 | 73 | 53 | 37 | 345 |
| White Croaker | | 1 | 8 | 3 | 10 | 3 | 58 | 83 |
| California Tonguefish | | 8 | 15 | 12 | 20 | 9 | 18 | 82 |
| Queenfish | | | | | | | 47 | 47 |
| California Lizardfish | 7 | 8 | 3 | 4 | 8 | 13 | | 43 |
| Hornyhead Turbot | | 5 | 10 | 3 | 12 | 8 | 2 | 40 |
| Longfin Sanddab | | | 3 | 1 | 8 | 3 | | 15 |
| Unidentified Pipefish | 3 | 3 | 1 | | | 1 | 1 | 9 |
| Basketweave Cusk-eel | | | 1 | | | | 4 | 5 |
| Fantail Sole | | 1 | 2 | | | 1 | | 4 |
| Shovelnose Guitarfish | | | | 1 | | 1 | 1 | 3 |
| Salema | | | | | | | 3 | 3 |
| California Halibut | | | | 1 | | 1 | 1 | 3 |
| Round Stingray | | | | 1 | | | 1 | 2 |
| Vermilion Rockfish | 1 | | | | | | | 1 |
| Spotted Cusk-eel | | | | | | | 1 | 1 |
| Sarcastic Fringehead | | | | | | | 1 | 1 |
| Pacific Seahorse | | | | | | 1 | | 1 |
| Pacific Pompano | | | 1 | | | | | 1 |
| Ocean Whitefish | | | | | 1 | | | 1 |
| Horn Shark | | | | | | | 1 | 1 |
| Giant Kelpfish | | | | | | | 1 | 1 |
| Diamond Turbot | | 1 | | | | | | 1 |
| California Skate | | | 1 | | | | | 1 |
| Blacksmith | | | | 1 | | | | 1 |
| Survey Total | 61 | 59 | 104 | 68 | 132 | 94 | 177 | 695 |

## Table D.4 *continued*

| Species | Summer 2016 | | | | | | | Species Abundance by Survey |
|---|---|---|---|---|---|---|---|---|
| | SD15 | SD16 | SD17 | SD18 | SD19 | SD20 | SD21 | |
| California Lizardfish | 283 | 199 | 116 | 357 | 108 | 223 | 282 | 1568 |
| Speckled Sanddab | 173 | 183 | 232 | 179 | 215 | 167 | 76 | 1046 |
| Longfin Sanddab | | 13 | 153 | 113 | 125 | 56 | 118 | 578 |
| Pacific Sanddab | 2 | | | | | 2 | | 183 |
| California Tonguefish | 7 | 6 | 24 | 32 | 27 | 5 | 26 | 127 |
| Yellowchin Sculpin | | | 4 | 3 | 4 | | 33 | 44 |
| Hornyhead Turbot | 4 | 2 | 5 | 8 | 1 | 10 | 4 | 34 |
| Roughback Sculpin | 5 | 2 | 2 | 3 | | | | 12 |
| Plainfin Midshipman | | 1 | | 4 | 2 | 3 | 2 | 12 |
| Longspine Combfish | | 1 | | 5 | 6 | | | 12 |
| Specklefin Midshipman | 1 | | 4 | 2 | | 3 | | 10 |
| California Halibut | 1 | | | 1 | 2 | 3 | 1 | 8 |
| Fantail Sole | 1 | | 1 | | | 3 | | 5 |
| English Sole | | 1 | | 2 | | 1 | 1 | 5 |
| Threadfin Sculpin | | | | | | 3 | | 3 |
| Spotted Turbot | | | 2 | | | | 1 | 3 |
| Pygmy Poacher | | | 1 | | | | 2 | 3 |
| Unidentified Pipefish | | 1 | 1 | | | 1 | | 3 |
| Vermilion Rockfish | | | | | | | 2 | 2 |
| Petrale Sole | | | | 1 | | | | 1 |
| Curlfin Sole | 1 | | | | | | | 1 |
| California Scorpionfish | | | | | | | 1 | 1 |
| Survey Total | 478 | 409 | 545 | 710 | 490 | 480 | 549 | 3661 |
| **Annual Total** | **539** | **468** | **649** | **778** | **622** | **574** | **726** | **4356** |

## Table D.5

Biomass (kg) by species and station for demersal fish collected at PLOO trawl stations during 2016.

| Species | Winter 2016 | | | | | | Species Biomass by Survey |
|---|---|---|---|---|---|---|---|
| | SD7 | SD8 | SD10[a] | SD12[a] | SD13[a] | SD14[a] | |
| Pacific Sanddab | 2.8 | 3.2 | 0.3 | 0.1 | 0.1 | | 6.5 |
| Longspine Combfish | 0.1 | 1.2 | 0.1 | | | | 1.4 |
| California Skate | | 0.8 | | | | | 0.8 |
| California Scorpionfish | 0.6 | | | | | | 0.6 |
| Stripetail Rockfish | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | | 0.5 |
| Halfbanded Rockfish | 0.1 | 0.2 | 0.1 | | 0.1 | | 0.5 |
| Pink Seaperch | 0.1 | 0.1 | 0.1 | | 0.1 | | 0.4 |
| English Sole | 0.4 | | | | | | 0.4 |
| California Lizardfish | | 0.1 | | | 0.2 | 0.1 | 0.4 |
| Shortspine Combfish | 0.1 | 0.1 | | 0.1 | | | 0.3 |
| Spotted Ratfish | | 0.2 | | | | | 0.2 |
| Plainfin Midshipman | 0.1 | 0.1 | | | | | 0.2 |
| Dover Sole | 0.1 | 0.1 | | | | | 0.2 |
| Yellowchin Sculpin | | 0.1 | | | | | 0.1 |
| Specklefin Midshipman | 0.1 | | | | | | 0.1 |
| Slender Sole | | | | 0.1 | | | 0.1 |
| Greenstriped Rockfish | | 0.1 | | | | | 0.1 |
| California Tonguefish | | 0.1 | | | | | 0.1 |
| Blacktip Poacher | | 0.1 | | | | | 0.1 |
| Bigmouth Sole | | 0.1 | | | | | 0.1 |
| Survey Total | 4.6 | 6.7 | 0.7 | 0.4 | 0.6 | 0.1 | 13.1 |

[a] One minute trawl, see Table D.1

## Table D.5 *continued*

| Species | SD7 | SD8[a] | SD10[a] | SD12[a] | SD13[a] | SD14[a] | Species Biomass by Survey |
|---|---|---|---|---|---|---|---|
| | Summer 2016 | | | | | | |
| Pacific Sanddab | 2.7 | 0.3 | 0.3 | 0.2 | 0.1 | 0.1 | 3.7 |
| Plainfin Midshipman | 1.3 | | | | 0.1 | | 1.4 |
| Stripetail Rockfish | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.8 |
| California Scorpionfish | | 0.3 | 0.1 | | 0.3 | | 0.7 |
| Longspine Combfish | 0.4 | 0.1 | 0.1 | | | | 0.6 |
| Dover Sole | 0.2 | 0.1 | 0.1 | 0.1 | | | 0.5 |
| California Lizardfish | 0.3 | | | | 0.1 | 0.1 | 0.5 |
| Shortspine Combfish | 0.1 | 0.1 | | 0.1 | | | 0.3 |
| Halfbanded Rockfish | | 0.1 | 0.1 | | 0.1 | | 0.3 |
| Yellowchin Sculpin | 0.1 | 0.1 | | | | | 0.2 |
| Slender Sole | 0.1 | | | 0.1 | | | 0.2 |
| Hornyhead Turbot | 0.1 | | 0.1 | | | | 0.2 |
| Vermilion Rockfish | | | | | | 0.1 | 0.1 |
| Spotted Cusk-eel | | | | 0.1 | | | 0.1 |
| Smooth Stargazer | 0.1 | | | | | | 0.1 |
| Roughback Sculpin | | 0.1 | | | | | 0.1 |
| Pink Seaperch | 0.1 | | | | | | 0.1 |
| Pacific Argentine | 0.1 | | | | | | 0.1 |
| Flag Rockfish | | | | | | 0.1 | 0.1 |
| English Sole | 0.1 | | | | | | 0.1 |
| California Tonguefish | 0.1 | | | | | | 0.1 |
| Undentified Rockfish | | | | | | 0.1 | 0.1 |
| Rosy Rockfish | | | 0.1 | | | | 0.1 |
| Brown Rockfish | | | | 0.1 | | | 0.1 |
| Survey Total | 6.0 | 1.4 | 1.0 | 0.8 | 0.8 | 0.6 | 10.6 |
| **Annual Total** | **10.6** | **8.1** | **1.7** | **1.2** | **1.4** | **0.7** | **23.7** |

[a] One minute trawl, see Table D.1

## Table D.6

Biomass (kg) by species and station for demersal fish collected at SBOO trawl stations during 2016.

| | Winter 2016 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name | SD15 | SD16 | SD17 | SD18 | SD19 | SD20 | SD21 | Species Biomass by Survey |
| White Croaker | | 0.1 | 0.2 | 0.1 | 0.3 | 0.1 | 2.0 | 2.8 |
| California Halibut | | | | 0.6 | | 0.3 | 1.7 | 2.6 |
| Shovelnose Guitarfish | | | | 0.2 | | 0.3 | 1.9 | 2.4 |
| Speckled Sanddab | 0.2 | 0.3 | 0.3 | 0.2 | 0.4 | 0.3 | 0.2 | 1.9 |
| Horn Shark | | | | | | | 1.4 | 1.4 |
| Round Stingray | | | | 0.6 | | | 0.4 | 1.0 |
| Hornyhead Turbot | | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 | 0.9 |
| Fantail Sole | | 0.4 | 0.3 | | | 0.2 | | 0.9 |
| California Lizardfish | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | | 0.8 |
| California Tonguefish | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.7 |
| Unidentified Pipefish | 0.1 | 0.1 | 0.1 | | | 0.1 | 0.1 | 0.5 |
| Longfin Sanddab | | | 0.1 | 0.1 | 0.1 | 0.1 | | 0.4 |
| Queenfish | | | | | | | 0.3 | 0.3 |
| Basketweave Cusk-eel | | | 0.1 | | | | 0.1 | 0.2 |
| Vermilion Rockfish | 0.1 | | | | | | | 0.1 |
| Spotted Cusk-eel | | | | | | | 0.1 | 0.1 |
| Sarcastic Fringehead | | | | | | | 0.1 | 0.1 |
| Salema | | | | | | | 0.1 | 0.1 |
| Pacific Seahorse | | | | | | 0.1 | | 0.1 |
| Pacific Pompano | | | 0.1 | | | | | 0.1 |
| Ocean Whitefish | | | | | 0.1 | | | 0.1 |
| Giant Kelpfish | | | | | | | 0.1 | 0.1 |
| Diamond Turbot | | 0.1 | | | | | | 0.1 |
| California Skate | | | 0.1 | | | | | 0.1 |
| Blacksmith | | | | 0.1 | | | | 0.1 |
| Survey Total | 0.6 | 1.4 | 1.8 | 2.2 | 1.2 | 1.9 | 8.8 | 17.9 |

## Table D.6 *continued*

| Name | Summer 2016 | | | | | | | Species Biomass by Survey |
|---|---|---|---|---|---|---|---|---|
| | SD15 | SD16 | SD17 | SD18 | SD19 | SD20 | SD21 | |
| California Lizardfish | 2.5 | 1.8 | 4.0 | 2.3 | 0.9 | 2.8 | 2.8 | 17.1 |
| Speckled Sanddab | 1.5 | 1.7 | 3.4 | 1.3 | 1.6 | 1.4 | 0.7 | 11.6 |
| Longfin Sanddab | | 0.3 | 4.4 | 0.8 | 0.9 | 1.3 | 2.0 | 9.7 |
| California Halibut | 0.4 | | | 0.1 | 0.8 | 1.6 | 0.4 | 3.3 |
| Hornyhead Turbot | 0.1 | 0.1 | 1.2 | 0.3 | 0.1 | 0.6 | 0.1 | 2.5 |
| Fantail Sole | 0.1 | | 1.2 | | | 0.8 | | 2.1 |
| Pacific Sanddab | 0.1 | | | | | 0.1 | | 1.2 |
| California Tonguefish | 0.1 | 0.1 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 1.0 |
| Plainfin Midshipman | | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.5 |
| English Sole | | 0.1 | | 0.2 | | 0.1 | 0.1 | 0.5 |
| Yellowchin Sculpin | | | 0.1 | 0.1 | 0.1 | | 0.1 | 0.4 |
| Specklefin Midshipman | 0.1 | | 0.1 | 0.1 | | 0.1 | | 0.4 |
| Roughback Sculpin | 0.1 | 0.1 | 0.1 | 0.1 | | | | 0.4 |
| Unidentified Pipefish | | 0.1 | 0.1 | | | 0.1 | | 0.3 |
| Longspine Combfish | | 0.1 | | 0.1 | 0.1 | | | 0.3 |
| Spotted Turbot | | | 0.1 | | | | 0.1 | 0.2 |
| Pygmy Poacher | | | 0.1 | | | | 0.1 | 0.2 |
| Vermilion Rockfish | | | | | | | 0.1 | 0.1 |
| Threadfin Sculpin | | | | | | 0.1 | | 0.1 |
| Petrale Sole | | | | 0.1 | | | | 0.1 |
| Curlfin Sole | 0.1 | | | | | | | 0.1 |
| California Scorpionfish | | | | | | | 0.1 | 0.1 |
| Survey Total | 5.1 | 4.5 | 15.1 | 5.7 | 4.7 | 9.2 | 6.9 | 51.2 |
| **Annual Total** | **5.7** | **5.9** | **16.9** | **7.9** | **5.9** | **11.1** | **15.7** | **69.1** |

## Table D.7

Summary of demersal fish community parameters for PLOO trawl stations sampled during 2016. Data are included for species richness, abundance, diversity (H'), and biomass (kg, wet weight). Highlighted/bold values indicate 10 minute trawls, all others were 1 minute in duration.

| Station | Winter | Summer | Station | Winter | Summer |
|---|---|---|---|---|---|
| *Species Richness* | | | *Abundance* | | |
| SD7 | **11** | **15** | SD7 | **157** | **277** |
| SD8 | **16** | 9 | SD8 | **275** | 65 |
| SD10 | 5 | 8 | SD10 | 21 | 42 |
| SD12 | 4 | 7 | SD12 | 7 | 31 |
| SD13 | 5 | 6 | SD13 | 14 | 25 |
| SD14 | 1 | 6 | SD14 | 1 | 13 |
| *Diversity* | | | *Biomass* | | |
| SD7 | **1.4** | **1.5** | SD7 | **4.6** | **6.0** |
| SD8 | **1.9** | 1.5 | SD8 | **6.7** | 1.4 |
| SD10 | 1.1 | 1.1 | SD10 | 0.7 | 1.0 |
| SD12 | 1.2 | 1.4 | SD12 | 0.4 | 0.8 |
| SD13 | 1.3 | 1.3 | SD13 | 0.6 | 0.8 |
| SD14 | 0.0 | 1.7 | SD14 | 0.1 | 0.6 |

## Table D.8

Summary of demersal fish community parameters for SBOO trawl stations sampled during 2016. Data are included for species richness, abundance, diversity (H'), and biomass (kg, wet weight).

| Station | Winter | Summer | Station | Winter | Summer |
|---|---|---|---|---|---|
| *Species Richness* | | | *Abundance* | | |
| SD15 | 4 | 10 | SD15 | 61 | 478 |
| SD16 | 8 | 10 | SD16 | 59 | 409 |
| SD17 | 11 | 12 | SD17 | 104 | 545 |
| SD18 | 10 | 13 | SD18 | 68 | 710 |
| SD19 | 7 | 9 | SD19 | 132 | 490 |
| SD20 | 11 | 13 | SD20 | 94 | 480 |
| SD21 | 15 | 13 | SD21 | 177 | 549 |
| *Diversity* | | | *Biomass* | | |
| SD15 | 0.6 | 0.9 | SD15 | 0.6 | 5.1 |
| SD16 | 1.4 | 1.0 | SD16 | 1.4 | 4.5 |
| SD17 | 1.5 | 1.4 | SD17 | 1.8 | 15.1 |
| SD18 | 1.4 | 1.3 | SD18 | 2.2 | 5.7 |
| SD19 | 1.4 | 1.4 | SD19 | 1.2 | 4.7 |
| SD20 | 1.5 | 1.3 | SD20 | 1.9 | 9.2 |
| SD21 | 1.7 | 1.4 | SD21 | 8.8 | 6.9 |

## Table D.9

Summary of demersal fish abnormalities and parasites at trawl stations sampled during 2016. A= ambicoloration; PE = eye parasite; PG = gill parasite; PL= leech [a].

| Region | Survey | Station | Species | Size Class | Count | Type | Abnormalities/Parasite |
|---|---|---|---|---|---|---|---|
| PLOO | Winter | SD8 | Pacific Sanddab | 11 | 1 | PE | *Phrixocephalus cincinnatus* |
| PLOO | Winter | SD8 | Pacific Sanddab | 8 | 1 | PE | *Phrixocephalus cincinnatus* |
| SBOO | Winter | SD17 | Hornyhead Turbot | 6 | 1 | PL | subclass Hirudinea (unidentified) |
| SBOO | Winter | SD18 | Speckled Sanddab | 7 | 1 | PG | *Elthusa vulgaris* |
| SBOO | Summer | SD15 | Pacific Sanddab | 11 | 1 | PG | *Elthusa vulgaris* |
| SBOO | Summer | SD15 | Pacific Sanddab | 12 | 1 | PG | *Elthusa vulgaris* |
| SBOO | Summer | SD17 | Spotted Turbot | 10 | 1 | A | Ambicoloration |
| SBOO | Summer | SD17 | Speckled Sanddab | 7 | 1 | A | Ambicoloration |
| SBOO | Summer | SD18 | Longfin Sanddab | 11 | 1 | PE | *Phrixocephalus cincinnatus* |
| SBOO | Summer | SD18 | Speckled Sanddab | 8 | 1 | PG | *Elthusa vulgaris* |

[a] An additional 111 *Elthusa vulgaris* were identified as part of invertebrate trawl catches during the year; see Tables D.10–D.12

## Table D.10

Summary taxonomic listing of megabenthic invertebrate taxa captured at all PLOO and SBOO trawl stations during 2016 (see Table D.1). Data are number of individuals (n). Taxonomic arrangement from SCAMIT (2014).

| Phylum | Class | Family | Taxon | n |
|---|---|---|---|---|
| **SILICEA** | | | | |
| | Demospongiae | | | |
| | | Suberitidae | *Suberites latus* | 1 |
| **CNIDARIA** | | | | |
| | Anthozoa | | | |
| | | Plexauridae | *Thesea* sp B | 1 |
| | | Virgulariidae | *Acanthoptilum* sp | 7 |
| | | | *Stylatula elongata* | 2 |
| | | Actiniaria [a] | Actiniaria (unidentified) | 1 |
| **MOLLUSCA** | | | | |
| | Gastropoda | | | |
| | | Bursidae | *Crossata ventricosa* | 6 |
| | | Epitoniidae | *Epitonium bellastriatum* | 1 |
| | | Buccinidae | *Kelletia kelletii* | 16 |
| | | Nassariidae | *Hinea insculpta* | 7 |
| | | Pseudomelatomidae | *Crassispira semiinflata* | 1 |
| | | Philinidae | *Philine alba* | 1 |
| | | | *Philine auriformis* | 8 |
| | | Onchidorididae | *Acanthodoris rhodoceras* | 2 |
| | | Dendronotidae | *Dendronotus iris* | 1 |
| | Bivalvia | | | |
| | | Pectinidae | *Leptopecten latiauratus* | 1 |
| | Cephalopoda | | | |
| | | Sepiolidae | *Rossia pacifica* | 1 |
| | | Octopodidae | *Octopus rubescens* | 23 |
| **ARTHROPODA** | | | | |
| | Malacostraca | | | |
| | | Hemisquillidae | *Hemisquilla californiensis* | 12 |
| | | Cymothoidae | *Elthusa vulgaris* | 111 |
| | | Sicyoniidae | *Sicyonia ingentis* | 164 |
| | | | *Sicyonia penicillata* | 573 |
| | | Alpheidae | *Alpheus clamator* | 1 |
| | | Hippolytidae | *Heptacarpus palpator* | 1 |
| | | | *Heptacarpus stimpsoni* | 1 |
| | | Crangonidae | *Crangon alba* | 1 |
| | | | *Crangon nigromaculata* | 107 |
| | | Diogenidae | *Paguristes bakeri* | 1 |
| | | | *Paguristes turgidus* | 1 |
| | | Paguridae | *Pagurus spilocarpus* | 2 |
| | | Munididae | *Pleuroncodes planipes* | 74,548 |
| | | Calappidae | *Platymera gaudichaudii* | 2 |
| | | Leucosiidae | *Randallia ornata* | 3 |
| | | Epialtidae | *Pugettia producta* | 1 |
| | | | *Loxorhynchus grandis* | 1 |
| | | Inachidae | *Ericerodes hemphillii* | 2 |

[a] Order; family unknown

## Table D.10 *continued*

| Taxon/Species | | | | n |
|---|---|---|---|---|
| | | Inachoididae | *Pyromaia tuberculata* | 4 |
| | | Cancridae | | 2 |
| | | | *Metacarcinus anthonyi* | 1 |
| | | | *Metacarcinus gracilis* | 3 |
| | | Portunidae | *Portunus xantusii* | 153 |
| **ECHINODERMATA** | | | | |
| | Asteroidea | | | |
| | | Luidiidae | *Luidia armata* | 1 |
| | | | *Luidia asthenosoma* | 1 |
| | | | *Luidia foliolata* | 3 |
| | | Astropectinidae | *Astropecten californicus* | 24 |
| | | | *Astropecten ornatissimus* | 3 |
| | Ophiuroidea | | | |
| | | Ophiuridae | *Ophiura luetkenii* | 2 |
| | | Ophiotricidae | *Ophiothrix spiculata* | 2 |
| | Echinoidea | | | |
| | | Toxopneustidae | *Lytechinus pictus* | 744 |
| | | Dendrasteridae | *Dendraster terminalis* | 25 |
| | Holothuroidea | | | |
| | | Stichopodidae | *Parastichopus californicus* | 4 |

## Table D.11

Total abundance by species and station for megabenthic invertebrates captured at PLOO trawl stations during 2016.

| Species | Winter 2016 | | | | | | Species Abundance by Survey |
|---|---|---|---|---|---|---|---|
| | SD7 | SD8 | SD10 [a] | SD12 [a] | SD13 [a] | SD14 [a] | |
| *Pleuroncodes planipes* | 38 | 30 | 3112 | 3360 | 3717 | 2389 | 12,646 |
| *Lytechinus pictus* | 172 | 221 | 38 | | 5 | | 436 |
| *Sicyonia ingentis* | 31 | 51 | | | | | 82 |
| *Astropecten californicus* | | 3 | | | | | 3 |
| *Octopus rubescens* | | 2 | | | | | 2 |
| *Elthusa vulgaris* | | 2 | | | | | 2 |
| *Parastichopus californicus* | 1 | | | | | | 1 |
| *Luidia foliolata* | | 1 | | | | | 1 |
| *Luidia asthenosoma* | | | 1 | | | | 1 |
| Survey Total | 242 | 310 | 3151 | 3360 | 3722 | 2389 | 13,174 |

[a] One minute trawl, see Table D.1

## Table D.11 *continued*

| Species | Summer 2016 | | | | | | Species Abundance by Survey |
|---|---|---|---|---|---|---|---|
| | SD7 | SD8 [a] | SD10 [a] | SD12 [a] | SD13 [a] | SD14 [a] | |
| *Pleuroncodes planipes* | 106 | 17,286 | 13,068 | 18,630 | 6140 | 6526 | 61,756 |
| *Lytechinus pictus* | 74 | 141 | 74 | 4 | 2 | 13 | 308 |
| *Sicyonia ingentis* | 8 | 31 | 10 | 6 | 24 | 3 | 82 |
| *Hinea insculpta* | | | | | | 7 | 7 |
| *Parastichopus californicus* | 1 | 2 | | | | | 3 |
| *Astropecten californicus* | 1 | | 2 | | | | 3 |
| *Luidia foliolata* | | | 1 | | 1 | | 2 |
| *Elthusa vulgaris* | | 1 | 1 | | | | 2 |
| *Suberites latus* | 1 | | | | | | 1 |
| *Platymera gaudichaudii* | | | | 1 | | | 1 |
| *Paguristes turgidus* | | | | | | 1 | 1 |
| *Paguristes bakeri* | 1 | | | | | | 1 |
| Survey Total | 192 | 17,461 | 13,156 | 18,641 | 6167 | 6550 | 62,167 |
| **Annual Total** | **434** | **17,771** | **16,307** | **22,001** | **9889** | **8939** | **75,341** |

[a] One minute trawl, see Table D.1

## Table D.12
Total abundance by species and station for megabenthic invertebrates captured at SBOO trawl stations during 2016.

| Species | Winter 2016 | | | | | | | Species Abundance by Survey |
|---|---|---|---|---|---|---|---|---|
| | SD15 | SD16 | SD17 | SD18 | SD19 | SD20 | SD21 | |
| *Sicyonia penicillata* | 9 | 36 | 41 | 46 | 117 | 140 | 85 | 474 |
| *Portunus xantusii* | 5 | 22 | 21 | 7 | 38 | 16 | 43 | 152 |
| *Crangon nigromaculata* | | 3 | 5 | 3 | 4 | | 90 | 105 |
| *Hemisquilla californiensis* | | 1 | 2 | 3 | 3 | 3 | | 12 |
| *Astropecten californicus* | 1 | 4 | | | | 5 | | 10 |
| *Pleuroncodes planipes* | | | | 1 | | 1 | 3 | 5 |
| *Elthusa vulgaris* | | | 1 | 3 | | | 1 | 5 |
| *Randallia ornata* | 1 | | 2 | | | | | 3 |
| *Pyromaia tuberculata* | | | | | 2 | | 1 | 3 |
| *Metacarcinus gracilis* | | 1 | 1 | 1 | | | | 3 |
| *Stylatula elongata* | 1 | 1 | | | | | | 2 |
| *Ophiothrix spiculata* | | | | | 1 | | 1 | 2 |
| *Kelletia kelletii* | | | | 2 | | | | 2 |
| *Dendraster terminalis* | 2 | | | | | | | 2 |
| Cancridae | | | | | | | 2 | 2 |
| *Rossia pacifica* | 1 | | | | | | | 1 |
| *Pugettia producta* | | | | | 1 | | | 1 |
| *Philine auriformis* | | | | 1 | | | | 1 |
| *Pagurus spilocarpus* | | | 1 | | | | | 1 |
| *Octopus rubescens* | | | | | 1 | | | 1 |
| *Luidia armata* | | | | | | 1 | | 1 |
| *Heptacarpus palpator* | | | | | | | 1 | 1 |
| *Crangon alba* | 1 | | | | | | | 1 |
| *Alpheus clamator* | | | | | | | 1 | 1 |
| Actiniaria | | | | 1 | | | | 1 |
| *Survey Total* | 21 | 68 | 74 | 68 | 167 | 166 | 228 | 792 |

**Table D.12** *continued*

| Species | Summer 2016 | | | | | | | Species Abundance by Survey |
|---|---|---|---|---|---|---|---|---|
| | SD15 | SD16 | SD17 | SD18 | SD19 | SD20 | SD21 | |
| *Pleuroncodes planipes* | 3 | 44 | 7 | 29 | 57 | | 1 | 141 |
| *Elthusa vulgaris* | 7 | 24 | 7 | 8 | 30 | 21 | 5 | 102 |
| *Sicyonia penicillata* | 1 | 1 | 24 | 4 | 20 | 4 | 45 | 99 |
| *Dendraster terminalis* | 23 | | | | | | | 23 |
| *Octopus rubescens* | 3 | 2 | 6 | 1 | 2 | 4 | 2 | 20 |
| *Kelletia kelletii* | | 2 | 7 | 5 | | | | 14 |
| *Astropecten californicus* | | 1 | | 4 | | 3 | | 8 |
| *Philine auriformis* | | | 6 | | 1 | | | 7 |
| *Acanthoptilum* sp | 7 | | | | | | | 7 |
| *Crossata ventricosa* | 3 | | | 2 | | | 1 | 6 |
| *Astropecten ornatissimus* | 3 | | | | | | | 3 |
| *Ophiura luetkenii* | 2 | | | | | | | 2 |
| *Ericerodes hemphillii* | | | | 2 | | | | 2 |
| *Crangon nigromaculata* | 2 | | | | | | | 2 |
| *Acanthodoris rhodoceras* | | | | | | | 2 | 2 |
| *Thesea* sp B | | | 1 | | | | | 1 |
| *Pyromaia tuberculata* | | | | | | | 1 | 1 |
| *Portunus xantusii* | | | 1 | | | | | 1 |
| *Platymera gaudichaudii* | | | 1 | | | | | 1 |
| *Philine alba* | 1 | | | | | | | 1 |
| *Pagurus spilocarpus* | | | 1 | | | | | 1 |
| *Metacarcinus anthonyi* | | | | | | | 1 | 1 |
| *Loxorhynchus grandis* | | | | | 1 | | | 1 |
| *Leptopecten latiauratus* | | | | 1 | | | | 1 |
| *Heptacarpus stimpsoni* | | | | 1 | | | | 1 |
| *Epitonium bellastriatum* | 1 | | | | | | | 1 |
| *Dendronotus iris* | | | 1 | | | | | 1 |
| *Crassispira semiinflata* | 1 | | | | | | | 1 |
| Survey Total | 57 | 74 | 62 | 57 | 111 | 32 | 58 | 451 |
| **Annual Total** | **78** | **142** | **136** | **125** | **278** | **198** | **286** | **1243** |

## Table D.13

Summary of megabenthic invertebrate community parameters for PLOO trawl stations sampled during 2016. Data are included for species richness, abundance, and diversity (H'). Highlighted/bold values indicate 10 minute trawls, all others were 1 minute in duration.

| Station | Winter | Summer | Station | Winter | Summer |
|---|---|---|---|---|---|
| *Species Richness* | | | *Abundance* | | |
| SD7 | **4** | **7** | SD7 | **242** | **192** |
| SD8 | **7** | 5 | SD8 | **310** | 17,461 |
| SD10 | 3 | 6 | SD10 | 3151 | 13,156 |
| SD12 | 1 | 4 | SD12 | 3360 | 18,641 |
| SD13 | 2 | 4 | SD13 | 3722 | 6167 |
| SD14 | 1 | 5 | SD14 | 2389 | 6550 |
| *Diversity* | | | | | |
| SD7 | **0.82** | **0.94** | | | |
| SD8 | **0.89** | 0.06 | | | |
| SD10 | 0.07 | 0.04 | | | |
| SD12 | 0.00 | 0.01 | | | |
| SD13 | 0.01 | 0.03 | | | |
| SD14 | 0.00 | 0.03 | | | |

## Table D.14

Summary of megabenthic invertebrate community parameters for SBOO stations sampled during 2016. Data are included for species richness, abundance, and diversity (H').

| Station | Winter | Summer | Station | Winter | Summer |
|---|---|---|---|---|---|
| *Species Richness* | | | *Abundance* | | |
| SD15 | 8 | 13 | SD15 | 21 | 57 |
| SD16 | 7 | 6 | SD16 | 68 | 74 |
| SD17 | 8 | 11 | SD17 | 74 | 62 |
| SD18 | 10 | 10 | SD18 | 68 | 57 |
| SD19 | 8 | 6 | SD19 | 167 | 111 |
| SD20 | 6 | 4 | SD20 | 166 | 32 |
| SD21 | 10 | 8 | SD21 | 228 | 58 |
| *Diversity* | | | | | |
| SD15 | 1.7 | 2.0 | | | |
| SD16 | 1.2 | 1.0 | | | |
| SD17 | 1.2 | 1.9 | | | |
| SD18 | 1.3 | 1.7 | | | |
| SD19 | 0.9 | 1.2 | | | |
| SD20 | 0.6 | 1.0 | | | |
| SD21 | 1.3 | 0.9 | | | |

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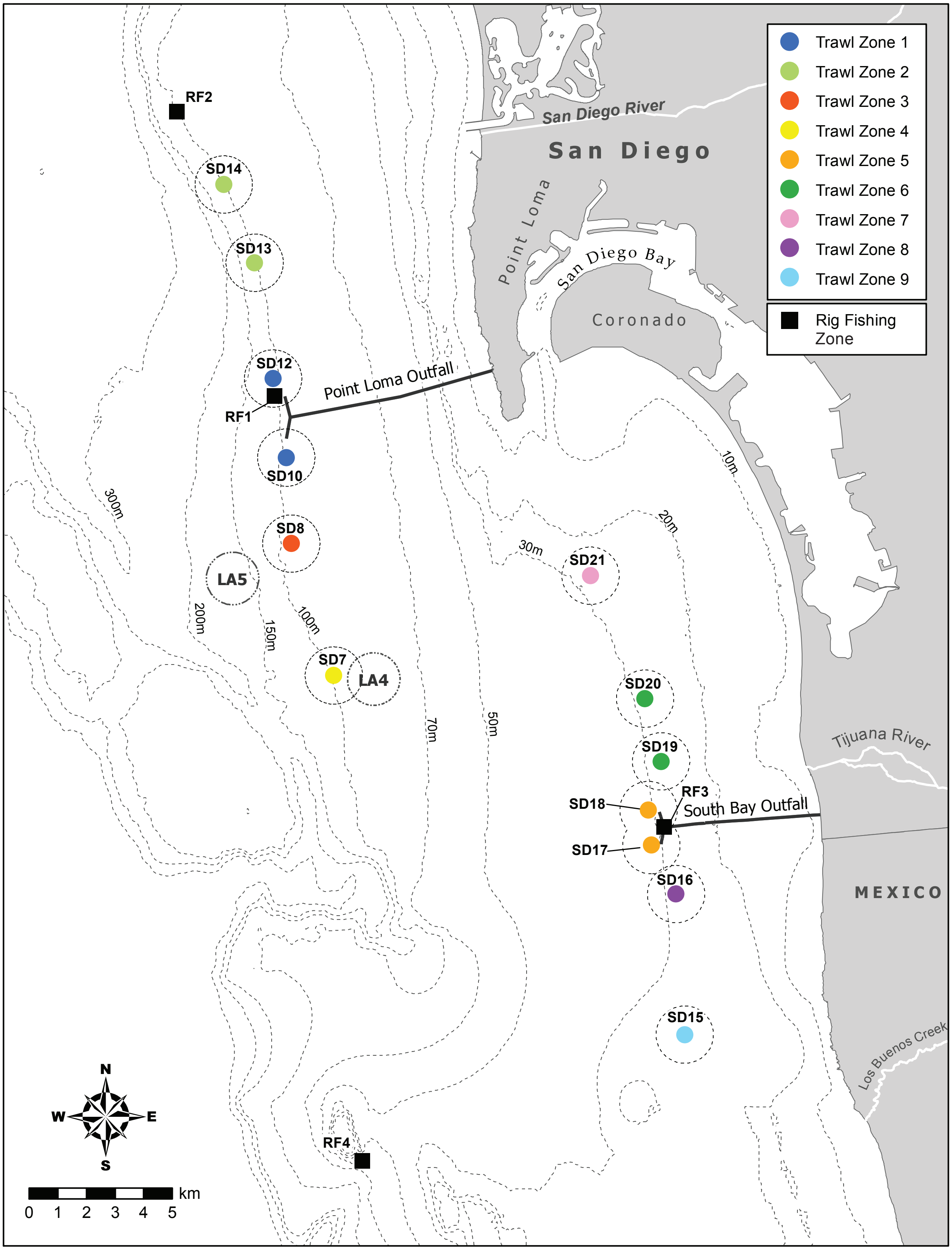
# Appendix E

## Chapter 5. Bioaccumulation of Contaminants in Fish Tissues

## Figures & Tables

# Appendix E

# FIGURES and TABLES




## Figure E.1

Trawl and rig fishing zone locations sampled around the Point Loma and South Bay Ocean Outfalls as part of the City of San Diego's Ocean Monitoring Program.

## Table E.1

Species of fish collected from each trawl and rig fishing zones during 2016.

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

[a] Includes Copper and Rosy Rockfish; [b] includes Greenstriped and Starry Rockfish; [c] includes Vermilion, Flag and Copper Rockfish; [d] includes Olive and Brown Rockfish; [e] includes Vermilion and Olive Rockfish

## Table E.2

Lengths and weights of fishes used for each composite (Comp) tissue sample from PLOO trawl and rig fishing zones during 2016. 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 | 21 | 25 | 23 | 261 | 415 | 344 |
| RF1 | 2 | Vermilion Rockfish | 4 | 15 | 25 | 18 | 104 | 402 | 185 |
| RF1 | 3 | Mixed Rockfish | 3 | 15 | 26 | 22 | 96 | 553 | 384 |
| RF2 | 1 | Speckled Rockfish | 3 | 26 | 28 | 27 | 348 | 620 | 485 |
| RF2 | 2 | Mixed Rockfish | 4 | 17 | 23 | 21 | 137 | 227 | 184 |
| RF2 | 3 | Mixed Rockfish | 3 | 25 | 35 | 28 | 380 | 1200 | 663 |
| TZ1 | 1 | Pacific Sanddab | 3 | 17 | 20 | 19 | 84 | 128 | 112 |
| TZ1 | 2 | Pacific Sanddab | 4 | 17 | 18 | 18 | 69 | 100 | 84 |
| TZ1 | 3 | Pacific Sanddab | 4 | 16 | 18 | 17 | 64 | 103 | 85 |
| TZ2 | 1 | Pacific Sanddab | 3 | 16 | 21 | 19 | 67 | 178 | 119 |
| TZ2 | 2 | Pacific Sanddab | 3 | 17 | 22 | 19 | 89 | 187 | 128 |
| TZ2 | 3 | Pacific Sanddab | 3 | 19 | 24 | 22 | 106 | 231 | 188 |
| TZ3 | 1 | Pacific Sanddab | 3 | 18 | 20 | 19 | 117 | 124 | 121 |
| TZ3 | 2 | Pacific Sanddab | 3 | 16 | 19 | 17 | 76 | 149 | 101 |
| TZ3 | 3 | Pacific Sanddab | 3 | 17 | 19 | 18 | 80 | 117 | 98 |
| TZ4 | 1 | Pacific Sanddab | 3 | 20 | 24 | 22 | 107 | 230 | 172 |
| TZ4 | 2 | Pacific Sanddab | 3 | 18 | 20 | 19 | 88 | 137 | 119 |
| TZ4 | 3 | Pacific Sanddab | 4 | 18 | 19 | 18 | 89 | 106 | 99 |

## Table E.3

Lengths and weights of fishes used for each composite (Comp) tissue sample from SBOO trawl and rig fishing stations during 2016. 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 | 18 | 26 | 23 | 198 | 620 | 442 |
| RF3 | 2 | Mixed Rockfish | 3 | 17 | 20 | 18 | 150 | 245 | 187 |
| RF3 | 3 | Mixed Rockfish | 3 | 21 | 26 | 23 | 268 | 441 | 372 |
| RF4 | 1 | Treefish | 3 | 21 | 24 | 22 | 274 | 400 | 343 |
| RF4 | 2 | Treefish | 3 | 22 | 24 | 23 | 343 | 400 | 376 |
| RF4 | 3 | Starry Rockfish | 3 | 23 | 23 | 23 | 289 | 315 | 304 |
| TZ5 | 1 | Fantail Sole | 5 | 17 | 24 | 21 | 97 | 305 | 208 |
| TZ5 | 2 | Honyhead Turbot | 8 | 11 | 18 | 14 | 34 | 130 | 77 |
| TZ5 | 3 | Longfin Sanddab | 8 | 12 | 18 | 14 | 35 | 119 | 63 |
| TZ6 | 1 | Longfin Sanddab | 8 | 13 | 18 | 14 | 42 | 120 | 60 |
| TZ6 | 2 | Longfin Sanddab | 14 | 11 | 13 | 12 | 32 | 52 | 39 |
| TZ6 | 3 | Longfin Sanddab | 13 | 12 | 14 | 12 | 32 | 59 | 39 |
| TZ7 | 1 | Longfin Sanddab | 11 | 13 | 18 | 14 | 40 | 131 | 56 |
| TZ7 | 2 | Longfin Sanddab | 6 | 13 | 18 | 15 | 51 | 127 | 67 |
| TZ7 | 3 | Longfin Sanddab | 3 | 12 | 22 | 17 | 47 | 217 | 135 |
| TZ8 | 1 | Longfin Sanddab | 10 | 13 | 14 | 13 | 39 | 56 | 46 |
| TZ8 | 2 | Longfin Sanddab | 11 | 12 | 17 | 14 | 35 | 112 | 50 |
| TZ8 | 3 | Fantail Sole | 4 | 22 | 27 | 25 | 254 | 397 | 337 |
| TZ9 | 1 | Fantail Sole | 8 | 13 | 21 | 18 | 39 | 185 | 121 |
| TZ9 | 2 | Spotted Turbot | 6 | 13 | 19 | 16 | 51 | 160 | 103 |
| TZ9 | 3 | Hornyhead Turbot | 7 | 12 | 15 | 13 | 31 | 111 | 54 |

## Table E.4

Constituents and method detection limits (MDL) used for the analysis of liver and muscle tissues of fishes collected from the PLOO and SBOO region during 2016. nr = not reportable.

| | MDL | | | MDL | |
|---|---|---|---|---|---|
| **Parameter** | **Liver** | **Muscle** | **Parameter** | **Liver** | **Muscle** |
| **Metals (ppm)** | | | | | |
| Aluminum (Al) | 2.4 | 2.4 | Lead (Pb) | 0.326 | 0.326 |
| Antimony (Sb) | 0.79 | 0.79 | Manganese (Mn) | 0.19 | 0.19 |
| Arsenic (As) | 0.308 | 0.308 | Mercury (Hg) | 0.002 | 0.002 |
| Barium (Ba) | 0.08 | 0.08 | Nickel (Ni) | 0.3 | 0.3 |
| Beryllium (Be) | 0.02 | 0.02 | Selenium (Se) | 0.19 | 0.19 |
| Cadmium (Cd) | 0.13 | 0.13 | Silver (Ag) | 0.206 | 0.206 |
| Chromium (Cr) | 0.136 | 0.136 | Thallium (Tl) | 0.43 | 0.43 |
| Copper (Cu) | 0.69 | 0.69 | Tin (Sn) | 0.33 | 0.33 |
| Iron (Fe) | 2.88 | 2.88 | Zinc (Zn) | 1.45 | 1.45 |
| **Chlorinated Pesticides (ppb)** | | | | | |
| *Hexachlorocyclohexane (HCH)* | | | | | |
| HCH, Alpha isomer | 1.58 | 0.16 | HCH, Delta isomer | 3.47 | 0.34 |
| HCH, Beta isomer | 4.5 | 0.45 | HCH, Gamma isomer | 3.68 | 0.37 |
| *Total Chlordane* | | | | | |
| Alpha (cis) chlordane | 5.89 | 0.59 | Heptachlor epoxide | 2.97 | 0.29 |
| Cis nonachlor | 6.06 | 0.61 | Methoxychlor | 13.10 | nr |
| Gamma (trans) chlordane | 3.84 | 0.38 | Oxychlordane | 2.81 | 0.28 |
| Heptachlor | 1.86 | 0.19 | Trans nonachlor | 5.12 | 0.51 |
| *Total Dichlorodiphenyltrichloroethane (DDT)* | | | | | |
| o,p-DDD | 2.03 | 0.21 | p,p-DDD | 2.62 | 0.26 |
| o,p-DDE | 3.16 | 0.31 | p,p-DDE | 1.75 | 0.18 |
| o,p-DDT | 2.92 | 0.29 | p,p-DDT | 2.66 | 0.27 |
| p,-p-DDMU | 3.44 | 0.34 | | | |
| *Miscellaneous Pesticides* | | | | | |
| Aldrin | 2.98 | 0.30 | Endrin | nr | nr |
| Alpha endosulfan | 1.77 | 0.17 | Endrin aldehyde | nr | nr |
| Beta endosulfan | nr | nr | Hexachlorobenzene (HCB) | 26.8 | 2.68 |
| Dieldrin | nr | nr | Mirex | 1.99 | 0.20 |
| Endosulfan sulfate | 2.31 | 0.23 | | | |

## Table E.4 *continued*

| Parameter | MDL Liver | MDL Muscle | Parameter | MDL Liver | MDL Muscle |
|---|---|---|---|---|---|
| **Polychlorinated Biphenyls Congeners (PCBs) (ppb)** | | | | | |
| PCB 18 | 1.21 | 0.12 | PCB 126 | 1.34 | 0.13 |
| PCB 28 | 1.65 | 0.16 | PCB 128 | 1.43 | 0.14 |
| PCB 37 | 1.43 | 0.14 | PCB 138 | 2.51 | 0.25 |
| PCB 44 | 1.16 | 0.12 | PCB 149 | 1.79 | 0.18 |
| PCB 49 | 0.97 | 0.10 | PCB 151 | 1.31 | 0.14 |
| PCB 52 | 1.27 | 0.12 | PCB 153/168 | 2.79 | 0.28 |
| PCB 66 | 1.16 | 0.12 | PCB 156 | 1.86 | 0.19 |
| PCB 70 | 1.40 | 0.14 | PCB 157 | 3.20 | 0.32 |
| PCB 74 | 1.09 | 0.11 | PCB 158 | 1.45 | 0.14 |
| PCB 77 | 1.81 | 0.18 | PCB 167 | 1.59 | 0.16 |
| PCB 81 | 1.63 | 0.16 | PCB 169 | 2.72 | 0.27 |
| PCB 87 | 1.39 | 0.14 | PCB 170 | 2.02 | 0.21 |
| PCB 99 | 1.25 | 0.12 | PCB 177 | 2.31 | 0.23 |
| PCB 101 | 1.49 | 0.15 | PCB 180 | 2.54 | 0.26 |
| PCB 105 | 1.83 | 0.19 | PCB 183 | 1.14 | 0.11 |
| PCB 110 | 1.42 | 0.14 | PCB 187 | 1.16 | 0.12 |
| PCB 114 | 1.31 | 0.13 | PCB 189 | 1.44 | 0.14 |
| PCB 118 | 2.38 | 0.24 | PCB 194 | 1.76 | 0.18 |
| PCB 119 | 1.96 | 0.20 | PCB 201 | 1.68 | 0.17 |
| PCB 123 | 1.94 | 0.19 | PCB 206 | 1.31 | nr |
| **Polycyclic Aromatic Hydrocarbons (PAHs) (ppb)** | | | | | |
| 1-methylnaphthalene | 27.9 | 26.4 | Benzo[G,H,I]perylene | 27.2 | 59.5 |
| 1-methylphenanthrene | 17.4 | 23.3 | Benzo[K]fluoranthene | 32.0 | 37.3 |
| 2,3,5-trimethylnaphthalene | 21.7 | 21.6 | Biphenyl | 38.0 | 19.9 |
| 2,6-dimethylnaphthalene | 21.7 | 19.5 | Chrysene | 18.1 | 23.0 |
| 2-methylnaphthalene | 35.8 | 13.2 | Dibenzo(A,H)anthracene | 37.6 | 40.3 |
| 3,4-benzo(B)fluoranthene | 30.2 | 26.8 | Fluoranthene | 19.9 | 12.9 |
| Acenaphthene | 28.9 | 11.3 | Fluorene | 27.3 | 11.4 |
| Acenaphthylene | 24.7 | 9.1 | Indeno(1,2,3-CD)pyrene | 25.6 | 46.5 |
| Anthracene | 25.3 | 8.4 | Naphthalene | 34.2 | 17.4 |
| Benzo[A]anthracene | 47.3 | 15.9 | Perylene | 18.5 | 50.9 |
| Benzo[A]pyrene | 42.9 | 18.3 | Phenanthrene | 11.6 | 12.9 |
| Benzo[e]pyrene | 41.8 | 40.6 | Pyrene | 9.1 | 16.6 |

## Table E.5

Concentrations of metals (ppm) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2016. See Table E.4 for MDLs and names of each metal represented by periodic table symbol; nd = not detected.

| | | | | Trace Metals | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trawl Zone | | Comp | Species | Al | As | Ba | Cd | Cr | Cu | Fe | Mn | Hg | Ni | Se | Ag | Sn | Zn |
| PLOO | TZ1 | 1 | Pacific Sanddab | nd | 5.1 | nd | 0.9 | 0.2 | 2.2 | 61 | 0.7 | 0.037 | nd | 0.56 | nd | 0.7 | 19 |
| | | 2 | Pacific Sanddab | nd | 6.4 | nd | 1.0 | 0.6 | 3.0 | 105 | 0.8 | 0.038 | nd | 0.59 | nd | 0.4 | 21 |
| | | 3 | Pacific Sanddab | nd | 5.7 | nd | 2.2 | 0.2 | 2.5 | 87 | 0.6 | 0.061 | nd | 0.70 | nd | 0.5 | 20 |
| | TZ2 | 1 | Pacific Sanddab | 5.0 | 6.1 | nd | 3.8 | 0.3 | 3.2 | 143 | 0.7 | 0.059 | nd | 0.73 | nd | 0.6 | 23 |
| | | 2 | Pacific Sanddab | nd | 5.9 | nd | 1.8 | 0.2 | 3.2 | 90 | 0.7 | 0.052 | nd | 0.63 | nd | 0.5 | 19 |
| | | 3 | Pacific Sanddab | nd | 4.9 | nd | 2.3 | 1.0 | 6.0 | 52 | 0.6 | 0.042 | nd | 0.73 | nd | 0.5 | 22 |
| | TZ3 | 1 | Pacific Sanddab | nd | 12.0 | nd | 2.0 | 1.3 | 6.1 | 75 | 1.3 | 0.039 | 0.6 | 0.95 | nd | 1.0 | 38 |
| | | 2 | Pacific Sanddab | nd | 3.3 | nd | 0.8 | 0.7 | 2.3 | 33 | 0.5 | 0.036 | nd | 0.69 | nd | 0.5 | 15 |
| | | 3 | Pacific Sanddab | nd | 5.9 | nd | 1.3 | 0.8 | 4.4 | 49 | 0.8 | 0.037 | nd | 0.70 | nd | 0.6 | 23 |
| | TZ4 | 1 | Pacific Sanddab | nd | 6.2 | nd | 2.8 | 0.7 | 4.7 | 42 | 0.7 | 0.043 | nd | 0.83 | nd | 0.6 | 23 |
| | | 2 | Pacific Sanddab | nd | 6.7 | nd | 1.6 | 0.6 | 3.4 | 39 | 0.9 | 0.040 | nd | 1.05 | nd | 0.5 | 24 |
| | | 3 | Pacific Sanddab | nd | 3.5 | nd | 0.8 | 1.0 | 2.0 | 27 | 0.5 | 0.028 | 0.3 | 0.49 | nd | 0.5 | 15 |
| | | | Detection Rate (%) | 8 | 100 | 0 | 100 | 100 | 100 | 100 | 100 | 100 | 17 | 100 | 0 | 100 | 100 |
| SBOO | TZ5 | 1 | Fantail Sole | nd | 20.1 | nd | 2.1 | 0.5 | 27.4 | 167 | 1.9 | 0.066 | nd | 0.68 | nd | 0.4 | 73 |
| | | 2 | Hornyhead Turbot | nd | 11.1 | nd | 5.9 | 0.5 | 8.3 | 82 | 1.3 | 0.237 | nd | 1.77 | 0.2 | 0.5 | 76 |
| | | 3 | Longfin Sanddab | nd | 12.1 | nd | 1.9 | 0.5 | 5.7 | 78 | 1.2 | 0.077 | nd | 1.22 | nd | 0.5 | 25 |
| | TZ6 | 1 | Longfin Sanddab | nd | 9.2 | nd | 1.4 | 0.5 | 4.9 | 92 | 1.1 | 0.074 | nd | 0.86 | nd | 0.5 | 26 |
| | | 2 | Longfin Sanddab | nd | 5.8 | nd | 1.0 | 0.6 | 6.4 | 75 | 1.1 | 0.059 | nd | 0.97 | nd | 0.5 | 23 |
| | | 3 | Longfin Sanddab | nd | 7.2 | nd | 1.2 | 0.7 | 6.2 | 91 | 1.2 | 0.066 | nd | 1.41 | nd | 0.5 | 27 |
| | TZ7 | 1 | Longfin Sanddab | nd | 9.1 | nd | 1.2 | 0.5 | 4.3 | 70 | 1.1 | 0.100 | nd | 0.94 | nd | 0.5 | 22 |
| | | 2 | Longfin Sanddab | nd | 9.9 | nd | 1.1 | 0.5 | 4.5 | 59 | 1.1 | 0.088 | nd | 0.7 | nd | 0.6 | 24 |
| | | 3 | Longfin Sanddab | nd | 8.7 | nd | 1.4 | 0.7 | 4.2 | 68 | 1.1 | 0.110 | 0.3 | 1.14 | nd | 0.5 | 28 |
| | TZ8 | 1 | Longfin Sanddab | nd | 10.6 | nd | 1.7 | nd | 7.1 | 111 | 1.7 | 0.088 | nd | 0.95 | nd | 0.5 | 28 |
| | | 2 | Longfin Sanddab | nd | 10.9 | nd | 1.3 | nd | 6.7 | 91 | 0.9 | 0.080 | nd | 1.00 | nd | 0.5 | 24 |
| | | 3 | Fantail Sole | nd | 39.4 | 0.236 | 4.0 | 0.2 | 16.4 | 188 | 2.6 | 0.130 | nd | 0.74 | nd | 0.4 | 61 |
| | TZ9 | 1 | Fantail Sole | nd | 33.2 | nd | 2.1 | nd | 17.8 | 205 | 1.1 | 0.073 | nd | 1.07 | nd | nd | 55 |
| | | 2 | Spotted Turbot | nd | 4.4 | nd | 3.5 | nd | 2.3 | 64 | 0.8 | 0.094 | nd | 1.57 | nd | nd | 22 |
| | | 3 | Hornyhead Turbot | nd | 5.2 | nd | 1.4 | 0.3 | 7.3 | 80 | 1.1 | 0.080 | nd | 1.53 | nd | 0.4 | 47 |
| | | | Detection Rate (%) | 0 | 100 | 7 | 100 | 73 | 100 | 100 | 100 | 100 | 7 | 100 | 7 | 87 | 100 |

## Table E.6

Concentrations of pesticides (ppb), tPCB (ppb), tPAH (ppb, SBOO samples only) and lipids (% weight) detected in liver tissues of fishes collected from PLOO and SBOO trawl zones during 2016. See Table E.4 for list of constituents with MDLs and Table E.9 for values of individual constituents summed for total chlordane (tChlor), total DDT, total endosulfan (tEndo), total HCH, total PCB, and total PAH; nd = not detected; na = not available; nr = not reportable.

| | | | | Pesticides | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Trawl Zone | | Comp | Species | tChlor[a] | tDDT | tEndo | tHCH | HCB | Mirex | tPCB | Lipids |
| PLOO | TZ1 | 1 | Pacific Sanddab | 0.28 | 436.5 | nd | 3.29 | nr | nd | 249.7 | 45.5 |
| | | 2 | Pacific Sanddab | nd | 421.3 | nd | 2.96 | nr | nd | 207.0 | 49.8 |
| | | 3 | Pacific Sanddab | 6.19 | 591.5 | nd | 2.28 | nr | 0.59 | 342.5 | 52.8 |
| | TZ2 | 1 | Pacific Sanddab | 3.24 | 295.4 | nd | 5.33 | nr | nd | 149.9 | 51.4 |
| | | 2 | Pacific Sanddab | 2.15 | 310.8 | nd | 3.22 | 9.3 | nd | 127.7 | 49.5 |
| | | 3 | Pacific Sanddab | nd | 403.7 | nd | 3.83 | 14.1 | nd | 176.3 | 47.0 |
| | TZ3 | 1 | Pacific Sanddab | nd | 345.1 | nd | 2.26 | nr | 0.40 | 227.0 | 43.9 |
| | | 2 | Pacific Sanddab | 3.50 | 388.0 | nd | 2.47 | nr | nd | 200.1 | 56.8 |
| | | 3 | Pacific Sanddab | 8.20 | 389.3 | nd | 4.44 | nr | nd | 275.1 | 51.7 |
| | TZ4 | 1 | Pacific Sanddab | nd | 276.0 | nd | 3.36 | nr | 0.92 | 294.8 | 44.3 |
| | | 2 | Pacific Sanddab | nd | 308.1 | nd | 2.34 | nr | nd | 200.9 | 52.3 |
| | | 3 | Pacific Sanddab | 1.73 | 305.3 | nd | 2.00 | nr | nd | 219.6 | 49.2 |
| | | | Detection Rate (%) | 58 | 100 | 0 | 100 | na | 25 | 100 | 100 |
| SBOO | TZ5 | 1 | Fantail Sole | nd | 50.7 | nd | 2.12 | 0.3 | nd | 44.1 | 9.9 |
| | | 2 | Hornyhead Turbot | nd | 53.5 | nd | 0.81 | 0.4 | nd | 28.1 | 6.1 |
| | | 3 | Longfin Sanddab | 4.14 | 439.7 | nd | 2.26 | nr | 0.78 | 239.6 | 31.9 |
| | TZ6 | 1 | Longfin Sanddab | 7.08 | 838.7 | nd | 2.64 | nr | 1.19 | 366.0 | 38.2 |
| | | 2 | Longfin Sanddab | 4.23 | 589.3 | nd | 2.64 | nr | 0.91 | 287.6 | 39.6 |
| | | 3 | Longfin Sanddab | 9.76 | 931.8 | 0.19 | 3.74 | nr | nd | 471.2 | 44.3 |
| | TZ7 | 1 | Longfin Sanddab | 1.01 | 410.0 | 0.08 | 4.85 | 5.1 | 1.19 | 369.2 | 30.3 |
| | | 2 | Longfin Sanddab | nd | 445.6 | nd | 2.61 | 3.3 | 1.02 | 432.6 | 30.8 |
| | | 3 | Longfin Sanddab | nd | 417.3 | nd | 1.80 | 4.8 | nd | 346.9 | 40.4 |
| | TZ8 | 1 | Longfin Sanddab | 1.65 | 671.7 | nd | 3.90 | 11.4 | 1.00 | 396.5 | 41.3 |
| | | 2 | Longfin Sanddab | 5.42 | 536.6 | nd | 2.60 | 14.1 | 1.14 | 321.9 | 38.1 |
| | | 3 | Fantail Sole | nd | 16.5 | nd | nd | 21.5 | nd | 9.7 | 3.8 |
| | TZ9 | 1 | Fantail Sole | 0.48 | 47.5 | nd | nd | nr | nd | 46.1 | 3.6 |
| | | 2 | Spotted Turbot | 0.08 | 8.9 | nd | 0.84 | nr | nd | 17.6 | 3.5 |
| | | 3 | Hornyhead Turbot | nd | 26.6 | nd | 0.89 | nr | nd | 16.1 | 8.1 |
| | | | Detection Rate (%) | 60 | 100 | 13 | 87 | na | 47 | 100 | 100 |

[a]Methoxychlor was not reportable for all samples from TZ1–TZ4, TZ7, TZ8, and composites 1 and 2 from TZ5

## Table E.7

Concentrations of metals (ppm) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2016. Highlighted/bold values meet or exceed OEHHA fish contaminant goals, USFDA action limits (AL), or median international standards (IS). See Table E.4 for names of each metal represented by periodic table symbol; nd = not detected; na= not available.

| | RF Zone | Comp | Species | Trace Metals | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | As | Ba | Cr | Fe | Mn | Hg | Se | Sn | Zn |
| PLOO | RF1 | 1 | Vermilion Rockfish | 8.6 | nd | 0.3 | 12.0 | 2.1 | 0.046 | 0.35 | 0.4 | 4 |
| | | 2 | Vermilion Rockfish | 6.9 | 0.144 | nd | 38.0 | 5.3 | 0.027 | 0.50 | 0.4 | 4 |
| | | 3 | Mixed Rockfish | 3.7 | 0.105 | nd | 16.0 | 4.0 | 0.060 | 0.52 | 0.4 | 4 |
| | RF2 | 1 | Speckled Rockfish | 2.9 | nd | 0.3 | 13.0 | 4.2 | 0.136 | 0.52 | 0.4 | 4 |
| | | 2 | Mixed Rockfish | 3.0 | nd | nd | 13.0 | 3.9 | 0.112 | 0.40 | 0.4 | 4 |
| | | 3 | Mixed Rockfish | 5.3 | 0.092 | nd | 20.0 | 3.6 | 0.137 | 0.55 | 0.4 | 4 |
| | | | Detection Rate (%) | 100 | 50 | 33 | 100 | 100 | 100 | 100 | 100 | 100 |
| SBOO | RF3 | 1 | CA Scorpionfish | 4.4 | nd | nd | 6.5 | 1.85 | 0.216 | 0.31 | 0.4 | 3 |
| | | 2 | Mixed Rockfish | 2.3 | nd | nd | 9.5 | nd | 0.070 | 0.38 | 0.4 | 4 |
| | | 3 | Mixed Rockfish | 5.9 | nd | nd | 4.0 | 2.6 | 0.044 | 0.46 | 0.5 | 4 |
| | RF4 | 1 | Treefish | 1.9 | nd | 0.5 | 4.5 | nd | 0.141 | 0.53 | 0.6 | 4 |
| | | 2 | Treefish | 2.0 | nd | 0.4 | 3.0 | nd | 0.213 | 0.54 | 0.4 | 3 |
| | | 3 | Starry Rockfish | 1.7 | nd | 0.7 | 4.5 | nd | 0.152 | 0.64 | 0.4 | 3 |
| | | | Detection Rate (%) | 100 | 0 | 50 | 100 | 33 | 100 | 100 | 100 | 100 |
| OEHHA[a] | | | | na | na | na | na | na | 0.22 | 7.4 | na | na |
| USFDA Action Limit[b] | | | | na | na | na | na | na | 1.0 | na | na | na |
| Median IS[b] | | | | 1.4 | na | 1.0 | na | na | 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

## Table E.8

Concentrations of pesticides (ppb), total PCB (ppb), total PAH (ppb, SBOO samples only) and lipids (% weight) detected in muscle tissues of fishes collected from PLOO and SBOO rig fishing zones during 2016. See Table E.4 for list of constituents with MDLs and Table E.9 for values of individual constituents summed for total chlordane (tChlor), total DDT, total HCH, and total PCB; nd = not detected; nr = not reportable; na = not analyzed.

| | RF Zone | Comp | Species | tChlor[a] | tDDT | tHCH | tPCB | Lipids |
|---|---|---|---|---|---|---|---|---|
| PLOO | RF1 | 1 | Vermilion Rockfish | 0.13 | 1.11 | 0.12 | 0.92 | 0.35 |
| | | 2 | Vermilion Rockfish | nd | 0.34 | 0.09 | 0.27 | 0.33 |
| | | 3 | Mixed Rockfish | nd | 0.73 | nd | 0.57 | 0.25 |
| | RF2 | 1 | Speckled Rockfish | nd | 0.28 | 0.04 | 0.15 | 0.17 |
| | | 2 | Mixed Rockfish | nd | 1.69 | 0.09 | 1.08 | 0.68 |
| | | 3 | Mixed Rockfish | nd | 0.81 | nd | 0.65 | 0.62 |
| | | | Detection Rate (%) | 17 | 100 | 67 | 100 | 100 |
| SBOO | RF3 | 1 | CA Scorpionfish | nd | 1.47 | 0.02 | 1.60 | 0.33 |
| | | 2 | Mixed Rockfish | nd | 0.59 | nd | 0.48 | 0.32 |
| | | 3 | Mixed Rockfish | 0.07 | 0.29 | 0.07 | 0.23 | 0.36 |
| | RF4 | 1 | Treefish | nd | 0.90 | 0.10 | 0.19 | 0.33 |
| | | 2 | Treefish | nd | 0.37 | nd | 0.38 | 0.38 |
| | | 3 | Starry Rockfish | nd | 0.45 | 0.14 | 0.17 | 0.25 |
| | | | Detection Rate (%) | 17 | 100 | 67 | 100 | 100 |
| OEHHA[b] | | | | 5.6 | 21 | na | 3.6 | — |
| USFDA Action Limit[c] | | | | 300 | 5000 | na | na | — |
| Median IS[c] | | | | 100 | 5000 | na | na | — |

[a] Missing methoxychlor

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

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

## Table E.9
Summary of constituents that make up total chlordane, total DDT, total endosulfan, total HCH, total PCB, and total PAH in composite (Comp) tissue samples from the PLOO and SBOO regions during 2016.

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| RF1 | 1 | Vermilion Rockfish | Muscle | Chlordane | Heptachlor epoxide | 0.005 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | Chlordane | Oxychlordane | 0.13 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | DDT | o,p-DDE | 0.015 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | DDT | p,p-DDE | 1.06 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | DDT | p,-p-DDMU | 0.035 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | HCH | HCH, Alpha isomer | 0.025 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | HCH | HCH, Beta isomer | 0.025 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | HCH | HCH, Gamma isomer | 0.07 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 28 | 0.03 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 37 | 0.01 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 49 | 0.025 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 52 | 0.035 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 66 | 0.035 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 70 | 0.01 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 74 | 0.01 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 77 | 0.01 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 99 | 0.065 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 101 | 0.025 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 105 | 0.04 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 110 | 0.015 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 118 | 0.065 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 123 | 0.01 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 128 | 0.015 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 138 | 0.105 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 149 | 0.015 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 153/168 | 0.145 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 156 | 0.015 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 167 | 0.01 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 169 | 0.01 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 170 | 0.035 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 180 | 0.055 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 187 | 0.04 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 194 | 0.025 | ppb |
| RF1 | 1 | Vermilion Rockfish | Muscle | PCB | PCB 206 | 0.07 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | DDT | o,p-DDE | 0.02 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | DDT | p,p-DDE | 0.31 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | DDT | p,-p-DDMU | 0.01 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | HCH | HCH, Beta isomer | 0.09 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 37 | 0.02 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 49 | 0.02 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 81 | 0.01 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 99 | 0.01 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 101 | 0.02 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 105 | 0.01 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 118 | 0.02 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 119 | 0.01 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 153/168 | 0.07 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 180 | 0.02 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 194 | 0.02 | ppb |
| RF1 | 2 | Vermilion Rockfish | Muscle | PCB | PCB 206 | 0.04 | ppb |
| | | | | | | | |
| RF1 | 3 | Mixed Rockfish | Muscle | DDT | o,p-DDE | 0.01 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | DDT | p,p-DDE | 0.72 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 28 | 0.02 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 37 | 0.01 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 49 | 0.01 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 52 | 0.02 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 66 | 0.02 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 70 | 0.01 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 74 | 0.01 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 99 | 0.03 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 101 | 0.03 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 118 | 0.05 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 128 | 0.01 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 138 | 0.08 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 149 | 0.01 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 153/168 | 0.12 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 180 | 0.05 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 187 | 0.03 | ppb |
| RF1 | 3 | Mixed Rockfish | Muscle | PCB | PCB 206 | 0.06 | ppb |
| | | | | | | | |
| RF2 | 1 | Speckled Rockfish | Muscle | DDT | o,p-DDE | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | DDT | p,p-DDE | 0.27 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | HCH | HCH, Alpha isomer | 0.02 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | HCH | HCH, Beta isomer | 0.02 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 28 | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 44 | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 49 | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 52 | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 70 | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 99 | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 128 | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 138 | 0.02 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 153/168 | 0.03 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 187 | 0.01 | ppb |
| RF2 | 1 | Speckled Rockfish | Muscle | PCB | PCB 206 | 0.02 | ppb |
| | | | | | | | |
| RF2 | 2 | Mixed Rockfish | Muscle | DDT | o,p-DDE | 0.02 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | DDT | p,p-DDE | 1.64 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | DDT | p,p-DDT | 0.03 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | HCH | HCH, Alpha isomer | 0.02 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| RF2 | 2 | Mixed Rockfish | Muscle | HCH | HCH, Beta isomer | 0.07 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 37 | 0.02 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 44 | 0.02 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 49 | 0.02 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 52 | 0.04 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 66 | 0.04 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 70 | 0.02 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 99 | 0.05 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 101 | 0.06 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 105 | 0.04 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 110 | 0.03 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 118 | 0.09 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 128 | 0.02 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 138 | 0.12 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 149 | 0.06 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 153/168 | 0.18 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 167 | 0.01 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 169 | 0.01 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 170 | 0.05 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 177 | 0.02 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 180 | 0.06 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 187 | 0.05 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 194 | 0.02 | ppb |
| RF2 | 2 | Mixed Rockfish | Muscle | PCB | PCB 206 | 0.05 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | DDT | o,p-DDE | 0.01 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | DDT | p,p-DDE | 0.8 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 28 | 0.03 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 44 | 0.01 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 49 | 0.02 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 52 | 0.01 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 66 | 0.02 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 74 | 0.01 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 99 | 0.05 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 105 | 0.02 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 110 | 0.03 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 118 | 0.03 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 128 | 0.01 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 138 | 0.06 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 149 | 0.03 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 153/168 | 0.09 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 156 | 0.01 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 180 | 0.09 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 183 | 0.01 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 187 | 0.04 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 194 | 0.02 | ppb |
| RF2 | 3 | Mixed Rockfish | Muscle | PCB | PCB 206 | 0.06 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| RF3 | 1 | California Scorpionfish | Muscle | DDT | p,p-DDE | 1.47 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | HCH | HCH, Alpha isomer | 0.02 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 49 | 0.02 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 52 | 0.02 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 66 | 0.03 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 70 | 0.01 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 99 | 0.04 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 101 | 0.05 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 105 | 0.01 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 110 | 0.02 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 114 | 0.02 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 118 | 0.13 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 128 | 0.03 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 138 | 0.2 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 149 | 0.05 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 153/168 | 0.51 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 156 | 0.01 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 158 | 0.02 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 167 | 0.02 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 170 | 0.05 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 177 | 0.03 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 180 | 0.08 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 183 | 0.03 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 187 | 0.13 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 194 | 0.03 | ppb |
| RF3 | 1 | California Scorpionfish | Muscle | PCB | PCB 206 | 0.06 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | DDT | p,p-DDE | 0.58 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | DDT | p,-p-DDMU | 0.01 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 49 | 0.02 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 52 | 0.01 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 99 | 0.02 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 101 | 0.02 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 105 | 0.01 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 118 | 0.05 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 128 | 0.02 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 138 | 0.05 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 149 | 0.02 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 153/168 | 0.1 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 156 | 0.01 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 180 | 0.04 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 183 | 0.01 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 187 | 0.04 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 189 | 0.01 | ppb |
| RF3 | 2 | Mixed Rockfish | Muscle | PCB | PCB 206 | 0.05 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | Chlordane | Oxychlordane | 0.07 | ppb |

**Table E.9** *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| RF3 | 3 | Mixed Rockfish | Muscle | DDT | o,p-DDE | 0.01 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | DDT | p,p-DDE | 0.28 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | HCH | HCH, Beta isomer | 0.05 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | HCH | HCH, Gamma isomer | 0.02 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 52 | 0.01 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 66 | 0.02 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 70 | 0.01 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 101 | 0.01 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 110 | 0.01 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 118 | 0.03 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 138 | 0.02 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 149 | 0.01 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 153/168 | 0.06 | ppb |
| RF3 | 3 | Mixed Rockfish | Muscle | PCB | PCB 206 | 0.05 | ppb |
| | | | | | | | |
| RF4 | 1 | Treefish | Muscle | DDT | p,p-DDD | 0.01 | ppb |
| RF4 | 1 | Treefish | Muscle | DDT | p,p-DDE | 0.89 | ppb |
| RF4 | 1 | Treefish | Muscle | HCH | HCH, Alpha isomer | 0.04 | ppb |
| RF4 | 1 | Treefish | Muscle | HCH | HCH, Beta isomer | 0.06 | ppb |
| RF4 | 1 | Treefish | Muscle | PCB | PCB 28 | 0.03 | ppb |
| RF4 | 1 | Treefish | Muscle | PCB | PCB 66 | 0.02 | ppb |
| RF4 | 1 | Treefish | Muscle | PCB | PCB 99 | 0.01 | ppb |
| RF4 | 1 | Treefish | Muscle | PCB | PCB 151 | 0.01 | ppb |
| RF4 | 1 | Treefish | Muscle | PCB | PCB 153/168 | 0.03 | ppb |
| RF4 | 1 | Treefish | Muscle | PCB | PCB 18 | 0.05 | ppb |
| RF4 | 1 | Treefish | Muscle | PCB | PCB 206 | 0.04 | ppb |
| | | | | | | | |
| RF4 | 2 | Treefish | Muscle | DDT | o,p-DDD | 0.01 | ppb |
| RF4 | 2 | Treefish | Muscle | DDT | o,p-DDE | 0.01 | ppb |
| RF4 | 2 | Treefish | Muscle | DDT | p,p-DDE | 0.33 | ppb |
| RF4 | 2 | Treefish | Muscle | DDT | p,-p-DDMU | 0.01 | ppb |
| RF4 | 2 | Treefish | Muscle | DDT | p,p-DDT | 0.01 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 44 | 0.005 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 52 | 0.01 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 66 | 0.02 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 74 | 0.005 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 87 | 0.015 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 99 | 0.015 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 101 | 0.015 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 110 | 0.015 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 118 | 0.035 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 128 | 0.015 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 138 | 0.035 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 149 | 0.015 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 153/168 | 0.07 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 156 | 0.01 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 158 | 0.005 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| RF4 | 2 | Treefish | Muscle | PCB | PCB 167 | 0.005 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 169 | 0.005 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 180 | 0.015 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 183 | 0.005 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 187 | 0.01 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 194 | 0.01 | ppb |
| RF4 | 2 | Treefish | Muscle | PCB | PCB 206 | 0.05 | ppb |
| | | | | | | | |
| RF4 | 3 | Starry Rockfish | Muscle | DDT | o,p-DDE | 0.01 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | DDT | p,p-DDD | 0.02 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | DDT | p,p-DDE | 0.42 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | HCH | HCH, Beta isomer | 0.07 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | HCH | HCH, Delta isomer | 0.07 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | PCB | PCB 37 | 0.02 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | PCB | PCB 66 | 0.04 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | PCB | PCB 99 | 0.03 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | PCB | PCB 118 | 0.03 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | PCB | PCB 157 | 0.01 | ppb |
| RF4 | 3 | Starry Rockfish | Muscle | PCB | PCB 206 | 0.04 | ppb |
| | | | | | | | |
| TZ1 | 1 | Pacific Sanddab | Liver | Chlordane | Oxychlordane | 0.275 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | DDT | o,p-DDE | 0.995 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | DDT | o,p-DDT | 0.69 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDD | 3.09 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDE | 416.0 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 12.3 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDT | 3.43 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.73 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 1.56 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.32 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.48 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 49 | 1.69 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 52 | 1.43 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 66 | 5.01 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.85 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.52 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 87 | 1.59 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 99 | 13.5 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 101 | 7.14 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 105 | 9.52 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 110 | 4.1 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 118 | 25.2 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 128 | 12.5 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 138 | 34.7 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 149 | 4.24 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 151 | 0.96 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 50.0 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 156 | 3.68 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 157 | 0.47 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 158 | 2.14 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 167 | 2.23 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 169 | 0.385 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 170 | 6.88 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 177 | 3.93 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 180 | 21.3 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 183 | 5.34 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 187 | 15.2 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 194 | 5.67 | ppb |
| TZ1 | 1 | Pacific Sanddab | Liver | PCB | PCB 206 | 5.75 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | DDT | o,p-DDE | 1.69 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | DDT | o,p-DDT | 0.57 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDD | 2.56 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDE | 401.0 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 13.1 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDT | 2.4 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.34 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 1.62 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.6 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 49 | 1.8 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 52 | 1.84 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 66 | 4.48 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.63 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.23 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 81 | 0.04 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 87 | 1.01 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 99 | 11.1 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 101 | 4.83 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 105 | 5.33 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 110 | 4.02 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 118 | 16.2 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 123 | 2.72 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 128 | 6.12 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 138 | 25.6 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 149 | 3.96 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 151 | 1.42 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 46.4 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 156 | 3.27 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 157 | 1.24 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 167 | 1.28 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 170 | 5.72 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 177 | 2.95 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 180 | 17.1 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 183 | 4.98 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 187 | 13.7 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 189 | 0.26 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 194 | 5.81 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 201 | 1.43 | ppb |
| TZ1 | 2 | Pacific Sanddab | Liver | PCB | PCB 206 | 8.89 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | Chlordane | Trans nonachlor | 6.19 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | DDT | o,p-DDE | 3.19 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | DDT | o,p-DDT | 0.76 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDD | 3.3 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDE | 567.0 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 13.9 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDT | 3.35 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.4 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 0.88 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.87 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 49 | 2.24 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 52 | 3.42 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 66 | 6.28 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 70 | 2.37 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.85 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 99 | 18.2 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 101 | 8.0 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 105 | 8.02 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 110 | 6.6 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 118 | 25.9 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 119 | 1.1 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 123 | 4.11 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 128 | 11.6 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 138 | 45.6 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 149 | 6.33 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 151 | 3.23 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 79.9 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 156 | 4.74 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 157 | 1.32 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 158 | 2.69 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 167 | 2.88 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 170 | 8.37 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 177 | 3.72 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 180 | 27 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 183 | 8.32 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 187 | 24.1 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 194 | 9.0 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 201 | 3.34 | ppb |
| TZ1 | 3 | Pacific Sanddab | Liver | PCB | PCB 206 | 11.4 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | Chlordane | Trans nonachlor | 3.24 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ2 | 1 | Pacific Sanddab | Liver | DDT | o,p-DDE | 1.02 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | DDT | o,p-DDT | 0.4 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDD | 1.62 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDE | 276.0 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 14.6 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDT | 1.71 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.35 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 3.98 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.06 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.42 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 49 | 0.87 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 52 | 1.26 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 66 | 3.5 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.05 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 74 | 0.78 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 87 | 0.63 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 99 | 7.68 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 101 | 3.82 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 105 | 4.81 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 110 | 3.15 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 118 | 14.4 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 128 | 5.3 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 138 | 20.4 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 149 | 2.24 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 151 | 0.59 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 36.5 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 156 | 1.74 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 158 | 1.27 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 167 | 1.19 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 169 | 1.17 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 170 | 4.45 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 177 | 1.26 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 180 | 11.1 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 183 | 4.28 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 187 | 9.08 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 194 | 2.8 | ppb |
| TZ2 | 1 | Pacific Sanddab | Liver | PCB | PCB 206 | 3.14 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | Chlordane | Trans nonachlor | 2.15 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | DDT | o,p-DDE | 1.42 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | DDT | o,p-DDT | 0.52 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDD | 2 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDE | 294.0 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 11.1 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDT | 1.75 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.1 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 2.12 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.01 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.4 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 49 | 1.23 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 52 | 1.01 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 66 | 3.35 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.11 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.0 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | HCH | PCB 77 | 0.45 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | HCH | PCB 99 | 6.35 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 101 | 2.64 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 105 | 3.7 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 110 | 2.38 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 118 | 11.0 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 119 | 0.45 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 123 | 1.7 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 128 | 3.47 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 138 | 16.3 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 149 | 2.66 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 151 | 0.83 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 29.1 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 156 | 1.74 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 157 | 0.51 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 158 | 0.86 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 167 | 1.02 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 170 | 4.63 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 177 | 1.94 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 180 | 9.88 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 183 | 2.11 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 187 | 7.84 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 194 | 3.57 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 201 | 0.28 | ppb |
| TZ2 | 2 | Pacific Sanddab | Liver | PCB | PCB 206 | 3.18 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | DDT | o,p-DDE | 0.73 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDD | 2.52 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDE | 386.0 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 12.7 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDT | 1.73 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.03 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 2.8 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.25 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.42 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 49 | 1.24 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 52 | 1.2 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 66 | 4.07 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.03 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.14 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 77 | 0.39 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 99 | 7.72 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 101 | 3.97 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 105 | 5.78 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 110 | 2.59 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 118 | 14.6 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 123 | 2.23 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 128 | 5.03 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 138 | 24.2 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 149 | 3.02 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 151 | 1.19 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 40.7 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 156 | 2.61 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 157 | 0.59 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 158 | 1.34 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 167 | 1.59 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 170 | 5.98 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 177 | 2.8 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 180 | 14.7 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 183 | 4.05 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 187 | 11.5 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 194 | 4.66 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 201 | 0.64 | ppb |
| TZ2 | 3 | Pacific Sanddab | Liver | PCB | PCB 206 | 4.05 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | DDT | o,p-DDE | 1.41 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | DDT | o,p-DDT | 0.14 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDD | 1.62 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDE | 330.0 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 9.99 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDT | 1.97 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.45 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 0.81 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.31 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.77 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 49 | 3.65 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 52 | 3.6 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 66 | 4.13 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 70 | 2.08 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.32 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 77 | 0.26 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 87 | 1.36 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 99 | 14.0 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 101 | 6.26 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 105 | 5.74 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 110 | 5.19 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 118 | 18.4 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 123 | 2.31 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 128 | 4.97 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 138 | 29.5 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 149 | 3.23 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 151 | 0.68 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 43.7 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 156 | 3.11 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 157 | 0.56 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 158 | 2.09 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 167 | 1.57 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 170 | 5.98 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 177 | 4.0 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 180 | 19.4 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 183 | 5.66 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 187 | 16.8 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 194 | 6.52 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 201 | 2.52 | ppb |
| TZ3 | 1 | Pacific Sanddab | Liver | PCB | PCB 206 | 6.35 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | Chlordane | Oxychlordane | 0.89 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | Chlordane | Trans nonachlor | 2.61 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | DDT | o,p-DDE | 2.42 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDD | 2.4 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDE | 369.0 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 11.7 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDT | 2.45 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.11 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 1.36 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.58 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.71 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 49 | 2.69 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 52 | 3.56 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 66 | 4.21 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.75 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.56 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 87 | 1.5 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 99 | 11.7 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 101 | 5.25 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 105 | 3.94 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 110 | 3.65 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 118 | 17.1 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 123 | 2.5 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 128 | 9.41 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 138 | 26.1 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 149 | 3.7 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 151 | 1.2 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 34.3 | ppb |

**Table E.9** *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 156 | 2.64 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 157 | 0.5 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 158 | 1.58 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 167 | 1.5 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 170 | 5.13 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 177 | 3.45 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 18 | 0.03 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 180 | 16.4 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 183 | 4.01 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 187 | 17.6 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 194 | 4.46 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 201 | 1.17 | ppb |
| TZ3 | 2 | Pacific Sanddab | Liver | PCB | PCB 206 | 5.26 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | Chlordane | Oxychlordane | 1.75 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | Chlordane | Trans nonachlor | 6.45 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | DDT | o,p-DDE | 1.21 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDD | 1.84 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDE | 373.0 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 11.1 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDT | 2.18 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.44 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 2.55 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | HCH | HCH, Gamma isomer | 0.45 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.29 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.9 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 49 | 2.25 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 52 | 1.41 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 66 | 5.42 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.94 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.69 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 87 | 1.46 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 99 | 16.2 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 101 | 9.24 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 105 | 8.5 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 110 | 7.24 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 118 | 26.1 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 123 | 3.72 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 128 | 12.6 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 138 | 36.2 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 149 | 5.52 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 151 | 0.58 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 55.8 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 156 | 3.57 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 157 | 0.96 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 158 | 2.5 | ppb |

**Table E.9** *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 167 | 2.42 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 170 | 7.44 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 177 | 4.45 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 180 | 20.5 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 183 | 6.5 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 187 | 14.0 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 189 | 0.31 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 194 | 6.43 | ppb |
| TZ3 | 3 | Pacific Sanddab | Liver | PCB | PCB 206 | 7.99 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | DDT | o,p-DDE | 0.85 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | DDT | o,p-DDT | 0.61 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDD | 1.72 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDE | 263.0 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 7.09 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | DDT | p,p-DDT | 2.68 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 1.82 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 1.54 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 28 | 0.98 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.62 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 49 | 1.25 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 52 | 2.51 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 66 | 4.55 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.77 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 74 | 2.12 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 87 | 1.8 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 99 | 12.8 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 101 | 6.26 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 105 | 11.1 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 110 | 4.51 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 114 | 0.79 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 118 | 34.2 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 123 | 3.0 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 128 | 13.4 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 138 | 39.2 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 149 | 4.68 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 151 | 1.69 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 58.7 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 156 | 5.52 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 157 | 1.44 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 158 | 3.05 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 167 | 3.01 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 169 | 1.65 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 170 | 7.01 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 177 | 3.54 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 180 | 22.2 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 183 | 8.2 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 187 | 19.3 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 194 | 6.82 | ppb |
| TZ4 | 1 | Pacific Sanddab | Liver | PCB | PCB 206 | 7.14 | ppb |
| | | | | | | | |
| TZ4 | 2 | Pacific Sanddab | Liver | DDT | o,p-DDE | 1.71 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | DDT | o,p-DDT | 0.25 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDE | 293.0 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 10.5 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | DDT | p,p-DDT | 2.62 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 0.96 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 1.38 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.07 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 44 | 0.57 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 49 | 1.3 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 52 | 1.83 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 66 | 3.56 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.26 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.42 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 87 | 0.97 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 99 | 13.3 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 101 | 6.1 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 105 | 5.85 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 110 | 3.4 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 118 | 18.4 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 123 | 2.34 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 128 | 9.46 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 138 | 25.5 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 149 | 3.51 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 151 | 1.27 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 39.6 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 156 | 2.24 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 157 | 0.87 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 158 | 1.65 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 167 | 1.62 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 170 | 6.33 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 177 | 1.25 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 180 | 15.9 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 183 | 5.26 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 187 | 14.1 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 194 | 4.71 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 201 | 1.55 | ppb |
| TZ4 | 2 | Pacific Sanddab | Liver | PCB | PCB 206 | 4.71 | ppb |
| | | | | | | | |
| TZ4 | 3 | Pacific Sanddab | Liver | Chlordane | Oxychlordane | 1.73 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | DDT | o,p-DDE | 1.04 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDD | 1.07 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDE | 290.0 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ4 | 3 | Pacific Sanddab | Liver | DDT | p,-p-DDMU | 11.5 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | DDT | p,p-DDT | 1.66 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | HCH | HCH, Alpha isomer | 0.2 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | HCH | HCH, Beta isomer | 1.8 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 28 | 1.09 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 49 | 1.65 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 52 | 1.63 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 66 | 4.13 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 70 | 1.67 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 74 | 1.24 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 87 | 1.06 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 99 | 12.5 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 101 | 6.56 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 105 | 6.81 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 110 | 3.91 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 114 | 0.17 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 118 | 20.1 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 119 | 1.14 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 128 | 11.2 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 138 | 25.4 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 149 | 3.28 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 151 | 1.57 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 153/168 | 41.3 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 156 | 2.84 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 158 | 1.84 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 167 | 1.71 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 170 | 6.32 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 177 | 3.87 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 180 | 20.8 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 183 | 5.5 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 187 | 15.8 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 189 | 0.14 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 194 | 6.32 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 201 | 1.37 | ppb |
| TZ4 | 3 | Pacific Sanddab | Liver | PCB | PCB 206 | 6.72 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | DDT | o,p-DDE | 0.22 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | DDT | p,p-DDD | 0.59 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | DDT | p,p-DDE | 47.8 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | DDT | p,-p-DDMU | 1.7 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | DDT | p,p-DDT | 0.42 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | HCH | HCH, Beta isomer | 1.74 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | HCH | HCH, Gamma isomer | 0.38 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 28 | 0.22 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 44 | 0.18 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 49 | 0.29 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 52 | 0.39 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 66 | 1.0 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 70 | 0.36 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 74 | 0.27 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 87 | 0.18 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 99 | 3.04 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 101 | 1.26 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 105 | 1.26 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 110 | 0.37 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 118 | 4.83 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 128 | 1.05 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 138 | 5.1 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 149 | 0.84 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 151 | 0.24 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 153/168 | 10.3 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 156 | 0.91 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 158 | 0.51 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 167 | 0.52 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 170 | 1.13 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 177 | 0.37 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 180 | 3.1 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 183 | 0.6 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 187 | 2.76 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 194 | 0.95 | ppb |
| TZ5 | 1 | Fantail Sole | Liver | PCB | PCB 206 | 2.08 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | DDT | o,p-DDD | 0.14 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | DDT | o,p-DDE | 0.66 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | DDT | p,p-DDD | 0.72 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | DDT | p,p-DDE | 50.2 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | DDT | p,-p-DDMU | 1.81 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | HCH | HCH, Alpha isomer | 0.29 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | HCH | HCH, Beta isomer | 0.52 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 49 | 0.41 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 52 | 0.36 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 66 | 0.55 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 70 | 0.32 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 77 | 0.11 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 99 | 1.23 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 101 | 1.16 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 105 | 0.34 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 118 | 1.97 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 128 | 0.41 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 138 | 2.77 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 149 | 1.07 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 151 | 0.63 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 153/168 | 7.48 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 156 | 0.39 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 167 | 0.2 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 170 | 0.89 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 177 | 0.76 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 180 | 1.78 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 183 | 0.74 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 187 | 2.25 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 194 | 0.85 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 201 | 0.18 | ppb |
| TZ5 | 2 | Hornyhead Turbot | Liver | PCB | PCB 206 | 1.26 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | Chlordane | Oxychlordane | 0.255 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | Chlordane | Trans nonachlor | 3.88 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | DDT | o,p-DDD | 0.96 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | DDT | o,p-DDE | 4.76 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | DDT | o,p-DDT | 0.425 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDD | 4.0 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDE | 415.0 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 11.2 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDT | 3.34 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | HCH | HCH, Alpha isomer | 0.7 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 1.56 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 28 | 0.895 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.17 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 49 | 1.17 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 52 | 1.3 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 66 | 3.12 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 70 | 0.66 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 74 | 1.17 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 87 | 0.745 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 99 | 12.3 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 101 | 4.79 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 105 | 4.59 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 110 | 2.18 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 118 | 17.2 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 119 | 0.27 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 123 | 2.52 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 128 | 5.1 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 138 | 29.9 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 149 | 5.07 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 151 | 2.09 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 60.7 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 156 | 2.73 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 157 | 0.84 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 158 | 1.85 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 167 | 1.85 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 169 | 1.27 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 170 | 7.55 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 177 | 4.4 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 180 | 20.3 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 183 | 5.85 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 187 | 21.9 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.38 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 194 | 7.98 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 201 | 1.0 | ppb |
| TZ5 | 3 | Longfin Sanddab | Liver | PCB | PCB 206 | 5.72 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | Chlordane | Cis nonachlor | 0.41 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | Chlordane | Trans nonachlor | 6.67 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDD | 0.95 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDE | 6.55 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDT | 0.66 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDD | 5.75 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDE | 806.0 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 15.5 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDT | 3.32 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | HCH | HCH, Alpha isomer | 0.81 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 1.83 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 28 | 1.63 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.43 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 49 | 1.35 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 52 | 1.94 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 66 | 5.31 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 70 | 0.84 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 74 | 1.71 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 87 | 1.36 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 99 | 18.5 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 101 | 8.64 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 105 | 7.47 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 110 | 3.72 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 118 | 28 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 119 | 0.53 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 123 | 3.59 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 128 | 7.56 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 138 | 47.9 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 149 | 9.67 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 151 | 4.7 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 95.5 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 156 | 4.26 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 157 | 0.98 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 158 | 2.44 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 167 | 2.95 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 170 | 11.2 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 177 | 6.5 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 180 | 30.8 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 183 | 7.25 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 187 | 31.1 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.55 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 194 | 9.81 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 201 | 0.76 | ppb |
| TZ6 | 1 | Longfin Sanddab | Liver | PCB | PCB 206 | 7.05 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | Chlordane | Alpha (cis) chlorodane | 0.93 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | Chlordane | Trans nonachlor | 3.3 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDD | 1.08 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDE | 5.57 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDT | 0.48 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDD | 5.53 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDE | 562.0 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 11.2 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDT | 3.45 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | HCH | HCH, Alpha isomer | 0.7 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 1.94 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 28 | 1.51 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 37 | 0.5 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.51 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 49 | 1.25 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 52 | 2.02 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 66 | 3.99 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 70 | 0.93 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 74 | 1.73 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 87 | 0.86 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 99 | 15.4 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 101 | 6.76 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 105 | 5.45 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 110 | 3.39 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 118 | 21.1 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 119 | 0.92 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 123 | 3.43 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 126 | 0.51 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 128 | 6.18 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 138 | 35.3 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 149 | 8.12 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 151 | 4.27 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 75.5 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 156 | 3.45 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 158 | 2.29 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 167 | 2.59 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 170 | 8.95 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 177 | 6.18 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 180 | 19.9 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 183 | 6.36 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 187 | 25.1 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.61 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 194 | 6.78 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 201 | 0.82 | ppb |
| TZ6 | 2 | Longfin Sanddab | Liver | PCB | PCB 206 | 4.94 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | Chlordane | Cis nonachlor | 2.67 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | Chlordane | Trans nonachlor | 7.09 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | DDT | o,p-DDD | 1.59 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | DDT | o,p-DDE | 7.21 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDD | 7.28 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDE | 894.0 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 16.8 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDT | 4.96 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | Endosulfan | Endosulfan Sulfate | 0.19 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | HCH | HCH, Alpha isomer | 0.88 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 1.97 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | HCH | HCH, Gamma isomer | 0.89 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 28 | 1.6 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.45 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 49 | 1.43 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 52 | 2.6 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 66 | 5.8 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 70 | 0.87 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 74 | 2.2 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 87 | 1.14 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 99 | 25.1 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 101 | 8.9 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 105 | 11.1 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 110 | 4.25 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 118 | 41.2 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 119 | 0.93 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 123 | 5.35 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 128 | 10.3 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 138 | 60.7 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 149 | 9.32 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 151 | 6.0 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 118.0 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 156 | 6.52 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 157 | 1.82 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 158 | 4.3 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 167 | 4.3 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 170 | 16.4 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 177 | 9.41 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 180 | 37.5 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 183 | 11.9 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 187 | 39.7 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.66 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 194 | 11.9 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 201 | 1.23 | ppb |
| TZ6 | 3 | Longfin Sanddab | Liver | PCB | PCB 206 | 8.31 | ppb |
| | | | | | | | |
| TZ7 | 1 | Longfin Sanddab | Liver | Chlordane | Heptachlor | 0.47 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | Chlordane | Oxychlordane | 0.54 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDD | 0.65 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDE | 4.56 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDT | 0.51 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDD | 3.83 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDE | 387.0 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 10.3 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDT | 3.1 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | Endosulfan | Endosulfan Sulfate | 0.08 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | HCH | HCH, Alpha isomer | 0.96 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 2.16 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | HCH | HCH, Delta isomer | 0.48 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | HCH | HCH, Gamma isomer | 1.25 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 28 | 1.79 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.55 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 49 | 2.06 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 52 | 3.32 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 66 | 5.63 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 70 | 1.23 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 74 | 1.99 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 87 | 1.52 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 99 | 19.4 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 101 | 8.97 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 105 | 7.42 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 110 | 4.35 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 118 | 30.6 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 123 | 3.79 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 128 | 8.75 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 138 | 46.1 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 149 | 8.72 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 151 | 4.26 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 89.5 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 156 | 4.34 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 157 | 1.17 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 158 | 2.73 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 167 | 3.17 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 170 | 11.0 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 177 | 6.76 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 18 | 0.27 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 180 | 27.7 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 183 | 9.45 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 187 | 32.1 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.53 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 194 | 10.5 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 201 | 1.3 | ppb |
| TZ7 | 1 | Longfin Sanddab | Liver | PCB | PCB 206 | 8.26 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDD | 0.94 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDE | 3.82 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDT | 0.41 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDD | 3.45 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDE | 424.0 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 9.25 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDT | 3.71 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | HCH | HCH, Alpha isomer | 0.8 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 1.81 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 28 | 1.94 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 37 | 0.34 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.61 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 49 | 2.23 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 52 | 2.63 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 66 | 5.61 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 70 | 1.4 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 74 | 2.4 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 87 | 1.25 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 99 | 21.0 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 101 | 8.84 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 105 | 7.09 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 110 | 4.32 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 118 | 30.3 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 123 | 3.72 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 128 | 10.4 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 138 | 60.1 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 149 | 10.1 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 151 | 3.85 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 120.0 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 156 | 5.3 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 157 | 1.75 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 158 | 3.71 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 167 | 3.66 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 170 | 13.8 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 177 | 5.84 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 18 | 0.35 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 180 | 35.9 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 183 | 10.3 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 187 | 30.2 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.71 | ppb |

**Table E.9** *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 194 | 12.5 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 201 | 1.27 | ppb |
| TZ7 | 2 | Longfin Sanddab | Liver | PCB | PCB 206 | 9.18 | ppb |
| | | | | | | | |
| TZ7 | 3 | Longfin Sanddab | Liver | DDT | o,p-DDE | 2.56 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDD | 5.44 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDE | 394.0 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 13.0 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | DDT | p,p-DDT | 2.28 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 1.8 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 28 | 1.58 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.54 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 49 | 2.52 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 52 | 3.2 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 66 | 5.92 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 70 | 1.61 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 74 | 2.2 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 87 | 1.48 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 99 | 22.3 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 101 | 9.41 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 105 | 7.24 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 110 | 5.55 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 118 | 27.1 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 119 | 0.95 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 123 | 3.4 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 128 | 8.59 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 138 | 45.3 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 149 | 8.31 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 151 | 4.36 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 85.2 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 156 | 4.08 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 157 | 1.39 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 158 | 2.73 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 167 | 2.67 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 170 | 8.84 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 177 | 5.21 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 18 | 0.21 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 180 | 23.9 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 183 | 6.72 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 187 | 26.8 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.41 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 194 | 9.15 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 201 | 1.0 | ppb |
| TZ7 | 3 | Longfin Sanddab | Liver | PCB | PCB 206 | 7 | ppb |
| | | | | | | | |
| TZ8 | 1 | Longfin Sanddab | Liver | Chlordane | Gamma (trans) chlordane | 0.33 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | Chlordane | Heptachlor epoxide | 0.27 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ8 | 1 | Longfin Sanddab | Liver | Chlordane | Oxychlordane | 1.05 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDD | 1.13 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDE | 6.63 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | DDT | o,p-DDT | 0.9 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDD | 5.39 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDE | 641.0 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 12.4 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | DDT | p,p-DDT | 4.21 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | HCH | HCH, Alpha isomer | 1.2 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 1.88 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | HCH | HCH, Delta isomer | 0.82 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 28 | 1.46 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 37 | 0.46 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.58 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 49 | 1.29 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 52 | 2.3 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 66 | 5.04 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 70 | 1.02 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 74 | 1.95 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 77 | 0.83 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 87 | 1.01 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 99 | 19.2 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 101 | 6.1 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 105 | 8.62 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 110 | 2.84 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 118 | 29.1 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 123 | 4.16 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 126 | 0.56 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 128 | 10.2 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 138 | 48.5 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 149 | 7.7 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 151 | 3.86 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 95.0 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 156 | 5.51 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 157 | 2.16 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 158 | 2.72 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 167 | 3.53 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 170 | 12.6 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 177 | 7.38 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 18 | 0.24 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 180 | 32.2 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 183 | 9.57 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 187 | 36.1 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.87 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 194 | 15.1 | ppb |
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 201 | 2.13 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ8 | 1 | Longfin Sanddab | Liver | PCB | PCB 206 | 14.6 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | Chlordane | Alpha (cis) chlordane | 0.92 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | Chlordane | Trans nonachlor | 4.5 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDD | 0.715 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDE | 7.22 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | DDT | o,p-DDT | 0.935 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDD | 5.1 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDE | 503.0 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | DDT | p,-p-DDMU | 13.7 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | DDT | p,p-DDT | 5.9 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | HCH | HCH, Alpha isomer | 0.91 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | HCH | HCH, Beta isomer | 1.69 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 28 | 1.16 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 44 | 0.43 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 49 | 1.25 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 52 | 1.57 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 66 | 4.29 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 70 | 0.825 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 74 | 1.54 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 87 | 0.875 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 99 | 16.1 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 101 | 5.78 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 105 | 7.56 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 110 | 2.97 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 118 | 24.2 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 119 | 0.21 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 123 | 3.63 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 128 | 8.55 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 138 | 43.5 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 149 | 6.54 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 151 | 3.81 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 153/168 | 83.5 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 156 | 3.95 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 157 | 0.45 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 158 | 2.22 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 167 | 2.86 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 169 | 1.29 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 170 | 9.92 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 177 | 5.67 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 180 | 24.5 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 183 | 7.55 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 187 | 28.2 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 189 | 0.43 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 194 | 8.84 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 201 | 1.08 | ppb |
| TZ8 | 2 | Longfin Sanddab | Liver | PCB | PCB 206 | 6.67 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ8 | 3 | Fantail Sole | Liver | DDT | o,p-DDE | 0.23 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | DDT | p,p-DDE | 15.9 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | DDT | p,-p-DDMU | 0.38 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | HCB | Hexachlorobenzene | 21.5 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 37 | 0.17 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 49 | 0.2 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 52 | 0.15 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 66 | 0.45 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 70 | 0.21 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 74 | 0.14 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 99 | 0.45 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 105 | 0.39 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 128 | 0.23 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 138 | 1.04 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 149 | 0.22 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 153/168 | 2.2 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 156 | 0.23 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 158 | 0.13 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 177 | 0.27 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 180 | 0.49 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 183 | 0.41 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 187 | 0.79 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 189 | 0.25 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 194 | 0.37 | ppb |
| TZ8 | 3 | Fantail Sole | Liver | PCB | PCB 206 | 0.96 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | Chlordane | Trans nonachlor | 0.48 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | DDT | o,p-DDE | 0.23 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | DDT | p,p-DDD | 0.75 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | DDT | p,p-DDE | 44.8 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | DDT | p,-p-DDMU | 1.27 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | DDT | p,p-DDT | 0.41 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 28 | 0.46 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 37 | 0.14 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 44 | 0.22 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 49 | 0.48 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 52 | 0.73 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 66 | 1.35 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 70 | 0.46 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 74 | 0.8 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 87 | 0.51 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 99 | 2.36 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 101 | 2.77 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 110 | 1.34 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 118 | 3.84 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 119 | 0.17 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 123 | 0.62 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 128 | 0.72 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 138 | 4.58 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 149 | 1.49 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 151 | 0.62 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 153/168 | 9.71 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 156 | 0.68 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 157 | 0.24 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 158 | 0.55 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 167 | 0.55 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 170 | 1.42 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 177 | 0.73 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 180 | 3.18 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 183 | 1.11 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 187 | 2.81 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 194 | 0.75 | ppb |
| TZ9 | 1 | Fantail Sole | Liver | PCB | PCB 206 | 0.7 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | Chlordane | Trans nonachlor | 0.08 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | DDT | p,p-DDE | 8.89 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | HCH | HCH, Alpha isomer | 0.34 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | HCH | HCH, Beta isomer | 0.5 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 44 | 0.11 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 49 | 0.34 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 52 | 0.29 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 66 | 0.24 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 70 | 0.11 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 74 | 0.15 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 87 | 0.09 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 99 | 0.68 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 101 | 0.74 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 105 | 0.18 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 110 | 0.21 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 118 | 1.16 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 128 | 0.32 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 138 | 2.45 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 149 | 0.44 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 151 | 0.19 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 153/168 | 4.86 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 156 | 0.17 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 170 | 0.65 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 177 | 0.05 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 180 | 1.5 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 183 | 0.43 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 187 | 0.93 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 194 | 0.55 | ppb |
| TZ9 | 2 | Spotted Turbot | Liver | PCB | PCB 206 | 0.73 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | DDT | o,p-DDD | 0.14 | ppb |

## Table E.9 *continued*

| Zone | Comp | Species | Tissue | Class | Constituent | Value | Units |
|---|---|---|---|---|---|---|---|
| TZ9 | 3 | Hornyhead Turbot | Liver | DDT | o,p-DDE | 0.78 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | DDT | p,p-DDD | 0.49 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | DDT | p,p-DDE | 24.4 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | DDT | p,-p-DDMU | 0.49 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | DDT | p,p-DDT | 0.32 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | HCH | HCH, Alpha isomer | 0.41 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | HCH | HCH, Beta isomer | 0.48 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 44 | 0.07 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 49 | 0.21 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 52 | 0.25 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 66 | 0.35 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 70 | 0.17 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 74 | 0.15 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 99 | 1.14 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 101 | 0.78 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 105 | 0.3 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 110 | 0.27 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 118 | 1.1 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 128 | 0.19 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 138 | 1.75 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 149 | 0.87 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 151 | 0.37 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 153/168 | 4.37 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 156 | 0.15 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 170 | 0.35 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 180 | 1.23 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 183 | 0.68 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 194 | 0.57 | ppb |
| TZ9 | 3 | Hornyhead Turbot | Liver | PCB | PCB 206 | 0.78 | ppb |

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# Appendix F

## Chapter 6. San DIego Regional Survey — Benthic Conditions

## Figures & Tables

# Appendix F

# FIGURES

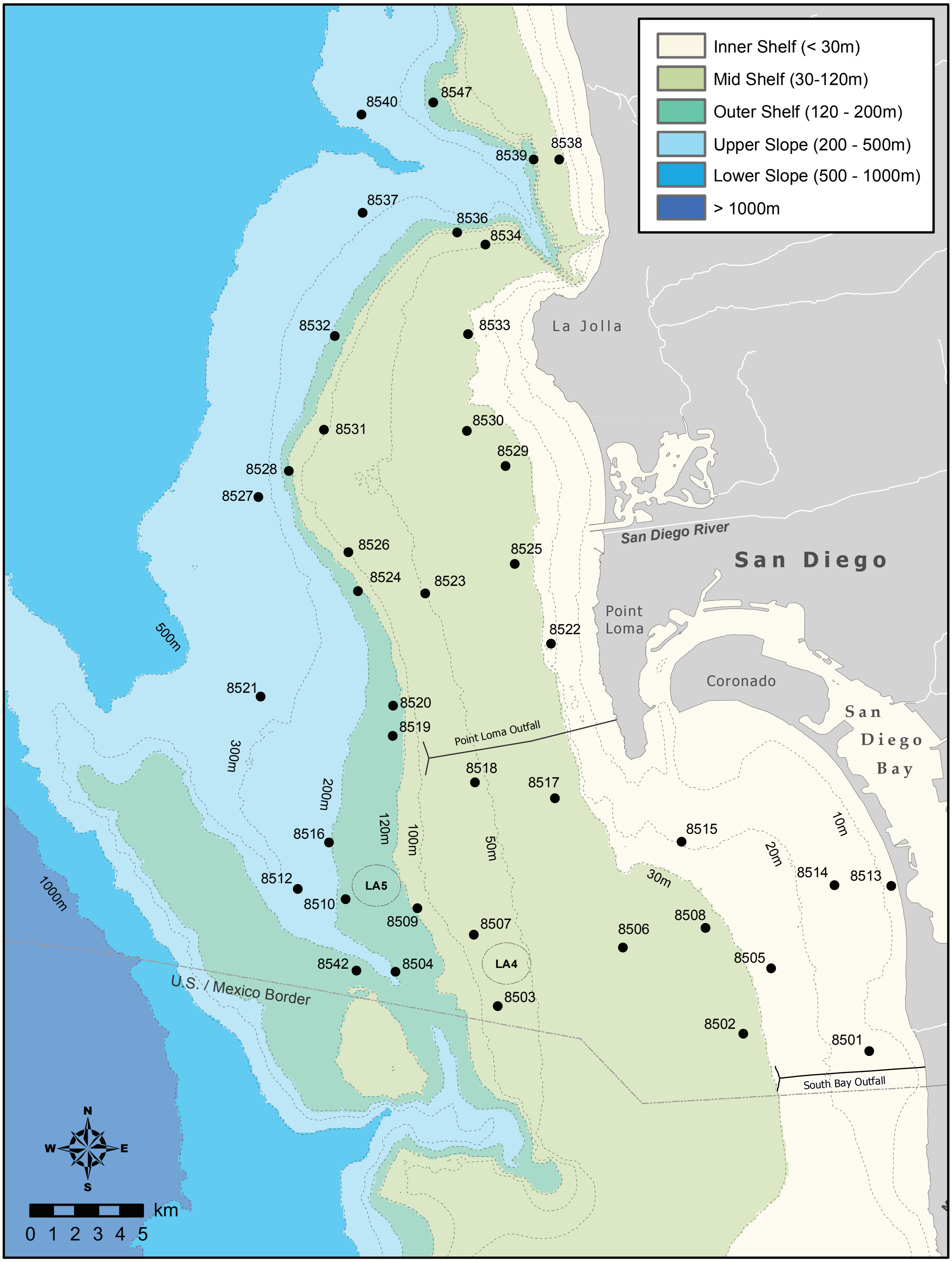
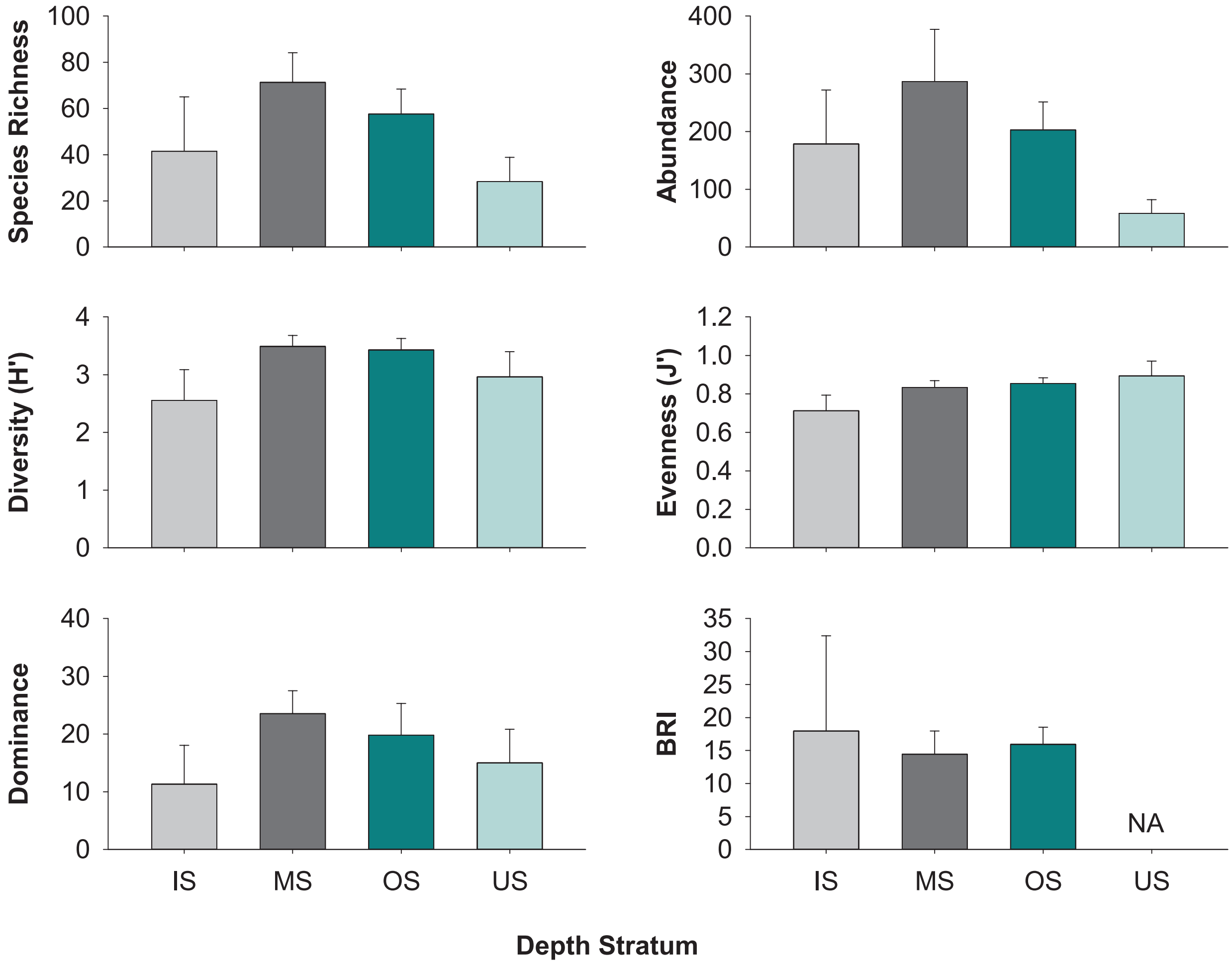


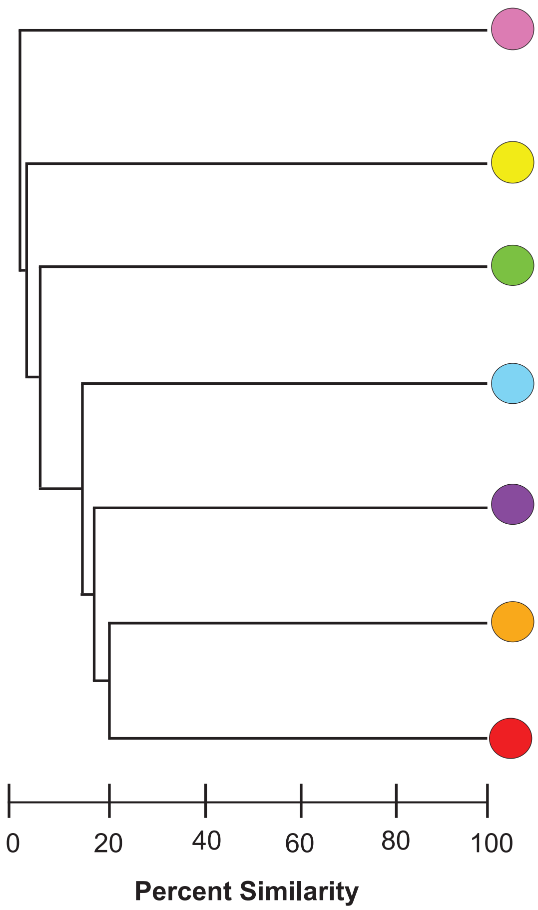

**Figure F.1**
Randomly generated regional benthic survey stations sampled during July 2016 as part of the City of San Diego's Ocean Monitoring Program.




## Figure F.2

Comparison of macrofaunal community structure metrics for the four major depth strata sampled during the 2016 regional benthic survey off San Diego. Data are expressed as means + 95% confidence intervals per stratum; NA = not applicable, BRI not calculated for upper slope stations.

**A**




| Cluster Group | n | Depth Range (m) | Community Metric | |
|---|---|---|---|---|
| | | | SR | Abun |
| A | 2 | 22–36 | 23 | 137 |
| B | 1 | 5 | 14 | 73 |
| C | 4 | 340–437 | 26 | 51 |
| D | 21 | 81–240 | 60 | 200 |
| E | 1 | 48 | 39 | 94 |
| F | 3 | 17–20 | 46 | 151 |
| G | 8 | 26–57 | 92 | 441 |

## Figure F.3

Results of cluster analysis of macrofaunal assemblages from San Diego regional benthic stations sampled during 2016. Data are presented as a dendrogram of main cluster groups with community metrics presented as mean values over all stations in each group (n). SR = species richness; Abun = abundance.

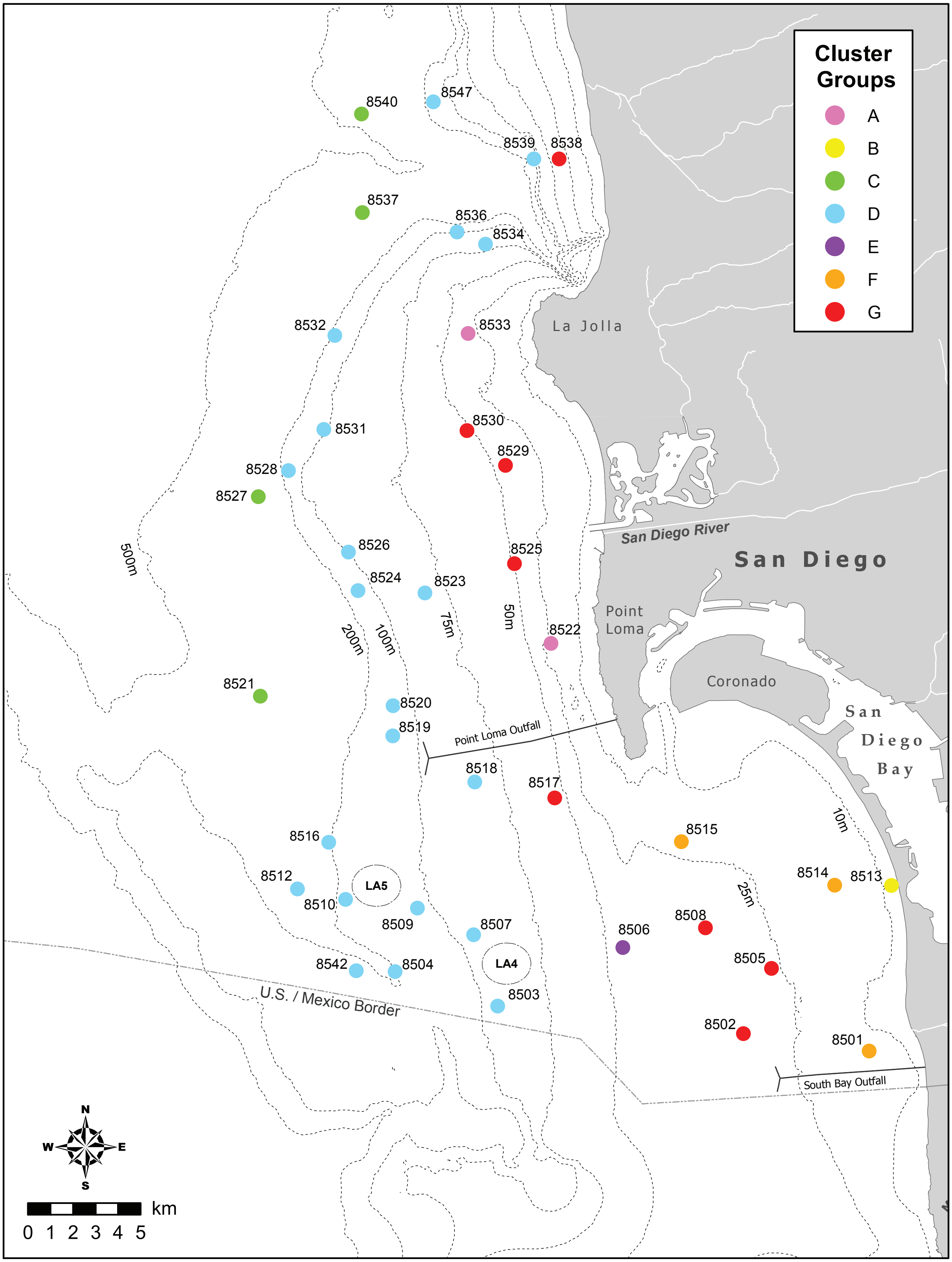



**Figure F.4**
Spatial distribution of cluster groups in the San Diego region. Colors of each circle correspond to colors in Figure F.3.

# Appendix F

# TABLES

## Table F.1

Summary of particle sizes and chemistry concentrations in sediments from San Diego regional benthic stations sampled during 2016. Data include detection rate (DR), minimum, maximum, and mean values for the entire survey area, as well as mean value by depth stratum; n = number of stations; nd = not detected.

| | 2016 Survey Area[a] | | | | Depth Strata | | | |
|---|---|---|---|---|---|---|---|---|
| Parameters | DR (%) | Min | Max | Mean | Inner Shelf n = 6 | Mid-Shelf n = 19 | Outer Shelf n = 10 | Upper Slope n = 5 |
| *Particle Size (%)* | | | | | | | | |
| Coarse particles | 18 | 0.0 | 22.0 | 1.0 | 3.7 | 0.8 | 0.5 | 0.0 |
| Med-coarse sands | 100 | 0.1 | 84.4 | 10.9 | 20.3 | 13.2 | 6.5 | 0.1 |
| Fine sands | 100 | 1.8 | 89.9 | 49.0 | 66.7 | 52.1 | 44.7 | 24.7 |
| Fines | 100 | 2.2 | 87.3 | 39.0 | 9.4 | 34.0 | 48.2 | 75.2 |
| *Organic Indicators* | | | | | | | | |
| Sulfides (ppm) | 100 | 0.20 | 31.90 | 7.50 | 2.05 | 5.71 | 8.37 | 19.11 |
| TN (% weight) | 93 | nd | 0.239 | 0.076 | 0.034 | 0.049 | 0.082 | 0.187 |
| TOC (% weight) | 98 | nd | 5.07 | 1.06 | 0.73 | 0.71 | 1.31 | 2.21 |
| TVS (% weight) | 100 | 0.40 | 9.20 | 2.81 | 0.71 | 1.96 | 3.31 | 7.42 |
| *Trace Metals (ppm)* | | | | | | | | |
| Aluminum | 100 | 1940 | 27,500 | 10,123 | 4213 | 8417 | 11,580 | 20,780 |
| Antimony | 83 | nd | 4.1 | 1.7 | nd | 1.3 | 1.9 | 2.6 |
| Arsenic | 100 | 0.72 | 4.18 | 1.96 | 1.58 | 2.09 | 1.72 | 2.39 |
| Barium | 100 | 5.1 | 129.0 | 47.2 | 21.9 | 40.1 | 51.6 | 95.2 |
| Beryllium | 3 | nd | 0.31 | 0.31 | nd | nd | 0.31 | nd |
| Cadmium | 18 | nd | 0.60 | 0.25 | nd | nd | 0.34 | 0.19 |
| Chromium | 100 | 6.0 | 69.6 | 24.5 | 9.1 | 20.1 | 28.0 | 52.5 |
| Copper | 95 | nd | 31.8 | 8.5 | 1.3 | 5.9 | 10.2 | 22.2 |
| Iron | 100 | 4350 | 28,100 | 13,343 | 5477 | 12,189 | 15,444 | 22,960 |
| Lead | 100 | 1.3 | 534.0 | 17.6 | 2.0 | 3.8 | 58.5 | 6.8 |
| Manganese | 100 | 17.2 | 218.0 | 105.3 | 61.5 | 99.4 | 110.0 | 170.6 |
| Mercury | 88 | nd | 0.226 | 0.037 | 0.006 | 0.021 | 0.057 | 0.070 |
| Nickel | 100 | 1.0 | 20.5 | 7.2 | 2.0 | 5.1 | 9.0 | 18.2 |
| Selenium | 28 | nd | 0.87 | 0.53 | nd | 0.48 | 0.60 | 0.49 |
| Silver | 3 | nd | 1.70 | 1.70 | nd | nd | 1.70 | nd |
| Tin | 83 | nd | 81.8 | 3.4 | 0.6 | 0.7 | 9.2 | 1.5 |
| Zinc | 100 | 8.0 | 83.5 | 34.7 | 13.1 | 31.0 | 38.9 | 66.2 |
| *Pesticides (ppt)* | | | | | | | | |
| Total DDT | 100 | 47 | 2164 | 728 | 116 | 652 | 922 | 1347 |
| Total Chlordane | 23 | nd | 258 | 144 | nd | 161 | 112 | 258 |
| HCB | 100 | 140 | 140 | 140 | nd | nd | 140 | nd |
| *Total PCB (ppt)* | 97 | nd | 24,314 | 1776 | 280 | 2493 | 1300 | 1646 |
| *Total PAH (ppb)* | 87 | nd | 365 | 62 | 27 | 46 | 78 | 95 |

[a] Minimum and maximum values were calculated using all samples (n = 40), whereas means were calculated on detected values only (n ≤ 40)

## Table F.2

Summary of particle size parameters (%) for each San Diego regional benthic station sampled during 2016. 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* | | | | | | | | | | | | | | | | | |
| 8513 | 5 | 0.0 | 0.0 | 0.0 | 3.2 | 29.5 | 32.7 | 55.0 | 9.9 | 64.9 | 1.3 | 0.7 | 0.4 | 0.0 | 0.0 | 2.4 | shell hash |
| 8501 | 17 | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 | 1.9 | 17.1 | 59.1 | 76.2 | 15.8 | 1.7 | 2.4 | 1.9 | 0.1 | 21.9 | shell hash |
| 8514 | 18 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 18.2 | 71.7 | 89.9 | 6.3 | 0.0 | 1.2 | 1.8 | 0.1 | 9.4 | |
| 8515 | 20 | 0.0 | 0.0 | 0.0 | 0.1 | 11.0 | 11.1 | 57.5 | 28.5 | 86.0 | 0.8 | 0.0 | 1.0 | 1.1 | 0.0 | 2.9 | shell hash, organic debris[a] |
| 8522[s] | 22 | 7.0 | 15.0 | 22.0 | 52.7 | 21.6 | 74.3 | 1.6 | 0.2 | 1.8 | 2.2 | — | — | — | — | 2.2 | gravel, shell hash |
| 8505 | 26 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.9 | 14.0 | 67.6 | 81.6 | 12.6 | 0.7 | 1.8 | 2.2 | 0.3 | 17.5 | organic debris[a] |
| *Middle Shelf* | | | | | | | | | | | | | | | | | |
| 8508 | 34 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 1.6 | 16.2 | 53.4 | 69.6 | 19.7 | 3.4 | 4.0 | 1.8 | 0.0 | 28.9 | organic debris[a] |
| 8502 | 35 | 0.0 | 0.0 | 0.0 | 0.0 | 2.8 | 2.8 | 21.1 | 48.3 | 69.4 | 18.7 | 2.9 | 3.4 | 2.5 | 0.3 | 27.8 | organic debris[a] |
| 8533 | 36 | 0.0 | 10.5 | 10.5 | 25.6 | 44.8 | 70.4 | 15.2 | 1.3 | 16.5 | 0.0 | 0.4 | 1.2 | 0.5 | 0.0 | 2.2 | shell hash |
| 8538 | 37 | 0.0 | 0.0 | 0.0 | 0.0 | 3.1 | 3.1 | 20.6 | 47.8 | 68.4 | 18.3 | 4.0 | 3.9 | 2.1 | 0.1 | 28.4 | surfgrass, organic debris[a] |
| 8529 | 45 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 16.1 | 55.0 | 71.1 | 15.8 | 3.8 | 5.7 | 2.7 | 0.1 | 28.1 | organic debris[a] |
| 8506 | 48 | 0.0 | 2.9 | 2.9 | 35.0 | 49.4 | 84.4 | 8.1 | 2.0 | 10.1 | 0.9 | 0.4 | 1.0 | 0.4 | 0.0 | 2.6 | shell hash, organic debris |
| 8525 | 48 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 1.6 | 18.7 | 49.7 | 68.4 | 16.4 | 4.1 | 6.1 | 3.2 | 0.2 | 30.0 | shell hash, organic debris[a] |
| 8530 | 52 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 1.4 | 14.0 | 39.6 | 53.6 | 19.1 | 8.3 | 12.0 | 5.2 | 0.5 | 45.1 | shell hash, organic debris[a] |
| 8517 | 57 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 1.4 | 17.5 | 46.8 | 64.3 | 17.1 | 5.8 | 7.8 | 3.3 | 0.3 | 34.3 | shell hash, organic debris[a] |
| 8523 | 81 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 7.3 | 34.0 | 41.3 | 29.0 | 11.3 | 12.4 | 5.2 | 0.7 | 58.6 | |
| 8518 | 85 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 6.0 | 35.6 | 41.6 | 30.6 | 10.7 | 11.8 | 4.8 | 0.5 | 58.4 | |
| 8534 | 85 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 8.4 | 45.6 | 54.0 | 26.1 | 6.9 | 8.6 | 4.0 | 0.4 | 45.9 | |
| 8507 | 91 | 0.0 | 0.0 | 0.0 | 0.0 | 5.1 | 5.1 | 24.6 | 32.2 | 56.8 | 13.3 | 6.9 | 10.5 | 6.7 | 0.8 | 38.2 | gravel, shell hash, rubber gasket |
| 8503 | 92 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 2.6 | 28.2 | 35.6 | 63.8 | 11.6 | 6.1 | 9.9 | 5.6 | 0.4 | 33.5 | |
| 8531 | 100 | 0.0 | 0.0 | 0.0 | 0.9 | 8.1 | 9.0 | 21.7 | 29.6 | 51.3 | 17.0 | 7.4 | 10.0 | 5.5 | 0.6 | 40.4 | gravel, shell hash |
| 8526 | 101 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 11.2 | 38.0 | 49.2 | 21.4 | 9.6 | 13.3 | 5.4 | 0.4 | 50.1 | gravel, shell hash |
| 8509 | 108 | 0.0 | 0.1 | 0.1 | 7.3 | 19.0 | 26.3 | 24.8 | 16.4 | 41.2 | 10.6 | 6.5 | 9.1 | 5.5 | 0.6 | 32.4 | black sand, gravel, shell hash |
| 8539 | 112 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 3.3 | 19.3 | 39.1 | 58.4 | 16.8 | 6.8 | 10.1 | 4.3 | 0.3 | 38.3 | shell hash, organic debris[a] |
| 8528 | 120 | 0.0 | 1.3 | 1.3 | 13.5 | 21.9 | 35.4 | 22.3 | 19.0 | 41.3 | 6.6 | 4.2 | 7.5 | 3.5 | 0.2 | 21.9 | gravel, cobble, shell hash |

[a] Contained worm tubes; [b] *Spiochaetoptorus* tubes; [s] measured by sieve (not Horiba; silt and clay fractions are indistinguishable)

**Table F.2** *continued*

| Station | Depth (m) | Coarse Particles | | | Med-Coarse Sands | | | Fine Sands | | | Fine Particles | | | | | | Visual Observations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gran | VCS | Total | CS | MS | Total | FS | VFS | Total | CSi | MSi | FSi | VFSi | Clay | Total | |
| *Outer Shelf* | | | | | | | | | | | | | | | | | |
| 8524 | 123 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.9 | 17.1 | 49.7 | 66.8 | 16.0 | 4.8 | 7.5 | 3.6 | 0.3 | 32.3 | shell hash |
| 8536 | 135 | 0.0 | 4.8 | 4.8 | 21.8 | 7.8 | 29.6 | 8.2 | 25.0 | 33.2 | 16.3 | 4.4 | 6.5 | 4.7 | 0.5 | 32.3 | black sand, shell hash |
| 8520 | 138 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 9.2 | 43.5 | 52.7 | 23.0 | 7.4 | 11.0 | 5.2 | 0.6 | 47.1 | shell hash, organic debris[a] |
| 8519 | 142 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 8.1 | 42.5 | 50.6 | 24.1 | 7.5 | 11.3 | 5.7 | 0.7 | 49.3 | organic debris[b] |
| 8542 | 147 | 0.0 | 0.5 | 0.5 | 10.2 | 20.5 | 30.7 | 20.0 | 13.3 | 33.3 | 9.3 | 6.6 | 11.0 | 7.6 | 1.0 | 35.4 | gravel, shell hash |
| 8547 | 156 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 6.4 | 38.7 | 45.1 | 25.8 | 9.5 | 13.7 | 5.4 | 0.3 | 54.8 | shell hash, organic debris[b] |
| 8504 | 171 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 1.3 | 14.6 | 35.5 | 50.1 | 15.7 | 8.5 | 15.8 | 7.4 | 0.8 | 48.2 | |
| 8532 | 178 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 9.1 | 47.3 | 56.4 | 22.3 | 6.2 | 9.6 | 4.9 | 0.6 | 43.5 | organic debris[a, b] |
| 8510 | 195 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 1.4 | 9.3 | 21.8 | 31.1 | 19.1 | 14.0 | 21.1 | 10.7 | 2.7 | 67.6 | gravel, shell hash |
| 8516 | 200 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.8 | 7.6 | 20.4 | 28.0 | 20.8 | 15.9 | 22.6 | 10.1 | 1.9 | 71.3 | algae, organic debris[b] |
| *Upper Slope* | | | | | | | | | | | | | | | | | |
| 8512 | 240 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 5.4 | 18.5 | 23.9 | 18.1 | 15.3 | 23.9 | 13.6 | 4.9 | 75.8 | shell hash, organic debris[b] |
| 8521 | 340 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 3.3 | 16.4 | 19.7 | 21.0 | 19.4 | 29.0 | 10.1 | 0.7 | 80.2 | organic debris[a] |
| 8527 | 350 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 8.2 | 30.5 | 38.7 | 21.0 | 14.3 | 20.0 | 5.7 | 0.1 | 61.1 | organic debris[a] |
| 8537 | 350 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 5.1 | 23.3 | 28.4 | 21.1 | 15.4 | 23.2 | 10.2 | 1.7 | 71.6 | organic debris[a] |
| 8540 | 437 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 2.9 | 9.7 | 12.6 | 14.4 | 20.6 | 34.0 | 15.5 | 2.8 | 87.3 | organic debris[a] |

[a] Contained worm tubes; [b] *Spiochaetoptorus* tubes; [s] measured by sieve (not Horiba; silt and clay fractions are indistinguishable)

## Table F.3

Concentrations of organic indicators detected in sediments from the 2016 San Diego regional benthic stations. See Table C.1 for MDLs; nd=not detected; ns=not sampled.

| | Station | Depth (m) | Sulfides (ppm) | TN (% wt) | TOC (% wt) | TVS (%wt) |
|---|---|---|---|---|---|---|
| *Inner Shelf* | 8513 | 5 | 1.95 | nd | nd | 0.50 |
| | 8501 | 17 | 2.13 | 0.026 | 0.16 | 0.85 |
| | 8514 | 18 | 1.24 | nd | 0.08 | 0.40 |
| | 8515 | 20 | 1.18 | nd | 0.08 | 0.60 |
| | 8522 | 22 | 0.20 | 0.050 | 3.24 | 1.00 |
| | 8505 | 26 | 5.62 | 0.026 | 0.12 | 0.90 |
| *Mid-Shelf* | 8508 | 34 | 4.77 | 0.043 | 0.30 | 1.20 |
| | 8502 | 35 | 1.51 | 0.030 | 0.20 | 1.20 |
| | 8533 | 36 | 2.72 | 0.040 | 2.98 | 1.00 |
| | 8538 | 37 | 9.19 | 0.047 | 0.37 | 1.50 |
| | 8529 | 45 | 4.76 | 0.050 | 0.35 | 1.60 |
| | 8506 | 48 | 0.46 | 0.027 | 0.11 | 0.70 |
| | 8525 | 48 | 3.27 | 0.036 | 0.30 | 1.90 |
| | 8530 | 52 | 3.81 | 0.054 | 0.51 | 2.20 |
| | 8517 | 57 | 5.50 | 0.050 | 0.44 | ns |
| | 8523 | 81 | 3.60 | 0.070 | 0.56 | 2.50 |
| | 8518 | 85 | 4.51 | 0.064 | 0.65 | 2.50 |
| | 8534 | 85 | 8.21 | 0.058 | 0.52 | 2.10 |
| | 8507 | 91 | 2.62 | 0.048 | 0.42 | 1.80 |
| | 8503 | 92 | 1.55 | 0.044 | 0.38 | 1.50 |
| | 8531 | 100 | 3.27 | 0.050 | 0.80 | 2.60 |
| | 8526 | 101 | 5.16 | 0.060 | 0.58 | 2.60 |
| | 8509 | 108 | 8.86 | 0.043 | 0.52 | 2.20 |
| | 8539 | 112 | 24.70 | 0.064 | 0.63 | 2.90 |
| | 8528 | 120 | 10.10 | 0.058 | 2.79 | 3.20 |
| *Outer Shelf* | 8524 | 123 | 3.84 | 0.050 | 0.41 | 2.00 |
| | 8536 | 135 | 7.72 | 0.052 | 0.86 | 1.60 |
| | 8520 | 138 | 2.82 | 0.060 | 0.54 | 2.20 |
| | 8519 | 142 | 4.97 | 0.060 | 0.55 | 2.60 |
| | 8542 | 147 | 3.90 | 0.110 | 5.07 | 4.30 |
| | 8547 | 156 | 13.00 | 0.073 | 0.71 | 3.20 |
| | 8504 | 171 | 4.10 | 0.080 | 1.15 | 3.80 |
| | 8532 | 178 | 3.40 | 0.054 | 0.47 | 2.20 |
| | 8510 | 195 | 8.01 | 0.138 | 1.48 | 5.40 |
| | 8516 | 200 | 31.90 | 0.146 | 1.82 | 5.80 |
| *Upper Slope* | 8512 | 240 | 20.00 | 0.190 | 2.69 | 7.50 |
| | 8521 | 340 | 7.05 | 0.205 | 2.54 | 8.10 |
| | 8527 | 350 | 6.48 | 0.142 | 1.64 | 5.80 |
| | 8537 | 350 | 31.60 | 0.157 | 1.71 | 6.50 |
| | 8540 | 437 | 30.40 | 0.239 | 2.45 | 9.20 |
| | | Detection Rate | 100 | 93 | 98 | 100 |

## Table F.4

Concentrations of trace metals (ppm) detected in sediments from the 2016 San Diego regional benthic stations. See Table C.1 for MDLs and translation of periodic table symbols; nd = not detected; na = not available.

| | Station | Depth (m) | Al | Sb | As | Ba | Be | Cd | Cr | Cu |
|---|---|---|---|---|---|---|---|---|---|---|
| *Inner Shelf* | 8513 | 5 | 4090 | nd | 0.98 | 30.7 | nd | nd | 7.4 | 1.0 |
| | 8501 | 17 | 5640 | nd | 1.46 | 26.8 | nd | nd | 11.8 | 1.7 |
| | 8514 | 18 | 4040 | nd | 0.87 | 15.2 | nd | nd | 9.7 | 0.8 |
| | 8515 | 20 | 3530 | nd | 1.38 | 12.7 | nd | nd | 7.4 | 1.1 |
| | 8522 | 22 | 1940 | nd | 4.09 | 19.1 | nd | nd | 6.0 | 1.3 |
| | 8505 | 26 | 6040 | nd | 0.72 | 27.0 | nd | nd | 12.1 | 2.0 |
| *Mid-Shelf* | 8508 | 34 | 6810 | 1.0 | 1.41 | 31.6 | nd | nd | 14.5 | 3.2 |
| | 8502 | 35 | 6610 | 1.1 | 1.21 | 30.4 | nd | nd | 14.4 | 3.4 |
| | 8533 | 36 | 3410 | 1.0 | 4.18 | 37.1 | nd | nd | 15.5 | nd |
| | 8538 | 37 | 11,100 | 1.4 | 1.98 | 71.9 | nd | nd | 26.0 | 6.9 |
| | 8529 | 45 | 7850 | 1.2 | 2.27 | 40.4 | nd | nd | 17.9 | 4.0 |
| | 8506 | 48 | 2050 | nd | 2.57 | 5.1 | nd | nd | 6.6 | nd |
| | 8525 | 48 | 8660 | 1.1 | 2.07 | 45.5 | nd | nd | 19.8 | 4.4 |
| | 8530 | 52 | 9270 | 1.2 | 2.50 | 47.9 | nd | nd | 20.1 | 5.1 |
| | 8517 | 57 | 9620 | 1.3 | 1.53 | 46.3 | nd | nd | 20.0 | 6.4 |
| | 8523 | 81 | 12,600 | 1.7 | 1.66 | 51.0 | nd | nd | 27.0 | 8.7 |
| | 8518 | 85 | 13,200 | 1.6 | 2.22 | 57.3 | nd | nd | 28.2 | 9.7 |
| | 8534 | 85 | 10,600 | 1.3 | 1.56 | 53.3 | nd | nd | 24.5 | 5.9 |
| | 8507 | 91 | 6540 | 0.9 | 1.80 | 28.4 | nd | nd | 14.3 | 10.5 |
| | 8503 | 92 | 5530 | 1.0 | 1.36 | 19.5 | nd | nd | 13.3 | 3.2 |
| | 8531 | 100 | 8290 | 1.5 | 1.55 | 26.5 | nd | nd | 24.1 | 3.7 |
| | 8526 | 101 | 10,100 | 1.3 | 1.34 | 36.9 | nd | nd | 22.5 | 6.2 |
| | 8509 | 108 | 8760 | 2.1 | 1.42 | 43.1 | nd | nd | 19.2 | 9.5 |
| | 8539 | 112 | 11,800 | 1.5 | 3.26 | 61.6 | nd | nd | 26.3 | 7.9 |
| | 8528 | 120 | 7130 | 1.9 | 3.84 | 28.8 | nd | nd | 28.0 | 2.3 |
| *Outer Shelf* | 8524 | 123 | 7520 | 1.1 | 1.21 | 24.9 | nd | nd | 17.2 | 4.2 |
| | 8536 | 135 | 7000 | 1.1 | 2.01 | 33.4 | nd | nd | 17.0 | 3.7 |
| | 8520 | 138 | 9570 | 1.3 | 1.70 | 34.4 | nd | nd | 21.0 | 6.6 |
| | 8519 | 142 | 10,500 | 1.3 | 1.16 | 37.5 | nd | nd | 23.2 | 7.9 |
| | 8542 | 147 | 8810 | 4.1 | 2.66 | 59.4 | nd | nd | 29.9 | 6.0 |
| | 8547 | 156 | 12,900 | 1.6 | 1.54 | 54.8 | nd | 0.24 | 29.9 | 8.7 |
| | 8504 | 171 | 11,200 | 2.2 | 2.41 | 55.3 | 0.31 | 0.60 | 27.8 | 10.1 |
| | 8532 | 178 | 10,200 | 1.4 | 0.97 | 39.7 | nd | 0.18 | 23.9 | 6.7 |
| | 8510 | 195 | 18,400 | 2.4 | 1.78 | 88.3 | nd | nd | 44.4 | 24.3 |
| | 8516 | 200 | 19,700 | 2.2 | 1.74 | 88.3 | nd | nd | 46.1 | 24.2 |
| *Upper Slope* | 8512 | 240 | 19,500 | 2.7 | 1.99 | 91.1 | nd | nd | 48.4 | 20.7 |
| | 8521 | 340 | 20,100 | 2.4 | 2.56 | 96.9 | nd | 0.18 | 50.2 | 21.6 |
| | 8527 | 350 | 16,100 | 2.1 | 1.55 | 71.0 | nd | 0.17 | 42.0 | 16.2 |
| | 8537 | 350 | 20,700 | 2.6 | 1.78 | 88.0 | nd | 0.17 | 52.1 | 20.8 |
| | 8540 | 437 | 27,500 | 3.1 | 4.06 | 129.0 | nd | 0.24 | 69.6 | 31.8 |
| | | Detection rate (%) | 100 | 83 | 100 | 100 | 3 | 17.5 | 100 | 95 |
| | | ERL[a]: | na | na | 8.2 | na | na | 1.2 | 81 | 34 |
| | | ERM[a]: | na | na | 70.0 | na | na | 9.6 | 370 | 270 |

[a] From Long et al. 1995

**Table F.4** *continued*

| | Station | Depth (m) | Fe | Pb | Mn | Hg | Ni | Se | Ag | Sn | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Inner Shelf* | 8513 | 5 | 5900 | 1.3 | 59.8 | 0.006 | 1.7 | nd | nd | nd | 15.3 |
| | 8501 | 17 | 6650 | 2.1 | 70.1 | nd | 2.8 | nd | nd | nd | 15.5 |
| | 8514 | 18 | 4590 | 1.6 | 63.5 | nd | 1.7 | nd | nd | nd | 10.5 |
| | 8515 | 20 | 5020 | 2.7 | 54.7 | 0.009 | 1.4 | nd | nd | 0.6 | 11.5 |
| | 8522 | 22 | 4350 | 2.6 | 55.5 | nd | 1.6 | nd | nd | nd | 10.0 |
| | 8505 | 26 | 6350 | 1.9 | 65.5 | 0.004 | 2.7 | nd | nd | nd | 15.8 |
| *Mid-Shelf* | 8508 | 34 | 7820 | 2.5 | 76.0 | 0.013 | 3.8 | nd | nd | 0.4 | 19.4 |
| | 8502 | 35 | 7490 | 2.4 | 72.2 | 0.007 | 3.8 | nd | nd | nd | 18.3 |
| | 8533 | 36 | 8560 | 4.4 | 85.0 | 0.004 | 1.4 | nd | nd | 0.5 | 24.4 |
| | 8538 | 37 | 14,200 | 3.0 | 157.0 | 0.007 | 5.6 | nd | nd | 0.5 | 41.5 |
| | 8529 | 45 | 10,400 | 3.4 | 109.0 | 0.014 | 4.2 | nd | nd | 0.7 | 28.6 |
| | 8506 | 48 | 5220 | 2.1 | 17.2 | nd | 1.0 | nd | nd | nd | 8.0 |
| | 8525 | 48 | 11,500 | 3.6 | 118.0 | 0.016 | 4.6 | nd | nd | 0.7 | 30.6 |
| | 8530 | 52 | 12,200 | 3.8 | 116.0 | 0.021 | 5.3 | nd | nd | 0.8 | 34.8 |
| | 8517 | 57 | 11,900 | 4.4 | 113.0 | 0.031 | 5.9 | nd | nd | 0.9 | 32.4 |
| | 8523 | 81 | 15,400 | 5.2 | 127.0 | nd | 8.3 | 0.48 | nd | 1.1 | 39.3 |
| | 8518 | 85 | 15,700 | 5.1 | 134.0 | 0.038 | 8.6 | nd | nd | 1.1 | 40.3 |
| | 8534 | 85 | 14,300 | 4.5 | 129.0 | 0.020 | 6.4 | nd | nd | 0.9 | 37.0 |
| | 8507 | 91 | 9320 | 4.9 | 71.8 | 0.030 | 4.7 | 0.41 | nd | 0.8 | 31.2 |
| | 8503 | 92 | 7990 | 3.2 | 69.8 | 0.013 | 4.8 | nd | nd | 0.5 | 18.6 |
| | 8531 | 100 | 15,500 | 3.0 | 85.4 | 0.017 | 5.2 | nd | nd | 0.6 | 34.0 |
| | 8526 | 101 | 13,100 | 3.8 | 106.0 | 0.036 | 7.1 | 0.55 | nd | 0.8 | 32.2 |
| | 8509 | 108 | 13,200 | 5.2 | 91.4 | 0.063 | 5.2 | nd | nd | 0.9 | 34.7 |
| | 8539 | 112 | 15,400 | 4.3 | 152.0 | 0.017 | 6.8 | nd | nd | 0.7 | 44.8 |
| | 8528 | 120 | 22,400 | 3.6 | 59.3 | 0.014 | 4.5 | nd | nd | 0.6 | 38.4 |
| *Outer Shelf* | 8524 | 123 | 10,500 | 2.9 | 81.0 | 0.015 | 5.1 | nd | nd | 0.5 | 25.7 |
| | 8536 | 135 | 9840 | 2.8 | 83.1 | 0.015 | 4.6 | nd | nd | 0.6 | 26.2 |
| | 8520 | 138 | 12,200 | 3.6 | 97.4 | 0.026 | 7.1 | 0.45 | nd | 0.6 | 30.4 |
| | 8519 | 142 | 12,900 | 3.7 | 104.0 | 0.036 | 7.8 | 0.48 | nd | 0.7 | 33.0 |
| | 8542 | 147 | 20,900 | 534.0 | 61.6 | 0.022 | 7.3 | nd | 1.7 | 81.8 | 36.4 |
| | 8547 | 156 | 16,000 | 8.5 | 136.0 | 0.028 | 8.5 | nd | nd | 1.4 | 41.9 |
| | 8504 | 171 | 15,200 | 5.2 | 104.0 | 0.037 | 10.7 | 0.78 | nd | 1.6 | 37.4 |
| | 8532 | 178 | 13,000 | 3.9 | 104.0 | 0.023 | 7.5 | 0.68 | nd | 0.7 | 34.4 |
| | 8510 | 195 | 22,100 | 10.0 | 165.0 | 0.139 | 14.8 | nd | nd | 1.8 | 62.1 |
| | 8516 | 200 | 21,800 | 9.9 | 164.0 | 0.226 | 16.4 | nd | nd | 1.8 | 61.7 |
| *Upper Slope* | 8512 | 240 | 22,300 | 7.5 | 155.0 | 0.086 | 19.7 | 0.14 | nd | 1.7 | 61.9 |
| | 8521 | 340 | 21,700 | 5.0 | 165.0 | 0.053 | 20.5 | 0.30 | nd | 1.1 | 64.8 |
| | 8527 | 350 | 19,700 | 5.6 | 137.0 | 0.053 | 14.7 | 0.87 | nd | 1.2 | 54.8 |
| | 8537 | 350 | 23,000 | 6.9 | 178.0 | 0.060 | 15.9 | nd | nd | 1.6 | 66.1 |
| | 8540 | 437 | 28,100 | 8.8 | 218.0 | 0.100 | 20.3 | 0.64 | nd | 2.0 | 83.5 |
| | | Detection rate (%) | 100 | 100 | 100 | 88 | 100 | 28 | 3 | 83 | 100 |
| | | ERL[a]: | na | 46.7 | na | 0.15 | 20.9 | na | 1.0 | na | 150 |
| | | ERM[a]: | na | 218.0 | na | 0.71 | 51.6 | na | 3.7 | na | 410 |

[a] From Long et al. 1995

## Table F.5

Concentrations of pesticides (ppt), total PCB (ppt), and total PAH (ppb) detected in sediments from the 2016 San Diego regional benthic stations. See Table C.1 for MDLs and Table F.6 for values of individual constituents; nd = not

| | Station | Depth (m) | tChlordane | tDDT | HCB | tPCB | tPAH |
|---|---|---|---|---|---|---|---|
| *Inner Shelf* | 8513 | 5 | nd | 52 | nr | 382 | 48 |
| | 8501 | 17 | nd | 151 | nr | nd | nd |
| | 8514 | 18 | nd | 47 | nr | 99 | nd |
| | 8515 | 20 | nd | 113 | nr | 763 | nd |
| | 8522 | 22 | nd | 63 | nr | 25 | nd |
| | 8505 | 26 | nd | 271 | nr | 131 | 7 |
| *Mid-Shelf* | 8508 | 34 | nd | 801 | nr | 250 | 4 |
| | 8502 | 35 | nd | 673 | nr | 174 | 9 |
| | 8533 | 36 | 160 | 587 | nr | 509 | 8 |
| | 8538 | 37 | nd | 291 | nr | 970 | 9 |
| | 8529 | 45 | nd | 339 | nr | 564 | 17 |
| | 8506 | 48 | nd | 101 | nr | 86 | nd |
| | 8525 | 48 | nd | 556 | nr | 593 | 68 |
| | 8530 | 52 | nd | 122 | nr | 154 | 11 |
| | 8517 | 57 | ns | ns | ns | ns | ns |
| | 8523 | 81 | 93 | 1284 | nr | 1953 | 39 |
| | 8518 | 85 | nd | 827 | nr | 1092 | 87 |
| | 8534 | 85 | nd | 710 | nr | 460 | 16 |
| | 8507 | 91 | nd | 1239 | nr | 24,314 | 113 |
| | 8503 | 92 | nd | 781 | nr | 676 | 8 |
| | 8531 | 100 | nd | 334 | nr | 208 | 10 |
| | 8526 | 101 | nd | 1081 | nr | 1055 | 12 |
| | 8509 | 108 | nd | 498 | nr | 11,004 | 320 |
| | 8539 | 112 | nd | 1164 | nr | 649 | 44 |
| | 8528 | 120 | 229 | 340 | nr | 156 | 11 |
| *Outer Shelf* | 8524 | 123 | 58 | 450 | nr | 663 | 9 |
| | 8536 | 135 | nd | 406 | 140 | 313 | 8 |
| | 8520 | 138 | 169 | 1241 | nr | 1374 | 12 |
| | 8519 | 142 | 26 | 1859 | nr | 1359 | 60 |
| | 8542 | 147 | nd | 316 | nr | 511 | 11 |
| | 8547 | 156 | nd | 1449 | nr | 704 | 15 |
| | 8504 | 171 | nd | 1576 | nr | 2117 | 84 |
| | 8532 | 178 | nd | 676 | nr | 878 | 11 |
| | 8510 | 195 | 64 | 552 | nr | 3191 | 365 |
| | 8516 | 200 | 241 | 699 | nr | 1892 | 208 |
| *Upper Slope* | 8512 | 240 | nd | 769 | nr | 4639 | 106 |
| | 8521 | 340 | nd | 767 | nr | 734 | 18 |
| | 8527 | 350 | nd | 924 | nr | 582 | 54 |
| | 8537 | 350 | 258 | 2164 | nr | 1524 | 97 |
| | 8540 | 437 | nd | 2113 | nr | 751 | 199 |
| | | Detection rate (%) | 23 | 100 | na | 97 | 87 |
| | | ERL[a]: | na | 1580 | na | na | 4022 |
| | | ERM[a]: | na | 46,100 | na | na | 44,792 |

[a] From Long et al. 1995

## Table F.6
Summary of the constituents that make up total chlordane, total DDT, total PCB, and total PAH in each sediment sample collected as part of the 2016 regional survey off San Diego.

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8501 | DDT | p,p-DDD | 13 | ppt |
| 8501 | DDT | p,p-DDE | 138 | ppt |
| | | | | |
| 8502 | DDT | o,p-DDD | 25 | ppt |
| 8502 | DDT | o,p-DDT | 42 | ppt |
| 8502 | DDT | p,-p-DDMU | 32 | ppt |
| 8502 | DDT | p,p-DDD | 63 | ppt |
| 8502 | DDT | p,p-DDE | 336 | ppt |
| 8502 | DDT | p,p-DDT | 175 | ppt |
| 8502 | PAH | 2,6-dimethylnaphthalene | 9 | ppb |
| 8502 | PCB | PCB 18 | 9 | ppt |
| 8502 | PCB | PCB 44 | 14 | ppt |
| 8502 | PCB | PCB 49 | 12 | ppt |
| 8502 | PCB | PCB 52 | 12 | ppt |
| 8502 | PCB | PCB 66 | 14 | ppt |
| 8502 | PCB | PCB 70 | 17 | ppt |
| 8502 | PCB | PCB 105 | 10 | ppt |
| 8502 | PCB | PCB 110 | 22 | ppt |
| 8502 | PCB | PCB 149 | 21 | ppt |
| 8502 | PCB | PCB 153/168 | 28 | ppt |
| 8502 | PCB | PCB 187 | 16 | ppt |
| | | | | |
| 8503 | DDT | o,p-DDD | 18 | ppt |
| 8503 | DDT | p,-p-DDMU | 48 | ppt |
| 8503 | DDT | p,p-DDD | 45 | ppt |
| 8503 | DDT | p,p-DDE | 582 | ppt |
| 8503 | DDT | p,p-DDT | 89 | ppt |
| 8503 | PAH | 2,6-dimethylnaphthalene | 8 | ppb |
| 8503 | PCB | PCB 49 | 13 | ppt |
| 8503 | PCB | PCB 52 | 13 | ppt |
| 8503 | PCB | PCB 66 | 27 | ppt |
| 8503 | PCB | PCB 99 | 35 | ppt |
| 8503 | PCB | PCB 101 | 40 | ppt |
| 8503 | PCB | PCB 105 | 29 | ppt |
| 8503 | PCB | PCB 110 | 41 | ppt |
| 8503 | PCB | PCB 118 | 45 | ppt |
| 8503 | PCB | PCB 128 | 34 | ppt |
| 8503 | PCB | PCB 138 | 79 | ppt |
| 8503 | PCB | PCB 149 | 79 | ppt |
| 8503 | PCB | PCB 153/168 | 107 | ppt |
| 8503 | PCB | PCB 170 | 15 | ppt |
| 8503 | PCB | PCB 180 | 67 | ppt |
| 8503 | PCB | PCB 187 | 54 | ppt |
| | | | | |
| 8504 | DDT | o,p-DDD | 35 | ppt |
| 8504 | DDT | o,p-DDE | 71 | ppt |
| 8504 | DDT | p,-p-DDMU | 87 | ppt |
| 8504 | DDT | p,p-DDD | 128 | ppt |
| 8504 | DDT | p,p-DDE | 1180 | ppt |
| 8504 | DDT | p,p-DDT | 75 | ppt |
| 8504 | PAH | 2,6-dimethylnaphthalene | 13 | ppb |
| 8504 | PAH | 3,4-benzo(B)fluoranthene | 13 | ppb |
| 8504 | PAH | Benzo[A]pyrene | 10 | ppb |

**Table F.6** *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8504 | PAH | Benzo[e]pyrene | 7 | ppb |
| 8504 | PAH | Benzo[G,H,I]perylene | 13 | ppb |
| 8504 | PAH | Fluoranthene | 10 | ppb |
| 8504 | PAH | Indeno(1,2,3-CD)pyrene | 8 | ppb |
| 8504 | PAH | Pyrene | 9 | ppb |
| 8504 | PCB | PCB 49 | 30 | ppt |
| 8504 | PCB | PCB 66 | 71 | ppt |
| 8504 | PCB | PCB 70 | 61 | ppt |
| 8504 | PCB | PCB 99 | 98 | ppt |
| 8504 | PCB | PCB 101 | 142 | ppt |
| 8504 | PCB | PCB 105 | 95 | ppt |
| 8504 | PCB | PCB 110 | 139 | ppt |
| 8504 | PCB | PCB 118 | 199 | ppt |
| 8504 | PCB | PCB 128 | 62 | ppt |
| 8504 | PCB | PCB 138 | 230 | ppt |
| 8504 | PCB | PCB 149 | 210 | ppt |
| 8504 | PCB | PCB 153/168 | 324 | ppt |
| 8504 | PCB | PCB 177 | 57 | ppt |
| 8504 | PCB | PCB 180 | 126 | ppt |
| 8504 | PCB | PCB 183 | 24 | ppt |
| 8504 | PCB | PCB 187 | 121 | ppt |
| 8504 | PCB | PCB 206 | 128 | ppt |
| 8505 | DDT | p,-p-DDMU | 20 | ppt |
| 8505 | DDT | p,p-DDE | 154 | ppt |
| 8505 | DDT | p,p-DDT | 97 | ppt |
| 8505 | PAH | 2,6-dimethylnaphthalene | 7 | ppb |
| 8505 | PCB | PCB 44 | 7 | ppt |
| 8505 | PCB | PCB 49 | 10 | ppt |
| 8505 | PCB | PCB 52 | 5 | ppt |
| 8505 | PCB | PCB 66 | 8 | ppt |
| 8505 | PCB | PCB 70 | 5 | ppt |
| 8505 | PCB | PCB 138 | 18 | ppt |
| 8505 | PCB | PCB 149 | 20 | ppt |
| 8505 | PCB | PCB 153/168 | 39 | ppt |
| 8505 | PCB | PCB 187 | 18 | ppt |
| 8506 | DDT | p,-p-DDMU | 13 | ppt |
| 8506 | DDT | p,p-DDE | 88 | ppt |
| 8506 | PCB | PCB 18 | 7 | ppt |
| 8506 | PCB | PCB 66 | 13 | ppt |
| 8506 | PCB | PCB 70 | 10 | ppt |
| 8506 | PCB | PCB 138 | 19 | ppt |
| 8506 | PCB | PCB 149 | 14 | ppt |
| 8506 | PCB | PCB 153/168 | 23 | ppt |
| 8507 | DDT | o,p-DDD | 16 | ppt |
| 8507 | DDT | p,-p-DDMU | 96 | ppt |
| 8507 | DDT | p,p-DDD | 94 | ppt |
| 8507 | DDT | p,p-DDE | 920 | ppt |
| 8507 | DDT | p,p-DDT | 113 | ppt |
| 8507 | PAH | 2,6-dimethylnaphthalene | 8 | ppb |
| 8507 | PAH | 3,4-benzo(B)fluoranthene | 18 | ppb |
| 8507 | PAH | Benzo[A]pyrene | 14 | ppb |
| 8507 | PAH | Benzo[e]pyrene | 11 | ppb |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8507 | PAH | Benzo[G,H,I]perylene | 13 | ppb |
| 8507 | PAH | Benzo[K]fluoranthene | 7 | ppb |
| 8507 | PAH | Chrysene | 8 | ppb |
| 8507 | PAH | Fluoranthene | 12 | ppb |
| 8507 | PAH | Indeno(1,2,3-CD)pyrene | 10 | ppb |
| 8507 | PAH | Pyrene | 12 | ppb |
| 8507 | PCB | PCB 18 | 120 | ppt |
| 8507 | PCB | PCB 28 | 160 | ppt |
| 8507 | PCB | PCB 44 | 530 | ppt |
| 8507 | PCB | PCB 49 | 400 | ppt |
| 8507 | PCB | PCB 52 | 1300 | ppt |
| 8507 | PCB | PCB 66 | 400 | ppt |
| 8507 | PCB | PCB 70 | 870 | ppt |
| 8507 | PCB | PCB 74 | 210 | ppt |
| 8507 | PCB | PCB 87 | 990 | ppt |
| 8507 | PCB | PCB 99 | 980 | ppt |
| 8507 | PCB | PCB 101 | 2500 | ppt |
| 8507 | PCB | PCB 105 | 990 | ppt |
| 8507 | PCB | PCB 110 | 2400 | ppt |
| 8507 | PCB | PCB 118 | 2300 | ppt |
| 8507 | PCB | PCB 119 | 120 | ppt |
| 8507 | PCB | PCB 123 | 210 | ppt |
| 8507 | PCB | PCB 128 | 530 | ppt |
| 8507 | PCB | PCB 138 | 2100 | ppt |
| 8507 | PCB | PCB 149 | 1700 | ppt |
| 8507 | PCB | PCB 151 | 320 | ppt |
| 8507 | PCB | PCB 153/168 | 2500 | ppt |
| 8507 | PCB | PCB 156 | 320 | ppt |
| 8507 | PCB | PCB 157 | 75 | ppt |
| 8507 | PCB | PCB 158 | 310 | ppt |
| 8507 | PCB | PCB 167 | 86 | ppt |
| 8507 | PCB | PCB 170 | 350 | ppt |
| 8507 | PCB | PCB 177 | 180 | ppt |
| 8507 | PCB | PCB 180 | 640 | ppt |
| 8507 | PCB | PCB 183 | 190 | ppt |
| 8507 | PCB | PCB 187 | 340 | ppt |
| 8507 | PCB | PCB 201 | 33 | ppt |
| 8507 | PCB | PCB 206 | 160 | ppt |
| | | | | |
| 8508 | DDT | p,-p-DDMU | 63 | ppt |
| 8508 | DDT | p,p-DDD | 58 | ppt |
| 8508 | DDT | p,p-DDE | 622 | ppt |
| 8508 | DDT | p,p-DDT | 57 | ppt |
| 8508 | PAH | 2,6-dimethylnaphthalene | 4 | ppb |
| 8508 | PCB | PCB 18 | 10 | ppt |
| 8508 | PCB | PCB 28 | 15 | ppt |
| 8508 | PCB | PCB 49 | 10 | ppt |
| 8508 | PCB | PCB 52 | 14 | ppt |
| 8508 | PCB | PCB 66 | 14 | ppt |
| 8508 | PCB | PCB 70 | 13 | ppt |
| 8508 | PCB | PCB 81 | 9 | ppt |
| 8508 | PCB | PCB 99 | 23 | ppt |
| 8508 | PCB | PCB 101 | 23 | ppt |
| 8508 | PCB | PCB 149 | 33 | ppt |
| 8508 | PCB | PCB 151 | 13 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8508 | PCB | PCB 153/168 | 47 | ppt |
| 8508 | PCB | PCB 187 | 26 | ppt |
| | | | | |
| 8509 | DDT | o,p-DDD | 27 | ppt |
| 8509 | DDT | o,p-DDE | 19 | ppt |
| 8509 | DDT | o,p-DDT | 21 | ppt |
| 8509 | DDT | p,-p-DDMU | 30 | ppt |
| 8509 | DDT | p,p-DDD | 38 | ppt |
| 8509 | DDT | p,p-DDE | 245 | ppt |
| 8509 | DDT | p,p-DDT | 118 | ppt |
| 8509 | PAH | 2,6-dimethylnaphthalene | 9 | ppb |
| 8509 | PAH | 3,4-benzo(B)fluoranthene | 46 | ppb |
| 8509 | PAH | Anthracene | 8 | ppb |
| 8509 | PAH | Benzo[A]anthracene | 29 | ppb |
| 8509 | PAH | Benzo[A]pyrene | 35 | ppb |
| 8509 | PAH | Benzo[e]pyrene | 24 | ppb |
| 8509 | PAH | Benzo[G,H,I]perylene | 27 | ppb |
| 8509 | PAH | Benzo[K]fluoranthene | 16 | ppb |
| 8509 | PAH | Chrysene | 29 | ppb |
| 8509 | PAH | Fluoranthene | 30 | ppb |
| 8509 | PAH | Indeno(1,2,3-CD)pyrene | 20 | ppb |
| 8509 | PAH | Phenanthrene | 9 | ppb |
| 8509 | PAH | Pyrene | 39 | ppb |
| 8509 | PCB | PCB 18 | 41 | ppt |
| 8509 | PCB | PCB 28 | 60 | ppt |
| 8509 | PCB | PCB 37 | 29 | ppt |
| 8509 | PCB | PCB 44 | 280 | ppt |
| 8509 | PCB | PCB 49 | 130 | ppt |
| 8509 | PCB | PCB 52 | 630 | ppt |
| 8509 | PCB | PCB 66 | 160 | ppt |
| 8509 | PCB | PCB 70 | 410 | ppt |
| 8509 | PCB | PCB 74 | 97 | ppt |
| 8509 | PCB | PCB 77 | 9 | ppt |
| 8509 | PCB | PCB 81 | 2 | ppt |
| 8509 | PCB | PCB 87 | 500 | ppt |
| 8509 | PCB | PCB 99 | 440 | ppt |
| 8509 | PCB | PCB 101 | 1000 | ppt |
| 8509 | PCB | PCB 105 | 410 | ppt |
| 8509 | PCB | PCB 110 | 1200 | ppt |
| 8509 | PCB | PCB 118 | 920 | ppt |
| 8509 | PCB | PCB 119 | 63 | ppt |
| 8509 | PCB | PCB 123 | 84 | ppt |
| 8509 | PCB | PCB 128 | 220 | ppt |
| 8509 | PCB | PCB 138 | 880 | ppt |
| 8509 | PCB | PCB 149 | 720 | ppt |
| 8509 | PCB | PCB 151 | 160 | ppt |
| 8509 | PCB | PCB 153/168 | 1200 | ppt |
| 8509 | PCB | PCB 156 | 140 | ppt |
| 8509 | PCB | PCB 157 | 34 | ppt |
| 8509 | PCB | PCB 158 | 130 | ppt |
| 8509 | PCB | PCB 167 | 40 | ppt |
| 8509 | PCB | PCB 170 | 150 | ppt |
| 8509 | PCB | PCB 177 | 98 | ppt |
| 8509 | PCB | PCB 180 | 300 | ppt |
| 8509 | PCB | PCB 183 | 89 | ppt |

**Table F.6** *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8509 | PCB | PCB 187 | 250 | ppt |
| 8509 | PCB | PCB 201 | 18 | ppt |
| 8509 | PCB | PCB 206 | 110 | ppt |
| | | | | |
| 8510 | Chlordane | Gamma(trans)Chlordane | 64 | ppt |
| 8510 | DDT | o,p-DDE | 38 | ppt |
| 8510 | DDT | p,-p-DDMU | 44 | ppt |
| 8510 | DDT | p,p-DDD | 110 | ppt |
| 8510 | DDT | p,p-DDE | 359 | ppt |
| 8510 | PAH | 2,6-dimethylnaphthalene | 15 | ppb |
| 8510 | PAH | 3,4-benzo(B)fluoranthene | 61 | ppb |
| 8510 | PAH | Anthracene | 10 | ppb |
| 8510 | PAH | Benzo[A]anthracene | 30 | ppb |
| 8510 | PAH | Benzo[A]pyrene | 42 | ppb |
| 8510 | PAH | Benzo[e]pyrene | 35 | ppb |
| 8510 | PAH | Benzo[G,H,I]perylene | 37 | ppb |
| 8510 | PAH | Benzo[K]fluoranthene | 21 | ppb |
| 8510 | PAH | Chrysene | 30 | ppb |
| 8510 | PAH | Fluoranthene | 24 | ppb |
| 8510 | PAH | Indeno(1,2,3-CD)pyrene | 29 | ppb |
| 8510 | PAH | Perylene | 11 | ppb |
| 8510 | PAH | Pyrene | 20 | ppb |
| 8510 | PCB | PCB 18 | 21 | ppt |
| 8510 | PCB | PCB 28 | 33 | ppt |
| 8510 | PCB | PCB 37 | 15 | ppt |
| 8510 | PCB | PCB 44 | 59 | ppt |
| 8510 | PCB | PCB 49 | 81 | ppt |
| 8510 | PCB | PCB 52 | 111 | ppt |
| 8510 | PCB | PCB 66 | 78 | ppt |
| 8510 | PCB | PCB 70 | 86 | ppt |
| 8510 | PCB | PCB 74 | 35 | ppt |
| 8510 | PCB | PCB 87 | 99 | ppt |
| 8510 | PCB | PCB 99 | 169 | ppt |
| 8510 | PCB | PCB 101 | 213 | ppt |
| 8510 | PCB | PCB 105 | 110 | ppt |
| 8510 | PCB | PCB 110 | 300 | ppt |
| 8510 | PCB | PCB 118 | 300 | ppt |
| 8510 | PCB | PCB 128 | 78 | ppt |
| 8510 | PCB | PCB 138 | 290 | ppt |
| 8510 | PCB | PCB 149 | 320 | ppt |
| 8510 | PCB | PCB 153/168 | 407 | ppt |
| 8510 | PCB | PCB 156 | 26 | ppt |
| 8510 | PCB | PCB 158 | 25 | ppt |
| 8510 | PCB | PCB 180 | 119 | ppt |
| 8510 | PCB | PCB 183 | 54 | ppt |
| 8510 | PCB | PCB 187 | 116 | ppt |
| 8510 | PCB | PCB 206 | 46 | ppt |
| | | | | |
| 8512 | DDT | o,p-DDE | 55 | ppt |
| 8512 | DDT | p,-p-DDMU | 52 | ppt |
| 8512 | DDT | p,p-DDD | 78 | ppt |
| 8512 | DDT | p,p-DDE | 584 | ppt |
| 8512 | PAH | 2,6-dimethylnaphthalene | 16 | ppb |
| 8512 | PAH | 3,4-benzo(B)fluoranthene | 9 | ppb |
| 8512 | PAH | Benzo[A]pyrene | 13 | ppb |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8512 | PAH | Benzo[e]pyrene | 14 | ppb |
| 8512 | PAH | Benzo[G,H,I]perylene | 16 | ppb |
| 8512 | PAH | Fluoranthene | 11 | ppb |
| 8512 | PAH | Indeno(1,2,3-CD)pyrene | 12 | ppb |
| 8512 | PAH | Perylene | 6 | ppb |
| 8512 | PAH | Pyrene | 11 | ppb |
| 8512 | PCB | PCB 28 | 21 | ppt |
| 8512 | PCB | PCB 44 | 15 | ppt |
| 8512 | PCB | PCB 49 | 33 | ppt |
| 8512 | PCB | PCB 52 | 34 | ppt |
| 8512 | PCB | PCB 66 | 37 | ppt |
| 8512 | PCB | PCB 70 | 40 | ppt |
| 8512 | PCB | PCB 74 | 16 | ppt |
| 8512 | PCB | PCB 99 | 44 | ppt |
| 8512 | PCB | PCB 101 | 84 | ppt |
| 8512 | PCB | PCB 105 | 34 | ppt |
| 8512 | PCB | PCB 110 | 90 | ppt |
| 8512 | PCB | PCB 118 | 108 | ppt |
| 8512 | PCB | PCB 138 | 123 | ppt |
| 8512 | PCB | PCB 149 | 244 | ppt |
| 8512 | PCB | PCB 153/168 | 437 | ppt |
| 8512 | PCB | PCB 169 | 195 | ppt |
| 8512 | PCB | PCB 170 | 141 | ppt |
| 8512 | PCB | PCB 177 | 143 | ppt |
| 8512 | PCB | PCB 180 | 1000 | ppt |
| 8512 | PCB | PCB 183 | 241 | ppt |
| 8512 | PCB | PCB 187 | 670 | ppt |
| 8512 | PCB | PCB 194 | 520 | ppt |
| 8512 | PCB | PCB 206 | 370 | ppt |
| 8513 | DDT | p,-p-DDMU | 17 | ppt |
| 8513 | DDT | p,p-DDE | 35 | ppt |
| 8513 | PAH | 3,4-benzo(B)fluoranthene | 12 | ppb |
| 8513 | PAH | Benzo[A]pyrene | 10 | ppb |
| 8513 | PAH | Benzo[e]pyrene | 7 | ppb |
| 8513 | PAH | Chrysene | 11 | ppb |
| 8513 | PAH | Pyrene | 8 | ppb |
| 8513 | PCB | PCB 18 | 18 | ppt |
| 8513 | PCB | PCB 28 | 27 | ppt |
| 8513 | PCB | PCB 37 | 11 | ppt |
| 8513 | PCB | PCB 44 | 19 | ppt |
| 8513 | PCB | PCB 49 | 14 | ppt |
| 8513 | PCB | PCB 52 | 20 | ppt |
| 8513 | PCB | PCB 66 | 15 | ppt |
| 8513 | PCB | PCB 70 | 13 | ppt |
| 8513 | PCB | PCB 74 | 11 | ppt |
| 8513 | PCB | PCB 81 | 8 | ppt |
| 8513 | PCB | PCB 101 | 21 | ppt |
| 8513 | PCB | PCB 110 | 18 | ppt |
| 8513 | PCB | PCB 118 | 15 | ppt |
| 8513 | PCB | PCB 128 | 14 | ppt |
| 8513 | PCB | PCB 138 | 21 | ppt |
| 8513 | PCB | PCB 149 | 27 | ppt |
| 8513 | PCB | PCB 151 | 14 | ppt |
| 8513 | PCB | PCB 153/168 | 41 | ppt |

**Table F.6** *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8513 | PCB | PCB 158 | 13 | ppt |
| 8513 | PCB | PCB 187 | 20 | ppt |
| 8513 | PCB | PCB 206 | 23 | ppt |
| | | | | |
| 8514 | DDT | p,p-DDE | 47 | ppt |
| 8514 | PCB | PCB 18 | 6 | ppt |
| 8514 | PCB | PCB 28 | 9 | ppt |
| 8514 | PCB | PCB 37 | 8 | ppt |
| 8514 | PCB | PCB 44 | 7 | ppt |
| 8514 | PCB | PCB 52 | 9 | ppt |
| 8514 | PCB | PCB 66 | 9 | ppt |
| 8514 | PCB | PCB 70 | 8 | ppt |
| 8514 | PCB | PCB 74 | 8 | ppt |
| 8514 | PCB | PCB 149 | 16 | ppt |
| 8514 | PCB | PCB 153/168 | 20 | ppt |
| | | | | |
| 8515 | DDT | p,-p-DDMU | 17 | ppt |
| 8515 | DDT | p,p-DDD | 36 | ppt |
| 8515 | DDT | p,p-DDE | 60 | ppt |
| 8515 | PCB | PCB 18 | 10 | ppt |
| 8515 | PCB | PCB 28 | 13 | ppt |
| 8515 | PCB | PCB 37 | 16 | ppt |
| 8515 | PCB | PCB 44 | 16 | ppt |
| 8515 | PCB | PCB 52 | 19 | ppt |
| 8515 | PCB | PCB 66 | 17 | ppt |
| 8515 | PCB | PCB 70 | 21 | ppt |
| 8515 | PCB | PCB 74 | 19 | ppt |
| 8515 | PCB | PCB 77 | 26 | ppt |
| 8515 | PCB | PCB 81 | 17 | ppt |
| 8515 | PCB | PCB 99 | 18 | ppt |
| 8515 | PCB | PCB 101 | 28 | ppt |
| 8515 | PCB | PCB 105 | 30 | ppt |
| 8515 | PCB | PCB 110 | 30 | ppt |
| 8515 | PCB | PCB 118 | 34 | ppt |
| 8515 | PCB | PCB 119 | 27 | ppt |
| 8515 | PCB | PCB 126 | 24 | ppt |
| 8515 | PCB | PCB 128 | 26 | ppt |
| 8515 | PCB | PCB 138 | 32 | ppt |
| 8515 | PCB | PCB 149 | 28 | ppt |
| 8515 | PCB | PCB 151 | 28 | ppt |
| 8515 | PCB | PCB 153/168 | 66 | ppt |
| 8515 | PCB | PCB 156 | 29 | ppt |
| 8515 | PCB | PCB 157 | 23 | ppt |
| 8515 | PCB | PCB 158 | 15 | ppt |
| 8515 | PCB | PCB 167 | 29 | ppt |
| 8515 | PCB | PCB 169 | 17 | ppt |
| 8515 | PCB | PCB 170 | 26 | ppt |
| 8515 | PCB | PCB 183 | 20 | ppt |
| 8515 | PCB | PCB 187 | 40 | ppt |
| 8515 | PCB | PCB 206 | 22 | ppt |
| | | | | |
| 8516 | Chlordane | Alpha(cis)Chlordane | 93 | ppt |
| 8516 | Chlordane | Gamma(trans)Chlordane | 80 | ppt |
| 8516 | Chlordane | TransNonachlor | 69 | ppt |
| 8516 | DDT | o,p-DDD | 25 | ppt |

**Table F.6** *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8516 | DDT | o,p-DDE | 30 | ppt |
| 8516 | DDT | p,-p-DDMU | 46 | ppt |
| 8516 | DDT | p,p-DDD | 88 | ppt |
| 8516 | DDT | p,p-DDE | 429 | ppt |
| 8516 | DDT | p,p-DDT | 82 | ppt |
| 8516 | PAH | 2,6-dimethylnaphthalene | 15 | ppb |
| 8516 | PAH | Benzo[A]anthracene | 24 | ppb |
| 8516 | PAH | Benzo[A]pyrene | 33 | ppb |
| 8516 | PAH | Benzo[e]pyrene | 27 | ppb |
| 8516 | PAH | Benzo[G,H,I]perylene | 22 | ppb |
| 8516 | PAH | Chrysene | 21 | ppb |
| 8516 | PAH | Fluoranthene | 20 | ppb |
| 8516 | PAH | Indeno(1,2,3-CD)pyrene | 18 | ppb |
| 8516 | PAH | Perylene | 8 | ppb |
| 8516 | PAH | Pyrene | 20 | ppb |
| 8516 | PCB | PCB 18 | 15 | ppt |
| 8516 | PCB | PCB 28 | 34 | ppt |
| 8516 | PCB | PCB 44 | 31 | ppt |
| 8516 | PCB | PCB 49 | 42 | ppt |
| 8516 | PCB | PCB 52 | 50 | ppt |
| 8516 | PCB | PCB 66 | 53 | ppt |
| 8516 | PCB | PCB 70 | 43 | ppt |
| 8516 | PCB | PCB 74 | 21 | ppt |
| 8516 | PCB | PCB 87 | 40 | ppt |
| 8516 | PCB | PCB 99 | 71 | ppt |
| 8516 | PCB | PCB 101 | 110 | ppt |
| 8516 | PCB | PCB 105 | 65 | ppt |
| 8516 | PCB | PCB 110 | 117 | ppt |
| 8516 | PCB | PCB 118 | 140 | ppt |
| 8516 | PCB | PCB 128 | 46 | ppt |
| 8516 | PCB | PCB 138 | 168 | ppt |
| 8516 | PCB | PCB 149 | 169 | ppt |
| 8516 | PCB | PCB 151 | 44 | ppt |
| 8516 | PCB | PCB 153/168 | 231 | ppt |
| 8516 | PCB | PCB 156 | 27 | ppt |
| 8516 | PCB | PCB 158 | 18 | ppt |
| 8516 | PCB | PCB 170 | 53 | ppt |
| 8516 | PCB | PCB 177 | 42 | ppt |
| 8516 | PCB | PCB 180 | 107 | ppt |
| 8516 | PCB | PCB 183 | 21 | ppt |
| 8516 | PCB | PCB 187 | 93 | ppt |
| 8516 | PCB | PCB 206 | 41 | ppt |
| 8518 | DDT | o,p-DDE | 32 | ppt |
| 8518 | DDT | o,p-DDT | 38 | ppt |
| 8518 | DDT | p,-p-DDMU | 50 | ppt |
| 8518 | DDT | p,p-DDD | 66 | ppt |
| 8518 | DDT | p,p-DDE | 515 | ppt |
| 8518 | DDT | p,p-DDT | 126 | ppt |
| 8518 | PAH | 2,6-dimethylnaphthalene | 15 | ppb |
| 8518 | PAH | 3,4-benzo(B)fluoranthene | 17 | ppb |
| 8518 | PAH | Benzo[A]pyrene | 13 | ppb |
| 8518 | PAH | Benzo[e]pyrene | 9 | ppb |
| 8518 | PAH | Benzo[G,H,I]perylene | 11 | ppb |
| 8518 | PAH | Indeno(1,2,3-CD)pyrene | 9 | ppb |

**Table F.6** *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8518 | PAH | Pyrene | 14 | ppb |
| 8518 | PCB | PCB 18 | 10 | ppt |
| 8518 | PCB | PCB 28 | 27 | ppt |
| 8518 | PCB | PCB 44 | 23 | ppt |
| 8518 | PCB | PCB 49 | 23 | ppt |
| 8518 | PCB | PCB 52 | 36 | ppt |
| 8518 | PCB | PCB 66 | 35 | ppt |
| 8518 | PCB | PCB 70 | 34 | ppt |
| 8518 | PCB | PCB 74 | 16 | ppt |
| 8518 | PCB | PCB 87 | 23 | ppt |
| 8518 | PCB | PCB 99 | 41 | ppt |
| 8518 | PCB | PCB 101 | 71 | ppt |
| 8518 | PCB | PCB 105 | 30 | ppt |
| 8518 | PCB | PCB 110 | 81 | ppt |
| 8518 | PCB | PCB 118 | 89 | ppt |
| 8518 | PCB | PCB 128 | 40 | ppt |
| 8518 | PCB | PCB 138 | 83 | ppt |
| 8518 | PCB | PCB 149 | 84 | ppt |
| 8518 | PCB | PCB 153/168 | 130 | ppt |
| 8518 | PCB | PCB 170 | 40 | ppt |
| 8518 | PCB | PCB 180 | 75 | ppt |
| 8518 | PCB | PCB 183 | 26 | ppt |
| 8518 | PCB | PCB 187 | 46 | ppt |
| 8518 | PCB | PCB 206 | 29 | ppt |
| 8519 | Chlordane | Gamma(trans)Chlordane | 26 | ppt |
| 8519 | DDT | o,p-DDD | 33 | ppt |
| 8519 | DDT | o,p-DDE | 57 | ppt |
| 8519 | DDT | o,p-DDT | 102 | ppt |
| 8519 | DDT | p,-p-DDMU | 72 | ppt |
| 8519 | DDT | p,p-DDD | 101 | ppt |
| 8519 | DDT | p,p-DDE | 1020 | ppt |
| 8519 | DDT | p,p-DDT | 474 | ppt |
| 8519 | PAH | 2,6-dimethylnaphthalene | 12 | ppb |
| 8519 | PAH | 3,4-benzo(B)fluoranthene | 12 | ppb |
| 8519 | PAH | Benzo[A]anthracene | 11 | ppb |
| 8519 | PAH | Benzo[e]pyrene | 8 | ppb |
| 8519 | PAH | Benzo[G,H,I]perylene | 5 | ppb |
| 8519 | PAH | Chrysene | 5 | ppb |
| 8519 | PAH | Pyrene | 8 | ppb |
| 8519 | PCB | PCB 28 | 24 | ppt |
| 8519 | PCB | PCB 37 | 12 | ppt |
| 8519 | PCB | PCB 44 | 21 | ppt |
| 8519 | PCB | PCB 49 | 31 | ppt |
| 8519 | PCB | PCB 52 | 34 | ppt |
| 8519 | PCB | PCB 66 | 43 | ppt |
| 8519 | PCB | PCB 70 | 40 | ppt |
| 8519 | PCB | PCB 74 | 22 | ppt |
| 8519 | PCB | PCB 87 | 43 | ppt |
| 8519 | PCB | PCB 99 | 57 | ppt |
| 8519 | PCB | PCB 101 | 87 | ppt |
| 8519 | PCB | PCB 105 | 52 | ppt |
| 8519 | PCB | PCB 110 | 82 | ppt |
| 8519 | PCB | PCB 118 | 108 | ppt |
| 8519 | PCB | PCB 138 | 118 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8519 | PCB | PCB 149 | 147 | ppt |
| 8519 | PCB | PCB 153/168 | 204 | ppt |
| 8519 | PCB | PCB 180 | 97 | ppt |
| 8519 | PCB | PCB 187 | 83 | ppt |
| 8519 | PCB | PCB 206 | 57 | ppt |
| 8520 | Chlordane | Alpha(cis)Chlordane | 48 | ppt |
| 8520 | Chlordane | Gamma(trans)Chlordane | 38 | ppt |
| 8520 | Chlordane | Methoxychlor | 51 | ppt |
| 8520 | Chlordane | TransNonachlor | 32 | ppt |
| 8520 | DDT | o,p-DDD | 37 | ppt |
| 8520 | DDT | o,p-DDE | 56 | ppt |
| 8520 | DDT | p,-p-DDMU | 65 | ppt |
| 8520 | DDT | p,p-DDD | 78 | ppt |
| 8520 | DDT | p,p-DDE | 845 | ppt |
| 8520 | DDT | p,p-DDT | 160 | ppt |
| 8520 | PAH | 2,6-dimethylnaphthalene | 12 | ppb |
| 8520 | PCB | PCB 18 | 17 | ppt |
| 8520 | PCB | PCB 28 | 33 | ppt |
| 8520 | PCB | PCB 44 | 22 | ppt |
| 8520 | PCB | PCB 49 | 21 | ppt |
| 8520 | PCB | PCB 52 | 31 | ppt |
| 8520 | PCB | PCB 66 | 30 | ppt |
| 8520 | PCB | PCB 70 | 31 | ppt |
| 8520 | PCB | PCB 74 | 24 | ppt |
| 8520 | PCB | PCB 77 | 27 | ppt |
| 8520 | PCB | PCB 87 | 28 | ppt |
| 8520 | PCB | PCB 99 | 52 | ppt |
| 8520 | PCB | PCB 101 | 61 | ppt |
| 8520 | PCB | PCB 105 | 50 | ppt |
| 8520 | PCB | PCB 110 | 71 | ppt |
| 8520 | PCB | PCB 118 | 101 | ppt |
| 8520 | PCB | PCB 128 | 40 | ppt |
| 8520 | PCB | PCB 138 | 131 | ppt |
| 8520 | PCB | PCB 149 | 110 | ppt |
| 8520 | PCB | PCB 151 | 35 | ppt |
| 8520 | PCB | PCB 153/168 | 180 | ppt |
| 8520 | PCB | PCB 170 | 40 | ppt |
| 8520 | PCB | PCB 177 | 52 | ppt |
| 8520 | PCB | PCB 180 | 59 | ppt |
| 8520 | PCB | PCB 183 | 21 | ppt |
| 8520 | PCB | PCB 187 | 64 | ppt |
| 8520 | PCB | PCB 206 | 44 | ppt |
| 8521 | DDT | o,p-DDE | 43 | ppt |
| 8521 | DDT | p,-p-DDMU | 48 | ppt |
| 8521 | DDT | p,p-DDD | 72 | ppt |
| 8521 | DDT | p,p-DDE | 542 | ppt |
| 8521 | DDT | p,p-DDT | 61 | ppt |
| 8521 | PAH | 2,6-dimethylnaphthalene | 9 | ppb |
| 8521 | PAH | Fluoranthene | 9 | ppb |
| 8521 | PCB | PCB 18 | 44 | ppt |
| 8521 | PCB | PCB 28 | 51 | ppt |
| 8521 | PCB | PCB 37 | 20 | ppt |
| 8521 | PCB | PCB 44 | 37 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8521 | PCB | PCB 49 | 31 | ppt |
| 8521 | PCB | PCB 52 | 47 | ppt |
| 8521 | PCB | PCB 66 | 45 | ppt |
| 8521 | PCB | PCB 70 | 46 | ppt |
| 8521 | PCB | PCB 74 | 23 | ppt |
| 8521 | PCB | PCB 77 | 43 | ppt |
| 8521 | PCB | PCB 99 | 32 | ppt |
| 8521 | PCB | PCB 101 | 48 | ppt |
| 8521 | PCB | PCB 105 | 63 | ppt |
| 8521 | PCB | PCB 110 | 54 | ppt |
| 8521 | PCB | PCB 114 | 58 | ppt |
| 8521 | PCB | PCB 123 | 64 | ppt |
| 8521 | PCB | PCB 153/168 | 28 | ppt |
| 8522 | DDT | p,-p-DDMU | 20 | ppt |
| 8522 | DDT | p,p-DDE | 43 | ppt |
| 8522 | PCB | PCB 49 | 7 | ppt |
| 8522 | PCB | PCB 52 | 4 | ppt |
| 8522 | PCB | PCB 66 | 6 | ppt |
| 8522 | PCB | PCB 70 | 8 | ppt |
| 8523 | Chlordane | Alpha(cis)Chlordane | 53 | ppt |
| 8523 | Chlordane | Gamma(trans)Chlordane | 39 | ppt |
| 8523 | DDT | o,p-DDE | 54 | ppt |
| 8523 | DDT | p,-p-DDMU | 94 | ppt |
| 8523 | DDT | p,p-DDD | 79 | ppt |
| 8523 | DDT | p,p-DDE | 942 | ppt |
| 8523 | DDT | p,p-DDT | 115 | ppt |
| 8523 | PAH | 2,6-dimethylnaphthalene | 13 | ppb |
| 8523 | PAH | 3,4-benzo(B)fluoranthene | 9 | ppb |
| 8523 | PAH | Benzo[G,H,I]perylene | 7 | ppb |
| 8523 | PAH | Pyrene | 9 | ppb |
| 8523 | PCB | PCB 44 | 36 | ppt |
| 8523 | PCB | PCB 49 | 33 | ppt |
| 8523 | PCB | PCB 52 | 36 | ppt |
| 8523 | PCB | PCB 66 | 62 | ppt |
| 8523 | PCB | PCB 70 | 55 | ppt |
| 8523 | PCB | PCB 74 | 31 | ppt |
| 8523 | PCB | PCB 99 | 82 | ppt |
| 8523 | PCB | PCB 101 | 101 | ppt |
| 8523 | PCB | PCB 105 | 48 | ppt |
| 8523 | PCB | PCB 110 | 116 | ppt |
| 8523 | PCB | PCB 118 | 153 | ppt |
| 8523 | PCB | PCB 128 | 52 | ppt |
| 8523 | PCB | PCB 138 | 188 | ppt |
| 8523 | PCB | PCB 149 | 184 | ppt |
| 8523 | PCB | PCB 153/168 | 284 | ppt |
| 8523 | PCB | PCB 158 | 20 | ppt |
| 8523 | PCB | PCB 170 | 99 | ppt |
| 8523 | PCB | PCB 177 | 44 | ppt |
| 8523 | PCB | PCB 180 | 170 | ppt |
| 8523 | PCB | PCB 183 | 49 | ppt |
| 8523 | PCB | PCB 187 | 112 | ppt |
| 8524 | Chlordane | Alpha(cis)Chlordane | 35 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8524 | Chlordane | Gamma(trans)Chlordane | 22 | ppt |
| 8524 | DDT | p,-p-DDMU | 30 | ppt |
| 8524 | DDT | p,p-DDD | 36 | ppt |
| 8524 | DDT | p,p-DDE | 343 | ppt |
| 8524 | DDT | p,p-DDT | 42 | ppt |
| 8524 | PAH | 2,6-dimethylnaphthalene | 9 | ppb |
| 8524 | PCB | PCB 18 | 19 | ppt |
| 8524 | PCB | PCB 44 | 22 | ppt |
| 8524 | PCB | PCB 49 | 28 | ppt |
| 8524 | PCB | PCB 52 | 24 | ppt |
| 8524 | PCB | PCB 66 | 27 | ppt |
| 8524 | PCB | PCB 70 | 19 | ppt |
| 8524 | PCB | PCB 74 | 16 | ppt |
| 8524 | PCB | PCB 81 | 17 | ppt |
| 8524 | PCB | PCB 99 | 30 | ppt |
| 8524 | PCB | PCB 101 | 26 | ppt |
| 8524 | PCB | PCB 105 | 28 | ppt |
| 8524 | PCB | PCB 110 | 25 | ppt |
| 8524 | PCB | PCB 118 | 43 | ppt |
| 8524 | PCB | PCB 128 | 30 | ppt |
| 8524 | PCB | PCB 138 | 56 | ppt |
| 8524 | PCB | PCB 149 | 60 | ppt |
| 8524 | PCB | PCB 153/168 | 78 | ppt |
| 8524 | PCB | PCB 156 | 16 | ppt |
| 8524 | PCB | PCB 158 | 16 | ppt |
| 8524 | PCB | PCB 183 | 23 | ppt |
| 8524 | PCB | PCB 187 | 30 | ppt |
| 8524 | PCB | PCB 206 | 29 | ppt |
| 8525 | DDT | o,p-DDD | 15 | ppt |
| 8525 | DDT | o,p-DDT | 53 | ppt |
| 8525 | DDT | p,-p-DDMU | 29 | ppt |
| 8525 | DDT | p,p-DDD | 32 | ppt |
| 8525 | DDT | p,p-DDE | 156 | ppt |
| 8525 | DDT | p,p-DDT | 271 | ppt |
| 8525 | PAH | 2,6-dimethylnaphthalene | 10 | ppb |
| 8525 | PAH | Benzo[G,H,I]perylene | 7 | ppb |
| 8525 | PAH | Chrysene | 9 | ppb |
| 8525 | PAH | Fluoranthene | 14 | ppb |
| 8525 | PAH | Phenanthrene | 13 | ppb |
| 8525 | PAH | Pyrene | 15 | ppb |
| 8525 | PCB | PCB 18 | 16 | ppt |
| 8525 | PCB | PCB 28 | 25 | ppt |
| 8525 | PCB | PCB 44 | 18 | ppt |
| 8525 | PCB | PCB 49 | 26 | ppt |
| 8525 | PCB | PCB 52 | 18 | ppt |
| 8525 | PCB | PCB 66 | 28 | ppt |
| 8525 | PCB | PCB 70 | 14 | ppt |
| 8525 | PCB | PCB 99 | 21 | ppt |
| 8525 | PCB | PCB 101 | 35 | ppt |
| 8525 | PCB | PCB 110 | 29 | ppt |
| 8525 | PCB | PCB 118 | 48 | ppt |
| 8525 | PCB | PCB 138 | 55 | ppt |
| 8525 | PCB | PCB 149 | 37 | ppt |
| 8525 | PCB | PCB 153/168 | 64 | ppt |

**Table F.6** *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8525 | PCB | PCB 169 | 11 | ppt |
| 8525 | PCB | PCB 170 | 33 | ppt |
| 8525 | PCB | PCB 180 | 60 | ppt |
| 8525 | PCB | PCB 187 | 32 | ppt |
| 8525 | PCB | PCB 206 | 23 | ppt |
| | | | | |
| 8526 | DDT | o,p-DDE | 60 | ppt |
| 8526 | DDT | p,-p-DDMU | 66 | ppt |
| 8526 | DDT | p,p-DDE | 824 | ppt |
| 8526 | DDT | p,p-DDT | 131 | ppt |
| 8526 | PAH | 2,6-dimethylnaphthalene | 12 | ppb |
| 8526 | PCB | PCB 44 | 17 | ppt |
| 8526 | PCB | PCB 49 | 24 | ppt |
| 8526 | PCB | PCB 52 | 27 | ppt |
| 8526 | PCB | PCB 66 | 42 | ppt |
| 8526 | PCB | PCB 70 | 34 | ppt |
| 8526 | PCB | PCB 74 | 17 | ppt |
| 8526 | PCB | PCB 99 | 58 | ppt |
| 8526 | PCB | PCB 101 | 70 | ppt |
| 8526 | PCB | PCB 105 | 37 | ppt |
| 8526 | PCB | PCB 110 | 66 | ppt |
| 8526 | PCB | PCB 118 | 100 | ppt |
| 8526 | PCB | PCB 138 | 102 | ppt |
| 8526 | PCB | PCB 149 | 76 | ppt |
| 8526 | PCB | PCB 153/168 | 159 | ppt |
| 8526 | PCB | PCB 158 | 31 | ppt |
| 8526 | PCB | PCB 180 | 109 | ppt |
| 8526 | PCB | PCB 183 | 25 | ppt |
| 8526 | PCB | PCB 187 | 61 | ppt |
| | | | | |
| 8527 | DDT | o,p-DDD | 32 | ppt |
| 8527 | DDT | o,p-DDE | 49 | ppt |
| 8527 | DDT | p,-p-DDMU | 50 | ppt |
| 8527 | DDT | p,p-DDD | 84 | ppt |
| 8527 | DDT | p,p-DDE | 643 | ppt |
| 8527 | DDT | p,p-DDT | 67 | ppt |
| 8527 | PAH | 2,6-dimethylnaphthalene | 35 | ppb |
| 8527 | PAH | 3,4-benzo(B)fluoranthene | 10 | ppb |
| 8527 | PAH | Fluoranthene | 9 | ppb |
| 8527 | PCB | PCB 18 | 14 | ppt |
| 8527 | PCB | PCB 28 | 22 | ppt |
| 8527 | PCB | PCB 37 | 17 | ppt |
| 8527 | PCB | PCB 44 | 22 | ppt |
| 8527 | PCB | PCB 49 | 25 | ppt |
| 8527 | PCB | PCB 52 | 24 | ppt |
| 8527 | PCB | PCB 66 | 32 | ppt |
| 8527 | PCB | PCB 70 | 20 | ppt |
| 8527 | PCB | PCB 74 | 18 | ppt |
| 8527 | PCB | PCB 77 | 15 | ppt |
| 8527 | PCB | PCB 99 | 33 | ppt |
| 8527 | PCB | PCB 101 | 37 | ppt |
| 8527 | PCB | PCB 105 | 30 | ppt |
| 8527 | PCB | PCB 110 | 53 | ppt |
| 8527 | PCB | PCB 118 | 31 | ppt |
| 8527 | PCB | PCB 138 | 36 | ppt |

**Table F.6** *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8527 | PCB | PCB 149 | 48 | ppt |
| 8527 | PCB | PCB 153/168 | 67 | ppt |
| 8527 | PCB | PCB 206 | 38 | ppt |
| | | | | |
| 8528 | Chlordane | Alpha(cis)Chlordane | 110 | ppt |
| 8528 | Chlordane | Gamma(trans)Chlordane | 78 | ppt |
| 8528 | Chlordane | TransNonachlor | 42 | ppt |
| 8528 | DDT | o,p-DDT | 41 | ppt |
| 8528 | DDT | p,-p-DDMU | 11 | ppt |
| 8528 | DDT | p,p-DDE | 129 | ppt |
| 8528 | DDT | p,p-DDT | 159 | ppt |
| 8528 | PAH | 2,6-dimethylnaphthalene | 11 | ppb |
| 8528 | PCB | PCB 18 | 12 | ppt |
| 8528 | PCB | PCB 28 | 12 | ppt |
| 8528 | PCB | PCB 44 | 13 | ppt |
| 8528 | PCB | PCB 52 | 13 | ppt |
| 8528 | PCB | PCB 66 | 10 | ppt |
| 8528 | PCB | PCB 70 | 11 | ppt |
| 8528 | PCB | PCB 74 | 9 | ppt |
| 8528 | PCB | PCB 99 | 19 | ppt |
| 8528 | PCB | PCB 138 | 17 | ppt |
| 8528 | PCB | PCB 151 | 13 | ppt |
| 8528 | PCB | PCB 153/168 | 28 | ppt |
| | | | | |
| 8529 | DDT | p,-p-DDMU | 32 | ppt |
| 8529 | DDT | p,p-DDD | 40 | ppt |
| 8529 | DDT | p,p-DDE | 268 | ppt |
| 8529 | PAH | 2,6-dimethylnaphthalene | 11 | ppb |
| 8529 | PAH | Pyrene | 6 | ppb |
| 8529 | PCB | PCB 49 | 17 | ppt |
| 8529 | PCB | PCB 66 | 25 | ppt |
| 8529 | PCB | PCB 70 | 15 | ppt |
| 8529 | PCB | PCB 99 | 29 | ppt |
| 8529 | PCB | PCB 101 | 24 | ppt |
| 8529 | PCB | PCB 110 | 27 | ppt |
| 8529 | PCB | PCB 118 | 34 | ppt |
| 8529 | PCB | PCB 138 | 48 | ppt |
| 8529 | PCB | PCB 149 | 62 | ppt |
| 8529 | PCB | PCB 153/168 | 105 | ppt |
| 8529 | PCB | PCB 180 | 63 | ppt |
| 8529 | PCB | PCB 187 | 48 | ppt |
| 8529 | PCB | PCB 194 | 68 | ppt |
| | | | | |
| 8530 | DDT | p,-p-DDMU | 6 | ppt |
| 8530 | DDT | p,p-DDE | 86 | ppt |
| 8530 | DDT | p,p-DDT | 30 | ppt |
| 8530 | PAH | 2,6-dimethylnaphthalene | 11 | ppb |
| 8530 | PCB | PCB 18 | 8 | ppt |
| 8530 | PCB | PCB 28 | 8 | ppt |
| 8530 | PCB | PCB 37 | 4 | ppt |
| 8530 | PCB | PCB 44 | 11 | ppt |
| 8530 | PCB | PCB 52 | 14 | ppt |
| 8530 | PCB | PCB 66 | 10 | ppt |
| 8530 | PCB | PCB 70 | 11 | ppt |
| 8530 | PCB | PCB 110 | 28 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8530 | PCB | PCB 138 | 19 | ppt |
| 8530 | PCB | PCB 149 | 21 | ppt |
| 8530 | PCB | PCB 187 | 19 | ppt |
| 8531 | DDT | p,-p-DDMU | 26 | ppt |
| 8531 | DDT | p,p-DDD | 23 | ppt |
| 8531 | DDT | p,p-DDE | 218 | ppt |
| 8531 | DDT | p,p-DDT | 67 | ppt |
| 8531 | PAH | 2,6-dimethylnaphthalene | 10 | ppb |
| 8531 | PCB | PCB 28 | 20 | ppt |
| 8531 | PCB | PCB 44 | 13 | ppt |
| 8531 | PCB | PCB 52 | 15 | ppt |
| 8531 | PCB | PCB 66 | 13 | ppt |
| 8531 | PCB | PCB 70 | 14 | ppt |
| 8531 | PCB | PCB 74 | 7 | ppt |
| 8531 | PCB | PCB 118 | 22 | ppt |
| 8531 | PCB | PCB 138 | 29 | ppt |
| 8531 | PCB | PCB 149 | 22 | ppt |
| 8531 | PCB | PCB 153/168 | 35 | ppt |
| 8531 | PCB | PCB 187 | 18 | ppt |
| 8532 | DDT | o,p-DDD | 18 | ppt |
| 8532 | DDT | o,p-DDE | 30 | ppt |
| 8532 | DDT | p,-p-DDMU | 42 | ppt |
| 8532 | DDT | p,p-DDD | 40 | ppt |
| 8532 | DDT | p,p-DDE | 483 | ppt |
| 8532 | DDT | p,p-DDT | 63 | ppt |
| 8532 | PAH | 2,6-dimethylnaphthalene | 11 | ppb |
| 8532 | PCB | PCB 18 | 10 | ppt |
| 8532 | PCB | PCB 28 | 23 | ppt |
| 8532 | PCB | PCB 44 | 16 | ppt |
| 8532 | PCB | PCB 49 | 13 | ppt |
| 8532 | PCB | PCB 52 | 20 | ppt |
| 8532 | PCB | PCB 66 | 26 | ppt |
| 8532 | PCB | PCB 70 | 22 | ppt |
| 8532 | PCB | PCB 74 | 12 | ppt |
| 8532 | PCB | PCB 87 | 25 | ppt |
| 8532 | PCB | PCB 99 | 37 | ppt |
| 8532 | PCB | PCB 101 | 53 | ppt |
| 8532 | PCB | PCB 105 | 30 | ppt |
| 8532 | PCB | PCB 110 | 57 | ppt |
| 8532 | PCB | PCB 118 | 83 | ppt |
| 8532 | PCB | PCB 128 | 37 | ppt |
| 8532 | PCB | PCB 138 | 97 | ppt |
| 8532 | PCB | PCB 149 | 70 | ppt |
| 8532 | PCB | PCB 153/168 | 122 | ppt |
| 8532 | PCB | PCB 158 | 22 | ppt |
| 8532 | PCB | PCB 180 | 42 | ppt |
| 8532 | PCB | PCB 187 | 30 | ppt |
| 8532 | PCB | PCB 206 | 33 | ppt |
| 8533 | Chlordane | Alpha(cis)Chlordane | 76 | ppt |
| 8533 | Chlordane | Gamma(trans)Chlordane | 47 | ppt |
| 8533 | Chlordane | TransNonachlor | 37 | ppt |
| 8533 | DDT | o,p-DDD | 49 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8533 | DDT | o,p-DDE | 52 | ppt |
| 8533 | DDT | p,-p-DDMU | 42 | ppt |
| 8533 | DDT | p,p-DDD | 60 | ppt |
| 8533 | DDT | p,p-DDE | 352 | ppt |
| 8533 | DDT | p,p-DDT | 31 | ppt |
| 8533 | PAH | 2,6-dimethylnaphthalene | 8 | ppb |
| 8533 | PCB | PCB 18 | 18 | ppt |
| 8533 | PCB | PCB 28 | 17 | ppt |
| 8533 | PCB | PCB 44 | 22 | ppt |
| 8533 | PCB | PCB 49 | 22 | ppt |
| 8533 | PCB | PCB 52 | 26 | ppt |
| 8533 | PCB | PCB 66 | 22 | ppt |
| 8533 | PCB | PCB 70 | 22 | ppt |
| 8533 | PCB | PCB 74 | 15 | ppt |
| 8533 | PCB | PCB 77 | 19 | ppt |
| 8533 | PCB | PCB 81 | 14 | ppt |
| 8533 | PCB | PCB 99 | 31 | ppt |
| 8533 | PCB | PCB 101 | 26 | ppt |
| 8533 | PCB | PCB 105 | 20 | ppt |
| 8533 | PCB | PCB 110 | 24 | ppt |
| 8533 | PCB | PCB 118 | 24 | ppt |
| 8533 | PCB | PCB 138 | 41 | ppt |
| 8533 | PCB | PCB 149 | 39 | ppt |
| 8533 | PCB | PCB 153/168 | 60 | ppt |
| 8533 | PCB | PCB 158 | 18 | ppt |
| 8533 | PCB | PCB 187 | 31 | ppt |
| 8534 | DDT | o,p-DDE | 52 | ppt |
| 8534 | DDT | p,-p-DDMU | 54 | ppt |
| 8534 | DDT | p,p-DDE | 562 | ppt |
| 8534 | DDT | p,p-DDT | 42 | ppt |
| 8534 | PAH | 2,6-dimethylnaphthalene | 16 | ppb |
| 8534 | PCB | PCB 28 | 16 | ppt |
| 8534 | PCB | PCB 37 | 7 | ppt |
| 8534 | PCB | PCB 44 | 11 | ppt |
| 8534 | PCB | PCB 49 | 16 | ppt |
| 8534 | PCB | PCB 52 | 11 | ppt |
| 8534 | PCB | PCB 66 | 24 | ppt |
| 8534 | PCB | PCB 70 | 17 | ppt |
| 8534 | PCB | PCB 74 | 9 | ppt |
| 8534 | PCB | PCB 99 | 28 | ppt |
| 8534 | PCB | PCB 101 | 28 | ppt |
| 8534 | PCB | PCB 110 | 38 | ppt |
| 8534 | PCB | PCB 118 | 49 | ppt |
| 8534 | PCB | PCB 138 | 54 | ppt |
| 8534 | PCB | PCB 149 | 44 | ppt |
| 8534 | PCB | PCB 153/168 | 79 | ppt |
| 8534 | PCB | PCB 187 | 30 | ppt |
| 8536 | DDT | o,p-DDE | 36 | ppt |
| 8536 | DDT | p,-p-DDMU | 27 | ppt |
| 8536 | DDT | p,p-DDD | 26 | ppt |
| 8536 | DDT | p,p-DDE | 318 | ppt |
| 8536 | PAH | 2,6-dimethylnaphthalene | 8 | ppb |
| 8536 | PCB | PCB 44 | 11 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8536 | PCB | PCB 49 | 12 | ppt |
| 8536 | PCB | PCB 52 | 10 | ppt |
| 8536 | PCB | PCB 66 | 15 | ppt |
| 8536 | PCB | PCB 70 | 14 | ppt |
| 8536 | PCB | PCB 101 | 15 | ppt |
| 8536 | PCB | PCB 110 | 26 | ppt |
| 8536 | PCB | PCB 118 | 38 | ppt |
| 8536 | PCB | PCB 138 | 38 | ppt |
| 8536 | PCB | PCB 149 | 40 | ppt |
| 8536 | PCB | PCB 153/168 | 60 | ppt |
| 8536 | PCB | PCB 187 | 35 | ppt |
| | | | | |
| 8537 | Chlordane | Alpha(cis)Chlordane | 76 | ppt |
| 8537 | Chlordane | Gamma(trans)Chlordane | 66 | ppt |
| 8537 | Chlordane | Heptachlor | 45 | ppt |
| 8537 | Chlordane | TransNonachlor | 72 | ppt |
| 8537 | DDT | o,p-DDD | 84 | ppt |
| 8537 | DDT | o,p-DDE | 138 | ppt |
| 8537 | DDT | p,-p-DDMU | 113 | ppt |
| 8537 | DDT | p,p-DDD | 146 | ppt |
| 8537 | DDT | p,p-DDE | 1520 | ppt |
| 8537 | DDT | p,p-DDT | 163 | ppt |
| 8537 | PAH | 2,6-dimethylnaphthalene | 23 | ppb |
| 8537 | PAH | 3,4-benzo(B)fluoranthene | 15 | ppb |
| 8537 | PAH | Benzo[A]pyrene | 9 | ppb |
| 8537 | PAH | Benzo[e]pyrene | 10 | ppb |
| 8537 | PAH | Benzo[G,H,I]perylene | 13 | ppb |
| 8537 | PAH | Fluoranthene | 11 | ppb |
| 8537 | PAH | Pyrene | 16 | ppb |
| 8537 | PCB | PCB 44 | 44 | ppt |
| 8537 | PCB | PCB 49 | 57 | ppt |
| 8537 | PCB | PCB 52 | 56 | ppt |
| 8537 | PCB | PCB 66 | 55 | ppt |
| 8537 | PCB | PCB 70 | 56 | ppt |
| 8537 | PCB | PCB 74 | 32 | ppt |
| 8537 | PCB | PCB 81 | 18 | ppt |
| 8537 | PCB | PCB 87 | 52 | ppt |
| 8537 | PCB | PCB 99 | 59 | ppt |
| 8537 | PCB | PCB 101 | 83 | ppt |
| 8537 | PCB | PCB 105 | 53 | ppt |
| 8537 | PCB | PCB 110 | 97 | ppt |
| 8537 | PCB | PCB 118 | 121 | ppt |
| 8537 | PCB | PCB 119 | 25 | ppt |
| 8537 | PCB | PCB 128 | 70 | ppt |
| 8537 | PCB | PCB 138 | 123 | ppt |
| 8537 | PCB | PCB 149 | 122 | ppt |
| 8537 | PCB | PCB 153/168 | 167 | ppt |
| 8537 | PCB | PCB 156 | 31 | ppt |
| 8537 | PCB | PCB 158 | 25 | ppt |
| 8537 | PCB | PCB 180 | 78 | ppt |
| 8537 | PCB | PCB 187 | 52 | ppt |
| 8537 | PCB | PCB 206 | 48 | ppt |
| | | | | |
| 8538 | DDT | p,-p-DDMU | 35 | ppt |
| 8538 | DDT | p,p-DDD | 25 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8538 | DDT | p,p-DDE | 231 | ppt |
| 8538 | PAH | 2,6-dimethylnaphthalene | 9 | ppb |
| 8538 | PCB | PCB 44 | 31 | ppt |
| 8538 | PCB | PCB 49 | 18 | ppt |
| 8538 | PCB | PCB 52 | 61 | ppt |
| 8538 | PCB | PCB 66 | 18 | ppt |
| 8538 | PCB | PCB 70 | 44 | ppt |
| 8538 | PCB | PCB 87 | 52 | ppt |
| 8538 | PCB | PCB 99 | 54 | ppt |
| 8538 | PCB | PCB 101 | 116 | ppt |
| 8538 | PCB | PCB 105 | 44 | ppt |
| 8538 | PCB | PCB 110 | 126 | ppt |
| 8538 | PCB | PCB 118 | 111 | ppt |
| 8538 | PCB | PCB 128 | 28 | ppt |
| 8538 | PCB | PCB 138 | 89 | ppt |
| 8538 | PCB | PCB 149 | 73 | ppt |
| 8538 | PCB | PCB 153/168 | 106 | ppt |
| 8539 | DDT | o,p-DDD | 24 | ppt |
| 8539 | DDT | o,p-DDE | 61 | ppt |
| 8539 | DDT | p,-p-DDMU | 100 | ppt |
| 8539 | DDT | p,p-DDD | 111 | ppt |
| 8539 | DDT | p,p-DDE | 869 | ppt |
| 8539 | PAH | 2,6-dimethylnaphthalene | 19 | ppb |
| 8539 | PAH | 3,4-benzo(B)fluoranthene | 9 | ppb |
| 8539 | PAH | Fluoranthene | 8 | ppb |
| 8539 | PAH | Pyrene | 8 | ppb |
| 8539 | PCB | PCB 49 | 24 | ppt |
| 8539 | PCB | PCB 52 | 25 | ppt |
| 8539 | PCB | PCB 66 | 33 | ppt |
| 8539 | PCB | PCB 70 | 24 | ppt |
| 8539 | PCB | PCB 74 | 17 | ppt |
| 8539 | PCB | PCB 87 | 26 | ppt |
| 8539 | PCB | PCB 99 | 50 | ppt |
| 8539 | PCB | PCB 101 | 62 | ppt |
| 8539 | PCB | PCB 105 | 36 | ppt |
| 8539 | PCB | PCB 110 | 63 | ppt |
| 8539 | PCB | PCB 118 | 58 | ppt |
| 8539 | PCB | PCB 138 | 60 | ppt |
| 8539 | PCB | PCB 149 | 54 | ppt |
| 8539 | PCB | PCB 153/168 | 84 | ppt |
| 8539 | PCB | PCB 187 | 34 | ppt |
| 8540 | DDT | o,p-DDD | 56 | ppt |
| 8540 | DDT | o,p-DDE | 125 | ppt |
| 8540 | DDT | p,-p-DDMU | 119 | ppt |
| 8540 | DDT | p,p-DDD | 163 | ppt |
| 8540 | DDT | p,p-DDE | 1410 | ppt |
| 8540 | DDT | p,p-DDT | 240 | ppt |
| 8540 | PAH | 2,6-dimethylnaphthalene | 26 | ppb |
| 8540 | PAH | 3,4-benzo(B)fluoranthene | 21 | ppb |
| 8540 | PAH | Benzo[A]pyrene | 15 | ppb |
| 8540 | PAH | Benzo[e]pyrene | 16 | ppb |
| 8540 | PAH | Benzo[G,H,I]perylene | 18 | ppb |
| 8540 | PAH | Chrysene | 14 | ppb |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8540 | PAH | Fluoranthene | 23 | ppb |
| 8540 | PAH | Indeno(1,2,3-CD)pyrene | 15 | ppb |
| 8540 | PAH | Perylene | 21 | ppb |
| 8540 | PAH | Pyrene | 29 | ppb |
| 8540 | PCB | PCB 44 | 25 | ppt |
| 8540 | PCB | PCB 49 | 47 | ppt |
| 8540 | PCB | PCB 52 | 49 | ppt |
| 8540 | PCB | PCB 66 | 47 | ppt |
| 8540 | PCB | PCB 70 | 53 | ppt |
| 8540 | PCB | PCB 99 | 54 | ppt |
| 8540 | PCB | PCB 101 | 66 | ppt |
| 8540 | PCB | PCB 105 | 34 | ppt |
| 8540 | PCB | PCB 110 | 77 | ppt |
| 8540 | PCB | PCB 138 | 74 | ppt |
| 8540 | PCB | PCB 149 | 69 | ppt |
| 8540 | PCB | PCB 153/168 | 99 | ppt |
| 8540 | PCB | PCB 187 | 58 | ppt |
| 8542 | DDT | p,-p-DDMU | 21 | ppt |
| 8542 | DDT | p,p-DDD | 24 | ppt |
| 8542 | DDT | p,p-DDE | 271 | ppt |
| 8542 | PAH | 2,6-dimethylnaphthalene | 11 | ppb |
| 8542 | PCB | PCB 18 | 12 | ppt |
| 8542 | PCB | PCB 28 | 16 | ppt |
| 8542 | PCB | PCB 44 | 20 | ppt |
| 8542 | PCB | PCB 49 | 20 | ppt |
| 8542 | PCB | PCB 52 | 24 | ppt |
| 8542 | PCB | PCB 66 | 19 | ppt |
| 8542 | PCB | PCB 70 | 19 | ppt |
| 8542 | PCB | PCB 74 | 14 | ppt |
| 8542 | PCB | PCB 99 | 28 | ppt |
| 8542 | PCB | PCB 101 | 36 | ppt |
| 8542 | PCB | PCB 105 | 22 | ppt |
| 8542 | PCB | PCB 110 | 41 | ppt |
| 8542 | PCB | PCB 118 | 50 | ppt |
| 8542 | PCB | PCB 138 | 47 | ppt |
| 8542 | PCB | PCB 149 | 40 | ppt |
| 8542 | PCB | PCB 153/168 | 77 | ppt |
| 8542 | PCB | PCB 187 | 28 | ppt |
| 8547 | DDT | o,p-DDD | 18 | ppt |
| 8547 | DDT | o,p-DDE | 77 | ppt |
| 8547 | DDT | p,-p-DDMU | 94 | ppt |
| 8547 | DDT | p,p-DDD | 74 | ppt |
| 8547 | DDT | p,p-DDE | 1130 | ppt |
| 8547 | DDT | p,p-DDT | 57 | ppt |
| 8547 | PAH | 2,6-dimethylnaphthalene | 15 | ppb |
| 8547 | PCB | PCB 18 | 20 | ppt |
| 8547 | PCB | PCB 28 | 33 | ppt |
| 8547 | PCB | PCB 37 | 14 | ppt |
| 8547 | PCB | PCB 44 | 19 | ppt |
| 8547 | PCB | PCB 49 | 28 | ppt |
| 8547 | PCB | PCB 52 | 21 | ppt |
| 8547 | PCB | PCB 66 | 38 | ppt |
| 8547 | PCB | PCB 70 | 27 | ppt |

## Table F.6 *continued*

| Station | Class | Constituent | Value | Units |
|---|---|---|---|---|
| 8547 | PCB | PCB 74 | 15 | ppt |
| 8547 | PCB | PCB 99 | 45 | ppt |
| 8547 | PCB | PCB 101 | 38 | ppt |
| 8547 | PCB | PCB 105 | 27 | ppt |
| 8547 | PCB | PCB 110 | 44 | ppt |
| 8547 | PCB | PCB 118 | 59 | ppt |
| 8547 | PCB | PCB 138 | 64 | ppt |
| 8547 | PCB | PCB 149 | 71 | ppt |
| 8547 | PCB | PCB 153/168 | 95 | ppt |
| 8547 | PCB | PCB 187 | 46 | ppt |

## Table F.7

Macrofaunal community parameters calculated for the 2016 San Diego regional benthic stations. SR = species richness; Abun = abundance; H' = Shannon diversity index; J' = Pielou's evenness; Dom = Swartz dominance; BRI = benthic response index; n = 1 grab per station.

| | Station | Depth (m) | SR | Abun | H' | J' | Dom | BRI [a] |
|---|---|---|---|---|---|---|---|---|
| *Inner Shelf* | 8513 | 5 | 14 | 73 | 1.9 | 0.73 | 4 | — |
| | 8501 | 17 | 55 | 170 | 3.0 | 0.75 | 17 | 23 |
| | 8514 | 18 | 40 | 125 | 2.9 | 0.79 | 13 | 24 |
| | 8515 | 20 | 42 | 159 | 2.8 | 0.76 | 13 | 23 |
| | 8522 | 22 | 22 | 207 | 1.9 | 0.61 | 3 | -3 |
| | 8505 | 26 | 76 | 336 | 2.7 | 0.63 | 18 | 23 |
| *Mid-Shelf* | 8508 | 34 | 133 | 830 | 3.3 | 0.67 | 24 | 23 |
| | 8502 | 35 | 85 | 460 | 3.0 | 0.68 | 17 | 22 |
| | 8533 | 36 | 23 | 67 | 2.5 | 0.79 | 8 | 4 |
| | 8538 | 37 | 53 | 155 | 3.6 | 0.90 | 22 | 24 |
| | 8529 | 45 | 90 | 442 | 3.8 | 0.84 | 30 | 20 |
| | 8506 | 48 | 39 | 94 | 3.3 | 0.91 | 17 | 24 |
| | 8525 | 48 | 94 | 363 | 3.8 | 0.84 | 35 | 17 |
| | 8530 | 52 | 110 | 512 | 3.9 | 0.83 | 31 | 13 |
| | 8517 | 57 | 93 | 428 | 3.5 | 0.77 | 23 | 14 |
| | 8523 | 81 | 47 | 191 | 3.0 | 0.79 | 13 | 8 |
| | 8518 | 85 | 48 | 155 | 3.3 | 0.86 | 19 | 11 |
| | 8534 | 85 | 58 | 209 | 3.4 | 0.84 | 19 | 14 |
| | 8507 | 91 | 83 | 243 | 4.0 | 0.91 | 34 | 3 |
| | 8503 | 92 | 62 | 188 | 3.6 | 0.88 | 24 | 4 |
| | 8531 | 100 | 62 | 153 | 3.7 | 0.90 | 26 | 7 |
| | 8526 | 101 | 63 | 186 | 3.7 | 0.89 | 25 | 11 |
| | 8509 | 108 | 89 | 209 | 4.2 | 0.93 | 42 | 11 |
| | 8539 | 112 | 62 | 392 | 3.3 | 0.79 | 16 | 23 |
| | 8528 | 120 | 62 | 167 | 3.5 | 0.85 | 22 | 21 |
| *Outer Shelf* | 8524 | 123 | 73 | 278 | 3.6 | 0.83 | 21 | 14 |
| | 8536 | 135 | 53 | 222 | 3.2 | 0.81 | 14 | 16 |
| | 8520 | 138 | 64 | 285 | 3.3 | 0.80 | 15 | 17 |
| | 8519 | 142 | 57 | 211 | 3.3 | 0.83 | 17 | 16 |
| | 8542 | 147 | 79 | 161 | 4.0 | 0.92 | 39 | 8 |
| | 8547 | 156 | 58 | 261 | 3.4 | 0.83 | 18 | 19 |
| | 8504 | 171 | 66 | 223 | 3.6 | 0.86 | 22 | 16 |
| | 8532 | 178 | 37 | 172 | 3.2 | 0.87 | 14 | 18 |
| | 8510 | 195 | 60 | 154 | 3.6 | 0.88 | 24 | 15 |
| | 8516 | 200 | 29 | 63 | 3.1 | 0.91 | 14 | 22 |
| *Upper Slope* | 8512 | 240 | 40 | 87 | 3.2 | 0.86 | 19 | — |
| | 8521 | 340 | 26 | 40 | 3.1 | 0.96 | 17 | — |
| | 8527 | 350 | 25 | 43 | 3.1 | 0.95 | 15 | — |
| | 8537 | 350 | 33 | 67 | 3.1 | 0.90 | 17 | — |
| | 8540 | 437 | 18 | 55 | 2.3 | 0.81 | 7 | — |

[a] BRI statistic not calculated for stations located at depths ≤5 m or >200 m

## Table F.8

Most abundant macroinvertebrate species per depth stratum collected at the 2016 San Diego regional benthic stations. Data include 10 most abundant species by total abundance per stratum. PA = percent abundance; FO = frequency occurrence; M/O = mean abundance per occurrence; M/G = mean abundance per grab.

| Strata | Species | Taxonomic Classification | PA | FO | M/O | M/G |
|---|---|---|---|---|---|---|
| *Inner Shelf* | *Spiophanes norrisi* | Polychaeta: Spionidae | 28 | 67 | 74 | 49 |
| | *Micranellum crebricinctum* | Mollusca: Gastropoda | 6 | 17 | 64 | 11 |
| | *Halistylus pupoideus* | Mollusca: Gastropoda | 6 | 17 | 59 | 10 |
| | *Mediomastus* sp | Polychaeta: Capitellidae | 4 | 67 | 11 | 7 |
| | *Pista wui* | Polychaeta: Terebellidae | 4 | 50 | 14 | 7 |
| | Gastropoda[a] | Mollusca: Gastropoda | 3 | 17 | 36 | 6 |
| | *Rhepoxynius menziesi* | Arthropoda: Amphipoda | 3 | 67 | 8 | 5 |
| | *Ampharete labrops* | Polychaeta: Ampharetidae | 2 | 67 | 6 | 4 |
| | *Dendraster excentricus* | Echinodermata: Echinoidea | 2 | 17 | 20 | 3 |
| | Trochoidea[a] | Mollusca: Gastropoda | 2 | 17 | 20 | 3 |
| *Mid-shelf* | *Spiophanes duplex* | Polychaeta: Spionidae | 10 | 95 | 29 | 28 |
| | *Spiophanes norrisi* | Polychaeta: Spionidae | 9 | 42 | 64 | 27 |
| | *Amphiodia urtica* | Echinodermata: Ophiuroidea | 5 | 58 | 23 | 14 |
| | *Eclysippe trilobata* | Polychaeta: Ampharetidae | 3 | 74 | 13 | 9 |
| | Euclymeninae sp B | Polychaeta: Maldanidae | 3 | 74 | 12 | 9 |
| | *Axinopsida serricata* | Mollusca: Bivalvia | 3 | 53 | 15 | 8 |
| | *Prionospio (Prionospio) dubia* | Polychaeta: Spionidae | 2 | 84 | 8 | 7 |
| | *Mediomastus* sp | Polychaeta: Capitellidae | 2 | 84 | 6 | 5 |
| | *Sternaspis affinis* | Polychaeta: Sternaspidae | 2 | 63 | 7 | 4 |
| | Euclymeninae | Polychaeta: Maldanidae | 1 | 68 | 6 | 4 |
| *Outer Shelf* | *Axinopsida serricata* | Mollusca: Bivalvia | 11 | 100 | 22 | 22 |
| | *Spiophanes kimballi* | Polychaeta: Spionidae | 7 | 80 | 19 | 15 |
| | *Nuculana* sp A | Mollusca: Bivalvia | 7 | 80 | 18 | 14 |
| | *Tellina carpenteri* | Mollusca: Bivalvia | 6 | 100 | 12 | 12 |
| | *Mediomastus* sp | Polychaeta: Capitellidae | 4 | 80 | 11 | 8 |
| | *Petaloclymene pacifica* | Polychaeta: Maldanidae | 4 | 80 | 9 | 7 |
| | *Eclysippe trilobata* | Polychaeta: Ampharetidae | 3 | 70 | 7 | 5 |
| | *Adontorhina cyclia* | Mollusca: Bivalvia | 2 | 60 | 7 | 4 |
| | *Amphiodia urtica* | Echinodermata: Ophiuroidea | 2 | 60 | 7 | 4 |
| | *Chaetozone hartmanae* | Polychaeta: Cirratulidae | 2 | 50 | 8 | 4 |

[a] Unidentified distinct species

**Table F.8** *continued*

| Strata | Species | Taxonomic Classification | PA | FO | M/O | M/G |
|---|---|---|---|---|---|---|
| *Upper* | *Maldane sarsi* | Polychaeta: Maldanidae | 10 | 100 | 6 | 6 |
| *Slope* | *Phyllochaetopterus limicolus* | Polychaeta: Chaetopteridae | 8 | 60 | 8 | 5 |
| | *Lirobittium calenum* | Mollusca: Gastropoda | 5 | 20 | 16 | 3 |
| | *Aphelochaeta monilaris* | Polychaeta: Cirratulidae | 5 | 80 | 4 | 3 |
| | *Lirobittium paganicum* | Mollusca: Gastropoda | 3 | 20 | 10 | 2 |
| | *Mediomastus* sp | Polychaeta: Capitellidae | 3 | 40 | 5 | 2 |
| | *Ancistrosyllis groenlandica* | Polychaeta: Pilargidae | 2 | 60 | 2 | 1 |
| | *Cadulus californicus* | Mollusca: Scaphopoda | 2 | 100 | 1 | 1 |
| | *Limifossor fratula* | Mollusca: Caudofoveata | 2 | 60 | 2 | 1 |
| | *Compressidens stearnsii* | Mollusca: Scaphopoda | 2 | 40 | 3 | 1 |
| | *Fauveliopsis glabra* | Polychaeta: Fauveliopsidae | 2 | 20 | 5 | 1 |
| | *Nuculana conceptionis* | Mollusca: Bivalvia | 2 | 80 | 1 | 1 |
| | *Phoronis* sp | Phoronidae | 2 | 20 | 5 | 1 |
| | *Spiophanes kimballi* | Polychaeta: Spionidae | 2 | 60 | 2 | 1 |