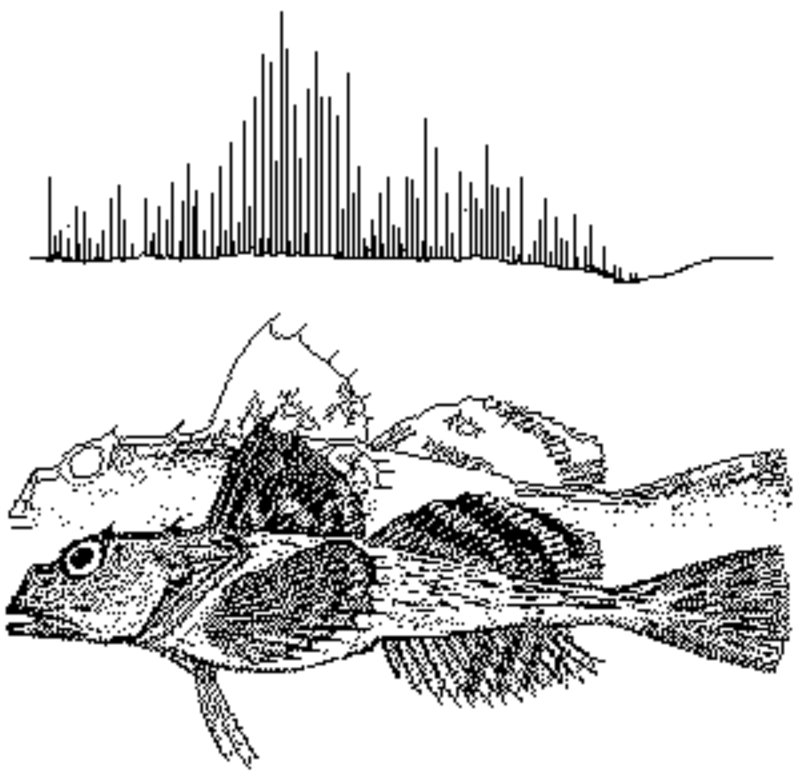
NOAA Technical Memorandum NOS ORCA 98

National Status and Trends Program
for Marine Environmental Quality

National Status and Trends Program Specimen Bank: Sampling Protocols, Analytical Methods, Results, and Archive Samples



Silver Spring, Maryland
August 1996

US Department of Commerce

noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Coastal Monitoring and Bioeffects Assessment Division
Office of Ocean Resources Conservation and Assessment
National Ocean Service

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Silver Spring, MD 20910

Notice

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National Status and Trends Program Specimen Bank: Sampling Protocols, Analytical Methods, Results, and Archive Samples

G. G. Lauenstein, A. Y. Cantillo, B. J. Koster, M. M. Schantz, S. F. Stone, R. Zeisler, and S. A. Wise

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United States Department of Commerce	National Oceanic and Atmospheric Administration	National Ocean Service
Michael Kantor Secretary	D. James Baker Under Secretary	W. Stanley Wilson Assistant Administrator

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CMBAD	Coastal Monitoring and Bioeffects Assessment Division/ORCA/NOS/NOAA
CRM	Certified reference material
DDTs	Dichlorophenyltrichloroethane and metabolites
ECD	Electron capture detection
EPA	U.S. Environmental Protection Agency
FDA	U.S. Food and Drug Administration
FID	Flame ionization detection
GC	Gas chromatography
GERG	Geochemical and Environmental Research Group/TAMU
IAEA	International Atomic Energy Agency (Austria)
INAA	Instrumental neutron activation analysis
LC	Liquid chromatography
L P E	Linear polyethylene
MS	Mass spectrometry
MSD	Mass selective detector
NBSB	National Biomonitoring Specimen Bank/NIST
NCI	National Cancer Institute
NIES	National Institute for Environmental Studies (Japan)
NIST	National Institute of Standards and Technology (formerly National Bureau of Standards)
NMFS	National Marine Fisheries Service/NOAA
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service/NOAA
NRC	National Research Council (Canada)
NS&T	NOAA National Status and Trends Program
ORCA	Office of Ocean Resources Conservation and Assessment/NOS/NOAA
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PGAA	Prompt gamma activation analysis
PWS	Prince William Sound
SRM	Standard Reference Material
TAMU	Texas A&M University
XRF	X-ray fluorescence

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ABSTRACT

The National Oceanic and Atmospheric Administration's (NOAA) National Status and Trends (NS&T) Program monitoring components, the National Benthic Surveillance and Mussel Watch Projects, have archived tissues and sediments in a specimen bank since 1985 and 1986, respectively. Additional samples were archived after the Exxon Valdez oil spill in Prince William Sound, Alaska. Samples from the Environmental Protection Agency's Mussel Watch Program, collected from 1976 to 1978, were added to the NS&T Specimen Bank in 1992. In the first years of the NS&T Specimen Bank project, selected specimens from the bank were homogenized and subsamples were analyzed as well as archived for long term storage. Contaminant analyses were performed to provide additional data on environmental quality and to ensure that data existed for sample stability studies. Samples in the NS&T Specimen Bank are available for retrospective analyses should a contaminant or group of contaminants be identified that were introduced into the environment during the years of the NS&T Program or during the EPA's Mussel Watch Program but that were not previously measured.

1. INTRODUCTION

The National Oceanic and Atmospheric Administration (NOAA) initiated the National Status and Trends (NS&T) Program in 1984 as a result of concerns about the condition of the Nation's coastal and estuarine ecosystems. The goal of the NS&T Program is to determine the current status and temporal trends of the environmental quality of U.S. coastal and estuarine waters. The NS&T program has had two monitoring components: the National Benthic Surveillance and Mussel Watch Projects. The major activity of these monitoring components is to monitor concentrations of inorganic and organic contaminants in benthic fish, shellfish, and sediments at over 300 sites along the U.S. coastline. The results of the monitoring components have been reported in detail in several publications (e.g., NOAA, 1987; NOAA, 1989; NOAA, 1991; O'Connor and Ehler, 1991; O'Connor *et al.*, 1994, O'Connor and Beliaeff (1995); Lauenstein, 1995). The National Benthic Surveillance Project started in 1984 with the sampling of benthic fish and sediments at 50 coastal and estuarine sites in the U.S. Sample collections occurred annually within the National Benthic Surveillance Project through 1993, and samples have now been obtained from over 140 different sites. The Mussel Watch Project started in 1986 with sampling of mussels or oysters, and sediments at 158 sites in the U.S. Samples have now been collected from over 250 different sites as part of the Mussel Watch Project.

The NS&T Program's Mussel Watch Project (the current monitoring project) monitors the concentrations of selected organic and inorganic contaminants (Tables 1 and 2) including polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), chlorinated pesticides, and trace elements. The contaminants monitored in the NS&T program were selected because they were identified by the scientific community to be of particular concern, and as a result are listed on the Environmental Protection Agency's Priority Pollutant list (Keith and Telliard, 1979). Since no monitoring program can identify and quantify all the PAHs, PCBs, chlorinated pesticides, organophosphate pesticides, organometallic contaminants, as well as other environmental contaminants, it is prudent to maintain a specimen bank so that retrospective analyses are possible. If measurable levels of a previously unquantified hazardous chemical are found in the environment, questions arise such as: When did the compound first enter the environment? Where did it come from? Is it increasing or decreasing in concentration? In addition, are there hazardous chemicals in the environment that are currently unknown (i.e., new pollutants)? Many of these questions could be answered if well-documented and carefully collected and preserved environmental specimens from the past were available.

The concept of environmental specimen banking, i.e., the long-term storage of biological specimens for retrospective analysis, has received increasing attention over the past decade as an important complement to traditional environmental pollution monitoring. A specimen bank containing well-preserved and documented environmental samples provides a valuable resource for retrospective analysis as analytical techniques improve or as concerns about as-yet unidentified pollutants arise. An environmental specimen bank provides the opportunity for retrospective analyses: (1) to measure "new" contaminants that were overlooked or unknown during the real-time monitoring, (2) to use improved analytical methods, and (3) to verify previous results. The availability of banked samples that were collected at regular intervals over several decades allows long-term trend monitoring with data generated using "comparable" analytical techniques. Environmental samples archived informally as part of monitoring programs have been found to be useful in past studies. For example, in the case of Kepone in the James River in Virginia, banked specimens were used to help establish when this chemical first entered the river (Huggett *et al.*, 1980). In the Great Lakes, retrospective analyses of herring gull eggs collected in 1971 and stored in a specimen bank until 1980, were used to confirm a decrease in the levels of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (Elliott *et al*., 1988). In both of these examples, the chemicals of interest were new or unknown pollutants at the time the samples were collected, but have since become national concerns in the environment. Several international workshops (Berlin *et al.*, 1979; Luepke 1979; Lewis *et al.*, 1984; and Wise and Zeisler 1985) were held in the 1970's and early 1980's to discuss the need for and the requirements of specimen banking activities. During this period, several countries established and implemented formal specimen banking programs. In 1979, the National Bureau of Standards [presently the National Institute of Standards and Technology (NIST)], in conjunction with the U.S. Environmental Protection Agency (EPA), established a pilot Environmental Specimen Bank Program to investigate the feasibility of long-term storage of environmental samples. The goals and the development of the NIST pilot Environmental Specimen Bank Program have been described in detail in previous publications and summarized in a review by Wise and Zeisler (1984). The pilot effort was originally intended to focus on four types of samples: human tissue, marine organisms and sediment, human food, and atmospheric samples. Human liver specimens were selected as the first sample type to be included in the pilot study; however, this pilot specimen bank project has now expanded to include other specimen types in a variety of projects. These different specimen banking activities at NIST are known collectively as the National Biomonitoring Specimen Bank (NBSB) and are described in several papers (Wise *et al.*, 1989; Zeisler *et al.*, 1992; Wise *et al.*, 1993; and Wise and Koster, 1994) and summarized briefly in Appendix A.

A specimen banking component was incorporated into the NS&T Program in 1985 in conjunction with the National Biomonitoring Specimen Bank at NIST (Lauenstein and Calder, 1988; Wise *et al.*, 1989; and Wise *et al., 1993*). The addition of this project to the NIST specimen banking activities helped to establish a marine specimen component within the NBSB and fulfill one of the goals of the pilot environmental specimen bank program.

2. NATIONAL STATUS AND TRENDS MONITORING PROJECTS

The National Benthic Surveillance Project was a cooperative effort NOAA's National Ocean Service (NOS) and NOAA's National Marine Fisheries Service (NMFS). The project was coordinated by the Coastal Monitoring and Bioeffects Assessment Division (CMBAD) of NOS's Office of Ocean Resources Conservation and Assessment (ORCA) and the field collections and laboratory analyses were performed by NOAA/NMFS. The National Benthic Surveillance Project collected fish and associated sediment samples annually from 1984 to 1993. Initially, samples were collected and analyzed from 50 sites around the U.S. coasts, including Alaska. By 1990, samples had been collected from 149 sites (Lauenstein *et al.*, 1993). Samples of fish and sediment from the National Benthic Surveillance Project were analyzed in NMFS laboratories in Gloucester, MA; Sandy Hook, NJ; Beaufort, NC; Charleston, SC; and Seattle, WA.

During the years 1986 through 1994, sampling and analysis of the shellfish and sediments (as part of the Mussel Watch Project) were conducted under contract by Battelle Ocean Sciences (East and West coasts) and Texas A&M University (TAMU) (Gulf Coast). Since 1995 samples from all three major U.S. coasts have been collected and samples analyzed by TAMU. During the first project year 158 sites were sampled, 145 of which supplied mollusks. The Mussel Watch Project has now increased its monitoring effort to over 250 sites (Lauenstein *et al.*, 1993) half of which are sampled and analyzed each year.

Information detailing the sampling and analytical methods for the National Benthic Surveillance and Mussel Watch Projects have been published by Lauenstein and Cantillo (1993).

3. SAMPLE COLLECTION AND STORAGE PROTOCOLS FOR SPECIMEN BANKING

3.1 Sample Collection

The purpose of a specimen bank is the long-term preservation of specimens that are representative of the state of a site or organism immediately prior to collection. Therefore, a major concern of specimen banking efforts is that the samples be collected, processed, and stored under conditions that avoid or minimize contamination of the specimens or other changes in their chemical composition. Most environmental samples contain low levels of inorganic and organic contaminants. Because these specimens are intended for long-term storage, which implies costs associated with maintaining the specimens, extreme caution must be exercised to ensure that contaminants are not artificially added. Sample collection protocols for mussel/oyster and sediment samples from the Mussel Watch Project and for sediment and fish muscle and liver tissues from the National Benthic Surveillance Project were developed specifically for the NS&T Specimen Bank. These protocols were described in Lauenstein *et al.*, (1987) and have been modified during the program. The current sample collection protocols are provided in Appendices B and C.

The basic strategy for the development of these protocols calls for: (1) the collection of duplicate samples, (2) the use of clean materials (or materials that minimize potential contamination) for any contact with the sample, and (3) freezing the sample as soon as possible after collection to minimize sample degradation. This approach was patterned after the original human liver protocol developed for the Pilot Environmental Specimen Bank project (Zeisler *et al.*, 1983). A sample amount of approximately 150 g was selected as sufficient quantity to allow multiple analyses over a long period of time. The collection of two equivalent samples of 150 g provides one specimen for analyses and one for permanent storage. Special materials are used for all contact with the sample to minimize potential contamination. For example, when samples required dissection (e.g., in the case of fish tissues), a titanium-bladed knife or scalpel was used to avoid adding environmentally important trace elements (e.g., Ni, Cr, and Fe) found in conventional cutting instruments. During sample preparation, contact with the specimen was generally limited to clean, dust-free Teflon surfaces and the specimens were stored in pre-cleaned Teflon bags or jars. After the specimens were placed in the storage containers, they were frozen on dry ice or in liquid nitrogen as soon as possible and transported to the specimen bank facility at NIST where they are stored in liquid nitrogen vapor phase freezers at -150 °C. The protocols for the collection of samples for the NS&T Specimen Bank were developed in conjunction with individuals involved in the NS&T sampling to achieve a suitable non-contaminating procedure within the bounds of practicality. As part of the sampling protocol, information describing the sample and the sampling site were recorded (see sampling forms in Appendices A and B); this information is maintained, both in hard copy and in a computer database, as part of the documentation for each sample in the NS&T Specimen Bank.

The sampling methods for the NS&T monitoring program have been summarized by Lauenstein and Cantillo (1993). For the Mussel Watch Project, samples of bivalves and sediment were collected at three stations within a site. For the National Benthic Surveillance Project, sediment samples were also collected at three stations within each site; however, for the fish tissue samples, fish were collected from one or more trawls at each site and analyses were performed on three composites of 10 fish each. Samples for the NS&T Specimen Bank were collected using procedures similar to those used to collect samples in the NS&T monitoring program. The specimen bank samples were pooled from subsamples taken at the three stations within a site, i.e., the samples should be representative of the average of the three stations. The fish tissue specimens for the specimen bank project were a composite of fish (30 to 200 depending on size) collected at the NS&T site. For the Mussel Watch portion of the Specimen Bank, each station provides two batches of approximately 16-18 mussels (*Mytilus edulis*/*M. californianus*) or two batches of 10 oysters (*Crassostrea virginica*), one batch designated as A and the other as B. Since there are three stations per site, the total combined sample for each site is 50 mussels or 30 oysters for each of the A and B duplicates (total of 100 mussels and 60 oysters).

3.2 Sample Archival

Samples are received at NIST either in biological, dry, liquid nitrogen shippers (fish tissues and sediments from the National Benthic Surveillance Project) or in styrofoam shippers containing dry ice (bivalve mollusks and sediment from the Mussel Watch Project) and transported to the NBSB facility. The samples are unpacked and the samples are inspected for any packaging problems and for unsuitable temperature. Sample data forms and sample labels are compared to insure that they correspond and that all information has been included. These samples are then placed in a liquid nitrogen vapor phase freezer for temporary storage and are logged into the temporary storage log book. They remain in the temporary storage until assigned an NBSB number and permanent liquid nitrogen freezer space.

When the samples are moved into the permanent freezer location, a storage form, which contains storage location information, is completed, and the information is entered into the inventory form on the NBSB micro-computer. The sediment and fish tissue samples, which are in Teflon jars, are placed in cylindrical cardboard tubes (6.0 cm dia x 63.5 cm long); each tube holds up to five samples. The bivalve samples are organized in stainless steel baskets in the freezer. The B batches of the bivalves are shucked while frozen and the tissue placed in Teflon jars (350 mL or 1000 mL) to reduce the required storage space and in preparation for analysis of selected samples. All samples remain in the liquid nitrogen freezer at approximately -150 °C until they are requested for analysis. Due to space limitation, the A batches have now been shucked using the same protocol as the B batches.

The duplicate samples of each specimen (Batches A and B, see protocol for details) collected for the specimen bank project are stored in different liquid nitrogen freezers to provide additional security. Sample A is intended for long-term storage while sample B is available for analyses (see Section 4.4 and Specimen Bank Access Policy requirements in Appendix D).

3.3 Homogenization of Specimens

The preparation of homogeneous sample aliquots from the bulk samples is a major requirement for specimen banking. Homogeneous sample aliquots are necessary to allow for valid comparison of analytical techniques and evaluation of the stability of specimens during storage. To address this requirement, a cryogenic homogenization procedure was developed using Teflon disk mills (Zeisler *et al.*, 1983). These mills are capable of homogenizing 50 g to 700 g samples to provide homogeneous frozen samples with greater than 90% of the particles less than 0.46 mm in diameter and with subsampling errors due to inhomogeneity estimated at less than 2%. Since the initial evaluation and report describing this procedure (Zeisler *et al.*, 1983), this technique has been used successfully for the homogenization of a variety of specimen types including: human liver and hair, mussel and oyster tissues, fish tissues (liver and muscle), honey bees, marine mammal tissues (liver, kidney, muscle, and blubber), chicken tissue, and total human diet composites. The cryogenic grinding procedure uses Teflon mills to minimize contamination and eliminate the risk of potential changes in the sample associated with thawing and re-freezing.

The tissue samples from the NS&T program (mussels/oyster tissue and fish liver and muscle tissue) are cryogenically homogenized using the procedure described above. The tissue homogenate is aliquoted into approximately 10 15-mL Teflon jars (approximately 7 g to 10 g of homogenate per jar) and 2 to 3 90-mL Teflon jars (~30 g per jar) for storage. For the sediment samples, the frozen material is allowed to thaw at room temperature and then thoroughly mixed with a Teflon stirring rod. After mixing, the sediment is aliquoted into four 90-mL Teflon jars. These subsamples of homogenized tissue and sediment are then available for analyses both within and outside the NOAA NS&T Specimen Bank project (see Specimen Access Policy, Appendix D).

4. INVENTORY OF THE NS&T SPECIMEN BANK

4.1 Mussel Watch and National Benthic Surveillance Projects

The NS&T Specimen Bank Project was designed to collect and archive specimens of fish tissue and sediment from the National Benthic Surveillance Project and specimens of mussel/oyster tissue and sediment from the Mussel Watch Project. From 1985 to 1992, specimens were collected for the specimen bank from approximately 30 Mussel Watch Project sites and 3 to 5 National Benthic Surveillance Project sites per year. These specimens were collected at the same time as the regular NS&T samples for monitoring were collected using the sampling protocols described in Appendices B and C.

The initial strategy of the NS&T specimen banking component was to obtain baseline samples from all of the sampling sites and then to collect additional samples at approximately five year intervals to provide the opportunity to monitoring long-term trends. The sampling rate of 30 Mussel Watch sites per year was based on the original 150 Mussel Watch sites to provide a bank of specimens from all the sites after five years. However, the number of sites in the Mussel Watch Project has increased from the original 158 sites to over 250 sites at the present time. In 1992, regular collection of specimens for the NS&T specimen bank was discontinued. At the present time, the NS&T specimen bank contains the following specimens from the Mussel Watch and National Benthic Surveillance Projects: mussels/oysters from 206 sites and sediments from 163 sites within the Mussel Watch Project; fish tissue (liver and muscle) from 32 sites and sediments from 36 sites within the National Benthic Surveillance Project. The current inventory of samples from the Mussel Watch Project and the National Benthic Surveillance Project is summarized in Tables E.1 and E.2 (Appendix E), respectively. These inventories include information concerning the site location, date collected, and the sample type (sediment or bivalve species).

The locations of Mussel Watch Project sites from which specimens are archived in the NS&T Specimen Bank are illustrated in the map in Figure 1. The locations of the National Benthic Surveillance Project sites from which specimens are archived is shown in Figure 2. Because of the large number of Mussel Watch and National Benthic Surveillance sites, more detailed maps are provided in Figures 3 - 16 for Mussel Watch sites and Figures 17 - 19 for National Benthic Surveillance sites.

4.2 Exxon Valdez Damage Assessment Specimens

In September, 1989 following the Exxon Valdez oil spill in the Prince William Sound of Alaska, specimens of sediment, fish muscle, fish liver, and fish eggs were collected at 4 sites and specimens of mussels were collected at 17 sites within the Prince William Sound for inclusion in the NS&T Specimen Bank. An inventory of these specimens is provided in Table E.3. A map of the Prince William Sound in Alaska is shown in Figure 20 showing the location of these sampling sites.

4.3 EPA Mussel Watch Specimens

From 1976 to 1978, the U.S. Environmental Protection Agency (EPA) conducted a Mussel Watch program to monitor contaminants around the U.S. coasts (Farrington, 1983). Samples of mussels and oysters were collected during this period from 100 sites. Not all of the sample material collected was analyzed during the project and the excess material was stored in freezers at the EPA laboratory in Narragansett, Rhode Island. In 1992, the archived EPA Mussel Watch specimens from 1976 - 1978 were offered to the NOAA NS&T program. Since many of the current NS&T Mussel Watch Project sites correspond to the original EPA Mussel Watch sites, these samples were of interest to NOAA for both reanalyses and continued archiving. The EPA samples were removed from the EPA freezers and shipped to the NBSB for inclusion in the NS&T Specimen Bank.

Farrington *et al.*, (1982) and Farrington (1983) indicated that samples from the EPA Mussel Watch Program were kept frozen at -10 °C to -20 °C until analyzed. The specimens were stored at this same temperature over the next 15 years. Some samples had desiccated as a result of thawing and refreezing and these were discarded. Samples collected for trace element analyses had been placed in double plastic bags and samples collected for organic analyses were wrapped in aluminum foil and then placed in plastic bags. Samples had been labeled by placing small cards with site information between the two plastic bags or between the samples in aluminum foil and their plastic bag. Labels were still legible after 15 years, but over this period the aluminum foil in all organic samples had turned to powder that adhered to the mussel and oyster samples. As a result, all of the samples intended for organic analysis were discarded and only specimens originally packaged for trace element analyses were transferred to the NBSB. An inventory of the samples from the EPA Mussel Watch Project that are currently stored in the NS&T Specimen Bank is provided in Table E.4 and the site locations are shown in Figure 21.

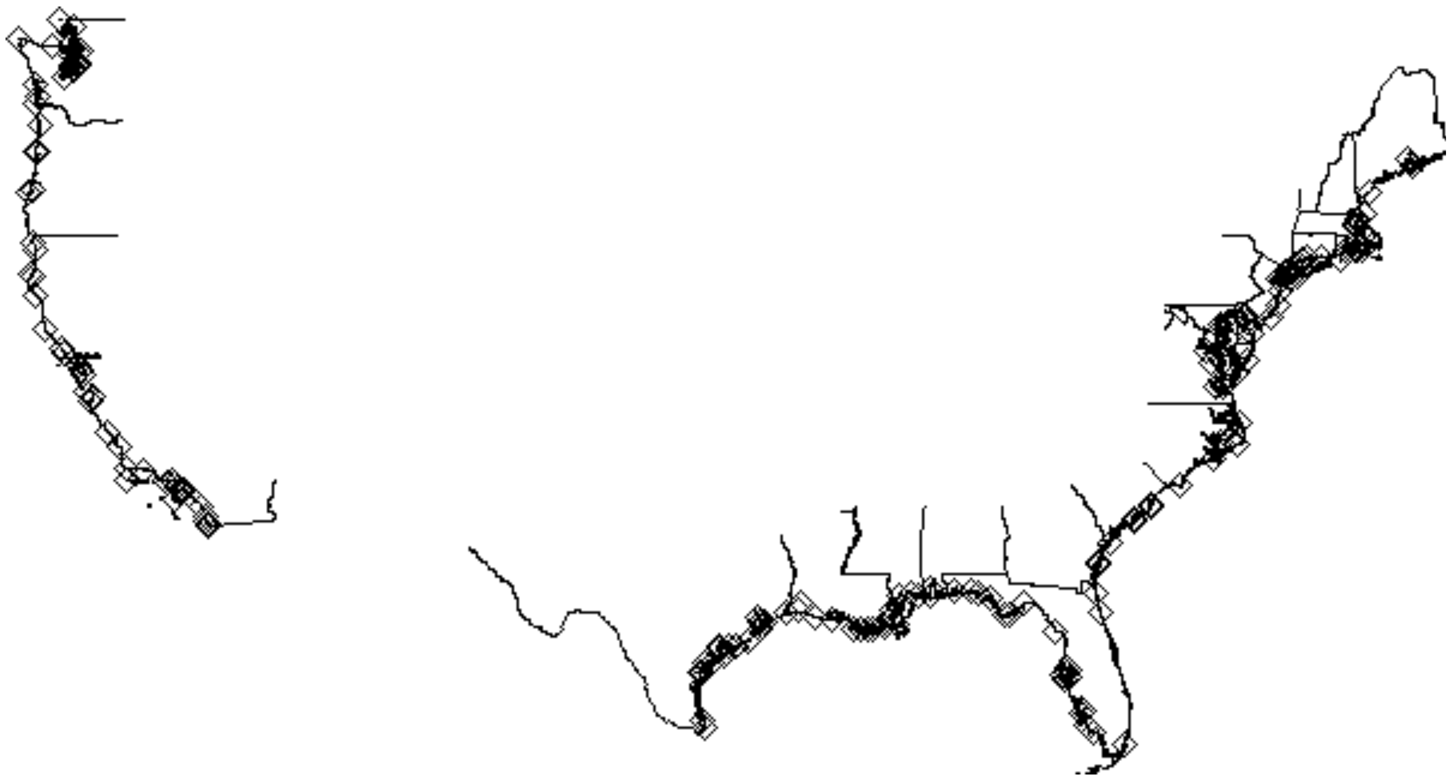

Figure 1. Archived Mussel Watch Project sites nationwide for which sample were archived.

Figure 2. Benthic Surveillance Project sites nationwide.

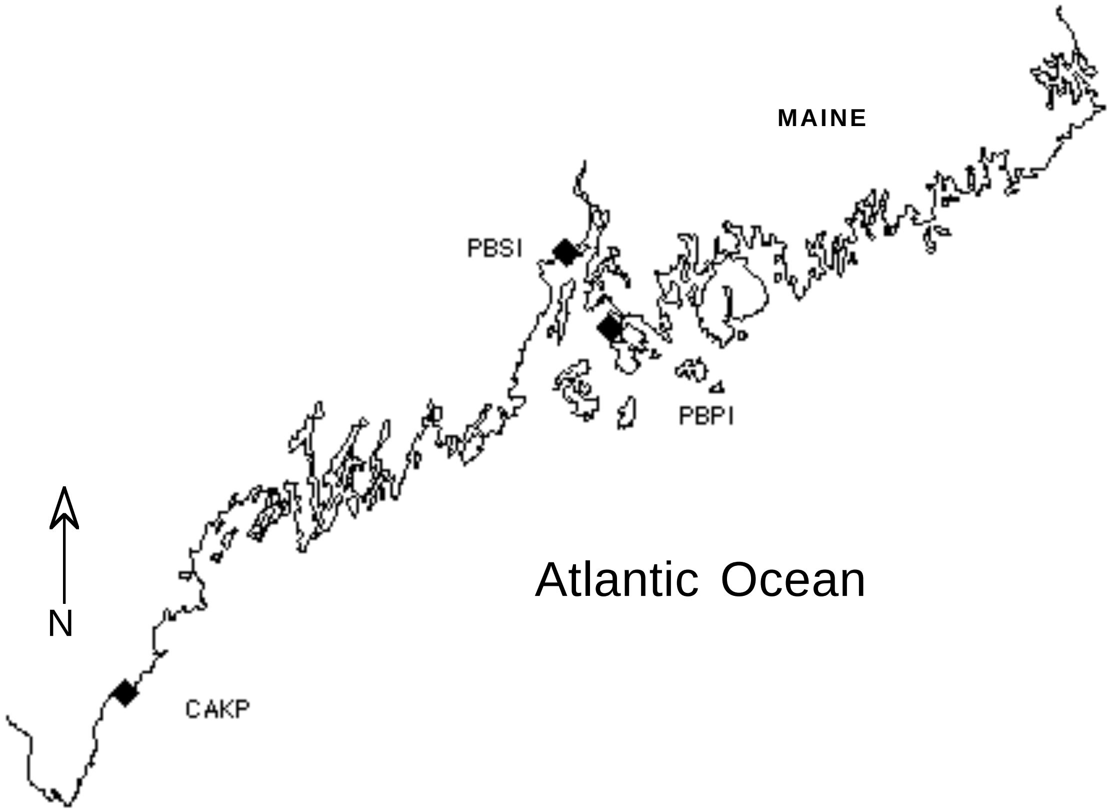

Figure 3. Mussel Watch Project sampling sites in Maine for which samples were archived.

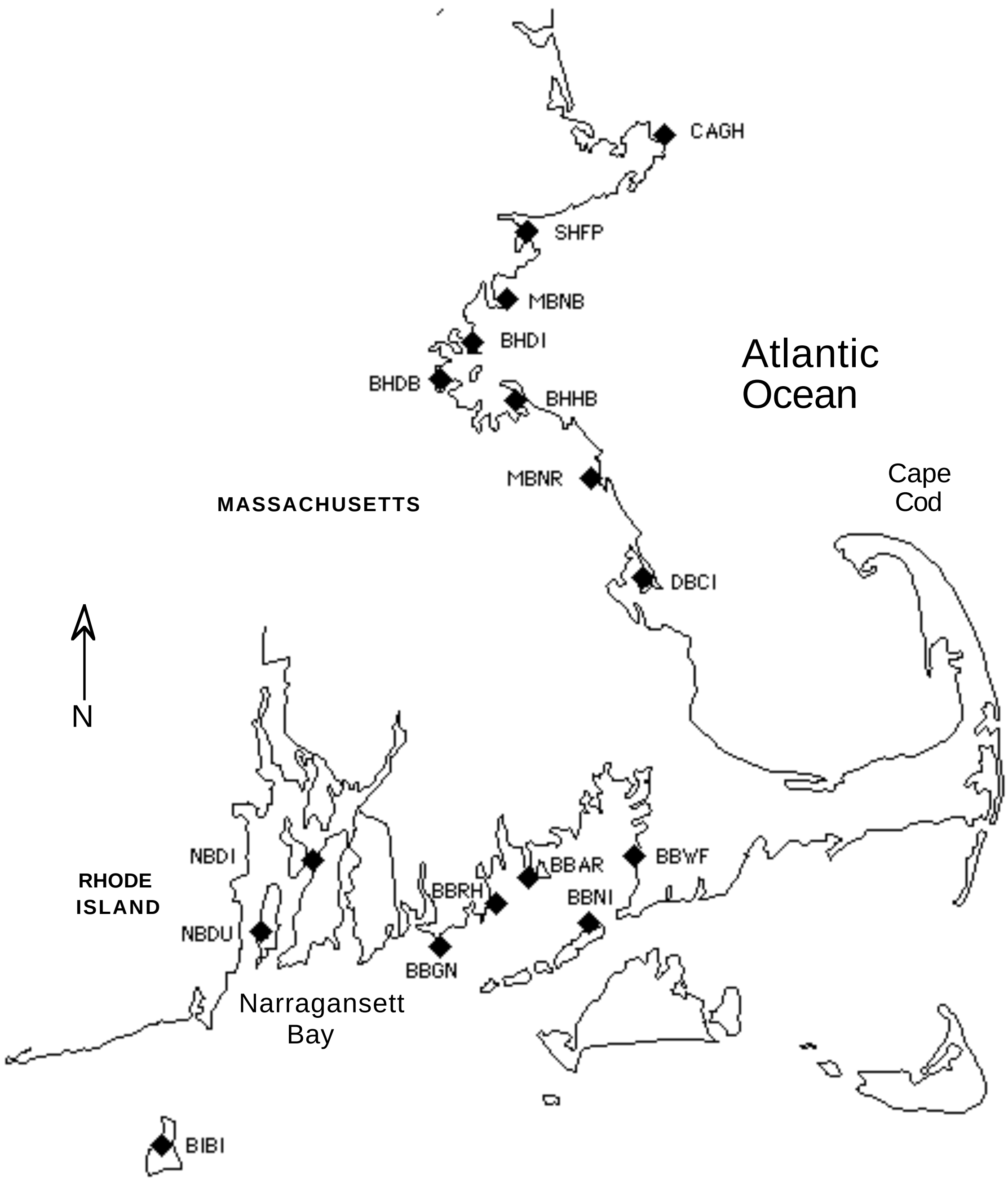

Figure 4. Mussel Watch Project sampling sites in Massachusetts and Rhode Island for which samples were archived.

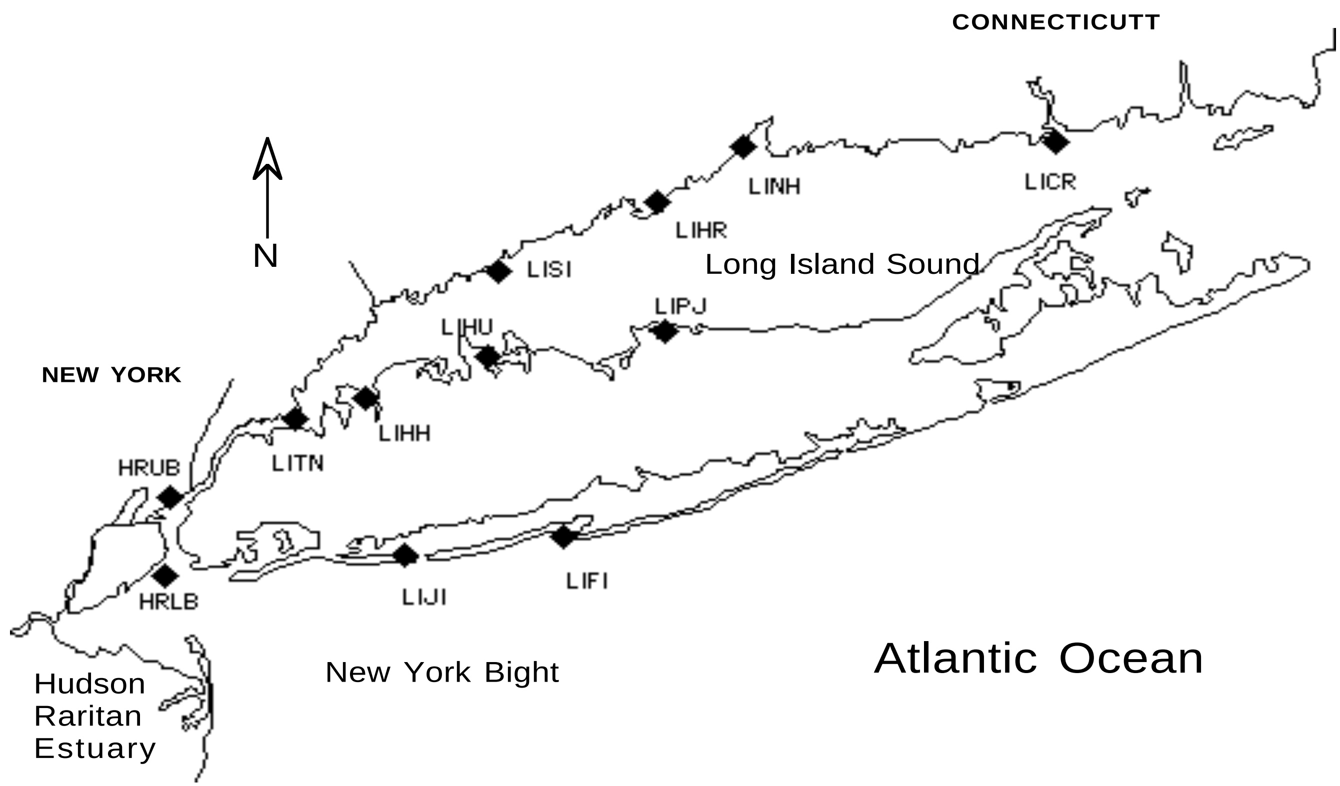

Figure 5. Mussel Watch sampling sites in Connecticutt and New York for which samples have been archived.

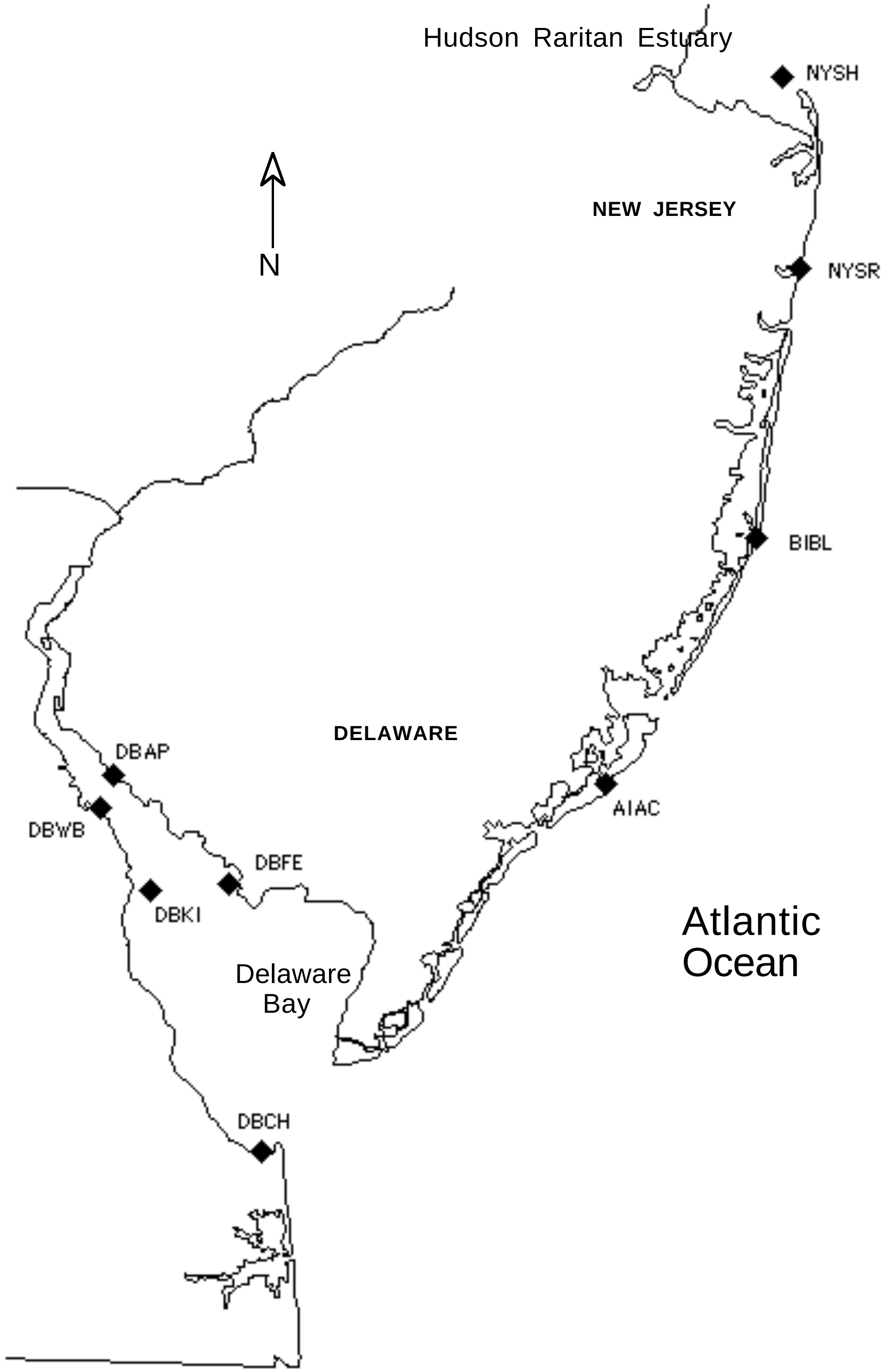

Figure 6. Mussel Watch Project sampling sites in New Jersey and Delaware for which samples were archived.

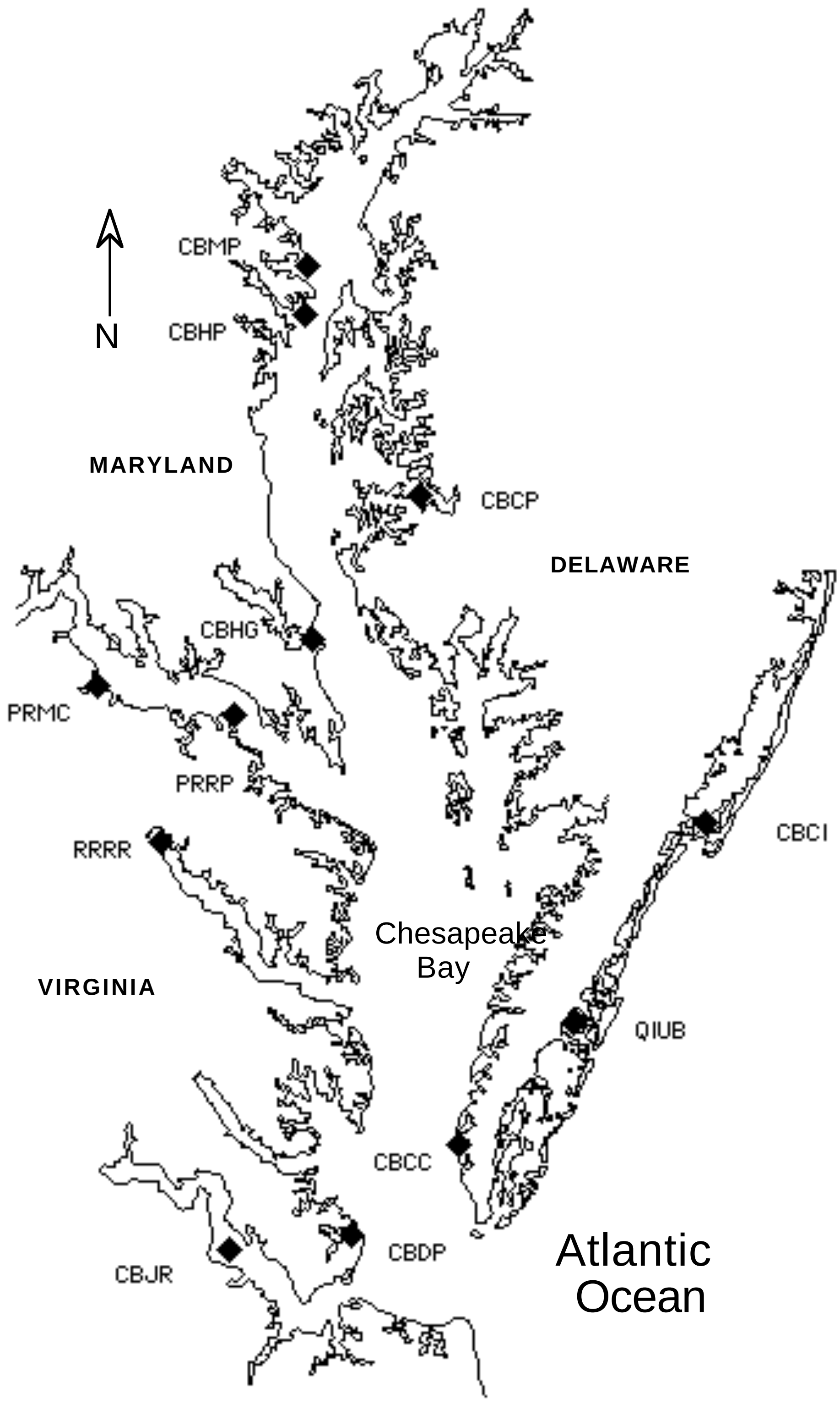

Figure 7. Mussel Watch Project sampling sites in Maryland and Virginia for which samples were archived.

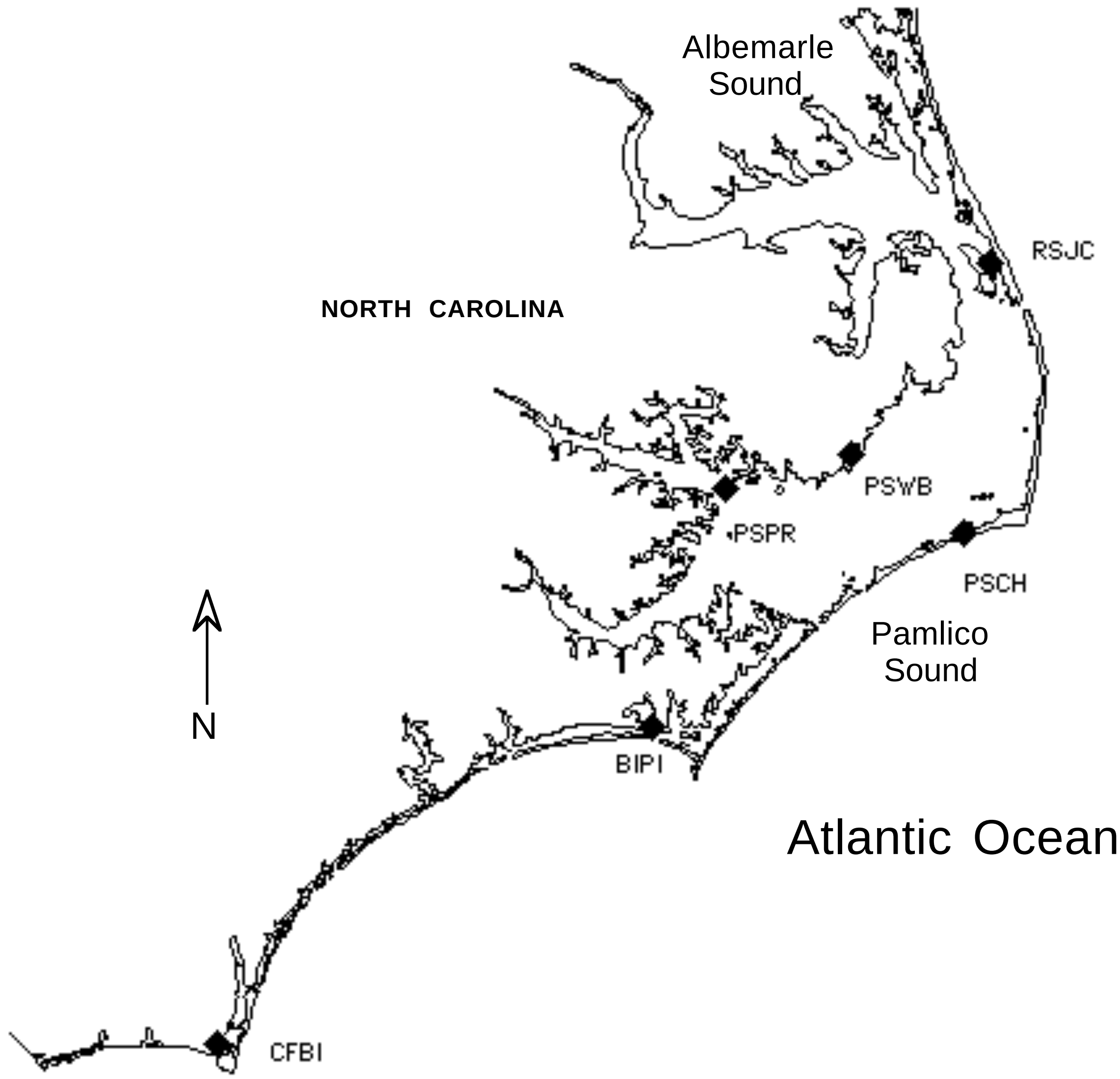

Figure 8. Mussel Watch Project sampling sites in North Carolina for which samples were archived.

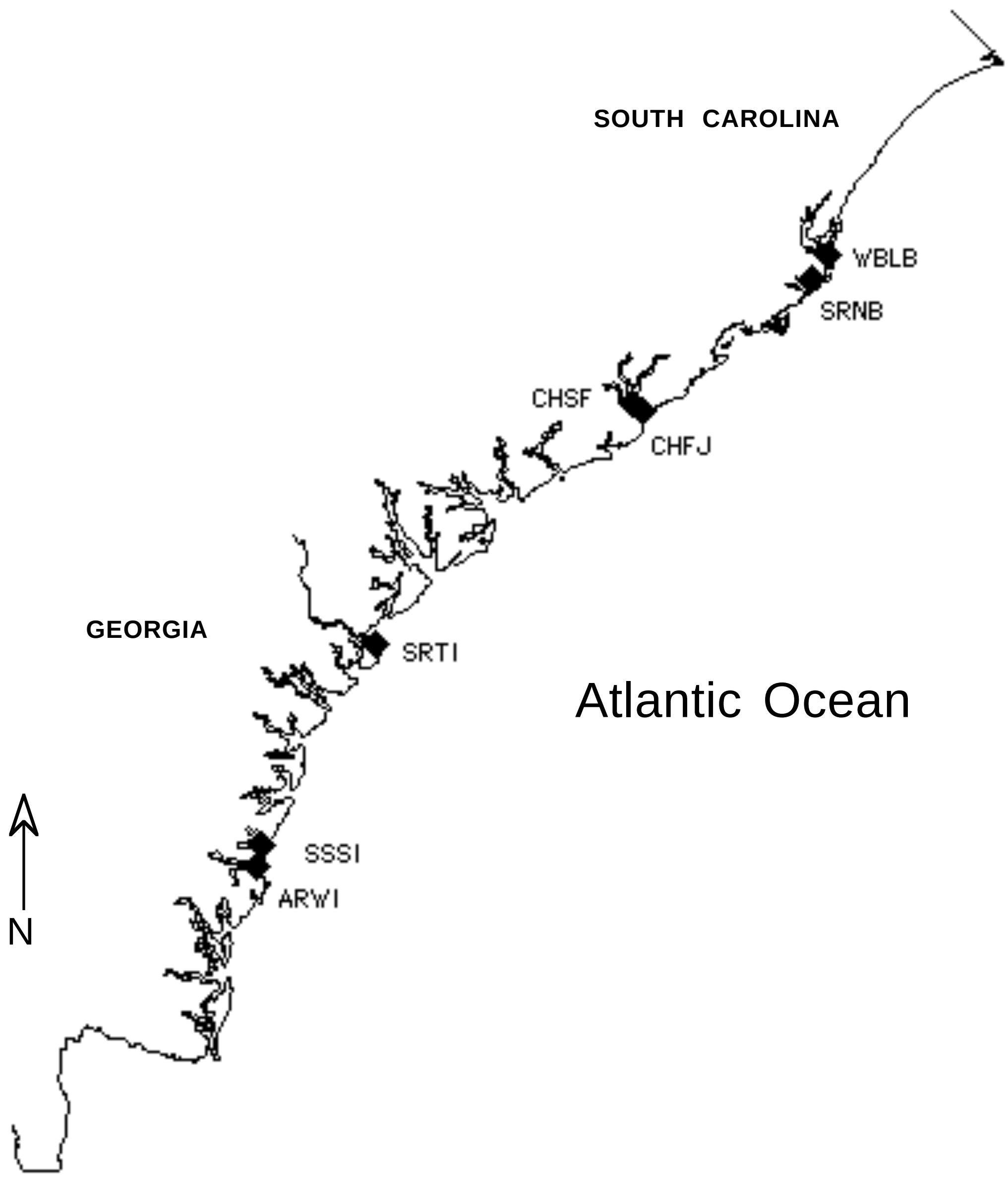

Figure 9. Mussel Watch Project sampling sites in South Carolina and Georgia for which samples were archived.

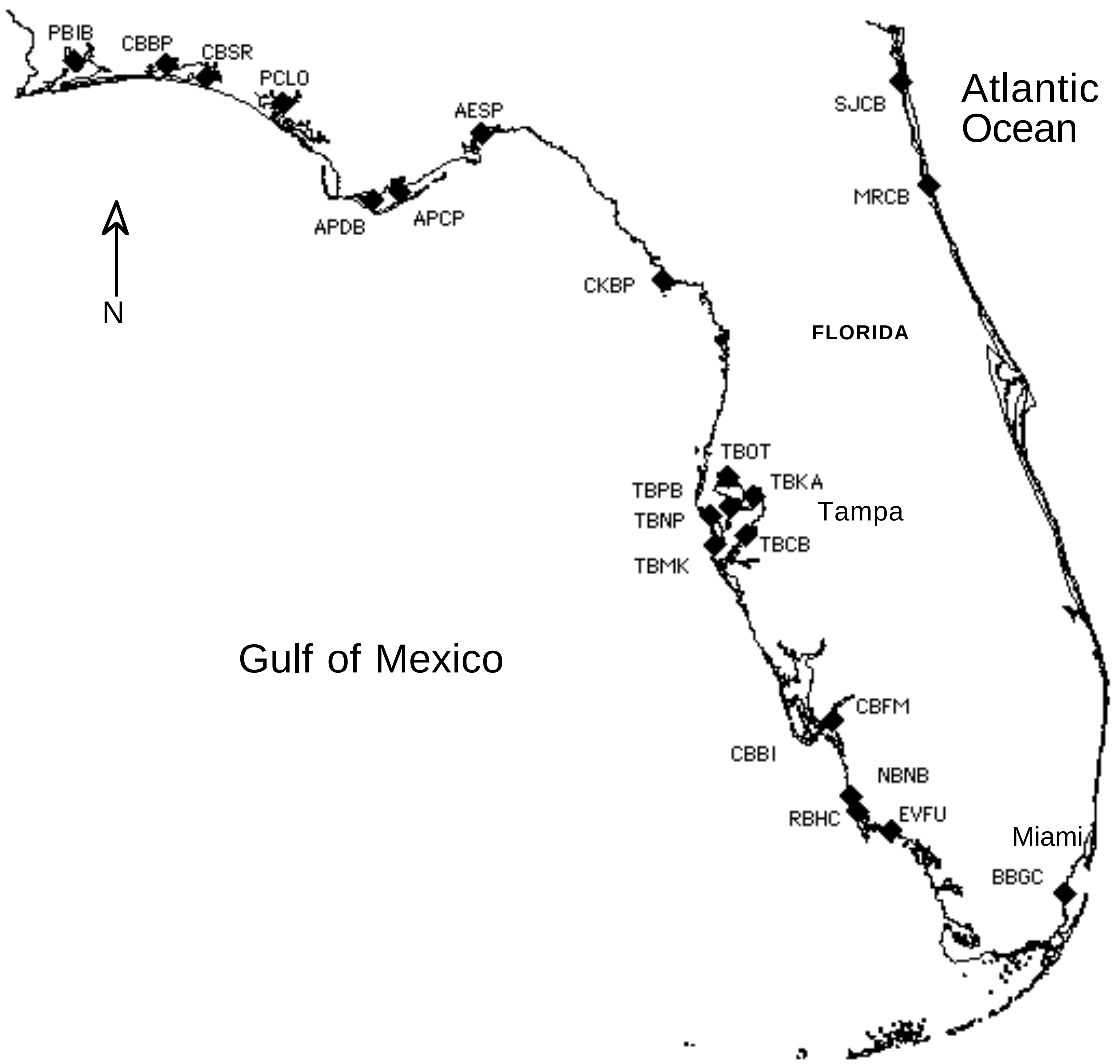

Figure 10. Mussel Watch Project sampling sites in Florida for which samples were archived.

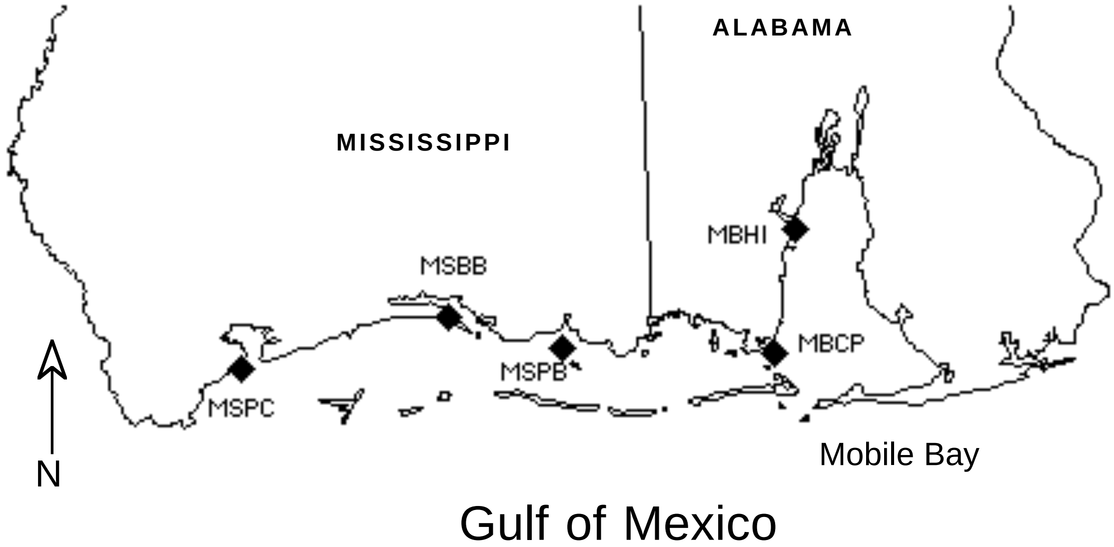

Figure 11. Mussel Watch Project sampling sites in Alabama and Mississippi for which samples were archived.

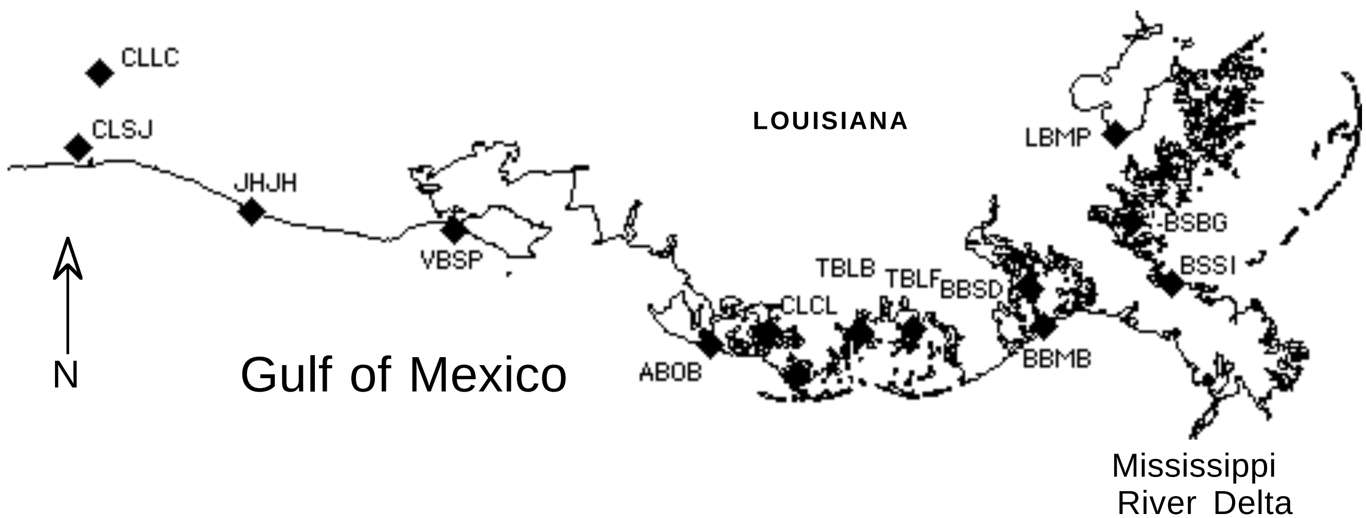

Figure 12. Mussel Watch Project sampling sites in Louisiana for which specimens have been archived.

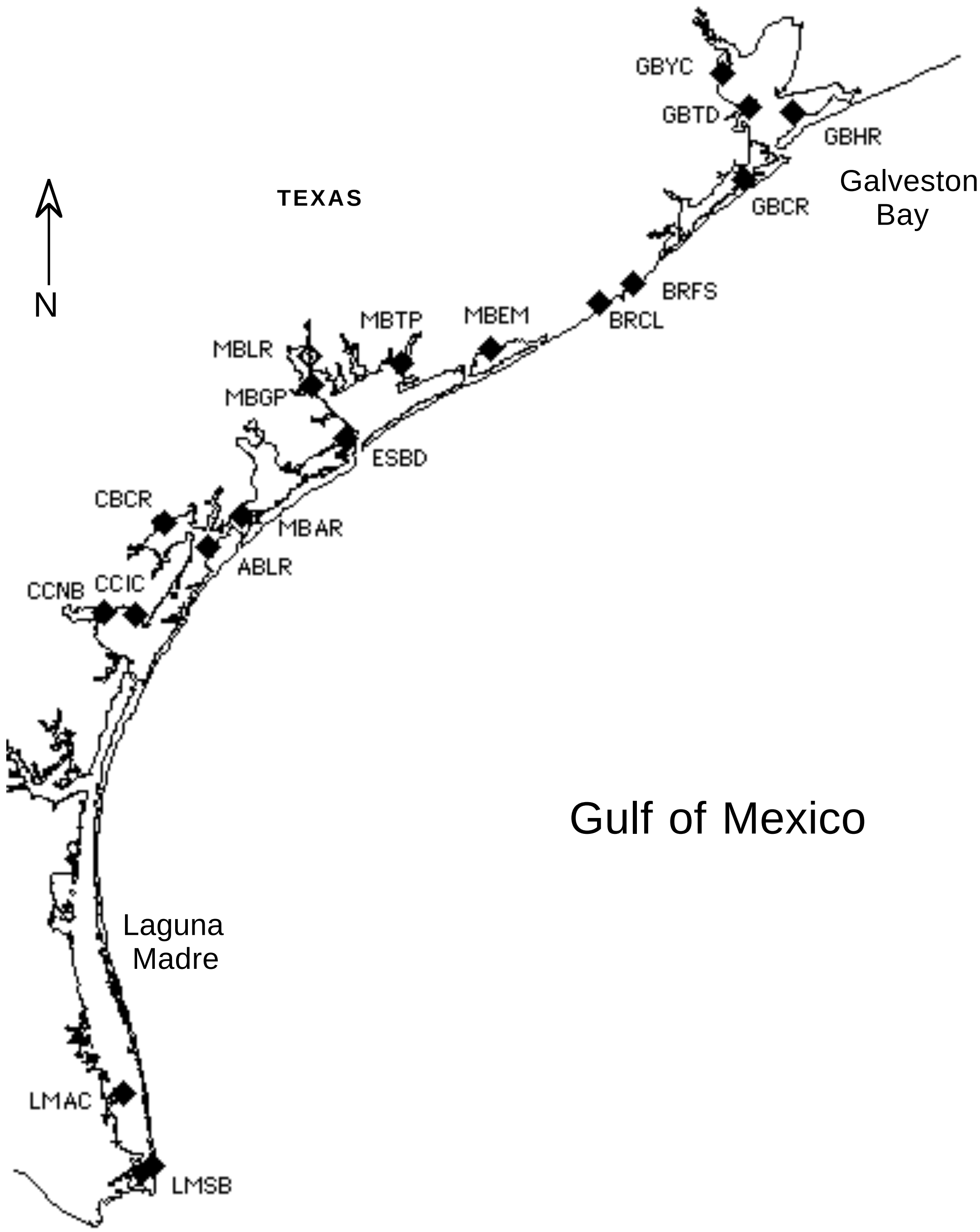

Figure 13. Mussel Watch Project sampling sites in Texas for which samples were archived.

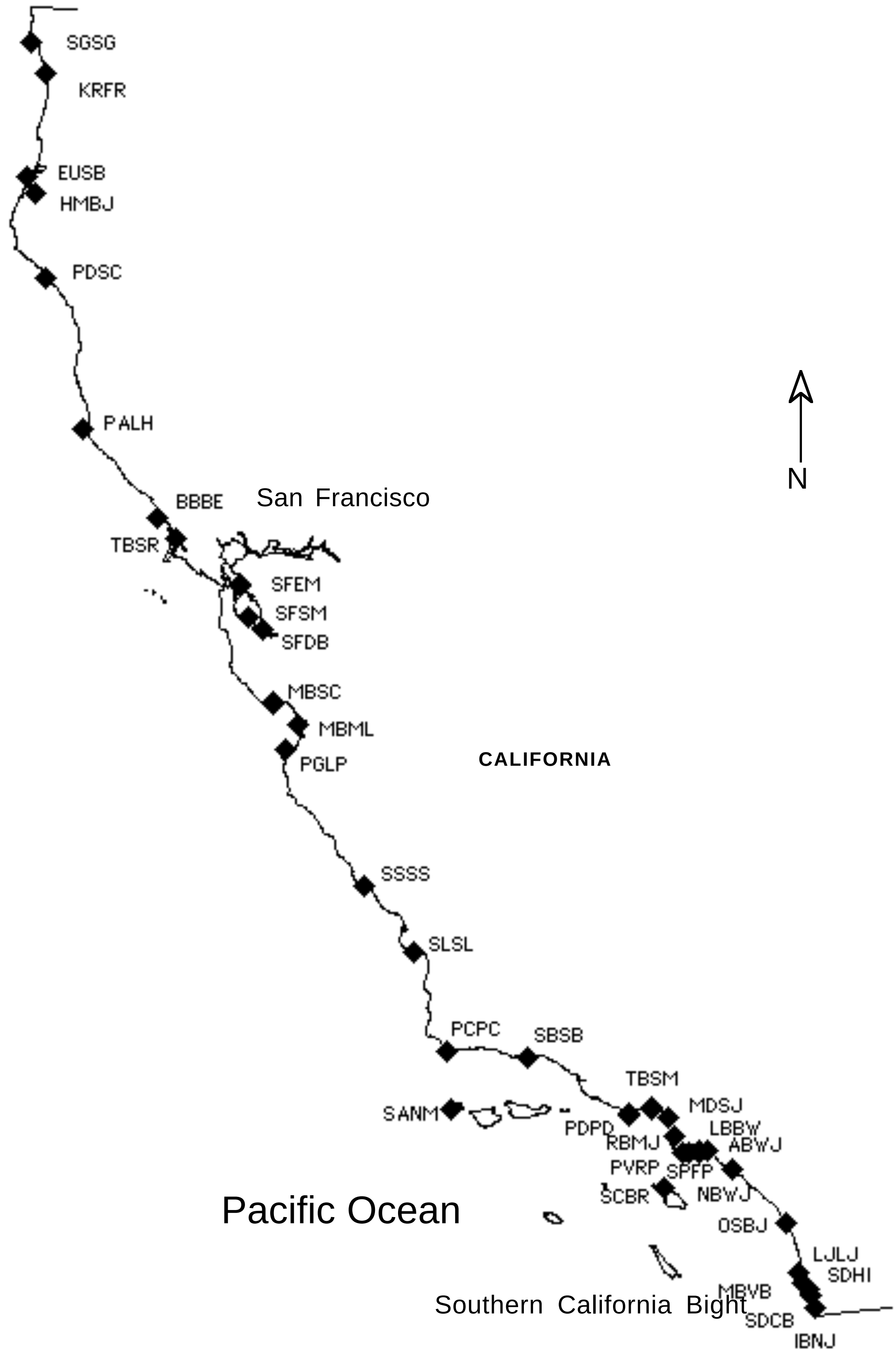

Figure 14. Mussel Watch Project sampling sites in California for which samples were archived.

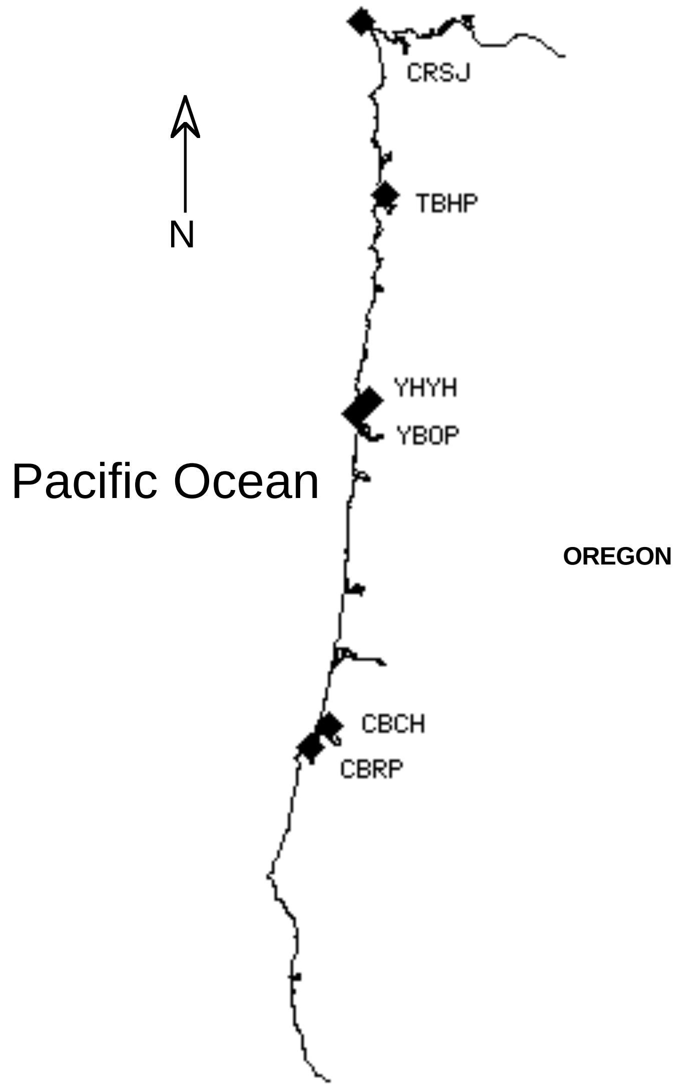

Figure 15. Mussel Watch Project sampling sites in Oregon for which samples were archived.

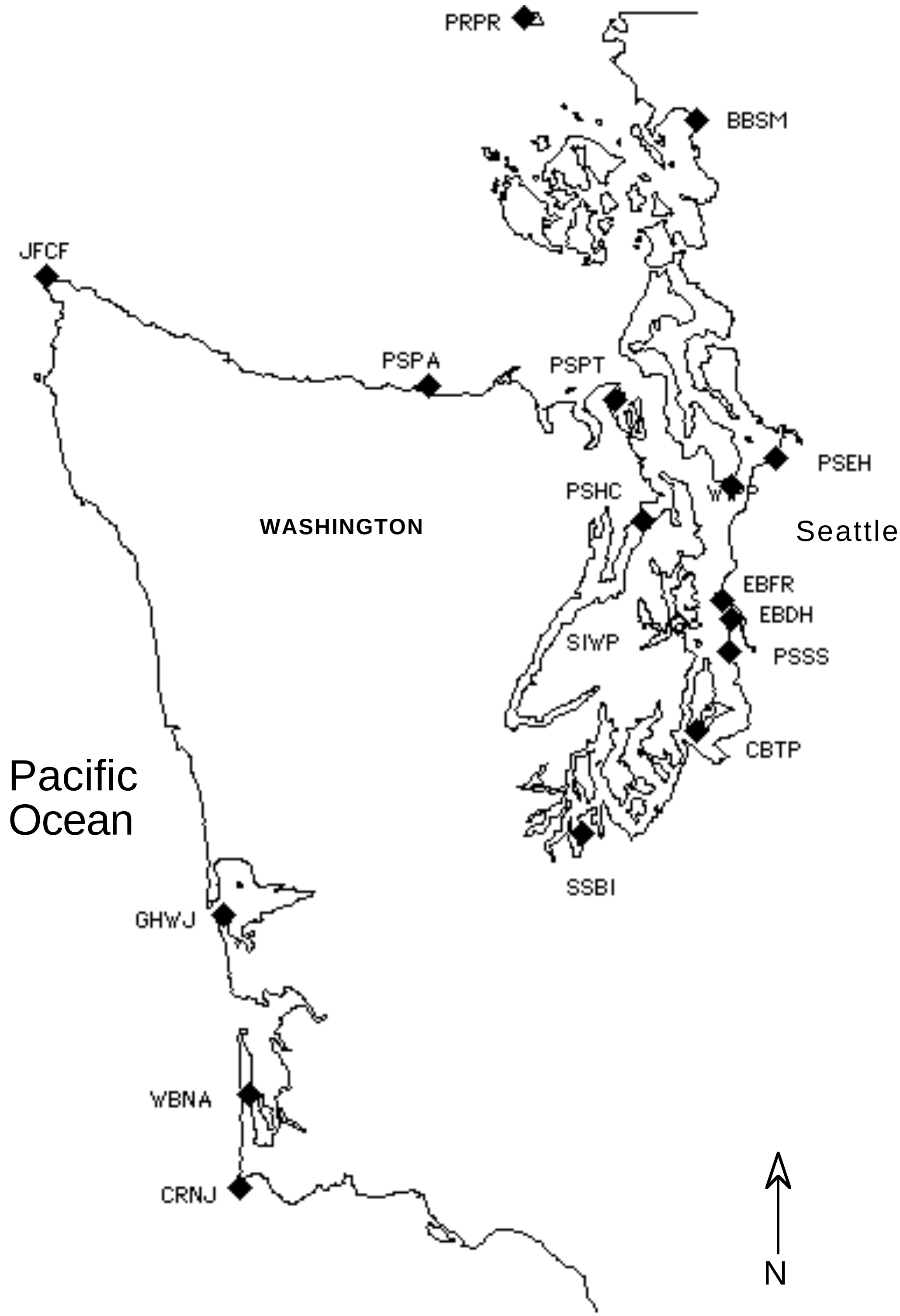

Figure 16. Mussel Watch Project sampling sites in Washington for which samples were archived.

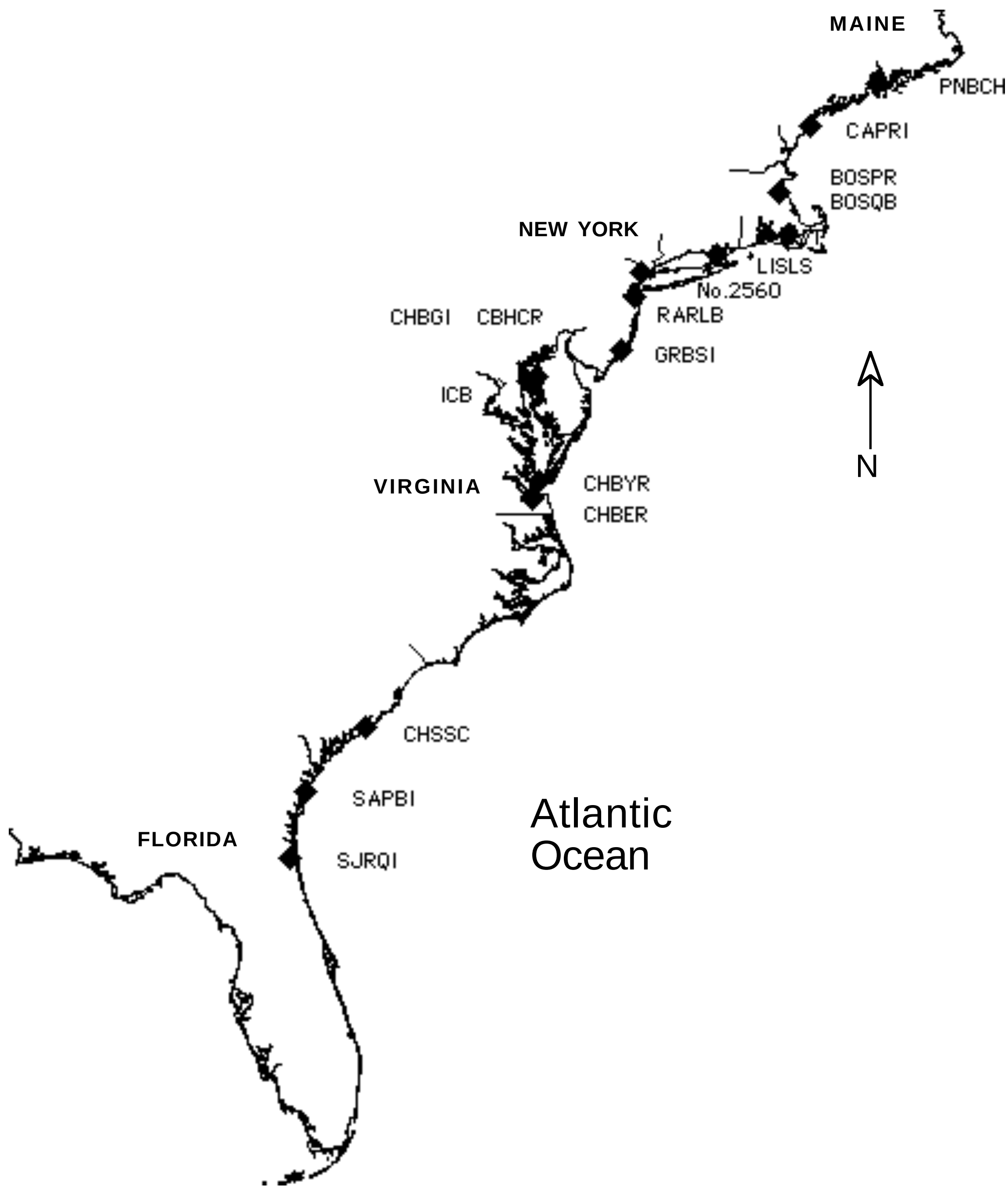

Figure 17. National Benthic Surveillance Project sites in the East Coast for which samples were archived.

Figure 18. Benthic Surveillance Project sampling sites in the Gulf Coast for wh
have been archived.

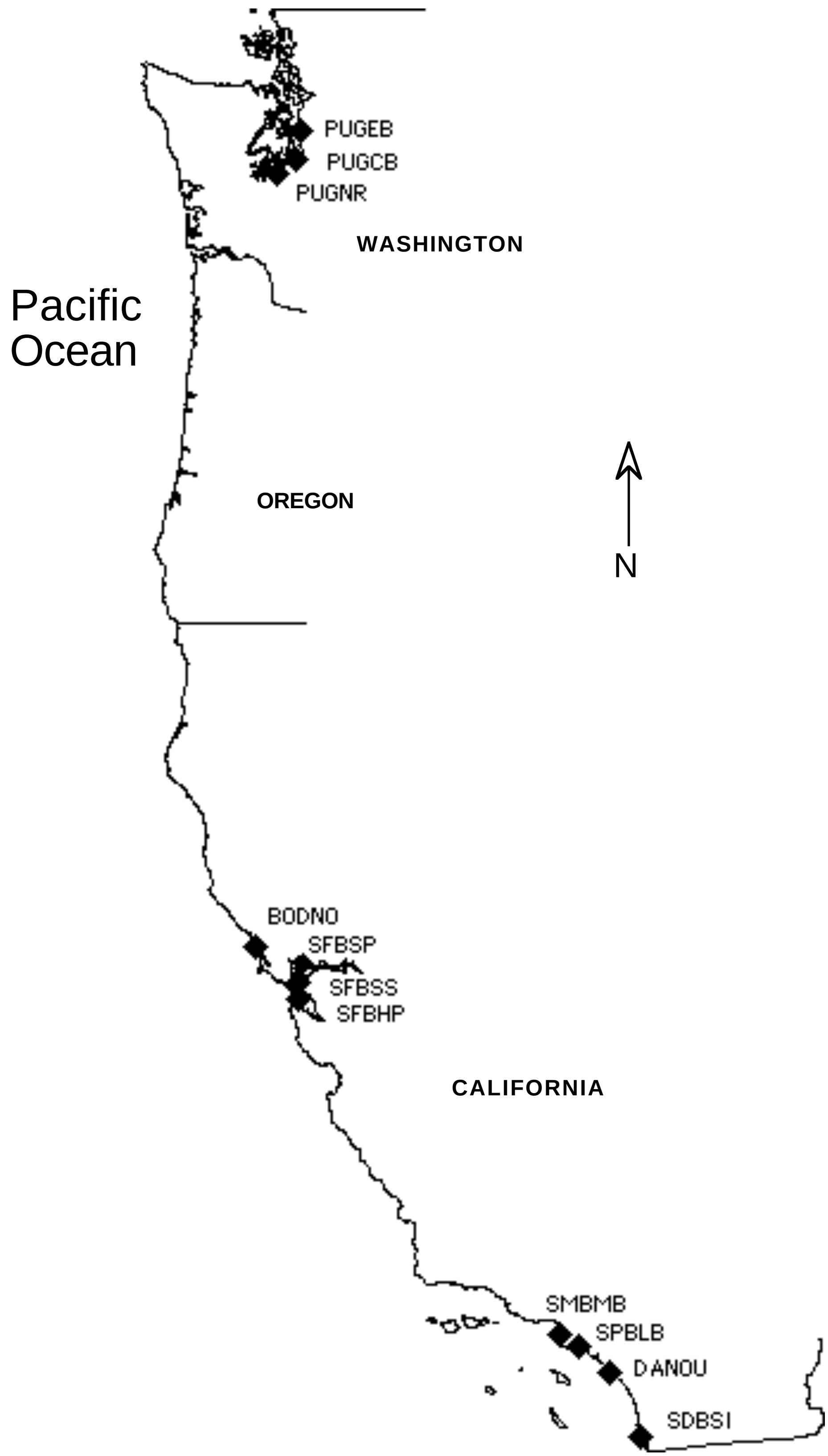

Figure 19. National Benthic Surveillance Project sites in the West Coast for which samples were archived.

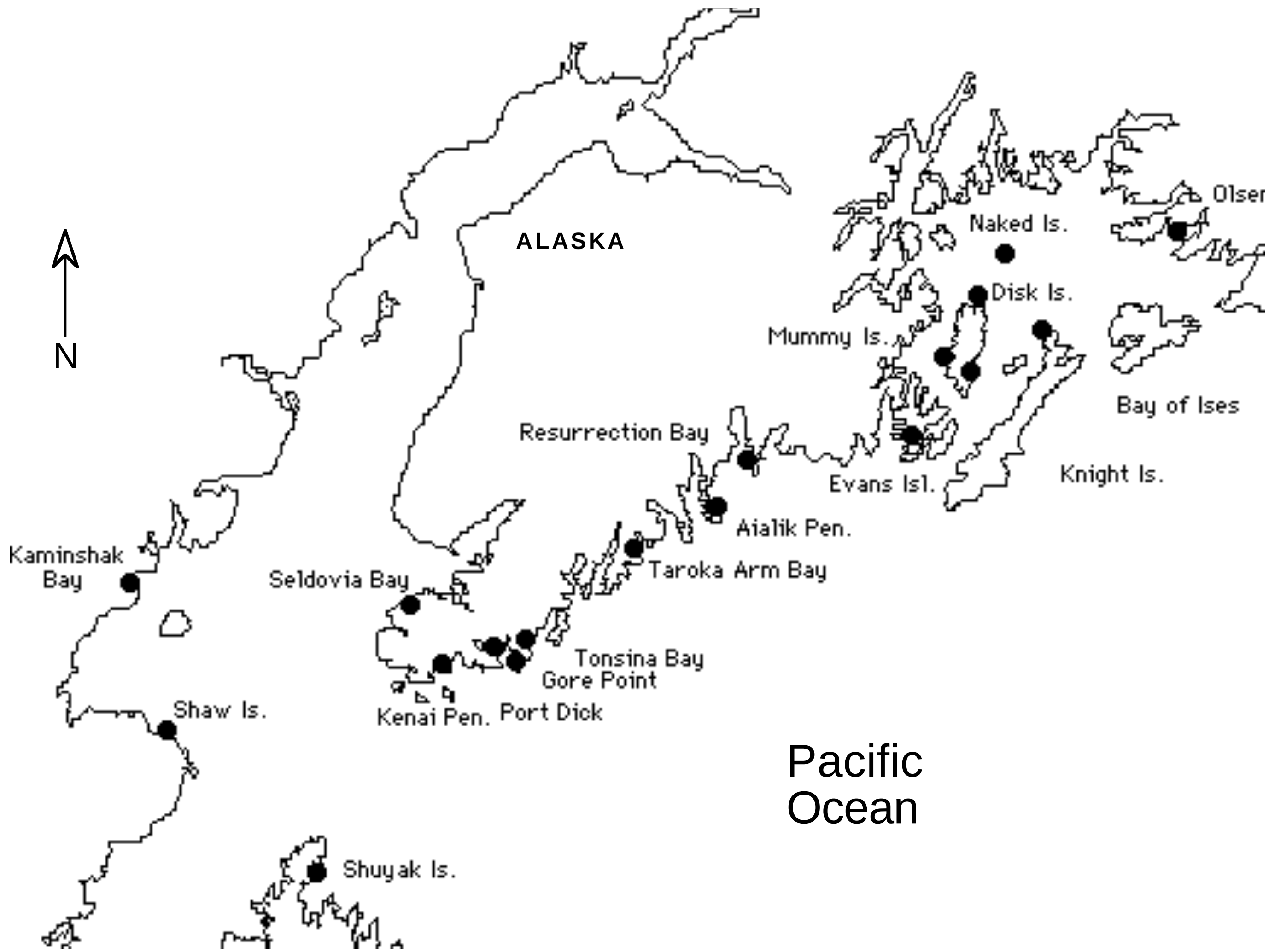

Figure 20. Exxon VALDEZ sampling sites for which samples were archived.

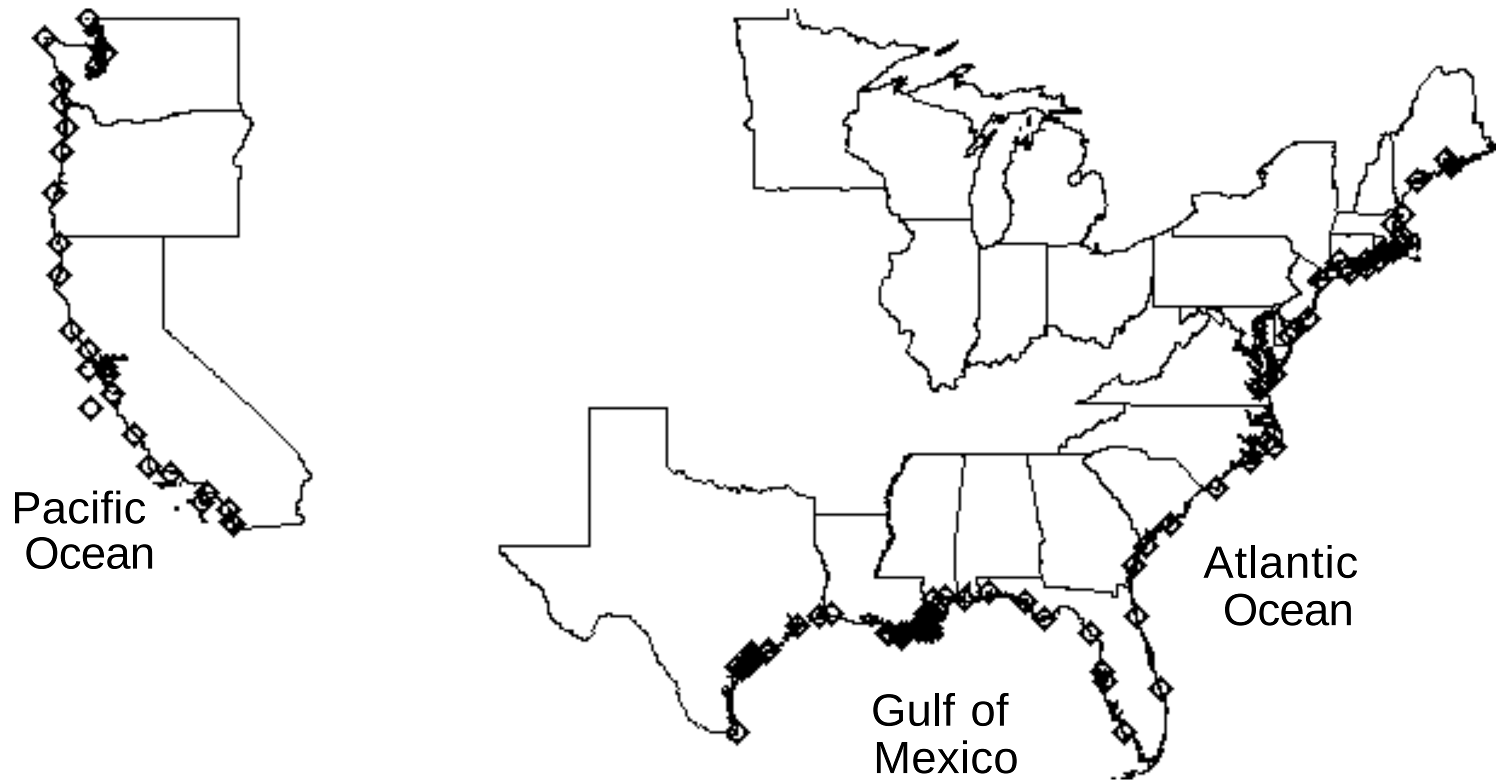

Figure 21. EPA Mussel Watch sampling sites from the mid-1970s for which samples were a

When samples were transferred to the NBSB, other samples from the same sites were sent to Battelle Ocean Sciences (Duxbury, MA) for analysis of the organic contaminants monitored in the NS&T program. Samples from 51 of these sites have been analyzed by Battelle Ocean Sciences and the results are discussed by Lauenstein (1995). Of these 51 samples analyzed, 10 samples were homogenized at NIST and subsamples of the homogenate were provided to Battelle Ocean Sciences and the Geochemical Environmental Research Group (GERG) of the Texas A&M University, College Station, TX. The subsamples for these 10 samples have been analyzed for organic contaminants by the two laboratories involved in the Mussel Watch analyses and by NIST, thereby providing a three-way interlaboratory sample split and intercomparison exercise.

4.4 Specimen Access Policy

Because of the costs associated with the collection and storage of specimens and the increasing value of these specimens after years of storage in the NS&T Specimen Bank, a policy was established on the disposition of the banked specimens and procedures, justification, and the review process for access to these specimens. This "Specimen Access Policy" was developed based on similar policy for the NOAA Alaska Marine Mammal Tissue Archival Project and the National Marine Mammal Tissue Bank (Becker *et al.*, 1991; Lillestolen *et al*., 1992). The Specimen Access Policy for the NS&T Specimen Bank is provided in Appendix E.

5. ANALYTICAL RESULTS

During the first three years (1985 - 1988) of the NS&T Specimen Bank project, NIST analyzed 10 - 15% of the specimens collected to determine the concentrations of selected organic and inorganic constituents (Tables F.1 through F.14, Appendix F). These analyses provide baseline data for the following purposes: (1) to evaluate the stability of the specimens during long-term storage, (2) to provide some real-time measure of contaminant concentrations for monitoring purposes, (3) to compare with results from samples collected in the future to monitor long-term trends in pollution, and (4) to compare with data obtained by other laboratories on subsamples from the NS&T Program (or similar samples collected at the same time from the same sites), i.e., quality assurance.

The analytes determined at NIST were selected analytes from those routinely measured as part of the NS&T monitoring program (Tables 1 and 2). Representative samples collected during the first three years (1985-1988) of the NS&T specimen banking effort were analyzed at NIST. From the Mussel Watch Project, bivalve tissue and sediment samples from a total of 18 sites were analyzed (six sites from each of three annual sample collections). From the National Benthic Surveillance Project, sediment, fish muscle tissue, and fish liver tissue samples from a total of 12 samples (six sites from each of two annual sample collections) were analyzed. In 1989, six of the bivalve samples that had been analyzed in 1986 were reanalyzed to determine the stability of selected analytes during storage (Table F.15, Appendix F).

5.1. Analytical Approach

5.1.1. Inorganic Analysis

Instrumental neutron activation analysis (INAA) was selected for the determination of inorganic constituents because of its ability to provide multi-element results on a single sample; however, some elements (notably Ni and Pb) cannot be determined with INAA in marine tissues. Hence, INAA was complemented with x-ray fluorescence (XRF) and prompt gamma activation analysis (PGAA) for the characterization of more than 40 elements in bivalve mollusks. The details of this approach have been described by Zeisler *et al.*, (1988).

Table 1. Trace elements analyzed in the National Status and Trends Program.

Symbol	Element	Symbol	Element
Al	Aluminum	Se	Selenium
Si	Silicon	Ag	Silver
Cr	Chromium	Cd	Cadmium
Mn	Manganese	Sn	Tin
Fe	Iron	Sb	Antimony
Ni	Nickel	Hg	Mercury
Cu	Copper	Tl	Thallium
Zn	Zinc	Pb	Lead
As	Arsenic		

Table 2. Trace organic compounds analyzed in the National Status and Trends Program.

Analytes	CAS◊	Analytes	CAS◊
Polycyclic aromatic hydrocarbons			
Acenaphthene	83-32-9	2,6-Dimethylnaphthalene	581-42-0
Acenaphthylene$^{\Delta}$	208-96-8	Fluoranthene	206-44-0
Anthracene	120-12-7	Fluorene	86-73-7
Benz[*a*]anthracene	56-55-3	Indeno[1,2,3-*cd*]pyrene$^{\Delta}$	193-39-5
Benzo[*a*]pyrene	50-32-8	1-Methylnaphthalene	90-12-0
Benzo[*e*]pyrene	192-97-2	2-Methylnaphthalene	91-57-6
Benzo[*b*]fluoranthene$^{\Delta}$	205-99-2	1-Methylphenanthrene	832-69-9
Benzo[*k*]fluoranthene$^{\Delta}$	207-08-9	Naphthalene	91-20-3
Benzo[*ghi*]perylene$^{\Delta}$	191-24-2	Perylene	198-55-0
Biphenyl	92-52-4	Phenanthrene	85-01-8
Chrysene	218-01-9	Pyrene	129-00-0
Dibenz[*a*,*h*]anthracene	53-70-3	1,6,7-Trimethylnaphthalene$^{\Delta}$	2245-38-7
Pesticides			
2,4'-DDD	53-19-0	Dieldrin	60-57-1
4,4'-DDD	72-54-8	Endrin	72-20-8
2,4'-DDE	3424-82-6	Heptachlor	76-44-8
4,4'-DDE	72-55-9	Heptachlor epoxide	1024-57-4
2,4'- DDT	58633-27-5	Hexachlorobenzene	118-74-1
4,4'-DDT	50-29-3	gamma-HCH	58-89-9
Aldrin	309-00-2	*trans*-Nonachlor	39765-80-5
cis-Chlordane	5103-71-9		

Table 2. Trace organic compounds analyzed in the National Status and Trends Program (cont.).

PCB congeners*

Analyte	IUPAC$^{\Delta}$ Numbers	CAS$^{\lozenge}$
2,4'-Dichlorobiphenyl	8	34883-43-7
2,2',5-Trichlorobiphenyl	18	37680-65-2
2,4,4'-Trichlorobiphenyl	28	7012-37-5
2,2',3,5'-Tetrachlorobiphenyl	44	41464-39-5
2,2',5,5'-Tetrachlorobiphenyl	52	35693-99-3
2,3',4,4'-Tetrachlorobiphenyl	66	32598-10-0
2,2',4,5,5'-Pentachlorobiphenyl	101	37680-73-2
2,3,3',4,4'-Pentachlorobiphenyl	105	32598-14-4
2,3',4,4',5-Pentachlorobiphenyl	118	31508-00-6
2,2',3,3',4,4'-Hexachlorobiphenyl	128	38380-07-3
2,2',3,4,4',5'-Hexachlorobiphenyl	138	35065-28-2
2,2',4,4',5,5'-Hexachlorobiphenyl	153	35065-27-1
2,2',3,3',4,4',5-Heptachlorobiphenyl	170	35065-30-6
2,2',3,4,4',5,5'-Heptachlorobiphenyl	180	36065-29-3
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	52663-68-0
2,2',3,3',4,4',5,6-Octachorobiphenyl	195	52663-78-2
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	206	40186-72-9
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	2051-24-3

Organotins

Monobutyltin
Dibutyltin
Tributyltin

* Certain PCBs congeners coelute on the type GC column used. A discussion of PCB congener coelutions can be found in Schantz *et al*., 1993.

$^{\Delta}$ International Union of Pure and Applied Chemistry.

$^{\lozenge}$ Chemical Abstracts Service registry numbers.

5.1.2. Organic Analysis

PAHs were determined in the first year of the NS&T Specimen Bank using gas chromatography with flame ionization detection (GC-FID). After the first year of the program, gas chromatography with mass spectrometric detection (GC-MS) was used for all PAH measurements. Reversed-phase liquid chromatography with fluorescence detection was also used to confirm GC-FID and GC-MS measurements for some samples. PCB congeners and chlorinated hydrocarbons were determined using gas chromatography with electron capture detection (GC-ECD). The general analytical approach for the determination of these compounds in marine sediment and tissue has been described previously (Schantz *et al., 1990*; Wise *et al.*, 1991).

5.2. Experimental Procedures

5.2.1. Inorganic Analyses

5.2.1.1. Materials

Certified reference materials (CRMs) and Standard Reference Materials (SRMs) from NIST, National Institute for Environmental Studies (NIES) (Tsukuba, Japan), and International Atomic Energy Agency (IAEA) (Vienna, Austria) were analyzed during the analysis of the various marine samples as control materials. For sediment analyses the following reference materials were analyzed: NIST SRM 1645 (River Sediment), NIST SRM 1646 (Estuarine Sediment), NIST SRM 2704 (Buffalo River Sediment), and IAEA SD-115-1/2 (Sediment). For tissue analyses, the following reference materials were analyzed: NIST SRM 1566 and NIST SRM 1566a (Oyster Tissue), NIST SRM 1572 (Citrus Leaves), NIES CRM No. 6 (Mussel Tissue), IAEA MA-B-3/TM (Fish Tissue), and IAEA MA-M-2/TM (Marine Mussel).

5.2.1.2 Instrumental Neutron Activation Analysis (INAA)

The following detailed procedures are specific for the most recent analyses of specimens; similar procedures, with minor modifications, were used for the earlier analyses of sediment and tissue. Subsamples of tissue selected for analysis by INAA were dried at 1 Pa, -20 °C shelf temperature and -50 °C condenser temperature for five days. The dry/wet ratios were determined from the weight loss during freeze drying. After reaching a stable dry weight, subsamples of approximately 250 mg were removed from each of the Teflon jars and were pelletized using a pellet press at 10000 Psi. Two or three pellets were formed using material from each of the jars. The pellets were weighed and packaged in acid-cleaned linear polyethylene (LPE) film for INAA. Certified biological reference materials were prepared in a similar method and included in the INAA scheme as controls. Standard solutions dried on filter paper were also pelletized and sealed in LPE.

The general INAA scheme, using the comparator technique, has been described previously (Greenberg *et al.*, 1984). Two sets of measurements were performed on each sample: a set of short irradiations and a set of long irradiations on each of the samples, controls, and standards. For the assay of short lived nuclides, the samples and controls were irradiated, one each together with one of the standards, for 30 s in the NIST reactor pneumatic facility RT-4 at 20 MW reactor power. The samples and controls were repackaged in clean LPE after the short irradiation for counting and the subsequent long irradiation. A high count rate gamma-spectrometer system in conjunction with the pneumatic shuttle system was used for the counting of the short half life nuclides. Counting was started after approximately 90 s of decay. This count was followed by a second count (600 s) using the same system after approximately 2 h decay to better assay the longer lived nuclides at lower count rates. Spectral data collections were controlled via the VAX 730 computer and a Nuclear Data micro multichannel analyzer system (ND µMCA).

For the assay of intermediate and long lived nuclides, the samples, controls, and standards were reirradiated for 16 h in the NIST reactor pneumatic facility RT-4 at 15 MW reactor power. A gamma spectrometer system linked to a sample changer was used for two separate counts of intermediate and longer lived nuclides. Gamma radiations were collected for 4-6 h after one week of decay and then again after 4-8 weeks of decay. The quantitative evaluation was performed by the comparator method, utilizing all standards from the individual irradiations. The ND peak search and activation analysis software was used to calculate specific activities of the nuclides in standards, i.e. "Standard Constants", and to calculate the unknown concentrations in the samples.

5.2.1.3. Prompt Gamma Activation Analysis (PGAA)

One pellet from each sample was packaged in Teflon film for irradiation in the NIST prompt-gamma activation analysis facility, which is described in detail elsewhere (Failey *et al.*, 1979). Spectral data were collected with a gamma spectrometer with an efficiency of 25% and 2.0 keV full width at half maximum resolution with split annulus NaI (Tl) detector. Count rates ranged from 12 - 24 h per sample. The method of monitor activation analysis was used with a titanium foil as the flux monitor. Quantitation was accomplished by using tabulated pure element prompt gamma emission rates and appropriate correction factors for background and blank contributions.

5.2.1.4. X-Ray Fluorescence (XRF) Analysis

Sample pellets of bivalve tissue, which were used for the INAA measurements, were analyzed by energy-dispersive XRF at Battelle Northwest Laboratory (Richland. WA). The XRF technique has been developed recently for application to matrices of unknown or poorly defined composition (Sanders *et al.*, 1983; Nielson and Sanders, 1983). For this application, a new approach to fundamental parameter calculations has been devised that utilizes incoherent and coherent backscatter intensities from the excitation radiation. The backscatter originates from all sample constituents, and thus provides information on the total sample mass as well as bulk sample composition. By appropriate use of scatter intensities in fundamental parameter matrix calculations, accurate analyses of unknown samples can be obtained without prior knowledge of the sample matrix.

A Kevex 0810 (Kevex Corp. Foster City, CA) was used for the XRF analyses. Excitation employed titanium, zirconium, silver, and gadolinium $K\alpha$, β X-rays from a secondary source in sequence. Analyses settings were as follows: titanium, 375-s count at 40 keV and 20 mA; zirconium, 3000-s count at 40 keV and 20 mA; silver, 2000-s count at 45 keV and 20 mA; gadolinium, 750-s count at 70 keV and 20 mA. Detection was accomplished with an energy-dispersive system employing a Si(Li) semiconductor detector with 1.2 x 10-5 m thickness beryllium window. The resolution was 180 eV at 6.4 keV, and efficiencies were greater than 85%. The instrument allowed only the backscatter caused by the sample to reach the detector. A multi-element, thin-film sensitivity curve was used as the only elemental calibration for analysis.

5.2.2. Organic Analysis

5.2.2.1. Materials

Certified reference materials were used as calibration solutions for all analyses. The following SRMs were used: NIST SRM 1491 (Aromatic Hydrocarbons in Hexane/Toluene), NIST SRM

1647a (Priority Pollutant PAH in Acetonitrile), NIST SRM 2261 (Concentrated Chlorinated Pesticides In Hexane), and NIST SRM 2262 (Concentrated PCB Congeners in Iso-octane). Individual PCB congeners were obtained from Ultra Scientific (New Kingston, RI), and pesticide standards were obtained from EPA (Research Triangle Park, NC).

5.2.2.2. Sample Preparation for Organic Analysis

A sample of 14 g to 16 g of wet fish muscle or bivalve tissue, 4 g to 5 g of wet fish liver tissue, or 14 g to 16 g of wet sediment was weighed to the nearest tenth of a milligram. The weighed sample was placed in a mortar containing approximately 50 g of sodium sulfate and then covered with another approximately 50 g portion of sodium sulfate. The tissue or sediment plus sodium sulfate was then ground to absorb the water in the tissue or sediment. At this point, the sodium sulfate mixture was placed in a glass extraction thimble, spiked with the internal standard solution (see Section 5.2.2.3), and Soxhlet extracted for 16 h to 20 h using 250 mL of methylene chloride.

After Soxhlet extraction, the methylene chloride extract was evaporatively concentrated to approximately I mL. In the case of the tissue extracts, the fraction containing the PAHs, PCB congeners, and chlorinated pesticides was separated from the majority of the lipid and biogenic material using size exclusion chromatography. This fraction was then evaporatively concentrated to approximately 800 µL for fractionation by normal-phase liquid chromatography on a semi-preparative aminosilane column (LC-NH_2). In the case of the sediment samples, a silica Sep Pak was used to separate the more polar material from the fraction of interest. Copper was then added to the remaining extract to remove sulfur contamination. As for the tissue extracts, the fraction of interest was concentrated to approximately 800 µL for fractionation by LC-NH_2. For the LC-NH_2 fractionation, two separate injections of 400 µL were made for: (1) the isolation of the PAHs from the aliphatics, and (2) the isolation of the PCBs and lower polarity pesticides from the more polar pesticides. A mobile phase of 2% methylene chloride in hexane was used for the isolation of the PAH fraction, a mobile phase of 100% hexane was used for the isolation of the PCBs and lower polarity pesticides, and a mobile phase of 5% methylene chloride in hexane was used for the isolation of the more polar pesticides. These separate fractions were evaporatively concentrated to approximately 500 µL for gas chromatographic (GC) or liquid chromatographic (LC) analysis.

5.2.2.3. Chromatographic Analysis

For the determination of the PAHs, extracts of the tissue or sediment samples, fractionated as described above, were analyzed by GC using either flame ionization detection (FID) or mass selective detection (MSD) or by LC using fluorescence detection. For the determination of the PCBs and pesticides, extracts were analyzed by GC using electron capture detection (ECD). For the GC analysis of the PAH fractions, 1-butylpyrene and *m*-tetraphenyl were added to the samples prior to extraction for use as internal standards. For the LC analysis of the PAH fraction, phenanthrene-d_{10}, fluoranthene-d_{10}, and perylene-d_{12} were added to the samples prior to extraction as internal standards. PCB 103 (2,2',4,5',6-pentachlorobiphenyl) and PCB 198 (2,2',3,3',4,5,5',6-octachlorobiphenyl) were added to the samples prior to extraction as internal standards for the analysis of the PCB and lower polarity pesticide fraction while endrin and perdeuterated 4,4'-DDT were added similarly for the analysis of the more polar pesticide fraction. Calibration solutions, NIST SRM 1491 for the PAHs using GC and either gravimetrically-prepared solutions or gravimetrically-diluted solutions of NIST SRM 2261 and 2262 for the chlorinated analytes, were Soxhlet extracted, concentrated, and fractionated in the same manner as the samples. Procedure blanks containing the internal standards were also processed.

For all of the GC analyses, a fused silica capillary column (0.25 µm film thickness and 0.25 mm internal diameter) containing a 5% phenyl-substituted polysiloxane phase (DB-5) was used. The column length changed during the course of the analyses. A 30 m column was used for the analyses of the Mussel Watch tissue and sediment samples collected during the first and second years and the National Benthic Surveillance fish liver and sediment collected during the first year, whereas a 60 m column was used for the remaining analyses. For the PAH analyses performed using a 30 m column, the column was held isothermal at 150 °C for 2 min and then temperature programmed at 4 °C/min to 280 °C for 15 min. The carrier gas used was hydrogen at an inlet pressure of 124 kPa (18 psig), and both the injector and FID temperatures were maintained at 300 °C. Split injections were done with a split flow of 25 mL/min. For the analyses of the chlorinated fractions, helium was used as the carrier gas at an inlet pressure of 124 kPa (18 psig) and a split flow of 25 mL/min. The injector and ECD temperatures were 250 and 300 °C, respectively. For the PCB and lower polarity pesticide fraction, the column was temperature programmed from 180 °C at 3 °C/min to 270 °C where it was held isothermal for 10 min. For the analysis of the more polar pesticide fraction, the column was held isothermal at 200 °C for 25 min and then programmed at 10 °C/min to 270 °C for 10 min. For the PAH analyses performed using a 60 m column, the MSD and on-column injections were used. The transfer line was maintained at 280 °C, and helium was used as the carrier gas at an inlet pressure of 221 kPa (32 psig). The column was held for 1 min at 34 °C, programmed at 40 °C/min to 200 °C for 2 min, and then programmed at 2 °C/min to 300 °C for 33 min. The ions monitored were 177.8, 191.8, 201.8, 227.8, 251.8, 257.8, 275.7, 277.8, and 305.8 amu with a dwell time of 60 ms for each ion. For the chlorinated analyses performed using the 60 m column, split injections were done using helium as the carrier gas with an inlet pressure of 280 kPa (40 psig) and a split flow of 25 mL/min. The ECD temperature was maintained at 320 °C. For the PCB and lower polarity pesticide fraction, the injection port temperature was maintained at 280 °C. The column was held at 200 °C for 30 min and then programmed at 2 °C/min to 270 °C for 30 min. For the more polar pesticide fraction, the injection port temperature was maintained at 250 °C. The column was held isothermal at 190 °C for 50 min, programmed at 1.5 °C/min to 215 °C, and then at 45 °C/min to 270 °C for 5 min.

For the Mussel Watch tissue samples from the second and third years and sediment samples from all three years, LC with fluorescence detection was also used for the analysis of the PAH fractions. LC analyses were performed on a reversed-phase octadecylsilane (C18) column, 5 µm particle size, 4.6 mm i.d. x 25 cm (Vydac 201TP, The Separations Group, Hesperia, CA) using procedures similar to those described previously (Wise *et al.*, 1991).

5.2.3. Percent Water Determination

Separate aliquots of 6 g to 8 g of each sample were freeze dried to determine the weight loss due to water. The aliquots were weighed and then freeze dried for 5 days at 1 Pa with a -10°C shelf temperature and a -50 °C condenser temperature. The temperature was slowly increased to 5 °C during the 5 days. The sample was considered dry when a stable weight was achieved. The percent water in the samples was determined by the weight loss after freeze drying. These sample dry weight conversion factors were used to report results on a dry weight basis for both the inorganic and organic analyses.

5.3. Inorganic Analysis Results

All analytical results for both inorganic and organic contaminants are reported on a dry weight basis; therefore, the percent water was determined for each specimen. The results for the percent water determinations in the sediment, bivalve tissue, and fish tissue samples are summarized in Tables F.1 and F.2 (Appendix F). The results for the determination of over 40 inorganic constituents in bivalve tissue and sediment samples from 18 Mussel Watch Project sites are summarized in Tables F.3 and F.4. The NS&T program routinely monitors five major elements and 12 trace elements. Consequently, the results from the NS&T specimen bank project provide information on over 20 additional elements not previously measured in the NS&T monitoring samples. For many of the samples in Tables F.3 and F.4, results are provided from duplicate analyses. Table F.5 compares the results from the original analyses of bivalve tissues (Table F.3) with similar analyses performed on subsamples from the same specimens after three years of storage in the specimen bank. Table F.6 summarizes the results for the determination of 36 elements in fish muscle and liver tissues from 12 National Benthic Surveillance Project sites. Sediment samples from the same 12 National Benthic Surveillance Project sites were also analyzed and the results are compared with the corresponding fish tissue results in Table F.7.

5.4. Organic Analysis Results

Results for PAHs are not reported in this dataset because the analyses in the initial two years of the Mussel Watch Project using GC-FID were considered less reliable because of the nonselective nature of the FIC. Analyses in later years were performed using selective MS detection. The results for the determination of 17 PCB congeners and 13 chlorinated pesticides are summarized in Tables F.8 and F.9 for bivalve tissue and sediment samples from 18 Mussel Watch Project sites. Tables F.10 and F.11 summarize the results for the determination of PCB congeners/chlorinated pesticides in fish muscle and liver tissues from 12 National Benthic Surveillance Project sites. Sediment samples from the same 12 National Benthic Surveillance Project sites were also analyzed and the results are compared with the corresponding fish tissue results (mean of the duplicate analyses) in Table F.12. Table F.13 compares the results from the original analyses of bivalve tissues for determination of PCBs and chlorinated pesticides (Table F.8) with similar analyses performed on the same samples after three years of storage in the specimen bank.

6. COMPARISON

Comparative results derived from the analyses of trace elements for archived samples are listed in Table 3. Samples from 16 sites were analyzed by NIST between 1986 and 1988, inclusive. The NIST derived concentrations were compared to the results of the analyses of samples collected at the same 16 sites for the same years as reported by the Mussel Watch Project contractor laboratories (NOAA, 1989). Results are presented for silver (Ag), arsenic (As), chromium (Cr), copper (Cu), and selenium (Se). Analyses were not performed on homogenates of the same samples because separate specimens were collected for the Specimen Bank and the Mussel Watch Projects. For the bivalve mollusk tissues, the results for the Mussel Watch Project represent the mean of analyses of samples from three stations and the NIST results are the mean of duplicate analyses of a composite sample from all three stations. The same kind of comparison was performed for a group of organic contaminants (4,4'-DDE; 4,4'-DDT, *cis*-chlordane, *trans*-nonachlor) (Table 4). Approximately 60% of NIST results were within the range of the NS&T monitoring results from the three stations. The NS&T monitoring range was defined as plus or minus two standard deviations of the analytical mean for each analyte at each site.

Table 3. Comparison of trace element data of Mussel Watch Project tissue samples from two laboratories (µg/g dry weight).

Site code	Ag NS&T	Ag NIST	As NS&T	As NIST	Cr NS&T	Cr NIST	Cu NS&T	Cu NIST	Se NS&T	Se NIST
1986										
BHDB	1.4	1.7	8.9	8.1	2.5	4.5	13	16	2.2	2.8
	(0.4)		(0.4)		(0.6)		(1)		(0.7)	
CBMP	6.9	5.8	6.5	4.7	0.88	1.4	337	317	3.6	3.7
	(0.4)		(0.6)		(0.10)		(31)		(0.4)	
CHFJ	4.0	3.3	30	35	0.87	1.6	120	97	2.2	2.9
	(0.5)		(3)		(0.11)		(10)		(0.2)	
GBCR	3.0	3.8	6.3	6.3	0.19	1.3	123	104	2.8	2.6
	(0.6)		(0.3)		(0.07)		(6)		(0.2)	
IBNJ	0.95	1.3	11	8.0	0.99	1.8	8.7	9.4	2.4	2.8
	(0.3)		(2)		(0.02)		(0.8)		(0.4)	
MSPB	3.2	2.8	17	17	1.1	2.5	103	75	2.1	2.7
	(1.0)		(5)		(0.7)		(32)		(0.6)	
1987										
BHHB	1.3	3.2	9.0	8.7	2.3	2.5	15	16	2.1	2.9
	(0.1)		(0.5)		(0.3)		(1)		(0.4)	
DBKI	4.2	6.6	8.2	7.1	0.54	1.2	183	129	2.6	3.1
	(1.7)		(0.7)		(0.07)		(6)		(0.3)	
MBCP	1.8	1.4	6.3	5.9	1.7	0.70	59	58	1.8	2.0
	(0.1)		(0.6)		(0.11)		(5)		(0.3)	
MBGP	1.8	1.5	6.9	6.3	0.14	0.34	111	92	3.5	3.6
	(0.2)		(0.3)		(0.06)		(11)		(0.1)	
MDSJ	0.91	2.3	11	8.0	2.3	16	9.4	≤9	5.4	4.4
	(0.3)		(2)		(0.3)		(0.7)		(0.4)	
PDPD	2.6	1.2	11	6.7	1.4	0.90	9.0	8.6	3.6	1.8
	(0.4)		(1)		(0.2)		(0.5)		(0.2)	
1988										
BBGN	0.32	0.21	17	9.4	1.0	1.5	10	9.4	2.3	3.0
	(0.01)		(1)		(0.1)		(1)		(0.3)	
HRLB	0.59	0.92	8.6	7.5	3.8	3.1	15	15	3.1	3.7
	(0.05)		(0.6)		(0.3)		(1)		(0.2)	
LIHH	0.30	0.30	5.7	3.5	1.6	1.5	12	13	2.4	2.8
	(0.04)		(0.3)		(0.1)		(1)		(0.2)	
SANM	0.12	0.09	20	9.6	1.6	1.8	6.4	9.7	3.5	2.9
	(0.02)		(1)		(0.3)		(0.4)		(0.3)	

For the NS&T results, the numbers in parentheses represent one standard deviation for the three stations within a site. The NIST results are the mean of results from the analysis of two subsamples from the specimen bank sample.

Table 4. Comparison of trace organic data of Mussel Watch Project tissue samples from two laboratories (ng/g dry weight).

Site code	4,4'-DDE NS&T	4,4'-DDE NIST	4,4'-DDT NS&T	4,4'-DDT NIST	*cis*-Chlordane NS&T	*cis*-Chlordane NIST	*trans*-Nonachlor NS&T	*trans*-Nonachlor NIST
1986								
BHDB	28	28	8.4	≤1	32	13	23	6.0
	(10)		*		(10)		(7)	
CBMP	37	15	ND	≤1	30	3.4	20	2.5
	(15)				(14)		(3)	
CHFJ	8.5	8.3	5.7	≤3	8.3	≤1	8.7	≤2
	*		*		(3.9)		(3)	
GBCR	4.3	7.3	0.44	≤2	4.1	≤1	3.0	2.2
	(1.3)		*		(0.9)		(0.7)	
IBNJ	102	163	24	15	8.6	≤1	8.6	≤1
	(70)		(8)		(0.5)		(0.6)	
MSPB	9.3	11	1.2	≤1	4.9	12	5.5	6.0
	(2.9)		(0.3)		(1.8)		(2)	
1987								
BHHB	68	34	52	10	48	14	26	11
	(21)		(22)		(13)		(8)	
DBKI	119	60	29	≤2	13	5.9	7.0	5.6
	(55)		*		(12)		(3)	
MBCP	64	59	9.4	6.6	12	7.9	7.2	6.4
	(19)		(14)		(7)		(5)	
MBGP	50	33	1.5	15	9.2	2.9	7.5	2.7
	(29)		(0.8)		(9.4)		(8)	
MDSJ	173	38	62	≤7	98	30	80	34
	(15)		(11)		(12)		(15)	
PDPD	393	104	22	5.2	17	4.9	10	4.3
	(344)		(17)$^{\Delta}$		(5)		(4)	
1988								
BBGN	6.1	6.6	4.1	2.7	3.9	3.4	4.1	3.9
	(0.4)		(0.1)$^{\Delta}$		(0.3)		(0.2)	
HRLB	99	145	21	31	25	49	20	50
	(37)		(6)		(2)		(4)	
LIHH	36	45	5.1	5.1	18	34	18	35
	(6)		(1.2)		(3)		(5)	
SANM	187	97	ND	2.3	6.0	5.7	5.3	5.5
	(12)				(0.5)		(0.3)	

ND - Not determined.
* Only one station was analyzed for this compound at this site.
$^{\Delta}$ Only two stations were analyzed for this compound at this site.
For the NS&T results, the numbers in parenthesis represent one standard deviation of a single measurement for the three stations within a site. The NIST results are the mean of results from the analysis of two subsamples from the specimen bank sample.

7. CONCLUSIONS

The cooperative effort of NOAA and NIST has resulted in an extensive sample archive from the coastal and estuarine environments of the U.S. Archived materials consist primarily of fish liver, fish muscle, bivalve mollusk tissues, and sediments. Samples have been archived from two national monitoring programs: the National Benthic Surveillance Project and the Mussel Watch Project. Additionally, samples have also been incorporated from Prince William Sound (collected during the time of the Exxon Valdez oil spill) and from the 1970s Mussel Watch Program. The value of specimen banking has been shown in the past when monitoring programs were able to perform retrospective analyses to determine whether or not contaminants previously unexpected existed in the environment. Even though NOAA's National Status and Trends Program reports the environmental concentration of over 70 trace elements and organic contaminants, this is still a small fraction of the total number of pesticides and chemicals released into the environment. A valid specimen bank is more than just a collection of samples in a freezer. Samples should be collected and archived in a non-contaminating way. Analysis should be performed on archived samples to help document sample stability. Field and analytical methods should be documented for the use of researchers.

8. ACKNOWLEDGEMENTS

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APPENDIX A

NATIONAL BIOMONITORING SPECIMEN BANK

Since 1985 and the establishment of the NS&T specimen bank, the specimen bank projects at NIST have expanded to include additional sample types, including: marine mammal tissues (kidney, liver, and blubber), human serum, and total human diet samples. These activities are associated with several different projects that are supported by various government agencies. These specimen banking activities are known collectively as the National Biomonitoring Specimen Bank (NBSB). The title reflects the inclusion of specimens of nutritional and medical importance in addition to those specimens archived for environmental purposes. These various projects have provided a wide range of experience in the collection, processing, long-term storage, and analysis of different samples types. These additional projects are described briefly below. More information can be found in Wise *et al*., 1993, and Wise and Koster (1994).

Human Liver Specimen Bank

The human liver project was a continuation of the original Pilot Environmental Specimen Bank program established in 1979 in cooperation with EPA. The pilot effort was originally intended to focus on four types of environmental specimens: human liver, marine specimens, food specimens, and an atmospheric accumulator. However, after other government agencies involved in projects related to the marine environment (e.g., NOAA) joined the NBSB program, the EPA/NIST pilot specimen bank project focused primarily on the establishment of a human liver bank and research related to specimen banking. From 1979 to 1994 over 650 human liver specimens from three different U.S. locations were collected and stored in the NBSB facility. Approximately 100 of these specimens were analyzed for the determination of trace element and selected chlorinated hydrocarbons (i.e., polychlorinated biphenyl congeners and chlorinated pesticides). The collection of human liver specimens was discontinued in 1994; however, these human liver specimens in the bank represent a substantial resource for EPA, and other research projects, for the investigation of environmental pollution trends in human populations (Wise et al., 1993).

Alaskan Marine Mammal Tissue Archival Project

The Alaskan Marine Mammal Tissue Archival Project (AMMTAP) was initiated in 1987, in conjunction with the Mineral Management Services (MMS) and NOAA, with the goal of establishing a representative collection of tissues from Alaskan marine mammals (e.g., seals, walruses, and whales) for future contaminant analyses and documentation of long-term trends in environmental quality. Because most marine mammals are at or near the top of the food chain, chemical analysis of their tissues may be useful in determining whether bioaccumulation of contaminants associated with human industrial activities is occurring in the marine food chains in the Arctic. In addition, some of the native population of Alaska depend upon such animals for a substantial portion of their diet. Therefore, the contaminant levels found in marine mammals may have health implications for the human population occupying these regions. A detailed discussion of the project, including the rationale for the selection of specimens and the sample collection protocols, has been published (Becker *et al*., 1988, 1991, 1993). Since 1987, specimens of liver, kidney, blubber, and muscle have been collected from northern fur seals, ringed seals, spotted seals, bearded seals, harbor seals, bowhead whales, walrus, polar bears, and beluga whales from various locations in Alaska (Koster *et al*., 1994). Results of the analyses of selected specimens from the AMMTAP have been published (Becker *et al*., 1992, 1995).

National Marine Mammal Tissue Bank

Increasing public and scientific interest in the health of marine mammals and the successful implementation of the AMMTAP made it desirable to expand the program to all U.S. coastal waters (and beyond) in a National Marine Mammal Tissue Bank (NMMTB). In 1989, a project was initiated with the Office of Protected Resources, the National Marine Fisheries Service within NOAA to develop the strategy for the establishment of the NMMTB. A team of Scientists, with expertise in marine mammal research and strandings, was assembled to advise NOAA on the development of the NMMTB. Each year, hundreds of marine mammals are found stranded on our coasts, and other marine mammals are taken incidentally during commercial fishing operations. The feasibility of specimen acquisition for the NMMTB from strandings and from incidental catches of marine mammals during commercial fishing operations was investigated. In 1990, a demonstration phase was established to evaluate the practical aspects of obtaining suitable specimens for the NMMTB from both incidental catches and strandings in the northeastern U.S. Specimens were obtained from harbor porpoises (*Phocoena phocoena*) taken incidentally in the northeast fisheries and pilot whales (*Globicephala melanea*) from a mass live stranding on Cape Cod. The collection of specimens from additional species and from the West coast have been incorporated into the program in recent years (Lillestolen *et al*., 1993 and Becker *et al*., 1994).

National Cancer Institute (NCI) Cancer Chemoprevention Program and IAEA/USDA/FDA Nutrients in Human Diet

Two additional projects, the Cancer Chemoprevention Program and the Nutrients in Human Diet Project, are not specifically directed toward specimen banking as are the EPA and NOAA projects; however, they do have minor specimen banking components associated with them. Both of these projects focus on nutrients rather than on environmental contaminants as in the three major projects described above. As part of a quality assurance program for the NCI's Cancer Chemoprevention Program, NIST serves as a reference laboratory for NCI supported laboratories involved in the determination of micronutrients in human serum (e.g., vitamins A, C, and E and beta-carotene). Large batches of human serum samples containing measured amounts of these analytes are prepared and distributed as proficiency testing samples for the various laboratories. Since the long-term stability of these nutrients in serum is unknown, selected well characterized specimens are stored under various conditions to determine storage stability. The Nutrients in Human Diet Project is a joint program among several different agencies to obtain comparative data on dietary intakes of nutritionally important minor and trace elements in nine countries. As part of this effort, samples of the total human diet composites, collected as part of the FDA “market basket” survey, are banked for long-term storage.

APPENDIX B

SPECIMEN BANK SAMPLING PROTOCOLS USED FOR THE NATIONAL BENTHIC SURVEILLANCE PROJECT

Samples of sediment and fish tissue (liver and muscle) were collected (1985-1992) as part of the NOAA National Status and Trends (NS&T) Program for storage in the National Biomonitoring Specimen Bank (NBSB) at the National Institute of Standards and Technology (NIST). This archive of samples is part of the NOAA NS&T Specimen Bank. Samples stored in the NOAA NS&T Specimen Bank are collected, processed, and packaged according to the protocols described below.

The collection protocol for samples included in the NOAA NS&T Specimen Bank consists of three stages: sample collection and preparation, fish dissection/sediment processing, and sample packaging and shipping. The division of the protocol into stages is used as an aid in organizing and simplifying the collection procedures. All information regarding the sample preparation is recorded on the Sampling Data form (NOAA NS&T National Benthic Surveillance Project)

Stage I. Sample Collection and Preparation - will occur on board the research vessel under conditions of limited control (i.e., sediment sampling and measuring, and sacrifice and cleaning of fish).

Stage II. Fish Dissection/Sediment Processing - will be performed in a clean-air work station (laminar airflow condition) under laboratory conditions on board the research vessel. This stage includes the dissection of the fish and the extruding of the sediment samples.

Stage III. Sample Packaging and Shipping - will be relatively standard for all samples; packaging will be performed in clean-air work station with pre-cleaned Teflon jars, and samples shipped at liquid nitrogen temperatures to NBSB.

FISH TISSUE SPECIMENS - NATIONAL BENTHIC SURVEILLANCE PROJECT

SAMPLE SELECTION

The amount of each sample to be banked should be approximately 150 g. Since duplicate samples (batches A and B) of each sample will be archived, approximately 300 g (2 x 150 g) of each tissue should be collected at each site. An estimate should be made of the number of individual fish required to obtain the necessary quantity of a sample for the specimen bank. This estimate should be based on the number and size of fish from a collection site. The number of individual fish to be pooled will be determined by the size of the fish liver. Ideally, equal amounts of liver and muscle tissue should be collected from each fish. If the amount of obtainable liver is limited due to size and/or number of fish at a specific site, the ratio of liver to muscle can be adjusted to 2:3, to obtain a full 2 x 150 g muscle sample and a minimum 2 x 100 g liver sample. For example, the average liver weight of Atlantic Croaker and Spot is approximately 0.7 to 2.0 g; therefore, 200 to 75 fish would be required, and the muscle tissue should be approximately 1.4 g to 4 g from each fish. The liver of a White Croaker weighs 2 to 3 g; therefore, a minimum of 100 fish are required and the muscle tissue should be approximately 3 g from each fish. The overall schematic of the fish sampling and necropsy protocol is illustrated in Figure 22.

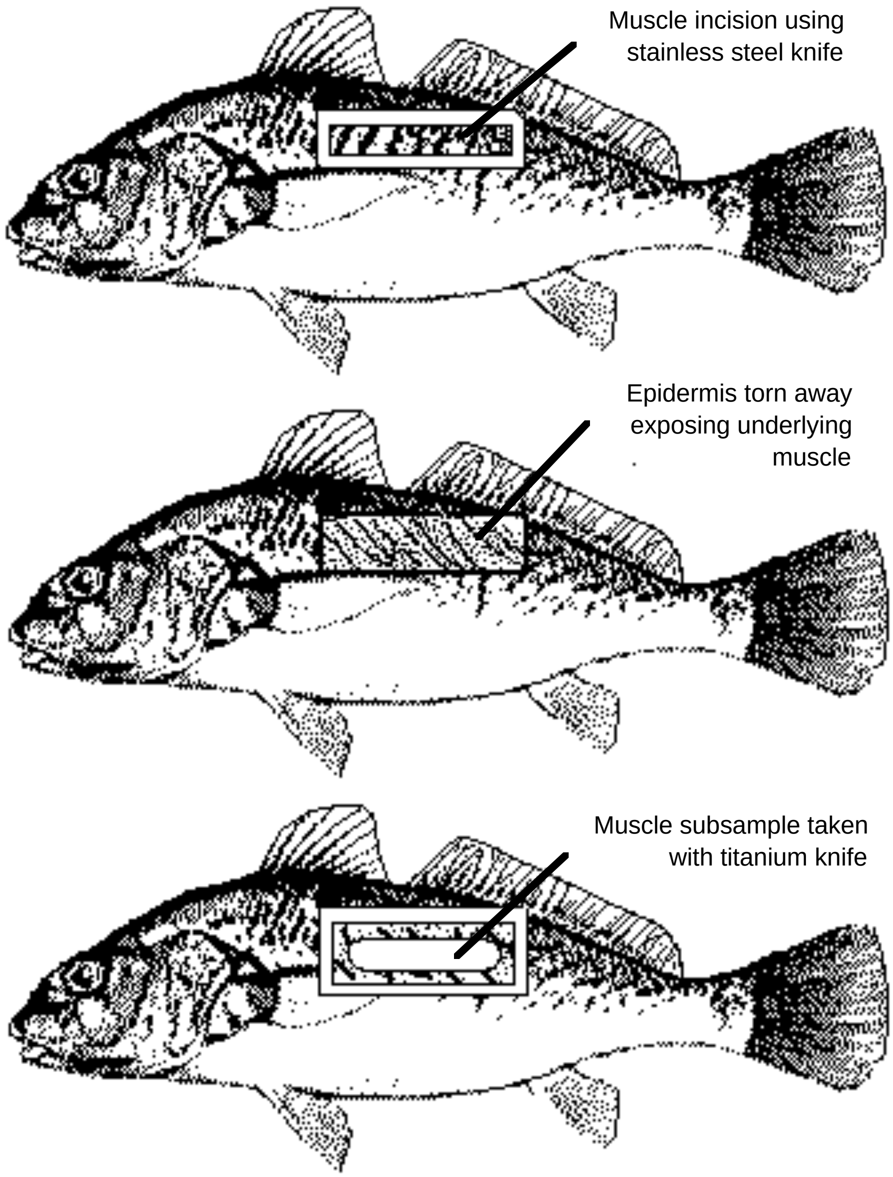

Figure 22. Three step muscle dissection sequence [Atlantic croaker (*Micropogonias undulatus*) shown].

Stage I. Sample Preparation (Fish Liver and Muscle tissue)

1. Measure and record the specimen's total length and sex; plot the lengths on the sample record form provided to obtain a histogram, and record the total number collected and the sex on the Sampling Data form for the NBSB.

2. Using a filleting knife or a scalpel (titanium if available but not the titanium knife supplied by NIST), sacrifice the specimen by severing the spinal cord. Wipe the body with a lint-free cloth to remove as much mucus as is practical.

3. With a clean pair of dust-free, non-talced vinyl gloves, transfer the fish specimen onto a lint-free cotton cloth in the clean-air work station (clean laminar flow conditions).

Stage II. Fish Dissection

Four sets of dissection instruments are used in the sample preparation process as follows:

Group 1. Scissors and forceps (used to enter sampling field)
Group 2. Sharp-pointed scalpel, scissors, forceps or hemostat, and titanium knife (used to excise sample)
Group 3. Scalpel or scissors, forceps or hemostat (used to enter sampling field)
Group 4. Forceps and titanium knife (used to excise sample)

1. Open the pre-cleaned teflon jar. Samples A and B of each tissue should be placed into the separate, pre-cleaned Teflon jars supplied by NIST. (Teflon jars and sheets are packaged under clean room conditions in larger Teflon bags and should be opened only in the clean air work station; the remaining jars should be resealed in the original Teflon bag.)

2. Using the scissors or scalpel and forceps from Group 1, open the body cavity. Wipe the instruments with a lint-free cotton cloth, rinse them with High Purity water, shake dry, and return them to their Group I position within the work station.

3. Using the surgical scissors from Group 2, free the liver from the surrounding tissue. Avoid cutting into the liver tissue. Remove the gall bladder. Place the liver on a clean Teflon sheet, and using the titanium knife, divide the liver into two equal parts for A and B samples. Wipe the implements with a lint-free cloth and rinse with HP water after each dissection.

4. If a partial tissue sample (i.e., less than the required 150 g) must be stored for a short interval before obtaining the total sample, the Teflon jar should be placed in a covered glass jar and cooled on ice, or for longer periods, refrigerated. After collection of the complete pooled sample, proceed with packaging and shipment procedure (Stage III).

5. Begin the dissection of the muscle tissue sample with the stainless steel scalpel or scissors from the third group of instruments. Place the specimen with the eyed or left side facing up. A series of four cuts is made into the dorsal section to expose a rectangular subsection of muscle (Figure 18). The first cut should be 100 to 150 mm long and extend from behind the head toward the tail, just above the lateral line. This cut is parallel and about 5 to 10 mm dorsal to the lateral line. The next cut is above and parallel to the first, just below the fin ridge. Then two perpendicular cuts are made at the ends of the parallel cuts to complete a rectangular incision. The scalpel is wiped and rinsed with HP water between cuts to remove scales and as much mucus as possible.

6. Use the scalpel from Group 3 to lift the edge of the skin along the cut line at the posterior end of the rectangular cut. Then hold the fish tail with one hand, and use the forceps or hemostat in the other hand tightly grasping the free edge of the skin. Pull the skin back from the rectangular cut to expose the muscle tissue mass (Figure 18). (Note: A layer of adipose tissue lies along the dorsal fin ridge. This tissue is not to be taken with the muscle tissue subsample.)

7. Use the titanium knife from Group 4 to obtain a "core" of the muscle tissue mass within the rectangular cut (Figure 18). Extreme care must be taken to assure that neither the contaminated rectangular cut line (including the area where the skin was lifted) nor the fish exterior is contacted either by the titanium knife or by the cored muscle sample. The titanium knife is then used to transfer this uncontaminated muscle tissue core to a clean Teflon sheet where the muscle tissue is divided with a titanium knife into A and B duplicates.

8. Record time of sample preparation on the Sampling Data form.

Stage III. Sample Packaging and Shipment

1. The liquid nitrogen shipper should be filled with liquid nitrogen for at least 6 hours to fully prepare it for shipping. This time is necessary to saturate fully the absorbent inside the shipper. Before placing the frozen samples in the shipper, the excess liquid nitrogen must be poured off. (Note: liquid nitrogen should not be stored in sealed containers. Personnel handling liquid nitrogen are cautioned to wear boots, cuffless trousers, nonabsorbent aprons, loose fitting insulated gloves, and face shields.)

2. The liquid nitrogen shipper should not be used for freezing the samples, but only for shipping. If no separate supply of liquid nitrogen is available, it may be convenient to fill the shippers completely with liquid nitrogen before departure on sampling trips. Excess liquid nitrogen may be used to quick-freeze the samples in the supplied plastic dewar.

3. After collection of the complete composite fish tissue samples, the Teflon jars are recapped.

4. The pooled samples are weighed using an empty Teflon jar or subtracting 145 g for the jar tare weight. The weights are recorded on the Sampling Data form and the sample labels. The lid labels are placed in the recessed lid and a second label is affixed to the outside of the jar and held on with wide transparent tape provided by NBSB. Wrap the tape around the jar several times to secure the label before freezing in liquid nitrogen.

5. The Teflon jars are then immersed in the plastic dewar containing liquid nitrogen for 10 minutes to rapidly freeze them.

6. The frozen tissue samples are transferred to the liquid nitrogen shipper for storage. The shippers will hold at least 10 sample jars. Once the shippers are full, they are shipped to the National Institute of Standards and Technology; the samples are not to be stored in intermediate freezers.

7. Make sure all entries on the NBSB National Benthic Surveillance Project Sampling Data forms are complete. Any deviations or modifications of this protocol must be noted on the Sampling Data form. In addition to the forms provided, include a copy of the applicable site log containing station latitude and longitude, geographic site name and associated National Status and Trend's assigned site number. Place a copy of the completed forms in the shipper, and retain another copy for your project records.

8. The frozen specimens and their corresponding Sampling Data sheets should be shipped by an overnight-express carrier. Maximum holding time for the shippers is 10 days. Send the shippers overnight to NIST. Ship the samples to: National Institute of Standards and Technology, Clopper Road, Bldg. 235 Room B118, Gaithersburg, MD 20899.

9. Notify the NIST Specimen Bank personnel by telephone as soon as possible after the specimens are shipped.

SEDIMENT SPECIMENS - NATIONAL BENTHIC SURVEILLANCE PROJECT

SEDIMENT COLLECTION

A sediment sample is required from selected sites for the NS&T specimen bank. The sample will consist of pooled sediment cores from one grab at each of the three stations at the site. Three box core samples will be taken from each station. From one of the box corers, two equivalent cylindrical core samples of approximately 50 mL will be taken; one will be designated as portion A and the other as portion B. Initially, three cylindrical core samples are taken from which two suitable ones can be selected to form the A and B portion of the respective box core. The A portions from each station will be pooled to provide sample A (150 mL) for the site; the B portions will provide sample B. The cylindrical sample cores are taken with the (120 mm x 42 mm internal diameter) Teflon tubes supplied by NIST. A core length of 30 mm will equal approximately 50 mL.

Stage I. Sediment Collection

1. Insert the Teflon cylinders into the box core (with the water layer remaining in the box core), close the top with the screw cap, and withdraw the core from the box core. The bottom end is also capped for intermediate storage or the foam plug (see Stage II step 3) is inserted for immediate extrusion.

2. The Teflon corers containing the sediment cores are transported to the clean work station (laminar flow hood) for processing.

Stage 11. Sediment Processing

1. The corers should be stored on ice or in the freezer until all six samples have been collected.

2. At the clean work station, the A and B portions of the sediment core are extruded into the pre-cleaned Teflon jars (180 mL).

3. The samples are extruded from the tubes by inserting foam plugs into the bottom of the tubes. When a seal is achieved with the foam plug in place, the top cap can be unscrewed. The water on top is now removed either with a Pasteur pipette or by holding the corer containing the sediment over a beaker and allowing the container water to overflow into the beaker as the sediment is pushed upwards. The sediment is pushed upwards until the surface reaches the rim of the tube. Use one of the 30 mm long labels to mark the length of the path for which the plug has to be pushed upwards. Push the plug to the marked endpoint. A 30 mm sediment core will be above the rim of the tube. Use the titanium knife to cut off this portion and place the sediment into the appropriate Teflon jar.

4. If the above sampling procedure for the collection of sediment cores from the box cores should not be possible, the appropriate portions should be obtained by scooping the sediment. The Teflon tubes should be used to define the approximate sample size.

5. If the sediment core is too fluid to permit an accurate extrusion and collection of the sediment plug, the core tubes may he placed in a freezer until just frozen; sediment tubes are then removed from the freezer and the frozen sediment is easily extruded.

6. The pooled sediment portions are weighed subtracting 145 g to tare the weight of the jar or use a jar to tare the balance. The weights are recorded on the sampling data form and the sample labels. The labels are completed with the site ID, sample type, date of collection, and cruise number; then the labels are affixed to the jars with wide transparent tape provided by NBSB. Wrap the tape around the jar several times to secure the label after freezing in liquid nitrogen.

7. The Teflon jars are then immersed in the plastic dewar containing liquid nitrogen for 10 minutes to rapidly freeze the samples.

Stage III. Sample Packaging and Shipment

1. The frozen sediment samples are transferred to the liquid nitrogen shipper for storage. The shippers will hold at least 10 sample jars. Once the shippers are full, they are shipped to the National Institute of Standards and Technology; the samples are not to be stored in intermediate freezers.

2. Make sure all entries on the NBSB National Benthic Surveillance Project Sampling Data forms are complete. Any deviations or modifications of this protocol must be noted on the Sampling Data form. In addition to the forms provided, include a copy of the applicable site log containing station latitude and longitude, geographic site name, and associated NS&T assigned site number. Place a copy of the completed forms in the shipper, and retain another copy for your project records.

3. The frozen specimens and their corresponding Sampling Data sheets should be shipped by an overnight-express carrier. Maximum holding time for the shippers is 10 days. Send the shippers C.O.D. to National Institute of Standards and Technology, Clopper Road, Bldg 235, Room B118, Gaithersburg, MD 20899.

4. Notify the NIST Specimen Bank personnel by telephone as soon as possible after the specimens are shipped.

CLEANING OF SAMPLING INSTRUMENTS

Before tissue dissection and after sharpening the titanium knives, the tools are wiped clean, scrubbed in detergent solution, rinsed extensively with tap water, rinsed in distilled/high-purity (HP) water (i.e., milli-Q or HPLC-grade Water), transferred to the fume exhaust hood where they are carefully rinsed with methylene chloride (CH_2Cl_2), and carried on a similarly cleaned cutting board covered with a Teflon sheet to the work station. At the work station the knives are transferred to clean, lintfree cotton cloths at the rear of the work area.

Following specified steps in the fish dissection process, and between specimens of a dissection group, the tools should be rinsed with HP water. While rinsing, and with gloved hands, run fingers over the blade and handle of the knife to help remove any adhering blood or tissue. This process should be performed before any fluid or tissue has a chance to dry on the knife. In the laboratory the knife should be rinsed with HP water again, as described above, and rinsed with ethanol or other suitable solvent. The knife is then placed on a clean surface (do not touch the blade) and allowed to air dry, preferably in a laminar flow hood. The knife should then be placed in a Teflon bag for storage and transportation to the next sampling site. The sediment corers should be treated in a similar manner, making sure to clean off any sediment adhering to the walls. After cleaning the implements, they should not be touched with ungloved hands.

APPENDIX C

SPECIMEN BANK SAMPLING PROTOCOLS FOR THE MUSSEL WATCH PROJECT

Samples of sediment and bivalve mollusks (oysters and mussels) are collected as part of the NOAA National Status and Trends (NS&T) Program for storage in the National Biomonitoring Specimen Bank (NBSB) at the National Institute of Standards and Technology (NIST). This archive of samples is part of the NOAA NS&T Specimen Bank. Samples stored in the NOAA NS&T Specimen Bank are collected, processed, and packaged according to the protocols described below.

The collection protocol for samples included in the NOAA NS&T Specimen Bank consists of three stages: bivalve/sediment collection and bivalve sorting, bivalve/sediment processing, and sample packaging and shipping. The division of the protocol into stages is used as an aid in organizing and simplifying the collection procedures. All information regarding the sample preparation is recorded on the Sampling Data form (NOAA NS&T Mussel Watch Project) (see page 58).

Stage I. Bivalve/Sediment collection and bivalve sorting will occur aboard the vessel under conditions of limited control; samples are counted, sorted, measured, and cleaned.

Stage II. Bivalve/Sediment processing will occur upon return to shore in a controlled environment using pre-cleaned Teflon bags and jars: samples are properly labeled.

Stage III. Sample packaging and shipping. Packaging performed in a controlled environment; samples shipped on dry ice to NBSB.

BIVALVE SPECIMENS - MUSSEL WATCH PROJECT

SAMPLE SELECTION

A composite bivalve sample is obtained from each site specified for specimen banking. Bivalve and sediment samples are taken from three stations at each site.

Each station provides two batches of approximately 16-18 mussels (*Mytilus edulis*/*M. californianus*) or two batches of 10 oysters (*Crassostrea virginica*), one batch designated as A and the other as B. Since there are three stations per site, the total combined sample for each site is approximately 50 mussels or 30 oysters for each of A and B replicates (total of 100 mussels and 60 oysters).

Stage I. Sample Collection and Sorting (Bivalves)

1. The oysters or mussels are collected by: dredging in a water depth of 2-3 m or more, sampling fork in water depth less than 1 m, tongs in water depth of 2-2.5 m, or by hand along shoreline.

2. After the collection is complete and wearing non-talced vinyl gloves, the bivalves are separated, and sorted to ensure that sufficient acceptable individual bivalves have been collected. Mussels less than 5 cm and greater than 8 cm long are discarded. Any bivalve which does not have a tightly closed shell is discarded. Acceptable oysters are in the size range of 7-10 cm. (Mortality is high for oysters larger than this.) Oysters are examined in the field to ensure that more than an empty shell is being taken.

3. After examination, bivalves are placed on a sorting tray which has holes in the bottom for drainage. The samples are rinsed with seawater and scrubbed with a non-contaminating brush (nylon or natural fiber brush). Then the samples are rinsed a second time with seawater.

Stage II. Bivalve Processing

1. With clean, non-talced vinyl gloves, fold the open end of a 14" x 18" (or 12" x 12") pre-cleaned Teflon bag over and keep the bag as free of contamination as possible. When the samples are placed in the Teflon bags, care should be taken to avoid getting fluid on the Teflon surface where the bag is to be sealed because it is difficult to get a good seal on wet Teflon surfaces. If moisture gets on the rim of the Teflon bag, use a clean lint-free cotton cloth to remove it, or put the partially sealed bag into another bag. (Teflon bags and sheets are packaged under clean room conditions in larger Teflon bags and should be carefully opened and kept as clean as possible; the remaining bags should be resealed in the original Teflon bag.)

2. Place 15-18 mussels or 10 whole oysters per station for each replicate sample into the Teflon bag. The total A and B replicate for each site will consist of 50 mussels or 30 oysters pooled from the three stations of a site.

3. Affix the label provided by NIST to the Teflon bag, designating the sample as portion A or B, and be sure all the information (site ID, site number, date, etc.) has been filled in.

4. The Teflon bag containing the bivalve samples is heat sealed using the portable heat sealer provided by NIST. Workable settings on the heat sealer are marked. However, if sealing problems still occur, vary the current/temperature and duration settings.

5. It is important to seal the bag with as little air remaining inside as possible. Air should be squeezed out. The seal can be tested by gently squeezing the bag to see if it holds pressure. A second seal is then made slightly away from the first and parallel to it to provide a double seal.

6. Each labeled bag is placed into a second bag, and double seals are made, as described above in 2. (Note: the label is between the two bags.)

7. The double bagged samples are placed in an ice chest containing dry ice.

8. Complete the NBSB Mussel Watch Project Sampling Data form. Any deviation or modification of this protocol must be noted on the Sampling Data form.

Stage III. Sample Packaging and Shipment

1. Frozen or chilled samples will be repacked with fresh dry ice in insulated dry-ice shipping containers and shipped by overnight express to the National Institute of Standards and Technology. Since dry-ice has a limited capacity to keep samples cold over extended periods of time, samples packed in dry-ice should not be shipped on Friday or before holidays. Ship the samples to: National Institute of Standards and Technology, Clopper Road, Bldg. 235 Room B118, Gaithersburg, MD 20899.

2. Notify the NIST Specimen Bank personnel by telephone as soon as possible after the samples are shipped.

SEDIMENT SPECIMENS - MUSSEL WATCH PROJECT

Two composite sediment samples are collected from each site designated for specimen banking. Sediment will be collected at three stations from within the designated bivalve site. A Kynar-coated modified Van Veen-type grab sampler is used to collect the A and B replicate portions of sediment.

Stage I. Sediment Collection

1. Using a Kynar-coated sample scoop, a 60 mL volume (approximately 2 scoops) of the top 1 cm of sediment are removed from the modified Van Veen-type grab.

2. Immediately transfer the sample to a pre-cleaned 180 mL Teflon jar, close the jar between the three samplings.

3. From the same grab cast, collect a second replicate 60 mL volume (2 scoops) of surface sediment and place the sample into a second Teflon jar. These two replicates constitute portion A and portion B, respectively.

4. The same procedure is carried out for two more stations to make the A and B portions for the site.

5. The combined sediment samples are stored cool (on ice) until returning to shore. (Eight hours maximum storage on ice.)

6. Care must be taken to wash the grab with seawater between each station and to clean the sampling scoop by: soap and water wash, water rinse, distilled water rinse, methanol rinse, and methylene chloride rinse.

Stage II. Sediment Processing

1. After the three stations have been combined to form the A and B replicates for the site, the sediment portions are weighed subtracting 145 g to tare the weight of the jar. The weights are recorded on the Sampling Data form and the sample labels. The lid labels are placed in the recessed lid and a second label is affixed to the outside of the jar and held on with wide transparent tape provided by NBSB. Wrap the tape around the jar several times to secure the label after freezing with liquid nitrogen.

2. Complete the NBSB Mussel Watch Project Sampling Data form. Any deviations or modifications of this protocol must be noted on the Sampling Data form.

3. The samples are then ready to be frozen for shipment. Make sure the lid is tightly secured.

Stage III. Sample Packaging and Shipment

1. Frozen or chilled samples will be repacked with fresh dry ice in insulated dry-ice shipping containers and shipped by overnight express to the National Institute of Standards and Technology. Since dry-ice has a limited capacity to keep samples cold over extended periods of time, samples packed in dry-ice should not be shipped on Friday or before holidays. Ship the samples to: National Institute of Standards and Technology, Clopper Road, Bldg. 235 Room B118, Gaithersburg, MD 20899.

2. Notify the NIST Specimen Bank personnel by telephone as soon as possible after the samples are shipped.

NATIONAL BIOMONITORING SPECIMEN BANK

Sampling Data - NOAA/NS&T Program

Benthic Surveillance Project

Sample Source: ______________________________

Site ID ______________________________ Lat. ________ Long. ________

FISH

Time of collection: [ ][ ][ ] day mo yr [ ] hr Collected by ______________________________

Intermediate Storage (Temp./remarks) ______________________________

____

Time of preparation: [ ][ ][ ] day mo yr [ ] hr Collection ______________________________

Time of LN2 Freezing: [ ][ ][ ] day mo yr [ ] hr Processor ______________________________

SEDIMENT

Time of collection: [ ][ ][ ] day mo yr [ ] hr Collected by ______________________________

Intermediate Storage (Temp./remarks) ______________________________

____

Time of preparation: [ ][ ][ ] day mo yr [ ] hr Collection ______________________________

Time of LN2 Freezing: [ ][ ][ ] day mo yr [ ] hr Processor ______________________________

Protocol: Standard Modified (Please note modification below)

Remarks:

Site ID ______________________________

Fish species ______________________________

Number & sex in sample (log number)

A: ______________________ B: ______________________

______________________ ______________________

Sediment grabs (log number)

A: ______________________ B: ______________________

______________________ ______________________

______________________ ______________________

Liver sample weight	A		g	B		g
Muscle sample weight	A		g	B		g
Sediment sample weight	A		g	B		g

Prepared by: ______________________________

Name (print)

____

Signature

NATIONAL BIOMONITORING SPECIMEN BANK

Sampling Data - NOAA/NS&T Program
Mussel Watch Project

Sample Source: ______________________________

Site ID ______________________ Lat. __________ Long. __________

BIVALVE Oyster ☐ Mussel ☐

Time of collection: day mo yr hr Collected by ______________________

Intermediate Storage (Temp./remarks) ______________________

Time of preparation: day mo yr hr Collection ______________________

Time of LN2 Freezing: day mo yr hr Processor ______________________

SEDIMENT

Time of collection: day mo yr hr Collected by ______________________

Intermediate Storage (Temp./remarks) ______________________

Time of preparation: day mo yr hr Collection ______________________

Time of LN2 Freezing: day mo yr hr Processor ______________________

Protocol: Standard Modified (Please note modification below)

Remarks:

Site ID ____________________

Number of bivalves in sample A: __________ B: __________

BIVALVE COLLECTION

Station sample numbers __________
____
____

____ INTERTIDAL	____ SUBTIDAL	____ SAND	____ MUD
____ SHELL	____ HAND	____ DREDGE	____ FORK
____ GRAB	____ OTHER		

SEDIMENT COLLECTION

Sediment sample weight (g) __________
____
____

Prepared by: ____________________
Name (print)

____
Signature

APPENDIX D

SPECIMEN ACCESS POLICY*

All requests for samples of tissue (fish or shellfish) or sediment for analyses or other uses will be considered. Release of samples to investigators will be contingent upon the approval of NS&T/NOAA and the NIST's National Biomonitoring Specimen Bank. Release of these archived materials will depend on a determination by NOAA that all the following conditions are met: (1) a sufficient amount of the requested specimens exist beyond anticipated needs of the NS&T Program, (2) the proposed work can only be practically satisfied through use of archived samples, and (3) such analyses or uses will be performed cooperatively by the requesting organization and the NS&T Program. If sample analyses are to provide a retrospective on coastal and marine pollution as opposed to identifying otherwise overlooked contaminants, then specimens must have been archived for at least five years prior to sample release. Of particular importance is the justification that samples from the NS&T Specimen Bank could not be obtained from other sources. The NS&T Specimen Bank is not intended to be a readily accessible source of marine specimens but only for research requiring banked samples from the past. The final decision on release of these archived specimens remains with NOAA.

Requests for samples from the NS&T Specimen Bank must include a clear and concise statement of the proposed work and be consistent with the goals of the NS&T and NBSB programs. The following specific information should be included in the request for samples:

1. Name of principal investigator and affiliated research or academic organization;
2. Purpose of the proposed research;
3. Detailed explanation of the proposed research;
4. Specific specimens (i.e., sample type and site) and quantities desired;
5. Description of the analyses to be performed including experimental procedures and detection levels;
6. Research facility where analyses will he conducted;
7. Analytical quality control procedures to be used (participation in the NS&T Quality Assurance Program is required):
8. Justification for use of banked tissue;
9. Expected date for completion of analyses, and schedule/date of subsequent reports;
10. Agreement to provide NS&T program and NIST with the results of all analyses; and
11. Agreement that credit and acknowledgement will be given to NOAA/NIST NBSB for use of banked specimens.

Costs incurred for providing samples (packaging, shipping, etc.) will be borne by the requester. In addition, samples may have to be cryogenically homogenized to provide subsamples (7 - 10 g) before being released for analysis. Only a portion of the NS&T samples have been previously homogenized. If samples must be homogenized, an additional cost will have to be borne by the individual or organization making the sample request.

Direct inquires regarding access to samples from the NS&T specimen bank to:

NOAA-Specimen Banking Project, N/ORCA2I
1305 East-West Highway
Silver Spring, MD 20910
(301) 713-3028

* The specimen access policy follows that of Becker *et al*. (1991).

APPENDIX E

NS&T SPECIMEN BANK INVENTORY

Sample type and species key:

AF - *Arius felis* (Hardhead catfish)
CS - *Cheilotrema saturnum* (Black croaker)
CV - *Crassostrea virginica* (American oyster)
GL - *Genyonemus lineatus* (White croaker)
HS - *Hippoglossus stenolepis* (Pacific halibut)
LX - *Leiostomus xanthurus* (Spot)
MA - *Morone americana* (White perch)
MC - *Mytilus californianus* (California mussel)
ME - *Mytilus edulis* (Blue mussel)
MO - *Myoxocephalus octodecemspinosus* (Longhorn sculpin)
MU - *Micropogonias undulatus* (Atlantic croaker)
OK - *Oncorhynchus keta* (chum salmon)
OS - *Ostrea sandvicensis* (Hawaiian oyster)
PA - *Pleuronectes americanus* (Winter flounder)
PnV - *Pleuronichthys verticalis* (Hornyhead turbot)
PS - *Platichthys stellatus* (Starry flounder)
PV - *Parophrys vetulas* (English sole)
SED - Sediment

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW2M178	PBSI*	Sears Island	Penobscot Bay	ME	44°27.13'	68°53.38'	27-Mar-87	ME
MW2S179	PBSI	Sears Island	Penobscot Bay	ME	44°27.13'	68°53.38'	27-Mar-87	SED
MW3M231	PBPI	Pickering Island	Penobscot Bay	ME	44°15.88'	68°44.05'	19-Mar-88	ME
MW3S232	PBPI	Pickering Island	Penobscot Bay	ME	44°15.88'	68°44.05'	19-Mar-88	SED
MW4M313	CAKP	Cape Arundel	Kennebunkport	ME	43°20.87'	70°28.48'	23-Mar-89	ME
MW3S229	CAGH	Gap Head	Cape Ann	MA	42°40.04'	70°36.30'	16-Mar-88	SED
MW3M230	CAGH	Gap Head	Cape Ann	MA	42°39.65'	70°35.71'	15-Mar-88	ME
MW7M461	SHFP	Folger Point	Salem Harbor	MA	42°31.13'	70°52.02'	10-Mar-92	ME
MW5M366	MBNB	Nahant Bay	Massachusetts Bay	MA	42°25.23'	70°54.41'	9-Mar-90	ME
MW5S367	MBNB	Nahant Bay	Massachusetts Bay	MA	42°25.58'	70°54.10'	9-Mar-90	SED
MW7M458	BHDI	Deer Island	Boston Harbor	MA	42°21.50'	70°58.40'	23-Feb-92	ME
MW1M048	BHDB	Dorchester Bay	Boston Harbor	MA	42°18.25'	71°02.30'	13-Jan-86	ME
MW1S049	BHDB	Dorchester Bay	Boston Harbor	MA	42°18.25'	71°02.30'	16-Jan-86	SED
MW2M163	BHHB	Hingham Bay	Boston Harbor	MA	42°16.45'	70°53.26'	2-Mar-87	ME
MW2S164	BHHB	Hingham Bay	Boston Harbor	MA	42°16.45'	70°53.26'	2-Mar-87	SED
MW5M368	MBNR	North River	Massachusetts Bay	MA	42°09.65'	70°44.41'	11-Mar-90	ME
MW5S369	MBNR	North River	Massachusetts Bay	MA	42°09.65'	70°44.41'	25-Mar-90	SED
MW4M307	DBCI	Clarks Island	Duxbury Bay	MA	42°00.88'	70°38.17'	6-Mar-89	ME
MW4S308	DBCI	Clarks Island	Duxbury Bay	MA	42°00.88'	70°38.17'	6-Mar-89	SED
MW5M370	BBWF	West Falmouth	Buzzards Bay	MA	41°36.50'	70°39.35'	21-Mar-90	ME
MW5S371	BBWF	West Falmouth	Buzzards Bay	MA	41°36.77'	70°40.37'	24-Mar-90	SED
MW5M372	BBNI	Naushon Island	Buzzards Bay	MA	41°30.77'	70°44.49'	22-Mar-90	ME
MW5S373	BBNI	Naushon Island	Buzzards Bay	MA	41°30.60'	70°44.26'	24-Mar-90	SED
MW1M046	BBRH	Round Hill	Buzzards Bay	MA	41°32.45'	70°55.52'	23-Jan-86	ME
MW1S047	BBRH	Round Hill	Buzzards Bay	MA	41°32.45'	70°55.52'	5-Feb-86	SED
MW7M459	BBRH	Round Hill	Buzzards Bay	MA	41°32.45'	70°55.52'	26-Feb-92	ME
MW2M165	BBAR	Angelica Rock	Buzzards Bay	MA	41°34.63'	70°51.78'	9-Mar-87	ME
MW2S166	BBAR	Angelica Rock	Buzzards Bay	MA	41°35.22'	70°52.70'	7-Mar-87	SED
MW7M460	BBAR	Angelica Rock	Buzzards Bay	MA	41°34.63'	70°51.78'	2-Mar-92	ME
MW3M225	BBGN	Goosebury Neck	Buzzards Bay	MA	41°28.68'	71°02.13'	28-Feb-88	ME
MW3S226	BBGN	Goosebury Neck	Buzzards Bay	MA	41°28.84'	71°01.34'	3-Mar-88	SED
MW2M176	NBDI	Dyer Island	Narragansett Bay	RI	41°36.20'	71°17.37'	12-Mar-87	ME
MW2S177	NBDI	Dyer Island	Narragansett Bay	RI	41°36.20'	71°17.37'	12-Mar-87	SED
MW1M050	NBDU	Dutch Island	Narragansett Bay	RI	41°30.08'	71°23.57'	3-Feb-86	ME
MW1S051	NBDU	Dutch Island	Narragansett Bay	RI	41°30.08'	71°23.57'	3-Feb-86	SED
MW3M227	BIBI	Block Island	Block Island Sound	RI	41°11.40'	71°35.14'	6-Mar-88	ME
MW3S228	BIBI	Block Island	Block Island Sound	RI	41°11.40'	71°35.14'	6-Mar-88	SED

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW2M117	LICR	Connecticut River	Long Island Sound	CT	41°15.83'	72°20.50'	12-Nov-86	ME
MW2S118	LICR	Connecticut River	Long Island Sound	CT	41°15.83'	72°20.50'	11-Nov-86	SED
MW7M455	LICR	Connecticut River	Long Island Sound	CT	41°15.83'	72°20.50'	12-Feb-91	ME
MW5M325	LINH	New Haven	Long Island Sound	CT	41°15.40'	72°56.67'	27-Nov-89	ME
MW5S326	LINH	New Haven	Long Island Sound	CT	41°15.40'	72°56.67'	28-Nov-89	SED
MW1M053	LIHR	Housatonic River	Long Island Sound	CT	41°10.07'	73°06.58'	12-Feb-86	ME
MW1S054	LIHR	Housatonic River	Long Island Sound	CT	41°10.07'	73°06.58'	13-Feb-86	SED
MW4M262	LISI	Sheffield Island	Long Island Sound	CT	41°03.40'	73°24.77'	11-Nov-88	ME
MW4M259	LIHU	Huntington Harbor	Long Island Sound	NY	40°55.00'	73°25.87'	12-Nov-88	ME
MW5M323	LIPJ	Port Jefferson	Long Island Sound	NY	40°57.57'	73°05.52'	1-Dec-89	ME
MW5S324	LIPJ	Port Jefferson	Long Island Sound	NY	40°57.57'	73°05.52'	1-Dec-89	SED
MW3S205	LIHH	Hempstead Harbor	Long Island Sound	NY	40°51.14'	73°40.14'	7-Dec-87	SED
MW3M206	LIHH	Hempstead Harbor	Long Island Sound	NY	40°51.14'	73°40.14'	5-Dec-87	ME
MW4M260	LITN	Throgs Neck	Long Island Sound	NY	40°49.17'	73°48.07'	12-Nov-88	ME
MW4S261	LITN	Throgs Neck	Long Island Sound	NY	40°49.17'	73°48.07'	12-Nov-88	SED
MW5M327	LIFI	Fire Island	Long Island	NY	40°37.68'	73°17.16'	2-Dec-89	ME
MW5M328	LIJI	Jones Inlet	Long Island	NY	40°35.81'	73°35.45'	5-Dec-89	ME
MW5S329	LIJI	Jones Inlet	Long Island	NY	40°35.81'	73°35.45'	5-Dec-89	SED
MW2M125	HRUB	Upper Hudson Bay	Raritan Estuary	NY	40°41.38'	74°02.55'	7-Dec-86	ME
MW2S126	HRUB	Upper Hudson Bay	Raritan Estuary	NY	40°41.38'	74°02.55'	7-Dec-86	SED
MW1M075	HRLB	Lower Bay	Hudson Raritan Est.	NY	40°33.97'	74°03.13'	15-Mar-86	ME
MW1S076	HRLB	Lower Bay	Hudson Raritan Est.	NY	40°33.97'	74°03.13'	13-Mar-86	SED
MW3S207	HRLB	Lower Bay	Hudson Raritan Est.	NY	40°33.97'	74°03.13'	14-Dec-87	SED
MW3M208	HRLB	Lower Bay	Hudson Raritan Est.	NY	40°33.97'	74°03.13'	19-Dec-87	ME
MW6M432	NYSH	Sandy Hook	New York Bight	NJ	40°29.27'	74°02.70'	26-Feb-91	ME
MW6S433	NYSH	Sandy Hook	New York Bight	NJ	40°29.27'	74°02.70'	26-Feb-91	SED
MW6M414	NYSR	Shark River	New York Bight	NJ	40°11.18'	74°00.38'	26-Feb-91	ME
MW6S415	NYSR	Shark River	New York Bight	NJ	40°11.18'	74°00.38'	26-Feb-91	SED
MW6M416	BIBL	Barnegat Light	Barnegat Inlet	NJ	39°45.52'	74°05.93'	26-Feb-91	ME
MW6S417	BIBL	Barnegat Light	Barnegat Inlet	NJ	39°45.52'	74°05.93'	26-Feb-91	SED
MW6M418	AIAC	Atlantic City	Absecon Inlet	NJ	39°22.15'	74°24.48'	26-Feb-91	ME
MW6S419	AIAC	Atlantic City	Absecon Inlet	NJ	39°22.15'	74°24.48'	26-Feb-91	SED
MW2Y123	DBFE	False Egg Island Pt.	Delaware Bay	NJ	39°12.82'	75°11.45'	16-Dec-87	CV
MW2S124	DBFE	False Egg Island Pt.	Delaware Bay	NJ	39°12.71'	75°11.45'	16-Dec-87	SED
MW3S209	DBFE	False Egg Island Pt.	Delaware Bay	NJ	39°12.71'	75°11.45'	13-Jan-88	SED
MW3Y210	DBFE	False Egg Island Pt.	Delaware Bay	NJ	39°12.82'	75°11.45'	13-Jan-88	CV
MW1Y077	DBAP	Arnolds Point Shoal	Delaware Bay	NJ	39°23.09'	75°25.88'	25-Mar-86	CV

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW1S078	DBAP	Arnolds Point Shoal	Delaware Bay	NJ	39°23.09'	75°25.88'	25-Mar-86	SED
MW4Y265	DBWB	Woodland Beach	Delaware Bay	DE	39°19.92'	75°27.42'	10-Dec-88	CV
MW4S266	DBWB	Woodland Beach	Delaware Bay	DE	39°19.92'	75°27.42'	10-Dec-88	SED
MW2Y119	DBKI	Kelly Island	Delaware Bay	DE	39°12.17'	75°21.30'	7-Jan-87	CV
MW2S120	DBKI	Kelly Island	Delaware Bay	DE	39°12.17'	75°21.30'	7-Jan-87	SED
MW6M440	DBCH	Cape Henlopen	Delaware Bay	DE	38°47.28'	75°07.42'	27-Mar-91	ME
MW1Y073	CBMP	Mountain Point Bar	Chesapeake Bay	MD	39°04.42'	76°24.73'	12-Mar-86	CV
MW1S074	CBMP	Mountain Point Bar	Chesapeake Bay	MD	39°04.42'	76°24.73'	12-Mar-86	SED
MW2Y133	CBHP	Hackett Point Bar	Chesapeake Bay	MD	38°58.37'	76°25.00'	21-Jan-87	CV
MW2S134	CBHP	Hackett Point Bar	Chesapeake Bay	MD	38°58.37'	76°25.00'	21-Jan-87	SED
MW6Y420	CBCP	Choptank River	Chesapeake Bay	MD	38°36.41'	76°07.20'	26-Feb-91	CV
MW6S421	CBCP	Choptank River	Chesapeake Bay	MD	38°36.41'	76°07.20'	26-Feb-91	SED
MW5Y341	PRMC	Mattox Creek	Potomac River	VA	38°13.12'	76°57.32'	14-Jan-90	CV
MW5S342	PRMC	Mattox Creek	Potomac River	VA	38°13.12'	76°57.32'	14-Jan-90	SED
MW2Y121	CBCC	Cape Charles	Chesapeake Bay	VA	37°17.09'	76°01.19'	9-Jan-87	CV
MW2S122	CBCC	Cape Charles	Chesapeake Bay	VA	37°17.09'	76°01.19'	9-Jan-87	SED
MW1Y062	CBDP	Dandy Point	Chesapeake Bay	VA	37°06.10'	76°19.41'	4-Mar-86	CV
MW1S063	CBDP	Dandy Point	Chesapeake Bay	VA	37°06.04'	76°17.73'	4-Mar-86	SED
MW6Y422	CBHG	Hog Point	Chesapeake Bay	MD	38°18.74'	76°23.87'	26-Feb-91	CV
MW6S423	CBHG	Hog Point	Chesapeake Bay	MD	38°18.74'	76°23.87'	26-Feb-91	SED
MW6S425	PRRP	Ragged Point	Potomac River	VA	38°09.37'	76°35.87'	26-Feb-91	SED
MW6Y424	PRRP	Ragged Point	Potomac River	VA	38°09.37'	76°35.87'	26-Feb-91	CV
MW7Y456	RRRR	Ross Rock	Rappahannock River	MD	37˚54.08'	76˚47.43'	18-Jan-92	CV
MW4Y288	CBJR	James River	Chesapeake Bay	VA	37°04.07'	76°36.68'	19-Jan-89	CV
MW4S289	CBJR	James River	Chesapeake Bay	VA	37°04.07'	76°36.68'	19-Jan-89	SED
MW3Y211	CBCI	Chincoteague Inlet	Chincoteaure Bay	VA	37°56.51'	75°22.60'	15-Jan-88	CV
MW3Y212	QIUB	Quinby Inlet	Upshur Bay	VA	37°31.85'	75°43.38'	23-Jan-88	CV
MW3S213	QIUB	Quinby Inlet	Upshur Bay	VA	37°31.85'	75°43.38'	24-Jan-88	SED
MW6Y426	RSJC	John Creek	Roanoke Sound	NC	35°53.47'	75°37.98'	26-Feb-91	CV
MW6S427	RSJC	John Creek	Roanoke Sound	NC	35°53.47'	75°37.98'	26-Feb-91	SED
MW6Y428	PSWB	Wysocking Bay	Pamlico Sound	NC	35°24.67'	76°03.45'	26-Feb-91	CV
MW6S429	PSWB	Wysocking Bay	Pamlico Sound	NC	35°24.67'	76°03.45'	26-Feb-91	SED
MW4Y296	PSPR	Pungo River	Pamilico Sound	NC	35°19.48'	76°26.95'	25-Jan-89	CV
MW4S297	PSPR	Pungo River	Pamilico Sound	NC	35°19.48'	76°26.95'	25-Jan-89	SED
MW5Y353	PSCH	Cape Hatteras	Pamilico Sound	NC	35°12.68'	75°43.24'	28-Jan-90	CV
MW5S354	PSCH	Cape Hatteras	Pamilico Sound	NC	35°12.37'	75°42.96'	29-Jan-90	SED
MW2Y149	CFBI	Battery Island	Cape Fear	NC	33°54.92'	78°00.50'	7-Feb-87	CV
MW2S150	CFBI	Battery Island	Cape Fear	NC	33°54.92'	78°00.50'	7-Feb-87	SED
MW5Y355	BIPI	Pivers Island	Beaufort Inlet	NC	34°43.10'	76°40.53'	2-Feb-90	CV

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW5S356	BIPI	Pivers Island	Beaufort Inlet	NC	34°43.10'	76°40.53'	2-Feb-90	SED
MW5Y357	WBLB	Lower Bay	Winyah Bay	SC	33°14.60'	79°11.78'	6-Feb-90	CV
MW5S358	WBLB	Lower Bay	Winyah Bay	SC	33°14.60'	79°11.78'	6-Feb-90	SED
MW4Y294	SRNB	Santee River	North Bay	SC	33°10.37'	79°14.92'	1-Feb-89	CV
MW4S295	SRNB	Santee River	North Bay	SC	33°10.37'	79°14.92'	1-Feb-89	SED
MW1Y044	CHFJ	Fort Johnson	Charleston Harbor	SC	32°43.32'	79°52.70'	12-Feb-86	CV
MW1S045	CHFJ	Fort Johnson	Charleston Harbor	SC	32°43.32'	79°52.70'	11-Feb-86	SED
MW2Y151	CHSF	Shutes Folly	Charleston Harbor	SC	32°46.83'	79°55.00'	13-Feb-87	CV
MW2S152	CHSF	Shutes Folly	Charleston Harbor	SC	32°46.83'	79°55.00'	13-Feb-87	SED
MW1Y035	SRTI	Tybee Island	Savannah River Est.	GA	32°01.20'	80°52.25'	4-Feb-86	CV
MW1S036	SRTI	Tybee Island	Savannah River Est.	GA	32°01.20'	80°52.25'	5-Feb-86	SED
MW6Y430	SSSI	Sapelo Island	Sapelo Sound	GA	31°23.20'	81°17.33'	26-Feb-91	CV
MW6S431	SSSI	Sapelo Island	Sapelo Sound	GA	31°23.20'	81°17.33'	26-Feb-91	SED
MW4Y299	ARWI	Wolfe Island	Altamaha River	GA	31°19.37'	81°18.48'	10-Feb-89	CV
MW4S300	ARWI	Wolfe Island	Altamaha River	GA	31°19.62'	81°19.50'	10-Feb-89	SED
MW2Y161	SJCB	Chicopit Bay	St. Johns River	FL	30°22.62'	81°26.63'	16-Feb-87	CV
MW2S162	SJCB	Chicopit Bay	St. Johns River	FL	30°22.62'	81°26.63'	17-Feb-87	SED
MW3Y224	MRCB	Crescent Beach	Matanzas River	FL	29°46.00'	81°15.38'	24-Feb-88	CV
MW5Y359	BBGC	Goulds Canal	Biscayne Bay	FL	25°31.39'	80°18.85'	24-Feb-90	CV
MW5S360	BBGC	Goulds Canal	Biscayne Bay	FL	25°31.39'	80°18.85'	25-Feb-90	SED
MW2Y171	EVFU	Faka Union Bay	Everglades	FL	25°54.08'	81°30.78'	2-Mar-87	CV
MW2S172	EVFU	Faka Union Bay	Everglades	FL	25°54.08'	81°30.78'	2-Mar-87	SED
MW1S065	RBHC	Henderson Creek	Rookery Bay	FL	26°01.50'	81°44.20'	20-Feb-86	SED
MW1Y066	RBHC	Henderson Creek	Rookery Bay	FL	26°01.50'	81°44.20'	20-Feb-86	CV
MW4Y290	NBNB	Naples Bay	Naples Bay	FL	26°06.78'	81°47.15'	12-Jan-89	CV
MW4S291	NBNB	Naples Bay	Naples Bay	FL	26°06.78'	81°47.15'	29-Jan-89	SED
MW5Y345	NBNB	Naples Bay	Naples Bay	FL	26°06.78'	81°47.15'	29-Jan-90	CV
MW5S346	NBNB	Naples Bay	Naples Bay	FL	26°06.78'	81°47.15'	29-Jan-90	SED
MW3S252	CBBI	Bird Island	Charlotte Harbor	FL	26°30.73'	82°02.18'	22-Feb-88	SED
MW5Y349	CBFM	Fort Meyers	Charlotte Harbor	FL	26°33.50'	81°55.37'	31-Jan-90	CV
MW5S350	CBFM	Fort Meyers	Charlotte Harbor	FL	26°33.50'	81°55.37'	31-Jan-90	SED
MW6Y410	TBCB	Cockroach Bay	Tampa Bay	FL	27°40.55'	82°30.56'	30-Jan-91	CV
MW6S411	TBCB	Cockroach Bay	Tampa Bay	FL	27°40.55'	82°30.56'	30-Jan-91	SED
MW2Y169	TBMK	Mullet Key Bayou	Tampa Bay	FL	27°37.28'	82°43.62'	1-Mar-87	CV
MW2S170	TBMK	Mullet Key Bayou	Tampa Bay	FL	27°37.28'	82°43.62'	1-Mar-87	SED
MW6Y412	TBNP	Navarez Park	Tampa Bay	FL	27°47.28'	82°45.28'	31-Jan-91	CV
MW6S413	TBNP	Navarez Park	Tampa Bay	FL	27°47.28'	82°45.28'	31-Jan-91	SED
MW3Y257	TBPB	Papys Bayou	Tampa Bay	FL	27°50.53'	82°36.62'	21-Feb-88	CV

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW3S258	TBPB	Papys Bayou	Tampa Bay	FL	27°50.53'	82°36.62'	21-Feb-88	SED
MW5Y351	TBKA	Peter O. Knight Airport	Tampa Bay	FL	27°54.46'	82°27.29'	31-Jan-90	CV
MW5S352	TBKA	Peter O. Knight Airport	Tampa Bay	FL	27°54.46'	82°27.29'	31-Jan-90	SED
MW5Y347	TBOT	Old Tampa Bay	Tampa Bay	FL	28°01.48'	82°37.95'	30-Jan-90	CV
MW5S348	TBOT	Old Tampa Bay	Tampa Bay	FL	28°01.48'	82°37.95'	30-Jan-90	SED
MW6Y408	TBOT	Old Tampa Bay	Tampa Bay	FL	28°01.48'	82°37.95'	30-Jan-91	CV
MW6S409	TBOT	Old Tampa Bay	Tampa Bay	FL	28°01.48'	82°37.95'	30-Jan-91	SED
MW2Y167	CKBP	Black Point	Cedar Key	FL	29°12.32'	83°04.25'	28-Feb-87	CV
MW2S168	CKBP	Black Point	Cedar Key	FL	29°12.32'	83°04.25'	28-Feb-87	SED
MW5Y343	AESP	Spring Creek	Apalchee Bay	FL	30°03.75'	84°19.37'	29-Jan-90	CV
MW5S344	AESP	Spring Creek	Apalchee Bay	FL	30°03.75'	84°19.37'	29-Jan-90	SED
MW1S071	APCP	Cat Point Bar	Apalachicola Bay	FL	29°43.45'	84°53.05'	27-Feb-86	SED
MW1Y072	APCP	Cat Point Bar	Apalachicola Bay	FL	29°43.45'	84°53.05'	27-Feb-86	CV
MW7Y454	APCP	Cat Point Bar	Apalachicola Bay	FL	29°43.45'	84°53.05'	24-Jan-92	CV
MW3Y241	APDB	Dry Bar	Apalachicola Bay	FL	29°40.45'	85°04.40'	18-Feb-88	CV
MW7Y453	PCLO	Little Oyster Bar	Panama City	FL	30°15.19'	85°40.95'	24-Jan-92	CV
MW6Y406	CBSR	Off Santa Rosa	Choctawhatchee Bay	FL	30°24.35'	86°12.75'	27-Jan-91	CV
MW6S407	CBSR	Off Santa Rosa	Choctawhatchee Bay	FL	30°24.78'	86°12.25'	27-Jan-91	SED
MW7Y452	CBPP	Postil Point	Choctawhatchee Bay	FL	30°28.85'	86°28.73'	23-Jan-92	CV
MW4Y292	PBIB	Indian Bayou	Pensacola Bay	FL	30°31.35'	87°06.38'	29-Jan-89	CV
MW4S293	PBIB	Indian Bayou	Pensacola Bay	FL	30°31.00'	87°06.70'	29-Jan-89	SED
MW5Y330	MBHI	Hollingers Island Channel	Mobile Bay	AL	30°33.80'	88°04.50'	8-Jan-90	CV
MW5S331	MBHI	Hollingers Island Channel	Mobile Bay	AL	30°33.80'	88°04.50'	8-Jan-90	SED
MW2Y155	MBCP	Cedar Point Reef	Mobile Bay	AL	30°18.70'	88°08.00'	16-Feb-87	CV
MW2S156	MBCP	Cedar Point Reef	Mobile Bay	AL	30°18.70'	88°08.00'	16-Feb-87	SED
MW1S067	MSPB	Pascagoula Bay	Mississippi Sound	MS	30°20.03'	88°36.10'	5-Feb-86	SED
MW1Y068	MSPB	Pascagoula Bay	Mississippi Sound	MS	30°20.03'	88°36.10'	5-Feb-86	CV
MW7Y450	MSPB	Pascagoula Bay	Mississippi Sound	MS	30°20.03'	88°36.10'	12-Jan-92	CV
MW2Y157	MSBB	Biloxi Bay	Mississippi Sound	MS	30°23.55'	88°51.45'	16-Feb-87	CV
MW2S158	MSBB	Biloxi Bay	Mississippi Sound	MS	30°23.55'	88°51.45'	16-Feb-87	SED
MW1S069	MSPC	Pass Christian	Mississippi Sound	MS	30°18.12'	89°19.62'	6-Feb-86	SED
MW1Y070	MSPC	Pass Christian	Mississippi Sound	MS	30°17.75'	89°19.60'	6-Feb-86	CV
MW5Y332	LBMP	Malheureux Point	Lake Borgne	LA	29°52.02'	89°40.70'	8-Jan-90	CV
MW5S333	LBMP	Malheureux Point	Lake Borgne	LA	29°52.02'	89°40.70'	8-Jan-90	SED
MW1Y089	BSBG	Bay Garderne	Breton Sound	LA	29°35.90'	89°37.25'	26-Mar-86	CV
MW1S090	BSBG	Bay Garderne	Breton Sound	LA	29°35.90'	89°37.25'	26-Mar-86	SED
MW6Y399	BSBG	Bay Garderne	Breton Sound	LA	29°35.90'	89°37.25'	10-Jan-91	CV
MW6Y400	BSBG	Bay Garderne	Breton Sound	LA	29°35.90'	89°37.25'	10-Jan-91	SED

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW3S242	BSSI	Sable Island	Breton Sound	LA	29°24.21'	89°29.10'	25-Feb-88	SED
MW3Y243	BSSI	Sable Island	Breton Sound	LA	29°24.21'	89°29.10'	25-Feb-88	CV
MW4Y285	BBSD	Bayou St. Denis	Barataria Bay	LA	29°24.18'	89°59.75'	6-Jan-89	CV
MW4S286	BBSD	Bayou St. Denis	Barataria Bay	LA	29°24.18'	89°59.75'	6-Jan-89	SED
MW3Y244	BBMB	Middle Bank	Barataria Bay	LA	29°16.55'	89°56.53'	28-Jan-88	CV
MW3S245	BBMB	Middle Bank	Barataria Bay	LA	29°16.55'	89°56.53'	28-Jan-88	SED
MW2Y159	TBLF	Lake Felicity	Terrebonne Bay	LA	29°15.80'	90°24.40'	13-Feb-87	CV
MW2S160	TBLF	Lake Felicity	Terrebonne Bay	LA	29°15.80'	90°24.40'	13-Feb-87	SED
MW3Y246	TBLB	Lake Barre	Terrebonne Bay	LA	29°15.60'	90°35.70'	29-Jan-88	CV
MW3S247	TBLB	Lake Barre	Terrebonne Bay	LA	29°15.60'	90°35.70'	29-Jan-88	SED
MW6Y397	TBLB	Lake Barre	Terrebonne Bay	LA	29°15.60'	90°35.70'	8-Jan-91	CV
MW6S398	TBLB	Lake Barre	Terrebonne Bay	LA	29°15.60'	90°35.70'	8-Jan-91	SED
MW1Y091	CLCL	Caillou Lake	Caillou Lake	LA	29°15.25'	90°55.80'	29-Mar-86	CV
MW1S092	CLCL	Caillou Lake	Caillou Lake	LA	29°15.25'	90°55.80'	29-Mar-86	SED
MW6Y388	SLBB	Blue Buck Point	Sabine Lake	LA	29°47.50'	93°54.42'	8-Dec-90	CV
MW6S389	SLBB	Blue Buck Point	Sabine Lake	LA	29°47.50'	93°54.42'	8-Dec-90	SED
MW6Y392	CLLC	Lake Charles	Calcasieu Lake	LA	30°03.50'	93°17.50'	8-Dec-90	CV
MW6S393	CLLC	Lake Charles	Calcasieu Lake	LA	30°03.42'	93°18.42'	8-Dec-90	SED
MW2Y153	ABOB	Oyster Bayou	Atchafalaya Bay	LA	29°14.40'	91°08.10'	11-Feb-87	CV
MW2S154	ABOB	Oyster Bayou	Atchafalaya Bay	LA	29°14.40'	91°08.10'	11-Feb-87	SED
MW3Y253	VBSP	Southwest Pass	Vermilion Bay	LA	29°34.60'	92°02.75'	28-Jan-88	CV
MW3S254	VBSP	Southwest Pass	Vermilion Bay	LA	29°34.60'	92°02.75'	28-Jan-88	SED
MW3Y248	JHJH	Joseph Harbor Bayou	Joseph Harbor Bayou	LA	29°37.75'	92°45.75'	17-Dec-87	CV
MW3S249	JHJH	Joseph Harbor Bayou	Joseph Harbor Bayou	LA	29°37.75'	92°45.75'	17-Dec-87	SED
MW1S042	CLSJ	St. Johns Island	Calcasieu Lake	LA	29°49.83'	93°23.00'	18-Jan-86	SED
MW1Y043	CLSJ	St. Johns Island	Calcasieu Lake	LA	29°49.83'	93°23.00'	17-Jan-86	CV
MW3Y255	GBHR	Hanna Reef	Galveston Bay	TX	29°28.85'	94°44.00'	9-Dec-87	CV
MW3S256	GBHR	Hanna Reef	Galveston Bay	TX	29°28.85'	94°44.00'	9-Dec-87	SED
MW6Y390	GBTD	Todds Dump	Galveston Bay	TX	29°30.06'	94°53.82'	7-Dec-90	CV
MW6S391	GBTD	Todds Dump	Galveston Bay	TX	29°30.06'	94°53.82'	7-Dec-90	SED
MW4Y282	GBYC	Yacht Club Reef	Galveston Bay	TX	29°37.30'	94°59.50'	1-Dec-88	CV
MW4S283	GBYC	Yacht Club Reef	Galveston Bay	TX	29°37.30'	94°59.50'	1-Dec-88	SED
MW1Y030	GBCR	Confederate Reef	Galveston Bay	TX	29°15.75'	94°54.88'	11-Jan-86	CV
MW1S031	GBCR	Confederate Reef	Galveston Bay	TX	29°16.10'	94°54.60'	10-Jan-86	SED
MW2Y127	GBCR	Confederate Reef	Galveston Bay	TX	29°15.75'	94°54.88'	16-Dec-86	CV
MW2S128	GBCR	Confederate Reef	Galveston Bay	TX	29°16.10'	94°54.60'	16-Dec-86	SED

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW7Y449	GBCR	Confederate Reef	Galveston Bay	TX	29°15.75'	94°54.88'	4-Dec-91	CV
MW5Y319	BRCL	Cedar Lakes	Brazos River	TX	28°51.50'	95°27.83'	4-Dec-89	CV
MW5S320	BRCL	Cedar Lakes	Brazos River	TX	28°51.50'	95°27.83'	4-Dec-89	SED
MW6Y386	BRFS	Freeport Surfside	Brazos River	TX	28°55.25'	95°20.33'	5-Dec-90	CV
MW6S387	BRFS	Freeport Surfside	Brazos River	TX	28°55.25'	95°20.33'	5-Dec-90	SED
MW4Y280	MBEM	East Matagorda Bay	Matagorda Bay	TX	28°42.67'	95°53.00'	13-Dec-88	CV
MW4S281	MBEM	East Matagorda Bay	Matagorda Bay	TX	28°42.67'	95°53.00'	13-Dec-88	SED
MW3Y250	MBTP	Tres Palacios Bay	Matagorda Bay	TX	28°39.50'	96°13.45'	12-Jan-88	CV
MW3S251	MBTP	Tres Palacios Bay	Matagorda Bay	TX	28°39.50'	96°13.45'	12-Jan-88	SED
MW1S038	MBGP	Gallinipper Point	Matagorda Bay	TX	28°35.25'	96°34.17'	31-Jan-86	SED
MW1Y039	MBGP	Gallinipper Point	Matagorda Bay	TX	28°35.25'	96°34.17'	31-Jan-86	CV
MW2Y129	MBGP	Gallinipper Point	Matagorda Bay	TX	28°35.25'	96°34.17'	13-Jan-87	CV
MW2S130	MBGP	Gallinipper Point	Matagorda Bay	TX	28°35.25'	96°34.17'	14-Jan-87	SED
MW4Y272	MBLR	Lavaca River Mouth	Matagorda Bay	TX	28°41.00'	96°34.65'	14-Dec-88	CV
MW4S273	MBLR	Lavaca River Mouth	Matagorda Bay	TX	28°39.80'	96°34.83'	14-Dec-88	SED
MW4Y274	ESBD	Bill Day's Reef	Espiritu Santo	TX	28°24.85'	96°26.27'	14-Dec-88	CV
MW4S275	ESBD	Bill Day's Reef	Espiritu Santo	TX	28°24.85'	96°26.27'	14-Dec-88	SED
MW4Y276	MBAR	Ayres Reef	Mesquite Bay	TX	28°10.15'	96°49.95'	15-Dec-88	CV
MW4S277	MBAR	Ayres Reef	Mesquite Bay	TX	28°10.15'	96°49.95'	15-Dec-88	SED
MW5Y317	CBCR	Copano Reef	Copano Bay	TX	28°08.47'	97°07.67'	13-Dec-89	CV
MW5S318	CBCR	Copano Reef	Copano Bay	TX	28°08.47'	97°07.67'	13-Dec-89	SED
MW2Y131	CBCR	Copano Reef	Copano Bay	TX	28°08.47'	97°07.67'	14-Jan-87	CV
MW2S132	CBCR	Copano Reef	Copano Bay	TX	28°08.47'	97°07.67'	14-Jan-87	SED
MW4Y278	ABLR	Long Reef	Aransas Bay	TX	28°03.88'	96°57.80'	15-Dec-88	CV
MW4S279	ABLR	Long Reef	Aransas Bay	TX	28°02.96'	96°56.77'	15-Dec-88	SED
MW5Y315	CCIC	Ingleside Cove	Corpus Christi	TX	27°50.28'	97°14.28'	14-Dec-89	CV
MW5S316	CCIC	Ingleside Cove	Corpus Christi	TX	27°50.28'	97°14.28'	14-Dec-89	SED
MW4Y270	CCNB	Nueces Bay	Corpus Christi	TX	27°51.17'	97°21.55'	15-Dec-88	CV
MW4S271	CCNB	Nueces Bay	Corpus Christi	TX	27°51.17'	97°21.55'	15-Dec-88	SED
MW1S040	LMSB	South Bay	Lower Laguna Madre	TX	26°02.77'	97°10.48'	24-Jan-86	SED
MW1Y041	LMSB	South Bay	Lower Laguna Madre	TX	26°02.77'	97°10.48'	24-Jan-86	CV
MW5Y321	LMAC	Arroyo Colorado	Laguna Madre	TX	26°16.80'	97°17.30'	14-Dec-89	CV
MW5S322	LMAC	Arroyo Colorado	Laguna Madre	TX	26°16.80'	97°17.30'	14-Dec-89	SED
MW7Y463	BPBP	Boat Basin	Barbers Point	HI	21°19.50'	158°07.45'	2-Apr-92	OS
MW1M029	IBNJ	North Jetty	Imperial Beach	CA	32°35.25'	117°07.95'	11-Jan-86	MC
MW1S032	IBNJ	North Jetty	Imperial Beach	CA	32°35.25'	117°07.95'	20-Jan-86	SED
MW4M268	SDCB	Coronado Bridge	San Diego Harbor	CA	32°41.21'	117°09.53'	10-Dec-88	ME
MW4S269	SDCB	Coronado Bridge	San Diego Harbor	CA	32°41.21'	117°09.53'	14-Dec-88	SED

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW4M267	SDHI	Harbor Island	San Diego Harbor	CA	32°43.49'	117°11.68'	8-Dec-88	ME
MW5M314	MBVB	Mission Bay	Ventura Bridge	CA	32°46.07'	117°14.47'	11-Dec-89	ME
MW2M140	LJLJ	La Jolla	Point La Jolla	CA	32°51.05'	117°16.15'	29-Dec-86	MC
MW2S173	LJLJ	La Jolla	Point La Jolla	CA	32°48.75'	117°19.72'	12-Mar-87	SED
MW4M306	OSBJ	Oceanside	Beach Jetty	CA	33°12.11'	117°23.56'	16-Feb-89	ME
MW6M436	SCBR	Bird Rock	Santa Catalina Is.	CA	33°27.10'	188°29.20'	22-Mar-91	MC
MW2M137	NBWJ	Wedge Jetty	Newport Bay	CA	33°35.48'	117°52.77'	7-Dec-86	MC
MW2S138	NBWJ	Wedge Jetty	Newport Bay	CA	33°35.12'	117°53.67'	10-Dec-86	SED
MW5M361	LBBW	Long Beach Breakwater	Long Beach	CA	33°43.42'	118°10.45'	7-Mar-90	ME
MW5S362	LBBW	Long Beach Breakwater	Long Beach	CA	33°43.42'	118°10.45'	7-Mar-90	SED
MW1M034	ABWJ	West Jetty	Anaheim Bay	CA	33°43.93'	118°06.02'	27-Jan-86	MC
MW1S052	ABWJ	West Jetty	Anaheim Bay	CA	33°44.27'	118°07.81'	12-Feb-86	SED
MW7M451	ABWJ	West Jetty	Anaheim Bay	CA	33°43.93'	118°06.02'	3-Dec-91	MC
MW2M175	SPFP	Fishing Pier	San Pedro Harbor	CA	33°42.42'	118°16.43'	12-Mar87	MC
MW2S139	SPFP	Fishing Pier	San Pedro Harbor	CA	33°42.62'	118°16.60'	7-Dec-86	SED
MW1M033	PVRP	Royal Palms State Park	Palos Verdes	CA	33°43.10'	118°19.35'	27-Jan-86	MC
MW1S064	PVRP	Royal Palms State Park	Palos Verdes	CA	33°42.65'	118°21.00'	18-Feb-86	SED
MW5M363	RBMJ	Municipal Jetty	Redondo Beach	CA	33°49.91'	118°23.50'	6-Mar-90	ME
MW5S364	RBMJ	Municipal Jetty	Redondo Beach	CA	33°49.41'	118°24.86'	10-Mar-90	SED
MW5S365	TBSM	Los Tunas Beach	Santa Monica Bay	CA	34°01.60'	118°33.73'	10-Mar-90	SED
MW6M439	TBSM	Los Tunas Beach	Santa Monica Bay	CA	34°02.33'	118°35.85'	10-Mar-91	MC
MW2M135	MDSJ	South Jetty	Marina Del Rey	CA	33°57.68'	118°27.42'	3-Dec-86	ME
MW2S136	MDSJ	South Jetty	Marina Del Rey	CA	33°59.49'	118°31.97'	3-Dec-86	SED
MW1M037	PDPD	Point Dume	Point Dume	CA	34°00.08'	118°48.48'	6-Feb-86	MC
MW1S061	PDPD	Point Dume	Point Dume	CA	33°59.90'	118°46.94'	1-Mar-86	SED
MW3M240	SANM	San Miguel Island	Tyler Bight	CA	34°01.68'	129°25.16'	14-Mar-88	MC
MW3M237	SBSB	Pt. Santa Barbara	Pt. Santa Barbara	CA	34°23.75'	119°43.72'	18-Dec-87	MC
MW3S238	SBSB	Pt. Santa Barbara	Pt. Santa Barbara	CA	34°23.15'	119°43.22'	4-Feb-88	SED
MW4M264	SBSB	Pt. Santa Barbara	Pt. Santa Barbara	CA	34°23.75'	119°43.72'	22-Nov-88	MC
MW3M236	PCPC	Pt. Conception	Pt. Conception	CA	34°26.70'	120°27.20'	3-Feb-88	MC
MW4M298	PCPC	Pt. Conception	Pt. Conception	CA	34°26.70'	120°27.20'	3-Feb-89	MC
MW6S437	PCPC	Pt. Conception	Pt. Conception	CA	34°26.56'	120°26.00'	22-Mar-91	SED
MW3M239	SLSL	Pt. San Luis	San Luis Obispo Bay	CA	35°09.64'	120°45.26'	19-Dec-87	MC
MW4M263	SLSL	Pt. San Luis	San Luis Obispo Bay	CA	35°09.64'	120°45.26'	21-Nov-88	MC
MW6S438	SLSL	Pt. San Luis	San Luis Obispo Bay	CA	35°09.72'	120°44.12'	20-Mar-91	SED
MW3M216	SSSS	San Simeon Point	San Simeon Point	CA	35°38.20'	121°11.70'	29-Jan-88	MC
MW3M214	PGLP	Lovers Point	Pacific Grove	CA	36°37.55'	121°54.91'	30-Jan-88	MC
MW6S435	PGLP	Lovers Point	Pacific Grove	CA	36°37.65'	121°54.15'	28-Feb-91	SED

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW6M434	MBML	Moss Landing	Monterey Bay	CA	36°48.09'	121°47.35'	25-Feb-91	MC
MW3M215	MBSC	Pt. Santa Cruz	Monterey Bay	CA	36°57.20'	122°01.45'	31-Jan-88	MC
MW2S174	SFDB	Dumbarton Bridge	San Francisco Bay	CA	37°31.60'	122°09.63'	12-Mar-87	SED
MW7M462	SFEM	Emeryville	San Francisco Bay	CA	37°49.25'	122°19.70'	20-Apr-92	ME
MW1S093	SFSM	San Mateo Bridge	San Francisco Bay	CA	37°35.30'	122°13.53'	11-Apr-86	SED
MW1M094	SFSM	San Mateo Bridge	San Francisco Bay	CA	37°34.91'	122°15.16'	11-Apr-86	ME
MW4M287	TBSR	Tomales Bay	Spenger's Residence	CA	38°08.95'	122°54.17'	20-Jan-89	ME
MW5M335	BBBE	Bodega Bay Entrance	Bodega Bay	CA	38°18.30'	123°03.87'	8-Jan-90	MC
MW6S402	BBBE	Bodega Bay Entrance	Bodega Bay	CA	38°18.50'	123°02.84'	12-Jan-91	SED
MW5M336	PALH	Pt. Arena Lighthouse	Pt. Arena	CA	38°57.18'	123°44.30'	9-Jan-90	MC
MW6M403	PDSC	Shelter Cove	Point Delgada	CA	40°02.31'	124°04.76'	19-Jan-91	MC
MW6M404	HMBJ	Humboldt Bay Jetty	Eureka	CA	40°46.13'	124°14.25'	15-Jan-91	MC
MW6S405	HMBJ	Humboldt Bay Jetty	Eureka	CA	40°45.06'	124°12.83'	19-Jan-91	SED
MW5S334	EUSB	Samoa Bridge	Eureka	CA	40°49.32'	124°10.09'	15-Jan-90	SED
MW4M284	KRFR	Flint Rock Head	Klamath River	CA	41°31.63'	124°04.78'	8-Jan-89	ME
MW1M096	SGSG	Point St. George	Point St. George	CA	41°44.88'	124°12.52'	29-Mar-86	MC
MW1S095	SGSG	Point St. George	Point St. George	CA	41°44.25'	124°11.33'	21-Apr-86	SED
MW3M217	CBCH	Coos Head	Coos Bay	OR	43°21.03'	124°19.85'	19-Dec-87	MC
MW3S218	CBCH	Coos Head	Coos Bay	OR	43°22.17'	124°18.80'	20-Dec-87	SED
MW1M057	CBRP	Russell Point	Coos Bay	OR	43°26.00'	124°13.15'	6-Feb-86	ME
MW1S059	CBRP	Russell Point	Coos Bay	OR	43°25.75'	124°13.03'	7-Feb-86	SED
MW6M394	CBRP	Russell Point	Coos Bay	OR	43°26.00'	124°13.15'	29-Nov-90	ME
MW2M147	YBOP	Oneatta Point	Yaquina Bay	OR	44°43.98'	124°00.05'	3-Dec-86	ME
MW2S148	YBOP	Oneatta Point	Yaquina Bay	OR	44°34.78'	124°00.78'	3-Dec-86	SED
MW1M056	YHYH	Yaquina Head	Yaquina Bay	OR	44°40.58'	124°04.68'	4-Feb-86	MC
MW6M395	YHYH	Yaquina Head	Yaquina Bay	OR	44°40.58'	124°04.68'	29-Nov-90	MC
MW1S060	YHSS	Sally's Slough	Yaquina Bay	OR	44°36.83'	124°00.95'	8-Feb-86	SED
MW3M219	TBHP	Hobsonville Point	Tillamook Bay	OR	45°32.87'	123°54.38'	17-Dec-87	ME
MW3S220	TBHP	Hobsonville Point	Tillamook Bay	OR	45°30.96'	123°55.59'	18-Dec-87	SED
MW1M081	CRSJ	South Jetty	Columbia River	OR	46°14.00'	124°02.78'	4-Mar-86	ME
MW1S082	CRYB	Youngs Bay	Columbia River	OR	46°11.00'	123°52.75'	4-Mar-86	SED
MW4M305	CRNJ	North Jetty	Columbia River	WA	46°16.67'	124°03.73'	15-Feb-89	ME
MW4S309	CRNJ	North Jetty	Columbia River	WA	46°16.15'	123°59.92'	23-Mar-89	SED
MW5M376	WBNA	Nahcotta	Willapa Bay	WA	46°29.80'	124°01.72'	6-Feb-90	ME
MW5S377	WBNA	Nahcotta	Willapa Bay	WA	46°30.48'	124°00.36'	6-Apr-90	SED
MW5S374	GHWJ	Westport Jetty	Gray's Harbor	WA	46°52.55'	124°04.87'	9-Apr-90	SED
MW3M221	GHWJ	Westport Jetty	Gray's Harbor	WA	46°54.75'	124°07.05'	29-Jan-88	MC
MW3M222	JFCF	Cape Flattery	Str. of Juan De Fuca	WA	48°23.30'	124°43.28'	27-Jan-88	MC

Table E.1. Specimen Bank Inventory for the Mussel Watch Project (1986 - 1992) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
MW3S223	JFNB	Neah Bay	Str. of Juan De Fuca	WA	48°22.48'	124°37.00'	17-Nov-87	SED
MW2M141	SSBI	Budd Inlet	South Puget Sound	WA	47°05.94'	122°53.60'	12-Dec-86	ME
MW2S142	SSBI	Budd Inlet	South Puget Sound	WA	47°06.03'	122°54.73'	17-Nov-86	SED
MW7M457	SSBI	Budd Inlet	South Puget Sound	WA	47°05.94'	122°53.60'	14-Jan-92	ME
MW4M302	CBTP	Commencement Bay	Tahlequah Point	WA	47°20.15'	122°30.10'	8-Dec-88	ME
MW4M301	PSSS	Puget Sound	South Seattle	WA	47°31.73'	122°23.92'	7-Dec-88	ME
MW4S312	PSSS	Puget Sound	South Seattle	WA	47°31.55'	122°24.27'	16-Mar-89	SED
MW5M339	EBFR	Fourmile Rock	Elliott Bay	WA	47°38.35'	122°24.74'	11-Dec-89	ME
MW5S375	EBFR	Fourmile Rock	Elliott Bay	WA	47°37.67'	122°24.33'	15-Mar-90	SED
MW5M338	EBDH	Duwamish Head	Elliott Bay	WA	47°35.73'	122°23.20'	9-Jan-90	ME
MW5S378	EBDH	Duwamish Head	Elliott Bay	WA	47°34.55'	122°25.08'	15-Mar-90	SED
MW2M143	SIWP	Waterman Point	Sinclair Inlet	WA	47°35.12'	122°34.15'	18-Dec-86	ME
MW2S144	SIWP	Waterman Point	Sinclair Inlet	WA	47°33.05'	122°37.62'	14-Nov-86	SED
MW5M337	PSHC	Hood Canal	Puget Sound	WA	47°49.90'	122°41.20'	8-Jan-90	ME
MW1M055	WIPP	Possession Point	Whidbey Island	WA	47°54.15'	122°22.80'	21-Jan-86	ME
MW1S058	WIPP	Possession Point	Whidbey Island	WA	47°54.61'	122°20.64'	29-Jan-86	SED
MW6M396	WIPP	Possession Point	Whidbey Island	WA	47°54.15'	122°22.80'	13-Dec-90	ME
MW5M340	PSPT	Port Townsend	Puget Sound	WA	48°06.32'	122°46.63'	8-Jan-90	ME
MW5S379	PSPT	Port Townsend	Puget Sound	WA	48°06.18'	122°45.90'	14-Mar-90	SED
MW4M304	PSEH	Everett Harbor	Puget Sound	WA	47°58.42'	122°13.72'	5-Jan-89	ME
MW4S310	PSEH	Everett Harbor	Puget Sound	WA	47°58.43'	122°14.22'	15-Mar-89	SED
MW4M303	PSPA	Port Angeles	Puget Sound	WA	48°08.38'	123°25.01'	9-Jan-89	ME
MW4S311	PSPA	Port Angeles	Puget Sound	WA	48°08.28'	123°25.10'	8-Mar-89	SED
MW2M145	BBSM	Saqualicum Marina Jetty	Bellingham Bay	WA	48°45.25'	122°29.97'	27-Jan-87	ME
MW2S146	BBSM	Saqualicum Marina Jetty	Bellingham Bay	WA	48°44.77'	122°30.72'	24-Nov-86	SED
MW6M401	PRPR	Point Roberts	Point Roberts	WA	48°59.30'	123°05.30'	14-Jan-91	ME
MW2M180	PVMC	Mineral Creek Flats	Port Valdez	AK	61°08.17'	146°27.75'	27-Mar-87	ME
MW2S181	PVMC	Mineral Creek Flats	Port Valdez	AK	61°06.75'	146°28.17'	27-Mar-87	SED
MW6M441	UISB	Siwash Bay	Unakwik Inlet	AK	60°57.62'	147°38.67'	28-Mar-91	ME

* Alternate site codes are found in Lauenstein *et al*. (1993).

Table E.2. Specimen Bank inventory for the National Benthic Surveillance Project (1985-1991).

NIST ID[†*]	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
BS2F186	PNBCH	Penobscot Bay	Colt Head Island	ME	44°15.0'	68°50.0'	24-Apr-87	MO
BS2L185	PNBCH	Penobscot Bay	Colt Head Island	ME	44°15.0'	68°50.0'	24-Apr-87	MO
BS2S187	PNBCH	Penobscot Bay	Colt Head Island	ME	44°15.0'	68°50.0'	27-Apr-87	SED
BS6S448	CAPRI	Cape Elizabeth	Richmond Island	ME	43°31.9'	70°16.6'	6-May-91	SED
BS1F084	BOSPR	Boston Harbor	President Roads	MA	42°20.0'	70°59.0'	8-Apr-86	PA
BS1L083	BOSPR	Boston Harbor	President Roads	MA	42°20.0'	70°59.0'	8-Apr-86	PA
BS1S085	BOSPR	Boston Harbor	President Roads	MA	42°20.0'	70°59.0	8-Apr-86	SED
BS5F381	BOSQB	Boston Harbor	Quincy Bay	MA	42°18.4'	70°58.4'	18-May-90	PA
BS5L380	BOSQB	Boston Harbor	Quincy Bay	MA	42°18.4'	70°58.4'	18-May-90	PA
BS5S382	BOSQB	Boston Harbor	Quincy Bay	MA	42°18.4'	70°58.4'	18-May-90	SED
BS1F087	BUZWI	Buzzards Bay	West Island	MA	41°35.0'	70°45.0'	7-Apr-86	PA
BS1L086	BUZWI	Buzzards Bay	West Island	MA	41°35.0'	70°45.0'	7-Apr-86	PA
BS1S088	BUZWI	Buzzards Bay	West Island	MA	41°35.0'	70°45.0'	8-Apr-86	SED
BS3F234	LISLS	Long Island Sound	Long Sand Shoal	NY	41°12.0'	72°20.0'	14-Apr-88	PA
BS3L233	LISLS	Long Island Sound	Long Sand Shoal	NY	41°12.0'	72°20.0'	14-Apr-88	PA
BS3S235	LISLS	Long Island Sound	Long Sand Shoal	NY	41°12.0'	72°20.0'	15-Apr-88	SED
BS7L464	2560	Hudson River		NY	40°53.5'	73°55.9'	24-Apr-92	MA
BS7F465	2560	Hudson River		NY	40°53.5'	73°55.9'	24-Apr-92	MA
BS7S466	2560	Hudson River		NY	40°53.5'	73°55.9'	24-Apr-92	SED
BS2F183	RARLB	Raritan Bay	Lower Bay	NJ	40°28.0'	74°05.0'	10-Apr-87	PA
BS2L182	RARLB	Raritan Bay	Lower Bay	NJ	40°28.0'	74°05.0'	10-Apr-87	PA
BS2S184	RARLB	Raritan Bay	Lower Bay	NJ	40°28.0'	74°05.0'	13-Apr-87	SED
BS1F079	GRTSI	Great Bay	Seven Island	NJ	39°31.0'	74°23.0'	27-Mar-86	PA
BS1S080	GRTSI	Great Bay	Seven Island	NJ	39°31.0'	74°23.0'	25-Mar-86	SED
BS1L153	GRTSI	Great Bay	Seven Island	NJ	39°31.0'	74°23.0'	1-Apr-86	PA
BS2S195	CHBGI	Chesapeake Bay	Gibson Island	MD	39°05.0'	76°20.0'	13-Jul-87	SED
BS1S028	ICB	Chesapeake Bay		MD	38°55.7'	76°25.0'	17-Jul-85	SED
BS6F443	CHBCR	Chesapeake Bay	Chester River	MD	39°01.6'	76°11.9'	9-Apr-91	MA
BS6L442	CHBCR	Chesapeake Bay	Chester River	MD	39°01.6'	76°11.9'	9-Apr-91	MA
BS6S444	CHBCR	Chesapeake Bay	Chester River	MD	39°01.6'	76°11.9'	10-Apr-91	SED
BS1S110	CHBYR	Chesapeake Bay	York River	VA	37°10.0'	76°10.0'	26-Jul-86	SED
BS1S109	CHBER	Chesapeake Bay	Elizabeth River	VA	36°50.8'	76°18.0'	28-Jul-86	SED
BS2F203	CHSSC	Charleston Harbor	South Channel	SC	32°45.4'	79°54.4'	16-Oct-87	MU
BS2L202	CHSSC	Charleston Harbor	South Channel	SC	32°45.4'	79°54.4'	16-Oct-87	MU
BS2S204	CHSSC	Charleston Harbor	South Channel	SC	32°45.4'	79°54.4'	16-Oct-87	SED
BS1F116	SAPBI	Sapelo Sound	Barbour Island River	GA	31°34.8'	81°14.5'	14-Aug-86	MU
BS1L115	SAPBI	Sapelo Sound	Barbour Island River	GA	31°34.8'	81°14.5'	13-Aug-86	MU
BS1S114	SAPBI	Sapelo Sound	Barbour Island River	GA	31°34.8'	81°14.5'	15-Aug-86	SED

Table E.2. Specimen Bank inventory for the National Benthic Surveillance Project (1985-1991) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
BS1F113	SJRQI	St. John's River	Quarantine Island	FL	30°23.5'	81°34.1'	20-Aug-86	MU
BS1L112	SJRQI	St. John's River	Quarantine Island	FL	30°23.5'	81°34.1'	19-Aug-86	MU
BS1S111	SJRQI	St. John's River	Quarantine Island	FL	30°23.5'	81°34.1'	18-Aug-86	SED
BS1F026	LOTCH	Charlotte Harbor	Cape Haze	FL	26°49.8'	82°06.3'	14-Oct-85	LX
BS1L027	LOTCH	Charlotte Harbor	Cape Haze	FL	26°49.8'	82°06.3'	14-Oct-85	LX
BS1S025	LOTCH	Charlotte Harbor	Cape Haze	FL	26°49.8'	82°06.3'	14-Oct-85	SED
BS2F200	PENPB	Pensacola Bay	Pensacola Bay	FL	30°25.5'	87°11.2'	10-Jul-87	MU
BS2L199	PENPB	Pensacola Bay	Pensacola Bay	FL	30°25.5'	87°11.2'	10-Jul-87	MU
BS2S201	PENPB	Pensacola Bay	Pensacola Bay	FL	30°25.5'	87°11.2'	10-Jul-87	SED
BS1F017	ROURI	Round Island	Round Island	MS	30°18.4'	88°36.6'	4-Sep-85	MU
BS1L018	ROURI	Round Island	Round Island	MS	30°18.4'	88°36.6'	4-Sep-85	MU
BS1S016	ROURI	Round Island	Round Island	MS	30°18.4'	88°36.6'	5-Sep-85	SED
BS5F384	MRDHP	Miss. R. Delta	Head of Passes	LA	29°12.6'	89°16.7'	11-Oct-90	AF
BS5L383	MRDHP	Miss. R. Delta	Head of Passes	LA	29°12.6'	89°16.7'	11-Oct-90	AF
BS5S385	MRDHP	Miss. R. Delta	Head of Passes	LA	29°12.6'	89°16.7'	10-Oct-90	SED
BS1F020	MRDSP	Miss. R. Delta	Southeast Pass	LA	29°07.2'	89°04.2'	8-Sep-85	MU
BS1L021	MRDSP	Miss. R. Delta	Southeast Pass	LA	29°07.2'	89°04.2'	8-Sep-85	MU
BS1S019	MRDSP	Miss. R. Delta	Southeast Pass	LA	29°07.2'	89°04.2'	9-Sep-85	SED
BS1F023	CCBLR	Corpus Christi	Long Reef	TX	27°49.6'	97°17.4'	20-Sep-85	MU
BS1L024	CCBLR	Corpus Christi	Long Reef	TX	27°49.6'	97°17.4'	20-Sep-85	MU
BS1S022	CCBLR	Corpus Christi	Long Reef	TX	27°49.6'	97°17.4'	23-Sep-85	SED
BS7L467	LAVPC	Lavaca Bay	Pt. Comfort	TX	28°39.3'	96°34.6'	12-Sep-92	AF
BS7F468	LAVPC	Lavaca Bay	Pt. Comfort	TX	28°39.3'	96°34.6'	12-Sep-92	AF
BS7S469	LAVPC	Lavaca Bay	Pt. Comfort	TX	28°39.3'	96°34.6'	12-Sep-92	SED
BS2F197	SDBSI	San Diego Bay	Shelter Island	CA	32°42.5'	117°13.7'	22-Jul-87	CS
BS2L196	SDBSI	San Diego Bay	Shelter Island	CA	32°42.5'	117°13.7'	22-Jul-87	CS
BS2S198	SDBSI	San Diego Bay	Shelter Island	CA	32°42.5'	117°13.7'	22-Jul-87	SED
BS1F002	DANOU	Dana Point Harbor	Outside	CA	33°27.0'	117°41.0'	19-Jul-85	GL
BS1F005	DANOU	Dana Point Harbor	Outside	CA	33°27.0'	117°41.0'	18-Jul-85	GL
BS1F106	DANOU	Dana Point Harbor	Outside	CA	33°27.0'	117°41.0'	19-Jul-86	PnV
BS1L003	DANOU	Dana Point Harbor	Outside	CA	33°27.0'	117°41.0'	19-Jul-85	GL
BS1L006	DANOU	Dana Point Harbor	Outside	CA	33°27.0'	117°41.0'	18-Jul-85	GL
BS1L107	DANOU	Dana Point Harbor	Outside	CA	33°27.0'	117°41.0'	19-Jul-86	PnV
BS1S001	DANOU	Dana Point Harbor	Outside	CA	33°27.0'	117°41.0'	19-Jul-85	SED
BS1S108	DANOU	Dana Point Harbor	Outside	CA	33°27.0'	117°41.0'	19-Jul-86	SED
BS1F008	SPBLB	San Pedro Bay	Long Beach	CA	33°44.0'	118°10.0'	20-Jul-85	GL
BS1L009	SPBLB	San Pedro Bay	Long Beach	CA	33°44.0'	118°10.0'	20-Jul-85	GL
BS1S007	SPBLB	San Pedro Bay	Long Beach	CA	33°44.0'	118°10.0'	21-Jul-85	SED
BS1F103	SMBMB	Santa Monica Bay	Manhattan Beach	CA	33°53.0'	118°26.0'	16-Jul-86	PnV

Table E.2. Specimen Bank inventory for the National Benthic Surveillance Project (1985-1991) (cont.).

NIST ID	Code	Site name	Site area	State	Latitude (N)	Longitude (W)	Collection date	Sample type
BS1L104	SMBMB	Santa Monica Bay	Manhattan Beach	CA	33°53.0'	118°26.0'	16-Jul-86	PnV
BS1S105	SMBMB	Santa Monica Bay	Manhattan Beach	CA	33°53.0'	118°26.0'	16-Jul-86	SED
BS1F100	SFBSS	San Francisco Bay	Southampton Shoal	CA	37°53.0'	122°24.0'	8-Jul-86	PS
BS1L101	SFBSS	San Francisco Bay	Southampton Shoal	CA	37°53.0'	122°24.0'	8-Jul-86	PS
BS1S102	SFBSS	San Francisco Bay	Southampton Shoal	CA	37°53.0'	122°24.0'	8-Jul-86	SED
BS2F193	SFBHP	San Francisco Bay	Hunters Point	CA	37°42.0'	122°22.0'	26-Jun-87	GL
BS2L192	SFBHP	San Francisco Bay	Hunters Point	CA	37°42.0'	122°22.0'	26-Jun-87	GL
BS2S194	SFBHP	San Francisco Bay	Hunters Point	CA	37°42.0'	122°22.0'	29-Jun-87	SED
BS2F190	SFBSP	San Francisco Bay	San Pablo Bay	CA	38°03.0'	122°17.0'	17-Apr-87	PS
BS2L189	SFBSP	San Francisco Bay	San Pablo Bay	CA	38°03.0'	122°17.0'	17-Apr-87	PS
BS2S191	SFBSP	San Francisco Bay	San Pablo Bay	CA	38°03.0'	122°17.0'	19-Apr-87	SED
BS1F097	BODNO	Bodega Bay	North	CA	38°18.0'	123°02.0'	29-Jun-86	PS
BS1L098	BODNO	Bodega Bay	North	CA	38°18.0'	123°02.0'	29-Jun-86	PS
BS1S099	BODNO	Bodega Bay	North	CA	38°18.0'	123°02.0'	30-Jun-86	SED
BS1F014	PUGNR	Puget Sound	Nisqually Reach	WA	47°06.8'	122°41.6'	14-Aug-85	PV
BS1L015	PUGNR	Puget Sound	Nisqually Reach	WA	47°06.8'	122°41.6'	14-Aug-85	PV
BS1S013	PUGNR	Puget Sound	Nisqually Reach	WA	47°06.8'	122°41.6'	14-Aug-85	SED
BS6F446	PUGCB	Puget Sound	Commencement Bay	WA	47°17.0'	122°25.3'	22-May-91	PV
BS6L445	PUGCB	Puget Sound	Commencement Bay	WA	47°17.0'	122°25.3'	22-May-91	PV
BS6S447	PUGCB	Puget Sound	Commencement Bay	WA	47°17.0'	122°25.3'	23-May-91	SED
BS1F011	PUGEB	Puget Sound	Elliott Bay	WA	47°36.0'	122°21.0'	12-Aug-85	PV
BS1L012	PUGEB	Puget Sound	Elliott Bay	WA	47°36.0'	122°21.0'	12-Aug-85	PV
BS1S010	PUGEB	Puget Sound	Elliott Bay	WA	47°36.0'	122°21.0'	12-Aug-85	SED

† The NIST sample code provides information about the collection year. The first year samples were collected for the specimen bank was 1985. All samples indicated with a "1" in the third column with the last three digits equal to or less than "028" were in fact collected in 1985. Samples with the "1" in the third column and numbers greater than 028 were collected in 1986. For all other samples, to calculate the collection year add the number found in the third column to 1985 plus one.

* Key for first column fourth character
F - Fish muscle sample
L - Liver sample
S - Sediment sample

Table E.3. Specimen Bank inventory for Alaska samples from the 1989 Exxon Valdez Damage Assessment.

NIST ID◊	NMFS ID	Site name	Site area	Latitude (N)	Longitude (W)	Collection date	Wt. A/B (g)	Number pooled	Species
EX1L001	NMFS #1227	Outside Bay	Naked Is.	60°38.67'	147°28.05'	23-May-89	146/150	9	HS
				60°38.56'	147°27.44'	24-May-89			
EX1F002	NMFS #1227	Outside Bay	Naked Is.	60°38.67'	147°28.05'	23-May-89	177/163	9	HS
				60°38.56'	147°27.44'	24-May-89			
EX1S003	NMFS #1227	Outside Bay	Naked Is.			25-May-89	135/141		
EX1L004	NMFS 11228	Snug Harbor	Knight Is.	60°14.23'	147°41.10'	30-May-89	189/188	6	OK
				60°17.40'	147°41.30'	31-May-89			
EX1F005	NMFS #1228	Snug Harbor	Knight Is.	60°14.23'	147°41.10'	30-May-89	180/168	6	OK
				60°17.40'	147°41.30'	31-May-89			
EX1S006	NMFS #1228	Snug Harbor	Knight Is.			31-May-89	145/146		
EX1E007	NMFS #1228	Snug Harbor	Knight Is.	60°14.23'	147°41.10'	30-May-89	162/154	5	OK
				60°17.40'	147°41.30'	31-May-89			
EX1L008	NMFS #1228	Snug Harbor	Knight Is.	60°15.75'	147°41.75'	31-May-89	126/142	10	HS
EX1F009	NMFS #1228	Snug Harbor	Knight Is.	60°15.75'	147°41.75'	31-May-89	172/174	10	HS
EX1L010		Evans Is.	Prince William S.	60°01.05'	148°08.5'	4-Jun-89	192/225	7	OK
EX1F011		Evans Is.	Prince William S.	60°01.05'	148°08.5'	4-Jun-89	148/156	7	OK
EX1S012		Evans Is.	Prince William S.	60°00.4'	148°08.9'	4-Jun-89	143/145		
EX1M013*	5	Mummy Is.	Prince William S.	60°17.26'	147°54.38'	5-Jul-89	69/71		ME
EX1M014*	6	Snug Harbor	Knight Is.	60°14.38'	147°43.11'	6-Jul-89	54/116		ME
EX1M015*	8	Knight Is.	Bay of Isles	60°23.0'	147°44.9'	8-Jul-89	84/175		ME
EX1M016*	10	Naked Is.	Cabin Bay	60°40.0'	147°30.0'	10-Jul-89	100/107		ME
EX1M017*	13	Disk Is.	Western PWS	60°29.9'	147°39.5'	13-Jul-89	119/103		ME
EX1M018*	18	Olsen Bay	Eastern PWS	60°43.0'	146°14.0'	18-Jul-89	155/300		ME
EX1M019*	20	Humpy Cove	Resurrection Bay	59°56.2'	149°19.0'	25-Jul-89	59/60		ME
EX1M020*	21	Pony (Agnes)	Aialik Penin. Cove	59°46.2'	149°34.9'	26-Jul-89	22/107		ME
EX1M021*	22	Taroka Arm	Two Arm Bay	59°37.5'	150°08.3'	27-Jul-89	78/74		ME
EX1M022*	25	Nuka Passage	Tonsina Bay	59°18.7'	150°55.0'	30-Jul-89	39/41		ME
EX1M023*	26		Gore Point	59°14.2'	150°58.8'	31-Jul-89	58/63		ME
EX1M024*	27	West Arm	Port Dick	59°17.2'	151°08.8'	1-Aug-89	57/50		ME
EX1M025*	28	Windy Bay	S. Kenai Peninsula	59°13.8'	151°31.0'	2-Aug-89	40/42		ME
EX1M026*	30	Seldovia	Seldovia Bay	59°25.8'	151°44.3'	4-Aug-89	30/68		ME
EX1M027*	31	Ursus Cove	N. Kamishak Bay	59°30.8'	153°45.1'	5-Aug-89	64/77		ME
EX1M029*	35		Shuyak Is.	58°30.2'	152°25.1'	9-Aug-89	48/48		ME

* Sampling Protocol not followed

◊ EX1L - Fish liver
EX1F - Fish muscle
EXIS - Sediment
EXIE - Fish eggs
EX1M - Mussel soft tissues

Table E.4. EPA Mussel Watch Program sample inventory in NS&T Specimen Bank.

EPA sample ID	NS&T nearest site$^{\Delta}$	Year collected	Sample condition	Amount stored	NIST number
Blue Hills Falls, ME	PBPI	1976	Good	307 g	EP7M032
Sears Island, ME	PBSI	1976	Small	131 g	EP7M076
Sears Island, ME	PBSI	1978	Very Good	245 g	EP7M091
Cape Newagen, ME	MSSP	1976	Good	294 g	EP7M031
Bailey Island, ME	MSSP	1978	Very Good	288 g	EP7M019
Portland, ME	MSSP	1978	Fair	310 g	EP7M081
Cape Ann, MA	CAGH	1978	Good	312 g	EP7M035
Boston, MA	BHDI	1977	Good	190 g	EP7M020*
Boston, MA	BHDI	1978	Small	290 g	EP7M059
Boston, MA	BHDI	1978	Small	282 g	EP7M060
New Bedford	BBAR	1978	Fair, small	128g	EP7M085
Plymouth, MA	DBCI	1978	Good	328 g	EP7M037
Cape Cod Canal, MA	BBCC	1976	Good	276 g	EP7M054
Sakonnet Point, RI	BBGN	1977	Good	350 g	EP7M033
Narragansett, RI	NBCI	1978	Good	284 g	EP7M058
Narragansett, RI	NBCI	1979	Good	259 g	EP7M075
Narragansett, RI	NBCI	1979	Good	313 g	EP7M079
Block Island, RI	BIBI	1976	Good	290 g	EP7M049
Great Gull Is, NY	LIGB	1976	Tiny	196 g	EP7M118
Millstone, CT	LIGB	1976	Small	259 g	EP7M069
New Haven, CT (Housatonic)	LIHR	1976	Good	261 g	EP7M028
Herod Point, LIS, NY	LIHR	1976	Fair	99 g	EP7M101
Herod Point, LIS, NY	LIHR	1977	Very Small	60 g	EP7M077
Rockway Point, NY	HRJB	1977	Very Small	182 g	EP7M021*
Rockway Point, NY	HRJB	1978	Very Small	321 g	EP7M026
Fire Island/Long Island, NY	MBTH	1978	Small	339 g	EP7M008
Atlantic City, NJ	AIAC	1977	Small	280 g	EP7M073
Cape May, NJ	DBCM	1978	Small	295 g	EP7M036
Cape Henlopen, DE	DBCH	1976	Small	295 g	EP7M042
Assateague, MD	QIUB	1978	Very Small	379 g	EP7M080
Wachapreague, VA	QIUB	1977	Very Dirty	263 g	EP7Y015
Cape Charles, VA	CBCC	1976	Poor	305 g	EP7Y018
Lynnhaven Bay, VA	CBDP	1976	Poor	222 g	EP7Y062
Lynnhaven Bay, VA	CBDP	1977	Small	251 g	EP7Y121
Lynnhaven Bay, VA	CBDP	1978	Fair, Dirty	200 g	EP7Y088
Hatteras Island, NC	PSWB	1976	Dirty	230 g	EP7Y023
Hatteras Island, NC	PSWB	1977	Small, Dirty	129 g	EP7Y106
Hatteras Island, NC	PSWB	1978	Med., Dirty	266 g	EP7Y113

Table E.4. EPA Mussel Watch Program sample inventory in NS&T Specimen Bank (cont.).

EPA sample ID	NS&T site	Year collected	Sample condition	Amount stored	NIST number
Beaufort, NC	BIPI	1976	Poor	203 g	EP7Y068
Beaufort, NC	BIPI	1978	Poor, Dirty	59 g	EP7Y102
Cape Fear, NC	CFBI	1976	Poor	204 g	EP7Y017
Cape Fear, NC	CFBI	1978	Fair, Dirty	246 g	EP7Y080
Charleston, SC	CHFJ	1977	Small	292 g	EP7Y071
Savannah River, GA	SRTI	1976	Poor	262 g	EP7Y030
Sapelo Island, GA	SSSI	1976	Dirty, Good	278 g	EP7Y115
Sapelo Island, GA	SSSI	1978	Small,Dirty	223 g	EP7Y050
St. Augustine, FL	MRCB	1976	Good	307 g	EP7Y014
Ft. Pierce, FL	IRSR	1978	Dirty	372 g	EP7Y024
Naples, FL	RBHC	1976	Dirty	309 g	EP7Y025
Anclote, FL	TBOT	1976	Poor	198 g	EP7Y056
Anclote, FL	TBOT	1977	Small, Poor	16 g	EP7Y090
Anclote, FL	TBOT	1978	Small, Fair	67 g	EP7Y093
Cedar Key, FL	CKBP	1976	Good	223 g	EP7Y078
Cedar Key, FL	CKBP	1977	Very Small	197 g	EP7Y070
Cedar Key, FL	CKBP	1978	Dirty, Small	169 g	EP7Y114
Tampa Bay, FL	TBCB	1978	Small	96 g	EP7Y110
Apalachicola, FL	APCP	1978	Good	273 g	EP7Y046
Panama City, FL	PCLO	1978	Small	284 g	EP7Y010
Pensacola, FL	PBIB	1977	Dirty	260 g	EP7Y052
Dauphin Island, AL	MBCP	1977	Good	284 g	EP7Y039
Pass Christian, MS	MSPC	1978	Good	302 g	EP7Y047
Biloxi, MS	MSBB	1977	Good	253 g	EP7Y112
Golden Meadow, LA	TBLF	1977	Very Good	317 g	EP7Y081
Lake Borgne, LA	LBMP	1977	Good	258 g	EP7Y079
Lake Borgne, LA	LBMP	1977	Good	184 g	EP7Y007*
Lake Borgne, LA	LBMP	1978	Very Good	335 g	EP7Y082
Bayou de West, LA	ABOB	1977	Good	228 g	EP7Y095
Bay de Illettes, LA	BBMB	1977	Fair	231 g	EP7Y087
Quartine Bay, LA	BSSI	1977	Very Good	312 g	EP7Y096
Quartine Bay, LA	BSSI	1978	Good	240 g	EP7Y083
Bastian Bay, LA	BSBG	1977	Good	271 g	EP7Y111
Lake Campo, LA	BSBG	1977	Very Good	275 g	EP7Y117
Black Bay, LA	BSBG	1978	Good	251 g	EP7Y057
Pumpkin Bay, LA	BSBG	1977	Good	307 g	EP7Y086
Calcasieu Lake, LA	CLSJ	1977	Good	282 g	EP7Y055
Lake Sabine Bay, LA	SLBB	1978	Good	272 g	EP7Y009

Table E.4. EPA Mussel Watch Program sample inventory in NS&T Specimen Bank (cont.).

EPA sample ID	NS&T site	Year collected	Sample condition	Amount stored	NIST number
Barataria Bay, LA	BBSD	1977	Good	264 g	EP7Y104
Terrebonne Bay, LA	TBLB	1978	Large, Dirty	265 g	EP7Y108
Drum Bay, LA	LBMP	1977	Good	256 g	EP7Y109
Bay Junop, LA	ABOB	1977	Large, Dirty	263 g	EP7Y120
Galveston Bay, TX	GBHR	1978	Good	254 g	EP7Y078
East Matgorda Bay, TX	MBEM	1977	Good	264 g	EP7Y072
Matagorda Bay, TX	MBDI	1978	Good	258 g	EP7Y074
Espiritu Santo, TX	ESSP	1978	Fair	221 g	EP7Y097
Lavaca Bay, TX	MBGP	1977	Good	224 g	EP7Y094
Fulton, TX	CBCR	1977	Very Good	316 g	EP7Y099
Brownsville, TX	LMSB	1977	Good	300 g	EP7Y077
San Antonio Bay, TX	SAMP	1977	Poor	329 g	EP7Y002
Mesquite Bay, TX	MBAR	1977	Good, Dirty	199 g	EP7Y084
Aransas Bay, TX	ABLR	1977	Good	176 g	EP7Y005*
Aransas Bay, TX	ABLR	1978	Good	280 g	EP7Y105
Panther Point, TX	SAPP	1977	Large, Good	261 g	EP7Y119
San Diego Harbor, CA	SDHI	1978	Good	314 g	EP7M066
Point La Jolla, CA	LJLJ	1978	Small, Good	147 g	EP7M089
Point La Jolla, CA	LJLJ	1977	Poor	199 g	EP7M012*
Oceanside Jetty, CA	OSBJ	1976	Poor	342 g	EP7M001
San Pedro Harbor, CA	SPFP	1976	Poor	344 g	EP7M040
Santa Catalina Island, CA	SCBR	1978	Good	190 g	EP7M098
Santa Catalina Island, CA	SCBR	1977	Poor	193 g	EP7M013*
Ricon Cliffs, CA	SBSB	1977	Fair	376 g	EP7M022
Point Arguello, CA	PCPC	1978	Large	355 g	EP7M122
San Simeon, CA	SSSS	1978	Good	306 g	EP7M067
Soberanes Point, CA	PGLP	1978	Fair	73 g	EP7M100
Santa Cruz, CA	MBSC	1978	Poor	264 g	EP7M048
South San Francisco, CA	SFSM	1978	Good	125 g	EP7M092
South San Francisco, CA	SFSM	1977	Fair	209 g	EP7M063
North San Francisco, CA	SFEM	1976	Poor	171 g	EP7M011*
Farallon Island, CA	FIEL	1978	Fair	265 g	EP7M041
Farallon Island, CA	FIEL	1977	Small	108 g	EP7M061
Bodega Head, CA	BBBE	1976	Poor	339 g	EP7M027
Point Arena, CA	PAPA	1976	Fair	311 g	EP7M034
Cape Mendocino, CA	HMBJ	1976	Fair	302 g	EP7M016
Humboldt, CA	HMBJ	1978	Good	292 g	EP7M065

Table E.4. EPA Mussel Watch Program sample inventory in NS&T Specimen Bank (cont.).

EPA sample ID	NS&T site	Year collected	Sample condition	Amount stored	NIST number
Point St George, OR	SGSG	1978	Fair	315 g	EP7M043
Gold Beach, OR	SGSG	1976	Poor	356 g	EP7M045
Coos Bay, OR	CBCH	1977	Poor	194 g	EP7M004*
Coos Bay, OR	CBCH	1976	Good	196 g	EP7M103
Yaquina Head, OR	YHYH	1977	Poor	182 g	EP7M006*
Yaquina Head, OR	YHYH	1976	Small, Dirty	229 g	EP7M107
Tillamook Bay, OR	TBHP	1976	Fair	328 g	EP7M044
Columbia River, OR	CRSJ	1978	Good	285 g	EP7M064
Willapa Bay, WA	GHWJ	1976	Small	277 g	EP7M051
Grays Harbor, WA	GHWJ	1976	Poor	320 g	EP7M038
Cape Flattery, WA	JFCF	1978	Poor	295 g	EP7M029
Puget Sound, WA	WIPP	1978	Small, Dirty	348 g	EP7M116
Puget Sound, WA	WIPP	1976	Fair	222 g	EP7M003*
Boundary Bay, WA	PRPR	1976	Small	259 g	EP7M053

$^{\Delta}$ That a site is "near" does not necessarily mean that the EPA and NOAA sites are co-located. Discussion of sites comparable between NOAA and EPA Mussel Watch Programs is provided in Lauenstein *et al*., 1990; Lauenstein, 1995; and Lauenstein (in press). EPA Mussel Watch sites descriptions are provided in Palmieri *et al*., 1984.
* Homogenized at NIST for analysis by NIST and shipped to Battelle and TAMU for analysis.

TISSUE CONDITION LEGEND:

Poor : tissue completely dry, ice crystals and dirt present.
Fair : tissue mostly dry, slightly gummy, ice crystals present.
Good : approximately 50% or more of the mussel tissue remained. Some ice crystals, drying around edge of shell.
Very Gcod : approximately 75% of mussel tissue remained, minimal ice crystals.
Small/Tiny : either small batch or small mussels.
Large : either large batch or large mussels.
Dirty : sample could not be shucked without some dirt on/in the sample.

APPENDIX F

ANALYTICAL RESULTS

All analyses were performed by NIST.

Mussel Watch Project samples: MW1 samples were collected during the Winter field season of 1986. The subsequent years follow sequentially: MW2, 1987; MW3, 1988; MW4, 1989; MW5, 1990; MW6, 1991; and MW7, 1992.

National Benthic Surveillance Project samples: The first samples were collected in 1985. All samples indicated with a "1" in the third column with the last three digits equal to or less than "028" collected in 1985. Samples with the "1" in the third column and numbers greater than 028 were collected in 1986. The subsequent years follow sequentially: BS2, 1987; BS3, 1988; BS4, 1989; BS5, 1990; BS6, 1991; and BS7, 1992.

Sample type and species key:

AF - *Arius felis* (Hardhead catfish)
CS - *Cheilotrema saturnum* (Black croaker)
CV - *Crassostrea virginica* (American oyster)
GL - *Genyonemus lineatus* (White croaker)
LX - *Leiostomus xanthurus* (Spot)
MA - *Morone americana* (White perch)
MC - *Mytilus californianus* (California mussel)
ME - *Mytilus edulis* (Blue mussel)
MO - *Myoxocephalus octodecemspinosus* (Longhorn sculpin)
MU - *Micropogonias undulatus* (Atlantic croaker)
OS - *Ostrea sandvicensis* (Hawaiian oyster)
PA - *Pleuronectes americanus* (Winter flounder)
PnV - *Pleuronichthys verticalis* (Hornyhead Turbot)
PS - *Platichthys stellatus* (Starry flounder)
PV - *Parophrys vetulas* (English sole)
SED - Sediment

Table F.1 Percent water in tissue and sediment samples for 20 sites from Mussel Watch Project (1985-1988).

Identification Number		Site	Species	% Water
MW1M029	B002	Imperial Beach, North Jetty, CA	MC	82.1
	B004[a]			82.2
	B005[b]			83.2
MW1S032	B001			23.2
MW1Y030	B002	Confederate Reef, Galveston, TX	CV	81.4
	B004			81.1
	B005			82.4
MW1S031	B001			57.0
MW1Y044	B002	Fort Johnson, Charleston Harbor, SC	CV	85.1
	B004			84.8
	B005			86.2
MW1S045	B001			38.4
MW1M048	B002	Dorchester Bay, Boston Harbor, MA	ME	85.0
	B004			85.0
	B005			86.2
MW1S049	B001			49.4
MW1Y068	B002	Pascagoula Bay, Mississippi Sound, MS	CV	87.3
	B004			86.7
	B005			87.9
MW1S067	B001			44.5
MW1Y073	B002	Mt. Point Bar, Baltimore Harbor, MD	CV	88.3
	B004			88.3
	B005			89.1
MW1S074	B001			82.6

Table F.1 Percent water in tissue and sediment samples for 20 sites from Mussel Watch Project (1985-1988) (cont).

Identification Number		Site	Species	% Water
MW2Y119	B011[c]	Kelly Island, Delaware Bay, DE	CV	87.3
	B012[d]			87.9
MW2S120	B001			53.9
MW2Y129	B011	Gallinipper Point, Matagorda Bay, TX	CV	87.3
	B012			87.9
MW2S130	B001			73.5
MW2M135	B011	South Jetty, Marina Del Rey, CA	ME	93.0
	B012			93.6
MW2S136	B001			35.4
MW2M137	B010	Point Dume, Point Dume, CA	MC	87.4
	B011			88.1
MW2S138	B001	Wedge Jetty, Newport Beach, CA		40.4
MW2Y155	B011	Cedar Point Reef, Mobile Bay, AL	CV	88.0
	B012			88.6
MW2S156	B001			74.9
MW2M163	B011[c]	Hingham Bay, Boston Harbor, MA	ME	88.4
	B012[d]			88.8
MW2S164	B001			34.0
MW3M206	B005	Hempstead Harbor, Long Island Sound, NY	ME	87.3
MW3S205	B005			71.5

Table F.1 Percent water in tissue and sediment samples for 20 sites from Mussel Watch Project (1985-1988) (cont).

Identification Number		Site	Species	% Water
MW3M208	B005	Lower Bay, Hudson Raritan Estuary, NY	ME	87.8
MW3S207	B005			42.3
MW3M217	B005	Coos Head, Coos Bay, OR	MC	84.8
MW3S218	B005			22.3
MW3M222	B006	Neah Bay, St. of Juan de Fuca, CA	MC	87.1
MW3S223	B004			63.8
MW3M225	B005	Goosebury Neck, Buzzards Bay, MA	ME	89.8
MW3S226	B005			26.5
MW3M240	B005	San Miguel Island, Tyler Bright, CA	MC	87.7
MW3S251	B005	Tres Palacois Bay, Matagorda Bay, TX		48.2

[a] MW1 - B004 samples were freeze dried at time of homogenization.
[b] MW1 - B005 samples were freeze dried at time of analysis.
[c] All MW2 - B011 samples and MW2M137 B010 were used for INAA.
[d] All MW2 - B012 samples and MW2M137 B011 were used for XRF.

Table F.2 Percent water in fish tissue (muscle and liver) and sediment for 12 sites from the National Benthic Surveillance Project (1985-86).

Sample Identification	Site	Species	% Water
BS1L003	Dana Point, CA	GL	75.2
BS1F002			77.1
BS1S001			24.4
BS1L012	Elliott Bay, WA	PV	70.8
BS1F011			80.5
BS1S010			33.8
BS1L015	Nisqually Reach, WA	PV	86.4
BS1F014			81.2
BS1S013			18.8
BS1L021	Mississippi Delta, LA	MU	79.4
BS1F020			81.7
BS1S019			27.4
BS1L024	Corpus Christi, TX	MU	70.7
BS1F023			76.8
BS1S022			74.0
BS1L027	Charlotte Harbor, FL	LX	63.7
BS1F026			71.2
BS1S025			29.7
BS1L083	Boston Harbor, MA	PA	77.0
BS1F084			80.9
BS1S085			53.6
BS1L086	Buzzards Bay, MA	PA	74.5
BS1F087			81.4
BS1S088			68.6

Table F.2 Percent water in fish tissue (muscle and liver) and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (cont).

Sample Identification	Site	Species	% Water
BS1L098	Bodega Bay, CA	PS	73.3
BS1F097			81.5
BS1S099			21.6
BS1L101	Southampton Shoal, CA	PS	64.3
BS1F100			79.9
BS1S102			35.2
BS1L104	Santa Monica Bay, CA	PnV	65.4
BS1F103			80.0
BS1S105			27.4
BS1L112	St. John's River, FL	MU	68.6
BS1F113			74.9
BS1S111			75.3

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.)[a].

Sample Identification[b]	Site	Species	Percent Water	H	B	Na	Mg	Al
MW1M029	Imperial Beach, San Diego, CA	MC	82.1			43500 ± 300[f]	6970 ± 280	988 ± 14
						40600 ± 300	5870 ± 270	925 ± 11
MW1Y030	Confederate Reef, Galveston Bay, TX	CV	81.4			22700 ± 200	3710 ± 180	294 ± 5
						21700 ± 200	3900 ± 170	288 ± 5
MW1Y044	Fort Johnson, Charleston Harbor, SC	CV	85.1			50900 ± 400	7390 ± 310	666 ± 11
						49500 ± 400	7210 ± 330	632 ± 10
MW1M048	Dorchester Bay, Boston Harbor, MA	ME	85.0			47700 ± 300	6800 ± 310	646 ± 10
						45400 ± 300	6750 ± 290	649 ± 10
MW1Y068	Pascagoula Bay, Mississippi Sound, MS	CV	87.3			49400 ± 300	7730 ± 360	1560 ± 20
						47700 ± 300	7450 ± 360	1620 ± 20
MW1Y073	Mountain Pt. Bar, Baltimore Harbor, MD	CV	88.3			22400 ± 200	3870 ± 170	193 ± 4
						22000 ± 200	4270 ± 170	143 ± 4
MW2Y119	Kelly Island, Delaware Bay, DE	CV	87.9			20200 ± 200	3200 ± 220	141 ± 2
			87.3	69100 ± 4000[c]	31.8 ± 4.2[c]	38600 ± 1700[c]		
MW2Y129	Gallinipper, Point Matagorda Bay, TX	CV	87.9			20500 ± 200	3460 ± 270	218 ± 3
			87.3	64600 ± 3400[c]	19.8 ± 3.0[c]	32800 ± 1300[c]		
MW2M135	South Jetty, Marina Del Rey, CA	ME	93.0			32400 ± 200	3240 ± 340	849 ± 8
			93.6	42900 ± 1600[c]	55.6 ± 7.5[c]	118800 ± 4800[c]		
MW2M137	Point Dume, Point Dume, CA	MC	88.1			62800 ± 6700[e]	3980 ± 890[e]	220 ± 26[e]
			87.4	55700 ± 3000[c]	47.6 ± 8.0[c]	81400 ± 3200[c]		

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification[b]	Site	Species	Percent Water	H	B	Na	Mg	Al
MW2Y155	Cedar Point Reef, Mobile Bay, AL	CV	88.0			22000 ± 200	2780 ± 230	438 ± 4
			88.6	66800 ± 3600[c]	13.6 ± 3.0[c]	29500 ± 1500[c]		
MW2M163	Hingham Bay, Boston Harbor, MA	ME	88.8			42900 ± 400	5250 ± 110	594 ± 7
			88.4	62200 ± 3400[c]	45.7 ± 6.6[c]	56500 ± 2400[c]		
MW3M206	Hempstead Harbor, Long Island Sound, NY	ME	87.3			31000 ± 400	4590 ± 290	588 ± 6
			87.7					
MW3M208	Lower Bay, Hudson Raritan Estuary, NY	ME	87.8			35800 ± 400	7270 ± 400	385 ± 4
			88.0					
MW3M217	Coos Head, Coos Bay, OR	MC	84.8			36600 ± 400	6670 ± 440	1060 ± 10
			85.0					
MW3M222	Neah Bay, Strait of Juan de Fuca, WA	MC	87.1			38900 ± 400	6000 ± 460	452 ± 5
			87.2					
MW3M225	Goosebury Neck, Buzzards Bay, MA	ME	89.8			50700 ± 600	7650 ± 480	1990 ± 20
			89.6					
MW3M240	San Miguel Island, Tyler Bight, CA	MC	87.7			51600 ± 600	7290 ± 450	267 ± 4
			87.7					

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification[b]	Si	P	S	Cl	K	Ca	Sc	V	Cr
MW1M029	1290 ± 410[d]	12620 ± 510[d]	21700 ± 780[d]	76200 ± 600	16500 ± 1500	12000 ± 800	0.232 ± 0.001	2.53 ± 0.33	1.68 ± 0.03
				73400 ± 600	10800 ± 1200	8670 ± 680	0.260 ± 0.002	2.66 ± 0.30	1.92 ± 0.03
MW1Y030	780 ± 370[d]	7160 ± 310[d]	12410 ± 460[d]	40900 ± 400	9770 ± 850	8800 ± 510	0.0533 ± 0.0003	1.39 ± 0.18	1.15 ± 0.02
				39700 ± 300	10800 ± 900	5450 ± 380	0.0526 ± 0.0004	1.94 ± 0.19	0.46 ± 0.03
MW1Y044	2400 ± 460[d]	7500 ± 490[d]	18320 ± 960[d]	87300 ± 700	16800 ± 1540	10600 ± 800	0.142 ± 0.001	8.89 ± 0.46	1.31 ± 0.03
				87800 ± 700	13900 ± 1400	17300 ± 1000	0.150 ± 0.001	9.74 ± 0.47	1.88 ± 0.05
MW1M048	2140 ± 310[d]	8940 ± 390[d]	20550 ± 780[d]	87300 ± 700	10700 ± 1400	8180 ± 710	0.107 ± 0.001	1.51 ± 0.33	4.26 ± 0.04
				81700 ± 700	11200 ± 1300	5020 ± 680	0.124 ± 0.001	2.27 ± 0.36	4.70 ± 0.05
MW1Y068	7010 ± 410[d]	6310 ± 290[d]	12820 ± 480[d]	90600 ± 800	13000 ± 1400	8500 ± 910	0.271 ± 0.002	4.69 ± 0.48	2.47 ± 0.04
				85600 ± 700	10600 ± 1300	7700 ± 800	0.324 ± 0.002	3.64 ± 0.42	2.57 ± 0.04
MW1Y073	≤680[d]	7560 ± 450[d]	11640 ± 610[d]	39300 ± 300	8200 ± 760	11600 ± 500	0.0734 ± 0.0005	≤0.58	1.42 ± 0.03
				38300 ± 300	11000 ± 900	21200 ± 700	0.0791 ± 0.0007	≤0.49	1.35 ± 0.05
MW2Y119				36100 ± 300	8900 ± 500	9090 ± 240	0.0384 ± 0.0003	0.29 ± 0.08	1.19 ± 0.06
				32400 ± 1600[d]	8670 ± 440[d]	2430 ± 130[d]			≤6.2[d]
			13300 ± 800[c]	51100 ± 2100[c]	14000 ± 800[c]				
MW2Y129				37500 ± 330	10000 ± 500	2860 ± 210	0.0521 ± 0.0003	0.59 ± 0.06	0.340 ± 0.033
				31900 ± 1600[d]	9330 ± 470[d]	3380 ± 180[d]			≤5.9[d]
			10000 ± 400[c]	40100 ± 1400[c]	10500 ± 400[c]				
MW2M135				67300 ± 600	4180 ± 670	≤1300	0.405 ± 0.002	3.37 ± 0.17	15.7 ± 0.2
				135000 ± 6800[d]	8170 ± 410[d]	7080 ± 370[d]			≤13[d]
			22600 ± 2700[c]	229000 ± 4000[c]	20900 ± 1200[c]				

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification[b]	Si	P	S	Cl	K	Ca	Sc	V	Cr
MW2M137				102000 ± 11000[e]	6180 ± 540	≤1600	0.0452 ± 0.0002	0.29 ± 0.25[e]	0.904 ± 0.013
				81500 ± 4100[d]	7500 ± 380[d]	5920 ± 310[d]			≤8.5[d]
			18600 ± 800[c]	12900 ± 4800[c]	11500 ± 900[c]				
MW2M155				41300 ± 400	10000 ± 500	2800 ± 240	0.107 ± 0.001	0.72 ± 0.08	0.703 ± 0.037
				36300 ± 1800[d]	9950 ± 500[d]	5200 ± 270[d]			≤6.2[d]
			7050 ± 790[c]	46900 ± 4100[c]	23900 ± 1000[c]				
MW2M163				86700 ± 700	9660 ± 580	4000 ± 470	0.104 ± 0.001	0.17 ± 0.11	2.47 ± 0.04
				67600 ± 3400[d]	9930 ± 500[d]	4570 ± 240[d]		≤8.1[d]	
			18600 ± 600[c]	105000 ± 4000[c]	14400 ± 800[c]				
MW3M206				56700 ± 600		≤500	0.123 ± 0.0001	≤0.35	1.47 ± 0.02
			15400 ± 900[c]	72800 ± 800[c]	12100 ± 400[c]				
MW3M208				63700 ± 700		4430 ± 202	0.0862 ± 0.0005	≤0.36	3.09 ± 0.04
			14000 ± 1200[c]	65800 ± 1100[c]	12500 ± 600[c]				
MW3M217				64900 ± 700		1420 ± 210	0.213 ± 0.001	3.26 ± 0.19	38.0 ± 0.3
			14800 ± 1000[c]	67400 ± 1300[c]	11700 ± 600[c]				
MW3M222				70100 ± 800		≤620	0.129 ± 0.001	1.15 ± 0.11	1.74 ± 0.03
			16200 ± 100[c]	71300 ± 900[c]	10900 ± 500[c]				
MW3M225				92600 ± 1000		≤760	0.170 ± 0.001	3.70 ± 0.20	1.48 ± 0.03
			15500 ± 800[c]	123000 ± 2000[c]	13800 ± 400[c]				
MW3M240				89500 ± 1010		3830 ± 280	0.0533 ± 0.0003	≤0.39	1.76 ± 0.03
			17820 ± 1100[c]	94400 ± 2500c	11500 ± 600[c]				

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Mn	Fe	Co	Ni	Cu	Zn	As	Se	Br
MW1M029	17.0 ± 1.6	582 ± 4	0.636 ± 0.003	≤1.4[d]	9.44 ± 0.66	144 ± 1	7.89 ± 0.40	2.79 ± 0.04	398 ± 10[d]
	18.3 ± 1.1	658 ± 4	0.646 ± 0.003			141 ± 1	8.05 ± 0.37	2.66 ± 0.02	
MW1Y030	12.1 ± 1.1	211 ± 2	0.338 ± 0.002	2.6 ± 0.5[d]	104.2 ± 3.9	1480 ± 10	5.66 ± 0.16	2.63 ± 0.02	209 ± 7[d]
	10.9 ± 0.7	206 ± 2	0.320 ± 0.002			1420 ± 10	6.99 ± 0.29	2.53 ± 0.02	
MW1Y044	17.8 ± 1.5	468 ± 3	0.458 ± 0.003	≤1.9[d]	96.9 ± 5.2	1450 ± 10	33.6 ± 0.5	2.77 ± 0.02	392 ± 20[d]
	13.7 ± 1.3	515 ± 4	0.472 ± 0.004			1470 ± 10	35.8 ± 0.8	2.96 ± 0.03	
MW1M048	14.0 ± 1.4	525 ± 4	0.355 ± 0.002	≤1.5[d]	15.8 ± 0.9	113 ± 1	7.51 ± 0.32	2.74 ± 0.02	420 ± 14[d]
	13.6 ± 1.2	589 ± 4	0.384 ± 0.002			121 ± 1	8.60 ± 0.45	2.90 ± 0.03	
MW1Y068	49.5 ± 1.7	1010 ± 10	0.826 ± 0.004	2.7 ± 0.7[d]	74.6 ± 2.9	2340 ± 30	16.1 ± 0.4	2.58 ± 0.02	340 ± 12[d]
	58.8 ± 1.8	1110 ± 10	0.887 ± 0.005			2370 ± 20	17.1 ± 0.7	2.66 ± 0.03	
MW1Y073	21.0 ± 0.8	240 ± 2	0.777 ± 0.004	9.4 ± 1.2[d]	317 ± 16	5860 ± 50	4.55 ± 0.28	3.72 ± 0.03	190 ± 10[d]
	25.8 ± 0.8	221 ± 3	0.745 ± 0.004			5680 ± 50	4.72 ± 0.37	3.65 ± 0.04	
MW2Y119	10.7 ± 0.4	198 ± 4	1.56 ± 0.01		119.9 ± 6.9	3820 ± 20	7.10 ± 0.19	3.09 ± 0.04	
	11.0 ± 1.7[d]			4.41 ± 0.62[d]	137.2 ± 7.0[d]				
MW2Y129	23.1 ± 0.4	199 ± 2	3.19 ± 0.01		83.3 ± 7.5	209 ± 1	6.32 ± 0.17	3.62 ± 0.03	
	26.6 ± 2.2[d]			2.03 ± 0.52[d]	100.2 ± 5.2[d]				
MW2M135	28.6 ± 1.1	1930 ± 20	1.32 ± 0.01		≤9	292 ± 2	8.00 ± 0.34	4.44 ± 0.04	
	54.3 ± 4.6[d]			1.95 ± 0.79[d]	14.3 ± 1.1[d]				
MW2M137	15.2 ± 1.9	148 ± 1	0.367 ± 0.002		≤15	115 ± 1	6.73 ± 0.24	1.78 ± 0.02	
	6.3 ± 2.1[d]			1.30 ± 0.59[d]	8.57 ± 0.75[d]				

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification[b]	Mn	Fe	Co	Ni	Cu	Zn	As	Se	Br
MW2Y155	7.10 ± 0.5	342 ± 3	0.314 ± 0.002		43.8 ± 6.7	758 ± 4	5.86 ± 0.16	1.98 ± 0.02	
	16.5 ± 1.9[d]			1.81 ± 0.47[d]	57.8 ± 3.1[d]				
MW2M163	11.0 ± 0.5	436 ± 4	0.418 ± 0.002		≤10	132 ± 1	8.72 ± 0.26	2.90 ± 0.02	
	9.4 ± 2.1[d]			≤1.2[d]	15.7 ± 1.0[d]				
MW3M206	26.9 ± 0.8	396 ± 2	0.509 ± 0.002		≤32	91.1 ± 0.7	3.53 ± 0.10	2.76 ± 0.02	
				2.12 ± 0.33[d]	12.7 ± 0.7[d]				
MW3M208	35.1 ± 0.8	379 ± 3	0.550 ± 0.002		≤34	110 ± 1	7.53 ± 0.20	3.69 ± 0.03	
				3.02 ± 0.36[d]	15.4 ± 0.9[d]				
MW3M217	13.9 ± 0.6	621 ± 4	0.698 ± 0.003		≤36	106 ± 1	5.51 ± 0.12	2.48 ± 0.02	
				3.93 ± 0.40[d]	11.1 ± 0.7[d]				
MW3M222	11.4 ± 0.8	344 ± 2	0.741 ± 0.003		≤35	158 ± 1	7.85 ± 0.15	2.99 ± 0.03	
				1.68 ± 0.32[d]	9.04 ± 0.58[d]				
MW3M225	25.0 ± 1.0	551 ± 4	0.453 ± 0.003		≤46	84.8 ± 0.7	9.44 ± 0.17	3.02 ± 0.03	
				1.36 ± 0.37[d]	9.40 ± 0.62[d]				
MW3M240	2.47 ± 0.02	180 ± 2	0.381 ± 0.002		≤38	153 ± 1	9.61 ± 0.16	2.92 ± 0.03	
				2.14 ± 0.39[d]	9.74 ± 0.63[d]				

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification[b]	Rb	Sr	Mo	Ag	Cd	Sn	Sb	I	Cs
MW1M029	5.46 ± 0.10	82.6 ± 4.1[d]	≤3.3	1.25 ± 0.03	≤7.3	≤8.4	0.0228 ± 0.0027	≤9.5	0.0309 ± 0.0028
	5.29 ± 0.10		≤2.3	1.25 ± 0.03	≤5.2	≤7.5	0.0237 ± 0.0025	≤9.5	0.0392 ± 0.0028
MW1Y030	4.11 ± 0.07	41 ± 10[d]	≤1.4	3.85 ± 0.04	≤3.0	≤5.7	0.0105 ± 0.0014	≤4.8	0.0266 ± 0.0028
	4.42 ± 0.15		≤1.6	3.71 ± 0.06	≤3.7	≤10	0.0115 ± 0.0026	≤5.5	0.0377 ± 0.0051
MW1Y044	5.04 ± 0.12	86 ± 6[d]	≤1.7	3.11 ± 0.05	≤5.6	≤9.2	0.0185 ± 0.0028	≤10.5	0.0323 ± 0.0043
	4.86 ± 0.26		≤2.9	3.46 ± 0.07	≤6.9	≤15	≤0.012	≤10.5	≤0.020
MW1M048	6.04 ± 0.10	47.8 ± 2.4[d]	≤2.4	1.64 ± 0.02	≤5.4	≤6.7	0.0632 ± 0.0028	≤10.5	0.0567 ± 0.0026
	6.78 ± 0.13		≤2.4	1.79 ± 0.03	≤5.6	≤7.5	0.0372 ± 0.0027	≤10	0.0537 ± 0.0029
MW1Y068	5.71 ± 0.16	55.6 ± 2.8[d]	3.75 ± 0.54	2.86 ± 0.05	≤5.4	≤10	0.0204 ± 0.0033	≤11.5	0.0978 ± 0.0052
	6.24 ± 0.27		≤3.1	2.82 ± 0.06	≤7.3	≤14	0.0227 ± 0.0039	≤11	0.0853 ± 0.0070
MW1Y073	2.77 ± 0.14	58.8 ± 4.2[d]	≤1.9	5.92 ± 0.07	5.9 ± 1.1	≤12	≤0.016	≤5.5	≤0.027
	2.89 ± 0.27		≤1.9	5.78 ± 0.10	3.5 ± 1.0	≤19	≤0.028	≤5.5	≤0.041
MW2Y119	2.77 ± 0.46	≤11	≤1.3	6.55 ± 0.05	4.24 ± 0.22[c]	≤12	0.0232 ± 0.0025	≤11[d]	0.0278 ± 0.0051
MW2Y129	3.04 ± 0.38	≤4.7	≤1.6	1.53 ± 0.01	3.12 ± 0.17[c]	≤4.7	0.0143 ± 0.0015	≤12[d]	0.0274 ± 0.0019
MW2M135	4.67 ± 0.39	84.3 ± 1.2	3.01 ± 0.67	2.32 ± 0.02	3.25 ± 0.21[c]	≤4.3	0.0644 ± 0.0027	28.1 ± 7.9[d]	0.0478 ± 0.0017
MW2M137	3.64 ± 0.11	59.08 ± 0.56	≤1.8	1.17 ± 0.01	0.39 ± 0.16[c]	≤1.5	0.0221 ± 0.0008	18.9 ± 6.4[d]	0.0260 ± 0.0007
MW2Y155	3.65 ± 0.40	108 ± 1	≤1.7	1.43 ± 0.01	2.45 ± 0.15[c]	≤4.1	0.0089 ± 0.0014	≤11[d]	0.0397 ± 0.0017

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification[b]	Rb	Sr	Mo	Ag	Cd	Sn	Sb	I	Cs
MW2M163	6.41 ± 0.40	47.3 ± 0.8	≤2.6	3.22 ± 0.02	1.81 ± 0.12[c]	≤3.0	0.0497 ± 0.0022	16.5 ± 5.8[d]	0.0541 ± 0.0012
MW3M206	5.71 ± 0.1	29.4 ± 0.5	≤1.1	0.300 ± 0.005	2.08 ± 0.23[c]	≤2.4	0.0159 ± 0.0011	≤8.92	0.0384 ± 0.0011
MW3M208	6.31 ± 0.25	43.4 ± 1.0	≤1.4	0.919 ± 0.011	4.02 ± 0.31[c]	≤2.9	0.0335 ± 0.0022	≤9.26	0.0462 ± 0.0019
MW3M217	5.33 ± 0.15	55.5 ± 1.0	≤1.2	0.0358 ± 0.0063	2.34 ± 0.30[c]	≤4.2	0.0142 ± 0.0018	≤10.45	0.0565 ± 0.0020
MW3M222	4.40 ± 0.25	40.8 ± 1.0	≤1.2	0.0537 ± 0.0061	5.31 ± 0.28[c]	≤4.1	0.0157 ± 0.0020	≤10.14	0.0338 ± 0.0018
MW3M225	10.4 ± 0.3	65.0 ± 1.5	≤1.4	0.206 ± 0.012	1.52 ± 0.30[c]	≤6.1	0.0304 ± 0.0033	≤12.80	0.0907 ± 0.0032
MW3M240	4.74 ± 0.15	77.1 ± 1.2	≤1.1	0.0949 ± 0.0068	4.95 ± 0.31[c]	≤3.3	0.0106 ± 0.0016	≤11.28	0.0320 ± 0.0021

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Ba	La	Ce	Sm	Eu	Tb	Hf	Ta
MW1M029	9.2 ± 1.0	0.381 ± 0.035	1.20 ± 0.02	0.168 ± 0.005	0.0328 ± 0.0008			
	6.9 ± 1.1	1.042 ± 0.035	1.98 ± 0.02	0.224 ± 0.004	0.0286 ± 0.0007			
MW1Y030	5.71 ± 0.81	0.177 ± 0.016	0.302 ± 0.008	0.0409 ± 0.0017	0.0102 ± 0.0003			
	≤7.9	0.209 ± 0.018	0.268 ± 0.014	0.0420 ± 0.0025	0.0109 ± 0.0006			
MW1Y044	≤3.0	0.221 ± 0.026	0.902 ± 0.016	0.0964 ± 0.0034	0.0209 ± 0.0006			
	≤17	0.494 ± 0.034	0.859 ± 0.023	0.0902 ± 0.0047	0.0188 ± 0.0008			
MW1M048	4.07 ± 0.94	0.177 ± 0.025	0.617 ± 0.015	0.0691 ± 0.0032	0.0146 ± 0.0005			
	≤4.4	0.557 ± 0.033	0.822 ± 0.019	0.0936 ± 0.0038	0.0176 ± 0.0006			
MW1Y068	10.6 ± 2.0	1.42 ± 0.04	2.56 ± 0.02	0.273 ± 0.004	0.0609 ± 0.0010			
	≤17	1.31 ± 0.05	2.47 ± 0.03	0.303 ± 0.006	0.0637 ± 0.0012			
MW1Y073	9.98 ± 1.98	0.236 ± 0.021	0.337 ± 0.013	0.0582 ± 0.0029	0.00872 ± 0.00077			
	≤14	0.132 ± 0.016	0.290 ± 0.019	0.0431 ± 0.0032	0.00899 ± 0.00127			
MW2Y119	≤91	0.288 ± 0.018	0.357 ± 0.026	0.0510 ± 0.0022	0.0101 ± 0.0003	≤0.0070	0.0430 ± 0.0038	≤0.0053
MW2Y129	≤98	0.535 ± 0.018	0.565 ± 0.017	0.117 ± 0.002	0.0258 ± 0.0003	0.0126 ± 0.0008	0.0284 ± 0.0018	0.00431 ± 0.00079
MW2M135	100 ± 22	0.662 ± 0.042	1.22 ± 0.02	0.120 ± 0.004	0.0309 ± 0.0004	0.0174 ± 0.0008	1.013 ± 0.009	0.0931 ± 0.0017
MW2M137	16.4 ± 2.4	0.111 ± 0.025	0.380 ± 0.008	0.0321 ± 0.0024	0.00714 ± 0.00011	0.00232 ± 0.00024	0.0112 ± 0.0005	0.00250 ± 0.00032
MW2Y155	≤140	0.393 ± 0.018	0.604 ± 0.017	0.0737 ± 0.0023	0.0152 ± 0.0002	0.00791 ± 0.00071	0.0357 ± 0.0020	0.00893 ± 0.00064
MW2M163	≤94	0.346 ± 0.031	0.584 ± 0.015	0.0597 ± 0.0029	0.0136 ± 0.0002	0.00385 ± 0.00050	0.0339 ± 0.0015	0.0505 ± 0.0012

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Ba	La	Ce	Sm	Eu	Tb	Hf	Ta
MW3M206	11.9 ± 1.9	2.06 ± 0.03	4.20 ± 0.03	≤0.0065	0.0264 ± 0.0006	0.0235 ± 0.0005	0.237 ± 0.003	2.68 ± 0.03
MW3M208	≤30	0.205 ± 0.020	0.484 ± 0.014	0.0189 ± 0.0026	0.0125 ± 0.0009	0.00488 ± 0.00059	0.0213 ± 0.0016	1.84 ± 0.02
MW3M217	≤12	0.375 ± 0.019	0.861 ± 0.013	≤0.0065	0.0365 ± 0.0011	0.0175 ± 0.0008	0.0383 ± 0.0014	4.67 ± 0.05
MW3M222	≤33	0.252 ± 0.017	0.733 ± 0.015	≤0.0074	0.0363 ± 0.0011	0.0177 ± 0.0008	0.0235 ± 0.0016	2.77 ± 0.03
MW3M225	≤18	0.393 ± 0.022	0.987 ± 0.020	≤0.0075	0.0274 ± 0.0016	0.0152 ± 0.0012	0.0957 ± 0.0024	3.76 ± 0.04
MW3M240	≤12	0.128 ± 0.017	0.432 ± 0.014	≤0.0067	0.0133 ± 0.0011	0.00876 ± 0.00087	0.0206 ± 0.0014	1.18 ± 0.01

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification[b]	Au	Hg	Pb	Th	U
MW1Y029	≤0.0069	0.0704 ± 0.0087	2.1 ± 1.0[d]	0.102 ± 0.002	
	0.0049 ± 0.0009	0.0973 ± 0.0082		0.340 ± 0.004	
MW1Y030	0.0160 ± 0.0007	0.109 ± 0.006	≤1.8[d]	0.048 ± 0.001	
	0.0170 ± 0.0008	0.0874 ± 0.0098		0.041 ± 0.003	
MW1Y044	≤0.0052	0.0989 ± 0.0085	≤2.0[d]	0.183 ± 0.003	
	0.0054 ± 0.0014	0.0628 ± 0.014		0.297 ± 0.006	
MW1M048	0.0635 ± 0.0016	0.205 ± 0.008	13.1 ± 1.0[d]	0.104 ± 0.002	
	0.0701 ± 0.0017	0.250 ± 0.010		0.151 ± 0.003	
MW1Y068	0.0039 ± 0.0008	0.158 ± 0.009	≤2.1[d]	0.325 ± 0.004	
	≤0.0063	0.140 ± 0.013		0.340 ± 0.006	
MW1Y073	0.0295 ± 0.0010	0.0955 ± 0.010	≤1.9[d]	0.036 ± 0.003	
	0.0284 ± 0.0010	≤0.055		0.032 ± 0.005	
MW2Y119	0.0534 ± 0.0009		≤1.3[d]	0.0349 ± 0.0068	0.313 ± 0.089
MW2Y129	0.0209 ± 0.0006		≤1.3[d]	0.0516 ± 0.0041	≤0.20
MW2M135	0.0337 ± 0.0013		23.5 ± 1.8[d]	0.158 ± 0.004	≤0.75
MW2M137	0.00659 ± 0.00087		3.59 ± 0.83[d]	0.0320 ± 0.0010	≤0.58
MW2Y155	0.00504 ± 0.00059		1.30 ± 0.65[d]	0.0716 ± 0.0043	≤0.24
MW2M163	0.0680 ± 0.0013		13.1 ± 1.1[d]	0.0734 ± 0.0032	≤0.59

Table F.3. Concentrations of inorganic constituents in bivalve samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification[b]	Au	Hg	Pb	Th	U
MW3M206	0.0472 ± 0.00066		4.11 ± 0.48[d]	0.670 ± 0.005	≤0.230
MW3M208	0.142 ± 0.002		6.66 ± 0.58[d]	0.0540 ± 0.0025	≤0.20
MW3M217	≤0.00095		1.96 ± 0.46[d]	0.0646 ± 0.0020	≤0.26
MW3M222	0.00080 ± 0.00022		≤0.89[d]	0.0292 ± 0.0025	≤0.27
MW3M225	0.0127 ± 0.0004		1.76 ± 0.94[d]	0.161 ± 0.003	≤0.32
MW3M240	≤0.00073		≤0.94[d]	0.0387 ± 0.0020	≤0.28

[a] All elements analyzed by instrumental neutron activation analysis (INAA) unless otherwise noted. Results for the analysis of duplicate samples by INAA or by a second analytical technique are reported for some samples.
[b] MW1 samples were collected during 1985-86; MW2 samples were collected during 1986-87; MW3 samples were collected during 1987-88.
[c] Analyzed by Prompt Gamma Activation Analysis (PGAA).
[d] Analyzed by X-Ray Fluorescence.
[e] Due to extremely high count rates an additional 10% uncertainty has been added.
[f] The uncertainties associated with the INAA results are due to counting statistics, including propagated uncertainties of the standard.

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.).

Sample Identification	Site	Percent Water	H	B	Na	Mg	Al	Si
MW1S031	Confederate Reef, Galveston Bay, TX	56.98	6610 ± 210[c]	85.3 ± 1.4[c]	14900 ± 100[d] 16300 ± 2000[c]	88.9 ± 8.1[e]	51500 ± 400 53100 ± 1400[c]	341000 ± 12000[c]
MW1S032	Imperial Beach, North Jetty, CA	23.24	6010 ± 370[c]	32.8 ± 1.0[c]	28800 ± 300 26400 ± 2000[c]	11500 ± 760	73700 ± 600 66300 ± 2600[c]	309000 ± 6500[c]
MW1S045	Fort Johnson, Charleston Harbor, SC	38.41	3510 ± 190[c]	42.5 ± 1.0[c]	476 ± 6 7950 ± 740[c]	962 ± 9	21300 ± 200 18900 ± 1100[c]	315000 ± 10000[c]
MW1S049	Dorchester Bay, Boston Harbor, MA	49.36	8710 ± 730[c]	47.1 ± 1.0[c]	29200 ± 300 24700 ± 3000[c]	11800 ± 740	58400 ± 500 47200 ± 2800[c]	264000 ± 12000[c]
MW1S067	Pascagoula Bay, Mississippi Sound, MS	44.48	6710 ± 250[c]	62.3 ± 2.2[c]	188 ± 3 8640 ± 540[c]	488 ± 1	27600 ± 200 26600 ± 1100[c]	394000 ± 11000[c]
MW1S074	Mountain Pt. Bar, Baltimore Harbor, MD	82.56	12610 ± 470[c]	106.1 ± 2.3[c]	616 ± 6 23400 ± 1300[c]	≤437	17000 ± 100 77500 ± 1900[c]	257000 ± 10000[c]
MW2S120	Kelly Island, Delaware Bay, DE	53.94	4900 ± 180[c]	67.4 ± 1.0[c]	20200 ± 200 21900 ± 1200[c]	964 ± 4	57300 ± 400 52000 ± 1200[c]	336000 ± 7000[c]
MW2S130	Gallinipper Point, Matagorda Bay, TX	73.54	9430 ± 320[c]	86.2 ± 1.9[c]	16800 ± 200 19200 ± 1600[c]	659 ± 8	54200 ± 400 53900 ± 1400[c]	311000 ± 9100[c]
MW2S136	South Jetty, Marina Del Rey, CA	35.42	3070 ± 150[c]	33.0 ± 0.7[c]	29100 ± 300 31100 ± 700[c]	698 ± 6	65900 ± 500 66800 ± 1400[c]	327000 ± 12000[c]
MW2S138	Wedge Jetty, Newport Bay, CA	40.38	4890 ± 230[c]	31.0 ± 2.7[c]	31600 ± 300 36900 ± 1000[c]	10400 ± 500 71700 ± 1800[c]	72000 ± 550	330000 ± 12000[c]

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Site	Percent Water	H	B	Na	Mg	Al	Si
MW2S156	Cedar Point Reef, Mobile Bay, AL	74.87	8570 ± 280[c]	17.5 ± 0.7[c]	10400 ± 100 12400 ± 2400[c]	289 ± 0.5	53800 ± 420 54800 ± 1200[c]	352000 ± 12000[c]
MW2S164	Hingham Bay, Boston Harbor, MA	33.98	5130 ± 340[c]	46.7 ± 1.4[c]	17500 ± 200 16400 ± 1800[c]	409 ± 2	42300 ± 340 38000 ± 1600[c]	369000 ± 16000[c]
MW3S205	Hempstead Harbor, Long Island Sound, NY	71.46	8560 ± 260[c]	79.7 ± 2.4[c]	30900 ± 400 33700 ± 3200[c]	13000 ± 900	58300 ± 530 68700 ± 9000[c]	211000 ± 5000[c]
MW3S207	Lower Bay, Hudson Raritan Estuary, NY	42.32	3710 ± 260[c]	65.4 ± 2.2[c]	14500 ± 200 18300 ± 2400[c]	6080 ± 600	34200 ± 300 32900 ± 5100[c]	263000 ± 6000[c]
MW3S218	Coos Head, Coos Bay, OR	22.32	2370 ± 99[c]	21.5 ± 0.9[c]	21800 ± 200 20900 ± 1100[c]	≤1750	55700 ± 500 53200 ± 2600[c]	262000 ± 4000[c]
MW3S223	Neah Bay, Strait of Juan de Fuca, WA	63.85	7860 ± 390[c]	88.9 ± 2.1[c]	31300 ± 200 36400 ± 2400[c]	10500 ± 1000	49000 ± 500 55300 ± 6700[c]	176000 ± 4000[c]
MW3S226	Goosebury Neck, Buzzards Bay, MA	26.46	663 ± 270[c]	69.1 ± 1.6[c]	23100 ± 300 11500 ± 640[c]	9870 ± 580	42300 ± 400 22500 ± 2700[c]	263000 ± 5000[c]
MW3S251	Tres Palacois Bay, Matagorda Bay, TX	48.22	5310 ± 220[c]	60.6 ± 1.6[c]	10000 ± 100 10200 ± 1400[c]	8480 ± 620	40500 ± 400 38400 ± 4600[c]	267000 ± 6000[c]

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	S	Cl	K	Ca	Sc	Ti	V	Cr	Mn	Fe
MW1S031	2810 ± 270[c]	15600 ± 200[c]	17200 ± 240[c]	27100 ± 800[c]	7.62 ± 0.09	3450 ± 180[c]	70.2 ± 1.3	57.7 ± 0.6	513 ± 6	23300 ± 200
									545 ± 90[c]	24000 ± 500[c]
MW1S032	≤1000[c]	5390 ± 110[c]	12200 ± 400[c]	31500 ± 1400[c]	14.8 ± 0.2	4170 ± 650[c]	66.2 ± 1.6	31.7 ± 0.4	529 ± 6	22400 ± 200
									555 ± 170[c]	32600 ±10000[c]
MW1S045	4450 ± 240[c]	8900 ± 160[c]	5950 ± 160[c]	88900 ± 1600[c]	4.67 ± 0.05	3340 ± 80[c]	32.9 ± 1.2	32.2 ± 0.4	310 ± 4	13200 ± 100
									356 ± 75[c]	13100 ± 500[c]
MW1S049	5510 ± 670[c]	20900 ± 400[c]	18800 ± 890[c]	53100 ± 2200[c]	8.13 ± 0.09	4100 ± 180[c]	61.5 ± 1.6	118 ± 1	434 ± 5	25100 ± 200
									637 ± 110[c]	24300 ± 1500[c]
MW1S067	2860 ± 440[c]	8230 ± 130[c]	6580 ± 260[c]	10600 ± 4200[c]	5.59 ± 0.06	3800 ± 74[c]	43.3 ± 0.91	50.2 ± 0.5	300 ± 4	17100 ± 100
									308 ± 150[c]	15700 ± 800[c]
MW1S074	7580 ± 450[c]	28500 ± 500[c]	23300 ± 390[c]	6600 ± 1000[c]	14.4 ± 0.2	5120 ± 110[c]	12.0 ± 0.93	114 ± 1	≤17	49700 ± 400
									4550 ± 150[c]	49300 ± 1000[c]
MW2S120	2980 ± 250[c]	10000 ± 130[c]	17900 ± 220[c]	22200 ± 3100[c]	8.18 ± 0.09	5470 ± 100[c]	68.2 ± 1.3	61.1 ± 0.6	712 ± 3	24900 ± 200
									752 ± 75[c]	25400 ± 200[c]
MW2S130	1810 ± 500[c]	23300 ± 600[c]	12200 ± 400[c]	16800 ± 900[c]	8.26 ± 0.09	3910 ± 290[c]	63.3 ± 1.6	55.4 ± 0.6	498 ± 6	26100 ± 200
									587 ± 140[c]	23400 ± 900[c]
MW2S136	1980 ± 270[c]	10200 ± 200[c]	23500 ± 300[c]	18500 ± 700[c]	6.33 ± 0.07	3420 ± 120[c]	51.9 ± 1.3	70.6 ± 0.7	247 ± 4	18300 ± 200
									240 ± 75[c]	18800 ± 400[c]
MW2S138	1000 ± 430[c]	13000 ± 100[c]	24700 ± 400[c]	25100 ± 1200[c]	8.35 ± 0.09	3900 ± 70[c]	71.6 ± 1.6	39.4 ± 0.4	416 ± 5	23000 ± 200
									≤300[c]	25400 ± 800[c]
MW2S156	3350 ± 280[c]	13900 ± 100[c]	9490 ± 160[c]	8270 ± 680[c]	9.19 ± 0.10	4330 ± 190[c]	82.7 ± 2.0	68.0 ± 0.7	257 ± 8	32245 ± 270
									1265 ± 150[c]	31400 ± 600[c]

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	S	Cl	K	Ca	Sc	Ti	V	Cr	Mn	Fe
MW2S164	740 ± 400[c]	8030 ± 360[c]	15500 ± 400[c]	5210 ± 550[c]	5.63 ± 0.06	3610 ± 130[c]	41.9 ± 1.1	44.4 ± 0.5	368 ± 4 354 ± 99[c]	18335 ± 200 19100 ± 6900[c]
MW3S205	6640 ± 800[c]	27200 ± 200[c]	20300 ± 500[c]	12700 ± 1500[c]	11.3 ± 0.1	3840 ± 170[c]	88.9 ± 2.1	90.6 ± 1.3	808 ± 12 810 ± 230[c]	32500 ± 370 31000 ± 1500[c]
MW3S207	816 ± 674[c]	11500 ± 300[c]	13800 ± 500[c]	9700 ± 1300[c]	7.21 ± 0.08	4590 ± 160[c]	48.0 ± 1.6	83.2 ± 1.1	434 ± 7 590 ± 170[c]	21200 ± 240 19000 ± 1100[c]
MW3S218	2340 ± 260[c]	4720 ± 100[c]	22500 ± 300[c]	11200 ± 600[c]	4.17 ± 0.04	1400 ± 70[c]	30.9 ± 1.2	49.3 ± 0.7	138 ± 3 ≤190[c]	11800 ± 130 10900 ± 500[c]
MW3S223	3090 ± 680[c]	32700 ± 400[c]	12400 ± 400[c]	11500 ± 1400[c]	15.7 ± 0.20	3870 ± 160[c]	106 ± 2	66.4 ± 0.9	383 ± 4 ≤450[c]	41700 ± 470 34900 ± 1200[c]
MW3S226	1220 ± 200[c]	5740 ± 100[c]	13600 ± 200[c]	4530 ± 320[c]	3.00 ± 0.03	3080 ± 80[c]	87.6 ± 1.7	25.7 ± 0.4	226 ± 4 290 ± 90[c]	9150 ± 104 9180 ± 300[c]
MW3S251	900 ± 410[c]	11600 ± 260[c]	13000 ± 300[c]	19200 ± 880[c]	6.42 ± 0.07	2680 ± 90[c]	46.1 ± 1.1	41.5 ± 0.6	286 ± 5 310 ± 65[c]	17800 ± 206 17800 ± 700[c]

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Co	Cu	Zn	As	Se	Rb	Sr	Mo	Ag
MW1S031	8.53 ± 0.04	≤96	74.9 ± 0.9	8.26 ± 0.18	0.135 ± 0.007	84.3 ± 1.8	118 ± 2	≤5.8	0.0233 ± 0.0001
MW1S032	6.96 ± 0.04	≤126	46.3 ± 1.0	1.68 ± 0.15	0.050 ± 0.003	32.0 ± 1.6	196 ± 6	≤7.7	≤0.088
MW1S045	3.32 ± 0.02	≤76	27.9 ± 0.5	6.87 ± 0.13	0.273 ± 0.010	22.5 ± 1.0	292 ± 2	31.0 ± 1.7	≤0.050
MW1S049	7.19 ± 0.04	≤137	151 ± 1	10.8 ± 0.2	0.551 ± 0.007	81.7 ± 1.7	238 ± 4	27.7 ± 3.1	3.48 ± 0.04
MW1S067	5.92 ± 0.03	≤65	51.6 ± 0.7	5.61 ± 0.12	0.305 ± 0.001	38.0 ± 1.4	≤27	≤4	0.0745 ± 0.0039
MW1S074	37.8 ± 0.2	≤247	328 ± 3	26.8 ± 0.3	1.43 ± 0.06	128 ± 3	51.2 ± 8.7	29.5 ± 2.8	0.245 ± 0.007
MW2S120	8.59 ± 0.04	≤110	119 ± 1	9.65 ± 0.31	0.111 ± 0.001	58.9 ± 1.6	182 ± 4	≤9.0	0.0322 ± 0.0029
MW2S130	7.87 ± 0.04	≤119	69.1 ± 0.8	7.79 ± 0.31	0.134 ± 0.001	88.7 ± 1.8	91 ± 1	≤8.0	0.0676 ± 0.0056
MW2S136	4.98 ± 0.03	≤102	54.5 ± 0.7	7.96 ± 0.32	0.128 ± 0.001	69.8 ± 1.5	253 ± 3	≤8.6	0.677 ± 0.008
MW2S138	6.71 ± 0.03	≤117	62.8 ± 0.8	6.49 ± 0.23	0.182 ± 0.005	85.2 ± 1.8	324 ± 4	32.0 ± 2.9	0.0492 ± 0.0016
MW2S156	9.66 ± 0.05	≤132	95.5 ± 1.0	14.3 ± 0.2	0.361 ± 0.003	64.9 ± 1.9	49.0 ± 2.4	≤5.5	≤0.072
MW2S164	5.10 ± 0.03	≤92	51.6 ± 0.7	4.04 ± 0.18	0.108 ± 0.005	66.7 ± 1.6	122 ± 2	≤4.9	0.594 ± 0.004
MW3S205	11.5 ± 0.1	≤162	253 ± 3	8.78 ± 0.20	0.936 ± 0.060	49.2 ± 1.5	103 ± 5	6.24 ± 0.86	3.70 ± 0.06
MW3S207	6.97 ± 0.04	≤124	118 ± 1	7.10 ± 0.13	0.529 ± 0.039	55.8 ± 1.4	87 ± 4	≤1.4	1.48 ± 0.03
MW3S218	4.21 ± 0.02	≤147	28.3 ± 0.3	6.18 ± 0.14	0.098 ± 0.016	47.1 ± 1.8	230 ± 3	2.02 ± 0.57	≤0.031

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Co	Cu	Zn	As	Se	Rb	Sr	Mo	Ag
MW3S223	10.54 ± 0.06	≤98	116 ± 1	8.15 ± 0.23	0.537 ± 0.040	47.4 ± 1.1	151 ± 5	≤1.8	≤0.082
MW3S226	1.96 ± 0.01	≤100	25.8 ± 0.3	2.28 ± 0.07	0.350 ± 0.026	65.9 ± 1.6	66.9 ± 2.5	3.90 ± 0.47	≤0.037
MW3S251	5.90 ± 0.04	≤99	44.8 ± 0.5	4.02 ± 0.09			47.7 ± 3.0	4.65 ± 0.51	≤0.057

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Cd	Sn	Sb	I	Cs	Ba	La	Ce	Sm
MW1S031	≤0.2[c]	≤17	0.540 ± 0.001	22.7 ± 2.3	4.27 ± 0.03	508 ± 1	28.2 ± 0.3	51.4 ± 0.6	5.41 ± 0.12 5.76 ± 0.12[c]
MW1S032	≤0.6[c]	8.4 ± 6.6	0.383 ± 0.008	8.95 ± 0.37	0.748 ± 0.001	452 ± 7	13.4 ± 0.1	23.4 ± 0.3	4.45 ± 0.10 4.63 ± 0.15[c]
MW1S045	≤0.2[c]	≤12	0.163 ± 0.001	6.2 ± 1.2	1.03 ± 0.01	201 ± 7	33.4 ± 0.3	56.4 ± 0.6	6.64 ± 0.14 5.55 ± 0.12[c]
MW1S049	1.1 ± 1.1[c]	4.0 ± 5.7	1.71 ± 0.04	45.8 ± 3.0	2.68 ± 0.02	389 ± 3	23.6 ± 0.2	44.5 ± 0.5	5.12 ± 0.11 4.74 ± 0.2[c]
MW1S067	≤0.4[c]	≤16	0.277 ± 0.004	8.1 ± 1.4	2.11 ± 0.02	219 ± 1	21.7 ± 0.2	57.6 ± 0.6	4.33 ± 0.10 5.9 ± 0.15[c]
MW1S074	0.4 ± 0.4[c]	≤20	1.77 ± 0.05	17.6 ± 0.7	6.20 ± 0.05	458 ± 1	46.6 ± 0.4	87.4 ± 1	9.69 ± 0.21 9.71 ± 0.22[c]
MW2S120	0.29 ± 0.06[c]	≤17	0.309 ± 0.007	19.9 ± 2.4	1.71 ± 0.02	448 ± 3	32.8 ± 0.3	59.1 ± 0.6	7.17 ± 0.16 7.64 ± 0.15[c]
MW2S130	≤0.4[c]	≤18	0.640 ± 0.009	16.4 ± 2.4	4.99 ± 0.04	383 ± 3	35.6 ± 0.3	63.3 ± 0.7	6.99 ± 0.15 5.96 ± 0.13[c]
MW2S136	0.24 ± 0.07[c]	≤15	0.547 ± 0.004	38.5 ± 3.6	1.96 ± 0.02	855 ± 2	25.1 ± 0.3	44.3 ± 0.5	4.83 ± 0.11 4.98 ± 0.1[c]
MW2S138	0.32 ± 0.13[c]	≤16	0.674 ± 0.008	51.0 ± 4.4	2.10 ± 0.02	807 ± 6	32.0 ± 0.3	52.8 ± 0.6	6.11 ± 0.13 5.65 ± 0.15[c]

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Cd	Sn	Sb	I	Cs	Ba	La	Ce	Sm
MW2S156		≤18	0.346 ± 0.008	25.0 ± 2.9	3.59 ± 0.03	224 ± 2	33.6 ± 0.3	66.0 ± 0.7	7.19 ± 0.16
	≤0.2[c]								6.75 ± 0.12[c]
MW2S164		≤15	0.595 ± 0.002	23.5 ± 2.2	1.53 ± 0.01	380 ± 5	12.8 ± 0.1	30.1 ± 0.4	2.97 ± 0.06
	0.11 ± 0.11[c]								4.12 ± 0.13[c]
MW3S205		≤17	0.927 ± 0.034	86.1 ± 7.8	3.35 ± 0.04	343 ± 18	38.1 ± 0.3	74.6 ± 1.2	7.61 ± 0.11
	2.16 ± 0.30[c]								7.94 ± 0.24[c]
MW3S207		≤11	0.649 ± 0.022	9.23 ± 0.64	1.58 ± 0.02	294 ± 16	33.5 ± 0.2	66.3 ± 1.1	5.19 ± 0.08
	0.83 ± 0.24[c]								6.81 ± 0.21[c]
MW3S218		≤5	0.329 ± 0.011	21.0 ± 3.2	1.39 ± 0.02	689 ± 18	13.7 ± 0.1	19.4 ± 0.3	2.23 ± 0.03
	0.20 ± 0.10[c]								2.17 ± 0.07[c]
MW3S223		≤14	0.661 ± 0.030	70.6 ± 7.6	2.29 ± 0.03	288 ± 18	14.5 ± 0.1	28.9 ± 0.5	3.02 ± 0.05
	0.48 ± 0.63[c]								3.36 ± 0.18[c]
MW3S226		≤7	≤0.020	91.1 ± 6.8	0.94 ± 0.01	237 ± 12	22.1 ± 0.2	40.0 ± 0.6	3.96 ± 0.06
	≤0.5[c]								4.31 ± 0.1[c]
MW3S251		≤10	0.426 ± 0.016	8.11 ± 0.56	3.49 ± 0.04	238 ± 13	23.6 ± 0.2	46.8 ± 0.8	4.04 ± 0.06
	0.38 ± 0.25[c]								4.49 ± 0.12[c]

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Eu	Gd	Tb	Hf	Ta	Au	Th	U
MW1S031	1.04 ± 0.01	5.84 ± 0.16[c]	0.620 ± 0.006	8.24 ± 0.07	0.922 ± 0.005	≤0.0039	7.89 ± 0.14	≤1.0
MW1S032	0.919 ± 0.007	5.5 ± 0.24[c]	0.568 ± 0.007	5.86 ± 0.06	0.469 ± 0.003	≤0.0052	3.78 ± 0.010	≤1.4
MW1S045	0.809 ± 0.007	6.12 ± 0.17[c]	0.568 ± 0.004	13.1 ± 0.1	1.16 ± 0.02	≤0.0028	7.96 ± 0.13	≤0.78
MW1S049	1.03 ± 0.01	5.01 ± 0.29[c]	0.590 ± 0.006	5.57 ± 0.05	2.11 ± 0.03	0.0322 ± 0.0016	5.88 ± 0.11	≤1.2
MW1S067	0.995 ± 0.014	5.8 ± 0.21[c]	0.768 ± 0.003	21.4 ± 0.2	1.10 ± 0.02	≤0.0028	8.94 ± 0.17	≤0.71
MW1S074	1.77 ± 0.02	9.42 ± 0.23[c]	1.03 ± 0.02	5.19 ± 0.06	1.28 ± 0.02	0.0122 ± 0.0015	11.2 ± 0.2	≤1.3
MW2S120	1.24 ± 0.02	7.59 ± 0.17[c]	0.734 ± 0.002	16.8 ± 0.1	1.07 ± 0.02	≤0.0070	6.76 ± 0.12	≤1.7
MW2S130	1.21 ± 0.02	5.96 ± 0.2[c]	0.756 ± 0.003	15.2 ± 0.1	1.16 ± 0.02	≤0.0061	10.0 ± 0.2	≤1.5
MW2S136	0.996 ± 0.013	4.82 ± 0.13[c]	0.503 ± 0.005	6.88 ± 0.06	0.672 ± 0.001	0.0118 ± 0.0022	6.54 ± 0.12	≤1.6
MW2S138	1.14 ± 0.01	6.07 ± 0.18[c]	0.577 ± 0.006	5.24 ± 0.05	0.784 ± 0.003	≤0.0045	7.03 ± 0.12	≤1.2
MW2S156	1.29 ± 0.02	6.64 ± 0.16[c]	0.805 ± 0.003	9.42 ± 0.08	1.06 ± 0.02	≤0.0039	8.99 ± 0.16	≤1.0
MW2S164	0.854 ± 0.009	3.8 ± 0.17[c]	0.456 ± 0.004	5.09 ± 0.05	1.23 ± 0.02	≤0.0035	3.15 ± 0.08	≤0.90
MW3S205	1.49 ± 0.02	7.15 ± 0.27[c]	0.692 ± 0.010	8.96 ± 0.10	1.14 ± 0.02	0.0447 ± 0.0012	9.80 ± 0.12	≤0.21
MW3S207	1.07 ± 0.01	5.74 ± 0.24[c]	0.432 ± 0.006	12.7 ± 0.1	1.01 ± 0.02	0.0288 ± 0.0008	10.5 ± 0.1	7.81 ± 0.11
MW3S218	0.606 ± 0.007	1.64 ± 0.08[c]	0.120 ± 0.002	2.40 ± 0.03	0.308 ± 0.005	≤0.0012	3.48 ± 0.04	0.172 ± 0.045

Table F.4. Concentrations of inorganic constituents in sediment samples from the Mussel Watch Project (1985-1988) (µg/g dry wt.) (cont.).

Sample Identification	Eu	Gd	Tb	Hf	Ta	Au	Th	U
MW3S223	0.935 ± 0.011	3.39 ± 0.18[c]	0.402 ± 0.006	3.20 ± 0.04	0.563 ± 0.011	0.00306 ± 0.00074	3.54 ± 0.05	5.83 ± 0.12
MW3S226	0.536 ± 0.006	3.35 ± 0.08[c]	0.339 ± 0.004	11.4 ± 0.1	1.07 ± 0.02	≤0.00089	7.33 ± 0.09	≤0.11
MW3S251	0.863 ± 0.010	3.94 ± 0.14[c]	0.391 ± 0.006	11.1 ± 0.1	0.808 ± 0.012	≤0.00098	8.78 ± 0.11	≤0.12

[a] All elements analyzed by instrumental neutron activation analysis (INAA) unless otherwise noted.
[b] MW1 samples were collected during 1985-86; MW2 samples were collected during 1986-87; MW3 samples were collected during 1987-88.
[c] Analyzed by prompt gamma activation analysis (PGAA).
[d] The uncertainties associated with the INAA results are due to counting statistics, including propagated uncertainties of the standard.
[e] The uncertainties associated with the INAA results are due to counting statistics, including propagated uncertainties of the standard.

Table F.5. Results of bivalve storage stability study (µg/g dry wt.).

Sample Identification	Site	Percent Water	Na	Mg	Al	Si	P	S
MW1M029 B002[a]	Imperial Beach, North Jetty, CA	82.1	43500 ± 300[d]	6970 ± 280	988 ± 14	1290 ± 410	12600 ± 500	21700 ± 780
			40600 ± 300	5870 ± 270	925 ± 11			
MW1M029 B004[b]		82.19	41300 ± 400	6010 ± 370	861 ± 8			
MW1M029 B005[c]		83.17	44800 ± 400	7660 ± 370	871 ± 8			
MW1Y030 B002	Confederate Reef, Galveston Bay, TX	81.4	22700 ± 200	3710 ± 180	294 ± 5	780 ± 370	7160 ± 310	12400 ± 500
			21700 ± 200	3900 ± 170	288 ± 5			
MW1Y030 B004		81.07	21700 ± 200	3160 ± 230	199 ± 3			
MW1Y030 B005		82.44	22400 ± 200	3920 ± 250	427 ± 4			
MW1Y044 B002	Fort Johnson, Charleston Harbor, SC	85.1	50900 ± 400	7390 ± 310	666 ± 11	2400 ± 460	7500 ± 490	18300 ± 1000
			49500 ± 300	7210 ± 330	632 ± 10			
MW1Y044 B004		84.79	49300 ± 400	7780 ± 420	693 ± 8			
MW1Y044 B005		86.23	46200 ± 400	7220 ± 340	644 ± 6			
MW1M048 B002	Dorchester Bay, Boston Harbor, MA	85.0	47700 ± 300	6800 ± 310	646 ± 10	2140 ± 310	8940 ± 390	20600 ± 800
			45400 ± 300	6750 ± 290	649 ± 10			
MW1M048 B004		84.95	46400 ± 400	6260 ± 250	586 ± 6			
MW1M048 B005		86.23	46200 ± 400	7700 ± 390	699 ± 6			

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Site	Percent Water	Na	Mg	Al	Si	P	S
MW1Y068 B002	Pascagoula Bay, Mississippi Sound, MS	87.3	49400 ± 300	7730 ± 360	1559 ± 19	7010 ± 410	6310 ± 290	12800 ± 500
			47700 ± 300	7450 ± 360	1616 ± 20			
MW1Y068 B004		86.71	47800 ± 400	7820 ± 330	1545 ± 14			
MW1Y068 B005		87.87	45000 ± 400	8980 ± 430	1708 ± 15			
MW1Y073 B002	Mountain Pt. Bar, Baltimore Harbor, MD	88.3	22400 ± 200	3870 ± 170	193 ± 4	≤680	7560 ± 450	11600 ± 600
			22000 ± 200	4270 ± 170	143 ± 4			
MW1Y073 B004		88.33	23800 ± 200	5640 ± 680	171 ± 13			
MW1Y073 B005		89.09	23600 ± 200	4170 ± 350	174 ± 9			

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Cl	K	Ca	Sc	V	Cr	Mn	Fe	Co
MW1M029 B002	76200 ± 600	16500 ± 1500	12000 ± 800	0.232 ± 0.001	2.53 ± 0.33	1.68 ± 0.03	17.0 ± 1.6	582 ± 4	0.636 ± 0.003
	73400 ± 600	10800 ± 1200	8670 ± 700	0.260 ± 0.002	2.66 ± 0.30	1.92 ± 0.03	18.3 ± 1.1	658 ± 4	0.646 ± 0.003
MW1M029 B004	73400 ± 600	≤6920	7270 ± 280	0.237 ± 0.003	2.36 ± 0.15	1.67 ± 0.03	24.5 ± 0.8	624 ± 8	0.627 ± 0.007
MW1M029 B005	78500 ± 700	≤6760	≤690	0.262 ± 0.004	2.42 ± 0.17	1.64 ± 0.03	20.6 ± 0.7	607 ± 8	0.669 ± 0.008
MW1Y030 B002	40900 ± 400	9800 ± 900	8800 ± 510	0.0533 ± 0.0003	1.39 ± 0.18	1.15 ± 0.02	12.1 ± 1.1	211 ± 2	0.338 ± 0.002
	39700 ± 300	10800 ± 900	5450 ± 380	0.0526 ± 0.0004	1.94 ± 0.19	0.47 ± 0.03	10.9 ± 0.7	206 ± 2	0.320 ± 0.002
MW1Y030 B004	39400 ± 400	≤4670	8760 ± 220	0.0382 ± 0.0007	1.50 ± 0.09	0.368 ± 0.030	9.73 ± 0.4	161 ± 3	0.305 ± 0.004
MW1Y030 B005	40500 ± 400	≤5050	5450 ± 220	0.0740 ± 0.0012	2.09 ± 0.14	0.579 ± 0.031	16.0 ± 0.5	263 ± 4	0.351 ± 0.005
MW1Y044 B002	87300 ± 700	16800 ± 1500	10600 ± 800	0.142 ± 0.001	8.89 ± 0.46	1.31 ± 0.03	17.8 ± 1.5	468 ± 3	0.458 ± 0.003
	87800 ± 700	13900 ± 1400	17300 ± 1000	0.150 ± 0.001	9.74 ± 0.47	1.88 ± 0.05	13.7 ± 1.3	515 ± 4	0.472 ± 0.004
MW1Y044 B004	87100 ± 800	≤7730	11500 ± 400	0.143 ± 0.002	8.84 ± 0.22	1.40 ± 0.04	19.7 ± 0.8	420 ± 6	0.445 ± 0.006
MW1Y044 B005	84300 ± 700	≤7410	19300 ± 400	0.141 ± 0.002	8.36 ± 0.23	1.58 ± 0.04	22.8 ± 0.7	432 ± 6	0.455 ± 0.006
MW1M048 B002	87300 ± 700	10700 ± 1400	8180 ± 710	0.107 ± 0.001	1.51 ± 0.33	4.26 ± 0.04	14.0 ± 1.4	525 ± 3	0.355 ± 0.002
	81700 ± 700	11200 ± 1300	5020 ± 680	0.124 ± 0.001	2.27 ± 0.36	4.70 ± 0.05	13.6 ± 1.2	589 ± 4	0.384 ± 0.002
MW1M048 B004	82100 ± 700	≤7060	2360 ± 150	0.106 ± 0.002	1.05 ± 0.20	3.82 ± 0.05	9.36 ± 0.4	480 ± 6	0.341 ± 0.004
MW1M048 B005	82300 ± 700	≤6940	2360 ± 260	0.128 ± 0.002	3.41 ± 0.16	4.50 ± 0.06	20.1 ± 0.7	564 ± 8	0.375 ± 0.004

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Cl	K	Ca	Sc	V	Cr	Mn	Fe	Co
MW1Y068 B002	90600 ± 800	13000 ± 1400	8500 ± 910	0.271 ± 0.002	4.69 ± 0.48	2.47 ± 0.04	49.5 ± 1.7	1010 ± 6	0.826 ± 0.004
	85600 ± 700	10600 ± 1300	7700 ± 800	0.324 ± 0.002	3.64 ± 0.42	2.57 ± 0.05	58.8 ± 1.8	1110 ± 7	0.887 ± 0.005
MW1Y068 B004	84300 ± 700	≤8710	9500 ± 320	0.260 ± 0.004	4.16 ± 0.20	2.30 ± 0.06	60.8 ± 1.2	857 ± 12	0.739 ± 0.009
MW1Y068 B005	81000 ± 700	≤8780	3470 ± 250	0.308 ± 0.004	4.69 ± 0.25	2.37 ± 0.06	49.4 ± 1.0	1000 ± 10	0.823 ± 0.01
MW1Y073 B002	39300 ± 300	8200 ± 800	11600 ± 500	0.0734 ± 0.0005	≤0.58	1.42 ± 0.03	21.0 ± 0.8	240 ± 2	0.777 ± 0.004
	38300 ± 300	11000 ± 900	21200 ± 700	0.0791 ± 0.0007	≤0.49	1.35 ± 0.05	25.8 ± 0.8	221 ± 3	0.745 ± 0.004
MW1Y073 B004	41600 ± 400	≤5860	12600 ± 400	0.0548 ± 0.0012	≤1.04	1.46 ± 0.07	23.1 ± 0.7	213 ± 5	0.732 ± 0.010
MW1Y073 B005	41400 ± 400	≤4130	25400 ± 400	0.0493 ± 0.0011	≤0.65	1.65 ± 0.06	18.4 ± 0.5	191 ± 5	0.670 ± 0.009

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Ni	Cu	Zn	As	Se	Br	Rb	Sr	Mo
MW1M029 B002	≤1.4	9.44 ± 0.66	144 ± 1	7.89 ± 0.40	2.79 ± 0.04	398 ± 10	5.46 ± 0.10	82.6 ± 4.1	≤3.3
			141 ± 1	8.05 ± 0.37	2.66 ± 0.02		5.29 ± 0.10		≤2.3
MW1M029 B004		≤33	140 ± 2	9.83 ± 0.29	2.45 ± 0.04		5.33 ± 0.12	99.6 ± 1.7	≤2.1
MW1M029 B005		≤38	154 ± 2	9.76 ± 0.35	2.62 ± 0.04		5.47 ± 0.13	62.4 ± 1.5	≤2.2
MW1Y030 B002	2.6 ± 0.5	104 ± 4	1480 ± 10	5.66 ± 0.16	2.63 ± 0.02	209 ± 7	4.11 ± 0.07	41 ± 10	≤1.4
			1420 ± 10	6.99 ± 0.29	2.53 ± 0.02		4.42 ± 0.15		≤1.6
MW1Y030 B004		108 ± 8	1370 ± 20	6.60 ± 0.13	2.35 ± 0.04		4.00 ± 0.22	≤3.9	≤1.7
MW1Y030 B005		70.0 ± 11	1410 ± 20	7.12 ± 0.14	2.46 ± 0.04		4.06 ± 0.20	≤3.8	≤1.7
MW1Y044 B002	≤1.9	96.9 ± 5.2	1450 ± 10	33.6 ± 0.5	2.77 ± 0.02	392 ± 20	5.04 ± 0.12	86 ± 6	≤1.7
			1470 ± 10	35.8 ± 0.8	2.96 ± 0.03		4.86 ± 0.26		≤2.9
MW1Y044 B004		≤41	1380 ± 20	32.0 ± 0.3	2.52 ± 0.04		4.23 ± 0.20	87.9 ± 2.3	≤2.4
MW1Y044 B005		≤36	1380 ± 20	34.2 ± 0.3	2.62 ± 0.04		4.87 ± 0.21	98.5 ± 2.2	≤2.2
MW1M048 B002	≤1.5	15.8 ± 0.9	113 ± 1	7.51 ± 0.32	2.74 ± 0.02	420 ± 14	6.04 ± 0.10	47.8 ± 2.4	≤2.4
			121 ± 1	8.60 ± 0.45	2.90 ± 0.03		6.78 ± 0.13		≤2.4
MW1M048 B004		≤65	110 ± 1	8.92 ± 0.28	2.52 ± 0.04		6.07 ± 0.13	39.8 ± 1.0	≤2.1
MW1M048 B005		≤32	113 ± 2	9.34 ± 0.30	2.58 ± 0.04		6.28 ± 0.12	44.2 ± 1.0	≤2.1
MW1Y068 B002	2.7 ± 0.7	74.6 ± 2.9	2340 ± 30	16.1 ± 0.4	2.58 ± 0.02	340 ± 12	5.71 ± 0.16	55.6 ± 2.8	3.75 ± 0.54
			2370 ± 20	17.1 ± 0.7	2.66 ± 0.03		6.24 ± 0.27		≤3.1

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Ni	Cu	Zn	As	Se	Br	Rb	Sr	Mo
MW1Y068 B004		≤40	2000 ± 30	16.8 ± 0.3	1.82 ± 0.04		4.65 ± 0.29	≤5.3	3.22 ± 0.51
MW1Y068 B005		≤38	2230 ± 30	19.6 ± 0.3	2.36 ± 0.05		5.65 ± 0.32	≤5.4	4.39 ± 0.47
MW1Y073 B002	9.4 ± 1.2	317 ± 16	5860 ± 50	4.55 ± 0.28	3.72 ± 0.03	190 ± 10	2.77 ± 0.14	58.8 ± 4.2	≤1.9
			5680 ± 50	4.72 ± 0.37	3.64 ± 0.04		2.89 ± 0.27		≤1.9
MW1Y073 B004		357 ± 32	5300 ± 70	5.25 ± 0.27	3.37 ± 0.07		2.67 ± 0.36	≤8.9	2.53 ± 0.54
MW1Y073 B005		396 ± 19	4990 ± 60	4.96 ± 0.20	3.17 ± 0.06		1.94 ± 0.29	≤7.5	1.66 ± 0.34

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Ag	Cd	Sn	Sb	I	Cs	Ba	La	Ce
MW1M029 B002	1.25 ± 0.03	≤7.3	≤8.4	0.0228 ± 0.0027	≤9.5	0.0309 ± 0.0028	9.2 ± 1.0	0.381 ± 0.035	1.20 ± 0.02
	1.25 ± 0.03	≤5.2	≤7.5	0.0237 ± 0.0025	≤9.5	0.0392 ± 0.0028	6.9 ± 1.1	1.04 ± 0.04	1.98 ± 0.02
MW1M029 B004	1.06 ± 0.02	≤4.4	≤2.6	0.0266 ± 0.0021	≤8.8	0.0429 ± 0.0021	6.1 ± 1.2	0.493 ± 0.023	1.00 ± 0.02
MW1M029 B005	1.12 ± 0.02	≤4.7	2.0 ± 1.3	0.0187 ± 0.0024	≤9.1	0.0381 ± 0.0022	4.1 ± 1.5	0.641 ± 0.025	1.23 ± 0.02
MW1Y030 B002	3.85 ± 0.04	≤3.0	≤5.7	0.0105 ± 0.0014	≤4.8	0.0266 ± 0.0028	5.71 ± 0.81	0.177 ± 0.016	0.302 ± 0.008
	3.71 ± 0.06	≤3.7	≤10	0.0115 ± 0.0026	≤5.5	0.0377 ± 0.0051	≤7.9	0.209 ± 0.018	0.268 ± 0.014
MW1Y030 B004	3.80 ± 0.06	≤3.4	1.8 ± 1.6	≤0.0074	≤6.4	0.0218 ± 0.0036	≤7.8	0.241 ± 0.020	0.213 ± 0.014
MW1Y030 B005	3.80 ± 0.06	≤3.3	≤4.9	0.0072 ± 0.0030	≤6.6	0.0350 ± 0.0037	≤8.7	0.369 ± 0.021	0.485 ± 0.017
MW1Y044 B002	3.11 ± 0.05	≤5.6	≤9.2	0.0185 ± 0.0028	≤10.5	0.0323 ± 0.0043	≤3.0	0.221 ± 0.026	0.902 ± 0.016
	3.46 ± 0.07	≤6.9	≤15	≤0.012	≤10.5	≤0.020	≤17	0.494 ± 0.034	0.859 ± 0.023
MW1Y044 B004	3.11 ± 0.05	≤4.9	≤5.1	0.0159 ± 0.0038	≤10.4	0.0350 ± 0.0038	≤8.6	0.486 ± 0.029	0.724 ± 0.020
MW1Y044 B005	3.23 ± 0.05	≤4.6	≤4.4	0.1070 ± 0.0050	≤9.6	0.0268 ± 0.0031	≤7.7	0.548 ± 0.028	0.929 ± 0.021
MW1M048 B002	1.64 ± 0.02	≤5.4	≤6.7	0.0632 ± 0.0028	≤10.5	0.0567 ± 0.0026	4.07 ± 0.94	0.177 ± 0.025	0.617 ± 0.015
	1.79 ± 0.03	≤5.6	≤7.5	0.0372 ± 0.0027	≤10	0.0537 ± 0.0029	≤4.4	0.557 ± 0.033	0.822 ± 0.019
MW1M048 B004	1.65 ± 0.03	≤4.4	≤2.1	0.0515 ± 0.0022	≤16.8	0.0520 ± 0.0019	2.4 ± 1.0	0.346 ± 0.025	0.552 ± 0.013
MW1M048 B005	1.69 ± 0.03	≤4.4	≤2.2	0.0512 ± 0.0024	≤8.9	0.0619 ± 0.0019	5.4 ± 1.1	0.400 ± 0.024	0.646 ± 0.014

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Ag	Cd	Sn	Sb	I	Cs	Ba	La	Ce
MW1Y068 B002	2.86 ± 0.05	≤5.4	≤10	0.0204 ± 0.0033	≤11.5	0.0978 ± 0.0052	10.6 ± 2.0	1.42 ± 0.04	2.56 ± 0.02
	2.82 ± 0.06	≤7.3	≤14	0.0227 ± 0.0039	≤11	0.0853 ± 0.0070	≤17	1.31 ± 0.05	2.47 ± 0.03
MW1Y068 B004	2.33 ± 0.05	≤4.5	≤2.9	0.0275 ± 0.0064	≤10.4	0.107 ± 0.006	20.2 ± 4.3	1.44 ± 0.03	2.32 ± 0.04
MW1Y068 B005	2.83 ± 0.05	4.0 ± 1.0	≤7.1	0.0216 ± 0.0055	≤10.1	0.112 ± 0.007	≤10.3	1.68 ± 0.03	2.91 ± 0.05
MW1Y073 B002	5.92 ± 0.07	5.9 ± 1.1	≤12	≤0.016	≤5.5	≤0.027	9.98 ± 1.98	0.236 ± 0.021	0.337 ± 0.013
	5.78 ± 0.10	3.5 ± 1.0	≤19	≤0.028	≤5.5	≤0.041	≤14	0.132 ± 0.016	0.290 ± 0.019
MW1Y073 B004	6.11 ± 0.10	5.4 ± 1.1	≤12	≤0.0221	≤10.6	≤0.025	≤15.4	0.211 ± 0.024	0.297 ± 0.023
MW1Y073 B005	5.85 ± 0.10	7.90 ± 0.81	≤10	≤0.0262	≤7.1	0.0143 ± 0.0065	≤12.4	0.161 ± 0.016	0.239 ± 0.017

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Sm	Eu	Tb	Hf	Ta	Au	Hg
MW1M029 B002	0.168 ± 0.005	0.0328 ± 0.0008				≤0.0069	0.0704 ± 0.0087
	0.224 ± 0.004	0.0286 ± 0.0007				0.0049 ± 0.0009	0.0973 ± 0.0082
MW1Y029 B004	0.130 ± 0.003	0.0255 ± 0.0005	0.00817 ± 0.00089	0.169 ± 0.003	0.0151 ± 0.0013	0.00595 ± 0.00068	
MW1M029 B005	0.148 ± 0.004	0.0294 ± 0.0006	0.0111 ± 0.0012	0.276 ± 0.004	0.0093 ± 0.0013	0.00328 ± 0.00070	
MW1Y030 B002	0.0409 ± 0.0017	0.0102 ± 0.0003				0.0160 ± 0.0007	0.109 ± 0.006
	0.0420 ± 0.0025	0.0109 ± 0.0006				0.0170 ± 0.0008	0.087 ± 0.010
MW1Y030 B004	0.0424 ± 0.0017	0.00816 .± 0.00054	0.0015 ± 0.0012	0.0242 ± 0.0024	≤0.0047	0.0145 ± 0.0006	
MW1Y030 B005	0.0679 ± 0.0019	0.0110 ± 0.0005	0.0052 ± 0.0010	0.0312 ± 0.0024	≤0.0048	0.0154 ± 0.0006	
MW1M044 B002	0.0964 ± 0.0034	0.0209 ± 0.0006				≤0.0052	0.0989 ± 0.0085
	0.0902 ± 0.0047	0.0188 ± 0.0008				0.0054 ± 0.0014	0.0628 ± 0.014
MW1Y044 B004	0.0831 ± 0.0027	0.0178 ± 0.0006	0.0065 ± 0.0025	0.358 ± 0.006	0.0084 ± 0.0020	0.00422 ± 0.00081	
MW1Y044 B005	0.122 ± 0.003	0.0202 ± 0.0005	0.0141 ± 0.0011	0.229 ± 0.004	0.0073 ± 0.0017	0.00497 ± 0.00077	
MW1Y048 B002	0.0691 ± 0.0032	0.0146 ± 0.0005				0.0635 ± 0.0016	0.205 ± 0.008
	0.0936 ± 0.0038	0.0176 ± 0.0006				0.0701 ± 0.0017	0.250 ± 0.010
MW1Y048 B004	0.0666 ± 0.0026	0.0129 ± 0.0003	0.00054 ± 0.00059	0.0297 ± 0.0012	0.0336 ± 0.0012	0.0623 ± 0.0010	
MW1Y048 B005	0.0812 ± 0.0028	0.0154 ± 0.0004	0.0103 ± 0.0006	0.0434 ± 0.0013	0.0463 ± 0.0015	0.0656 ± 0.0011	

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Sm	Eu	Tb	Hf	Ta	Au	Hg
MW1Y068 B002	0.273 ± 0.004	0.0609 ± 0.0010				0.0039 ± 0.0008	0.158 ± 0.009
	0.303 ± 0.006	0.0637 ± 0.0012				≤0.0063	0.140 ± 0.013
MW1Y068 B004	0.294 ± 0.004	0.0509 ± 0.0012	0.0121 ± 0.0023	0.434 ± 0.008	0.0386 ± 0.0035	≤0.0020	
MW1Y068 B005	0.346 ± 0.004	0.0592 ± 0.0013	0.00913 ± 0.0023	0.480 ± 0.008	0.0409 ± 0.0034	0.00520 ± 0.00069	
MW1Y073 B002	0.0582 ± 0.0029	0.00872 ± 0.00077				0.0295 ± 0.0010	0.0955 ± 0.010
	0.0431 ± 0.0032	0.00899 ± 0.00127				0.0284 ± 0.0010	≤0.055
MW1Y073 B004	0.0593 ± 0.0032	0.0081 ± 0.0011	≤0.0059	≤0.012	≤0.013	0.0292 ± 0.0010	
MW1Y073 B005	0.0634 ± 0.0024	0.0069 ± 0.0012	0.0024 ± 0.0020	0.0094 ± 0.0035	≤0.015	0.0308 ± 0.0007	

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Pb	Th	U
MW1M029 B002	2.1 ± 1.0	0.102 ± 0.002	
		0.340 ± 0.004	
MW1M029 B004		0.104 ± 0.002	≤0.48
MW1Y029 B005		0.101 ± 0.002	≤0.51
MW1Y030 B002	≤1.8	0.0478 ± 0.0014	
		0.0405 ± 0.0027	
MW1Y030 B004		0.0278 ± 0.0026	≤0.40
MW1Y030 B005		0.0854 ± 0.0035	≤0.39
MW1Y044 B002	≤2.0	0.183 ± 0.003	
		0.297 ± 0.006	
MW1Y044 B004		0.212 ± 0.005	≤0.57
MW1Y044 B005		0.201 ± 0.004	≤0.52
MW1Y048 B002	13.1 ± 1.0	0.104 ± 0.002	
		0.151 ± 0.003	
MW1Y048 B004		0.0925 ± 0.002	≤0.49
MW1Y048 B005		0.121 ± 0.002	≤0.48

Table F.5. Results of bivalve storage stability study (µg/g dry wt.) (cont.).

Sample Identification	Pb	Th	U
MW1Y068 B002	≤2.1	0.325 ± 0.004	
		0.340 ± 0.006	
MW1Y068 B004		0.276 ± 0.006	0.60 ± 0.12
MW1Y068 B005		0.403 ± 0.008	≤0.51
MW1Y073 B002	≤1.9	0.0361 ± 0.0028	
		0.0325 ± 0.0048	
MW1Y073 B004		0.0309 ± 0.0051	0.69 ± 0.12
MW1Y073 B005		0.0300 ± 0.0046	0.449 ± 0.089

[a] B002 subsamples analyzed in 1986 (Original analysis in duplicate). All results from NAA except for Si, P, S, Ni, Br, Sr, Pb which were analyzed by x-ray fluorescence.
[b] B004 subsamples freeze-dried in 1986 and stored at room temperature until analyzed in 1989 (Reanalysis).
[c] B005 subsamples freeze-dried in 1989 after storage at LN_2 temperature for 36 months (Reanalysis).
[d] The uncertainties associated with the INAA results are due to counting statistics, including propagated uncertainties of the standard.

Table F.6 Concentrations of inorganic constituents in fish tissue samples (muscle and liver) for 12 sites from the National Benthic Surveillance Project (1985-1986) (µg/g dry wt., unless otherwise noted).[a]

Sample Identification	Site	Species	Na	Mg	Al	Cl	K	Ca
<u>Muscle Tissue</u>								
BS1F002	Dana Point, CA	GL	2180 ± 20[b]	1340 ± 30	3.28 ± 0.13	2960 ± 20	19400 ± 200	858 ± 28
BS1F011	Elliott Bay, WA	PV	2470 ± 20	1360 ± 40	2.56 ± 0.22	3350 ± 30	22000 ± 500	1090 ± 30
BS1F014	Nisqually Reach, WA	PV	2620 ± 30	1520 ± 60	1.89 ± 0.24	3660 ± 30	22300 ± 500	587 ± 25
BS1F020	Mississippi Delta, LA	MU	2100 ± 20	1500 ± 30	2.27 ± 0.10	1950 ± 20	17200 ± 100	773 ± 26
BS1F023	Corpus Christi, TX	MU	1780 ± 20	1400 ± 30	4.25 ± 0.14	2080 ± 20	17200 ± 100	1310 ± 40
BS1F026	Charlotte Harbor, FL	LX	942 ± 9.0	1220 ± 30	1.50 ± 0.10	1310 ± 10	15200 ± 100	704 ± 23
BS1F084	Boston Harbor, MA	PA	2390 ± 20	1290 ± 50	1.09 ± 0.15	3110 ± 30	25900 ± 500	363 ± 24
BS1F087	Buzzards Bay, MA	PA	2890 ± 20	1330 ± 40	≤0.25	3170 ± 30	24900 ± 200	341 ± 15
BS1F097	Bodega Bay, CA	PS	2860 ± 30	1650 ± 70	2.99 ± 0.28	4020 ± 40	23500 ± 500	288 ± 23
BS1F100	Southampton Shoal, CA	PS	2010 ± 20	1460 ± 40	≤0.23	2820 ± 20	22800 ± 200	217 ± 12
BS1F103	Santa Monica Bay, Ca	PnV	2460 ± 20	1370 ± 50	2.57 ± 0.26	3690 ± 30	21300 ± 500	442 ± 22
BS1F113	St. John's River, FL	MU	1330 ± 20	1290 ± 40	2.19 ± 0.18	1730 ± 20	17600 ± 400	1630 ± 40
<u>Liver Tissue</u>								
BS1L003	Dana Point, CA	GL	3790 ± 30	472 ± 81	7.50 ± 0.56	5550 ± 40	8910 ± 300	264 ± 39
BS1L012	Elliott Bay, WA	PV	4640 ± 30	850 ± 99	27.0 ± 1.0	7710 ± 60	10670 ± 300	456 ± 55
BS1L015	Nisqually Reach, WA	PV	5740 ± 40	872 ± 117	41.6 ± 1.0	9490 ± 70	12640 ± 400	909 ± 88
BS1L021	Mississippi Delta, LA	MU	7280 ± 50	1310 ± 130	34.5 ± 0.9	10470 ± 80	9860 ± 400	513 ± 77
BS1L024	Corpus Christi, TX	MU	5630 ± 40	972 ± 119	40.2 ± 1.0	8850 ± 60	9150 ± 300	685 ± 65
BS1L027	Charlotte Harbor, FL	LX	7680 ± 60	1470 ± 220	7.71 ± 1.27	11350 ± 100	18300 ± 600	281 ± 66
BS1L083	Boston Harbor, MA	PA	5850 ± 40	856 ± 104	10.6 ± 0.6	9790 ± 70	15000 ± 400	313 ± 48
BS1L086	Buzzards Bay, MA	PA	4270 ± 40	828 ± 98	5.45 ± 0.47	7230 ± 60	13100 ± 300	144 ± 32
BS1L098	Bodega Bay, CA	PS	4780 ± 40	596 ± 90	6.90 ± 0.45	8030 ± 60	12000 ± 300	161 ± 45
BS1L101	Southampton Shoal, CA	PS	2970 ± 30	443 ± 76	7.49 ± 0.50	5570 ± 40	8520 ± 200	165 ± 34
BS1L104	Santa Monica Bay, CA	PnV	8220 ± 60	1060 ± 200	27.7 ± 1.4	13490 ± 110	19400 ± 600	≤263
BS1L112	St. John's River, FL	MU	3780 ± 30	681 ± 80	4.58 ± 0.51	5910 ± 40	10100 ± 300	302 ± 41

Table F.6 Concentrations of inorganic constituents in fish tissue samples (muscle and liver) for 12 sites from the National Benthic Surveillance Project (1985-1986) (µg/g dry wt., unless otherwise noted) (cont.).

Sample Identification	Sc	V	Cr	Mn	Fe	Co	Cu	Zn
Muscle Tissue								
BS1F002	0.000224 ± 0.000031	≤0.016	0.0707 ± 0.0080	0.690 ± 0.050	25.6 ± 0.5	0.0240 ± 0.0004	≤1.8	15.3 ± 0.2
BS1F011	0.000226 ± 0.000016	≤0.034	0.154 ± 0.010	0.610 ± 0.058	8.48 ± 0.20	0.0151 ± 0.0002	≤3.4	17.1 ± 0.1
BS1F014	0.000229 ± 0.000016	≤0.038	0.208 ± 0.011	0.441 ± 0.069	10.5 ± 0.2	0.0165 ± 0.0003	≤3.9	17.5 ± 0.1
BS1F020	0.000306 ± 0.000032	≤0.013	0.106 ± 0.008	2.22 ± 0.05	10.2 ± 0.3	0.0708 ± 0.0009	≤1.5	18.1 ± 0.2
BS1F023	0.000585 ± 0.000039	≤0.015	0.111 ± 0.009	0.941 ± 0.048	9.05 ± 0.26	0.0616 ± 0.0008	≤1.6	17.7 ± 0.2
BS1F026	0.000108 ± 0.000027	≤0.011	0.184 ± 0.010	0.636 ± 0.033	7.86 ± 0.24	0.0103 ± 0.0003	≤1.2	19.3 ± 0.3
BS1F084	0.000106 ± 0.000017	≤0.033	0.213 ± 0.011	0.224 ± 0.053	7.61 ± 0.21	0.0135 ± 0.0002	≤3.5	33.4 ± 0.3
BS1F087	0.000075 ± 0.000034	≤0.017	0.0603 ± 0.0089	0.447 ± 0.039	6.39 ± 0.28	0.0165 ± 0.0004	≤1.8	32.6 ± 0.4
BS1F097	0.000206 ± 0.000018	≤0.040	0.141 ± 0.010	0.340 ± 0.066	7.03 ± 0.21	0.0562 ± 0.0005	≤4.1	31.1 ± 0.2
BS1F100	≤0.000072	≤0.016	0.0487 ± 0.0083	0.418 ± 0.036	7.16 ± 0.28	0.0398 ± 0.0006	≤1.7	27.0 ± 0.4
BS1F103	0.000129 ± 0.000015	≤0.038	0.231 ± 0.011	0.361 ± 0.043	8.15 ± 0.20	0.0064 ± 0.0002	≤3.8	14 ± 0.1
BS1F113	0.000155 ± 0.000013	≤0.027	0.0977 ± 0.0092	1.17 ± 0.05	21.8 ± 0.3	0.0104 ± 0.0002	≤3.0	21.1 ± 0.2
Liver Tissue								
BS1L003	0.001975 ± 0.000081	≤0.12	1.17 ± 0.02	6.21 ± 0.20	295 ± 2	0.194 ± 0.001	63.8 ± 3.7	105 ± 1
BS1L012	0.00676 ± 0.00015	2.21 ± 0.07	9.63 ± 0.10	5.10 ± 0.18	887 ± 5	1.647 ± 0.007	19.9 ± 4.3	88.0 ± 0.7
BS1L015	0.00298 ± 0.00019	1.02 ± 0.06	30.9 ± 0.2	5.15 ± 0.21	787 ± 5	1.936 ± 0.009	29.0 ± 4.5	128 ± 1
BS1L021	0.00612 ± 0.00014	0.162 ± 0.040	0.983 ± 0.024	20.0 ± 0.5	622 ± 4	1.438 ± 0.006	≤12	97.9 ± 0.8
BS1L024	0.00588 ± 0.00012	0.245 ± 0.041	0.498 ± 0.017	5.93 ± 0.19	381 ± 2	1.519 ± 0.006	57.6 ± 4.1	117 ± 1
BS1L027	0.000889 ± 0.000091	≤0.28	0.344 ± 0.017	7.76 ± 0.33	386 ± 2	0.183 ± 0.001	90.9 ± 8.8	90.5 ± 0.7
BS1L083	0.00136 ± 0.00011	1.99 ± 0.06	0.608 ± 0.026	4.82 ± 0.18	1450 ± 8	0.710 ± 0.003	40.6 ± 3.7	114 ± 1
BS1L086	0.000600 ± 0.000090	1.54 ± 0.05	0.047 ± 0.020	4.97 ± 0.17	674 ± 4	0.260 ± 0.002	32.5 ± 3.4	109 ± 1
BS1L098	0.00271 ± 0.00011	0.967 ± 0.041	0.157 ± 0.015	3.48 ± 0.15	899 ± 5	1.828 ± 0.007	54.1 ± 3.4	159 ± 1
BS1L101	0.00346 ± 0.00013	0.813 ± 0.036	0.059 ± 0.014	3.00 ± 0.12	847 ± 5	1.103 ± 0.005	69.5 ± 3.4	109 ± 1
BS1L104	0.00337 ± 0.00013	1.69 ± 0.095	0.145 ± 0.017	3.80 ± 0.28	217 ± 2	0.265 ± 0.002	45.7 ± 7.5	102 ± 1
BS1L112	0.00173 ± 0.00010	0.111 ± 0.027	0.143 ± 0.016	3.12 ± 0.11	289 ± 2	0.958 ± 0.004	20.7 ± 2.8	71.3 ± 0.6

Table F.6 Concentrations of inorganic constituents in fish tissue samples (muscle and liver) for 12 sites from the National Benthic Surveillance Project (1985-1986) (µg/g dry wt., unless otherwise noted) (cont.).

Sample Identification	As	Se	Rb	Sr	Mo	Ag	Cd	Sn	Sb
Muscle Tissue									
BS1F002	5.19 ± 0.06	1.43 ± 0.02	3.41 ± 0.06	≤0.63	≤0.90	≤0.0043	≤1.2	≤1.4	0.00201 ± 0.00046
BS1F011	49.4 ± 0.4	2.92 ± 0.03	4.16 ± 0.06	8.57 ± 0.42	≤0.10	≤0.0073	≤0.14	≤2.5	0.00165 ± 0.00036
BS1F014	26.9 ± 0.2	1.37 ± 0.02	4.28 ± 0.06	3.43 ± 0.35	≤0.21	≤0.0080	≤0.26	≤2.8	≤0.0014
BS1F020	2.20 ± 0.04	6.62 ± 0.09	4.60 ± 0.08	≤0.57	≤0.87	≤0.0038	≤1.2	≤1.2	0.00219 ± 0.00052
BS1F023	5.41 ± 0.06	4.64 ± 0.06	5.15 ± 0.09	≤0.59	≤0.88	≤0.0037	≤1.1	≤1.2	0.00196 ± 0.00041
BS1F026	5.41 ± 0.07	1.52 ± 0.02	4.14 ± 0.07	≤0.57	≤1.0	0.0066 ± 0.0018	≤1.2	≤1.1	0.00259 ± 0.00044
BS1F084	21.9 ± 0.2	0.98 ± 0.01	3.87 ± 0.06	≤1.4	≤0.59	≤0.0082	≤0.61	≤2.6	≤0.0018
BS1F087	96.0 ± 0.6	1.42 ± 0.02	4.54 ± 0.08	≤0.77	≤1.2	≤0.0053	≤1.8	≤1.7	0.00224 ± 0.00045
BS1F097	8.66 ± 0.09	2.91 ± 0.03	4.97 ± 0.07	≤1.4	≤0.41	≤0.0084	≤0.44	≤2.7	0.00189 ± 0.00044
BS1F100	5.89 ± 0.08	2.42 ± 0.03	5.42 ± 0.08	≤0.67	≤1.1	≤0.0047	≤1.3	≤1.5	0.00123 ± 0.00038
BS1F103	36.4 ± 0.3	6.35 ± 0.05	3.27 ± 0.05	≤1.3	≤0.47	0.0178 ± 0.0021	≤0.52	≤2.6	0.0109 ± 0.0007
BS1F113	0.151 ± 0.006	1.26 ± 0.01	12.1 ± 0.1	4.54 ± 0.32	≤0.13	≤0.0069	≤0.14	≤2.3	≤0.0016
Liver Tissue									
BS1L003	6.10 ± 0.12	12.9 ± 0.1	2.66 ± 0.05	≤2.0	≤1.2	1.584 ± 0.014	2.86 ± 0.48	0.427 ± 0.044	0.00875 ± 0.00077
BS1L012	77.1 ± 0.6	11.1 ± 0.1	2.40 ± 0.07	≤2.9	≤2.2	0.174 ± 0.008	≤3.3	7.28 ± 0.18	0.0256 ± 0.0016
BS1L015	27.6 ± 0.2	8.31 ± 0.07	2.90 ± 0.12	≤4.6	≤1.9	0.352 ± 0.012	2.86 ± 0.73	7.18 ± 0.26	0.0518 ± 0.0032
BS1L021	2.74 ± 0.07	22.7 ± 0.2	2.91 ± 0.08	≤3.1	≤1.4	≤0.0194	≤2.4	25.8 ± 0.4	0.0203 ± 0.0016
BS1L024	6.86 ± 0.13	19.2 ± 0.2	2.78 ± 0.06	≤2.2	≤1.3	0.242 ± 0.006	≤2.1	5.15 ± 0.19	0.00699 ± 0.00092
BS1L027	14.5 ± 0.1	8.46 ± 0.07	2.05 ± 0.05	≤2.5	≤1.0	0.218 ± 0.007	≤1.8	1.94 ± 0.1	0.00556 ± 0.00072
BS1L083	10.8 ± 0.1	7.07 ± 0.06	3.36 ± 0.12	≤3.3	≤1.4	2.689 ± 0.023	≤2.3	1.16 ± 0.09	0.0100 ± 0.0014
BS1L086	80.3 ± 0.6	6.14 ± 0.06	2.86 ± 0.07	≤3.1	≤1.3	0.484 ± 0.009	≤2.4	0.714 ± 0.086	0.00663 ± 0.00094
BS1L098	6.49 ± 0.09	8.52 ± 0.07	4.14 ± 0.11	≤2.6	≤1.2	0.614 ± 0.008	12.9 ± 0.6	0.574 ± 0.064	0.0109 ± 0.0011
BS1L101	4.87 ± 0.06	7.04 ± 0.06	3.01 ± 0.07	≤2.8	≤1.0	0.201 ± 0.007	2.61 ± 0.39	1.14 ± 0.07	0.0078 ± 0.0011
BS1L104	9.87 ± 0.11	10.5 ± 0.1	1.90 ± 0.06	≤3.8	≤1.4	7.263 ± 0.058	≤2.4	0.88 ± 0.10	0.0135 ± 0.002
BS1L112	0.33 ± 0.04	5.92 ± 0.05	5.54 ± 0.09	≤2.6	≤0.8	0.107 ± 0.007	≤1.8	6.41 ± 0.13	0.0079 ± 0.0011

Table F.6 Concentrations of inorganic constituents in fish tissue samples (muscle and liver) for 12 sites from the National Benthic Surveillance Project (1985-1986) (µg/g dry wt., unless otherwise noted) (cont).

Sample Identification	I	Cs	Ba	La	Ce	Sm	Eu	Tb
Muscle Tissue								
BS1F002	≤0.40	0.0590 ± 0.0012	≤1.4	≤0.026	≤0.016	≤0.0040	0.000206 ± 0.000047	≤0.00092
BS1F011	≤0.86	0.0632 ± 0.0010	≤1.4	≤0.0025	≤0.033	≤0.00051	≤0.00097	≤0.0017
BS1F014	≤0.95	0.0698 ± 0.0010	≤3.9	≤0.0047	≤0.035	≤0.0011	≤0.0010	≤0.0019
BS1F020	≤0.33	0.0152 ± 0.0006	≤1.8	≤0.025	0.0094 ± 0.0057	≤0.0040	0.000224 ± 0.000044	≤0.00078
BS1F023	≤0.36	0.0306 ± 0.0008	≤1.9	≤0.023	≤0.015	≤0.0041	0.000224 ± 0.000047	0.00034 ± 0.00034
BS1F026	≤0.29	0.0426 ± 0.0009	0.44 ± 0.73	≤0.022	≤0.014	≤0.0051	0.000095 ± 0.000036	≤0.00071
BS1F084	≤0.86	0.0952 ± 0.0012	≤4.7	≤0.0069	≤0.034	≤0.0045	≤0.0011	≤0.0013
BS1F087	≤0.38	0.112 ± 0.002	≤2.0	≤0.029	≤0.019	≤0.0057	≤0.00011	≤0.0011
BS1F097	≤0.94	0.0702 ± 0.0011	≤4.1	≤0.0055	≤0.034	≤0.0031	≤0.0012	≤0.0018
BS1F100	≤0.36	0.0682 ± 0.0013	≤1.6	≤0.024	≤0.017	≤0.0055	≤0.00012	≤0.00051
BS1F103	≤0.91	0.0457 ± 0.0008	≤3.4	≤0.0064	≤0.033	≤0.0035	≤0.00097	≤0.0018
BS1F113	≤0.74	0.100 ± 0.001	≤3.8	≤0.0026	≤0.029	≤0.00067	≤0.00097	≤0.0012
Liver Tissue								
BS1L003	3.71 ± 0.60	0.0248 ± 0.0012	≤2.3	≤0.031	≤0.031	≤0.0064	≤0.00036	ND[c]
BS1L012	2.74 ± 0.72	0.0124 ± 0.0018	≤2.0	0.149 ± 0.025	0.140 ± 0.013	0.0202 ± 0.0024	0.00202 ± 0.00023	ND
BS1L015	≤3.4	0.0280 ± 0.0033	≤4.1	≤0.067	≤0.065	≤0.0052	≤0.0010	ND
BS1L021	≤3.2	0.0080 ± 0.0018	≤2.9	≤0.053	0.087 ± 0.013	≤0.0058	0.00116 ± 0.00019	ND
BS1L024	5.08 ± 0.82	0.0179 ± 0.0014	≤2.3	≤0.038	0.072 ± 0.008	≤0.0065	0.00078 ± 0.00012	ND
BS1L027	9.33 ± 1.57	0.0098 ± 0.0016	≤1.8	≤0.039	≤0.025	≤0.0041	≤0.00038	ND
BS1L083	3.39 ± 0.87	0.0380 ± 0.0018	≤7.4	≤0.048	0.082 ± 0.012	≤0.0044	0.00065 ± 0.00014	ND
BS1L086	≤2.3	0.0419 ± 0.0022	≤2.9	≤0.043	≤0.035	≤0.0055	≤0.00047	ND
BS1L098	≤2.0	0.0376 ± 0.0016	≤5.6	≤0.041	0.038 ± 0.008	≤0.0049	0.00045 ± 0.00011	ND
BS1L101	≤1.7	0.0190 ± 0.0020	≤2.2	≤0.034	≤0.039	≤0.0039	0.00084 ± 0.00015	ND
BS1L104	8.42 ± 1.65	0.0197 ± 0.0022	≤2.7	≤0.052	≤0.052	≤0.0052	≤0.00098	ND
BS1L112	≤1.8	0.0329 ± 0.0018	≤2.6	≤0.038	≤0.041	≤0.0045	≤0.00048	ND

Table F.6 Concentrations of inorganic constituents in fish tissue samples (muscle and liver) for 12 sites from the National Benthic Surveillance Project (1985-1986) (µg/g dry wt., unless otherwise noted) (cont).

Sample Identification	Hf	Ta	Au	Hg	Th	U
Muscle Tissue						
BS1F002	≤0.0011	≤0.00058	≤0.00094	ND	≤0.0019	≤0.16
BS1F011	≤0.0020	0.00456 ± 0.00040	≤0.000089	ND	≤0.0037	≤0.013
BS1F014	≤0.0021	0.00508 ± 0.00040	≤0.00016	ND	≤0.0039	≤0.027
BS1F020	≤0.00097	≤0.00059	≤0.00086	ND	≤0.0018	≤0.15
BS1F023	≤0.00097	≤0.00057	≤0.00082	ND	≤0.0018	≤0.15
BS1F026	≤0.00091	≤0.00052	≤0.00083	ND	≤0.0017	≤0.16
BS1F084	≤0.0022	0.00234 ± 0.00038	≤0.00032	ND	≤0.0039	≤0.089
BS1F087	≤0.0013	≤0.00067	≤0.0012	ND	0.00091 ± 0.00094	≤0.21
BS1F097	≤0.0022	0.00457 ± 0.00047	≤0.00023	ND	≤0.0039	≤0.062
BS1F100	0.00079 ± 0.00041	≤0.00062	≤0.00090	ND	≤0.0020	≤0.17
BS1F103	≤0.0020	0.00291 ± 0.00034	≤0.00028	ND	≤0.0036	≤0.070
BS1F113	≤0.0019	0.00339 ± 0.00033	≤0.000092	ND	≤0.0033	≤0.016
Liver Tissue						
BS1L003	ND	ND	≤0.0027	0.331 ± 0.006	0.0044 ± 0.0011	ND[c]
BS1L012	ND	ND	0.0098 ± 0.0014	0.296 ± 0.008	≤0.0058	ND
BS1L015	ND	ND	≤0.0050	0.177 ± 0.012	≤0.0088	ND
BS1L021	ND	ND	≤0.0037	0.039 ± 0.008	0.0560 ± 0.0019	ND
BS1L024	ND	ND	≤0.0029	0.204 ± 0.005	0.0081 ± 0.0011	ND
BS1L027	ND	ND	≤0.0028	0.265 ± 0.007	0.0127 ± 0.0012	ND
BS1L083	ND	ND	0.0548 ± 0.0013	0.767 ± 0.010	0.0067 ± 0.0017	ND
BS1L086	ND	ND	≤0.0026	0.239 ± 0.009	≤0.0063	ND
BS1L098	ND	ND	0.0107 ± 0.0008	0.625 ± 0.007	0.0041 ± 0.0011	ND
BS1L101	ND	ND	0.0084 ± 0.0007	0.378 ± 0.008	≤0.0048	ND
BS1L104	ND	ND	0.0037 ± 0.0008	0.631 ± 0.011	≤0.0064	ND
BS1L112	ND	ND	≤0.0027	0.040 ± 0.006	≤0.0054	ND

[a] All elements analyzed by instrumental neutron activation analysis (INAA).
[b] The uncertainties associated with the INAA results are due to counting statistics, including propagated uncertainties of the standard.
[c] Not determined.

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.).

Sample Identification[b]	Site	Species	Percent Water	H	B	Na	Mg	Al	Si	S
BS1L003	Dana Point, CA	GL	75.2			3790 ± 30[d]	472 ± 81	7.50 ± 0.56		
BS1F002			77.1			2180 ± 20	1340 ± 30	3.28 ± 0.13		
BS1S001			24.4			26600 ± 300	10200 ± 630	66200 ± 350		
BS1L012	Elliott Bay, WA	PV	70.8			4640 ± 30	850 ± 99	27.0 ± 1.0		
BS1F011			80.5			2470 ± 20	1360 ± 40	2.56 ± 0.22		
BS1S010			33.8			29200 ± 400	19300 ± 900	77300 ± 400		
BS1L015	Nisqually Reach, WA	PV	86.4			5740 ± 40	872 ± 117	41.6 ± 1.0		
BS1F014			81.2			2620 ± 30	1520 ± 60	1.89 ± 0.24		
BS1S013			18.8			30400 ± 300	20800 ± 900	74800 ± 400		
BS1L021	Mississippi Delta, LA	MU	79.4			7280 ± 50	1310 ± 130	34.5 ± 0.9		
BS1F020			81.7			2100 ± 20	1510 ± 30	2.27 ± 0.10		
BS1S019			27.4			11600 ± 200	7590 ± 490	41700 ± 400		
BS1L024	Corpus Christi, TX	MU	70.7			5630 ± 40	972 ± 119	40.2 ± 1.0		
BS1F023			76.8			1780 ± 20	1400 ± 30	4.25 ± 0.14		
BS1S022			74.0			39400 ± 500	21100 ± 1000	68400 ± 500		
BS1L027	Charlotte Harbor, FL	LX	63.7			7680 ± 60	1470 ± 220	7.71 ± 1.27		
BS1F026			71.2			940 ± 9.0	1220 ± 30	1.50 ± 0.10		
BS1S025			29.7			5000 ± 60	3500 ± 300	3400 ± 70		
				2330 ± 130[c]	19.8 ± 0.9	7680 ± 1600[c]			311000 ± 3000[c]	≤600[c]
BS1L083	Boston Harbor, MA	PA	77.0			5850 ± 40	856 ± 104	10.6 ± 0.6		
BS1F084			80.9			2390 ± 20	1290 ± 50	1.09 ± 0.15		
BS1S085			53.6			26300 ± 200	9000 ± 600	56400 ± 500		
				6650 ± 240[c]	53.3 ± 1.9	26400 ± 1700[c]			280000 ± 3000[c]	3690 ± 500[c]

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

Sample Identification[b]	Site	Species	Percent Water	H	B	Na	Mg	Al	Si	S
BS1L086	Buzzards Bay, MA	PA	74.5			4270 ± 40	828 ± 98	5.45 ± 0.47		
BS1F087			81.4			2890 ± 20	1330 ± 40	≤0.25		
BS1S088			68.6			31900 ± 300	11600 ± 800	56400 ± 500		
				8850 ± 270[c]	106 ± 3	34500 ± 2600[c]			242000 ± 5000[c]	4570 ± 740[c]
BS1L098	Bodega Bay, CA	PS	73.3			4780 ± 40	596 ± 90	6.90 ± 0.45		
BS1F097			81.5			2860 ± 30	1650 ± 70	2.99 ± 0.28		
BS1S099			21.6			23100 ± 200	14600 ± 600	49400 ± 400		
				2720 ± 140[c]	32.0 ± 1.2	22600 ± 1200[c]			313000 ± 5000[c]	≤700[c]
BS1L101	Southampton Shoal, CA	PS	64.3			2970 ± 30	443 ± 76	7.49 ± 0.50		
BS1F100			79.9			2010 ± 20	1460 ± 40	≤0.23		
BS1S102			35.2			20700 ± 200	14700 ± 600	63400 ± 500		
				5410 ± 210[c]	49.8 ± 1.8	21500 ± 1300[c]			272000 ± 2000[c]	≤800[c]
BS1L104	Santa Monica Bay, CA	PnV	65.4			8220 ± 60	1060 ± 200	27.7 ± 1.4		
BS1F103			80.0			2460 ± 20	1370 ± 50	2.57 ± 0.26		
BS1S105			27.4			28100 ± 200	10700 ± 600	66500 ± 600		
				2410 ± 9.5[c]	27.4 ± 1.0	28800 ± 1700[c]			291000 ± 5000[c]	≤850[c]
BS1L112	St. John's River, FL	MU	68.6			3780 ± 30	681 ± 80	4.58 ± 0.51		
BS1F113			74.9			1330 ± 20	1290 ± 40	2.19 ± 0.18		
BS1S111			75.3			19100 ± 200	9810 ± 500	49500 ± 400		
				12000 ± 400[c]	63.9 ± 2.2	17200 ± 1300[c]			222000 ± 2000[c]	11000 ± 500[c]

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

Sample Identificatio	Cl	K	Ca	Sc	Ti	V	Cr	Mn	Fe
BS1L003	5550 ± 40	8910 ± 270	264 ± 39	0.00198 ± 0.00008		≤0.12	1.17 ± 0.02	6.21 ± 0.20	295 ± 2
BS1F002	2960 ± 20	19400 ± 200	858 ± 28	0.000224 ± 0.00003		≤0.016	0.0707 ± 0.0080	0.690 ± 0.050	25.6 ± 0.5
BS1S001	6100 ± 140	22500 ± 100	23400 ± 200	9.55 ± 0.09		58.3 ± 3.0	35.7 ± 1.0	366 ± 5	19000 ± 200
BS1L012	7710 ± 60	10700 ± 300	456 ± 55	0.00676 ± 0.00015		2.21 ± 0.07	9.63 ± 0.10	5.10 ± 0.18	887 ± 5
BS1F011	3350 ± 30	22000 ± 500	1086 ± 32	0.000226 ± 0.000016		≤0.034	0.154 ± 0.010	0.610 ± 0.058	8.48 ± 0.20
BS1S010	9500 ± 200	≤3800	26700 ± 200	16.5 ± 0.2		108 ± 4	82.3 ± 1.9	631 ± 8	45500 ± 400
BS1L015	9490 ± 70	12600 ± 400	909 ± 88	0.00298 ± 0.00019		1.02 ± 0.06	30.9 ± 0.2	5.15 ± 0.21	787 ± 5
BS1F014	3660 ± 30	22300 ± 500	587 ± 25	0.000229 ± 0.000016		≤0.038	0.208 ± 0.011	0.441 ± 0.069	10.5 ± 0.2
BS1S013	3860 ± 180	≤4000	35900 ± 200	11.7 ± 0.1		92.0 ± 3.5	36.5 ± 0.9	662 ± 8	35500 ± 300
BS1L021	10470 ± 80	9860 ± 370	513 ± 77	0.00612 ± 0.00014		0.162 ± 0.040	0.983 ± 0.024	20.05 ± 0.48	622 ± 4
BS1F020	1950 ± 20	17200 ± 100	773 ± 26	0.000306 ± 0.000032		≤0.013	0.106 ± 0.008	2.215 ± 0.052	10.2 ± 0.3
BS1S019	2320 ± 90	20400 ± 100	10200 ± 100	5.34 ± 0.05		44.6 ± 2.5	41.5 ± 1.0	277 ± 4	16700 ± 200
BS1L024	8850 ± 60	9150 ± 300	685 ± 65	0.00588 ± 0.00012		0.245 ± 0.041	0.498 ± 0.017	5.93 ± 0.19	381 ± 2
BS1F023	2080 ± 20	17200 ± 200	1310 ± 40	0.000585 ± 0.000039		≤0.015	0.111 ± 0.009	0.941 ± 0.048	9.05 ± 0.26
BS1S022	56220 ± 600	26700 ± 1500	31500 ± 2100	11.8 ± 0.1		95.2 ± 4.0	56.5 ± 1.3	551 ± 7	37500 ± 400
BS1L027	11350 ± 100	18300 ± 600	281 ± 66	0.000889 ± 0.000091		≤0.28	0.344 ± 0.017	7.76 ± 0.33	386 ± 2
BS1F026	1310 ± 10	15200 ± 100	704 ± 23	0.000108 ± 0.000027		≤0.011	0.184 ± 0.010	0.636 ± 0.033	7.86 ± 0.24
BS1S025	6270 ± 70	≤1900	≤3200	0.536 ± 0.008		6.31 ± 0.70	12.1 ± 0.2	19.3 ± 1.3	2420 ± 60
	6740 ± 270[c]	810 ± 160[c]	84300 ± 1900[c]		415 ± 59[c]			≤200[c]	2960 ± 120[c]
BS1L083	9790 ± 70	15000 ± 400	313 ± 48	0.00136 ± 0.00011		1.99 ± 0.06	0.608 ± 0.026	4.82 ± 0.18	1450 ± 10
BS1F084	3110 ± 30	25900 ± 500	363 ± 24	0.000106 ± 0.000017		≤0.033	0.213 ± 0.011	0.224 ± 0.053	7.61 ± 0.2
BS1S085	17570 ± 180	≤5900	12800 ± 400	9.44 ± 0.13		75.5 ± 1.7	148 ± 2	424 ± 10	24100 ± 600
	21010 ± 440[c]	19700 ± 400[c]	86700 ± 1000[c]		4420 ± 120[c]			≤600[c]	23800 ± 900[c]

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

ISample dentification	Cl	K	Ca	Sc	Ti	V	Cr	Mn	Fe
BS1L086	7230±60	13100±300	144±32	0.000600±0.000090		1.54±0.05	0.047±0.020	4.97±0.17	674±4
BS1F087	3170±30	24900±200	341±15	0.000075±0.000034		≤0.017	0.0603±0.0089	0.447±0.039	6.39±0.28
BS1S088	35700±300	≤6800	4190±400	10.4±0.1		78.8±1.9	83.2±1.2	366±9	30300±700
	41200±800[c]	20400±500[c]	6720±1200[c]		3930±170[c]			480±120[c]	30100±1200[c]
BS1L098	8030±60	12000±300	161±45	0.00271±0.00011		0.967±0.041	0.157±0.015	3.48±0.15	899±5
BS1F097	4020±40	23500±500	288±23	0.000206±0.000018		≤0.040	0.141±0.010	0.340±0.066	7.03±0.21
BS1S099	5610±80	≤4500	22000±500	7.32±0.10		72.0±1.4	369±5	337±8	19400±400
	5640±130[c]	9660±250[c]	20200±800[c]		2860±110[c]			410±90[c]	20000±1100[c]
BS1L101	5570±40	8520±200	165±34	0.00346±0.00013		0.813±0.036	0.059±0.014	3.00±0.12	847±5
BS1F100	2820±20	22800±200	217±12	≤0.000072		≤0.016	0.0487±0.0083	0.418±0.036	7.16±0.28
BS1S102	7840±110	≤5300	19400±400	16.0±0.2		109±2	229±3	627±14	46400±1100
	9010±200[c]	13000±300[c]	17200±800[c]		3120±60[c]			600±130[c]	44200±800[c]
BS1L104	13500±100	19400±600	≤260	0.00337±0.00013		1.69±0.095	0.145±0.017	3.80±0.28	217±2
BS1F103	3690±30	21300±470	442±22	0.000129±0.000015		≤0.038	0.231±0.011	0.361±0.043	8.15±0.20
BS1S105	7050±100	21600±1900	34800±700	7.85±0.11		51.4±1.2	90.9±1.3	395±9	20600±500
	6830±140[c]	20800±400[c]	26700±1000[c]		3690±160[c]			430±140[c]	20300±1100[c]
BS1L112	5910±40	10100±300	302±41	0.00173±0.00010		0.111±0.027	0.143±0.016	3.12±0.11	289±2
BS1F113	1730±20	17600±400	1630±40	0.000155±0.000013		≤0.027	0.0977±0.0092	1.173±0.054	21.8±0.3
BS1S111	22900±200	17200±1500	20700±600	8.90±0.12		57.8±1.5	65.0±1.0	310±8	24000±600
	24900±600[c]	12800±300[c]	23400±1200[c]		3570±90[c]			405±120[c]	21000±600[c]

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

Sample Identification	Co	Cu	Zn	As	Se	Rb	Sr	Mo	Ag	Cd
BS1L003	0.194±0.001	63.8±3.7	105±1	6.1±0.1	12.9±0.1	2.66±0.05	≤2.0	≤1.2	1.584±0.01	2.86±0.48
BS1F002	0.0240±0.0004	≤1.8	15.3±0.2	5.19±0.06	1.43±0.02	3.41±0.06	≤0.63	≤0.90	≤0.0043	≤1.2
BS1S001	4.98±0.02		49.7±0.4	4.24±0.28	≤0.07	62.5±1.1	284±4	3.45±0.43	≤0.05	≤6
BS1L012	1.65±0.01	19.9±4.3	88.0±0.7	77.1±0.6	11.1±0.1	2.40±0.07	≤2.9	≤2.2	0.174±0.008	≤3.3
BS1F011	0.0151±0.0002	≤3.4	17.1±0.1	49.4±0.4	2.92±0.03	4.16±0.06	8.57±0.42	≤0.10	≤0.0073	≤0.14
BS1S010	16.4±0.1		164±2	16.8±0.5	0.312±0.028	41.7±2.0	413±5	4.86±0.59	0.401±0.024	≤9
BS1L015	1.94±0.009	29.0±4.5	128±1	27.6±0.2	8.31±0.07	2.90±0.12	≤4.6	≤1.9	0.352±0.012	2.86±0.73
BS1F014	0.0165±0.0002	≤3.9	17.5±0.1	26.9±0.2	1.37±0.02	4.28±0.06	3.43±0.35	≤0.21	≤0.0080	≤0.26
BS1S013	12.8±0.1		76.3±0.6	2.66±0.37	≤0.07	50.2±2.0	420±5	4.44±0.79	≤0.08	≤8
BS1L021	1.44±0.01	≤12	97.9±0.8	2.74±0.07	22.7±0.2	2.91±0.08	≤3.1	≤1.4	≤0.019	≤2.4
BS1F020	0.0708±0.0009	≤1.5	18.1±0.2	2.20±0.04	6.62±0.09	4.60±0.08	≤0.57	≤0.87	≤0.0038	≤1.2
BS1S019	7.92±0.03		55.5±0.5	6.84±0.38	≤0.07	63.3±1.4	214±3	2.06±0.31	≤0.04	≤5
BS1L024	1.52±0.01	57.6±4.1	117±1	6.86±0.13	19.2±0.2	2.78±0.06	≤2.2	≤1.3	0.242±0.006	≤2.1
BS1F023	0.0616±0.0008	≤1.6	17.7±0.2	5.42±0.06	4.64±0.06	5.15±0.09	≤0.59	≤0.88	≤0.0037	≤1.1
BS1S022	11.3±0.1		155±1	10.4±0.5	≤0.10	109±2	173±4	4.58±0.56	≤0.10	≤9
BS1L027	0.183±0.001	90.9±8.8	90.5±0.7	14.5±0.1	8.46±0.07	2.05±0.05	≤2.5	≤1.0	0.218±0.007	≤1.8
BS1F026	0.0103±0.0003	≤1.2	19.3±0.3	5.41±0.07	1.52±0.02	4.14±0.07	≤0.57	≤1.0	0.0066±0.0018	≤1.2
BS1S025	0.255±0.007	≤66	5.13±0.2	1.13±0.06	0.071±0.041	3.55±0.4	508±9	≤0.60	≤0.042	≤0.7
										≤0.5[c]
BS1L083	0.710±0.003	40.6±3.7	114±1	10.8±0.1	7.07±0.06	3.36±0.12	≤3.3	≤1.4	2.69±0.02	≤2.3
BS1F084	0.0135±0.0002	≤3.5	33.4±0.3	21.9±0.2	0.977±0.013	3.87±0.06	≤1.4	≤0.59	≤0.0082	≤0.61
BS1S085	7.83±0.06	≤120	156±3	9.26±0.23	0.413±0.091	90±2	132±15	7.85±0.78	3.79±0.09	≤2.2
										1.61 ± 0.15[c]

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

Sample Identification	Co	Cu	Zn	As	Se	Rb	Sr	Mo	Ag	Cd
BS1L086	0.260±0.002	32.5±3.4	109±1	80.3±0.6	6.14±0.06	2.86±0.07	≤3.1	≤1.3	0.484±0.009	≤2.4
BS1F087	0.0165±0.0004	≤1.8	32.6±0.4	96.0±0.6	1.42±0.02	4.54±0.08	≤0.77	≤1.2	≤0.0053	≤1.8
BS1S088	7.57±0.06	≤140	113±2	12.0±0.3	0.366±0.085	99±2	98±16	2.6±1.0	0.493±0.042	≤2.7
										0.7±0.2[c]
BS1L098	1.83±0.01	54.1±3.4	159±1	6.49±0.09	8.52±0.07	4.14±0.11	≤2.6	≤1.2	0.614±0.008	12.9±0.6
BS1F097	0.0562±0.0005	≤4.1	31.1±0.2	8.66±0.09	2.91±0.03	4.97±0.07	≤1.4	≤0.41	≤0.0084	≤0.44
BS1S099	8.67±0.06	≤110	41.6±0.8	5.78±0.16	≤0.10	41.6±1.5	232±14	≤0.94	≤0.076	≤1.4
										0.16±0.10[c]
BS1L101	1.10±0.01	69.5±3.4	109±1	4.87±0.06	7.04±0.06	3.01±0.07	≤2.8	≤1.0	0.201±0.007	2.61±0.39
BS1F100	0.0398±0.0006	≤1.7	27.0±0.4	5.89±0.08	2.42±0.03	5.42±0.08	≤0.67	≤1.1	≤0.0047	≤1.3
BS1S102	21.3±0.1	≤110	96.6±2.1	10.4±0.3	≤0.32	49.8±2.1	175±17	1.04±0.52	≤0.22	≤1.9
										0.32±0.01[c]
BS1L104	0.265±0.002	45.7±7.5	102±1	9.87±0.11	10.5±0.1	1.90±0.06	≤3.8	≤1.4	7.26±0.06	≤2.4
BS1F103	0.0064±0.0002	≤3.8	14.0±0.1	36.4±0.3	6.35±0.05	3.27±0.05	≤1.3	≤0.47	0.0178±0.0021	≤0.52
BS1S105	5.50±0.04	≤120	81.9±1.5	3.84±0.19	0.148±0.048	67.6±1.8	372±16	5.87±0.64	2.37±0.06	≤1.8
										1.65±0.15[c]
BS1L112	0.958±0.004	20.7±2.8	71.3±0.6	0.33±0.04	5.92±0.05	5.54±0.09	≤2.6	≤0.8	0.107±0.007	≤1.8
BS1F113	0.0104±0.0002	≤3.0	21.1±0.2	0.151±0.006	1.26±0.01	12.1±0.1	4.54±0.32	≤0.13	≤0.0069	≤0.14
BS1S111	4.96±0.04	≤120	131±3	7.14±0.28	0.678±0.082	50.2±1.6	127±13	5.85±0.73	0.095±0.035	≤2.1
										0.74±0.12[c]

TTable F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

Sample Identification	Sn	Sb	I	Cs	Ba	La	Ce	Sm	Eu
BS1L003	0.427±0.044	0.00875±0.00077	3.71±0.60	0.0248±0.0012	≤2.3	≤0.031	≤0.031	≤0.0064	≤0.00036
BS1F002	≤1.4	0.00201±0.00046	≤0.40	0.0590±0.0012	≤1.4	≤0.026	≤0.016	≤0.0040	0.000206±0.000047
BS1S001	≤9	0.476±0.025		2.48±0.02	463±25	29.5±0.5	48.1±0.7	5.90±0.08	1.34±0.07
BS1L012	7.28±0.18	0.0256±0.0016	2.74±0.72	0.0124±0.0018	≤2.0	0.149±0.025	0.140±0.013	0.0202±0.0024	0.00202±0.0002
BS1F011	≤2.5	0.00165±0.00036	≤0.86	0.0632±0.0010	≤3.9	≤0.0025	≤0.033	≤0.00051	≤0.00097
BS1S010	≤13	2.71±0.05		2.54±0.16	425±30	22.0±0.4	37.5±0.6	4.79±0.07	1.40±0.08
BS1L015	7.18±0.26	0.0518±0.0032	≤3.4	0.0280±0.0033	≤4.1	≤0.067	≤0.065	≤0.0052	≤0.0010
BS1F014	≤2.8	≤0.0014	≤0.95	0.0698±0.0010	≤3.9	≤0.0047	≤0.035	≤0.0011	≤0.0010
BS1S013	≤15	0.143±0.025		2.63±0.02	428±23	23.3±0.4	38.2±0.6	4.48±0.06	1.27±0.07
BS1L021	25.8±0.4	0.0203±0.0016	≤3.2	0.0080±0.0018	≤2.9	≤0.053	0.087±0.013	≤0.0058	0.00116±0.00019
BS1F020	≤1.2	0.00219±0.00052	≤0.33	0.0152±0.0006	≤1.8	≤0.025	0.0094±0.0057	≤0.0040	0.000224±0.000044
BS1S019	≤9	0.515±0.019		2.46±0.02	667±17	34.7±0.6	51.3±0.8	5.58±0.08	1.15±0.06
BS1L024	5.15±0.19	0.00699±0.00092	5.08±0.82	0.0179±0.0014	≤2.3	≤0.038	0.072±0.008	≤0.0065	0.00078±0.00012
BS1F023	≤1.2	0.00196±0.00041	≤0.36	0.0306±0.0008	≤1.9	≤0.023	≤0.015	≤0.0041	0.000224±0.000047
BS1S022	≤15	0.635±0.029		8.33±0.05	662±27	39.2±0.7	63.7±1.0	6.81±0.09	1.42±0.08
BS1L027	1.94±0.10	0.00556±0.00072	9.33±1.57	0.0098±0.0016	≤1.8	≤0.039	≤0.025	≤0.0041	≤0.00038
BS1F026	≤1.1	0.00259±0.00044	≤0.29	0.0426±0.0009	0.44±0.73	≤0.022	≤0.014	≤0.0051	0.000095±0.000036
BS1S025	≤9.3	0.0644±0.0090	≤4.6	0.136±0.006	24.1±7.1	3.374±0.041	6.44±0.25	0.794±0.018 0.542±0.06[c]	0.152±0.003
BS1L083	1.16±0.09	0.0100±0.0014	3.39±0.87	0.0380±0.0018	≤7.4	≤0.048	0.082±0.012	≤0.0044	0.00065±0.00014
BS1F084	≤2.6	≤0.0018	≤0.86	0.0952±0.0012	≤4.7	≤0.0069	≤0.034	≤0.0045	≤0.0011
BS1S085	≤17	6.57±0.14	65.0±4.8	2.91±0.06	388±26	27.5±0.3	49.1±1.8	6.00±0.14 5.19±0.18[c]	1.13±0.02

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

Sample Identification	Sn	Sb	I	Cs	Ba	La	Ce	Sm	Eu
BS1L086	0.714 ± 0.086	0.00663 ± 0.00094	≤2.28	0.0419 ± 0.0022	≤2.9	≤0.043	≤0.035	≤0.0055	≤0.00047
BS1F087	≤1.7	0.00224 ± 0.00045	≤0.38	0.112 ± 0.002	≤2.0	≤0.029	≤0.019	≤0.0057	≤0.000114
BS1S088	≤9	0.398 ± 0.030	110 ± 7	3.83 ± 0.07	329 ± 27	40.0 ± 0.5	71.1 ± 2.5	7.65 ± 0.17	1.25 ± 0.02
								6.07±0.27[c]	
BS1L098	0.574 ± 0.064	0.0109 ± 0.0011	≤2.0	0.0376 ± 0.0016	≤5.6	≤0.041	0.038 ± 0.008	≤0.0049	0.00045 ± 0.00011
BS1F097	≤2.7	0.00189 ± 0.00044	≤0.94	0.0702 ± 0.0011	≤4.1	≤0.0055	≤0.034	≤0.0031	≤0.0012
BS1S099	≤16	0.364 ± 0.024	≤7.8	1.50 ± 0.03	422 ± 19	25.0 ± 0.3	38.2 ± 1.4	2.92 ± 0.07	0.621 ± 0.011
								2.73 ± 0.10[c]	
BS1L101	1.14 ± 0.07	0.0078 ± 0.0011	≤1.7	0.0190 ± 0.0020	≤2.2	≤0.034	≤0.039	≤0.0039	0.00084 ± 0.00015
BS1F100	≤1.5	0.00123 ± 0.00038	≤0.36	0.0682 ± 0.0013	≤1.6	≤0.024	≤0.017	≤0.0055	≤0.00011
BS1S102	≤44	0.458 ± 0.077	≤8.7	2.580 ± 0.06	531 ± 30	16.6 ± 0.2	29.9 ± 1.1	4.04 ± 0.09	0.973 ± 0.018
								3.55 ± 0.12[c]	
BS1L104	0.88 ± 0.10	0.0135 ± 0.002	8.42 ± 1.65	0.0197 ± 0.0022	≤2.7	≤0.052	≤0.052	≤0.0052	≤0.00098
BS1F103	≤2.6	0.0109 ± 0.0007	≤0.91	0.0457 ± 0.0008	≤3.4	≤0.0064	≤0.033	≤0.0035	≤0.00097
BS1S105	≤7	0.541 ± 0.024	39.2 ± 3.7	1.22 ± 0.02	964 ± 26	41.9 ± 0.5	73.5 ± 2.6	7.32 ± 0.16	1.30 ± 0.02
								6.45 ± 0.16[c]	
BS1L112	6.41 ± 0.13	0.0079 ± 0.0011	≤1.8	0.0329 ± 0.0018	≤2.6	≤0.038	≤0.041	≤0.0045	≤0.00048
BS1F113	≤2.3	≤0.0016	≤0.74	0.100 ± 0.001	≤3.8	≤0.0026	≤0.029	≤0.00067	≤0.00097
BS1S111	≤12	0.296 ± 0.029	42.7 ± 3.6	2.13 ± 0.04	347 ± 24	37.4 ± 0.4	66.9 ± 2.4	7.74 ± 0.18	1.19 ± 0.02
								6.29 ± 0.21[c]	

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

Sample Identification	Gd	Tb	Hf	Ta	Au	Hg	Th	U
BS1L003					≤0.0027	0.331±0.006	0.0044±0.0011	
BS1F002		≤0.00092	≤0.0011	≤0.00058	≤0.00094		≤0.0019	≤0.16
BS1S001					0.005±0.0007	≤0.10	10.4±0.1	
BS1L012					0.0098±0.0014	0.296±0.008	≤0.0058	
BS1F011		≤0.0017	≤0.0020	0.00456±0.00040	≤0.000089		≤0.0037	≤0.013
BS1S010					0.0246±0.0019	0.824±0.029	5.23±0.06	
BS1L015					≤0.0050	0.177±0.012	≤0.0088	
BS1F014		≤0.0019	≤0.0021	0.00508±0.00040	≤0.00016		≤0.0039	≤0.027
BS1S013					≤0.006	≤0.11	6.39±0.07	
BS1L021					≤0.0037	0.039±0.008	0.0560±0.0019	
BS1F020		≤0.00078	≤0.00097	≤0.00059	≤0.00086		≤0.0018	≤0.15
BS1S019					0.0096±0.0009	0.172±0.019	7.64±0.08	
BS1L024					≤0.0029	0.204±0.005	0.0081±0.0011	
BS1F023		0.00034±0.00034	≤0.00097	≤0.00057	≤0.00082		≤0.0018	≤0.15
BS1S022					0.0114±0.0016	0.272±0.013	12.4±0.1	
BS1L027					≤0.0028	0.265±0.007	0.0127±0.0012	
BS1F026		≤0.00071	≤0.00091	≤0.00052	≤0.00083		≤0.0017	≤0.16
BS1S025	0.63±0.10[C]	0.118±0.005	2.73±0.06	0.170±0.007	≤0.00047		0.694±0.014	1.15±0.06
BS1L083					0.0548±0.0013	0.767±0.010	0.0067±0.0017	
BS1F084		≤0.0013	≤0.0022	0.00234±0.00038	≤0.00032		≤0.0039	≤0.089
BS1S085	4.45±0.15[C]	0.450±0.011	5.35±0.11	3.09±0.06	0.0644±0.0012		6.37±0.8	1.72±0.14
BS1L086					≤0.0026	0.239±0.009	≤0.0063	
BS1F087		≤0.0011	≤0.0013	≤0.00067	≤0.0012		0.00091±0.00094	≤0.21
BS1S088	5.47±0.18[C]	0.539±0.012	6.72±0.13	1.50±0.03	0.00903±0.00085		9.91±0.11	2.22±0.17

Table F.7 Concentrations of inorganic constituents in fish tissue, muscle and liver and sediment for 12 sites from the National Benthic Surveillance Project (1985-86) (µg/g dry wt.) (cont.).

Sample Identification	Gd	Tb	Hf	Ta	Au	Hg	Th	U
BS1L098					0.0107±0.0008	0.625±0.007	0.0041±0.0011	
BS1F097		≤0.0018	≤0.0022	0.00457±0.00047	≤0.00023		≤0.0039	≤0.062
BS1S099	1.7±0.07[c]	0.0636±0.0067	2.11±0.04	0.392±0.013	≤0.00086		8.91±0.10	0.936±0.092
BS1L101					0.00837±0.00067	0.378±0.008	≤0.0048	
BS1F100		≤0.00051	0.00079±0.00041	≤0.00062	≤0.00090		≤0.0020	≤0.17
BS1S102	2.96±0.10[c]	0.308±0.014	3.24±0.08	0.358±0.027	≤0.0012		3.71±0.058	0.752±0.113
BS1L104					0.00367±0.00081	0.631±0.011	≤0.0064	
BS1F103		≤0.0018	≤0.0020	0.00291±0.00034	≤0.00028		≤0.0036	≤0.070
BS1S105	4.84±0.13[c]	0.447±0.10	11.4±0.2	0.689±0.016	0.0880±0.0013		11.0±0.1	2.13±0.12
BS1L112					≤0.0027	0.040±0.006	≤0.0054	
BS1F113		≤0.0012	≤0.0019	0.00339±0.00033	≤0.000092		≤0.0033	≤0.016
BS1S111	5.42±0.14[c]	0.663±0.014	14.2±0.3	0.878±0.022	≤0.0013		9.69±0.11	3.56±0.15

[a] All elements analyzed by instrumental neutron activation analysis (INAA)

[b] Sample from the same site are listed in order fish liver (BS1L...), fish flesh (Muscle)(BS1F...), and sediment (BS1S...).

[c] PGAA Numbers

[d] The uncertainties associated with the INAA results are due to counting statistics, including propagated uncertainties of the standard.

Table F.8. Concentrations of PCBs and chlorinated pesticides in bivalve samples from the Mussel Watch Project (1985-1988) (ng/g dry wt.).

Sample Identification[b]	Site	Code	Species	PCB 8	PCB 18	PCB 28	PCB 44	PCB 52	PCB 66	PCB 101	PCB 105
MW1M029	Imperial Beach, N. Jetty	IBNJ	MC	ND[c]	ND	ND	ND	ND	ND	13.5 (0.2)	ND
	San Diego, CA			ND	ND	ND	ND	ND	ND	13.9 (0.2)	ND
MW1Y030	Confederate Reef,	GBCR	CV	ND	ND	ND	ND	ND	ND	10.1 (0.3)	ND
	Galveston, Bay, TX			ND	ND	ND	ND	ND	ND	10.4 (0.2)	ND
MW1Y044	Fort Johnson, Charleston	CHFJ	CV	ND	ND	ND	ND	ND	ND	5.7 (0.1)	ND
	Harbor, SC			ND	ND	ND	ND	ND	ND	5.6 (0.1)	ND
MW1M048	Dorchester Bay, Boston	BHDF	ME	ND	ND	ND	ND	ND	ND	92.6 (0.4)	ND
	Harbor, MA			ND	ND	ND	ND	ND	ND	93.3 (0.3)	ND
MW1Y068	Pascagoula Bay,	MSPB	CV	ND	ND	ND	ND	ND	ND	11.4 (0.1)	ND
	Mississippi Sound, MS			ND	ND	ND	ND	ND	ND	11.3 (0.1)	ND
MW1Y073	Mountain Point Bar,	CBMP	CV	ND	ND	ND	ND	ND	ND	10.8 (0.1)	ND
	Baltimore Harbor, MD			ND	ND	ND	ND	ND	ND	10.9 (0.1)	ND
MW2Y119	Kelly Island, Delaware	DBKI	CV	10.8 (0.2)	1.2 (0.1)	1.8 (0.1)	≤2	5.1 (0.3)	≤2	10.5 (0.8)	3.2 (0.2)
	Bay, DE			9.6 (0.3)	1.2 (0.1)	1.8 (0.1)	≤1	5.3 (0.2)	≤1	12.6 (0.6)	3.2 (0.2)
MW2Y129	Gallinipper Point,	MBGP	CV	≤1	1.6 (0.2)	1.0 (0.1)	1.4 (0.2)	2.2 (0.1)	≤1	5.4 (0.3)	1.6 (0.2)
	Matagorda Bay, TX			≤1	1.8 (0.1)	1.2 (0.1)	1.7 (0.1)	2.9 (0.2)	≤1	5.8 (0.3)	1.6 (0.1)
MW2M135	South Jetty, Marina	MDSJ	ME	≤2	≤2	1.4 (0.1)	≤1	3.2 (0.2)	≤1	5.3 (0.3)	3.4 (0.2)
	Del Rey, CA			≤3	≤2	1.6 (0.1)	≤1	3.5 (0.1)	≤1	6.9 (0.4)	3.0 (0.1)
MW2M137	Point Dume, Point	PDPD	MC	≤1	≤1	1.3 (0.1)	≤1	2.5 (0.2)	≤1	8.0 (0.1)	2.2 (0.1)
	Dume, CA			≤2	≤2	1.2 (0.1)	≤1	2.3 (0.1)	≤1	8.1 (0.6)	2.9 (0.2)
MW2Y155	Cedar Point Reef,	MBCP	CV	≤2	≤2	0.9 (0.1)	≤1	2.7 (0.1)	≤1	5.6 (0.3)	0.9 (0.1)
	Mobile Bay, AL			≤2	≤2	1.0 (0.1)	≤1	3.1 (0.2)	≤1	5.2 (0.2)	0.7 (0.1)

Table F.8. Concentrations of PCBs and chlorinated pesticides in bivalve samples from the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

ISample Identification[b]	Site	Code	Species	PCB 8	PCB 18	PCB 28	PCB 44	PCB 52	PCB 66	PCB 101	PCB 105
MW2M163	Hingham Bay, Boston Harbor, MA	BHHB	ME	≤1	6.0 (0.3)	8.2 (0.4)	≤1	19.1 (0.9)	≤1	53.4 (2.1)	24.6 (1.8)
				≤2	5.8 (0.4)	8.5 (0.6)	≤1	20.7 (1.1)	≤1	57.8 (1.8)	23.5 (0.9)
MW3M206	Hempstead Harbor, Long Island Sound, NY	LIHH	ME	121 (2)	4.8 (0.2)	30.6 (0.6)	9.2 (0.1)	34.5 (0.3)	37.6 (1.1)	49.9 (0.6)	11.4 (0.2)
				116 (2)	5.3 (0.2)	29.4 (0.4)	9.6 (0.2)	36.9 (0.9)	37.8 (0.4)	47.1 (0.4)	11.6 (0.2)
MW3M208	Lower Bay, Hudson Raritan Estuary, NY	HRLB	ME	152 (1)	37.6 (1.7)	125 (1)	46.3 (0.3)	21.8 (0.1)	154 (2)	157 (3)	31.3 (0.2)
				146 (1)	36.6 (0.2)	123 (2)	46.5 (0.5)	21.4 (0.2)	151 (1)	154 (2)	30.6 (0.1)
MW3M217	Coos Head, Coos Bay, OR	CBCH	MC	69.0 (1.4)	7.8 (0.1)	2.5 (0.1)	1.1 (0.1)	3.8 (0.1)	5.6 (0.1)	6.2 (0.1)	1.2 (0.1)
				74.2 (5.1)	8.1 (0.3)	2.5 (0.1)	1.1 (0.1)	4.4 (0.1)	5.5 (0.1)	6.5 (0.1)	1.2 (0.1)
MW3M222	Neah Bay, Strait of Juan de Fuca, WA	JFCF	MC	124 (3)	≤1	2.0 (0.1)	0.5 (0.1)	2.7 (0.3)	2.2 (0.2)	2.3 (0.1)	0.6 (0.1)
				127 (2)	≤1	2.0 (0.1)	0.5 (0.1)	2.6 (0.2)	2.5 (0.3)	2.4 (0.1)	0.6 (0.1)
MW3M225	Goosebury Neck, Buzzards Bay, MA	BBGN	ME	61.7 (0.5)	6.6 (0.2)	18.4 (0.4)	5.5 (0.2)	25.4 (0.6)	27.0 (1.0)	45.3 (0.4)	8.6 (0.2)
				57.9 (1.3)	6.2 (0.2)	17.3 (0.6)	5.2 (0.1)	23.4 (0.2)	25.9 (0.4)	43.4 (0.7)	8.1 (0.2)
MW3M240	San Miguel Island, Tyler Bight, CA	SANM	MC	23.7 (0.2)	≤1	2.2 (0.1)	1.0 (0.1)	8.4 (0.2)	4.2 (0.2)	4.5 (0.1)	1.7 (0.1)
				24.9 (0.6)	≤1	2.3 (0.1)	1.0 (0.1)	8.9 (0.3)	4.0 (0.2)	4.3 (0.1)	1.7 (0.1)

Table F.8. Concentrations of PCBs and chlorinated pesticides in bivalve samples from the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

Sample Identification[b]	PCB 118	PCB 128	PCB 138	PCB 153	PCB 170	PCB 180	PCB 187	PCB 195	PCB 206	PCB 209	Hexachloro-benzene	γ-HCH
MW1M029	ND[c]	ND	ND	30.2 (0.2)	ND	ND	ND	ND	ND	ND	≤1	3.5 (0.2)
	ND	ND	ND	29.9 (0.1)	ND	ND	ND	ND	ND	ND	≤1	3.8 (0.3)
MW1Y030	ND	ND	ND	11.9 (0.1)	ND	ND	ND	ND	ND	ND	3.1 (0.1)	1.2 (0.1)
	ND	ND	ND	11.9 (0.2)	ND	ND	ND	ND	ND	ND	3.0 (0.1)	1.1 (0.1)
MW1Y044	ND	ND	ND	9.9 (0.1)	ND	ND	ND	ND	ND	ND	1.1 (0.1)	≤1
	ND	ND	ND	9.8 (0.1)	ND	ND	ND	ND	ND	ND	1.1 (0.1)	≤1
MW1M048	ND	ND	ND	79.4 (0.7)	ND	ND	ND	ND	ND	ND	1.6 (0.1)	1.3 (0.1)
	ND	ND	ND	80.3 (0.5)	ND	ND	ND	ND	ND	ND	1.5 (0.1)	1.2 (0.1)
MW1Y068	ND	ND	ND	16.7 (0.3)	ND	ND	ND	ND	ND	ND	≤1	≤1
	ND	ND	ND	17.0 (0.2)	ND	ND	ND	ND	ND	ND	≤1	≤1
MW1Y073	ND	ND	ND	12.8 (0.2)	ND	ND	ND	ND	ND	ND	15.1 (0.4)	≤1
	ND	ND	ND	13.1 (0.1)	ND	ND	ND	ND	ND	ND	15.3 (0.3)	≤1
MW2Y119	8.0 (0.1)	1.6 (0.2)	14.7 (0.7)	17.2 (0.6)	1.9 (0.2)	2.8 (0.2)	≤1	≤1	≤1	≤1	≤1	12.1 (0.6)
	8.6 (0.4)	1.4 (0.1)	13.0 (0.8)	15.8 (0.9)	1.6 (0.3)	3.3 (0.3)	≤1	≤1	≤1	≤1	≤1	11.5 (0.4)
MW2Y129	3.0 (0.1)	≤1	5.6 (0.4)	9.8 (0.4)	3.7 (0.2)	5.3 (0.3)	5.5 (0.2)	≤1	≤1	≤1	≤1	0.4 (0.1)
	3.8 (0.2)	≤1	5.8 (0.3)	10.1 (0.6)	3.6 (0.2)	5.4 (0.2)	5.2 (0.2)	≤1	≤1	≤1	≤1	0.4 (0.1)
MW2M135	7.9 (0.4)	2.6 (0.2)	12.4 (0.6)	11.7 (0.8)	1.5 (0.1)	4.4 (0.3)	≤1	≤1	≤1	≤1	≤1	≤4
	8.0 (0.3)	2.6 (0.2)	12.9 (0.8)	12.4 (0.6)	1.4 (0.1)	4.4 (0.2)	≤1	≤1	≤1	≤1	≤1	≤4
MW2M137	20.4 (0.7)	≤1	11.2 (1.0)	11.1 (0.6)	1.4 (0.1)	2.7 (0.3)	≤1	≤1	≤1	≤1	≤1	1.0 (0.1)
	26.4 (0.8)	≤1	12.4 (0.8)	12.7 (1.2)	1.7 (0.1)	2.2 (0.1)	≤1	≤1	≤1	≤1	≤1	0.9 (0.1)
MW2Y155	2.6 (0.2)	2.8 (0.1)	8.5 (0.3)	10.3 (0.5)	1.3 (0.1)	2.3 (0.1)	4.4 (0.1)	≤1	≤1	≤1	≤1	1.6 (0.1)
	2.8 (0.1)	2.9 (0.1)	8.6 (0.4)	10.2 (0.4)	1.3 (0.1)	2.3 (0.3)	4.2 (0.3)	≤1	≤1	≤1	≤1	1.4 (0.1)

Table F.8. Concentrations of PCBs and chlorinated pesticides in bivalve samples from the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

Sample Identification[b]	PCB 118	PCB 128	PCB 138	PCB 153	PCB 170	PCB 180	PCB 187	PCB 195	PCB 206	PCB 209	Hexachloro-benzene	γ-HCH
MW2M163	75.7 (4.1)	12.9 (0.8)	98.0 (7.1)	101 (6)	2.5 (0.1)	9.7 (0.4)	24.6 (1.1)	≤1	≤1	≤1	≤1	≤1
	71.5 (3.3)	13.1 (0.5)	103 (6)	92.3 (4.1)	2.7 (0.1)	10.0 (0.5)	25.3 (0.9)	≤1	≤1	≤1	≤1	≤1
MW3M206	35.1 (0.6)	≤3	46.2 (1.1)	54.7 (0.9)	1.5 (0.1)	7.3 (0.2)	17.7 (0.4)	≤1	≤1	≤1	8.2 (0.1)	3.0 (0.1)
	36.3 (0.1)	≤4	47.3 (0.2)	56.3 (0.2)	1.5 (0.1)	7.2 (0.1)	18.4 (0.2)	≤1	≤1	≤1	8.4 (0.1)	3.1 (0.1)
MW3M208	109 (2)	≤4	131 (2)	135 (1)	4.9 (0.1)	31.7 (0.5)	45.4 (1.3)	0.5 (0.1)	0.5 (0.1)	0.6 (0.1)	18.5 (0.1)	2.4 (0.1)
	107 (2)	≤4	128 (2)	132 (1)	4.8 (0.1)	30.8 (0.7)	43.6 (0.5)	0.4 (0.1)	0.5 (0.1)	0.6 (0.1)	18.3 (0.2)	2.3 (0.1)
MW3M217	4.3 (0.1)	≤3	8.6 (0.2)	7.6 (0.3)	0.5 (0.1)	1.9 (0.1)	3.3 (0.2)	≤1	≤1	≤1	0.6 (0.1)	3.0 (0.1)
	4.3 (0.1)	≤3	8.3 (0.2)	8.1 (0.2)	0.5 (0.1)	2.0 (0.1)	2.9 (0.2)	≤1	≤1	≤1	0.8 (0.1)	3.0 (0.1)
MW3M222	2.9 (0.2)	≤3	3.1 (0.1)	3.3 (0.2)	0.5 (0.1)	1.3 (0.1)	1.4 (0.2)	≤1	≤1	≤1	0.7 (0.1)	4.1 (0.1)
	3.0 (0.2)	≤3	3.2 (0.1)	3.5 (0.1)	0.5 (0.1)	1.3 (0.1)	1.4 (0.1)	≤1	≤1	≤1	0.7 (0.1)	4.2 (0.1)
MW3M225	41.7 (0.6)	≤3	62.9 (1.8)	79.7 (0.5)	1.1 (0.1)	3.8 (0.1)	11.2 (0.7)	≤1	≤1	≤1	0.9 (0.1)	0.8 (0.1)
	39.7 (1.0)	≤3	60.0 (1.6)	75.7 (1.3)	1.0 (0.1)	3.5 (0.1)	10.1 (0.3)	≤1	≤1	≤1	0.8 (0.1)	0.8 (0.1)
MW3M240	6.9 (0.5)	≤3	17.5 (0.4)	18.5 (0.3)	0.8 (0.1)	3.5 (0.1)	4.6 (0.2)	0.6 (0.1)	≤1	≤1	1.6 (0.1)	1.8 (0.1)
	6.5 (0.2)	≤3	16.8 (0.5)	18.2 (0.4)	0.8 (0.1)	3.5 (0.1)	4.5 (0.2)	0.5 (0.1)	≤1	≤1	1.4 (0.1)	1.8 (0.1)

Table F.8. Concentrations of PCBs and chlorinated pesticides in bivalve samples from the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

Sample Identification[b]	Heptachlor Epoxide	*cis*-Chlordane	*trans*-Nonachlor	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
MW1M029	≤1	≤1	≤1	≤1	≤1	3.4 (0.2)	165 (5)	25.1 (0.5)	13.6 (0.3)	75.5 (0.6)	14.9 (0.5)
	≤1	≤1	≤1	≤1	≤1	3.7 (0.1)	160 (3)	25.9 (0.3)	14.1 (0.4)	76.9 (0.9)	14.4 (0.4)
MW1Y030	≤1	≤1	2.0 (0.2)	≤1	≤1	≤1	7.1 (0.3)	9.1 (0.3)	≤1	≤1	≤2
	≤1	≤1	2.3 (0.1)	≤1	≤1	≤1	7.5 (0.3)	9.6 (0.5)	≤1	≤1	≤1
MW1Y044	≤1	≤1	≤2	≤2	≤1	≤1	8.1 (0.3)	≤1	3.4 (0.4)	≤1	≤2
	≤1	≤1	≤2	≤2	≤1	≤1	8.5 (0.2)	≤1	2.9 (0.3)	≤1	≤3
MW1M048	5.7 (0.2)	12.1 (0.4)	6.0 (0.4)	≤2	≤1	≤1	28.6 (0.6)	≤7	≤1	≤1	≤1
	5.4 (0.3)	12.8 (0.5)	5.9 (0.3)	≤2	≤1	≤1	27.7 (0.5)	≤6	≤1	≤1	≤1
MW1Y068	≤1	≤1	≤1	≤2	≤1	≤1	10.9 (0.1)	≤1	10.4 (0.4)	17.4 (0.8)	≤1
	≤1	≤1	≤1	≤2	≤1	≤1	10.8 (0.1)	≤1	9.8 (0.5)	16.4 (0.5)	≤1
MW1Y073	≤1	3.3 (0.3)	2.4 (0.1)	≤1	≤1	≤1	14.2 (0.4)	14.1 (0.6)	23.1 (0.6)	13.9 (0.6)	≤1
	≤1	3.5 (0.1)	2.6 (0.1)	≤1	≤1	≤1	14.8 (0.2)	14.7 (0.6)	23.6 (0.4)	12.9 (0.4)	≤1
MW2Y119	1.4 (0.1)	5.9 (0.3)	5.9 (0.3)	14.0 (0.3)	≤1	12.1 (0.2)	59.8 (1.1)	25.0 (0.8)	87.1 (4.1)	2.8 (0.2)	≤1
	1.5 (0.1)	5.9 (0.2)	5.3 (0.4)	11.8 (0.8)	≤1	11.2 (0.3)	60.3 (1.3)	21.1 (0.9)	95.6 (3.2)	2.3 (0.1)	≤2
MW2Y129	0.6 (0.1)	2.7 (0.1)	2.7 (0.1)	2.3 (0.2)	≤1	0.8 (0.1)	31.4 (1.6)	≤1	3.9 (0.2)	≤1	15.4 (1.1)
	0.5 (0.1)	3.0 (0.2)	2.6 (0.1)	1.9 (0.1)	≤1	0.8 (0.1)	33.7 (1.0)	≤1	4.3 (0.2)	≤1	14.0 (0.8)
MW2M135	3.4 (0.2)	30.4 (1.1)	34.6 (1.1)	12.6 (0.6)	≤1	3.8 (0.1)	37.7 (0.6)	≤7	65.7 (4.1)	2.7 (0.2)	≤5
	4.6 (0.3)	29.5 (0.9)	33.2 (1.4)	12.7 (0.6)	≤1	3.6 (0.1)	38.7 (0.9)	≤10	63.9 (1.4)	2.7 (0.1)	≤7
MW2M137	≤1	4.7 (0.3)	4.2 (0.2)	4.7 (0.2)	≤1	9.8 (0.6)	107 (5)	3.8 (0.2)	10.0 (0.8)	2.3 (0.2)	5.2 (0.4)
	≤1	5.1 (0.2)	4.3 (0.2)	4.9 (0.3)	≤1	11.0 (1.1)	101 (3)	3.7 (0.2)	9.6 (0.6)	2.0 (0.1)	5.1 (0.3)
MW2Y155	6.4 (0.3)	7.7 (0.4)	6.4 (0.3)	8.3 (0.4)	≤1	56.7 (3.3)	57.6 (1.9)	40.3 (1.6)	44.1 (2.0)	≤1	6.7 (0.4)
	6.5 (0.3)	8.0 (0.5)	6.4 (0.4)	8.3 (0.6)	≤1	58.5 (2.1)	60.6 (3.0)	41.5 (1.1)	48.2 (1.9)	≤1	6.4 (0.2)

Table F.8. Concentrations of PCBs and chlorinated pesticides in bivalve samples from the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

Sample Identification[b]	Heptachlor Epoxide	*cis*-Chlordane	*trans*-Nonachlor	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
MW2M163	≤1	14.6 (0.3)	11.4 (0.4)	2.0 (0.1)	≤1	6.3 (0.3)	34.3 (1.0)	2.3 (0.1)	1.4 (0.1)	7.2 (0.3)	10.1 (0.3)
	≤1	13.7 (0.5)	11.5 (0.3)	1.9 (0.1)	≤1	6.9 (0.4)	34.3 (1.7)	1.9 (0.1)	1.5 (0.1)	7.9 (0.4)	9.7 (0.4)
MW3M206	8.2 (0.2)	32.7 (0.7)	35.0 (1.0)	10.4 (0.3)	≤1	2.6 (0.1)	44.5 (1.3)	10.9 (0.5)	73.8 (1.8)	1.6 (0.1)	5.0 (0.3)
	8.4 (0.2)	33.6 (0.6)	35.4 (0.4)	10.7 (0.3)	≤1	2.8 (0.1)	45.6 (0.6)	11.6 (0.6)	75.5 (0.9)	1.6 (0.1)	5.2 (0.1)
MW3M208	12.4 (0.2)	49.4 (0.5)	49.9 (0.2)	9.1 (0.1)	1.9 (0.1)	32.0 (0.5)	147 (2)	38.9 (0.5)	187 (3)	5.0 (0.2)	31.3 (0.2)
	12.2 (0.2)	48.6 (0.8)	49.4 (0.4)	9.0 (0.1)	1.9 (0.1)	31.6 (0.2)	143 (3)	38.2 (0.7)	184 (2)	4.9 (0.1)	30.7 (0.4)
MW3M217	3.2 (0.1)	6.3 (0.1)	3.5 (0.1)	5.2 (0.2)	≤1	1.1 (0.1)	29.7 (1.0)	≤1	6.1 (0.2)	2.9 (0.2)	1.9 (0.1)
	3.1 (0.1)	6.2 (0.1)	3.4 (0.1)	5.1 (0.1)	≤1	1.1 (0.1)	29.1 (0.4)	≤1	5.9 (0.2)	2.8 (0.1)	1.8 (0.1)
MW3M222	11.0 (0.2)	26.4 (0.3)	7.6 (0.1)	10.0 (0.1)	≤1	0.4 (0.1)	5.8 (0.1)	≤1	3.2 (0.1)	0.5 (0.1)	0.6 (0.1)
	11.4 (0.2)	27.6 (0.3)	7.9 (0.1)	10.4 (0.1)	≤1	0.5 (0.1)	5.9 (0.2)	≤1	3.3 (0.1)	0.5 (0.1)	0.7 (0.1)
MW3M225	11.5 (0.2)	3.5 (0.1)	4.0 (0.2)	2.1 (0.1)	≤1	≤1	6.8 (0.2)	0.4 (0.1)	5.2 (0.2)	0.9 (0.1)	2.8 (0.1)
	10.9 (0.2)	3.3 (0.1)	3.7 (0.2)	2.0 (0.1)	≤1	≤1	6.4 (0.2)	0.4 (0.1)	5.0 (0.2)	0.9 (0.1)	2.6 (0.1)
MW3M240	3.7 (0.2)	5.7 (0.1)	5.5 (0.1)	1.5 (0.1)	1.1 (0.1)	1.9 (0.1)	100 (3)	0.4 (0.1)	3.2 (0.1)	≤1	2.3 (0.1)
	3.6 (0.2)	5.6 (0.2)	5.4 (0.1)	1.5 (0.1)	1.2 (0.1)	1.8 (0.1)	94.9 (3.1)	0.4 (0.1)	3.1 (0.1)	≤1	2.3 (0.1)

[a] All chlorinated organic constituents determined by gas chromatography with electron capture detection (GC-ECD). Two extracts analyzed in triplicate; concentration value is the mean value, and uncertainties are ±1 standard deviation of a single measurement.

[b] MW1 samples were collected during 1985-1986; MW2 samples were collected during 1986-1987; MW3 samples were collected during 1987-1988.

[c] ND = Not Determined.

Table F.9 Concentrations of PCB congeners and chlorinated pesticides in sediment samples for the Mussel Watch Project (1985-1988) (ng/g dry wt.).

Sample Identification[b]	Site	Site Code	PCB 8	PCB 18	PCB 28	PCB 44	PCB 52	PCB 66	PCB 101	PCB 105	PCB 118
MW1S031	Confederate Reef,	GBCR	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Galveston Bay, TX		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S032	Imperial Beach,	SDIB	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	San Diego, CA		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S045	Fort Johnson,	CHPJ	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Charleston Harbor, SC		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S049	Dorchester Bay,	BHDB	≤1	8.0 (0.4)	1.2 (0.1)	≤1	≤1	≤1	10.8 (0.4)	6.5 (0.2)	10.2 (0.3)
	Boston Harbor, MA		≤1	9.1 (0.5)	1.4 (0.1)	≤1	≤1	≤1	11.4 (0.3)	6.9 (0.3)	10.7 (0.4)
MW1S067	Pascagoula Bay,	MSPB	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Mississippi Sound, MS		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S074	Mountain Point Bar,	CBMP	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Baltimore Harbor, MD		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S120	Kelly Island	DBKI	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Delaware Bay, DE		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S130	Gallinipper Point,	MBGP	≤1	≤1	≤1	≤1	≤1	≤1	2.3 (0.1)	≤1	≤1
	Matagorda Bay, TX		≤1	≤1	≤1	≤1	≤1	≤1	2.5 (0.2)	≤1	≤1
MW2S136	South Jetty,	MDSJ	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Marina Del Rey, CA		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S138	Balboa Channel Jetty,	NBBC	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Newport Bay, MA		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S156	Cedar Point Reef,	MBCD	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Mobile Bay, AL		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1

Table F.9 Concentrations of PCB congeners and chlorinated pesticides in sediment samples for the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.)..

Sample Identification[b]	Site	Site Code	PCB 8	PCB 18	PCB 28	PCB 44	PCB 52	PCB 66	PCB 101	PCB 105	PCB 118
MW2S164	Hingham Bay,	BHHB	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Boston Harbor, MA		≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S205	Hempstead Harbor,	LIHH	21.9 (0.3)	11.0 (0.3)	4.1 (0.1)	2.9 (0.1)	3.6 (0.1)	6.7 (0.1)	5.1 (0.1)	1.7 (0.1)	5.1 (0.1)
	Long Island Sound, NY		22.1 (0.4)	11.5 (0.2)	4.2 (0.1)	3.0 (0.1)	3.7 (0.1)	6.9 (0.1)	5.1 (0.1)	1.8 (0.1)	5.2 (0.1)
MW3S207	Lower Bay, Hudson Raritan	HRLB	8.3 (0.3)	3.8 (0.2)	8.7 (0.2)	3.9 (0.1)	4.9 (0.2)	7.6 (0.3)	4.6 (0.1)	1.6 (0.1)	3.9 (0.1)
	Estuary, NY		8.6 (0.1)	4.0 (0.1)	9.1 (0.1)	4.1 (0.1)	5.1 (0.1)	7.8 (0.1)	4.7 (0.1)	1.6 (0.1)	4.1 (0.1)
MW3W218	Coos Head, Coos Bay, OR	CBCH	8.4 (0.5)	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
			8.4 (0.3)	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S223	Neah Bay, Strait of	JFCF	5.5 (0.1)	2.4 (0.1)	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Juan de Fuca, WA		5.5 (0.1)	2.6 (0.1)	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S226	Goosebury Neck,	BBGN	7.0 (0.3)	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Buzzards Bay, MA		7.0 (0.1)	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S251	Tres Palacois Bay,	MBTP	5.1 (0.1)	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	Matagorda Bay, TX		5.1 (0.2)	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1

Table F.9 Concentrations of PCB congeners and chlorinated pesticides in sediment samples for the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

Sample Identification[b]	PCB 128	PCB 138	PCB 153	PCB 170	PCB 180	PCB 187	PCB 195	PCB 206	PCB 209	Hexachloro-benzene	γ-HCH	Heptachlor Epoxide
MW1S031	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S032	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S045	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S049	≤ 1	11.9 (0.5)	10.0 (0.3)	2.7 (0.1)	6.2 (0.3)	≤1	≤1	≤1	≤1	2.5 (0.2)	≤1	≤1
	≤ 1	12.9 (0.6)	10.4 (0.4)	2.7 (0.1)	6.4 (0.4)	≤1	≤1	≤1	≤1	3.0 (0.3)	≤1	≤1
MW1S067	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S074	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S120	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S130	≤ 1	2.6 (0.1)	3.4 (0.2)	≤1	1.3 (0.1)	1.6 (0.1)	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	2.8 (0.2)	3.7 (0.2)	≤1	1.3 (0.1)	1.7 (0.1)	≤1	≤1	≤1	≤1	≤1	≤1
MW2S136	≤ 1	1.1 (0.1)	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S138	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S156	≤ 1	≤1	1.1 (0.1)	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1

Table F.9 Concentrations of PCB congeners and chlorinated pesticides in sediment samples for the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

Sample Identification[b]	PCB 128	PCB 138	PCB 153	PCB 170	PCB 180	PCB 187	PCB 195	PCB 206	PCB 209	Hexachloro-benzene	γ-HCH	Heptachlor Epoxide
MW2S164	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S205	≤ 1	6.3 (0.1)	6.2 (0.1)	1.1 (0.1)	4.4 (0.1)	4.6 (0.1)	1.2 (0.1)	1.0 (0.1)	≤1	1.5 (0.1)	≤1	≤1
	≤ 1	6.4 (0.1)	6.6 (0.1)	1.1 (0.1)	4.4 (0.1)	4.7 (0.1)	1.3 (0.1)	1.0 (0.1)	≤1	1.5 (0.1)	≤1	≤1
MW3S207	≤ 1	4.8 (0.1)	4.7 (0.1)	1.2 (0.1)	4.0 (0.1)	≤1	1.4 (0.1)	≤1	1.8 (0.1)	≤1	≤1	≤1
	≤ 1	4.9 (0.1)	4.9 (0.1)	1.3 (0.1)	4.2 (0.1)	≤1	1.5 (0.1)	≤1	1.9 (0.1)	≤1	≤1	≤1
MW3W218	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S223	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S226	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S251	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1

Table F.9 Concentrations of PCB congeners and chlorinated pesticides in sediment samples for the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

Sample Identification[b]	*cis*- Chlordene	*trans*- Nonachlor	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
MW1S031	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S032	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S045	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S049	≤1	≤1	≤1	≤ 1	≤1	2.7 (0.1)	≤1	≤1	≤1	3.9 (0.2)
	≤1	≤1	≤1	≤ 1	≤1	3.0 (0.2)	≤1	≤1	≤1	4.8 (0.3)
MW1S067	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW1S074	≤1	1.3 (0.1)	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	1.1 (0.1)	1.6 (0.1)	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S120	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	2.9 (0.2)
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	3.8 (0.3)
MW2S130	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW2S136	≤1	≤1	≤1	≤ 1	2.6 (0.2)	11.5 (0.6)	1.5 (0.1)	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	3.8 (0.3)	13.1 (0.7)	2.2 (0.1)	≤1	≤1	≤1
MW2S138	≤1	≤1	≤1	≤ 1	≤1	5.4 (0.3)	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	5.6 (0.3)	≤1	≤1	≤1	≤1
MW2S156	≤1	≤1	≤1	≤ 1	≤1	1.2 (0.1)	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1

Table F.9 Concentrations of PCB congeners and chlorinated pesticides in sediment samples for the Mussel Watch Project (1985-1988) (ng/g dry wt.) (cont.).

Sample Identification[b]	*cis*-Chlordene	*trans*-Nonachlor	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
MW2S164	2.1 (0.1)	1.9 (0.1)	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	1.2 (0.1)
	1.1 (0.1)	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S205	2.0 (0.1)	1.6 (0.1)	≤1	≤ 1	4.4 (0.1)	5.0 (0.1)	1.4 (0.1)	6.3 (0.1)	1.2 (0.1)	1.7 (0.1)
	2.0 (0.1)	1.6 (0.1)	≤1	≤ 1	4.5 (0.1)	5.0 (0.1)	1.4 (0.1)	6.4 (0.1)	1.3 (0.1)	1.7 (0.1)
MW3S207	0.9 (0.1)	≤1	≤1	≤ 1	1.4 (0.1)	3.7 (0.1)	1.3 (0.1)	4.9 (0.1)	≤1	1.7 (0.1)
	1.0 (0.1)	≤1	≤1	≤ 1	1.4 (0.1)	3.8 (0.1)	1.3 (0.1)	5.1 (0.2)	≤1	1.8 (0.1)
MW3W218	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S223	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S226	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
MW3S251	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1
	≤1	≤1	≤1	≤ 1	≤1	≤1	≤1	≤1	≤1	≤1

[a] All PCB congener and chlorinated pesticides determined by gas chromatography with electron capture detection (GC-ECD). Two extracts analyzed in triplicate; concentrations value is the mean value, and uncertainties are (1 standard deviation of simple measurement.

[b] MW1 samples were collected during 1985-1986; MW2 samples were collected during 1986-1987; MW3 samples were collected during 1987-1988.

Table F.10. Concentration of PCB congeners and chlorinated pesticides in fish muscle tissue from 12 sites for the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.).

Sample Identification	Site	Site Code	Species	PCB 8	PCB 18	PCB 28	PCB 44	PCB 52	PCB 66	PCB 101	PCB 105
BS1F002	Dana Point, CA	DANOU	GL	1.4 (0.1)	≤1	2.7 (0.1)	3.0 (0.4)	3.9 (0.2)	9.5 (0.3)	13.6 (0.3)	5.0 (0.2)
				1.4 (0.1)	≤1	2.7 (0.1)	3.01 (0.4)	3.8 (0.2)	9.5 (0.4)	13.7 (0.2)	5.0 (0.2)
BS1F011	Elliott Bay, WA	ELLEB	PV	26.7 (1.5)	≤3	1.9 (0.1)	≤1	8.2 (0.1)	30.2 (1.3)	174 (4)	11.6 (0.8)
				26.3 (1.3)	≤2	2.0 (0.1)	≤1	8.2 (0.1)	37.1 (5.1)	176 (3)	12.1 (0.4)
BS1F014	Nisqually Reach, WA	PUGNR	PV	9.8 (0.3)	≤3	≤1	≤1	1.2 (0.1)	2.9 (0.2)	19.6 (0.4)	2.0 (0.1)
				10.2 (0.3)	≤4	≤2	≤1	1.2 (0.1)	2.7 (0.1)	19.8 (0.2)	2.3 (0.1)
BS1F020	Mississippi Delta, LA	MRDSP	MU	1.6 (0.1)	0.5 (0.1)	1.1 (0.1)	≤1	2.9 (0.1)	4.2 (0.2)	13.0 (1.3)	1.7 (0.2)
				1.7 (0.1)	0.6 (0.1)	1.0 (0.1)	≤1	2.7 (0.1)	3.8 (0.1)	11.8 (1.0)	1.6 (0.1)
BS1F023	Corpus Christi, TX	CCBLR	MU	4.1 (0.1)	1.1 (0.1)	3.2 (0.1)	0.7 (0.1)	1.6 (0.1)	2.8 (0.1)	6.1 (0.1)	0.6 (0.1)
				4.4 (0.3)	1.0 (0.1)	3.0 (0.1)	0.6 (0.1)	1.5 (0.1)	2.5 (0.1)	5.5 (0.2)	0.5 (0.1)
BS1F026	Charlotte Harbor, FL	LOTCH	LX	4.6 (0.1)	1.1 (0.1)	≤1	≤1	1.5 (0.1)	1.4 (0.1)	0.8 (0.1)	3.3 (0.1)
				4.8 (0.3)	1.1 (0.1)	≤1	≤1	1.4 (0.1)	1.3 (0.1)	0.7 (0.1)	3.2 (0.1)
BS1F084	Boston Harbor, MA	BOSPR	PA	≤8	≤5	6.5 (0.1)	≤1	4.0 (0.1)	29.9 (0.5)	65.8 (2.2)	35.4 (0.8)
				≤10	≤7	6.2 (0.1)	≤1	4.2 (0.1)	29.3 (0.7)	65.7 (1.1)	34.6 (0.3)
BS1F087	Buzzards Bay, MA	BUZWI	PA	3.4 (0.2)	0.7 (0.1)	6.5 (0.2)	2.4 (0.2)	6.5 (0.1)	22.8 (1.2)	34.7 (0.5)	18.3 (1.6)
				3.7 (0.3)	0.7 (0.1)	6.1 (0.1)	2.2 (0.1)	6.0 (0.1)	21.2 (1.2)	32.6 (0.4)	16.0 (0.2)
BS1F097	Bodega Bay, CA	BODNO	PS	≤7	≤4	1.6 (0.1)	≤1	1.4 (0.1)	2.9 (0.1)	18.1 (0.2)	2.6 (0.5)
				≤6	≤1	1.6 (0.1)	≤1	1.4 (0.1)	2.7 (0.1)	18.8 (0.2)	2.9 (0.2)
BS1F100	Southampton Shoal, CA	SFBSS	PS	1.2 (0.1)	0.5 (0.1)	1.9 (0.1)	1.9 (0.2)	3.6 (0.2)	6.5 (0.3)	7.6 (0.4)	0.6 (0.1)
				1.2 (0.1)	0.5 (0.1)	1.8 (0.1)	1.7 (0.1)	3.5 (0.1)	5.9 (0.1)	7.0 (0.1)	0.5 (0.1)
BS1F103	Santa Monica Bay, CA	SMBMB	PnV	≤8	≤5	3.7 (0.1)	≤1	5.2 (0.2)	17.1 (0.4)	71.6 (1.7)	12.1 (0.2)
				≤7	≤4	3.7 (0.1)	≤1	5.4 (0.2)	16.7 (0.5)	70.0 (3.1)	11.8 (0.3)
BS1F113	St. John's River, FL	SJRQI	MU	11.9 (0.2)	≤5	4.3 (0.1)	≤1	3.8 (0.1)	8.3 (0.2)	52.3 (1.0)	6.9 (0.4)
				12.2 (0.1)	≤8	4.3 (0.1)	≤1	3.8 (0.1)	8.4 (0.1)	52.7 (0.4)	6.5 (0.2)

Table F.10. Concentration of PCB congeners and chlorinated pesticides in fish muscle tissue from 12 sites for the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.) (cont.).

Sample Identification	PCB 118	PCB 128	PCB 138	PCB 153	PCB 170	PCB 180	PCB 187	PCB 195	PCB 206	PCB 209	Hexachloro benzene	γ-HCH
BS1F002	15.5 (0.5)	5.2 (0.1)	21.9 (0.3)	22.6 (0.8)	3.5 (0.2)	6.7 (0.2)	7.4 (0.4)	0.4 (0.1)	0.8 (0.1)	≤1	0.9 (0.1)	0.7 (0.1)
	15.7 (0.4)	5.3 (0.1)	21.9 (0.2)	22.3 (0.3)	3.5 (0.2)	6.8 (0.1)	7.5 (0.4)	0.4 (0.1)	0.8 (0.1)	≤1	0.9 (0.1)	0.7 (0.1)
BS1F011	35.5 (1.1)	5.9 (0.2)	96.8 (2.8)	115 (2)	22.5 (2.0)	46.0 (0.1)	37.3 (0.9)	4.6 (0.4)	3.6 (0.1)	1.3 (0.1)	3.9 (0.5)	0.3 (0.1)
	35.4 (0.1)	5.9 (0.3)	98.8 (1.2)	117 (1)	22.3 (1.9)	46.5 (0.3)	37.8 (0.4)	4.7 (0.3)	3.6 (0.1)	1.3 (0.1)	3.7 (0.2)	0.3 (0.1)
BS1F014	5.5 (0.1)	1.8 (0.1)	11.3 (0.2)	12.8 (0.2)	1.8 (0.1)	4.0 (0.1)	4.0 (0.1)	0.4 (0.1)	0.6 (0.1)	0.5 (0.1)	2.1 (0.1)	0.1 (0.1)
	5.4 (0.2)	1.8 (0.1)	11.5 (0.4)	12.7 (0.2)	1.7 (0.1)	4.0 (0.1)	4.1 (0.1)	≤1	0.6 (0.1)	0.5 (0.1)	2.1 (0.1)	0.1 (0.1)
BS1F020	13.3 (1.0)	2.8 (0.3)	31.8 (4.2)	41.1 (5.2)	8.1 (0.3)	20.3 (2.5)	13.6 (1.3)	1.2 (0.2)	1.6 (0.1)	1.2 (0.2)	0.5 (0.1)	≤1
	11.9 (0.8)	2.9 (0.4)	31.4 (4.6)	41.1 (2.4)	7.8 (0.6)	19.8 (1.3)	12.8 (0.8)	1.1 (0.1)	1.4 (0.2)	1.2 (0.1)	0.6 (0.1)	≤1
BS1F023	4.3 (0.1)	1.9 (0.1)	13.7 (0.4)	21.9 (0.7)	3.7 (0.4)	6.6 (0.2)	10.7 (0.4)	0.6 (0.1)	0.7 (0.1)	≤1	0.4 (0.1)	0.7 (0.1)
	3.8 (0.1)	1.8 (0.1)	13.4 (0.3)	21.1 (0.3)	3.5 (0.1)	6.3 (0.1)	10.3 (0.3)	0.5 (0.1)	0.5 (0.1)	≤1	0.4 (0.1)	0.7 (0.1)
BS1F026	1.3 (0.1)	≤1	2.9 (0.1)	3.3 (0.1)	1.7 (0.1)	1.0 (0.1)	1.1 (0.1)	≤1	≤1	≤1	1.1 (0.1)	3.4 (0.2)
	1.1 (0.1)	≤1	2.8 (0.2)	3.2 (0.1)	1.5 (0.1)	0.9 (0.1)	1.1 (0.1)	≤1	≤1	≤1	1.1 (0.1)	3.5 (0.1)
BS1F084	80.5 (2.5)	11.0 (0.3)	124 (1)	139 (1)	22.1 (0.3)	53.6 (0.5)	25.5 (0.7)	5.3 (0.1)	4.4 (0.2)	3.3 (0.2)	8.9 (0.2)	2.4 (0.1)
	79.5 (2.6)	10.8 (0.3)	126 (2)	142 (1)	22.0 (0.5)	53.0 (0.5)	25.9 (0.3)	5.2 (0.1)	4.5 (0.2)	3.2 (0.1)	8.4 (0.1)	2.5 (0.1)
BS1F087	82.0 (1.1)	12.8 (0.5)	110 (2)	122 (1)	13.9 (1.1)	19.3 (0.3)	14.3 (0.7)	1.0 (0.1)	1.8 (0.1)	0.7 (0.1)	0.7 (0.1)	≤1
	74.1 (0.5)	13.0 (1.2)	108 (1)	119 (1)	13.3 (0.4)	18.7 (0.5)	14.3 (0.1)	0.9 (0.1)	1.5 (0.1)	0.7 (0.1)	0.7 (0.1)	≤1
BS1F097	4.3 (0.2)	3.2 (0.1)	11.7 (0.3)	15.3 (0.5)	2.3 (0.1)	7.0 (0.2)	6.2 (0.1)	1.4 (0.1)	1.2 (0.1)	1.0 (0.1)	≤1	0.5 (0.1)
	4.5 (0.1)	3.3 (0.1)	11.9 (0.3)	15.9 (0.7)	2.3 (0.1)	7.1 (0.1)	6.3 (0.1)	1.4 (0.1)	1.1 (0.1)	1.1 (0.1)	≤1	0.5 (0.1)
BS1F100	4.4 (0.2)	2.9 (0.1)	16.1 (0.8)	16.7 (0.5)	5.0 (0.5)	9.1 (0.1)	8.6 (0.3)	0.7 (0.1)	0.7 (0.1)	0.5 (0.1)	5.8 (0.1)	≤1
	4.0 (0.1)	3.0 (0.2)	15.6 (0.2)	15.9 (0.4)	4.8 (0.2)	8.9 (0.1)	8.3 (0.4)	0.6 (0.1)	0.6 (0.1)	0.5 (0.1)	6.0 (0.1)	≤1
BS1F103	25.1 (0.1)	2.4 (0.1)	37.3 (0.6)	34.2 (1.2)	6.0 (0.3)	12.9 (0.4)	11.3 (0.3)	1.6 (0.1)	1.6 (0.1)	0.9 (0.1)	1.2 (0.1)	≤1
	25.1 (0.1)	2.7 (0.1)	36.9 (0.7)	33.8 (0.5)	5.9 (0.2)	13.1 (0.4)	11.3 (0.2)	1.8 (0.1)	1.8 (0.1)	1.0 (0.1)	1.4 (0.1)	≤1
BS1F113	10.3 (0.2)	2.1 (0.1)	27.5 (0.5)	28.6 (0.9)	6.7 (0.1)	12.4 (0.3)	≤1	1.3 (0.1)	1.3 (0.1)	≤1	9.0 (0.1)	4.5 (0.2)
	10.6 (0.6)	2.1 (0.1)	27.6 (0.6)	28.8 (0.7)	6.6 (0.3)	12.3 (0.2)	≤1	1.4 (0.1)	1.2 (0.2)	≤1	8.9 (0.1)	4.5 (0.3)

Table F.10. Concentration of PCB congeners and chlorinated pesticides in fish muscle tissue from 12 sites for the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.) (cont.).

Sample Identification	Heptachlor Epoxide	*cis*-Chlordene	*trans*-Nonachlor	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
BS1F002	≤1	6.0 (0.2)	11.5 (0.6)	1.3 (0.1)	≤1	46.4 (0.8)	804 (12)	1.7 (0.1	43.2 (2.7)	4.8 (0.2)	9.1 (0.7)
	≤1	5.7 (0.1)	11.4 (0.3)	1.2 (0.1)	≤1	47.8 (0.1)	817 (9)	1.7 (0.1	42.5 (1.9)	4.9 (0.1)	9.4 (0.1)
BS1F011	≤1	2.4 (0.1)	4.8 (0.3)	0.6 (0.1)	≤1	≤1	18.0 (0.5)	2.6 (0.2	23.2 (1.0)	≤1	2.6 (0.1)
	≤1	2.5 (0.1)	4.4 (0.3)	0.6 (0.1)	≤1	≤1	18.3 (0.3)	2.8 (0.1	22.3 (0.6)	≤1	2.8 (0.1)
BS1F014	0.1 (0.1)	0.6 (0.1)	1.1 (0.1)	0.3 (0.1)	≤1	≤1	5.8 (0.1)	≤1	≤1	≤1	0.5 (0.1)
	0.1 (0.1)	0.6 (0.1)	1.1 (0.1)	0.3 (0.1)	≤1	≤1	5.8 (0.1)	≤1	≤1	≤1	0.5 (0.1)
BS1F020	1.9 (0.1)	5.4 (0.4)	7.6 (0.6)	16.5 (1.2)	≤1	0.5 (0.1)	46.0 (5.6)	0.4 (0.1)	26.8 (2.4)	5.7 (0.4)	1.9 (0.2)
	1.7 (0.1)	5.2 (0.1)	7.5 (0.2)	16.3 (0.6)	≤1	0.5 (0.1)	43.1 (3.8)	0.4 (0.1)	26.1 (0.8)	5.7 (0.1)	1.9 (0.1)
BS1F023	0.5 (0.1)	3.1 (0.2)	5.3 (0.4)	3.4 (0.3)	≤1	≤1	27.0 (0.6)	≤1	5.4 (0.5)	4.7 (0.3)	1.8 (0.2)
	0.5 (0.1)	2.9 (0.0)	5.3 (0.1)	3.4 (0.1)	≤1	≤1	25.2 (0.8)	≤1	5.3 (0.1)	4.7 (0.1)	1.9 (0.1)
BS1F026	0.5 (0.1)	3.5 (0.2)	6.0 (0.4)	5.0 (0.3)	1.7 (0.1)	0.6 (0.1)	13.9 (0.3)	≤1	13.2 (1.0)	3.5 (0.3)	≤1
	0.5 (0.1)	3.4 (0.1)	6.1 (0.1)	5.0 (0.1)	1.5 (0.1)	0.6 (0.1)	13.2 (0.3)	≤1	13.2 (0.3)	3.7 (0.1)	≤1
BS1F084	0.6 (0.1)	33.0 (0.5)	57.5 (4.7)	3.3 (0.2)	1.8 (0.1)	12.2 (0.2)	27.6 (1.2)	≤1	≤1	22.3 (0.3)	6.3 (0.2)
	0.6 (0.1)	33.9 (0.4)	58.1 (3.4)	3.2 (0.1)	1.8 (0.1)	12.4 (0.5)	28.4 (0.9)	≤1	≤1	22.2 (0.2)	6.0 (0.2)
BS1F087	≤1	1.8 (0.2)	2.6 (0.3)	2.4 (0.2)	≤1	≤1	16.7 (0.4)	≤1	≤1	5.9 (0.6)	2.1 (0.3)
	≤1	1.7 (0.1)	2.5 (0.1)	2.3 (0.1)	≤1	≤1	16.1 (0.3)	≤1	≤1	5.9 (0.1)	2.2 (0.1)
BS1F097	≤1	1.8 (0.1)	3.1 (0.2)	0.7 (0.1)	0.7 (0.1)	1.2 (0.1)	32.4 (1.2)	≤1	≤1	1.6 (0.1)	1.7 (0.1)
	0.3 (0.1)	2.0 (0.1)	3.5 (0.2)	0.8 (0.1)	0.7 (0.1)	1.4 (0.1)	35.4 (0.7)	≤1	≤1	1.3 (0.1)	1.6 (0.1)
BS1F100	≤1	2.2 (0.2)	4.0 (0.3)	4.5 (0.3)	≤1	≤1	27.1 (0.2)	0.5 (0.1)	25.1 (1.8)	3.2 (0.2)	2.7 (0.2)
	≤1	2.1 (0.1)	4.0 (0.1)	4.4 (0.2)	≤1	≤1	25.9 (0.3)	0.5 (0.1)	24.9 (0.7)	3.2 (0.1)	2.7 (0.1)
BS1F103	2.0 (0.1)	3.6 (0.1)	8.6 (0.3)	≤1	≤1	5.4 (0.2)	88.6 (1.8)	≤1	≤1	≤1	≤1
	1.9 (0.1)	3.9 (0.2)	8.5 (0.2)	≤1	≤1	5.6 (0.2)	90.2 (1.3)	≤1	≤1	≤1	≤1
BS1F113	1.5 (0.1)	5.6 (0.2)	5.8 (0.2)	2.4 (0.1)	≤1	2.2 (0.1)	21.4 (0.5)	0.2 (0.1)	4.3 (0.1	≤1	0.1
	1.6 (0.1)	5.4 (0.1)	6.1 (0.2)	2.4 (0.2)	≤2	2.2 (0.1)	20.8 (0.7)	0.2 (0.1)	4.4 (0.3	≤1	0.1

[a] All chlorinated organic constituents determined by gas chromatography with electron capture detection (GC-ECD). Two extracts analyzed in triplicate; concentration value is the mean value, and uncertainties are ±1 standard deviation of a single measurement.

[b] ND = Not Determined.

Table F.11. Concentration of PCB congeners and chlorinated pesticides in fish liver tissue samples for 12 sites from the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.).

Sample Identification	Site	Site Code	Species	PCB 8	PCB 18	PCB 28	PCB 44	PCB 52	PCB 66	PCB 101	PCB 105
BS1L003	Dana Point, CA	DANOU	GL	ND[b]	ND	8.2 (0.6)	ND	14.2 (0.6)	ND	38.2 (2.2)	ND
				ND	ND	7.7 (0.5)	ND	15.5 (0.3)	ND	43.7 (1.0)	ND
BS1L012	Elliott Bay, WA	PUGEB	PV	ND	ND	≤2	ND	148 (11)	ND	632 (23)	ND
				ND	ND	≤3	ND	142 (6)	ND	648 (7)	ND
BS1L015	Nisqually Reach, WA	PUGNR	PV	ND	ND	≤7	ND	17.0 (2.0)	ND	48.2 (2.7)	ND
				ND	ND	≤6	ND	16.4 (1.3)	ND	50.1 (1.0)	ND
BS1L021	Mississippi Delta, LA	MRDSP	MU	ND	ND	≤1	ND	17.0 (0.5)	ND	55.2 (3.3)	ND
				ND	ND	≤1	ND	16.7 (0.2)	ND	54.2 (3.9)	ND
BS1L024	Corpus Christi, TX	CCBLR	MU	ND	ND	≤3	ND	≤3	ND	11.3 (1.2)	ND
				ND	ND	≤3	ND	≤3	ND	14.5 (1.4)	ND
BS1L027	Charlotte Harbor, FL	LOTCH	LX	ND	ND	4.6 (0.3)	ND	8.5 (0.4)	ND	9.5 (0.3)	ND
				ND	ND	5.0 (0.3)	ND	6.8 (0.4)	ND	12.7 (0.2)	ND
BS1L083	Boston Harbor, MA	BOSPR	PA	ND	ND	74.6 (1.3)	ND	4.2 (0.2)	ND	220 (15)	ND
				ND	ND	76.7 (2.7)	ND	4.4 (0.3)	ND	222 (8)	ND
BS1L086	Buzzards Bay, MA	BUZWI	PA	ND	ND	27.0 (2.0)	ND	7.5 (0.4)	ND	588 (11)	ND
				ND	ND	25.7 (0.6)	ND	7.3 (0.2)	ND	572 (13)	ND
BS1L098	Bodega Bay, CA	BODNO	PS	ND	ND	22.8 (2.1)	ND	≤1	ND	80 (4)	ND
				ND	ND	23.4 (0.4)	ND	≤1	ND	81 (1)	ND
BS1L101	Southampton Shoal, CA	SFBSS	PS	ND	ND	41.3 (3.3)	ND	≤1	ND	219 (17)	ND
				ND	ND	42.4 (1.6)	ND	≤1	ND	234 (6)	ND
BS1L104	Santa Monica Bay, CA	SMBMB	PnV	ND	ND	77.7 (1.0)	ND	3.7 (0.2)	ND	1177 (36)	ND
				ND	ND	75.3 (1.4)	ND	3.2 (0.2)	ND	1161 (15)	ND
BS1L112	St. John's River, FL	SRJQI	MU	ND	ND	31.7 (1.1)	ND	8.9 (0.6)	ND	118 (7)	ND
				ND	ND	31.3 (0.7)	ND	8.9 (0.4)	ND	133 (3)	ND

Table F.11. Concentration of PCB congeners and chlorinated pesticides in fish liver tissue samples from 12 sites from the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.) (cont.).

Sample Identification	PCB 118	PCB 128	PCB 138	PCB 153	PCB 170	PCB 180	PCB 187	PCB 195	PCB 206	PCB 209	Hexachloro benzene	γ-HCH
BS1L003	ND	ND	48.1 (1.4)	61.8 (3.9)	ND	21.0 (0.8)	ND	ND	ND	ND	8.6 (0.1)	2.7 (0.2)
	ND	ND	51.7 (4.0)	56.3 (2.7)	ND	19.0 (0.4)	ND	ND	ND	ND	8.4 (0.2)	2.9 (0.1)
BS1L012	ND	ND	203 (9)	1361 (12)	ND	677 (36)	ND	ND	ND	ND	≤1	≤1
	ND	ND	223 (8)	1300 (17)	ND	656 (43)	ND	ND	ND	ND	≤1	≤1
BS1L015	ND	ND	9.3 (0.2)	101 (2)	ND	29.6 (0.4)	ND	ND	ND	ND	19.6 (0.6)	2.8 (0.1)
	ND	ND	10.1 (0.5)	101 (10)	ND	33.4 (1.8)	ND	ND	ND	ND	20.1 (0.4)	2.6 (0.1)
BS1L021	ND	ND	86.2 (4.4)	78.3 (3.1)	ND	≤1	ND	ND	ND	ND	≤1	≤1
	ND	ND	79.2 (6.5)	67.6 (1.7)	ND	≤1	ND	ND	ND	ND	≤1	≤1
BS1L024	ND	ND	26.0 (1.3)	36.8 (1.9)	ND	11.5 (0.5)	ND	ND	ND	ND	≤1	≤1
	ND	ND	25.2 (2.0)	34.0 (0.8)	ND	11.2 (0.4)	ND	ND	ND	ND	≤1	≤1
BS1L027	ND	ND	9.2 (0.3)	10.0 (0.1)	ND	3.3 (0.2)	ND	ND	ND	ND	2.6 (0.2)	≤1
	ND	ND	8.7 (0.5)	9.6 (0.1)	ND	2.9 (0.2)	ND	ND	ND	ND	2.5 (0.2)	≤1
BS1L083	ND	ND	1190 (40)	31.7 (1.2)	ND	509 (21)	ND	ND	ND	ND	≤2	1.9 (0.3)
	ND	ND	1230 (20)	36.3 (0.8)	ND	507 (12)	ND	ND	ND	ND	≤1	1.8 (0.1)
BS1L086	ND	ND	2040 (40)	31.5 (0.9)	ND	286 (3)	ND	ND	ND	ND	≤2	3.7 (0.1)
	ND	ND	2040 (30)	31.5 (0.4)	ND	282 (4)	ND	ND	ND	ND	≤2	3.6 (0.1)
BS1L098	ND	ND	194 (2)	8.4 (0.3)	ND	98.2 (1.8)	ND	ND	ND	ND	≤1	13.3 (0.8)
	ND	ND	198 (3)	7.9 (0.3)	ND	101 (3)	ND	ND	ND	ND	≤1	12.9 (0.3)
BS1L101	ND	ND	534 (4)	17.2 (0.4)	ND	325 (3)	ND	ND	ND	ND	≤1	22.8 (1.7)
	ND	ND	532 (3)	17.2 (0.3)	ND	337 (2)	ND	ND	ND	ND	≤1	21.9 (0.4)
BS1L104	ND	ND	1780 (50)	50.5 (1.7)	ND	672 (3)	ND	ND	ND	ND	≤1	35.8 (3.3)
	ND	ND	1780 (60)	50.0 (1.2)	ND	659 (11)	ND	ND	ND	ND	≤1	33.4 (2.1)
BS1L112	ND	ND	103 (8)	5.5 (0.2)	ND	47.7 (1.0)	ND	ND	ND	ND	≤1	137 (2)
	ND	ND	95.2 (2.9)	5.7 (0.2)	ND	48.4 (1.6)	ND	ND	ND	ND	≤1	134 (1)

Table F.11. Concentration of PCB congeners and chlorinated pesticides in fish liver tissue samples from 12 sites from the National Benthic Surveillance Project(1985-1986) (ng/g dry wt.) (cont.).

Sample Identification	Heptachlor Epoxide	*cis*-Chlordene	*trans*-Nonachlor	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
BS1L003	≤1	17.2 (0.7)	36.0 (2)	9.2 (0.3)	≤2	76.0 (2.2)	1700 (50)	3.5 (0.2)	82.8 (5.8)	62.4 (3.3)	21.3 (0.4)
	≤1	19.4 (1.3)	39.0 (3)	10.5 (0.1)	≤2	66.6 (0.3)	1180 (50)	3.9 (0.3)	84.6 (3.2)	57.9 (2.7)	20.6 (1.2)
BS1L012	≤1	28.6 (1.1)	41.7 (0.8)	20.3 (0.3)	≤2	4.2 (0.1)	221 (11)	34.6 (1.2)	304 (5)	≤3	32.7 (0.8)
	≤1	26.9 (1.4)	45.5 (3.7)	20.0 (0.6)	≤2	4.5 (0.4)	198 (1)	33.3 (0.7)	305 (6)	≤2	33.8 (3.5)
BS1L015	32.4 (2.5)	6.5 (0.1)	17.6 (0.4)	11.0 (0.2)	≤3	9.7 (0.2)	63.1 (3.2)	≤2	13.0 (0.3)	51.6 (2.3)	≤3
	27.1 (2.3)	6.8 (0.4)	15.8 (0.4)	11.9 (0.3)	≤3	9.3 (0.3)	67.2 (1.9)	≤4	13.0 (0.3)	53.7 (1.2)	≤2
BS1L021	≤1	20.6 (0.2)	31.2 (1.3)	67.7 (1.0)	≤1	4.3 (0.1)	176 (2)	≤1	111 (8)	34.5 (1.5)	≤1
	≤1	23.0 (1.7)	39.0 (0.9)	62.6 (2.2)	≤1	4.5 (0.4)	152 (4)	≤2	120 (6)	33.3 (1.0)	≤2
BS1L024	≤1	6.2 (0.3)	10.4 (0.1)	10.3 (0.3)	≤1	6.9 (0.1)	49.7 (3.2)	≤1	8.6 (0.4)	≤3	16.2 (0.4)
	≤1	6.3 (0.4)	9.9 (0.6)	10.3 (0.8)	≤2	6.3 (0.2)	51.4 (2.2)	≤2	7.9 (0.6)	≤2	16.0 (0.2)
BS1L027	≤1	7.2 (0.3)	10.9 (0.5)	11.6 (0.1)	2.0 (0.1)	2.5 (0.1)	37.5 (0.3)	≤1	4.8 (0.5)	25.0 (0.9)	≤1
	≤1	7.3 (0.3)	11.3 (0.3)	10.9 (0.2)	1.8 (0.1)	2.2 (0.1)	34.9 (2.6)	≤1	5.2 (0.3)	25.7 (0.2)	≤1
BS1L083	13.1 (0.6)	222 (3)	450 (23)	77.0 (3.7)	≤1	88.5 (1.0)	576 (14)	4.7 (0.4)	50.9 (4.5)	618 (17)	49.5 (1.2)
	13.4 (0.4)	208 (10)	459 (17)	80.4 (0.7)	≤1	87.8 (0.9)	549 (2)	4.9 (0.2)	50.3 (0.8)	631 (6)	48.5 (0.7)
BS1L086	19.9 (1.8)	33.4 (1.4)	62.1 (2.7)	86.9 (0.6)	≤1	144 (3)	491 (10)	3.6 (0.3)	34.8 (0.7)	255 (9)	21.1 (1.0)
	21.1 (0.4)	33.0 (3.4)	61.7 (1.4)	87.5 (1.0)	≤1	146 (1)	498 (4)	3.2 (0.1)	38.1 (1.3)	258 (10)	20.6 (0.7)
BS1L098	31.7 (1.2)	39.4 (2.5)	101 (7)	62.1 (3.0)	≤3	12.3 (1.6)	943 (31)	≤3	205 (5)	469 (14)	35.5 (0.7)
	33.9 (3.8)	37.7 (2.9)	99.3 (4.3)	62.7 (0.4)	≤1	13.3 (1.4)	926 (5)	≤2	207 (4)	459 (17)	35.7 (1.9)
BS1L101	17.4 (0.6)	74.9 (1.6)	168 (4)	290 (4)	7.4 (0.4)	9.7 (0.3)	891 (26)	44.2 (2.4)	462 (11)	≤ 3	71.0 (1.3)
	15.7 (0.5)	71.2 (1.5)	170 (7)	291 (5)	7.4 (0.4)	9.7 (0.2)	905 (15)	45.7 (0.7)	464 (7)	≤ 2	68.8 (0.9)
BS1L104	15.4 (1.1)	203 (8)	794 (15)	88.8 (0.8)	25.3 (0.5)	1150 (20)	8130 (100)	227 (10)	2030 (90)	2040 (120)	57.9 (3.1)
	15.6 (0.5)	205 (10)	801 (5)	91.4 (1.2)	25.2 (2.8)	1140 (10)	8190 (20)	219 (5)	2140 (60)	2030 (20)	57.7 (1.1)
BS1L112	101 (5)	152 (8)	193 (16)	271 (13)	4.4 (0.4)	25.6 (2.6)	411 (11)	36.4 (3.6)	582 (9)	637 (8)	1250 (20)
	101 (4)	149 (1)	194 (5)	278 (3)	4.5 (0.2)	23.0 (0.4)	403 (8)	35.0 (2.1)	578 (8)	627 (5)	1240 (10)

[a] All chlorinated organic constituents determined by gas chromatography with electron capture detection (GC-ECD). Two extracts analyzed in triplicate; concentration value is the mean value, and uncertainties are ±1 standard deviation of a single measurement.

[b] ND = Not Determined.

Table F.12 Concentrations of PCB congeners and chlorinate pesticides in fish tissue (muscle and liver) and sediment from 12 sites from the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.).

Sample Identification[b]	Site	Species	PCB 8	PCB 18	PCB 28	PCB 44	PCB 52	PCB 66	PCB 101	PCB 105
BS1L003	Dana Point, CA	GL	ND	ND	8.0 (0.6)	ND	14.9 (0.8)	ND	41.0 (3.3)	ND
BS1F002			1.4 (0.1)	≤1	2.7 (0.1)	3.0 (0.4)	3.9 (0.2)	9.5 (0.3)	13.6 (0.3)	5.0 (0.3)
BS1S001			ND	ND	ND	ND	ND	ND	18.0 (1.0)	ND
BSIL012	Elliott Bay, WA	PV	ND	ND	≤3	ND	145 (10)	ND	640 (19)	ND
BS1F011			26.5 (1.5)	ND	1.9 (0.1)	≤1	8.2 (0.1)	33.6 (5.5)	175 (4)	11.9 (0.7)
BS1S010			ND	ND	ND	ND	ND	ND	24.1 (0.4)	ND
BS1L015	Nisqually Reach, WA	PV	ND	ND	ND	ND	16.7 (1.7)	ND	49.1 (2.3)	ND
BS1F014			10.0 (0.3)	≤4	≤7	≤1	1.2 (0.1)	2.8 (0.2)	19.7 (0.4)	2.2 (0.2)
BS1S013			ND	ND	≤1	ND	ND	ND	≤1	ND
BS1L021	Mississippi Delta, LA	MU	ND	ND	≤1	ND	16.8 (0.4)	ND	54.7 (3.6)	ND
BS1F020			1.7 (0.1)	≤1	1.0 (0.1)	0.4 (0.1)	2.8 (0.1)	4.0 (0.3)	12.4 (1.4)	1.7 (0.2)
BS1S019			ND	ND	ND	ND	ND	ND	9.3 (0.2)	ND
BS1L024	Corpus Christi, TX	MU	ND	ND	≤3	ND	≤4	ND	12.9 (2.1)	ND
BS1F023			4.2 (0.2)	1.0 (0.1)	3.1 (0.2)	0.7 (0.1)	1.5 (0.1)	2.7 (0.2)	5.8 (0.3)	0.6 (0.1)
BS1S022			ND	ND	ND	ND	ND	ND	51.9 (3.5)	ND
BS1L027	Charlotte Harbor, FL	LX	ND	ND	4.8 (0.3)	ND	7.6 (0.9)	ND	11.1 (1.6)	ND
BS1F026			4.7 (0.2)	≤1	≤1	≤1	1.5 (0.1)	1.3 (0.1)	0.7 (0.1)	0.3 (0.1)
BS1S025			0.2	≤1	≤1	≤1	≤1	≤1	≤1	≤1
BS1L083	Boston Harbor, MA	PA	ND	ND	75.7 (2.4)	ND	4.3 (0.3)	ND	221 (12)	ND
BS1F084			≤10	≤7	6.3 (0.2)	≤1	4.1 (0.1)	29.6 (0.7)	65.7 (1.9)	35.0 (0.8)
BS1S085			3.1 (0.1)	1.3 (0.1)	5.6 (0.1)	1.8 (0.1)	11.4 (0.3)	6.0 (0.4)	4.2 (0.1)	2.4 (0.1)
BS1L086	Buzzards Bay, MA	PA	ND	ND	26.4 (1.6)	ND	7.4 (0.3)	ND	580 (14)	ND
BS1F087			3.6 (0.3)	0.7 (0.1)	6.3 (0.3)	2.3 (0.2)	6.2 (0.3)	22.0 (1.6)	33.6 (1.2)	17.2 (1.8)
BS1S088			≤1	≤1	1.0 (0.1)	0.8 (0.1)	3.3 (0.1)	1.3 (0.1)	1.8 (0.1)	0.7 (0.1)

Table F.12 Concentrations of PCB congeners and chlorinate pesticides in fish tissue (muscle and liver) and sediment from 12 sites from the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.) (cont)..

Sample Identification[b]	Site	Species	PCB 8	PCB 18	PCB 28	PCB 44	PCB 52	PCB 66	PCB 101	PCB 105
BS1L098	Bodega Bay, CA	PS	ND	ND	23.1 (1.5)	ND	≤1	ND	80.4 (2.9)	ND
BS1F097			≤7	≤1	1.6 (001)	≤1	1.4 (0.1)	2.8 (0.1)	18.5 (0.5)	2.7 (0.5)
BS1S099			0.3	≤1	≤1	≤1	≤1	≤1	≤1	≤1
BS1L101	Southampton Shoal, CA	PS	ND	ND	41.8 (2.7)	ND	0.8 (0.1)	ND	226 (15)	ND
BS1F100			1.2 (0.1)	0.5 (0.1)	1.9 (0.1)	1.8 (0.2)	3.6 (0.2)	6.2 (0.4)	7.3 (0.5)	0.5 (0.1)
BS1S102			≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1
BS1L104	Santa Monica Bay, CA	PnV	ND	ND	76.5 (1.7)	ND	3.5 (0.3)	ND	1169 (29)	ND
BS1F103			≤8	≤5	3.7 (0.1)	≤1	5.3 (0.2)	16.9 (0.5)	70.8 (2.9)	12.0 (0.3)
BS1S105			0.1	≤1	0.4 (0.1)	0.7 (0.1)	2.2 (0.1)	2.6 (0.2)	1.4 (0.1)	1.4 (0.1)
BS1L112	St. John's River, FL	MU	ND	ND	31.5 (0.9)	ND	8.9 (0.5)	ND	125 (9)	ND
BS1F113			12.0 (0.3)	≤7	4.3 (0.1)	≤1	3.8 (0.1)	8.3 (0.2)	52.5 (0.8)	6.7 (0.4)
BS1S111			1.4 (0.1)	≤1	1.6 (0.1)	0.5 (0.1)	3.0 (0.1)	1.9 (0.1)	1.9 (0.1)	0.3 (0.1)

Table F.12 Concentrations of PCB congeners and chlorinate pesticides in fish tissue (muscle and liver) and sediment from 12 sites from the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.) (cont.).

Sample Identification[b]	PCB 118	PCB 128	PCB 138	PCB 153	PCB 170	PCB 180	PCB 187	PCB 195	PCB 206	PCB 209	Hexachloro-benzene
BS1L003	ND	ND	49.9 (3.5)	59.1 (4.3)	ND	20.0 (1.2)	ND	ND	ND	ND	8.5 (0.1)
BS1F002	15.6 (0.5)	5.3 (0.2)	21.9 (0.3)	22.4 (0.7)	3.5 (0.2)	6.8 (0.2)	7.4 (0.5)	0.4 (0.1)	0.8 (0.1)	≤1	0.9 (0.1)
BS1S001	ND	ND	ND	13.7 (0.4)	ND	ND	ND	ND	ND	ND	6.5 (0.3)
BSIL012	ND	ND	213 (13)	1330 (34)	ND	666 (41)	ND	ND	ND	≤1	≤1
BS1F011	35.4 (0.8)	5.9 (0.3)	97.8 (2.6)	116 (2)	22.4 (2.2)	46.3 (0.5)	37.5 (0.8)	4.7 (0.2)	3.6 (0.1)	1.3 (0.1)	3.8 (0.4)
BS1S010	ND	ND	ND	33.3 (0.4)	ND	ND	ND	ND	ND	≤5	≤2
BS1L015	ND	ND	9.7 (0.5)	101 (7)	ND	31.5 (2.3)	ND	ND	ND	ND	19.9 (0.5)
BS1F014	5.5 (0.2)	1.8 (0.1)	11.4 (0.3)	12.8 (0.2)	1.7 (0.1)	4.0 (0.1)	4.1 (0.1)	≤1	0.5 (0.1)	0.5 (0.1)	2.1 (0.1)
BS1S013	ND	ND	5.2 (0.2)	ND	ND	ND	ND	ND	ND	≤2	≤1
BS1L021	ND	ND	82.7 (6.6)	72.9 (5.9)	ND	≤1	ND	ND	ND	ND	≤1
BS1F020	12.6 (1.3)	2.8 (0.4)	31.6 (5)	41.1 (4.5)	7.9 (0.5)	20.0 (2.2)	13.2 (1.3)	1.2 (0.2)	1.5 (0.2)	1.2 (0.2)	0.6 (0.1)
BS1S019	ND	ND	ND	6.6 (0.1)	ND	ND	ND	ND	ND	ND	10.3 (0.3)
BS1L024	ND	ND	25.6 (1.7)	35.4 (2.0)	ND	11.3 (0.5)	ND	ND	ND	ND	≤1
BS1F023	4.0 (0.2)	1.8 (0.1)	13.6 (0.4)	21.5 (0.8)	3.6 (0.3)	6.4 (0.2)	10.5 (0.4)	0.5 (0.1)	0.6 (0.1)	≤1	0.4 (0.1)
BS1S022	ND	ND	ND	58.0 (3.1)	ND	ND	ND	ND	ND	ND	≤14
BS1L027	ND	ND	8.9 (0.5)	9.8 (0.2)	ND	3.1 (0.3)	ND	ND	ND	ND	2.6 (0.2)
BS1F026	1.2 (0.1)	0.5 (0.1)	2.9 (0.1)	3.2 (0.1)	0.6 (0.1)	0.9 (0.1)	1.1 (0.1)	≤1	≤1	≤1	1.1 (0.1)
BS1S025	≤1	≤1	0.2	≤1	0.1	≤1	≤1	≤1	≤1	≤1	≤1
BS1L083	ND	ND	1210 (40)	34.0 (2.5)	ND	508 (17)	ND	ND	ND	ND	≤2
BS1F084	8.0 (2.9)	10.9 (0.3)	125 (2)	140 (2)	22.0 (0.4)	53.3 (0.6)	25.7 (0.1)	5.3 (0.1)	4.4 (0.2)	3.3 (0.2)	8.6 (0.3)
BS1S085	4.6 (0.3)	1.0 (0.1)	5.9 (0.1)	4.3 (0.1)	1.6 (0.1)	2.9 (0.1)	2.2 (0.1)	≤1	0.9 (0.1)	0.7 (0.1)	3.4 (0.1)
BS1L086	ND	ND	2040 (40)	31.5 (0.7)	ND	284 (4)	ND	ND	ND	ND	≤2
BS1F087	78.0 (4.4)	12.9 (1.0)	109 (2)	121 (2)	13.6 (0.9)	19.0 (0.6)	14.3 (0.5)	0.9 (0.1)	1.6 (0.2)	0.7 (0.1)	0.7 (0.1)
BS1S088	1.8 (0.1)	0.5 (0.1)	2.8 (0.1)	2.2 (0.1)	0.5 (0.1)	0.6 (0.1)	0.4 (0.1)	≤1	≤1	≤1	≤1

Table F.12 Concentrations of PCB congeners and chlorinate pesticides in fish tissue (muscle and liver) and sediment from 12 sites from the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.) (cont.).

Sample Identification[b]	PCB 118	PCB 128	PCB 138	PCB 153	PCB 170	PCB 180	PCB 187	PCB 195	PCB 206	PCB 209	Hexachloro benzene
BS1L098	ND	ND	196 (3)	8.2 (0.4)	ND	99.4 (2.7)	ND	ND	ND	ND	≤ 1
BS1F097	4.4 (0.2)	3.2 (0.1)	11.8 (0.3)	15.6 (0.7)	2.3 (0.1)	7.1 (0.2)	≤1	1.4 (0.1)	1.1 (0.1)	1.1 (0.1)	≤ 1
BS1S099	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤ 1	0.8 (0.1)
BS1L101	ND	ND	533 (4)	17.2 (0.4)	ND	331 (7)	ND	ND	ND	ND	≤ 1
BS1F100	4.2 (0.3)	3.0 (0.1)	15.8 (0.7)	16.3 (0.6)	4.9 (0.4)	9.0 (0.2)	8.4 (0.5)	0.6 (0.1)	0.7 (0.1)	0.5 (0.1)	5.9 (0.2)
BS1S102	≤1	0.2 (0.1)	0.2 (0.1)	≤1	0.2 (0.1)	≤1	≤1	≤1	≤1	≤ 1	≤ 1
BS1L104	ND	ND	1780 (60)	50.3 (1.5)	ND	666 (10)	ND	ND	ND	ND	≤ 1
BS1F103	25.1 (0.9)	2.5 (0.2)	37.1 (0.7)	34.0 (1.0)	5.9 (0.3)	13.0 (0.5)	11.3 (0.3)	1.7 (0.2)	1.7 (0.2)	0.9 (0.1)	1.3 (0.1)
BS1S105	2.5 (0.1)	0.6 (0.1)	2.8 (0.1)	2.1 (0.1)	0.7 (0.1)	1.4 (0.1)	0.8 (0.1)	≤1	0.4 (0.1)	0.3 (0.1)	≤ 1
BS1L112	ND	ND	98.9 (6.9)	5.6 (0.3)	ND	48.0 (1.4)	ND	ND	ND	ND	≤ 1
BS1F113	10.5 (0.5)	2.1 (0.1)	27.5 (0.6)	28.7 (0.9)	6.7 (0.2)	12.4 (0.3)	≤1	1.3 (0.1)	1.2 (0.1)	≤1	9.0 (0.1)
BS1S111	0.9 (0.1)	0.4 (0.1)	3.5 (0.1)	3.2 (0.1)	1.3 (0.1)	2.4 (0.1)	1.3 (0.1)	≤1	1.1 (0.1)	0.4 (0.1)	2.2 (0.1)

Table F.12 Concentrations of PCB congeners and chlorinate pesticides in fish tissue (muscle and liver) and sediment from 12 sites from the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.) (cont.).

Sample Identification[b]	γ-HCH	Heptachlor Epoxide	*cis*- Chlordane	*trans*- Nonachlor	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
BS1L003	ND	≤1	18.3 (1.5)	37.5 (3.0)	9.9 (0.7)	≤2	71.3 (4.9)	1442 (266)	3.7 (0.3)	83.7 (4.8)	60.2 (3.8)	20.9 (0.9)
BS1F002	0.7 (0.1)	0.2 (0.1)	5.9 (0.2)	11.5 (0.5)	1.2 (0.1)	≤1	47.1 (0.9)	811 (13)	1.7 (0.1)	42.9 (2.4)	4.8 (0.2)	9.2 (0.6)
BS1S001	ND	5.2 (0.1)	≤1	≤1	≤3	≤1	≤1	≤1	2.2 (0.8)	≤1	≤1	≤1
BSIL012	ND	≤1	27.8 (1.5)	43.6 (3.3)	20.2 (0.5)	≤2	4.4 (0.3)	209 (14)	34.0 (1.2)	304 (6)	≤2	33.3 (2.6)
BS1F011	0.3 (0.1)	≤1	2.5 (0.2)	4.6 (0.4)	0.6 (0.1)	≤1	≤1	18.2 (0.5)	2.7 (0.2)	22.7 (1.0)	≤1	2.7 (0.2)
BS1S010	ND	≤1	≤1	≤1	≤1	≤1	≤1	1.6 (0.1)	≤1	≤1	≤1	≤1
BS1L015	2.7 (0.1)	29.8 (3.5)	6.7 (0.4)	16.7 (1.0)	11.5 (0.5)	≤3	9.5 (0.3)	65.1 (3.4)	≤4	13.0 (0.3)	52.6 (2.1)	≤2
BS1F014	≤1	≤1	0.6 (0.1)	1.1 (0.1)	≤1	≤1	1.0 (0.1)	5.8 (0.1)	≤1	≤1	≤1	0.5 (0.1)
BS1S013	≤1	≤1	≤1	≤1	≤3	≤1	≤1	≤1	≤1	≤1	≤1	≤1
BS1L021	0.6 (0.1)	≤1	21.8 (1.7)	35.1 (4.1)	65.2 (3.1)	≤1	4.4 (0.3)	164 (12)	≤2	116 (8)		
BS1F020	≤1	1.8 (0.2)	5.3 (0.3)	7.5 (0.5)	16.4 (1.0)	≤1	0.5 (0.1)	44.6 (5.5)	0.4 (0.1)	26.5 (2.0)	5.7 (0.3)	1.9 (0.2)
BS1S019	0.6 (0.1)	≤1	≤1	≤1	≤2	≤1	≤1	≤1	≤1	≤1	≤1	≤1
BS1L024	≤1	≤1	6.2 (0.4)	10.1 (0.5)	10.3 (0.6)	≤1	6.6 (0.3)	50.6 (2.9)	≤2	8.3 (0.6)	≤2	16.1 (0.3)
BS1F023	0.7 (0.1)	0.5 (0.1)	3.0 (0.2)	5.3 (0.3)	3.4 (0.2)	≤1	≤1	26.1 (1.2)	≤1	5.4 (0.4)	4.7 (0.3)	1.8 (0.1)
BS1S022	≤5	≤3	≤2	≤2	≤9	≤6	≤6	≤3	≤1	≤1	≤1	≤1
BS1L027	0.7 (0.1)	≤1	7.3 (0.3)	11.1 (0.5)	11.2 (0.4)	1.9 (0.1)	2.3 (0.2)	36.2 (2.3)	≤1	5.0 (0.5)	25.4 (0.8)	≤1
BS1F026	3.5 (0.2)	0.5 (0.1)	3.5 (0.2)	6.0 (0.3)	5.0 (0.3)	1.6 (0.1)	0.5 (0.1)	13.5 (0.5)	≤1	13.2 (0.8)	3.6 (0.3)	≤1
BS1S025	≤1	≤1	0.2 (0.1)	0.1 (0.1)	≤1	≤1	≤1	≤1	≤1	1.9 (0.2)	≤1	≤1
BS1L083	1.9 (0.2)	13.3 (0.6)	215 (11)	455 (21)	78.7 (3.1)	≤1	88.2 (1.0)	563 (17)	4.8 (0.3)	50.6 (3.3)	624 (14)	49.0 (1.1)
BS1F084	2.5 (0.1)	0.6 (0.1)	33.4 (0.7)	57.8 (4.5)	3.2 (0.2)	≤1	12.3 (0.4)	28.0 (1.3)	≤1	≤1	22.3 (0.3)	6.1 (0.3)
BS1S085	≤1	≤1	≤1	≤1	≤1	≤1	≤1	1.1 (0.1)	≤1	5.1 (0.4)	≤1	≤1
BS1L086	3.7 (0.1)	20.5 (1.4)	33.2 (2.6)	61.9 (2.2)	87.2 (0.9)	≤1	145 (3)	494 (8)	3.4 (0.3)	36.5 (1.9)	256 (9)	20.8 (0.9)
BS1F087	≤1	≤1	1.7 (0.1)	2.6 (0.2)	2.3 (0.2)	≤1	≤1	16.4 (0.5)	≤1	≤1	5.9 (0.4)	2.1 (0.2)
BS1S088	≤1	≤1	≤1	≤1	≤1	≤1	≤1	0.4 (0.1)	≤1	1.3 (0.1)	0.3 (0.1)	≤1

Table F.12 Concentrations of PCB congeners and chlorinate pesticides in fish tissue (muscle and liver) and sediment from 12 sites from the National Benthic Surveillance Project (1985-1986) (ng/g dry wt.) (cont.).

Sample Identification[b]	γ-HCH	Heptachlor Epoxide	*cis*-Chlordane	*trans*-Nonachlor	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
BS1L098	13.1 (0.6)	32.8 (3.0)	38.6 (2.8)	100 (6)	62.4 (2.2)	≤3	12.8 (1.6)	934 (24)	≤3	206 (5)	464 (16)	35.6 (1.4)
BS1F097	0.5 (0.1)	≤1	1.9 (0.1)	3.3 (0.3)	0.8 (0.1)	0.7 (0.1)	1.3 (0.1)	33.9 (1.9)	≤1	≤1	1.5 (0.2)	1.6 (0.1)
BS1S099	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	≤1	3.2 (0.2)	≤1	≤1
BS1L101	22.4 (1.3)	16.5 (1.0)	73.0 (2.4)	169 (6)	290 (5)	7.4 (0.4)	9.7 (0.3)	898 (22)	44.9 (1.9)	463 (9)	≤3	69.9 (1.6)
BS1F100	≤1	≤1	2.1 (0.2)	4.0 (0.2)	4.5 (0.3)	0.4 (0.1)	0.3 (0.1)	26.5 (0.7)	0.5 (0.1)	25.0 (1.5)	3.2 (0.2)	2.7 (0.2)
BS1S102	≤1	≤1	≤1	≤1	≤1	≤1	≤1	0.4 (0.1)	≤1	4.5 (0.2)	≤1	≤1
BS1L104	34.6 (3.0)	15.5 (0.9)	204 (9)	797 (11)	90.1 (1.7)	25.2 (2.0)	1146 (17)	8160 (80)	223 (9)	2083 (95)	2035 (83)	57.8 (2.3)
BS1F103	≤1	2.0 (0.1)	3.7 (0.2)	8.5 (0.3)	≤1	≤1	5.5 (0.2)	89.4 (1.9)	≤1	≤1	≤1	≤1
BS1S105	≤1	≤1	0.4 (0.1)	0.1	0.1	0.7 (0.1)	1.7 (0.1)	13.5 (0.4)	0.6 (0.1)	5.7 (0.4)	0.3 (0.1)	0.1
BS1L112	136 (2)	101 (4)	151 (6)	194 (12)	274 (10)	4.4 (0.4)	24 (2)	407 (10)	35.7 (3.0)	580 (9)	632 (8)	1241 (16)
BS1F113	4.5 (0.3)	1.6 (0.1)	5.5 (0.2)	6.0 (0.3)	2.1 (0.90)	≤1	2.2 (0.1)	21.1 (0.8)	≤1	4.4 (0.3)	≤1	≤1
BS1S111	≤1	≤1	1.7 (0.1)	0.7 (0.1)	0.7 (0.1)	1.3 (0.1)	≤1	0.8 (0.1)	2.7 (0.1)	10.9 (0.5)	1.0 (0.1)	≤1

[a] All chlorinated organic constitutents analyzed by gas chromatography with electron capture detection (GC-ECD). Two extracts analyzed in triplicate; concentration value is the mean value, and uncertainties are (1 standard deviation of a single measurement.

[b] Sample from the same site are listed in order of fish liver (BS1L...); fish muscle (BS1F...); sediment (BS1S...).

[c] ND = Not Determined.

Table F.13. Results of bivalve storage stability study for PCBs and chlorinated pesticides (ng/g dry wt.).

Sample Identification	Site Code	PCB 101	PCB 153	Hexachloro-benzene	γ-HCH	Heptachlor Epoxide	*cis*-Chlordane	*trans*-Nonachlor
MW1M029 B011 & B012[a]	SDIB	13.7 (0.8)	30.0 (0.6)	≤1	3.7 (0.1)	≤1	≤1	≤1
B016[b]		12.6 (0.6)	28.3 (1.5)	≤1	3.0 (0.1)	≤1	≤1	≤1
MW1Y030 B011 & B012	GBCR	10.2 (0.3)	11.9 (0.3)	3.1 (0.3)	1.2 (0.1)	≤1	≤1	2.2 (0.1)
B016		6.8 (0.3)	6.8 (0.1)	3.3 (0.1)	1.5 (0.1)	≤1	4.7 (0.2)	3.0 (0.2)
MW1Y044 B011 & B012	CHFJ	5.7 (0.3)	9.2 (0.3)	1.1	≤1	≤1	≤1	≤2
B013		5.6 (0.3)	9.8 (0.1)	1.1 (0.1)	≤1	≤1	6.6 (0.1)	4.3 (0.1)
MW1M048 B011 & B012	BHDB	93.0 (4.4)	79.7 (2.5)	1.5	1.3 (0.1)	5.5 (0.2)	12.4 (0.2)	6.1 (0.2)
B016		96.2 (4.6)	57.5 (0.9)	2.1 (0.1)	≤1	≤1	18.1 (0.5)	8.2 (0.4)
MW1Y068 B011 & B012	MSPB	11.3 (0.9)	16.9 (0.9)	≤1	≤1	≤1	≤1	≤1
B016		11.1 (0.4)	16.8 (0.4)	≤1	≤1	≤2	4.4 (0.1)	3.4 (0.1)
MW1M073 B011 & B012	CBMP	10.8 (0.9)	13.0 (0.2)	15.2 (0.1)	≤1	≤1	3.5 (0.1)	2.5 (0.1)
B016		9.6 (0.4)	10.5 (0.3)	≤1	≤1	≤1	4.0 (0.2)	2.8 (0.1)

Table F.13. Results of bivalve storage stability study for PCBs and chlorinated pesticides (ng/g, dry wt.) (cont.).

Sample Identification	Dieldrin	Mirex	2,4'-DDE	4,4'-DDE	2,4'-DDD	4,4'-DDD	2,4'-DDT	4,4'-DDT
MW1M029 B011 & B012[a]	≤1	≤1	3.6 (0.3)	163 (6)	25.6 (0.8)	12.0 (0.2)	76.0 (2.2)	14.7 (1.3)
B016[b]	≤2	≤1	≤1	161 (10)	20.6 (1.1)	13.9 (0.4)	7.6 (0.4)	≤2
MW1Y030 B011 & B012	≤1	≤1	≤1	7.3 (0.4)	9.4 (0.1)	≤2	≤1	≤2
B016	≤1	≤1	≤1	7.2 (0.5)	0.9 (0.1)	≤1	≤1	≤1
MW1Y044 B011 & B012	≤2	≤1	≤1	8.4 (0.8)	≤1	≤4	≤1	≤3
B013	2.0 (0.1)	≤1	≤1	7.3 (0.4)	≤1	3.1 (0.1)	≤1	≤1
MW1M048 B011 & B012	≤2	≤1	≤1	28.1 (1.0)	≤7	≤2	≤1	≤1
B016	1.9 (0.1)	≤1	5.0 (0.2)	29.2 (1.7)	4.9 (0.3)	≤1	≤1	≤1
MW1Y068 B011 & B012	≤2	≤1	≤1	10.8 (0.6)	≤1	≤1	≤1	≤1
B016	1.2 (0.1)	≤1	≤1	10.9 (0.7)	10.9 (0.3)	10.1 (0.1)	17.0 (0.3)	25.2 (1.3)
MW1M073 B011 & B012	≤1	≤1	≤1	14.6 (0.3)	14.6 (1.0)	≤1	13.6 (1.0)	≤1
B016	≤1	≤1	≤1	13.7 (0.7)	2.2 (0.2)	23.4 (2.0)	15.8 (1.9)	≤1

[a] B011 and B012 subsamples analyzed in 1986; results are average concentrations from the analysis of the two subsamples.
[b] B013 and B016 subsamples analyzed in 1989 after storage at LN_2 temperature for 36 months (Reanalysis).