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Assessment of Sediment Contamination in Casco Bay and Appendix A, 1992

The Geochemical and Environmental Research Group

Texas A & M University

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Environmental Research Group

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ASSESSMENT OF SEDIMENT CONTAMINATION IN CASCO BAY

Interpretive Report

and

Appendix A

· Quality Assurance Data Summaries

prepared by

GEOCHEMICAL AND ENVIRONMENTAL RESEARCH GROUP
AND THE DEPARTMENT OF OCEANOGRAPHY
TEXAS A&M UNIVERSITY
833 GRAHAM ROAD
COLLEGE STATION, TEXAS 77845

prepared for the

CASCO BAY ESTUARY PROJECT

FINAL REPORT

August 1992

TECHNICAL REPORT #92-157

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1.0 EXECUTIVE SUMMARY

In April 1990 Casco Bay was designated an estuary of national significance and included in EPA's National Estuary Program. Casco Bay's beauty and protected waters have made it a sought after location for residences, businesses, industry and recreation. The informed management of Casco Bay offers an opportunity to protect this important natural resource. As a first step, a study was designed to assess current contaminant levels in sediments throughout the bay. Sediments, as a repository of contaminants derived from human activities, provide a mechanism to assess the present status of contamination. While concentrations of contaminants do not indicate ecosystem health they do provide information on the importance of various contaminating processes, assess the areal extent of contamination, and provide for comparisons with other documented pollutant occurrences. Indicators of contamination from petroleum utilization (aliphatic and polycyclic aromatic hydrocarbons), agricultural activities (pesticides), urbanization (hydrocarbons, pesticides, trace metals), and industrialization (PCB's, hydrocarbons, trace metals) were measured at 65 locations within five regions of the bay.

The study consisted of several elements. Sediments were analyzed by state-of-the-art, highly sensitive methods compatible with NOAA Status & Trends techniques and other national environmental programs. A strict quality assurance project plan was instituted and adhered to throughout the program. Quality assurance is provided by an integrated management system that ensures that the data quality is commensurate with project objectives. Quality is assured by monitoring data from duplicate analyses, matrix spikes, surrogates, blanks, calibration checks, and standard reference materials. Pesticides, PCB's, polycyclic aromatic hydrocarbons (PAH), and selected trace metals (Cd, Cu, Pb, Cr, Ni, Ag, Zn, Fe, Hg, As, and Se) were measured. Historical reports of sediment contaminant analyses in Casco Bay were summarized and compared to the data produced by this study. Data comparisons were used to discern temporal changes and to evaluate Casco Bay in relation to other U.S. estuaries (primarily by comparison with NOAA National Status and Trends data). The concentrations of chemicals in Casco Bay sediments were compared with data on biological effects from Long and Morgan (1990) and the Washington State Sediment Quality Criteria. However, biological effects were not directly evaluated as part of this study.

One or more anthropogenic contaminants; trace metals, PCB's, DDT, chlordane, or polycyclic aromatic hydrocarbons (PAH); were detected at all locations sampled. The geographic distribution of contaminants is initially controlled by the frequency of occurrence of sources and secondarily by oceanographic conditions. The most widespread contaminants are associated with the utilization of petroleum and petroleum products. Polycyclic aromatic hydrocarbons (PAH) are the primary agent causing the toxic effects attributed to petroleum. Hydrocarbon contamination decreases in intensity with increasing distance from areas of highest population density. Localized sites of contamination are associated with cities, effluent outfalls, and spills. The predominant PAH in sediments adjacent to urban and industrialized locations are combustion-derived (i.e., car exhaust, urban run-off, etc.). Sediments from the Inner Bay region of Casco Bay; closest to Portland, ME; contain the highest levels of trace metals, PCBs, DDTs, and chlordane. For contaminants other than PAH (and these only at a few locations) and PCBs at one location, the levels of contamination in Casco Bay would not be considered high on a national basis. Variations in contaminant concentrations with time are difficult to assess based on historical information because of different methods of analysis, variations in the contaminants measured, and a lack of common station locations. However, in general the contaminant concentrations measured in this study are within the ranges reported in previous studies.

The high PAH concentrations in Inner Bay sediments are similar to other contaminated estuaries. PAH concentrations in Inner Bay sediments are nearly an order of magnitude lower than PAH concentrations thought to produce toxic responses in marine benthic organisms, i.e., total PAH ≥ 35,000 ppb. While historical data on biological effects are useful for qualitative comparisons it should be noted that toxicity is effected by factors other than concentration (i.e., biological availability). The mode of occurrence of PAH has been shown to vary widely depending on original source. Coal or soot associated combustion PAH are often tightly bound or occur in the interiors of particles. This mode of occurrence renders these

PAH largely inert to organisms. In contrast, equivalent concentrations of liquid hydrocarbons such as oil or creosote may induce toxicological effects. Biological availability is important in determining whether a contaminant evokes a biological response. A majority of PAH detected in Casco Bay are combustion related and most likely sequestered in fine particulates that tend to reduce apparent toxicity. The remainder of the PAH are weathered residues of petroleum contributed by spills and runoff. No direct measure of biological effect was measured in this study and literature data is provided as a qualitative comparison.

PCB concentrations above 400 ppb (dry wt.) have been shown to elicit a toxic response in some benthic organisms. Only one site from Casco Bay is above this threshold (Figure 1). DDT concentrations in Casco Bay sediments are also low compared to concentrations known to cause a toxic response in most benthic organisms. Chlordane concentrations are low on a national basis and should pose little or no threat of toxic biological effects. Again, biological effects are only inferred from previous literature studies and were not directly measured as part of this study. Other organochlorine pesticides including aldrin, BHC, dieldrin, endosulfan (I, II, and sulfate), endrin, endrin aldehyde, heptachlor, heptachlor epoxide, toxaphene, and hexachlorobenzene were found at low concentrations (<~0.25 ppb dry wt.).

While Casco Bay sediments would not be considered "high" in trace metal content it is important to assess whether these concentrations would be harmful to organisms. The concentrations of metals known to elicit toxic biological responses are much higher than those found in Casco Bay sediments. Metal concentrations in Casco Bay sediments are comparable to uncontaminated sediments. Ag, Cd, Pb, Zn, and Hg concentrations suggest that additions of metals from anthropogenic activities have occurred at a few locations. However, even the few elevated trace metal concentrations in Casco Bay are much lower than those of highly contaminated sediments from Hudson-Raritan, Long Island Sound, Boston Harbor and elsewhere. It is unlikely that the trace metals in Casco Bay sediments are causing toxic effects in marine organisms. As with PAH, biological availability must be

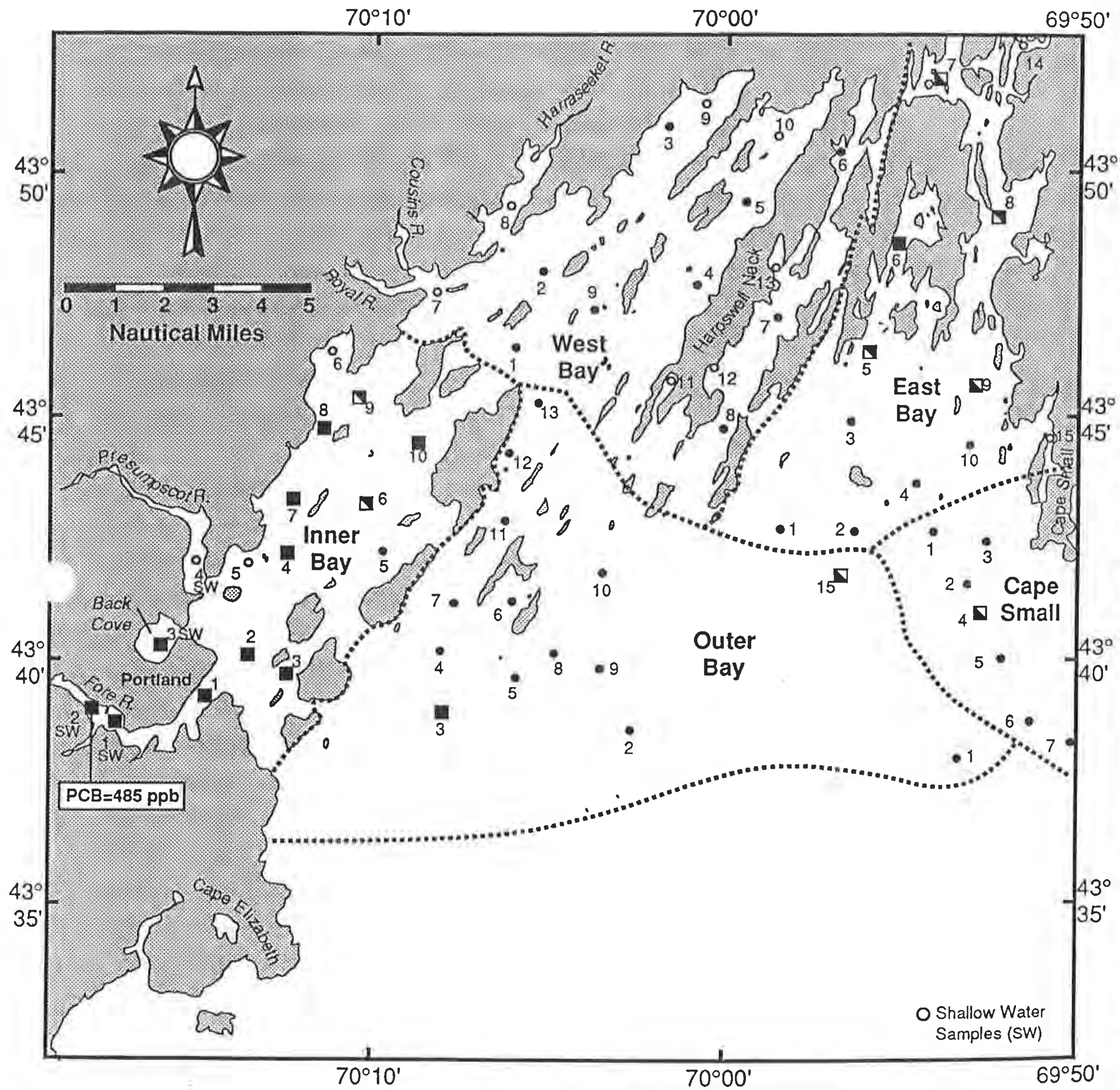

Figure 1. Location of the 25% highest organic (◪) and inorganic (◪) contaminants in sediments from Casco Bay.

considered when estimating the potential toxicity of trace metal contamination.

The highest 25% of organic contaminants were located at 10 Inner Bay, 2 Outer Bay, 3 East Bay, and 1 Cape Small sites (Figure 1). Eight of the ten most highly contaminated stations are located in the Inner Bay region including the six stations with the highest concentrations. The lowest levels of organic contaminants were in the Cape Small and West Bay regions. High levels of organic contaminants tend to co-occur at a single location. Locations with the 25% highest levels of inorganic contamination were at 12 Inner Bay, 3 East Bay, and 1 Outer Bay locations. Nine of the ten locations with the highest concentrations were in the Inner Bay region including the eight highest stations. Lowest metal concentrations occurred in the Cape Small region. Eleven stations were ranked in the highest 25% for both inorganic and organic contaminants (Figure 1). Nine of the eleven were Inner Bay locations.

Contaminants related to human activities are detectable throughout Casco Bay but in most cases occur at exceedingly low concentrations. A variety of processes release contaminants to Casco Bay and these chemicals have accumulated in bay sediments. The focus of contamination in the Inner Bay region is directly associated with population centers and industrialization. Localized contamination by various chemicals is generally far below levels suspected of evoking a toxic biological response.

2.0 INTRODUCTION AND BACKGROUND

2.1 Overview

Casco Bay has a wealth of natural resources and marine habitats that support a rich and diverse ecological web of life. Casco Bay is situated along the Atlantic Coast of Maine and encompasses the body of water enclosed by Cape Small to the northeast and Cape Elizabeth to the southwest (Figures 2 and 3). The bay proper is a 400 km^2 embayment of the Gulf of Maine which includes Portland Harbor, a major docking facility, and the principal fishing port of Maine (Larsen *et al.*, 1983a). More than 300 miles of coastline and nearly four hundred islands are encompassed by the bay (Larsen *et al.*, 1983a). Casco Bay's beauty, clean water, fish and waterfowl, and its deep and protected waters have made it a sought-after location for residences, businesses, industry and recreation. In April, 1990, Casco Bay was designated an estuary of national significance and was included in EPA's National Estuary Program (NEP). The NEP goal is to protect and improve water quality while enhancing living resources through the development of comprehensive conservation and management plans (CCMPs). CCMPs are designed to ensure the ecological integrity of designated estuaries. Anthropogenic activities may threaten the environmental integrity of Casco Bay. However, the informed management of Casco Bay's users offers an opportunity to restore as well as protect this important natural resource. This study provides an assessment of sediment contamination in Casco Bay. Spatial trends in contaminant concentrations among the five regions of the Bay are compared and temporal trends in contaminant concentrations are described based on historical data. Data generated by this study are intended as an aid to the resource agencies which formulate management decisions as well as a guide to future studies within Casco Bay.

2.1.1 Environmental Setting

Casco Bay consists of a complex system of narrow bays, islands and peninsulas oriented along a northeast axis (Figure 3). The geology of this region is controlled by the Paleozoic bedrock structure which was sculpted

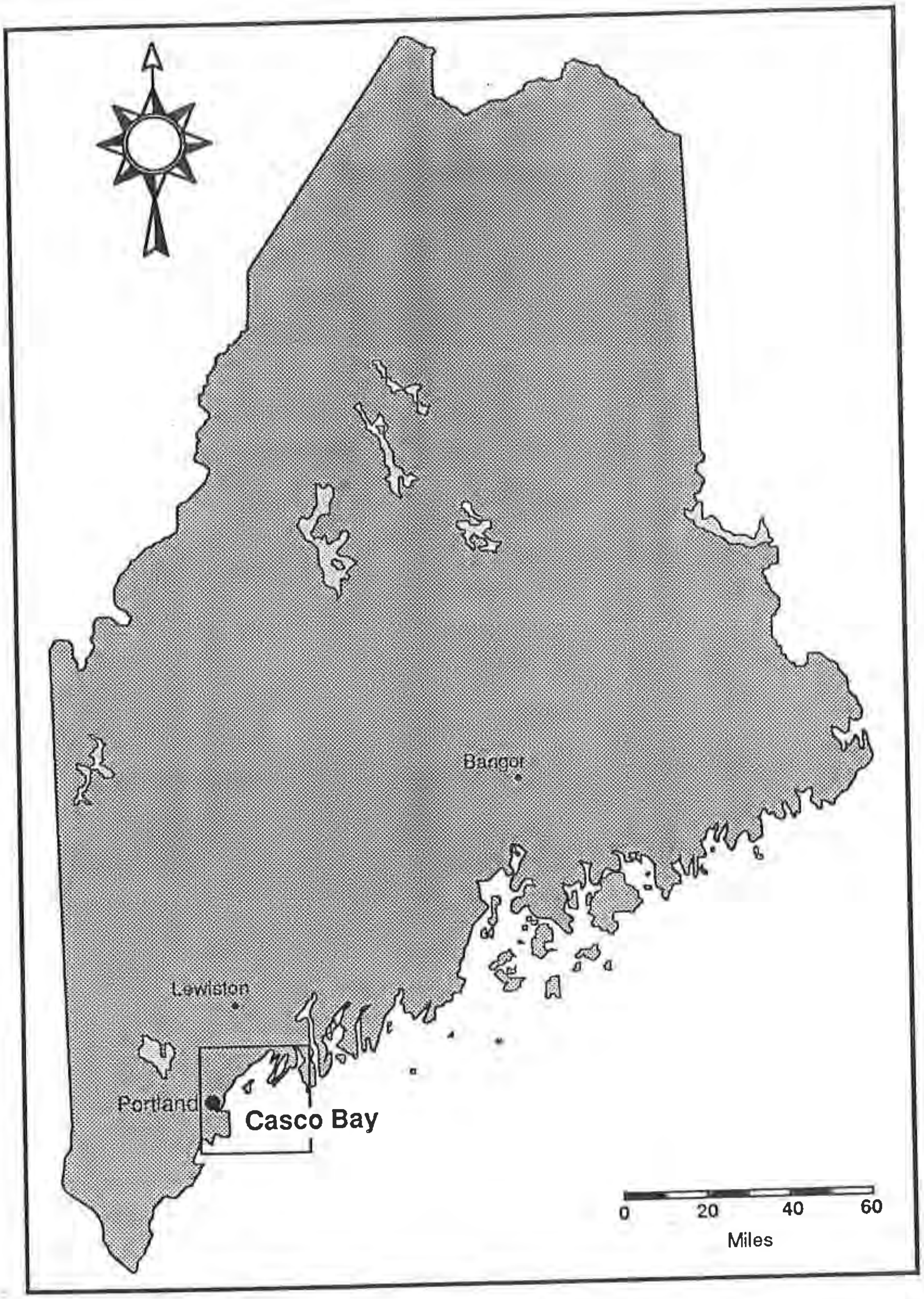

Figure 2. Location of Casco Bay within the state of Maine.

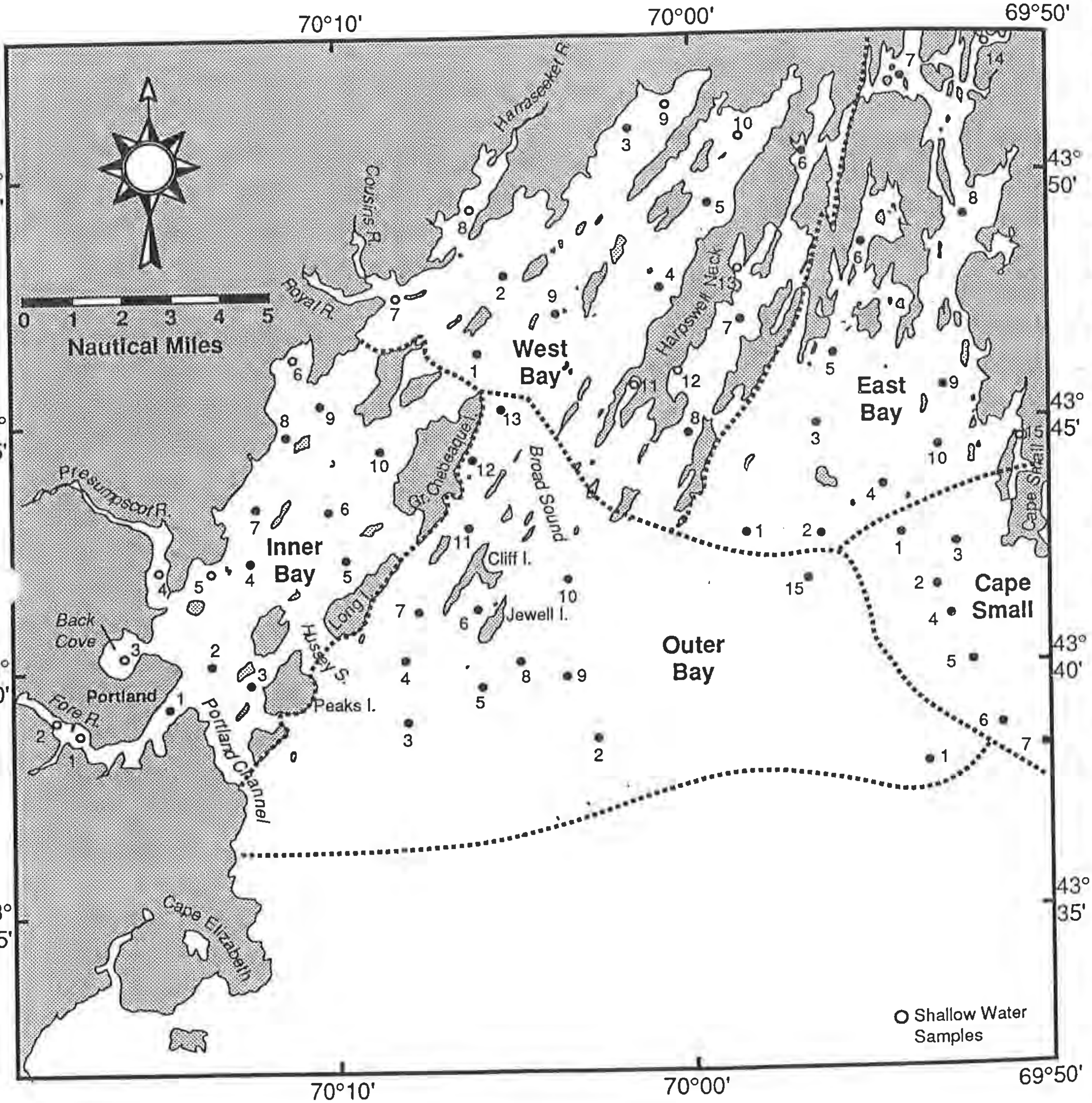

Figure 3. Sampling Sites for the 1991 Casco Bay sediment quality study.

by glacial ice movements at 70 to 90 degrees to the structural grain. The bedrock in this region is composed of high grade metasedimentary rocks (Kelley, 1987). Casco Bay can be subdivided into three zones on the basis of sedimentary accumulation; an inner, a middle and an outer zone (Belknap *et al.* 1987). The outer zone is characterized by virtually no sediment cover on bathymetric highs and no major sediment accumulation in bathymetric lows. This zone is strongly influenced by wave action which results in low sediment accumulation rates. Wave action is the dominant factor affecting the coastlines of the outer islands. The middle zone has a thicker till, evidence of glacial marine sediment (the Presumpscot formation) and Holocene mud. The inner zone is a sedimentary accumulation zone with thick Holocene muds, drowned stratified sands and only a slightly reworked Pleistocene section (Belknap *et al.*, 1987).

The climate in the Casco Bay region may be characterized as a humid northern temperate climate. Prevailing winds in the region are south-southwest in the summer, shifting to the north-northwest in the fall and winter. The prevailing southwest winds can produce localized upwelling in the deeper channel areas in the summer (Fefer and Schettig, 1980). This region can experience strong winter storm events with winds exceeding 100 km/hr from the northeast, persisting for several days (Kelley, 1987). The storm events often result in sediment resuspension and transport. The average coastal temperatures vary between 5 to 10°C; however, the winters can be quite severe and are cold enough for shallow estuaries, beaches, marshes and flats to freeze (Fefer and Schettig, 1980). The precipitation patterns are bimodal in nature with peaks in the spring and the fall.

Casco Bay receives a low freshwater discharge of about 40 m^3/sec (Belknap *et al.* 1987) from the Fore, Presumpscot, and Royal Rivers. It also appears that the Androscoggin and Kennebec Rivers, which discharge just north of Cape Small, influence Casco Bay. According to Fefer and Schettig (1980) sufficient fluvial discharge can develop a weak current which is generally in a southerly direction along the Maine coast. For this reason, the eastern boundary of the study area extends beyond Cape Small, to include a portion of the plume of the Kennebec and Androscoggin Rivers. The most densely populated portion of the Casco Bay watershed; the Portland metropolitan area, the Fore and Presumpscot Rivers, and Back Cove; has historically received the highest contaminant exposure.

2.1.2 Contaminants of Interest

Polycyclic aromatic hydrocarbon, aliphatic hydrocarbon, pesticide, PCB and selected trace metal contaminants can have multiple sources including petroleum usage, refineries, agricultural activities, industrialization, urbanization, spills, run-off, municipal sewage disposal, and shipping activities. Aliphatic and aromatic hydrocarbons are major constituents of both unprocessed and refined petroleum. Aromatic hydrocarbons account for most of the biological toxicity exhibited by petroleum. Natural populations of hydrocarbon oxidizing bacteria are widespread in the marine environment and are often highly efficient at remineralizing a portion of petroleum related compounds. However macromolecular constituents of petroleum, while relatively inert and non-toxic, may persist for years.

Synthetic chlorinated compounds have found wide usage as pesticides and specialty dielectric fluids in electrical equipment. The pesticides and PCBs measured as part of this study are all in a class of chemicals called organochlorines. These are chemicals produced by people by chlorinating organic compounds. As an example, PCB is an abbreviation for polychlorinated biphenyl. It is a generic name for the product of chlorination of biphenyl and aromatic hydrocarbon. PCBs are mixtures of some of the 209 possible chlorinated biphenyl congeners. PCBs are industrial compounds found in such products as dielectric and heat transfer fluids, fire retardants, paint additives, immersion oils, adhesives and others. The use and production of PCBs is banned in the U.S., but due to their persistence are still found in the environment. DDT is a chlorinated aromatic hydrocarbon that was extensively used as a pesticide during World War II and until 1970 when its use was banned in the U.S. In the environment DDT breaks down to form DDD and DDE which are also toxic. DDT is still produced in many countries including Mexico. Chlordane is a pesticide that was used for termite control. The mixture sold as chlordane (technical chlordane) contains many compounds, but the most abundant constituents are alpha-chlordane, gamma-chlordane, heptachlor, trans-nonachlor and cis-nonachlor, which were measured as part of this program. These compound concentrations are summed and reported as total chlordane. The production of chlordane in the U.S. was suspended in 1988. These are the major chlorinated hydrocarbons detected in sediments from Casco Bay. While both natural chemicals such as hydrocarbons and synthetic chlorinated compounds can degrade in the environment, PCBs are believed to be most persistent. These hydrophobic organics are also known to bioaccumulate and often biomagnify in organisms.

Trace metals in sediments have multiple anthropogenic sources as well as natural sources. All sediments have a natural background concentration of all metals, including metals known to be toxic such as Cd, Hg and Pb. Furthermore, this natural background concentration can vary by up to a factor of 100 from place to place depending on sediment mineralogy and grain size. The question, then, is not is a given metal present, but rather what concentration is present and is this an enrichment over the expected background amount? The ratio of the concentration of potentially toxic metals to that of Al or Fe is helpful in assessing anthropogenic influences because the ratios vary much less than absolute amounts under natural conditions. If metals are added by mining, metallurgy, plating, cleaning, or other human activities they will increase the metal to Al or Fe ratios because these latter elements are present in high concentrations in sediments and are unlikely to be perturbed by human activities.

2.1.3 Sources of Hydrocarbon in Coastal Areas

Aliphatic hydrocarbon (AH) compositions have been extensively used to estimate the relative importance of hydrocarbon sources. The use of aliphatic hydrocarbons as indicator compounds is based on the premise that recognizable assemblages of normal and branched alkanes are associated with specific sources. In nature however, few unique aliphatic end-members occur. Plankton produce simple mixtures of hydrocarbons dominated by n-$C_{15,17,19}$ and pristane (Clark and Blumer, 1967; Blumer *et al.*, 1970; Goutx and Saliot, 1980). Petroleum also contains these compounds but also contains nearly equal amounts of n-$C_{16,18,20}$ and phytane

(Farrington and Tripp, 1977; Farrington *et al.*, 1973). Straight chain biowaxes with 25,27,29 and 31 carbons have been used extensively as indicators of recent terrestrial or land-derived organic matter. Waxes derived from normal alkanes are also found in petroleum but are accompanied by near equal amounts of $n\text{-}C_{24,26,28,30}$. The presence of an unresolved complex mixtures (UCM) in the gas chromatographic analysis also indicates petroleum contamination. The UCM is primarily due to petroleum though in non-purified extracts a portion of the UCM may be biological in origin.

PAH are ubiquitous in sedimentary environments and can have multiple sources including petroleum, biosynthesis, early diagenesis, coal, combustion and immature/mature sediments. Molecular compositions have been extensively documented so that these various sources can be recognized based on the relative abundance of parent and alkylated homologues and ring number distributions (Hites *et al.*, 1980; LaFlamme and Hites, 1978; Wakeham *et al.*, 1980a,b). A clear association between petroleum and PAH has been demonstrated. Few aromatic hydrocarbons are synthesized by organisms and the complex mixture of alkylated homologues present in petroleum are only formed at elevated temperatures.

The incomplete combustion of fossil fuels has long been recognized as an important source of PAH to the environment (Youngblood and Blumer, 1975; LaFlamme and Hites, 1978). These combustion PAH can be derived from anthropogenic activities as well as natural events such as forest and range fires. In recent sediments, anthropogenic sources have been determined to be the primary source of combustion or pyrogenic PAH. In remote areas distant from urbanization, combustion PAH represent the majority of aromatic hydrocarbons present in sediments. An increase in sediment PAH around the turn of the century in sediment cores in the northern hemisphere has been attributed to the increased use of coal (Charles and Hites, 1987). In urban atmospheres, these combustion products are in the form of particulates that contain both aliphatic and aromatic hydrocarbons (Lee *et al.*, 1977). Combustion PAH can be deposited on the sea surface by dry deposition or rain-out of atmospheric particles, or transported to the ocean via runoff after deposition on land. Combustion PAH have been detected in marine sediments throughout the world

(LaFlamme and Hites, 1978; Youngblood and Blumer, 1975; Windsor and Hites, 1979; Wade *et al.*, 1988).

Combustion PAH can be recognized by their molecular compositions. Due to their high temperature formation the most stable highly condensed PAH are dominant. Compounds with three or more benzene rings, no alkylations, and a linear arrangement of ring structures are typical of combustion PAH (i.e., anthracene, fluoranthene, pyrene, benzanthracenes, benzofluoranthenes, chrysene, indenopyrenes, and dibenzanthracenes). Another feature in the dominance of non-alkylated compounds over alkylated compounds within a homologous series such as naphthalenes and phenanthrenes. In contrast alkylated PAH are usually the most abundant PAH in petroleum.

In summary hydrocarbons are a ubiquitous component of marine sediments derived from both natural and anthropogenic sources (Figure 4). The molecular composition of hydrocarbons is extremely useful in deconvoluting complex contaminant scenarios in marine systems.

2.2 Historical Data

Several sets of historical data are particularly germane to the present study (Figure 5). Larsen *et al.* (1983a,b,c) measured trace metals, PAH and PCBs in sediments from Casco Bay collected in 1980. A further study of sediment contaminants in Casco Bay was conducted as part of two multi-year studies by NOAA, the Benthic Surveillance Program and the Status and Trends Program. Sediments were collected between 1984 and 1988 at a few sites with selected sites occupied more than once. A more extensive suite of individual analytes were measured than in the 1980 study. However, the same general suite of contaminants were determined. A large database collected for the entire U.S. coast as part of NOAA's programs will be used to compare Casco Bay to other coastal bays and estuaries. In these studies fine-grained (<20% sand) sediment was collected at 232 sites along the U.S. Atlantic, Pacific and Gulf Coasts. At each site sediment was taken from three stations, one to 500 meters apart, for a total of 696 samples that were analyzed between 1986 and 1989 (O'Connor, 1990). Finally two sediment

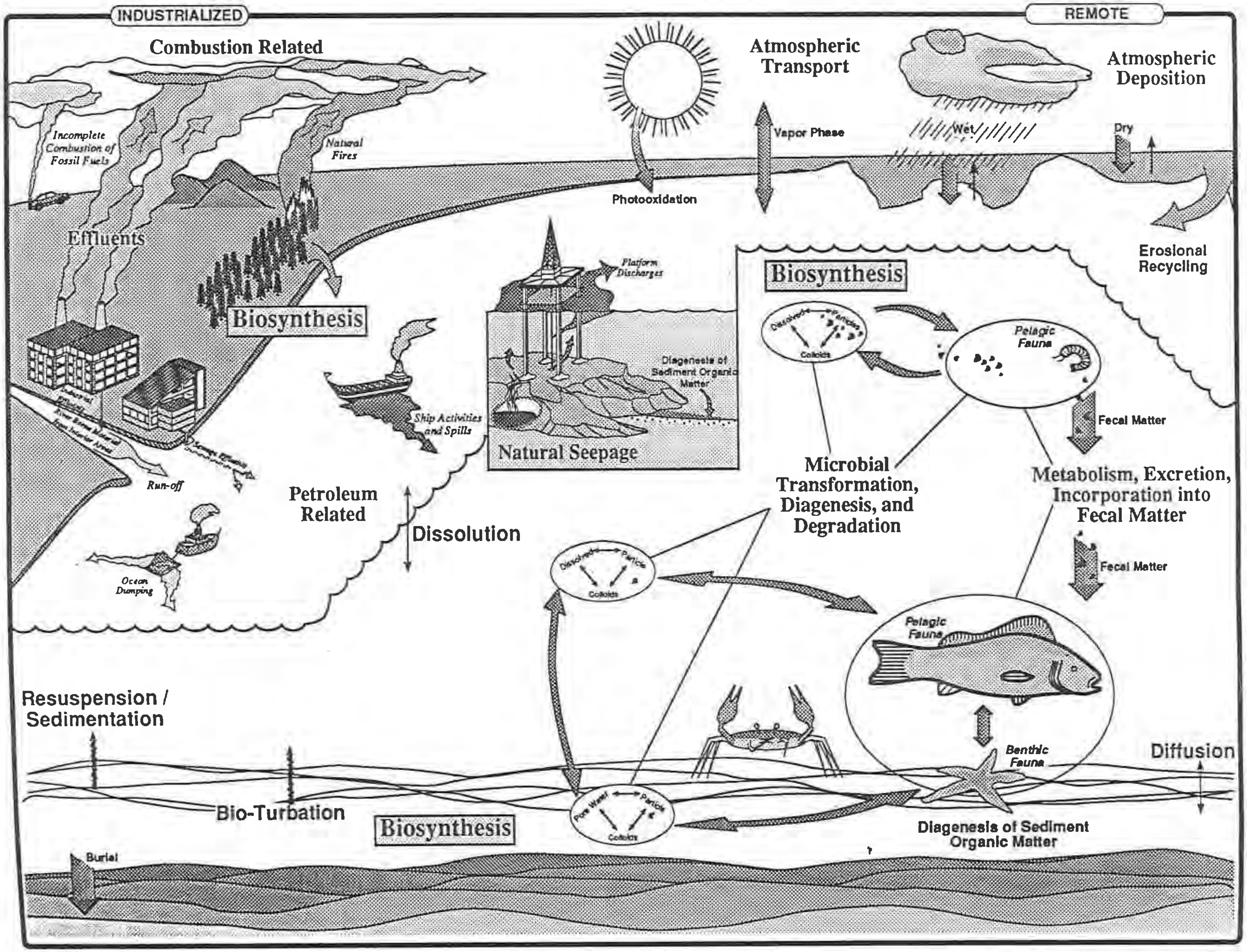

Figure 4. Global biogeochemical cycle of hydrocarbons (modified from McElroy *et al.*, 1989).

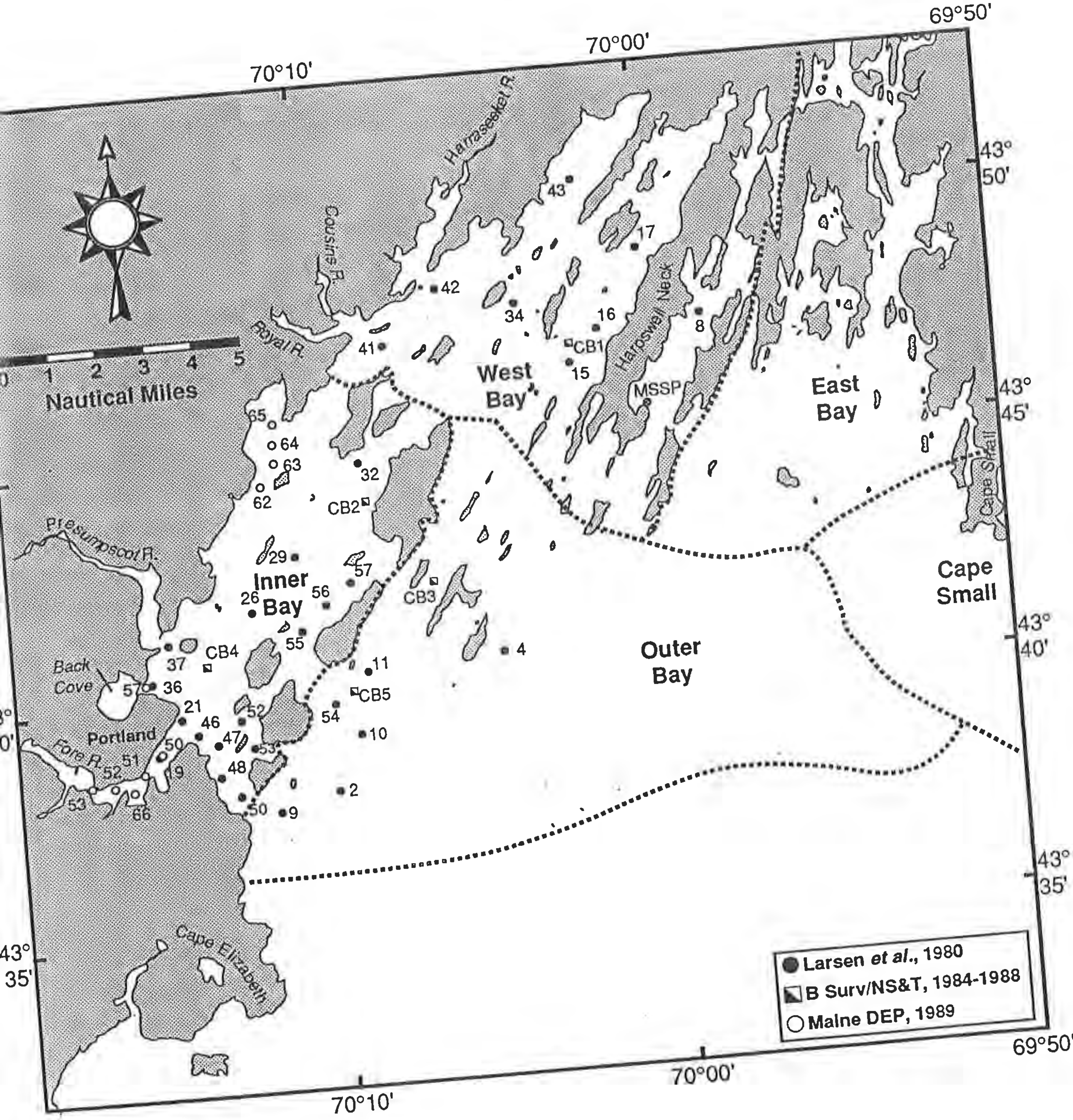

Figure 5. Historical sampling sites in Casco Bay between 1980 and 1989.

transects were sampled by the Maine Department of Environmental Protection in 1989 and analyzed for trace metals, PCBs, and PAH (Doggett, pers. comm.).

Comparisons of data produced over long periods of time by multiple laboratories should be viewed with caution. For many contaminant measurements with high quality assurance, sensitive methods have only recently become available. Often quite variable methods are used with each having its own potential for analytical bias. The level and details of quality assurance protocols vary widely and the method detection limits, accuracy, and precision of the data are a direct outcome of the QA protocols adopted. Methods of detector calibration, calculations (including units) and corrections for surrogates tend to obscure comparisons as well. Another factor that confounds historical comparisons is collection of samples by widely differing techniques. For example, the depth of sediment sampled can produce significant variability in the concentrations measured. Contamination is a relatively recent event on a geological time scale and concentrations could be diluted if more deeply buried, uncontaminated sediment is added to the sample.

2.2.1 Hydrocarbons

Larsen *et al.* (1983a) analyzed sediments at 30 stations throughout Casco Bay (Table 1). Polynuclear aromatic hydrocarbons were detected at all stations. Pyrene; benzo(a)anthracene; chrysene; benzo(b)fluoranthene; benzo(a)pyrene; dibenzo(a,h)anthracene; benzo-g,h,i-perylene; and indeno-1,2,3-c,d-pyrene were detected at 73% of the stations. Individual PAHs exceeded 1000 ppb wet wt. at several stations with benzo(b)fluoranthene concentrations as high as 4550 ppb. Total PAH concentrations ranged from 215 to 14,425 ppb wet wt. with a mean of 2,164 ppb wet wt. Multiple sources were indicated as contributors of petroleum contaminants to bay sediments. Stations in the mid and upper bay had PAH levels ≤ 900 ppb wet wt. whereas PAH levels > 2000 ppb wet wt. were detected in the vicinity of Portland, the principal shipping channel, and the mouth of the Presumpscot River. Localized anthropogenic sources of PAH are concentrated in these areas. Preferential preservation of high molecular weight PAH was

Table 1. Polycyclic aromatic hydrocarbon concentrations (ppb wet wt.) from a 1980 sampling of Casco Bay sediments (Larsen *et al.*, 1983a)

Peak No.(a,b)	Station # / Analyte (ppb wet wt.)	2	4	8	9	10	11	15	16	17	19	21	26	29	32	34
1	Naphthalene	0	0	0	113	0	0	0	0	0	0	0	0	0	0	0
2	Acenaphthylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Acenaphthene	0	0	140	0	34	0	0	58	0	1150	0	0	0	0	84
4	Fluorene	0	18	22	18	0	0	41	0	29	0	23	40	94	0	0
5	Phenanthrene	0	15	36	55	0	0	0	0	0	670	0	0	0	0	0
6	Anthracene	0	0	0	34	0	0.	0	0	0	0	0	0	0	0	0
7	Fluoranthene	0	0	0	136	0	0	0	0	0	0	218	0	0	0	0
8	Pyrene	57	0	64	67	72	136	32	52	36	685	208	113	120	54	55
9	Benzo(a)anthracene	110	71	92	56	191	188	60	59	41	670	417	162	254	54	48
10	Chrysene	86	80	98	46	163	154	66	43	618	545	241	216	204	72	72
11	Benzo(b)fluoranthene	99	205	340	136	346	335	132	147	169	1860	488	497	434	124	184
12	Benzo(k)fluoranthene	0	0	0	0	0	0	0	0	0	0	0	0	0	48	0
13	Benzo(a)pyrene	26	32	34	10	103	168	29	20	20	398	98	114	98	17	25
14	Dibenzanthracene	87	36	46	37	125	137	26	62	48	720	210	178	158	48	72
15	Benzo(ghi)perylene	39	22	0	16	82	46	22	34	40	328	106	78	94	25	44
16	Indenopyrene	33	26	28	21	52	67	24	30	32	269	82	74	60	31	30
	PAH's/Sta	8	9	10	13	9	8	9	9	9	10	10	9	9	9	9
	aTOTAL PAH	537	505	900	745	1168	1231	432	505	1033	7295	2091	1472	1516	473	614
	bTOTAL PAH*	312	242	514	556	615	713	252	262	776	4387	1287	719	830	228	314

Station # / Analyte (ppb wet wt.)	36	37	41	42	43	46	47	48	50	52	53	54	55	56	57
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acenaphthylene	1870	0	165	0	0	0	0	0	0	0	0	0	0	0	0
Acenaphthene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fluorene	0	0	17	22	65	302	0	0	226	108	0	0	16	28	18
Phenanthrene	0	810	0	0	0	0	0	0	2000	0	0	0	0	0	0
Anthracene	0	0	0	0	0	0	0	0	755	0	0	0	0	0	0
Fluoranthene	0	0	0	0	0	0	0	0	1420	0	0	0	0	0	0
Pyrene	0	635	51	38	30	242	0	870	1680	44	0	64	189	137	35
Benzo(a)anthracene	211	530	65	62	46	287	59	565	1325	226	294	32	152	129	68
Chrysene	800	775	66	55	41	363	52	650	1450	236	448	81	198	129	71
Benzo(b)fluoranthene	0	4550	151	0	0	1380	248	2850	2845	376	1415	286	440	454	165
Benzo(k)fluoranthene	0	0	43	0	21	0	0	0	0	0	0	0	84	193	0
Benzo(a)pyrene	0	312	0	14	11	163	0	420	805	86	82	50	58	56	40
Dibenzanthracene	0	396	39	0	30	0	31	635	920	127	256	0	140	198	54
Benzo(ghi)perylene	0	152	28	0	0	72	0	305	494	0	0	0	87	75	23
Indenopyrene	0	150	25	24	18	89	12	272	505	48	0	30	70	79	25
PAH's/Sta	3	9	10	6	8	8	5	8	12	8	5	6	10	10	9
TOTAL PAH	2881	8310	650	215	262	2898	402	6567	14425	1251	2495	543	1434	1478	499
TOTAL PAH*	2881	3212	389	215	211	1446	123	2777	10166	748	824	257	683	558	257

$^{a}PAH = \Sigma$ 1-16
$^{b}PAH^{*} = \Sigma$ (1-10) + 13+16

suggested to contribute to the relative abundance of these compounds compared with the more volatile, lower molecular weight compounds. Combustion processes are most likely the major source of sedimentary PAH as evidenced by the dominance of non-alkylated and highly condensed ring compounds. This early survey did not measure the alkylated PAH indicative of unprocessed petroleum.

Results of the NOAA Status and Trends Program and the Benthic Surveillance Programs are summarized in Table 2. These programs monitored sediment PAH at a few locations from 1984-1988. Selected alkyl PAH isomers were monitored as well as unsubstituted PAH. As in previous studies the PAH detected are abundant in high molecular weight, highly condensed combustion related PAH. The total of all PAH measured varied from 475 to 7,315 ppb dry wt. The sum of the most commonly measured PAH(*) varied from 330 to 3,496 ppb dry wt. surrogate corrected. It should be noted that NOAA Status and Trends locations are intentionally chosen distant from known point sources of contamination.

The Maine Department of Environmental Protection, in conjunction with EPA, sampled two transects in Casco Bay in 1989 (Doggett, pers. comm.). The sediments were analyzed for a range of PAH (Table 3). The molecular composition of the PAH was similar to previous studies with high molecular weight PAH being most abundant. Sites near Portland had a mean PAH concentration of 36,950 ppb dry wt. These values are high compared to the 1980 study. However, these samples were taken in areas near the South Portland outfall and a coal tar contaminated site. Coal tar is made by the high temperature carbonization (pyrolysis) of bituminous coal and therefore most of the PAH it contains are non-alkylated parent compounds (Merrill and Wade, 1985). Sediment PAH concentrations along a transect in the western region of the bay had a mean concentration of 2,570 ppb dry wt. PAH compositions were similar at both locations.

2.2.2 Pesticides and PCBs

Contamination of the marine environment by chlorinated pesticides and polychlorinated biphenyls (PCBs) has received considerable attention over the past several years. Much of this attention has focused on the coastal

Table 2. PAH data from the National Status & Trends and the Benthic Surveillance Programs for Casco Bay (* = data missing; 0.0 = data below LOQ; ppb dry weight).

Sample ID	84CSCCB5SED	85CSCCB2SED	85CSCCB1SED	85CSCCB3SED	85CSCCB4SED	85CSCCB5SED
Sample Year	84	85	85	85	85	85
Analyte (ppb dry weight)						
Naphthalene	0.0	31.8	12.9	0.0	50.5	38.7
2-Methylnaphthalene	0.0	14.3	0.0	0.0	30.9	18.3
1-Methylnaphthalene	0.0	0.0	0.0	0.0	0.0	16.7
Biphenyl	0.0	0.0	0.0	0.0	0.0	0.0
2,6-Dimethylnaphthalene	0.0	122.1	0.0	0.0	0.0	0.0
Acenaphthylene	*	*	*	*	*	*
Acenaphthene	37.7	0.0	0.0	0.0	0.0	0.0
1,6,7-Trimethylnaphthane	*	*	*	*	*	*
Fluorene	0.0	0.0	0.0	0.0	19.3	12.7
Phenanthrene	262.0	129.9	60.4	100.9	238.5	133.6
Anthracene	793.2	16.9	0.0	12.9	52.5	38.1
1-Methylphenanthrene	3280.3	19.6	0.0	18.2	35.7	16.9
Fluoranthene	504.0	215.6	101.1	171.4	421.4	222.2
Pyrene	676.9	177.0	60.2	127.8	411.2	224.1
Benzo(a)anthracene	595.8	76.9	39.8	61.0	163.5	111.3
Chrysene	388.9	117.2	59.6	104.2	220.9	146.2
Benzo(b)fluoranthene	*	*	*	*	*	*
Benzo(k)fluoranthene	*	*	*	*	*	*
Benzo(b&k)fluoranthene	*	*	*	*	*	*
Benzo(e)pyrene	170.7	0.0	0.0	0.0	0.0	0.0
Benzo(a)pyrene	237.5	0.0	0.0	0.0	0.0	0.0
Perylene	368.5	0.0	2.3	1.7	2.6	0.0
Dibenzo(ah)anthracene	0.0	0.0	0.0	0.0	0.0	0.0
Benzo(ghi)perylene	*	*	*	*	*	*
Indenopyrene	*	*	*	*	*	*
TOTAL PAH	7315	921	336	598	1647	979
TOTAL PAH *	3496	765	334	578	1578	927

Sample ID	86CSCCB2SED	86CSCCB1SED	AAI077	AAI078	AAI079
Sample Year	86	86	88	88	88
Analyte (ppb dry weight)					
Naphthalene	26.7	0.0	7.4	8.5	4.9
2-Methylnaphthalene	10.7	0.0	6.3	7.6	4.3
1-Methylnaphthalene	7.9	0.0	4.4	5.2	2.8
Biphenyl	0.0	10.0	3.0	3.3	0.0
2,6-Dimethylnaphthalene	0.0	0.0	7.7	5.7	5.2
Acenaphthylene	19.3	9.9	15.0	16.0	7.4
Acenaphthene	0.0	0.0	0.0	0.0	0.0
1,6,7-Trimethylnaphthane	0.0	0.0	2.9	0.0	0.0
Fluorene	7.0	0.0	6.3	7.1	3.5
Phenanthrene	100.7	44.0	64.0	72.0	38.0
Anthracene	97.1	101.6	15.0	16.0	9.8
1-Methylphenanthrene	225.0	369.0	15.0	13.0	7.0
Fluoranthene	178.8	74.7	130.0	150.0	80.0
Pyrene	178.0	112.1	130.0	140.0	74.0
Benzo(a)anthracene	68.7	46.2	55.0	62.0	34.0
Chrysene	96.9	37.7	52.0	76.0	39.0
Benzo(b)fluoranthene	66.4	42.6	26.0	35.0	23.0
Benzo(k)fluoranthene	0.0	0.0	33.0	35.0	18.0
Benzo(b&k)fluoranthene	*	*	*	*	*
Benzo(e)pyrene	83.3	32.0	54.0	62.0	32.0
Benzo(a)pyrene	89.0	34.8	67.0	76.0	39.0
Perylene	36.5	14.9	32.0	42.0	20.0
Dibenzo(ah)anthracene	0.0	0.0	3.8	5.4	0.0
Benzo(ghi)perylene	59.2	31.7	59.0	66.0	33.0
Indenopyrene	64.5	33.2	0.0	0.0	0.0
TOTAL PAH	1416	994	789	904	475
TOTAL PAH *	927	494	542	624	330

Table 3. Polycyclic aromatic hydrocarbon data (ppb dry wt.) from a 1989 sampling of Casco Bay (Doggett, personal communication)

Sample ID Analyte (ppb)	50A	50B	50C	51A	51B	51C	52A	52C	52D	53A	53B	53C	66A	66B
Naphthalene	94	70	70	350	330	6700	93	89	120	45	60	120	100	180
2-Methylnaphthalene	41	41	79	260	130	1900	36	35	58	32	37	45	71	270
1-Methylnaphthalene	41	41	41	240	190	1400	36	35	43	32	33	32	64	220
Biphenyl	41	41	41	110	82	630	36	35	36	32	33	32	50	92
2,6-dimethylnaphthalene	41	41	41	370	210	1200	36	35	43	32	37	32	120	78
Acenaphthylene	98	99	99	5000	5600	7800	150	220	160	100	110	170	260	380
Acenaphthene	49	41	41	610	810	1100	36	35	43	32	33	32	340	600
Fluorene	86	79	79	1000	760	4800	71	99	97	62	53	80	580	570
Phenanthrene	670	690	590	13000	10000	17000	63	780	760	580	550	570	3500	3300
Anthracene	320	240	260	9200	8500	9700	250	370	310	200	220	290	810	890
2-methylphenanthrene	110	41	41	2500	2000	5200	46	89	140	100	93	45	400	470
Fluoranthene	1200	1500	1200	21000	22000	23000	1500	2200	1800	1400	1500	1500	7000	8800
Pyrene	1100	1500	1200	23000	23000	26000	1500	2400	1700	1400	1400	1900	6600	8500
Benzo(a)anthracene	580	640	600	14000	14000	17000	770	1200	850	660	680	900	1800	2100
Chrysene	870	860	810	12000	15000	15000	950	1400	1200	940	930	1000	2000	2200
Benzo(k)fluoranthene	1200	1300	1200	17000	17000	21000	1500	2100	1800	1400	1400	1700	2500	3000
Benzo(e)pyrene	380	420	360	5800	5900	7000	480	700	600	480	480	560	830	960
Benz(a)pyrene	510	560	510	6000	5900	16000	730	1100	930	620	670	930	1300	1700
Perylene	140	150	140	2300	2200	2500	180	280	220	190	170	270	320	380
Dibenzo(ah)anthracene	620	650	620	2600	2500	2700	710	990	730	590	640	810	810	880
benzo(ghi)perylene	870	850	840	13000	13000	6900	890	1300	1300	1000	1000	1100	1500	1800
Indenopyrene	1000	960	900	5700	6300	6900	1000	1500	1400	1100	1200	1200	1700	1900
TOTAL PAH	10061	10814	9762	155040	155412	201430	11063	16992	14340	11027	11329	13318	32655	39270
TOTAL PAH *	6577	7239	6359	110860	112200	151000	7113	11393	9370	7139	7406	8692	25990	31120

Sample ID Analyte (ppb)	66C	57A	57B	57C	62A	62B	62C	63A	64A	64B	64C	65A	65B	65C
Naphthalene	85	80	200	73	39	39	38	47	43	42	43	42	42	40
2-Methylnaphthalene	57	43	70	32	39	39	38	47	43	42	43	42	42	40
1-Methylnaphthalene	39	31	42	32	39	39	38	47	43	42	43	42	42	40
Biphenyl	36	31	35	32	39	39	38	47	43	42	43	42	42	40
2,6-dimethylnaphthalene	68	49	66	32	39	39	38	47	43	42	43	42	42	40
Acenaphthylene	280	110	56	57	39	39	38	47	43	42	43	42	42	40
Acenaphthene	230	210	63	32	39	39	38	47	43	42	43	42	42	40
Fluorene	290	320	94	89	39	39	38	47	43	42	43	42	42	40
Phenanthrene	2300	5100	590	530	100	75	87	110	77	79	64	67	80	68
Anthracene	810	820	170	220	39	39	38	47	43	42	43	42	42	40
2-methylphenanthrene	360	370	140	19	39	39	38	47	43	42	43	42	42	40
Fluoranthene	5900	7400	1100	940	210	190	190	260	165	180	160	160	210	200
Pyrene	5600	6600	980	1400	220	180	190	240	150	160	150	140	190	180
Benzo(a)anthracene	1700	2000	410	1200	78	63	72	90	56	63	60	46	71	80
Chrysene	2500	2500	620	1200	140	130	130	160	94	110	100	96	126	130
Benzo(k)fluoranthene	2800	3500	800	2100	180	150	180	230	130	150	130	130	160	160
Benzo(e)pyrene	880	1100	260	610	62	55	61	75	43	50	43	42	55	52
Benz(a)pyrene	1400	1700	320	980	70	59	65	80	47	50	55	42	63	64
Perylene	360	430	130	250	39	39	38	47	43	42	43	42	42	40
Dibenzo(ah)anthracene	860	990	520	860	560	500	430	560	480	470	480	530	600	570
benzo(ghi)perylene	1500	1900	680	970	410	370	380	490	400	400	400	380	430	390
Indenopyrene	180	2000	780	1100	500	440	450	580	480	470	480	450	510	470
TOTAL PAH	28235	37284	8126	12758	2959	2641	2653	3392	2595	2644	2595	2545	2957	2804
TOTAL PAH *	21275	28840	5383	7821	1513	1332	1374	1755	1284	1322	1284	1211	1460	1392

zone and estuaries, especially near large population centers (e.g., Farrington *et al.*, 1982, 1983; Risebrough *et al.*, 1983). These environments receive the largest inputs of chemical contaminants and are also ecologically sensitive areas. Toxic organic compounds of synthetic origin, such as pesticides and PCBs, have been reported at high concentrations (ppm) in the coastal environment. Pesticides and PCBs can affect the productivity of marine organisms and in some cases accumulations in fish and shellfish have resulted in fisheries advisories to protect human health. Most pesticides and PCBs that enter the marine environment are only sparingly soluble in water and tend to be preferentially associated with particles and collect in sediments. Therefore sediments reflect long-term (years) contaminant accumulation in coastal environments. Sediment concentrations of pesticides and PCBs provide information on the geographic distribution of these contaminants as well as identify areas where concentrations are high enough to be of possible ecological concern.

The historical data for pesticide and PCB concentrations for Casco Bay are limited. The comparison of data is confounded by the use of different extraction and analytical methods. Therefore, only a limited amount of data is summarized (Tables 4 and 5). Most of the data are for PCB concentrations. The earliest survey data failed to detect PCBs (Larsen *et al.*, 1983b). However the method used had a detection limit in the range of 100 ppb dry wt. As is evident by examination of the available data (Table 4) a majority of the reported data is below this detection limit. Detectable PCB concentrations were reported in all subsequent studies. In one report concentrations for PCBs range from 2.1 to 850 ppb wet wt. (Ray *et al.*, 1983). The highest value detected (850 ppb wet wt.) was for Back Cove sediment however the other three stations in Back Cove had concentrations of only 3.3, 6.1 and 7.5 ppb wet wt. The reason for the high concentration of PCB at the one site was not explained by the authors, but other contaminants (ΣDDT and Σchlordane) were also high at that location. If this high value is not included the range is from 2.1 to 360 ppb wet wt. This is within the range of values reported by the NOAA National Status and Trends (NS&T) Program for the east coast of the U.S. (Table 5).

Based on the historical data in Table 4 total PCB concentrations are generally higher in the Inner Bay and lower in other regions of the bay. This

Table 4. Concentration of total PCBs, total DDTs, and total chlordane for Casco Bay sediments (ppb dry weight with the exception of Ray *et at.*, 1983 which is wet weight).

General Location	Stations	ΣPCB (ppb)	ΣDDT (ppb)	ΣChlordane (ppb)	Reference	Sampling Year
Survey of Entire Bay	32	< 100	ND	ND	A	1980
Fore River	4	2.1-32	<0.03-11	<0.03-0.52	B	1980
Back Cove	4	3.3-850*	1.8-42*	0.18-9.8*	B	1980
Fore River	6	80-320	ND	ND	C	1981-1983
West Bay	1	40-100	ND	ND	C	1981-1983
Fore River	5	32-360	ND	ND	D	1989
Back Cove	1	35-65	ND	ND	D	1989
Inner Bay	4	38-43	ND	ND	D	1989
West Bay	2	8.5-123	0.9-11.4	0.3-8.4**	E	1984-1989
Outer Bay	2	47-95	0-0.9	0-4.1**	E	1984-1989
Inner Bay	2	93-127	6.2-21	0.5-3.9**	E	1984-1989

A = Larsen *et al.*, 1983b
B = Ray *et al.*, 1983
C = Larsen *et al.*, 1984
D = Doggett, pers. comm.
E = NOAA NS&T
ND = Not Determined

*One station had high values for PCBs, DDTs, and chlordane. Others were no more than three times the lowest value.

**These concentrations do not include all of the components of technical chlordane and are most likely low by a factor of two.

Table 5. PCB and pesticide concentrations (ppb dry weight) from the National Status & Trends and the Benthic Surveillence Programs for Casco Bay sediments.

Sample ID Sample Year	84CSCCB5SED 84	85CSCCB2SED 85	85CSCCB1SED 85	85CSCCB3SED 85	85CSCCB4SED 85	85CSCCB5SED 85	86CSCCB2SED 86	86CSCCB1SED 86	AAI077 88	AAI078 88	AAI079 88
PCBs (ppb dry wt.)											
PCB8	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0
PCB18	*	*	*	*	*	*	4.2	0.0	0.0	0.0	0.0
PCB28	*	*	*	*	*	*	0.0	7.3	0.0	0.0	0.0
PCB44	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0
PCB52	*	*	*	*	*	*	17.2	21.4	0.0	0.0	0.0
PCB66	*	*	*	*	*	*	4.6	4.8	1.3	1.0	0.5
PCB101	*	*	*	*	*	*	0.0	0.0	0.4	0.5	0.0
PCB105	*	*	*	*	*	*	0.0	0.6	0.0	0.0	0.0
PCB110+77	*	*	*	*	*	*	0.0	0.0	*	*	*
PCB118	*	*	*	*	*	*	2.2	2.0	0.0	0.0	0.0
PCB126	*	*	*	*	*	*	0.0	0.0	*	*	*
PCB128	*	*	*	*	*	*	1.4	0.0	0.0	0.0	0.0
PCB138	*	*	*	*	*	*	0.9	0.0	0.7	1.0	0.5
PCB153	*	*	*	*	*	*	4.2	0.0	0.6	0.8	0.4
PCB170	*	*	*	*	*	*	0.0	0.0	0.0	0.9	0.6
PCB180	*	*	*	*	*	*	0.8	0.9	0.8	1.0	0.6
PCB187	*	*	*	*	*	*	2.2	1.6	0.7	0.8	0.4
PCB195	*	*	*	*	*	*	1.0	0.0	0.0	0.0	0.0
PCB206	*	*	*	*	*	*	0.6	1.9	0.9	1.0	0.7
PCB209	*	*	*	*	*	*	0.8	0.0	0.9	1.1	0.7
TOTAL DI-PCB's	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*
TOTAL TRI-PCB's	24.4	7.0	4.0	7.0	2.0	4.0	17.3	19.2	*	*	*
TOTAL TET-PCB's	15.5	8.0	6.0	12.0	13.0	6.0	61.0	75.7	*	*	*
TOTAL PEN-PCB's	22.6	31.0	12.0	31.0	25.0	10.0	15.2	13.9	*	*	*
TOTAL HEX-PCB's	8.1	18.0	11.0	9.0	18.0	9.0	22.2	3.5	*	*	*
TOTAL HEP-PCB's	15.1	24.0	2.0	22.0	24.0	10.0	7.8	8.2	*	*	*
TOTAL OCT-PCB's	9.7	7.0	2.0	3.0	7.0	5.0	3.4	1.2	*	*	*
TOTAL NON-PCB's	0.0	7.0	0.0	4.0	4.0	3.0	0.6	1.9	*	*	*
PESTICIDES (ppb dry wt.)											
OPDDE	0.0	0.0	0.0	0.0	0.0	0.0	1.9	2.0	0.0	0.0	0.0
PPDDE	0.0	2.0	0.0	0.0	0.7	0.0	3.9	2.7	1.1	1.3	0.7
OPDDD	0.0	5.0	0.0	0.0	3.0	0.0	1.8	0.0	0.5	0.6	0.3
PPDDD	0.0	0.0	0.4	0.5	2.0	0.6	11.6	6.2	0.0	0.0	0.0
OPDDT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PPDDT	0.0	0.4	0.5	0.0	0.5	0.3	2.2	0.5	0.0	1.4	0.9
Aldrin	3.2	0.0	0.0	0.0	0.0	0.0	4.1	7.7	0.0	0.0	0.0
Alphachl	2.5	1.0	0.3	1.0	0.5	0.0	1.5	1.1	0.8	1.0	0.6
Tnonchl	0.2	0.0	0.0	0.0	0.0	0.0	0.5	1.5	0.0	0.8	0.5
Dieldrin	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.0	0.8	0.8	0.5
Heptachlor	1.4	0.0	0.0	0.0	0.0	0.0	2.0	5.8	0.0	0.0	0.0
Heptaepo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.6
Hexachl	1.5	3.0	0.4	1.0	1.0	0.4	1.0	0.0	0.6	0.6	0.4
Lindane	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mirex	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

* = data missing; 0.0 = data below LOQ; data is on dry weight basis

is consistent with PAH and trace metal data and also with proximity to highly urbanized and industrialized areas, in this case, the city of Portland. The historical data for total DDT (sum of o,p-DDE; p,p-DDE; o,p-DDD; p,p-DDD; o,p-DDT; and p,p-DDT) are even more limited (Table 4). Total DDT ranges from below the detection limit (~0.5 ppb) to 21 ppb if the high value reported by Ray *et al.* (1983) is not included. As discussed earlier, the one high value is anomalous. The total DDTs, based on this limited data set, appear to be highest in Inner Bay and lowest in Outer Bay sediments. Concentrations are generally higher close to river mouths and near to shore. The historical data for total chlordane are also limited. Concentrations for total chlordane range from < 0.03 to 9.8 ppb. The NS&T data (O'Connor, 1990) do not include data for all the components in technical chlordane thus underestimating chlordane by a factor of two. Therefore the actual range of concentrations is more likely < 0.03 to 19 ppb dry wt. The highest concentrations of chlordane were reported for West Bay sediments.

In summary, although the use of PCBs, DDTs, and chlordane have been limited and/or banned in the U.S., these contaminants and their metabolites are still detected at levels of a few hundred ppb or less in sediments from Casco Bay. These concentrations are similar to those reported for many coastal areas (i.e., Sericano *et al.*, 1990). The geographic distribution of these contaminants in Casco Bay cannot be adequately described based solely on the historical data available.

2.2.3 Trace Metals

Larsen, *et al.* (1983c) took 32 grab samples of sediment from Casco Bay, covering most of the area sampled by the Casco Bay Estuary Program. Grain size and organic carbon content were determined for these sediments as well as concentrations of Cd, Cr, Cu, Ni, Pb and Zn (Table 6). The metal concentrations determined by Larsen, *et al.* (1983c) cannot be considered total metal as the sample preparation method was an aqua regia leach. As has been shown by Trefry and Presley (1976) and others, this leach normally removes 70-90% of metals such as Cd, Cu, Pb and Zn, but might remove only 30-50% of Cr and Ni, depending on sediment mineralogy and other factors. Larsen *et al.* (1983c) report essentially 100% extraction of all metals from

Table 6. Concentration of metals (ppm dry weight) in sediments from Casco Bay, Maine in 1980 with corresponding percent of sediment < 63 µm, organic carbon content (ppm dry weight; Larsen *et al.*, 1983c) and water depth (m).

Station	Water Depth (m)	Cd (ppm)	Cr (ppm)	Cu (ppm)	Ni (ppm)	Pb (ppm)	Zn (ppm)	% < 63 µm	Organic Carbon (%)
2	30.5	<0.25	27.0	9.45	11.0	13.5	39.0	46.3	8.6
4	33.6	0.40	26.0	8.38	18.5	18.5	49.4	36.0	15.7
8	15.3	0.30	23.0	8.70	13.0	12.0	43.0	36.7	13.3
9	16.8	0.20	8.50	2.40	4.53	10.5	20.8	0.9	4.7
10	38.1	0.35	39.1	14.0	22.8	29.7	70.8	79.2	21.1
11	24.4	0.25	31.0	11.4	18.5	24.0	59.5	65.4	19.1
13	14.6	0.50	36.5	11.8	19.5	21.5	65.5	65.0	21.6
15	17.1	0.55	38.0	20.0	20.0	33.5	73.5	79.6	23.9
16	15.3	0.55	54.0	16.4	27.5	25.0	30.5	95.1	38.2
17	11.3	0.60	47.5	16.6	32.0	19.5	84.5	98.6	35.6
19	13.7	0.87	49.2	44.5	23.6	61.4	81.9	78.2	26.2
20	10.4	0.80	46.5	32.0	18.5	51.0	100.0	83.4	26.6
21	7.6	0.59	36.6	25.5	22.8	45.0	90.1	89.5	33.2
26	9.2	0.60	55.0	19.7	22.5	35.0	89.0	96.8	37.2
29	13.7	0.50	50.0	16.3	20.0	29.5	74.5	77.1	24.1
32	7.6	0.65	40.0	15.8	22.0	21.5	66.0	95.6	41.3
34	10.7	0.50	49.4	15.8	23.7	20.2	71.6	97.0	34.0
36	7.9	0.90	10.8	13.8	6.60	59.0	80.0	84.8	233.0
37	2.1	0.75	34.5	19.2	14.0	35.5	83.5	54.3	44.5
41	7.3	0.40	31.0	13.1	21.0	16.5	61.0	79.3	2.31
42	6.1	0.55	43.0	14.8	23.0	20.5	68.0	92.8	25.4
43	7.6	0.55	50.4	16.1	24.4	19.0	73.8	97.6	30.7
46	7.6	0.45	26.0	15.0	14.0	30.5	70.5	42.9	15.2
47	16.8	<0.25	21.5	9.90	12.0	90.0	36.0	34.5	5.5
48	9.2	0.30	18.0	10.2	9.35	22.5	44.5	26.3	11.2
50	21.4	0.45	5.85	4.45	5.75	16.5	21.0	2.7	1.5
52	15.3	0.60	34.5	20.2	20.5	35.5	80.5	80.3	26.1
53	15.3	0.80	44.0	22.6	9.05	---	87.0	30.4	37.8
54	32.0	<0.25	23.5	7.95	12.5	18.0	41.0	33.6	10.8
55	25.6	0.30	20.5	8.70	11.0	17.5	40.5	26.5	10.9
56	13.7	0.55	43.0	17.0	23.0	32.0	81.0	72.1	28.5
57	14.3	0.45	41.5	14.6	16.0	28.0	64.0	90.7	23.4

the National Institute of Standards and Testing (NIST) Standard Reference Material 1654 River Sediment by their leach but it should be noted that SRM 1654 is a highly contaminated sediment and therefore contains a higher percentage of non-lattice (leachable) metals than pristine sediments. Therefore, the high recoveries obtained in SRM 1654 give no information as to the reliability of data at the background levels detected in Casco Bay.

The concentrations found by Larsen *et al.* (1983c) show considerable variation from site to site within Casco Bay for all metals. And while there is a tendency for higher values of Cd, Cr, Cu, Pb and Zn to occur in Portland Harbor sediments, these values are still much lower than those found in sediments of highly polluted areas along the northeastern U.S. seaboard such as the Hudson-Raritan Estuary (O'Connor, 1990; Long and Morgan, 1990). Furthermore, except for a few samples, Larsen *et al.* (1983c) found a good correlation between metals and grain size. The observed metal enrichment in the fine fraction is that expected for a uncontaminated sediment. Only values well off a best fit line would be considered contamination (Trefry and Presley, 1976).

Trace metal concentrations in sediment collected at five sites in Casco Bay between 1984 and 1986 as part of NOAA's Benthic Surveillance Program, along with data from one site collected in 1988 as part of the NOAA Status and Trends Program are summarized in Table 7. These are similar to those reported by Larsen *et al.* (1983c). They also show considerable areal as well as temporal variability. For example, Pb concentration more than doubled at one Benthic Surveillance site between 1985 and 1986. Finer grained material is normally more enriched in trace metals, but silt and clay content at this site only varied from 88% to 98%. A variation in Pb concentrations from 26 to 55 ppm dry wt. cannot be explained by sediment texture variations alone. At the same site, Cu concentrations varied from 22 to 28 ppm dry wt. and Zn concentrations from 117 to 128 ppm dry wt., consistent with observed variations in grain size. Other anomalies in these data sets could be pointed out, but none of them are large enough to have ecological consequences (Long and Morgan, 1990). The somewhat noisy character of area-wide data is primarily due to the variable nature of Casco Bay sediment texture as reflected in grain size and organic carbon content.

Table 7. Trace metal data (ppm dry weight) from the Benthic Surveillence and NOAA Status and Trend Program for Casco Bay sediments.

Sample ID	84CSCCB5SED	84CSCCB14SED	84CSCCB15SED	85CSCCB2SED	85CSCCB1SED	85CSCCB3SED	85CSCCB4SED	85CSCCB5SED
Sample Year	84	84	84	85	85	85	85	85
Bulk Parameters (ppm)								
TOC	20500	12700	17400	34700	28100	*	28300	-0.001
TIC	*	*	*	*	*	*	*	*
Silt+Clay (g/g)	0.792	0.381	0.646	0.938	0.882	*	0.763	*
Metals (ppm)								
Ag	0.11	0.06	0.09	0.20	0.12	*	0.32	*
Al	67400	61200	64100	76900	76900	*	93100	*
As	9.76	9.22	7.59	16.60	14.30	*	8.53	*
Cd	0.23	0.10	0.11	0.35	0.27	*	0.37	*
Cr	81.6	87.7	107.0	102.0	96.7	*	80.4	*
Cu	18.9	15.1	16.9	22.3	21.7	*	29.1	*
Fe	26500	32300	28900	39200	39700	*	29900	*
Hg	0.14	0.09	0.14	0.16	0.06	*	0.26	*
Mn	595	1010	579	563	618	*	541	*
Ni	23.3	23.6	22.8	36.7	30.3	*	26.9	*
Pb	29.0	25.3	33.1	38.0	25.9	*	38.6	*
Sb	0.55	0.63	0.70	0.40	0.20	*	0.35	*
Se	0.04	0.30	0.00	0.68	0.55	*	0.00	*
Si	306000	312000	308000	354000	284000	*	295000	*
Sn	3.20	2.68	3.38	6.08	4.12	*	7.13	*
Zn	79.1	73.2	76.5	117.0	105.0	*	108.0	*

Sample ID	86CSCCB2SED	86CSCCB4SED	86CSCCB1SED	AA1077	AA1078	AA1079
Sample Year	86	86	86	88	88	88
Bulk Parameters (ppm)						
TOC	32300	32400	28000	13000	22000	7300
TIC	*	*	*	700	600	700
Silt+Clay (g/g)	0.983	0.924	0.943	0.374	0.524	0.226
Metals (ppm)						
Ag	0.23	0.49	0.13	0.09	0.25	0.05
Al	-0.001	-0.001	-0.001	4700	6500	5800
As	15.30	13.20	12.70	8.20	14.00	4.40
Cd	0.49	0.67	0.34	0.12	0.26	0.08
Cr	97.1	85.3	92.0	74.0	83.0	35.0
Cu	27.8	32.7	19.1	14.0	20.0	8.1
Fe	41900	36700	41100	2600	3300	1900
Hg	0.23	0.37	0.18	0.06	0.07	0.03
Mn	518	528	573	*	*	*
Ni	37.4	37.1	32.6	24.0	31.0	17.0
Pb	54.6	56.1	34.0	30.0	32.0	28.0
Sb	0.81	0.61	0.49	*	*	*
Se	0.00	0.00	0.00	0.63	0.80	0.29
Si	262000	270000	276000	*	*	*
Sn	5.26	6.60	4.00	2.70	3.10	2.80
Zn	128.0	128.0	108.0	67.0	90.0	49.0

* = data missing; 0.0 = data below LOQ; data is on dry weight basi

A set of ten sites were sampled (nine of them in triplicate) by the Maine Department of Environmental Protection in association with the USEPA (MDEP/EPA) in 1989 (Doggett, pers. comm.). Sediments were analyzed for grain size, Pb, Ni, Cr, Zn, Cu, Fe and Hg. Only the data were available for this report and no description of sample preparation or analysis techniques was available. The values for all metals (Table 8) are higher than those reported by Larsen *et al.* (1983c). A methodological difference might explain the higher values especially due to the difficulty in producing accurate trace metal concentrations at near background levels. It is more likely however that the variation is a function of sample location. Most of the MDEP/EPA samples were collected within Portland Harbor and the Fore River area where relatively high metal concentrations are expected. Like the Larsen *et al.* (1983c) samples, the MDEP/EPA samples have metal concentrations lower than those in sediments from highly contaminated areas such as the Hudson-Raritan Estuary (O'Connor, 1990; Long and Morgan, 1990).

3.0 METHODS

Sediment samples were analyzed for the contaminants listed in Table 9. The trace contaminants monitored include trace metals, aliphatic and polycyclic aromatic hydrocarbons, pesticides and PCBs. The QA/QC Procedures are described in detail in the Project Work and Quality Assurance Plan. Matrix spikes, laboratory sample duplicates and laboratory blanks were processed with each batch of samples (10-20 samples/batch) as detailed in the Standard Operating Procedures (SOPs, Appendix D). Duplicates were produced by splitting the sample in the laboratory (i.e., aliquots from a single sample). Standard reference materials provided by NIST were analyzed to audit the performance of the SOPs. The methods and quality assurance procedures used are those of NOAA's National Status and Trend Program, EPA's Environmental Monitoring and Assessment Program - Near Coastal (EMAP-NC) and those approved by the U.S. Fish and Wildlife Service (FWS) for trace organic contaminant analyses. These methods have undergone extensive intercalibration with EPA, NOAA, NIST

Table 8. Trace metal data (ppm dry weight) from a 1989 sampling of Casco Bay sediments by the Maine Department of Environmental Protection and the EPA (Doggett, personal communication).

Sample ID	50A	50B	50C	51A	51B	51C	52A	52C	52D	53A	53B	53C	·66A	66B
Pb	49.0	51.0	57.0	39.0	38.0	46.0	59.0	61.0	67.0	53.0	58.0	57.0	68.0	59.0
Ni	33.0	33.0	35.0	17.0	15.0	28.0	33.0	36.0	37.5	32.0	30.6	29.0	31.0	33.5
Zn	130.0	125.0	140.0	94.0	96.0	99.5	100.0	145.0	155.0	140.0	122.0	130.0	140.0	140.0
Cr	47.0	46.0	52.0	27.0	23.0	33.0	45.0	48.0	50.0	41.0	31.0	37.0	41.0	44.0
Cu	43.0	42.0	46.0	23.0	27.0	31.5	43.0	43.0	45.0	39.0	40.2	36.0	38.0	41.5
Fe	29000	29500	33000	15000	14000	18500	29000	27500	33000	29000	29200	27000	26000	29000
Hg	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.2	0.3	0.3	0.3

Sample ID	66C	57A	57B	57C	62A	62B	62C	63A	64A	64B	64C	65A	65B	65C
Pb	70.0	46.0	52.0	67.0	23.0	26.0	20.0	21.0	21.0	27.0	23.0	23.0	24.0	17.0
Ni	36.0	21.5	23.0	23.0	32.0	28.0	29.0	34.5	34.0	33.5	37.5	35.0	35.0	36.0
Zn	160.0	85.0	98.0	105.0	79.0	79.0	77.0	90.5	90.3	83.0	96.5	89.0	88.0	91.0
Cr	48.0	35.0	38.0	39.0	41.0	41.0	49.0	47.0	47.0	46.0	48.0	45.0	46.0	47.0
Cu	47.0	28.5	28.0	27.5	18.0	19.0	15.0	21.0	19.7	18.5	22.0	20.0	20.0	22.0
Fe	30000	17000	20000	19500	27000	24000	25000	30500	30300	29500	32000	30000	30000	32000
Hg	0.3	0.3	0.4	0.4	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.3	0.1

Table 9. Analytes measured in the Casco Bay Estuary Program. (Standard Operating Procedures are provided in Appendix D)

Total Metals

cadmium
copper
lead
nickel
chromium
silver
zinc
iron
mercury
arsenic
selenium

Hydrocarbons

naphthalene
2-methylnaphthalene
1-methylnaphthalene
biphenyl
2,6-dimethylnaphthalene
acenaphthylene
acenaphthene
fluorene
phenanthrene
anthracene
2-methylphenanthrene
fluoranthene
pyrene
benzo(a)anthracene
chrysene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(a)pyrene
benzo(e)pyrene
perylene
indeno (1,2,3-cd) pyrene
dibenzo (a,h) anthracene
benzo (g,h,i) perylene

In addition

- Extended PAHs (alkylated homologues useful in differentiating oil from combustion sources).
- Aliphatic fraction quantitation including C_{12}-C_{34} n-alkanes, pristane, phytane and the unresolved complex mixture.

Table 9. (Continued)

PCBs

Congener specific analysis of 20 individual PCB's including quantitative estimates of the amount of arochlor mixtures

Pesticides

aldrin	endrin
alpha-BHC	endrin aldehyde
beta-BHC	heptachlor
BHC-delta	heptachlor epoxide
gamma-BHC	toxaphene
alpha chlordane	hexachlorobenzene
gamma chlordane	DDE 2,4'
dieldrin	DDD 2,4'
endosulfan I	DDT 2,4'
endosulfan II	DDD 4',4
endosulfan sulfate	DDE 4',4
	DDT 4', 4

Ancillary Parameters

(1) TOC was determined by combustion in a Leco Carbon Analyzer to CO_2 and subsequent quantitation by IR.

(2) Grain size (sand, silt and clay) was determined by the Folk settling method.

(3) Organic nitrogen was determined by a Kjeldahl digestion.

(4) Percent Solids (dry weight) are determined and reported for all samples.

*note organic analyte concentrations are reported on the basis of dry weight of sediment and is corrected for surrogate recoveries.

and FWS. Detailed Standard Operating Procedures are provided in Appendix D.

3.1 Sample Collection

Sediment samples were collected by researchers from EPA Region I, the University of Maine (UME), the Maine Geological Survey, and the Geochemical and Environmental Research Group of Texas A&M University in early August 1991. The Technical Advisory Committee divided the bay into 5 regions. These regions were chosen on the basis of geologic and other features. Based on historical information station locations were chosen to provide good areal coverage, sample surface sediments of different ages (including erosional features), and include representative coverage of benthic communities. Bathymetry and sediment texture also guided site selection. The sampling sites are designated as CS, EB, IB, OB, SW and WB, and a number, identifying their location in the bay (Cape Small, East Bay, Inner Bay, Outer Bay, Shallow Water and West Bay; see Figure 3 and Table 10).

Samples taken from the University of Maine Vessel

Samples were taken with a Smith-McIntyre grab sampler. The grab was lowered with a small hydraulic winch. Care was taken to lower the sampler onto the bottom without disturbing the surface layer. The sampler was carefully raised to the deck so the contents were not disturbed. Each grab was examined and discarded if disturbed. Lack of disturbance was inferred if the surface layer was intact and the sediment surface was not touching the cover plates of the grab. If this occurred, the grab was emptied, flushed with seawater and redeployed. The surface water contained in the grab sampler was allowed to drain and then the top 2 cm of sediment was sampled. A metal spoon cleaned with MeCl was used to take the trace organic sample and to place the sediment in a clean, combusted (400°C) 1/2 pint mason jar (in duplicate) sealed with combusted aluminum foil. Care was taken to sample sediment that was not in direct contact with the sides of the grab sampler. The other half of the grab was sampled with a

Table 10. Station Information for the Casco Bay Estuary Program's 1991 sampling effort.

Sta #	Latidude Deg	Latidude Min	Latidude Sec	Longitude Deg	Longitude Min	Longitude Sec	Date Sampled	Time Sampled	Water Depth (ft)	Sample Device
Inner Bay Stations										
IB-1	70	14	41	43	39	44	10-Aug-1991	1115	44	Smith-McIntyre
IB-2	70	13	37	43	40	5	10-Aug-1991	1050	42	Smith-McIntyre
IB-3	70	12	17	43	39	40	08-Aug-1991	0930	<25	Smith-McIntyre
IB-4	70	12	21	43	41	59	10-Aug-1991	1030	36	Smith-McIntyre
IB-5	70	9	41	43	42	1	10-Aug-1991	0900	58	Smith-McIntyre
IB-6	70	10	15	43	43	0	10-Aug-1991	0915	57	Smith-McIntyre
IB-7	70	11	59	43	43	18	10-Aug-1991	1010	41	Smith-McIntyre
IB-8	70	11	14	43	44	38	10-Aug-1991	0955	40	Smith-McIntyre
IB-9	70	10	29	43	45	19	10-Aug-1991	0945	34	Smith-McIntyre
IB-10	70	8	42	43	44	19	10-Aug-1991	0930	36	Smith-McIntyre
West Bay Stations										
WB-1	70	5	58	43	46	26	09-Aug-1991	2015	40	Smith-McIntyre
WB-2	70	5	10	43	47	47	09-Aug-1991	1955	37	Smith-McIntyre
WB-3	70	1	40	43	50	43	09-Aug-1991	1850	10	Smith-McIntyre
WB-4	70	0	37	43	47	36	09-Aug-1991	1815	29	Smith-McIntyre
WB-5	69	69	15	43	49	9	09-Aug-1991	1825	21	Smith-McIntyre
WB-6	69	56	49	43	50	23	10-Aug-1991	1915	0	By Hand
WB-7	69	58	31	43	47	3	09-Aug-1991	1710	53	Smith-McIntyre
WB-8	69	59	55	43	44	42	09-Aug-1991	1650	104	Smith-McIntyre
WB-9	70	3	23	43	46	59	09-Aug-1991	1940	48	Smith-McIntyre
East Bay Stations										
EB-1	69	58	24	43	42	37	09-Aug-1991	1615	117	Smith-McIntyre
EB-2	69	56	15	43	42	19	09-Aug-1991	1605	117	Smith-McIntyre
EB-3	69	56	31	43	44	47	09-Aug-1991	1540	66	Smith-McIntyre
EB-4	69	54	25	43	43	39	09-Aug-1991	1235	94	Smith-McIntyre
EB-5	69	55	54	43	46	20	09-Aug-1991	1445	47	Smith-McIntyre
EB-6	69	55	3	43	48	30	09-Aug-1991	1515	23	Smith-McIntyre
EB-7	69	54	2	43	52	3	10-Aug-1991	1445	0	By Hand
EB-8	69	52	12	43	48	47	09-Aug-1991	1400	48	Smith-McIntyre
EB-9	69	52	49	43	45	32	09-Aug-1991	1330	60	Smith-McIntyre
EB-10	69	53	0	43	44	9	09-Aug-1991	1245	78	Smith-McIntyre
Cape Small Stations										
CS-1	69	54	7	43	42	40	09-Aug-1991	1225	78	Smith-McIntyre
CS-2	69	54	12	43	41	37	09-Aug-1991	1210	108	Smith-McIntyre
CS-3	69	52	48	43	42	7	09-Aug-1991	1215	80	Smith-McIntyre
CS-4	69	53	51	43	40	59	09-Aug-1991	1150	124	Smith-McIntyre
CS-5	69	53	3	43	40	12	09-Aug-1991	1147	125	Smith-McIntyre
CS-6	69	51	36	43	38	30	09-Aug-1991	1125	180	Smith-McIntyre
CS-7	69	49	49	43	38	1	09-Aug-1991	1115	127	Smith-McIntyre
Outer Bay Stations										
OB-1	69	53	35	43	37	36	08-Aug-1991	1345	318	Smith-McIntyre
OB-2	70	2	11	43	38	9	08-Aug-1991	1300	180	Smith-McIntyre
OB-3	70	8	23	43	38	36	08-Aug-1991	1045	180	Smith-McIntyre
OB-4	70	8	11	43	39	6	08-Aug-1991	1800	97	Smith-McIntyre
OB-5	70	5	27	43	39	3	08-Aug-1991	1115	135	Smith-McIntyre
OB-6	70	5	59	43	40	0	08-Aug-1991	1740	52	Smith-McIntyre
OB-7	70	7	54	43	40	59	08-Aug-1991	1715	105	Smith-McIntyre
OB-8	70	4	36	43	39	46	08-Aug-1991	1140	132	Smith-McIntyre
OB-9	70	3	27	43	39	42	08-Aug-1991	1150	170	Smith-McIntyre
OB-10	70	2	28	43	41	13	08-Aug-1991	1520	148	Smith-McIntyre
OB-11	70	6	3	43	43	57	08-Aug-1991	1700	110	Smith-McIntyre
OB-12	70	6	0	43	44	18	08-Aug-1991	1630	35	Smith-McIntyre
OB-13	70	5	7	43	45	18	08-Aug-1991	1515	58	Smith-McIntyre
OB-15	69	56	42	43	40	41	08-Aug-1991	1430	175	Smith-McIntyre

Table 10. (Continued)

Sta #	Latitude Deg	Latitude Min	Latitude Sec	Longitude Deg	Longitude Min	Longitude Sec	Date Sampled	Time Sampled	Water Depth (ft)	Sample Device
Shallow Water Stations										
SW-1	70	17	10	43	38	42	07-Aug-1991	0945	<25	Ponar
SW-2	70	17	48	43	39	2	07-Aug-1991	1045	<25	Ponar
SW-3	70	15	50	43	40	12	07-Aug-1991	1145	<25	Ponar
SW-4	70	14	47	43	42	4	07-Aug-1991	1200	<25	Ponar
SW-5	70	13	26	43	41	54	07-Aug-1991	1400	<25	Ponar
SW-6	70	11	11	43	46	17	07-Aug-1991	1600	<25	Ponar
SW-7	70	8	20	43	47	28	07-Aug-1991	1650	<25	Ponar
SW-8	70	6	8	43	49	18	07-Aug-1991	1730	<25	Ponar
SW-9	70	0	22	43	51	17	07-Aug-1991	1815	<25	Ponar
SW-10	69	58	17	43	50	40	07-Aug-1991	1900	<25	Ponar
SW-11	70	1	30	43	45	42	10-Aug-1991	1720	0	By Hand
SW-12	70	0	16	43	45	53	10-Aug-1991	1745	0	By Hand
SW-13	69	58	36	43	47	59	10-Aug-1991	1830	0	By Hand
SW-14	69	51	41	43	52	34	10-Aug-1991	1525	0	By Hand
SW-15	69	50	42	43	44	25	09-Aug-1991	1315	5	Smith-McIntyre

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clean plastic spoon. The spoon was washed with Microcleaning Solution and rinsed with dionized water. Again sediment was taken from the top 2 cm that was not in direct contact with the sides of the grab sampler and placed in a ziplock bag (in duplicate). A final sample was taken for grain size from the remaining top 2 cm of sediment and placed in a whirlpak bag. All samples were placed on ice immediately after collection.

Samples taken from the EPA Whaler

These samples were taken with a small ponar grab sampler. Since the sampler was not large enough for the amount of sample needed, a series of grabs were taken. The sampler was lowered by hand with care as described above to avoid disturbing the sediment. After retrieval of the sampler, the sediment was checked for any disturbances, if none occurred it was accepted and sampled. Sampling was as described above with the exception that multiple grabs were needed to obtain sufficient sample. This required taking an aliquot from each grab attempt for each sample; 2 jars for organics, 2 ziplock bags for metals, and 1 whirlpak for grain size. To avoid sampling the same spot on multiple attempts, the boats position was adjusted by shortening or lengthening the anchor line. Water depths were not available at these stations but are estimated to be < 10 m. Samples were stored immediately on ice as before. Sampling equipment was cleaned as described above.

Samples taken by Hand

These stations were sampled at low tide by walking out from the shore. Samples were taken *in situ* with spoons, sampling only the upper 2 cm. At all stations sampled by hand, duplicates for trace metals and trace organics were taken except for WB-6. Spoons were cleaned and samples stored as described above.

3.2 Variances from SOP's

Few variances from SOP's occurred during the execution of this program. As detailed above sediment samples were chilled on ice directly after field collection and not frozen as stated in the SOP. This variance should cause no deterioration in sample or data quality. At the request of the project management the percent contribution of aroclors to PCBs and confirmation of selected pesticides on a second GC column were performed. These are not part of GERG SOP's. Trace metal analyses did not vary from the SOPs.

3.3 Method Detection Limits

Method detection limits (MDL) were determined from seven replicate samples with analyte or spiked analyte concentrations less than 10 times the estimated MDL (EPA Method,1988). MDL are summarized in Tables 11-15. The MDL is calculated as the students t value appropriate for the 99% confidence level multiplied by the standard deviation of the 7 replicate analyses.

Data for analytes not detected are left blank and the qualifier was "ND" is entered denoting not detected. Data that are below the method detection limit (MDL) for an analyte are qualified with a "J". If an MDL was not calculated for a specific analyte the MDL of a similar analyte is used to qualify data. For the analysis of aliphatic hydrocarbons, the MDL for pristane was used for phytane. For individual n-alkanes with no MDL calculated, the MDL for the nearest alkane was used; i.e., the MDL for n-C_{32} was used for n-C_{31}. For the alkylations of the various parent aromatic compounds, if no individual alkylations were available, the MDL of the parent compound was used; i.e., for the C1-, C2-, C3- and C4-chrysenes, the MDL for chrysene was used. If individual alkylations were measured, that MDL was applied to the entire group, i.e., for C2-naphthalenes, the MDL for 2,6-dimethylnaphthalene was used. In the case of the C2-, C3- and C4-phenanthrenes, the MDL for C1-phenanthrene was used.

Table 11. Casco Bay Estuary Program MDL Determinations 1991 (date determined 7/18/91)

LABSAMNO: ID: SAMPLEWT: Alkanes and Isoprenoids	Q1356 MDL SED 10.1 ppb dry wt	Q1357 MDL SED 10.3 ppb dry wt	Q1358 MDL SED 10.2 ppb dry wt	Q1359 MDL SED 10.1 ppb dry wt	Q1360 MDL SED 10.0 ppb dry wt	Q1361 MDL SED 10.0 ppb dry wt	Q1362 MDL SED 10.3 ppb dry wt	MDL	LCL	UCL
C_{10}	17.70	20.70	23.00	21.90	26.90	29.80	26.90	11.68	7.48	25.70
C_{11}	7.80	7.80	11.70	7.40	8.40	11.00	6.60	5.33	3.41	11.72
C_{12}	9.90	9.10	9.50	11.20	12.30	10.10	6.30	5.21	3.33	11.46
C_{13}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	a		
C_{14}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b		
C_{15}	18.30	22.80	25.60	19.30	26.10	26.30	19.80	9.63	6.16	21.18
C_{16}	12.00	10.60	11.70	10.10	14.50	14.70	9.30	5.81	3.72	12.79
C_{17}	9.10	7.00	7.70	6.90	7.80	6.70	4.40	3.98	2.55	8.76
Pristane	14.10	16.40	17.70	17.60	21.60	18.80	17.70	6.32	4.04	13.90
C_{18}	11.20	9.50	10.80	10.80	10.90	11.10	7.80	3.44	2.20	7.56
Phytane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c		
C_{19}	12.30	11.10	11.30	11.30	10.90	11.00	10.30	1.67	1.07	3.68
C_{20}	12.00	10.30	9.90	10.50	10.00	8.90	8.60	3.11	1.99	6.83
C_{21}	12.50	10.40	9.80	11.60	9.80	9.60	9.30	3.29	2.10	7.23
C_{22}	14.00	13.70	12.20	13.00	11.40	12.40	12.50	2.49	1.59	5.48
C_{23}	23.30	12.90	11.90	11.70	12.20	12.50	11.80	11.74	7.51	25.82
C_{24}	14.80	12.00	12.40	12.50	12.70	14.30	13.70	2.96	1.90	6.52
C_{25}	15.90	12.70	12.40	12.30	11.90	12.50	12.10	3.83	2.45	8.42
C_{26}	14.80	12.50	11.70	11.40	11.50	11.40	11.80	3.40	2.18	7.49
C_{27}	14.30	12.90	11.90	11.30	12.00	12.00	11.60	2.82	1.80	6.20
C_{28}	14.00	12.20	11.60	11.00	12.00	11.60	11.60	2.66	1.70	5.86
C_{29}	16.40	12.20	12.10	11.30	12.50	11.10	12.40	4.92	3.15	10.82
C_{30}	14.60	12.80	11.00	11.40	12.10	12.30	12.30	3.22	2.06	7.08
C_{31}	1.90	0.80	0.00	0.00	0.00	0.00	0.60	d		
C_{32}	12.70	10.50	7.30	9.50	7.40	9.10	9.60	5.15	3.29	11.32
C_{33}	1.30	0.00	0.00	0.00	0.00	0.00	0.00	e		
C_{34}	9.60	7.90	0.60	5.60	2.70	4.70	3.80	8.49	5.43	18.67
Surrogate Recoveries										
C_{12}ALKD:	66.1%	75.6%	69.1%	67.3%	73.4%	72.3%	66.8%			
C_{20}ALKD:	71.2%	74.7%	73.3%	73.5%	73.1%	73.6%	69.7%			
C_{24}ALKD:	74.7%	77.9%	75.8%	75.7%	74.9%	75.2%	72.3%			
C_{30}ALKD:	75.8%	77.1%	72.2%	73.3%	72.8%	71.8%	70.5%			

a - MDL set equal to that of n-C_{11}
b - MDL set equal to that of n-C_{14}
c - MDL set equal to that of n-pristine
d - MDL set equal to that of n-C_{30}
e - MDL set equal to that of n-C_{32}

Table 12. Casco Bay Estuary Program MDL determinations 1991 (date determined 7/17/91)

LABSAMNO: ID: SAMPLEWT: UNIT: PNA Analyte	Q1355 MDL SED 10.10 (ppb) dry wt.	Q1356 MDL SED 10.09 (ppb) dry wt.	Q1357 MDL SED 10.34 (ppb) dry wt.	Q1358 MDL SED 10.15 (ppb) dry wt.	Q1359 MDL SED 10.12 (ppb) dry wt.	Q1360 MDL SED 10.02 (ppb) dry wt.	Q1361 MDL SED 10.01 (ppb) dry wt.	MDL (ppb) dry wt.	LCL (ppb) dry wt.	UCL (ppb) dry wt.
Naphthalene	4.57	3.85	3.37	3.87	2.90	3.41	4.14	1.53	0.98	3.37
2-Methylnaphthalene	3.43	3.07	3.07	2.99	2.87	3.11	3.46	0.61	0.39	1.35
1-Methylnaphthalene	3.69	3.16	3.48	3.16	2.93	3.53	3.54	0.76	0.49	1.67
2,6-Dimethnaphthalene	2.98	2.57	2.66	2.41	2.49	2.59	2.49	0.52	0.33	1.14
2,3,5-Trimethnaphthalene	2.80	2.35	2.45	2.16	2.36	2.40	2.27	0.56	0.36	1.22
Biphenyl	4.82	3.21	3.21	3.80	2.92	3.55	3.86	1.74	1.11	3.83
Acenaphthylene	2.78	2.54	2.49	2.21	2.32	2.24	2.22	0.59	0.38	1.30
Acenaphthene	3.05	2.68	2.71	2.38	2.49	2.43	2.38	0.68	0.43	1.49
Fluorene	3.39	2.76	3.01	2.39	2.58	2.49	2.53	0.98	0.63	2.16
Phenanthrene	3.14	2.76	2.66	2.54	2.43	2.43	2.49	0.70	0.45	1.55
Anthracene	2.72	2.56	2.51	1.97	2.08	1.93	1.97	0.93	0.59	2.04
1-Methylphen	3.00	2.69	2.67	2.38	2.29	2.37	2.39	0.71	0.45	1.56
Dibenzothiophene	2.11	1.94	1.42	1.78	1.43	1.33	1.36	0.87	0.56	1.92
Fluoranthene	2.44	2.34	2.25	2.00	1.95	1.91	2.00	0.59	0.38	1.29
Pyrene	2.62	2.39	2.27	2.05	1.99	1.89	1.99	0.73	0.47	1.61
Benanthracene	1.37	1.30	1.23	1.08	1.08	0.98	1.08	0.39	0.25	0.86
Chrysene	2.72	2.46	2.50	2.09	2.10	2.05	2.12	0.73	0.47	1.62
Benbfluoran	1.87	1.62	1.84	1.35	1.34	1.55	1.44	0.60	0.39	1.33
Benkfluoran	1.95	1.84	1.72	1.57	1.47	1.17	1.50	0.72	0.46	1.59
Benepyrene	2.12	1.85	1.94	1.59	1.56	1.50	1.62	0.64	0.41	1.42
Benapyrene	1.37	1.03	0.90	0.94	0.87	0.60	0.75	0.67	0.43	1.47
Perylene	5.11	3.70	3.80	2.23	3.96	6.44	4.35	3.62	2.32	7.97
I123cdpyrene	1.67	1.38	1.43	1.11	1.13	1.04	1.21	0.62	0.40	1.36
Dibenzo(a,h)anthracene	1.26	1.13	1.14	0.88	0.92	0.84	0.96	0.44	0.28	0.96
Benzo(g,h,i)perylene)	1.28	1.20	1.11	0.78	0.92	0.76	0.89	0.57	0.37	1.26
Surrogate Recoveries										
NAPHD8:	55.51	53.62	50.24	54.81	52.09	50.54	45.26			
ACEND10:	60.80	66.68	62.06	66.76	62.30	62.43	58.63			
PHEND10:	67.97	72.12	70.41	72.20	73.81	73.30	66.79			
CHRYD12:	57.76	62.86	58.20	61.10	61.94	61.81	56.49			
PERYD12:	11.38	2.55	4.16	6.62	1.62	1.62	3.38			

Table 13. Casco Bay Estuary Program MDL determinations 1991 (date determined 6/12/91)

LABSAMNO:	Q1355	Q1356	Q1357	Q1358	Q1359	Q1360	Q1361	MDL	LCL	UCL
ID:	MDL SED	MDL SED	MDL SED	MDL SED	MDL SED	MDL SED	MDL SED			
SAMPLEWT:	10.10	10.09	10.34	10.15	10.12	10.02	10.01			
UNIT:	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)			
Analyte	dry wt	dry wt	dry wt	dry wt	dry wt	dry wt	dry wt			
Endosulfan I								a		
Endosulfan II								b		
Endosulfan Sulfate								c		
Endrin Aldehyde								d		
Toxaphene - Summary of Peaks								e		
Alpha-BHC	0.33	0.40	0.36	0.36	0.43	0.34	0.38	0.09	0.06	0.21
HCB	1.36	0.75	0.92	1.82	1.10	1.63	1.48	1.08	0.69	2.37
Beta-BHC	0.44	0.39	0.41	0.39	0.44	0.43	0.43	0.06	0.04	0.13
Gamma-BHC	0.33	0.37	0.33	0.34	0.38	0.40	0.37	0.08	0.05	0.17
Delta-BHC	0.36	0.41	0.41	0.35	0.43	0.41	0.40	0.08	0.05	0.17
Heptachlor	0.34	0.38	0.38	0.38	0.41	0.40	0.37	0.06	0.04	0.13
Hepta-Epoxide	0.32	0.34	0.32	0.31	0.35	0.37	0.37	0.07	0.04	0.15
Oxychlordane	0.34	0.41	0.38	0.36	0.40	0.40	0.40	0.07	0.05	0.16
Gamma-Chlordane	0.38	0.37	0.40	0.40	0.44	0.43	0.41	0.07	0.05	0.16
Alpha-Chlordane	0.38	0.41	0.37	0.38	0.40	0.44	0.42	0.07	0.05	0.16
Trans-Nonachlor	0.33	0.36	0.34	0.35	0.38	0.37	0.35	0.05	0.03	0.12
CIS-nonachlor	0.35	0.39	0.37	0.37	0.41	0.41	0.40	0.07	0.04	0.14
Aldrin	2.26	2.26	1.54	1.65	1.63	1.71	1.85	0.83	0.53	1.83
Dieldrin	1.81	1.99	0.53	0.48	0.49	0.49	0.64	1.87	1.20	4.12
Endrin	0.30	0.33	0.30	0.31	0.34	0.35	0.36	0.07	0.04	0.15
Mirex	0.39	0.40	0.37	0.39	0.41	0.40	0.39	0.04	0.02	0.08
2,4'DDE (o,p'DDE)	1.86	1.93	1.24	1.32	1.31	1.36	1.44	0.78	0.50	1.71
4,4'DDE (p,p'DDE)	0.44	0.48	0.47	0.44	0.45	0.43	0.42	0.06	0.04	0.13
2,4'DDD (o,p'DDD)	0.68	0.72	0.47	0.51	0.52	0.51	0.54	0.27	0.17	0.58
4,4'DDD (p,p'DDD)	0.42	0.48	0.39	0.40	0.45	0.42	0.42	0.09	0.06	0.20
2,4'DDT (o,p'DDT)	0.29	0.35	0.33	0.33	0.37	0.37	0.34	0.07	0.04	0.15
4,4'DDT (p,p'DDT)	0.84	0.96	0.58	0.59	0.63	0.62	0.61	0.41	0.27	0.91

a - MDL estimated to be 1 ppb
b - MDL estimated to be 1 ppb
c - MDL estimated to be 1 ppb
d - MDL estimated to be 1 ppb
e - MDL estimated to be 1 ppb

Table 14. Casco Bay Estuary Program MDL determination 1991 (date determined 6/12/91)

LABSAMNO: ID: SAMPLEWT: UNIT: Analyte	Q1355 MDL SED 10.10 (ppb) dry wt	Q1356 MDL SED 10.09 (ppb) dry wt	Q1357 MDL SED 10.34 (ppb) dry wt	Q1358 MDL SED 10.15 (ppb) dry wt	Q1359 MDL SED 10.12 (ppb) dry wt	Q1360 MDL SED 10.02 (ppb) dry wt	Q1361 MDL SED 10.01 (ppb) dry wt	MDL	LCL	UCL
PCB # (Chlorination)										
8 (CL2)	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.13	0.08	0.28
18 (CL3)	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.07	0.05	0.15
28 (CL3)	0.3	0.4	0.4	0.4	0.5	0.4	0.4	0.09	0.06	0.21
44 (CL4)	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.10	0.06	0.22
52 (CL4)	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.05	0.03	0.12
66 (CL4)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.06	0.04	0.14
101 (CL5)	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.07	0.04	0.15
105 (CL5)	0.6	0.7	0.5	0.5	0.5	0.5	0.5	0.16	0.11	0.36
110/77 (CL5/4)	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.07	0.04	0.14
118/108/149(CL5/5/6)	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.05	0.03	0.11
128 (CL6)	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.07	0.05	0.16
138 (CL6)	1.2	1.4	1.0	0.9	1.0	0.9	1.0	0.50	0.32	1.09
126 (CL5)	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.10	0.06	0.21
153 (CL6)	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.05	0.03	0.10
170 (CL7)	0.6	0.6	0.5	0.5	0.7	0.5	0.5	0.18	0.11	0.39
180 (CL7)	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.09	0.05	0.19
187/182/159(CL7/7/6)	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.08	0.05	0.17
195 (CL8)	0.4	0.5	0.4	0.5	0.5	0.5	0.4	0.07	0.05	0.16
206 (CL9)	0.4	0.5	0.4	0.5	0.5	0.4	0.4	0.09	0.06	0.21
209 (CL10)	0.4	0.5	0.4	0.5	0.5	0.5	0.5	0.10	0.06	0.22
Surrogate Recoveries										
DBOFB%:	87.9%	89.7%	88.9%	87.9%	87.2%	81.8%	84.2%			
PCB#103%:	96.3%	98.0%	97.5%	98.3%	94.6%	88.3%	90.6%			
PCB#198%:	104.7%	111.1%	103.6%	107.0%	98.8%	89.4%	93.8%			

Table 15. Casco Bay Estuary Program MDL determinations for trace metals 1991 (ppm dry weight).

LABSAMNO ID ANALYTE	REP-1 MDL SED CONC	REP-2 MDL SED CONC	REP-3 MDL SED CONC	REP-4 MDL SED CONC	REP-5 MDL SED CONC	REP-6 MDL SED CONC	REP-7 MDL SED CONC	MDL CONC	LCL CONC	UCL CONC
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Ag	0.034	0.040	0.049	0.049	0.050	0.059	0.072	0.035	0.022	0.076
As	1.04	1.15	1.31	1.40	1.43	1.57	1.66	0.61	0.39	1.35
Cd	0.026	0.027	0.028	0.029	0.029	0.029	0.029	0.004	0.003	0.009
Cr	0.027	0.029	0.033	0.033	0.036	0.044	0.047	0.021	0.013	0.045
Cu	0.40	0.42	0.47	0.49	0.50	0.53	0.54	0.15	0.09	0.32
Fe	44.45	48.39	48.62	49.79	52.16	54.22	54.61	10.03	6.42	22.07
Hg	11.62	12.69	13.23	14.76	14.88	14.95	15.03	3.79	2.43	8.34
Ni	0.93	0.91	1.14	0.81	1.23	0.88	1.27	0.51	0.33	1.13
Pb	0.25	0.26	0.26	0.27	0.28	0.39	0.30	0.05	0.03	0.11
Se	0.54	0.4	0.43	0.43	0.37	0.45	0.45	0.15	0.09	0.32
Zn	1.94	2.1	2.13	2.29	2.5	2.61	3.25	1.22	0.78	2.69

For the other PCB congeners reported, the MDLs were assigned based on the level of chlorination. All MDLs that were calculated for a specific level of chlorination were averaged and assigned to that specific level.

Level of Chlorination	MDL (ppb)
2	0.14
3	0.10
4	0.05
5	0.06
6	0.09
7	0.09
8	0.06
9	0.07
10	0.10

Other pesticides for which no MDL was calculated, an MDL was estimated based on blanks and the lowest standard's response.

3.4 Quality Assurance Summary

In general the majority of the quality assurance objectives were met. The recoveries of perylene d_{12} were below 20% in a few cases. This surrogate is only used to quantitate perylene. The low recoveries of d_{12}-perylene mimic the recoveries of perylene. The losses seem to be related to samples with low amounts of organic matter (i.e., blanks). It is our opinion that the low recovery of d_{12}-perylene does not effect the overall quality of the data. The recoveries of the pesticide/PCB internal standard PCB #198 was erratic. It was not used for quantitation purposes, therefore it does not effect data quality. Two spiked matrix samples (Q2089, Q2093) had low recoveries of n-C_{32} and n-C_{34}. Several of the samples used for matrix spikes had high concentrations of aliphatic and aromatic hydrocarbons when compared to the amount "spiked" into the sample. In these cases the large native concentration must be subtracted from the "total" concentration to arrive at spike recoveries. The differences detected are sometimes less that the analytical uncertainty and these samples are labeled with an M to indicate a matrix interference. This is also the case for the 4,4'-DDD in Matrix Spike sample Q2133.

The method utilized consistently produces low and variable recoveries of HCB and Beta-BHC. The recoveries are generally about 30-40%. These pesticides were not detected above 1 ppb except for HCB in the sample from OB-2 (8.24 ppb dry wt.). Because of the low recoveries of HCB using our procedure, HCB concentrations could be higher than calculated. Mirex recovery was only 65% in spike sample Q2123 and endrin recoveries were 52 and 76%, respectively for spike samples Q2133 and Q2137. The recoveries for 2,4'-DDT and 4,4'-DDT were also low for spike sample Q2133. Mirex and endrin recoveries were acceptable for all other spike matrix samples and no mirex or endrin was detected above 1 ppb. The quality of the data is therefore judged to be sufficient for the purpose of this study.

All organic contaminant data utilized in this report are corrected for surrogate recoveries. A surrogate is a compound of similar structure and chemistry added to a sample at the initiation of the analysis. It is hoped that the surrogate will mimic the behavior of the analyte of interest and thus can be used to correct for analytical losses during sample analysis. A known amount is added at the beginning of the analysis and at the end of the analysis the amount of the compound is determined. Any difference in the starting and ending amount must be lost due to sample handling. Data are reported both as corrected and uncorrected in the data appendix however all data within this report are corrected to 100% surrogate recovery.

Laboratory duplicates show some variability. This variability is due to small scale heterogeneity of the sediment samples. When sediments are extensively homogenized by sieving and grinding reproducibilities on the order of 10-30% can be achieved (i.e., NIST SRMs). The inhomogeneity of sediments in this study is generally within this range but some of the higher molecular weight PAH show more variability. This may be due, for example, to small soot particles in one subsample and not in another. Most PAH in the study area are combustion-derived which is generally due to very fine carbonized particles. One of the samples, IB-1, analyzed as a triplicate, illustrate a good agreement between two replicates (C3195 and Q2139), while the third replicate has higher concentrations of most of the higher molecular weight aromatic hydrocarbons. This increase is accompanied by subtle changes in PAH composition suggesting heterogeneity in the sample and not analytical bias. The heterogeneous nature of marine sediments is well documented in the literature.

For trace metals four samples were analyzed in duplicate and four were spiked with all elements determined. In addition, two standard reference materials were analyzed. All QA data met the required QA criteria specified in the QA plan and are summarized in Appendix A.

3.5 Confirmation of Pesticides and PCB Analyses

Samples (~10%) from each geographic location that had the highest pesticide or PCB concentrations were selected for confirmation on a second GC column (HP-17) with a different polarity and therefore elution order compared with the column used for the primary analyses (DB-5). The results of these confirmations are summarized in Table 16. The presence of PCBs and pp'-DDE was confirmed in all the samples analyzed using a second column. With the exception of cis-nonachlor, the presence of all analytes with concentrations above 1 ppb were confirmed by the second column analysis. It appears that an unknown compound co-elutes with cis-nonachlor on a DB-5 column. Some pesticides could not be confirmed at concentrations less than 1 ppb due to the presence of PCBs at relatively high (16-450 ppb dry wt.) concentrations. The detection of pesticides could not be confirmed with a second column analysis if the concentrations were below 1 ppb dry wt. Therefore data below 1 ppb should be interpreted in light of these confirmation limitations.

4.0 CONTAMINANT CONCENTRATIONS

4.1 Hydrocarbons

Aliphatic hydrocarbons were detected at all stations sampled. Normal and branched alkanes were a mixture of terrestrial, planktonic, petroleum and pyrogenic hydrocarbons. Normal and isoprenoid alkanes were detected as well as an occasional unresolved complex mixture (UCM) an indication of petroleum contamination. The majority of resolved alkanes had odd carbon

Table 16. Summary of Casco Bay Pesticide & PCB Analysis Confirmation Analyses (ppb dry wt. surrogate corrected)

Raw File # Station	C3067P CS-4 (ppb)	C3091P EB-9 (ppb)	C3195P IB-1 (ppb)	C3107P IB-7 (ppb)	C3119P OB-3 (ppb)	C3145P SW-2 (ppb)	C3147P SW-3 (ppb)	C3175P WB-1 (ppb)
Alpha-BHC	0.42	0.11	0.23	0.14	0.14	0.10	0.25	0.23
HCB	0.04	0.06	0.08	< MDL**	0.01	0.01	0.08	< MDL**
Beta-BHC	< MDL**	< MDL**	< MDL**	0.14	< MDL**	< MDL**	0.18	0.13
Gamma-BHC	< MDL**	0.07	0.01	0.30	0.09	0.10	0.14	0.15
Delta-BHC	0.01	< MDL**	< MDL**	0.11	0.06	0.09	0.20	0.04
Heptachlor	0.02	< MDL**	0.08	< MDL**	< MDL**	0.03	0.13	< MDL**
Hepta-Epoxide	0.17	< MDL**	0.29	< MDL**	< MDL**	< MDL**	0.15	< MDL**
Oxychlordane	0.03	< MDL**	0.13	0.23	0.06	0.23	0.40	0.04
Gamma-Chlordane	0.08	*1.55	*2.79	*0.80	0.10	*1.06	*2.58	*0.53
Alpha Chlordane	0.20	0.19	0.40	0.64	0.12	0.53	0.74	0.22
Trans-nonachlor	0.10	0.10	0.26	0.04	0.06	0.39	0.41	0.06
CIS-nonachlor	0.11	0.07	0.16	0.13	0.09	1.74	0.50	0.05
Aldrin	< MDL**	0.15	< MDL**	0.02	0.02	0.03	< MDL**	0.01
Dieldrin	0.46	0.43	*0.87	0.42	0.20	*0.94	0.67	0.14
Endrin	< MDL**	< MDL**	< MDL**	< MDL**	0.55	0.84	< MDL**	< MDL**
Mirex	0.66	0.49	0.31	0.29	< MDL**	0.22	0.04	< MDL**
2,4'DDE (O,P'DDE)	0.01	0.10	0.10	0.10	0.03	< MDL**	0.07	< MDL**
4,4'DDE (P,P'DDE)	*0.85	*1.60	*3.91	*1.82	*1.49	*2.90	*4.21	*0.92
2,4'DDD (O,P'DDD)	0.17	0.35	*1.53	0.41	0.26	*1.46	*1.75	0.12
4,4'DDD (P,P'DDD)	0.45	*1.62	*6.49	*1.83	*1.78	*8.61	*13.34	0.53
2,4'DDT (O,P'DDT)	0.15	< MDL**	0.11	0.06	0.09	*1.51	0.16	0.01
4,4'DDT (P,P'DDT)	0.25	0.48	*1.32	0.48	0.47	*2.33	0.89	0.52
TOTAL PCB's	*38.63	*38.39	*110.26	*50.99	*25.81	*446.99	*94.21	*15.96

* Presence confirmed by detection on a second more polar GC capillary column (HP-17).
**< MDL = less than the method detection limit.

chain lengths with twenty-three to thirty three carbons indicative of plant biowaxes (Figure 6). N-C_{15}, n-C_{17}, n-C_{19}, n-C_{21}, and pristane were often more abundant than the co-occurring even carbon-numbered normal alkanes and phytane suggesting a phytoplankton input. Total alkane and UCM concentrations varied as a function of clay and organic carbon content (Figures 7 and 8). The UCM generally co-varied with PAH concentrations suggesting a common origin most likely run-off from adjacent municipal and industrial sites (Figures 9). Little, if any, fresh petroleum spillage was evident. Total alkanes and UCM concentrations varied from 151 to 10,078 ppb dry wt surrogate corrected and 2 to 335 ppm dry wt., respectively (Figures 10 and 11). Previous studies did not report aliphatic hydrocarbon compositions or concentrations.

Polycyclic aromatic hydrocarbons (PAH) were also detected at all locations sampled (Figure 12). The predominant PAH are highly condensed ring structures with few alkylations indicating a pyrogenic or combustion source (Figure 13). Four ring and larger PAH account for more than 60% of sedimentary PAH throughout the study area. Soot from car exhaust, high temperature burning of fossil fuels at municipal and industrial sites, and coal tar probably contribute contaminants of this type to bay sediments. A comparison of aromatics with two or more carbon substitutions to unsubstituted PAH suggests that the majority of the alkylated PAH are co-sourced in combustion derived materials (Figure 14). While combustion derived PAH are enhanced in unsubstituted compounds alkylated PAH do co-occur as residues although in decreased abundance as compared to petroleum. The co-variance of PAH and UCM (Figure 9) as well as PAH distributions indicate that sediment hydrocarbons are most likely derived from a combination of combustion residues and weathered petroleum. Both of these inputs exhibit highest concentrations in sediments in the vicinity of the greater Portland metropolitan area. Hydrocarbon composition is nearly uniform throughout the bay (Figure 10). Two locations exhibit enhanced alkylated PAH concentrations suggestive of weathered petroleum. The shallow water site (SW-1) in Fore River and the one high value in East Bay (EB-9) exhibit characteristics typical of biodegraded oil (i.e., lack of n-alkanes, the presence of an UCM, and abundant alkylated PAH).

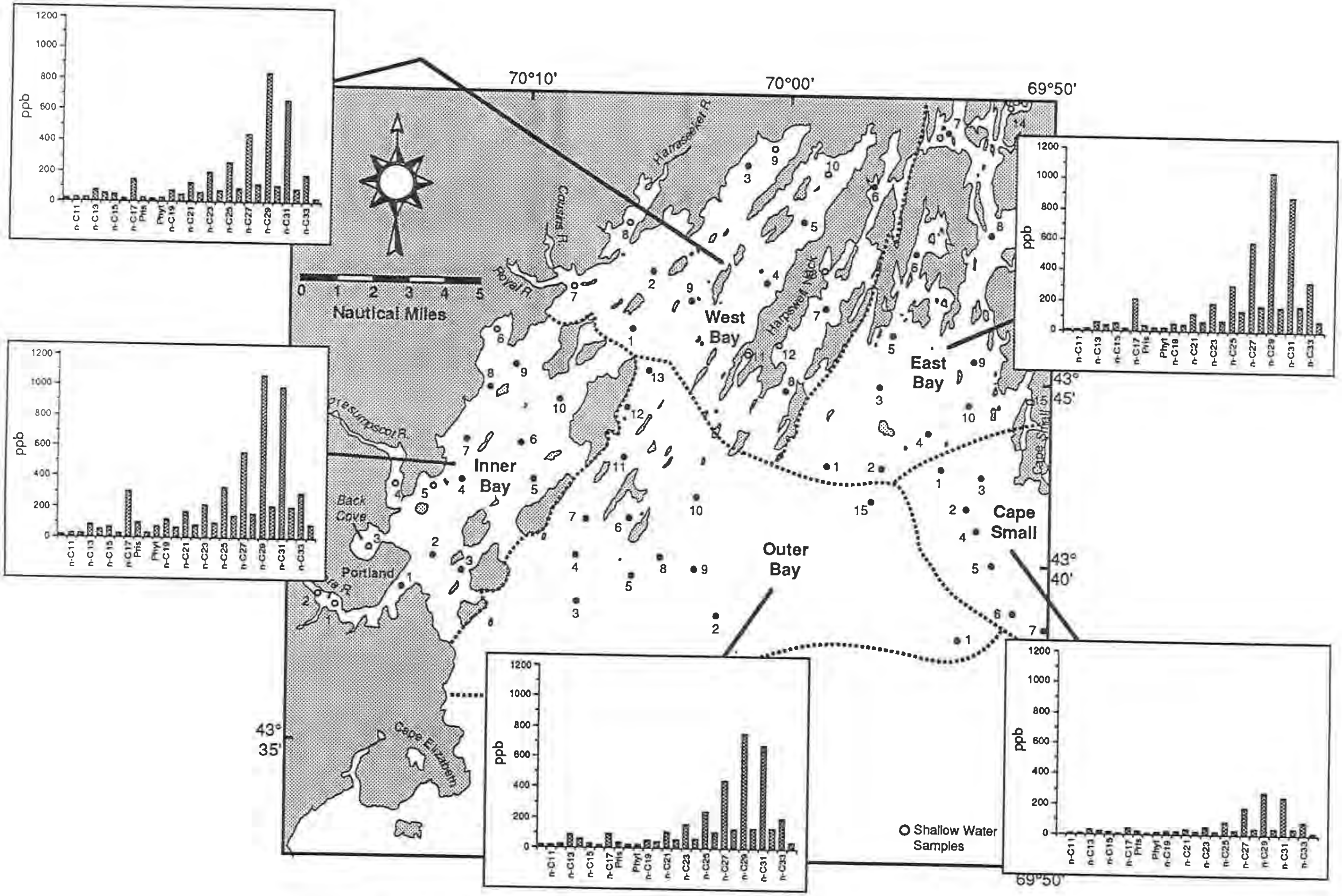

Figure 6. Average normal alkane and isoprenoid concentrations (ppb dry weight, surrogate corrected) and distributions in sediments from Casco Bay.

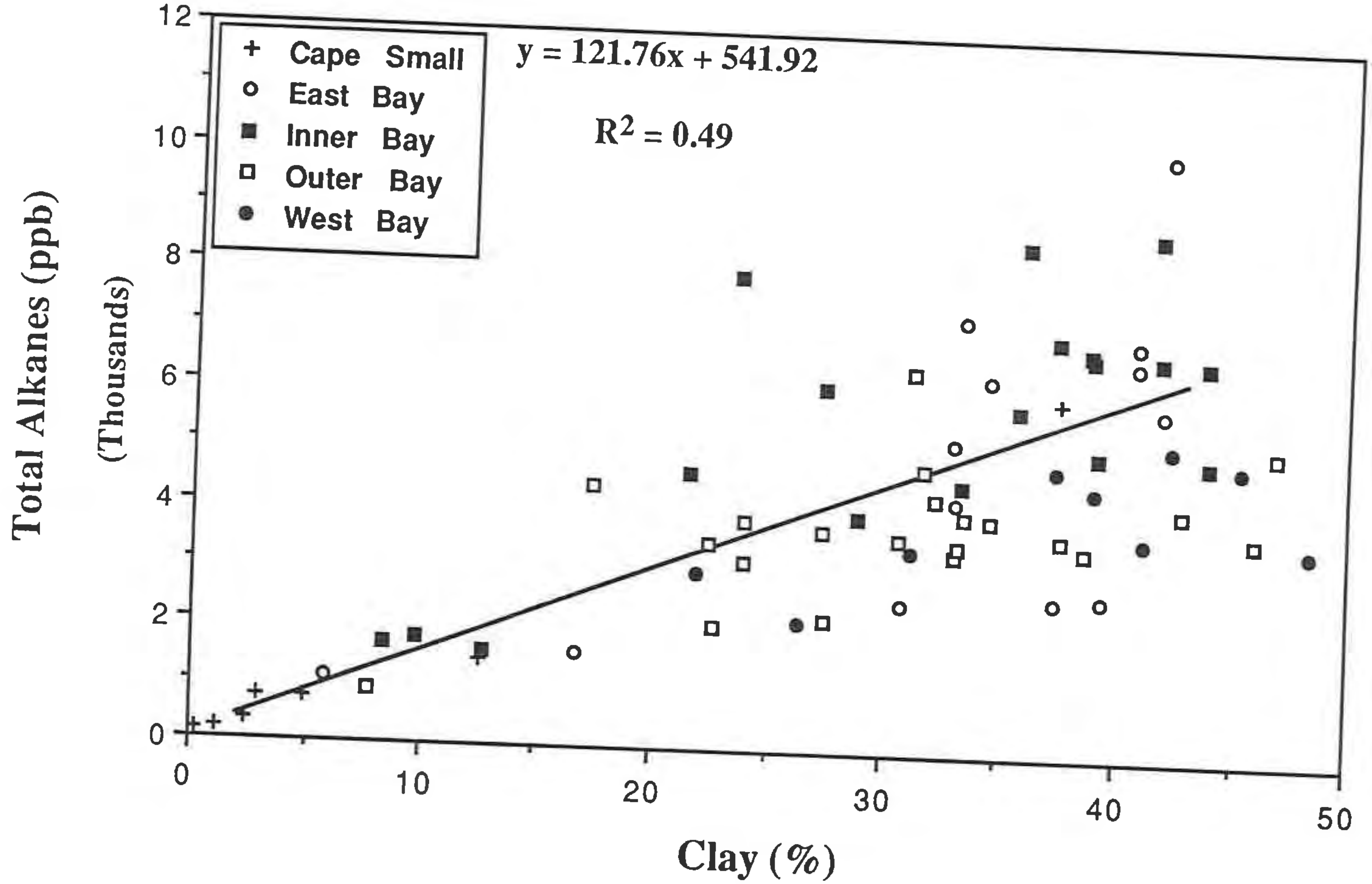

Figure 7. The relationship between total alkane concentration (ppb dry weight, surrogate corrected) and the clay content (%) of sediments from Casco Bay.

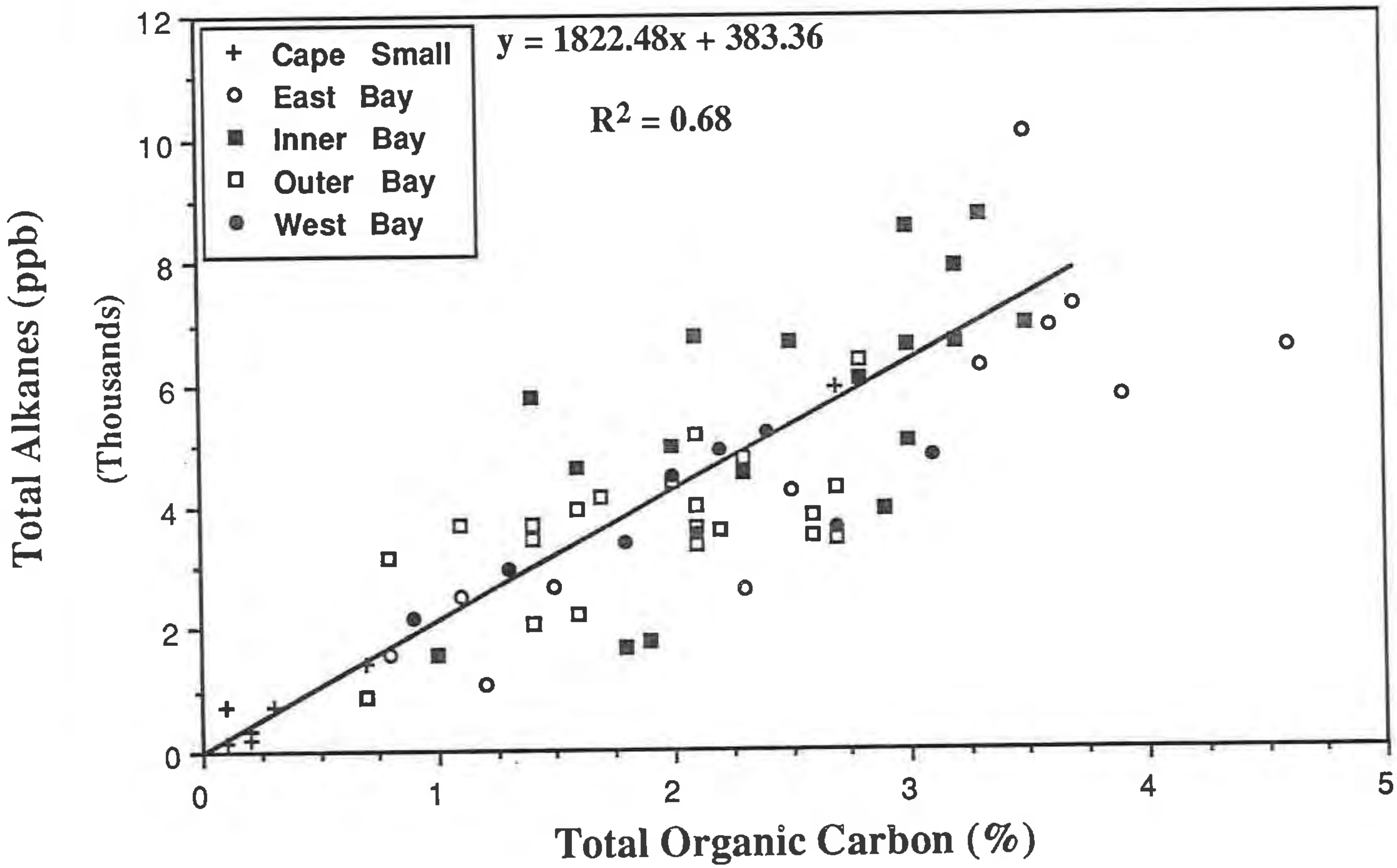

Figure 8. The relationship between total alkane concentration (ppb dry weight, surrogate added) and the organic carbon content (%) of Casco Bay sediments.

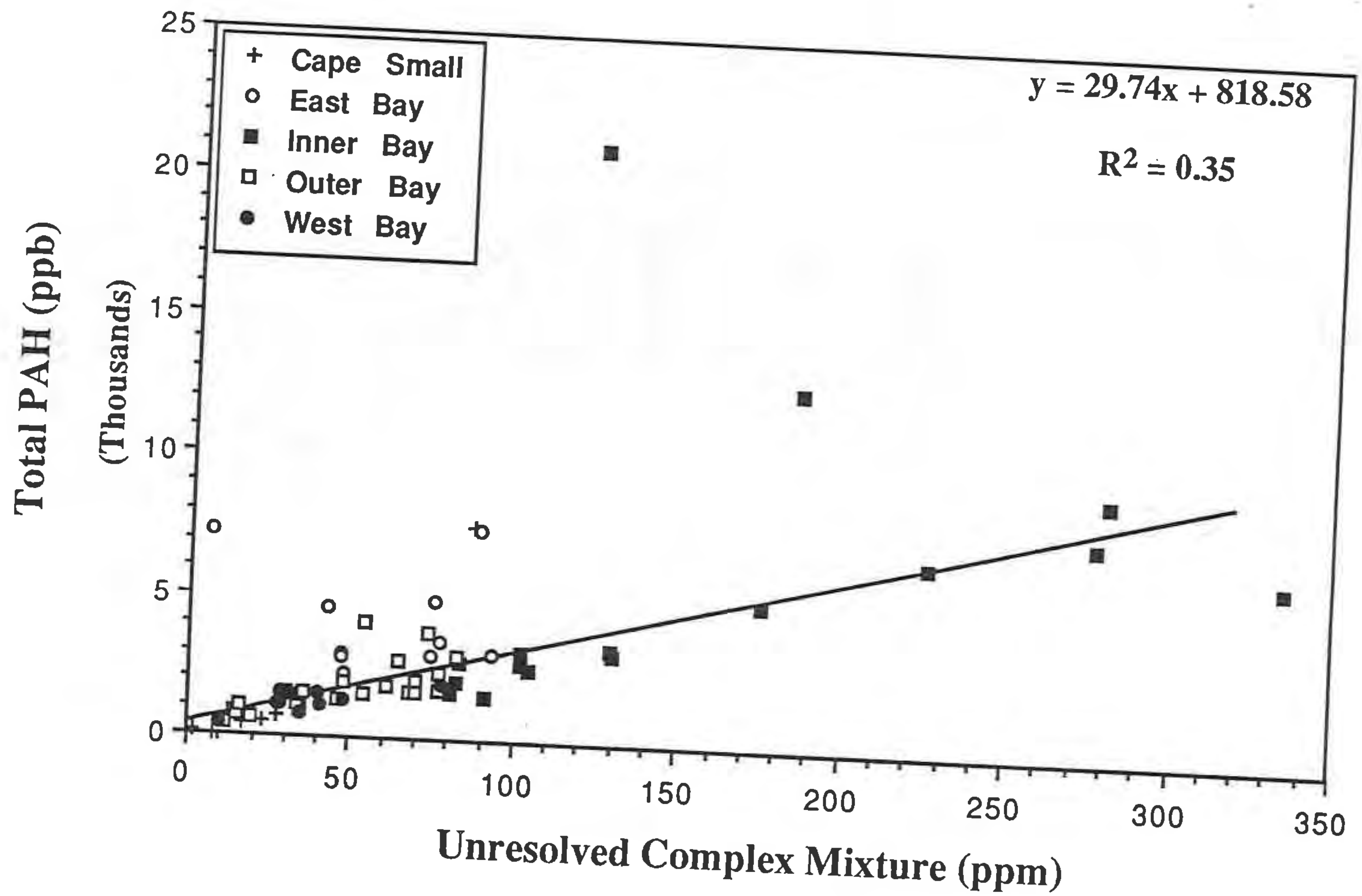

Figure 9. The relationship between polycyclic aromatic hydrocarbon (PAH) (ppb dry weight, surrogate corrected) and unresolved complex mixture (UCM) concentrations (ppm dry weight) in Casco Bay sediments.

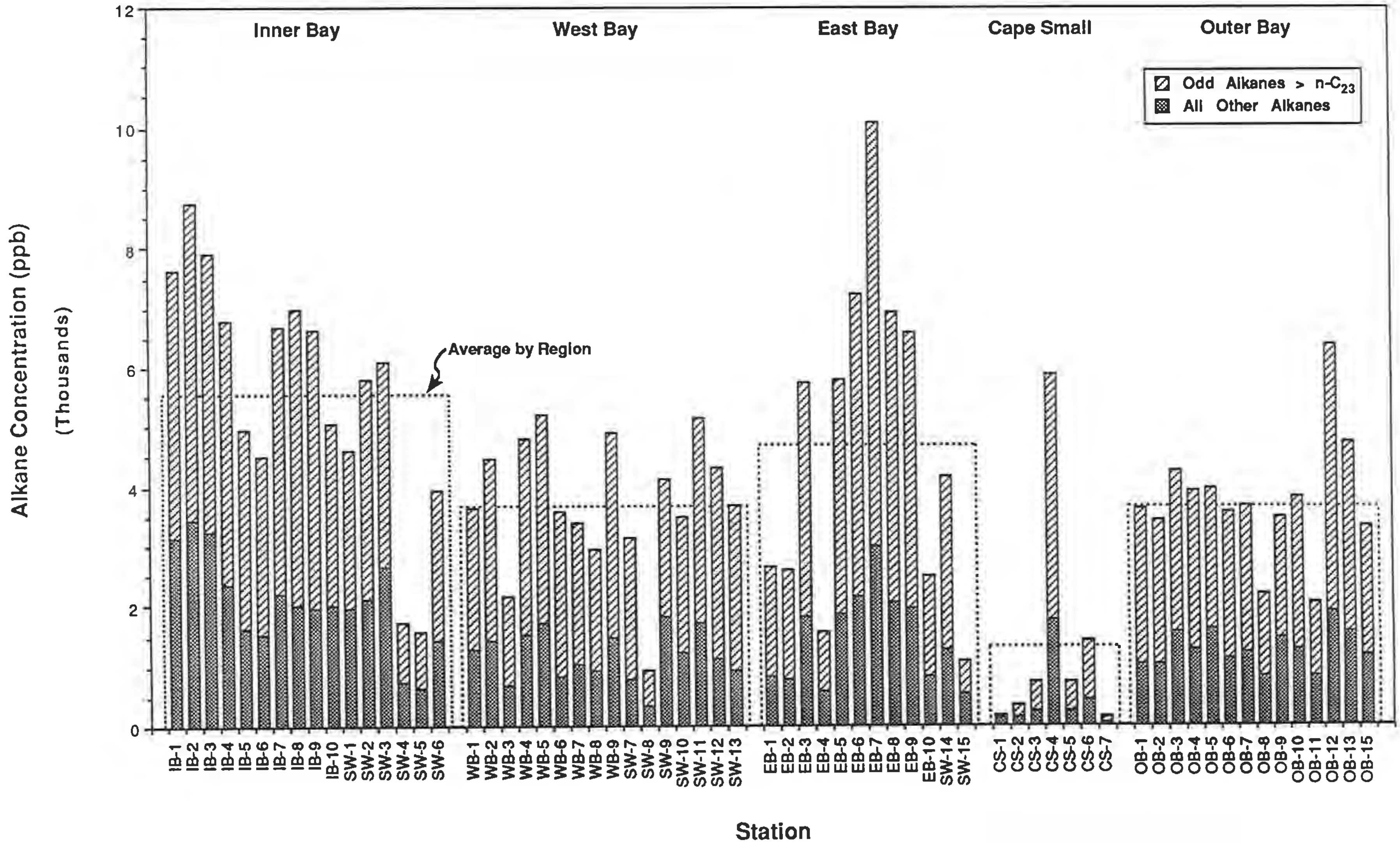

Figure 10. Summary of alkane concentrations (ppb dry weight, surrogate corrected) in sediments by region within Casco Bay.

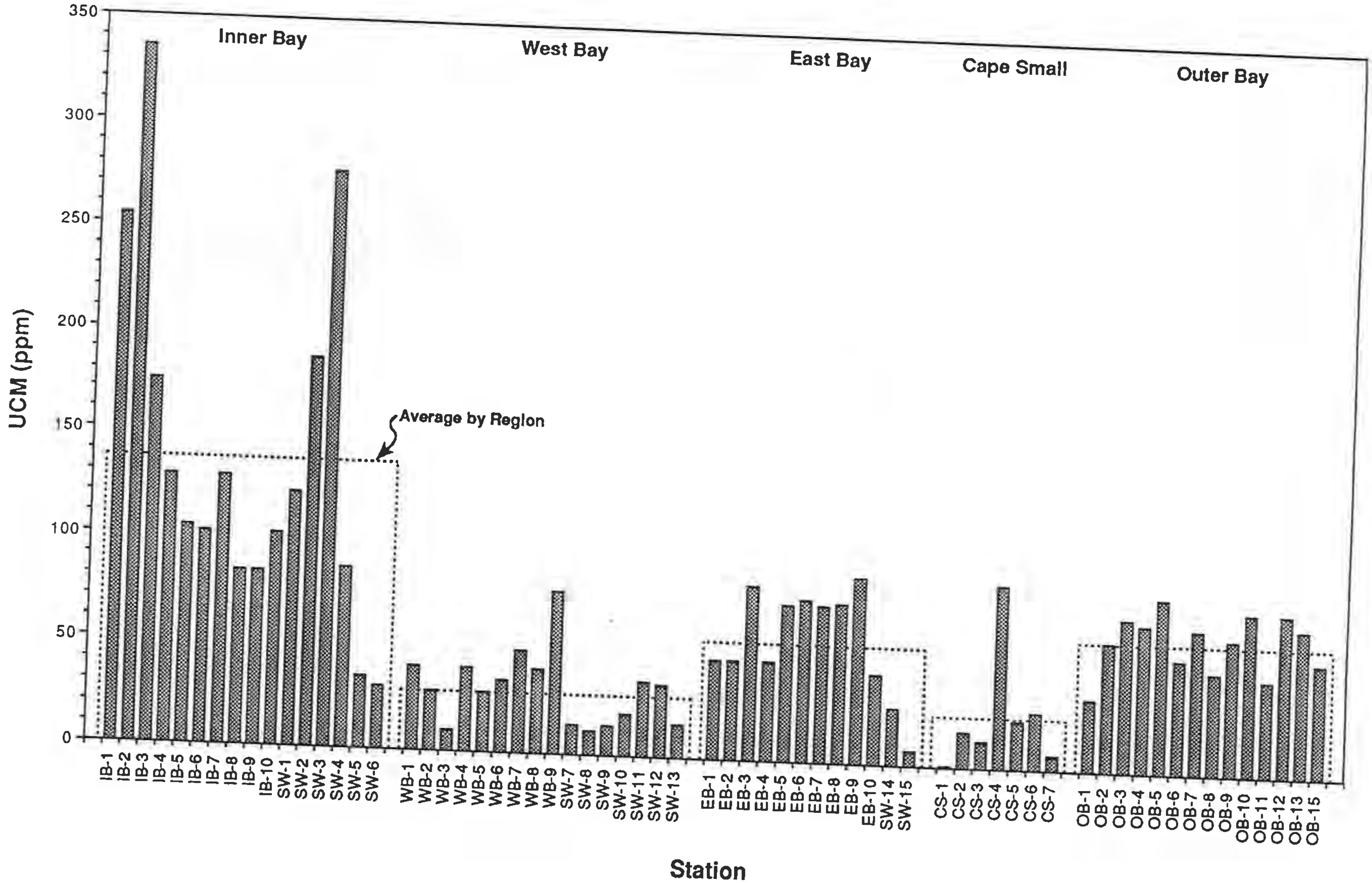

Figure 11. Summary of unresolved complex mixture concentrations (ppm dry weight) in sediments by region within Casco Bay.

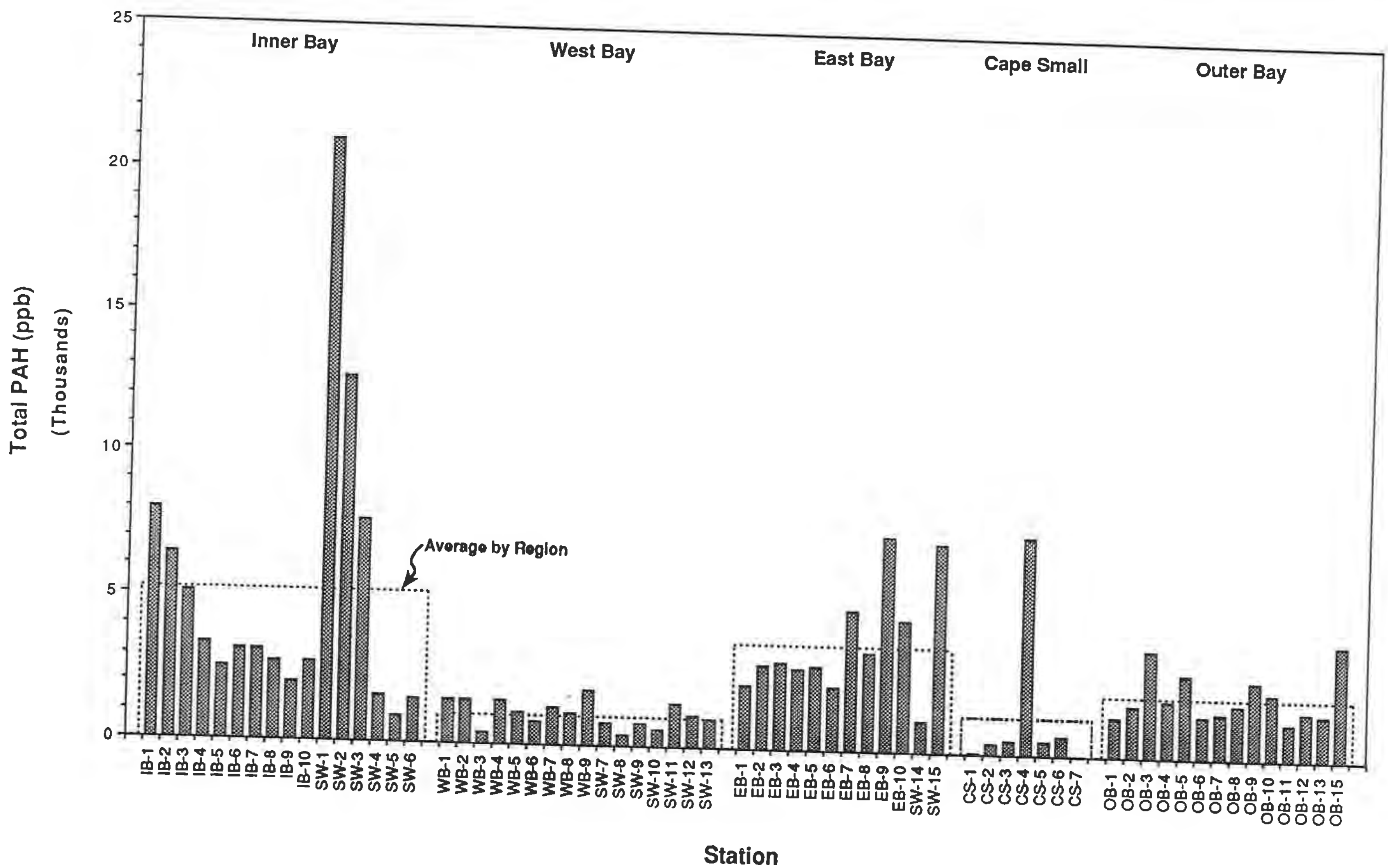

Figure 12. Summary of PAH concentrations (ppb dry weight, surrogate corrected) in sediments by region within Casco Bay.

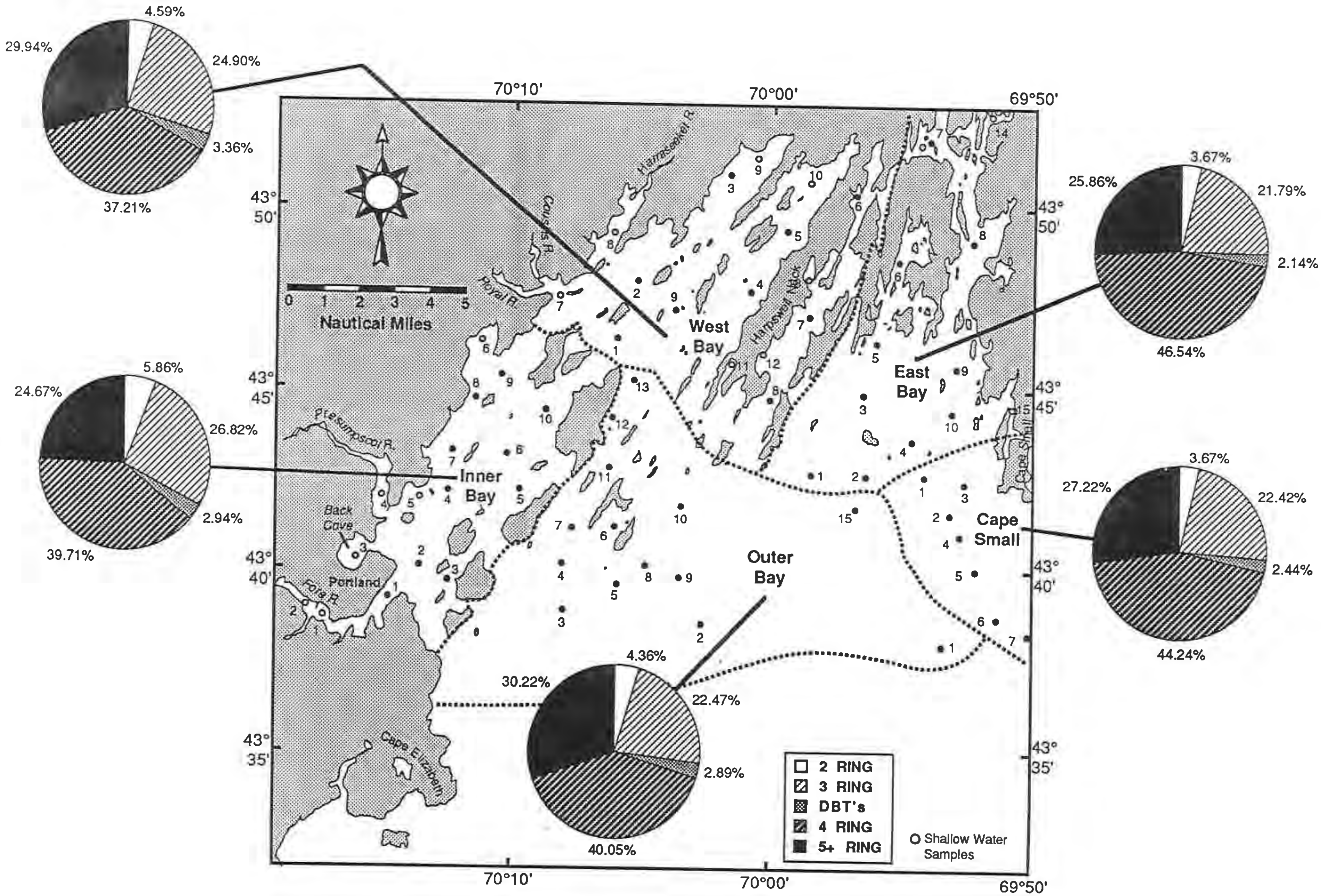

Figure 13. Average PAH compositions in sediments by region within Casco Bay.

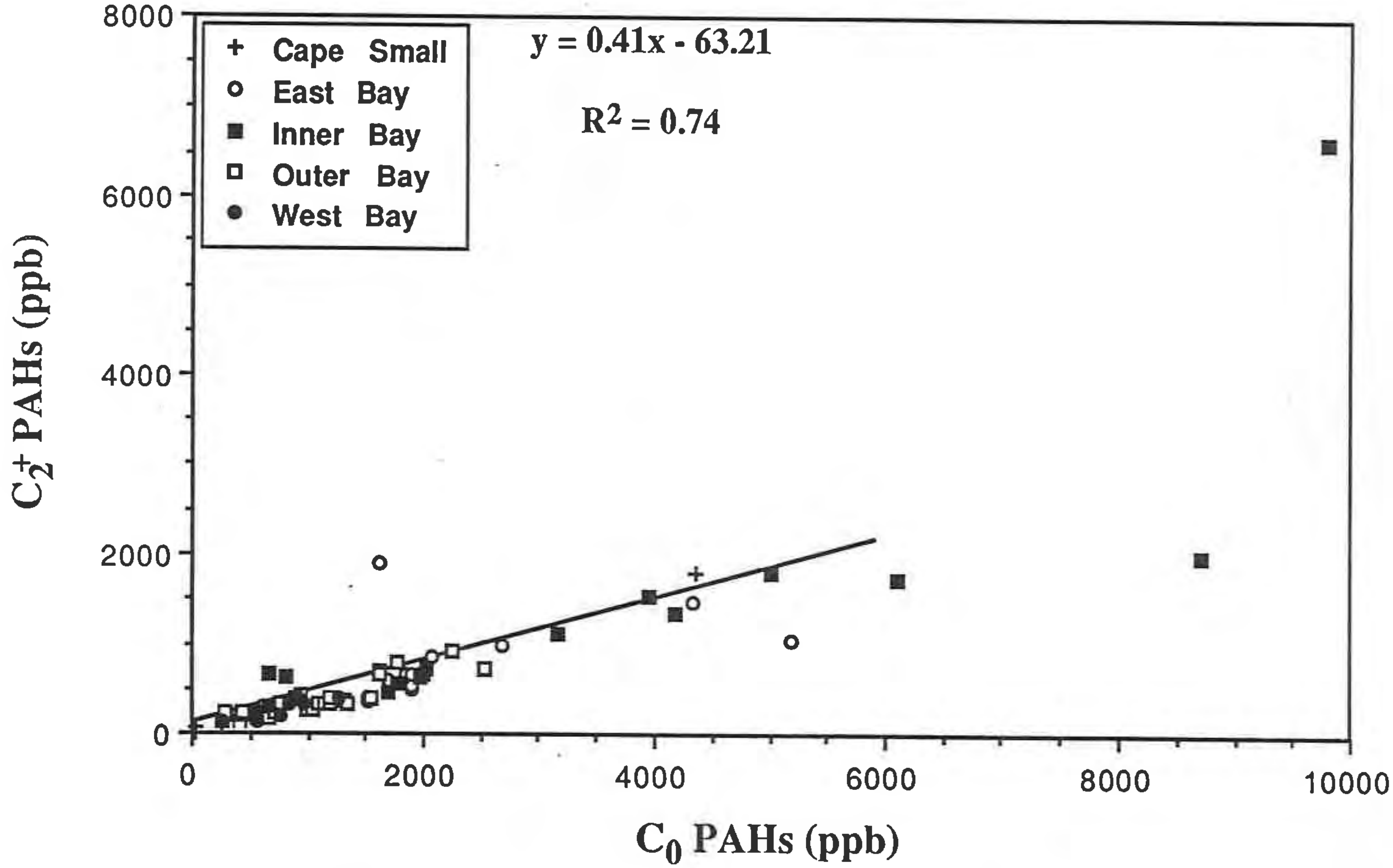

Figure 14. The relationship between non-alkylated PAH and PAH with 2 or more carbon substitutions.

4.1.1 Geographic and Historical Comparisons

Hydrocarbon concentrations vary widely across the study area. The southern part of Casco Bay is most highly contaminated with PAH as documented in previous studies (Figure 15). However elevated PAH concentrations are also present at a few sites in East Bay and Cape Small (note that total PAH only include analytes measured in all previous studies to facilitate comparisons, i.e., PAH*; see Table 1). Sediments from the Fore River area and locations close to Portland contain high concentrations of PAH. Contaminants in general decrease with distance from these populated areas. Average UCM concentrations in sediments decrease in order with Inner Bay > Outer Bay > East Bay > West Bay > Cape Small (Figures 11 and 16). One Station in the Cape Small (CS-4) region was unusual compared to other sites in the region. Most Cape Small stations contained < 1.0% organic carbon and more than 65% sand whereas sediment from Station CS-4 contained 2.7% organic carbon and only 29.9% sand. Total alkanes, UCM, and total PAH concentrations were elevated at this location as well. Station EB-9 was also high in total PAH. An organic carbon content of 4.6% at EB-9 is the highest for all of the sediments sampled.

Land derived materials (i.e., n-C_{23} to n-C_{33} plant biowaxes), as indicated by total alkanes decrease with distance from shore suggesting that contaminants would be deposited close to their point of origin (Figure 7). However, while rapid sedimentation may be important it should also be noted that land-derived organic debris is widespread in the study area suggesting that associated contaminants can be transported throughout the bay (Figure 17). In general hydrocarbon contaminant composition is relatively uniform throughout the bay indicative of a common or similar source. As previously discussed a few anomalous sites in East Bay and Cape Small exhibit PAH contamination that is most likely derived from anthropogenic activities in the immediate area. Pyrogenic PAH account for the majority of the PAH detected suggesting that the most likely source is run-off from municipal and industrial sites. The importance of air transport of particulates (stack effluents) is unknown.

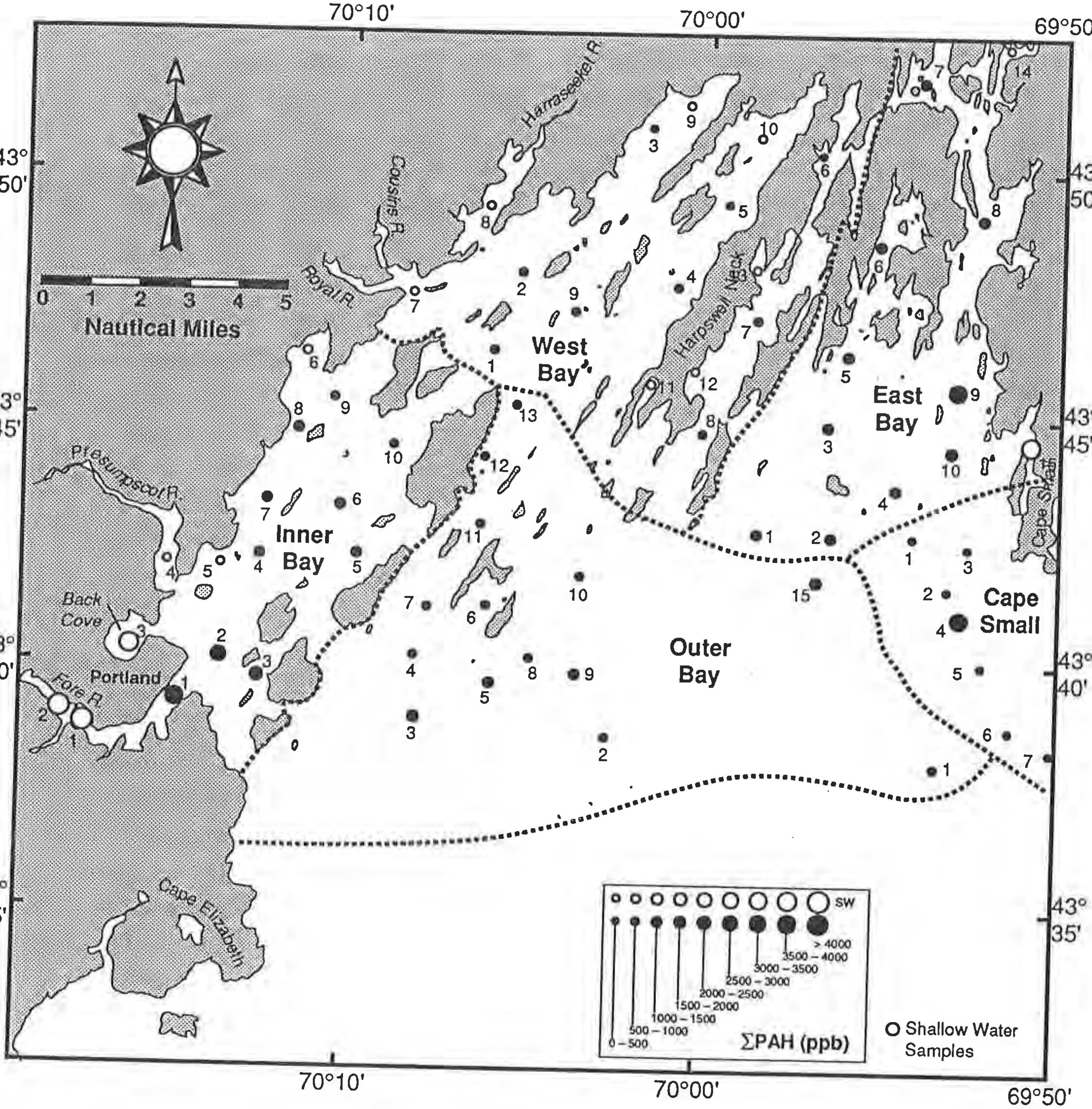

Figure 15. Regional distribution of PAH concentrations (ppb dry weight, surrogate corrected) in sediments from Casco Bay.

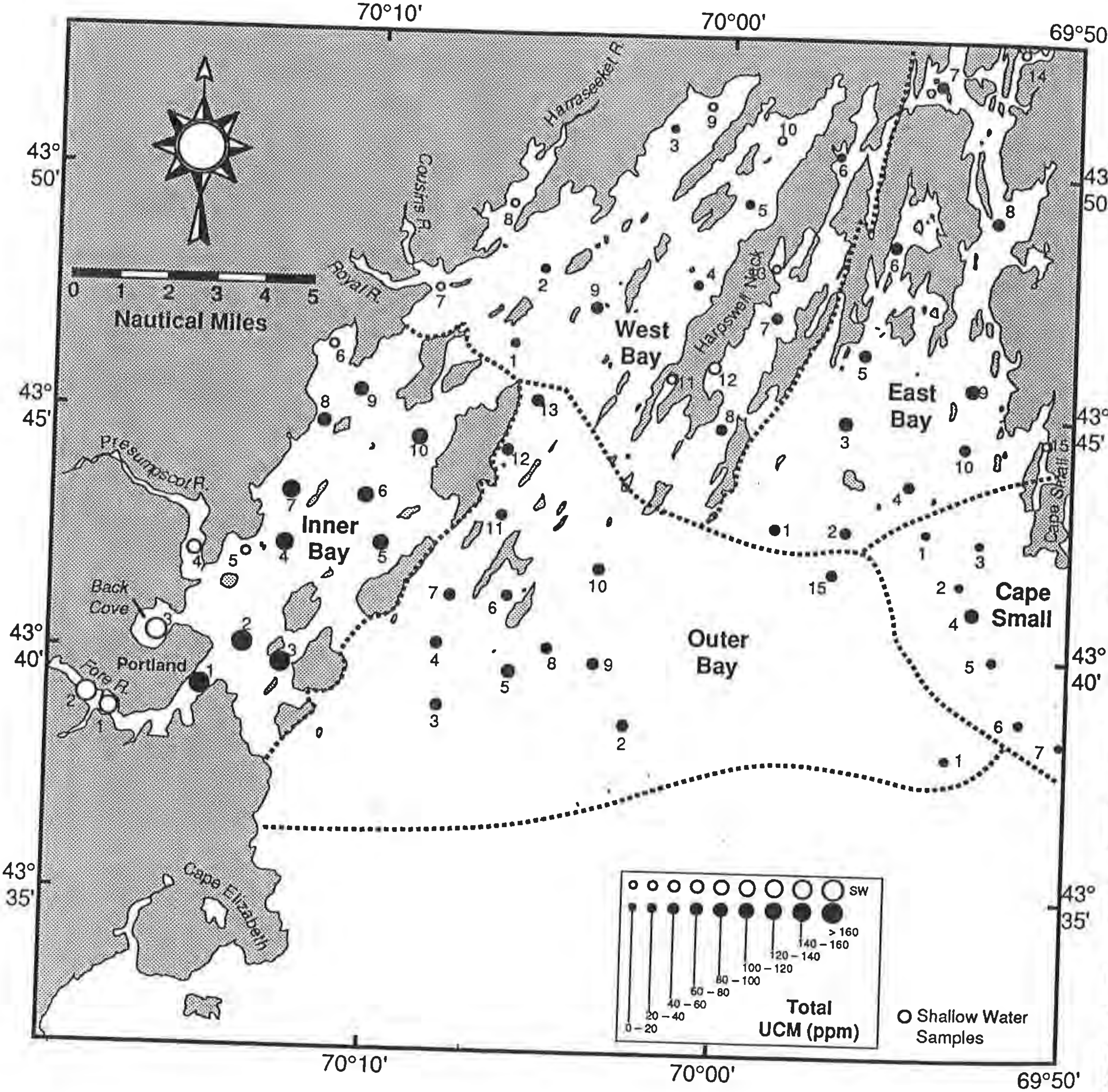

Figure 16. Regional distribution of UCM concentrations (ppm dry weight) in sediments from Casco Bay.

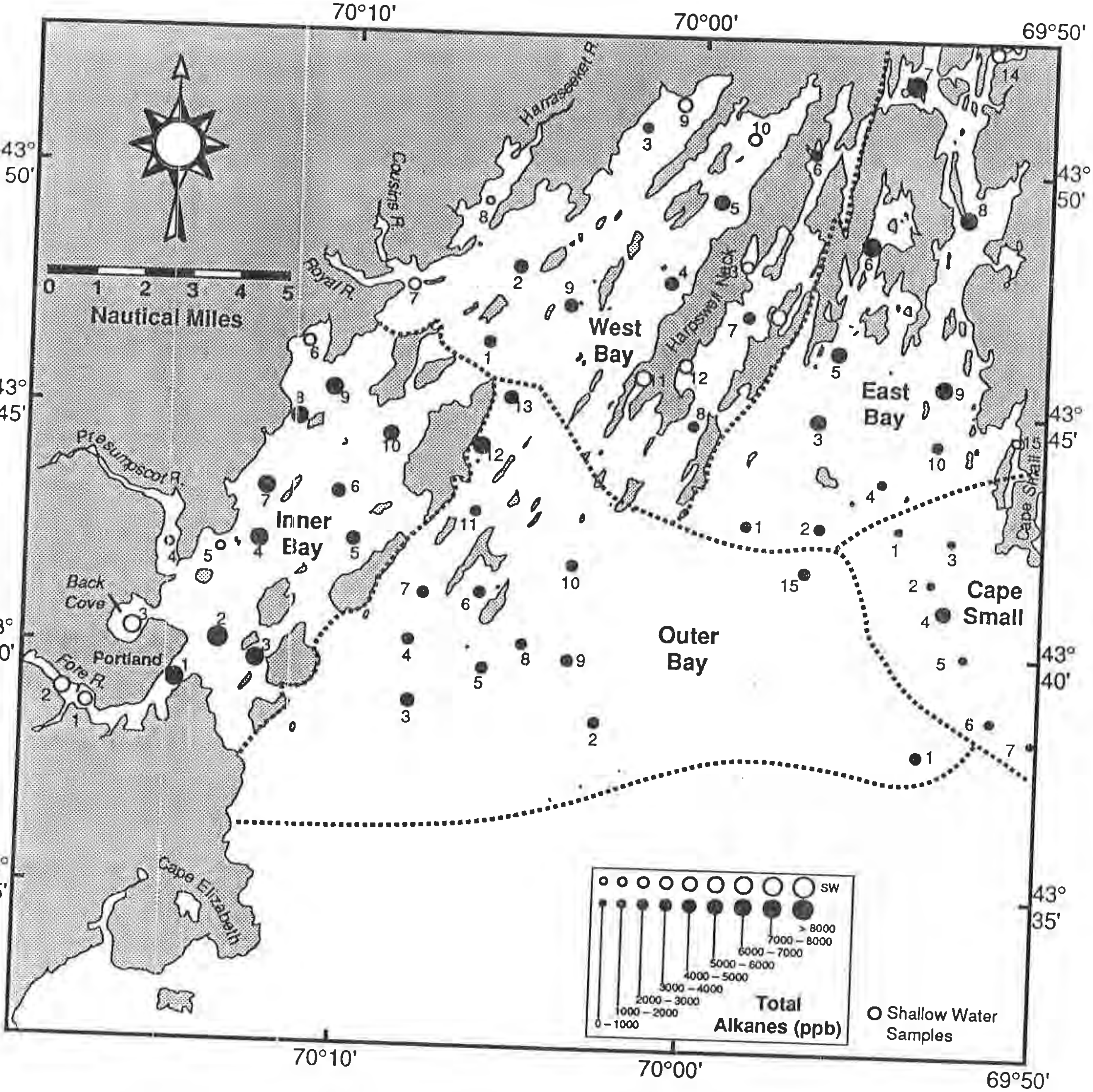

Figure 17. Regional distribution of alkane concentrations (ppb dry weight, surrogate corrected) in sediments from Casco Bay.

Although a comparison of historical hydrocarbon data is obscured by variations in analytical protocols, variations in the contaminants measured, and variable station locations, previous studies do provide a historical perspective for the present study. Comparisons between studies are facilitated by summing only those analytes measured in all studies (i.e, PAH*; see Table 1). The general pattern of high and low contamination has persisted since the first survey in 1980 (Figures 18 and 19). Temporal changes are also difficult to discern because of variations in station locations, methodologies and contaminants measured between studies. However, variations between studies are no larger than variations within studies. Areal heterogeneity in inputs and sediment texture appear to control the variations observed in contaminant concentrations. The composition of hydrocarbon contaminants has remained similar over time, however the more source diagnostic alkylated PAH homologues were not always measured.

4.1.2 Comparison With Other U.S. Coastal Waters

Casco Bay sites are compared to the NOAA NS&T east coast data set for 1986 to 1989 in Figures 20 and 21. All concentrations utilized in this report, including literature comparisons, are not corrected for the sand content of the sediments. The present levels of PAH in Casco Bay sediments are similar in magnitude to NOAA National Status and Trends (NOAA NS&T) sites along the eastern seaboard. PAH in Casco Bay's sediments are on average slightly lower than the average for the NOAA NS&T sites. It should be noted that in general NOAA NS&T sites are chosen distant from known point sources of contamination. The 1989 Maine DEP sampling was limited in the number of samples and emphasized at two relatively highly contaminated area (Figure 21).

A convenient definition of high concentrations of contaminants on a national basis was proposed by O'Connor (1990) using the extensive NOAA NS&T database for the entire U.S. coastal environment. High concentrations were considered to be those whose logarithmic value is more than the mean plus one standard deviation of the logarithm of all concentrations. In a normal distribution this would be the highest 17% of the values. Casco Bay sediments contain high values as defined by the NOAA NS&T program (i.e., total PAH > 2400 ppb dry wt. surrogate corrected).

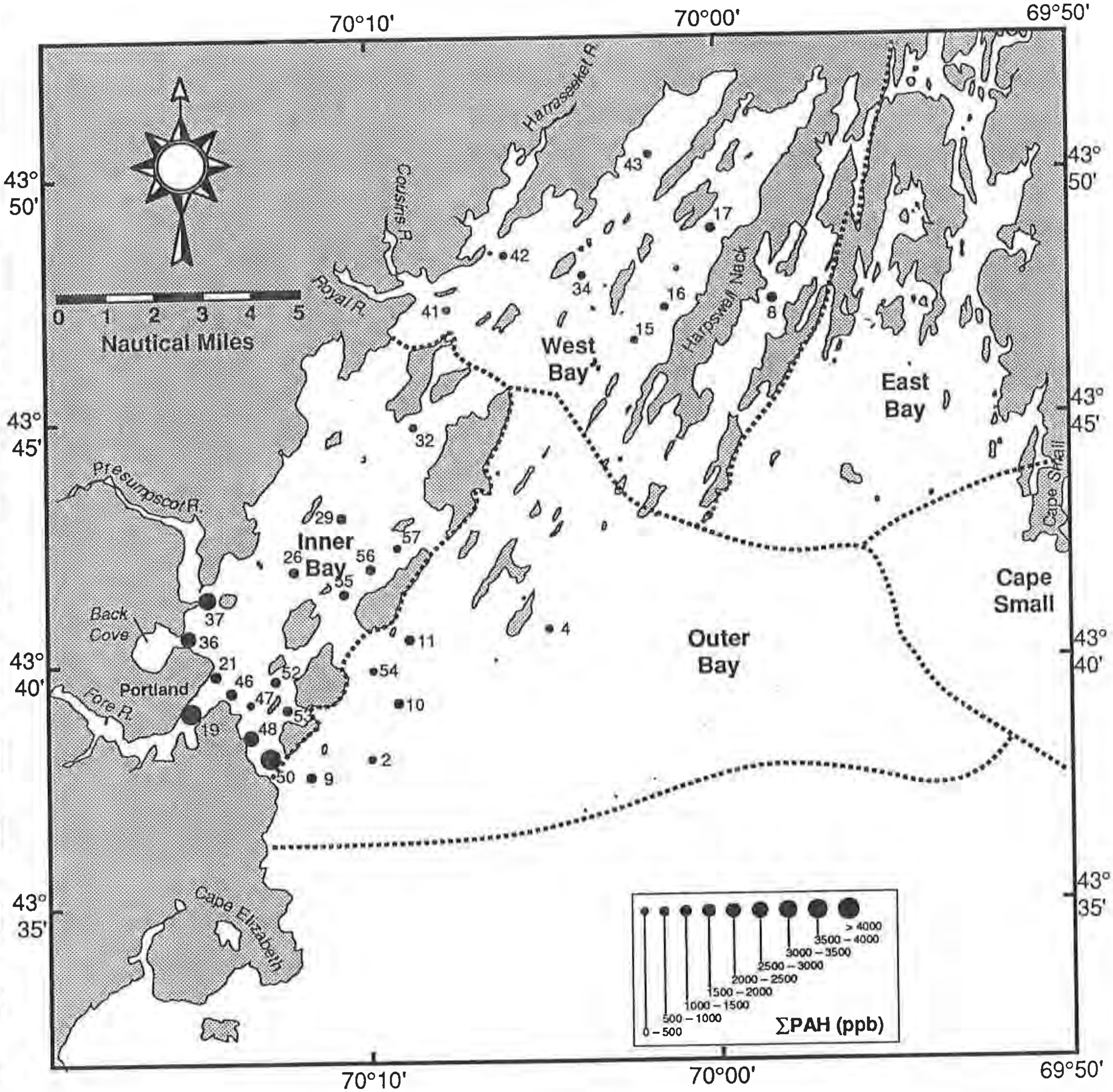

Figure 18. Regional distribution of PAH concentrations (ppb wet weight) in sediments from Casco Bay during a 1980 sampling (Larsen *et al.*, 1983).

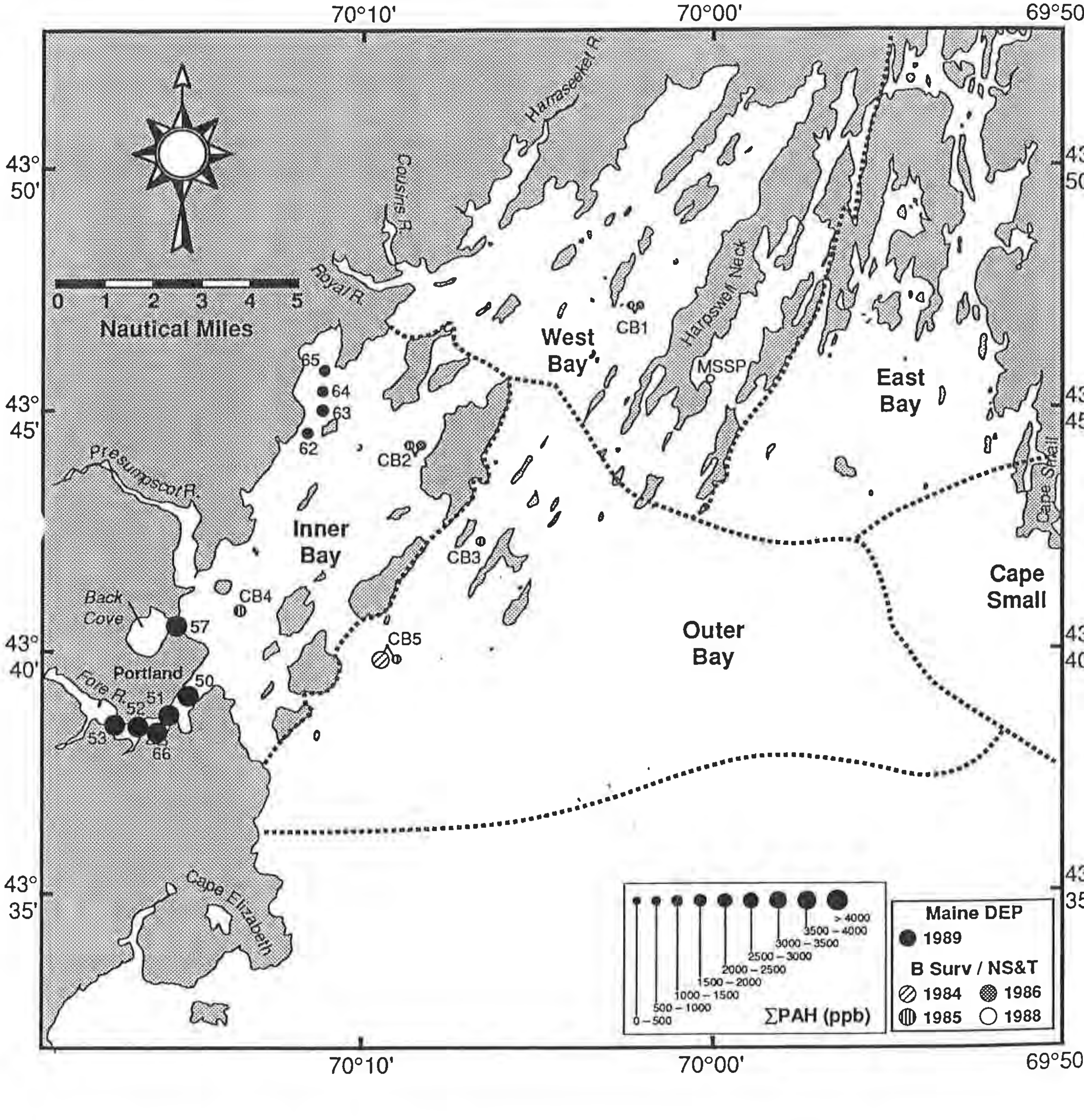

Figure 19. Summary of PAH concentrations (ppb dry weight, NOAA surrogate corrected) in sediments from Casco Bay measured between 1984 and 1989.

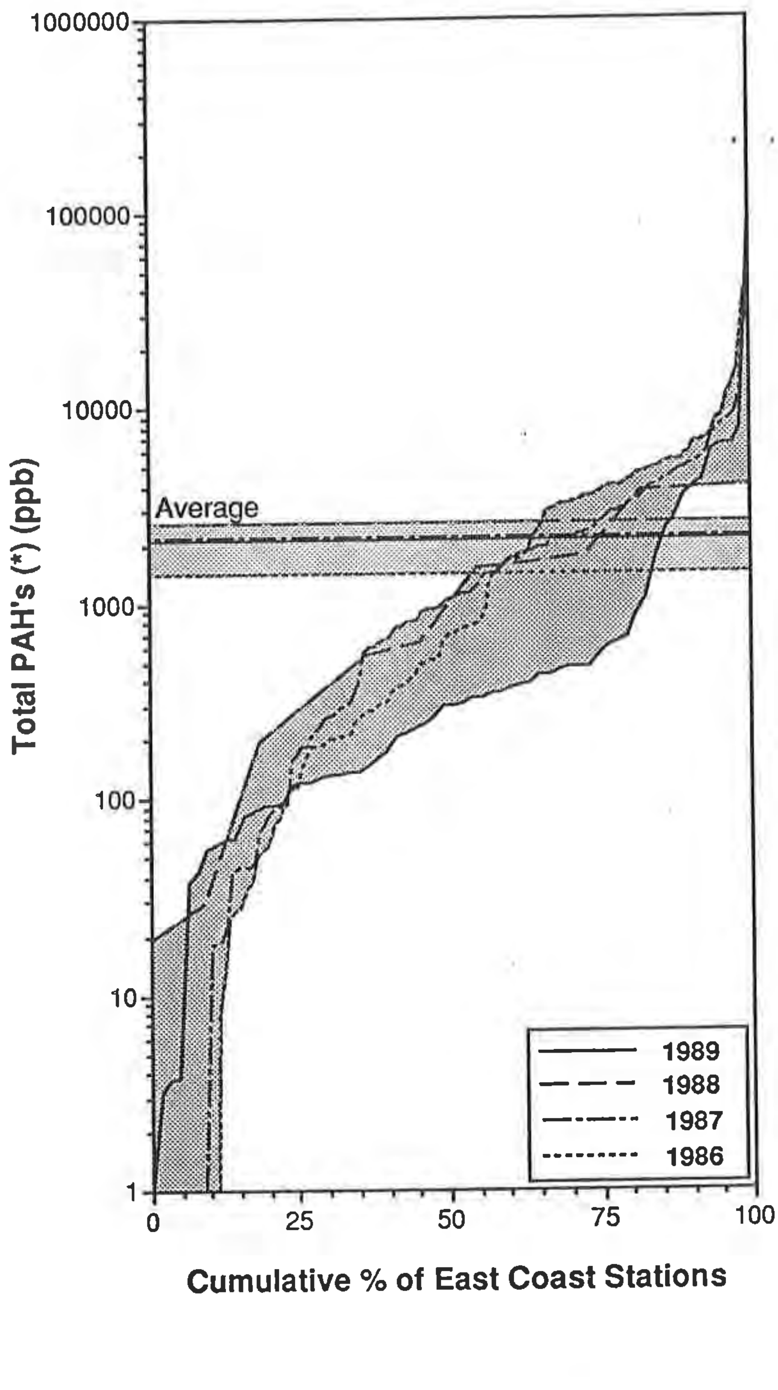

Figure 20. Summary of PAH concentrations (ppb dry weight, surrogate corrected) in sediments from the East Coast of the U.S. sampled during the NOAA Status and Trends Program between 1986 and 1989. (Total PAH*, see Table 1).

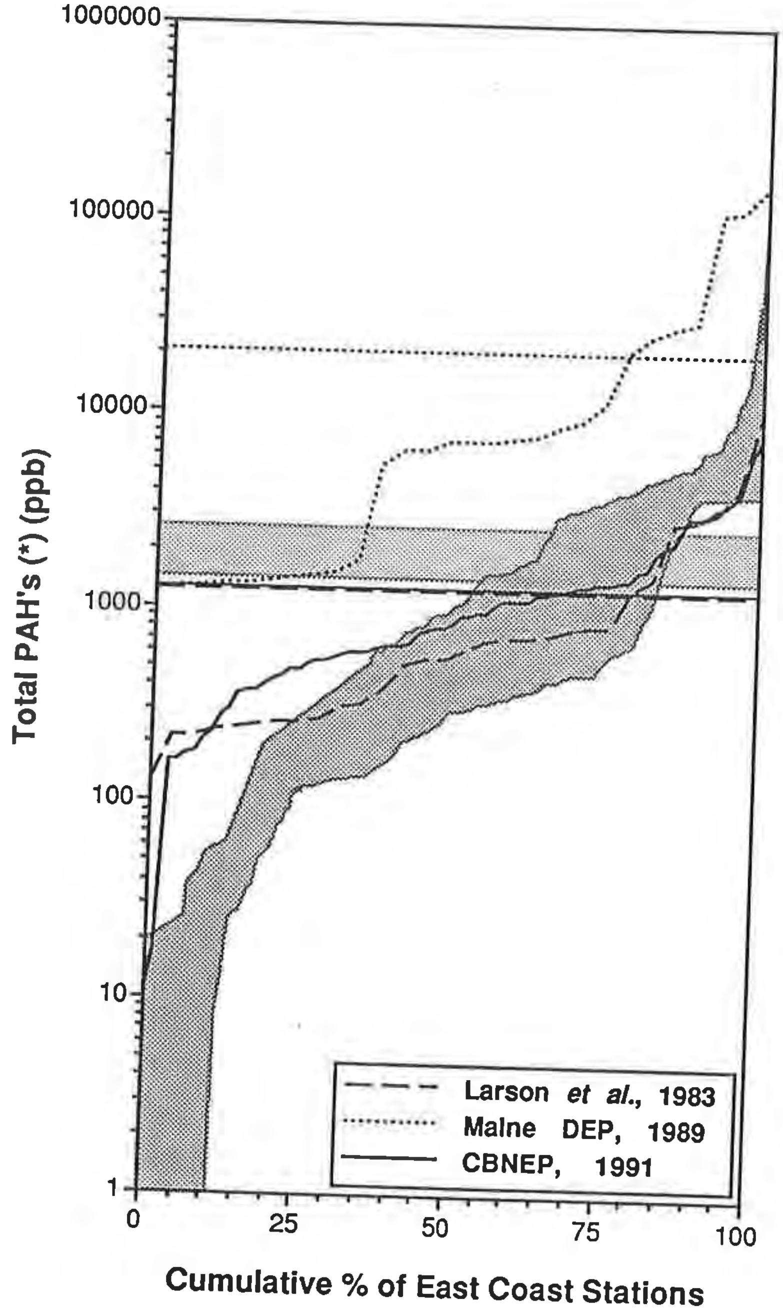

Figure 21. Comparison of PAH concentrations in sediments from Casco Bay and NOAA Status and Trends stations along the East Coast.

The highest concentrations are at locations in Inner Bay, East Bay and Cape Small.

4.2 PCBs and Pesticides

The concentrations of PCBs and a suite of chlorinated pesticides (Table 9) are reported in detail in Appendix B. The data summarized here are for compounds or the summation of compounds that are consistently found at concentrations 2 to 5 times above the detection limit (~0.25 ppb dry wt. surrogate corrected for individual compounds). The presence of these compounds was confirmed by analysis of selected samples using a second GC column of different polarity (see Methods Section). Due to the generally low concentrations of most pesticides the discussion will only consider total PCBs, total DDTs and total chlordane.

4.2.1 Geographic and Historical Comparisons

The total PCB concentration for this study ranges from 0.4 to 485 ppb dry wt. surrogated corrected with a median concentration of 15 ppb (Figure 22). Due to proximity to the urban and industrial complex of Portland sediment total PCBs shows that the concentrations are highest in the Inner Bay (Figure 23). Concentrations are lowest in Cape Small and West Bay with a few anomalous concentrations in East Bay. The range and areal distribution of PCB concentration are consistent with historical data (see Tables 4 and 5). The one high concentration at site SW-2 is not as high as the PCB concentration of 850 ppb wet wt. reported by Ray *et al.* (1983). Total PCB concentration is displayed as a function of sediment organic carbon matter in Figure 24 (R^2 = 0.23). PCB concentrations for Inner Bay sediments, a suspected major source region, are higher than the general trend (i.e., fall above the line). If these sites are excluded the correlation improves (R^2 = 0.49) indicating a general trend of increasing PCB concentration with increasing TOC. It should also be noted that the site from Cape Small with total PCB concentration of 40 ppb dry wt. surrogate corrected has a higher TOC content (2.8%) than other samples from Cape Small. The correlation between total PCB concentrations and clay content is

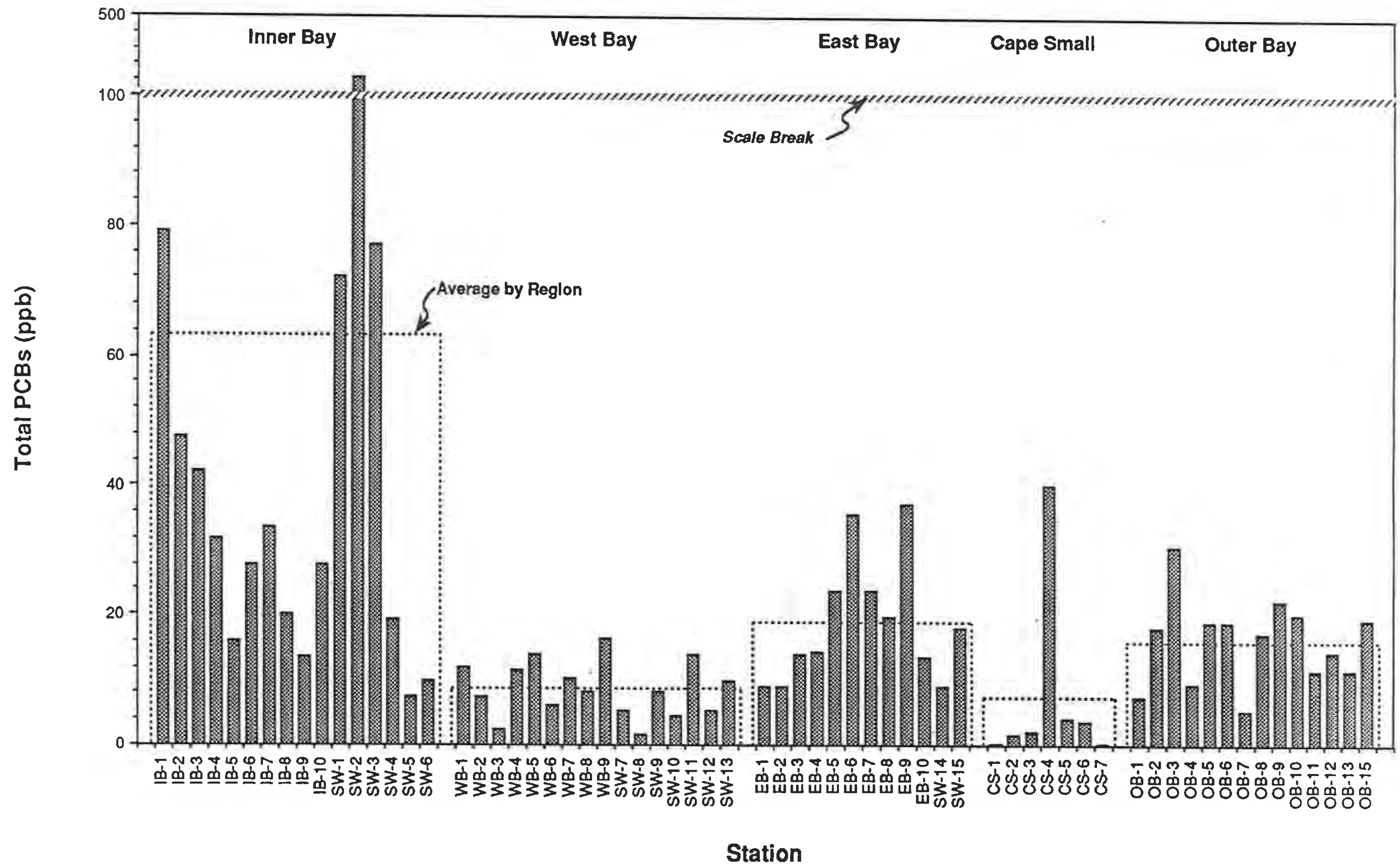

Figure 22. Summary of PCB concentrations (ppb dry weight, surrogate corrected) in sediments by region within Casco Bay.

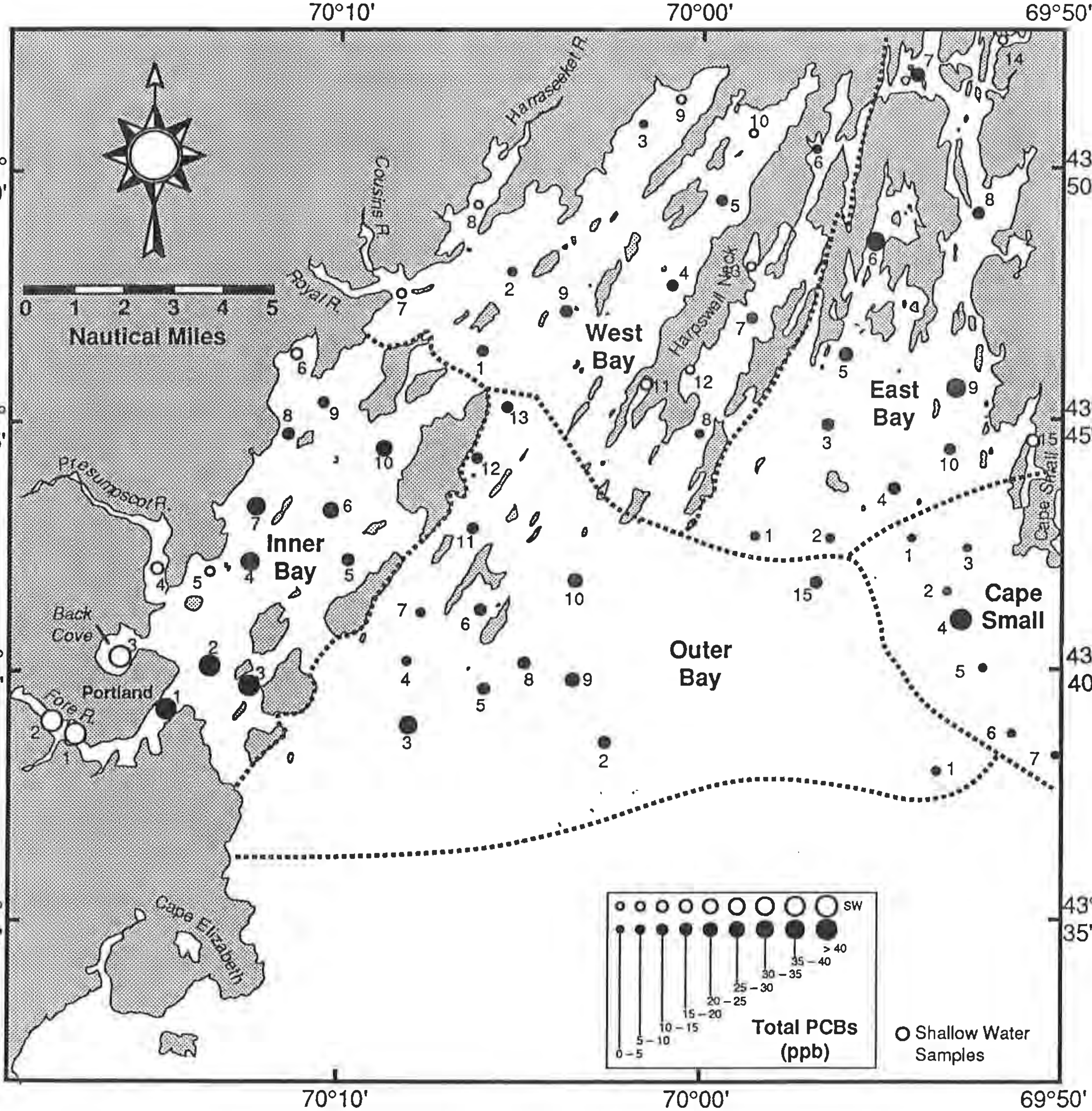

Figure 23. Regional distribution of total PCB concentrations (ppb dry weight, surrogate corrected) in sediments from Casco Bay.

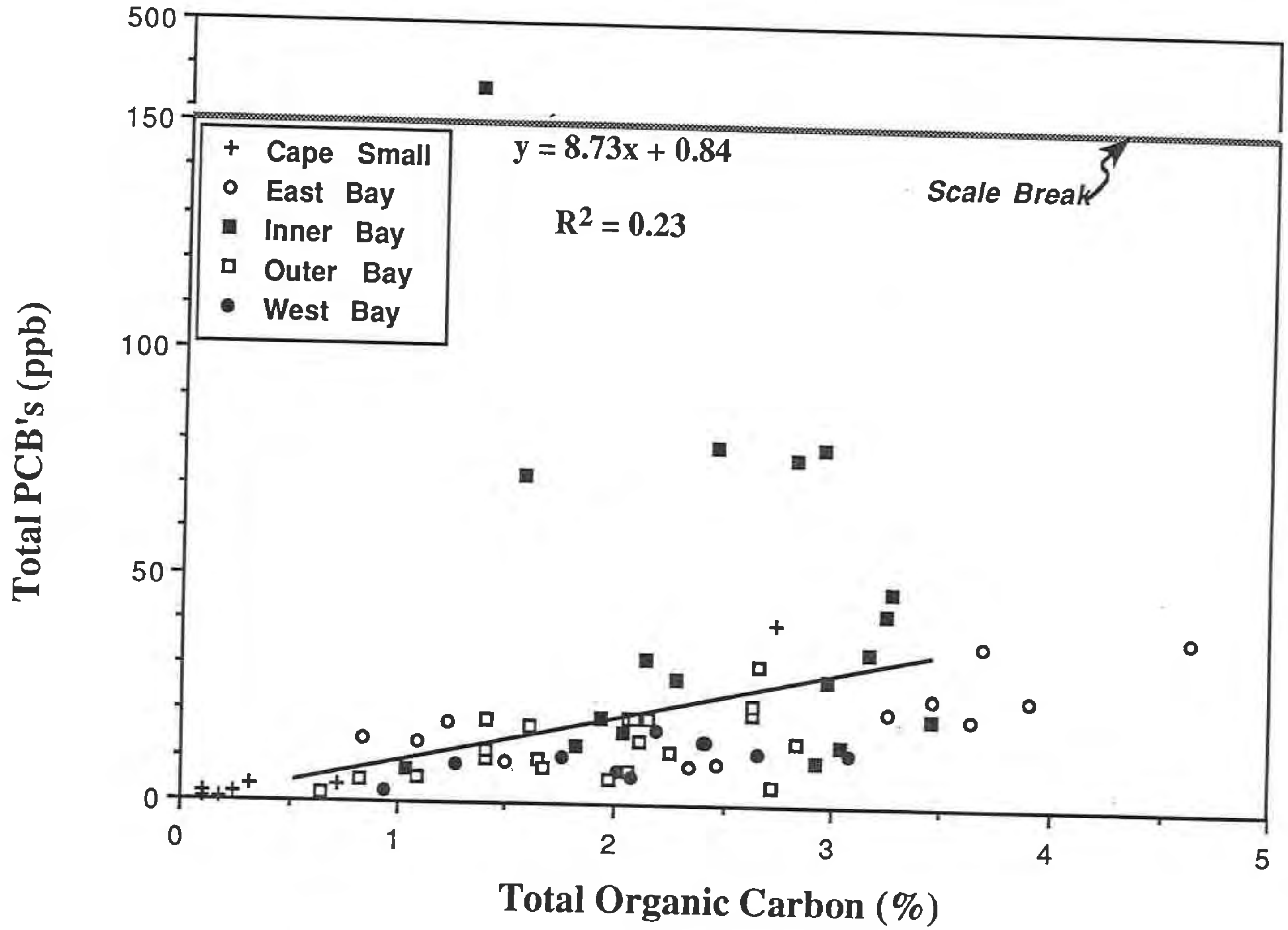

Figure 24. The relationship between total PCB concentration (ppb dry weight, surrogate corrected) and total organic carbon content (%) of sediments from Casco Bay.

similar to that for TOC. Previous studies also concluded there was no statistically significant correlation between grain size or TOC and PCB concentration in the Inner Bay region (Larsen *et al.*, 1984).

Total DDT concentrations for this study range from below the detection limit (0.25 ppb) to 21 ppb dry weight surrogate corrected (Figure 25). The DDTs were dominated by the p,p' isomers as compared to the o,p' isomers. This is not unexpected since technical grade DDT is primarily p,p' isomers (75 to 85%). In the environment DDT is metabolized to DDD and DDE. In some samples DDD is the major metabolite while in other samples DDE predominates. There is often a relatively high percentage of undegraded DDT in Casco Bay sediments. It has been suggested (Rapaport *et al.*, 1985) that atmospheric inputs of fresh DDT coming from Central American countries that still use DDT may be atmospherically deposited in the northeastern U.S. This might explain the high percentage of DDT observed in this study. The geographic distribution of total DDT concentrations is similar to that found for PCBs. The Inner Bay has the highest concentration in Casco Bay (Figure 26). East Bay and Outer Bay have intermediate concentrations, West Bay lower concentrations and lowest concentrations are in the Cape Small region. This distribution reflects the proximity of sources of DDT to Inner Bay and East Bay sites. There is little correlation between total DDT concentrations and clay content or TOC content (Figure 27). The relationship improves if the Inner Bay sites are deleted. In general there is an increase in total DDT concentration with an increase in TOC.

The geographic distribution of total chlordane concentrations show that the highest values are at Inner Bay sites (Figures 28 and 29). East Bay and Outer Bay sites are intermediate, while West Bay and Cape Small sites exhibit the lowest concentrations. There is no apparent relationship between total chlordane concentrations and TOC content (Figure 30). This is in part due to the lack of detectable chlordane at many sites. Total chlordane concentrations ranged from below the detection limit (0.25 ppb) to 4.9 ppb dry wt. surrogate corrected (Figure 29).

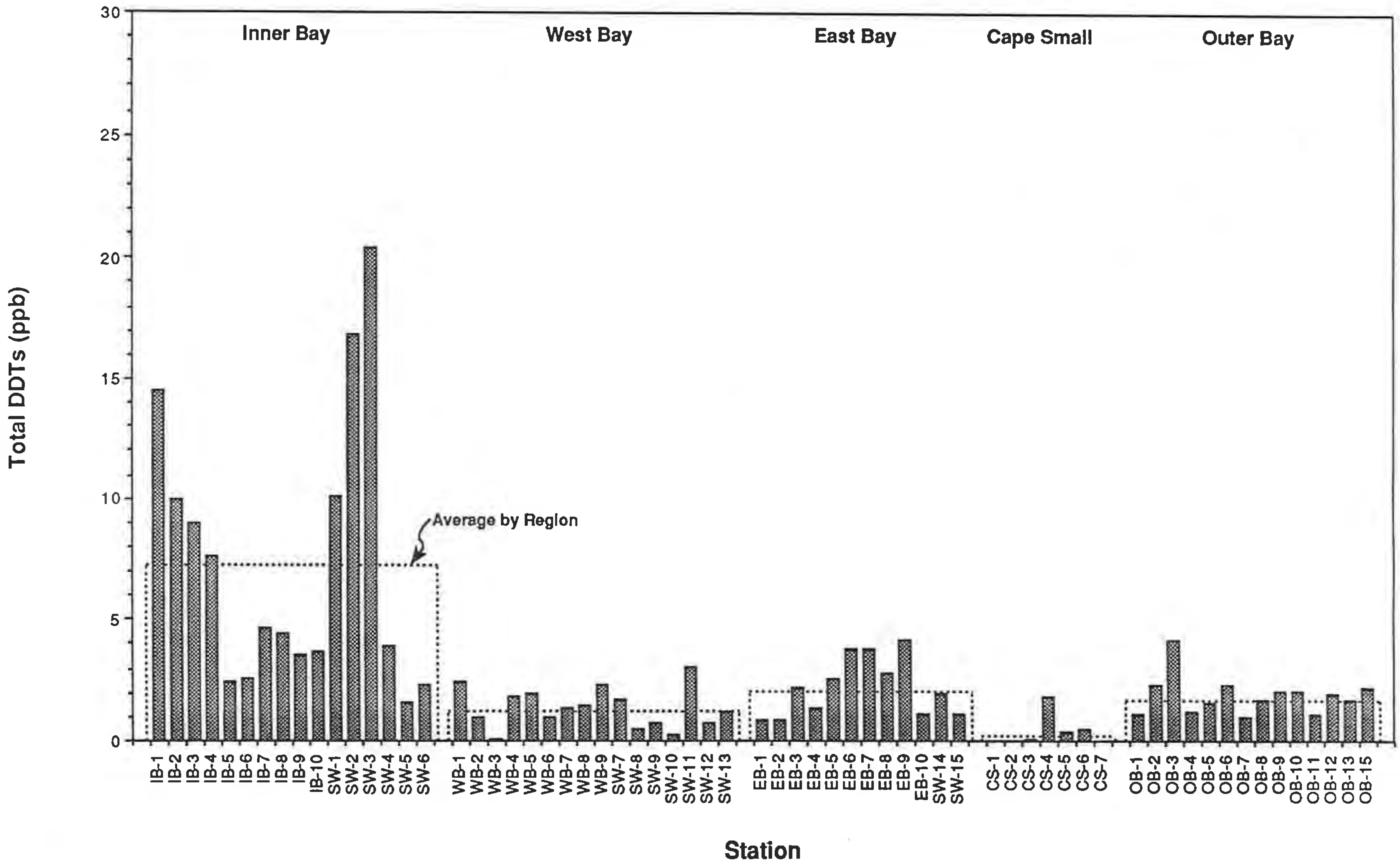

Figure 25. Summary of DDT concentrations (ppb dry weight, surrogate corrected) in sediments by region within Casco Bay.

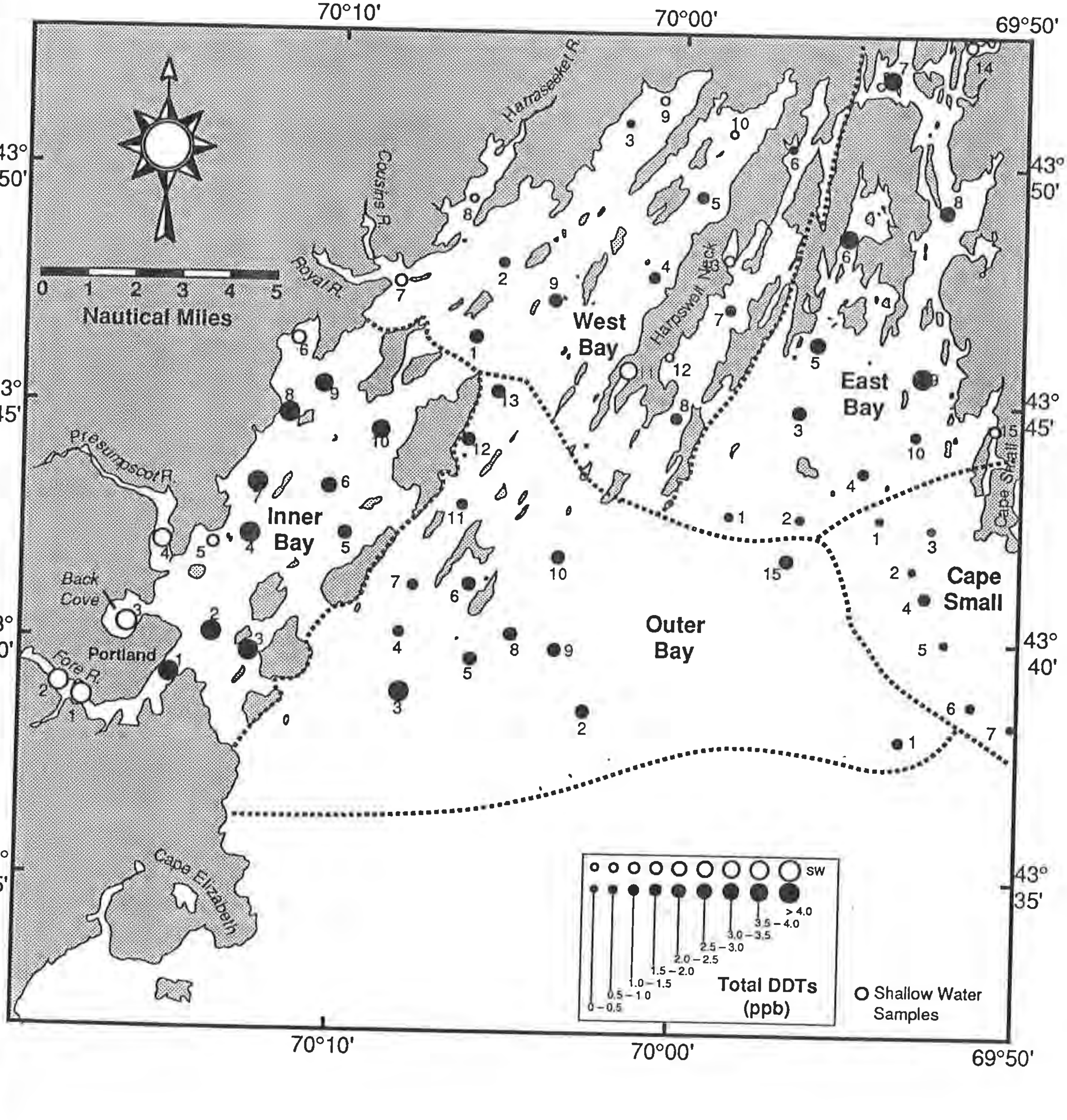

Figure 26. Regional distribution of total DDT concentrations (ppb dry weight, surrogate corrected) in sediments from Casco Bay.

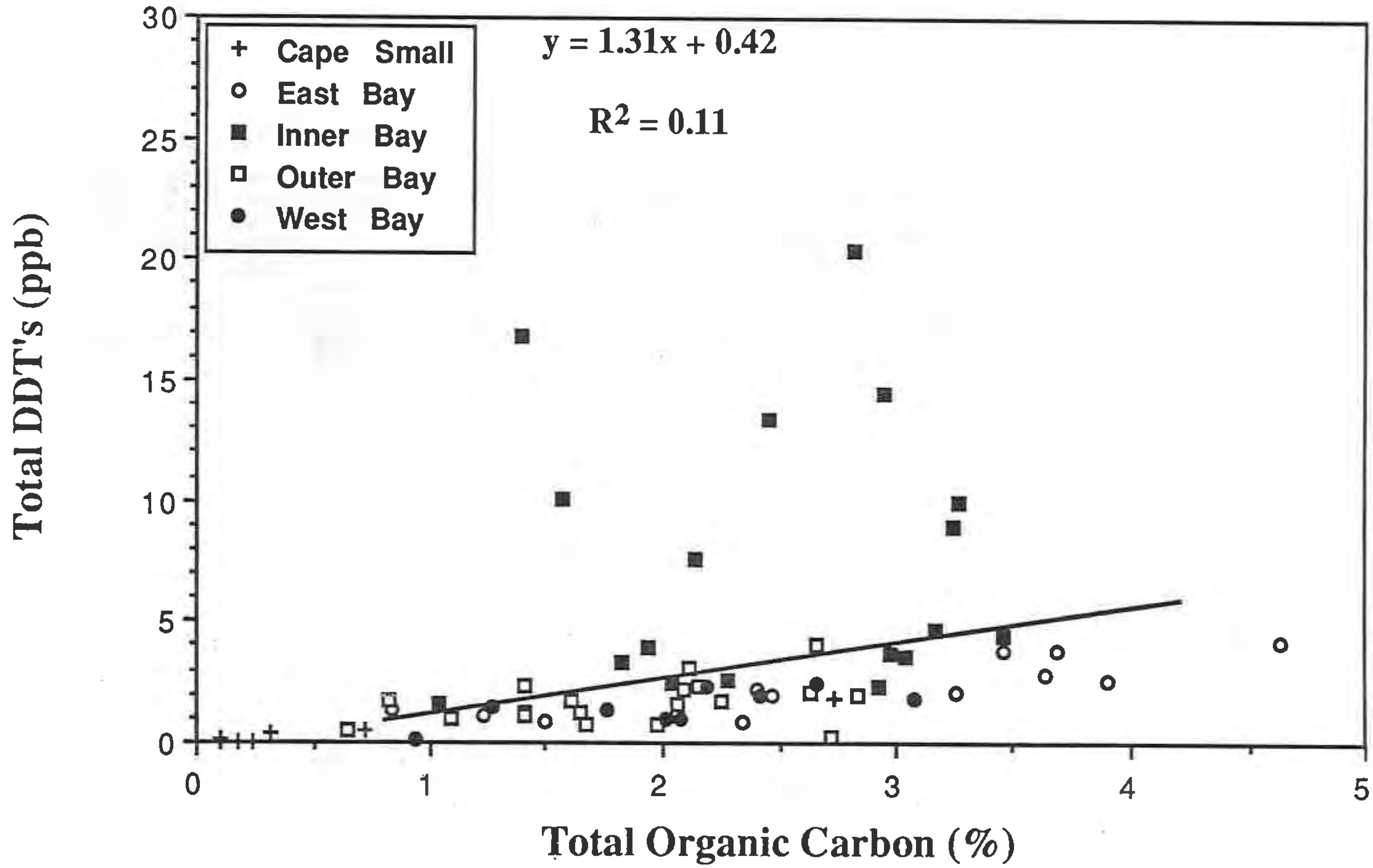

Figure 27. The relationship between total DDT concentration (ppb dry weight, surrogate corrected) and total organic carbon content (%) of sediments from Casco Bay.

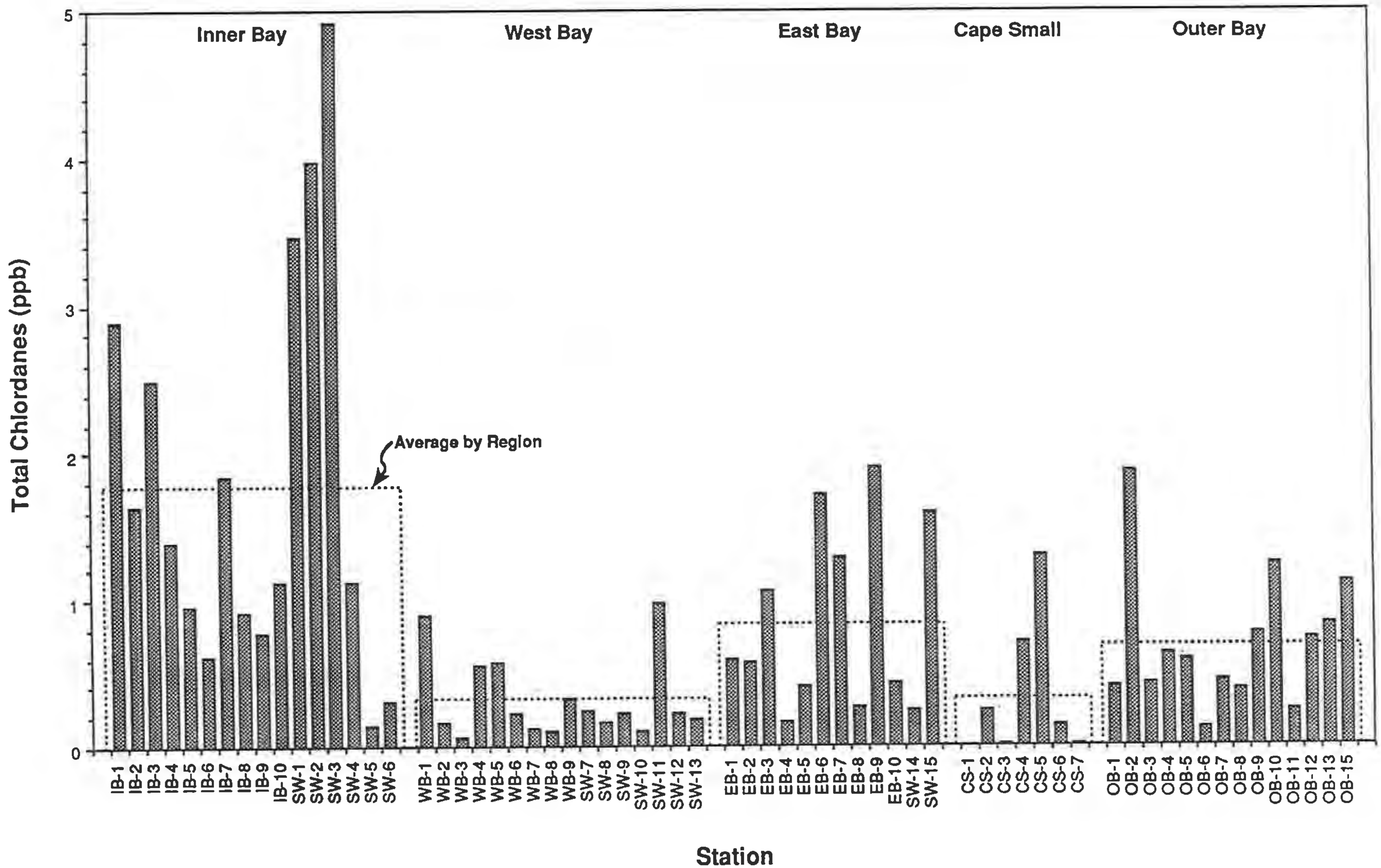

Figure 28. Summary of chlordane concentrations (ppb dry weight, surrogate corrected) in sediments by region within Casco Bay.

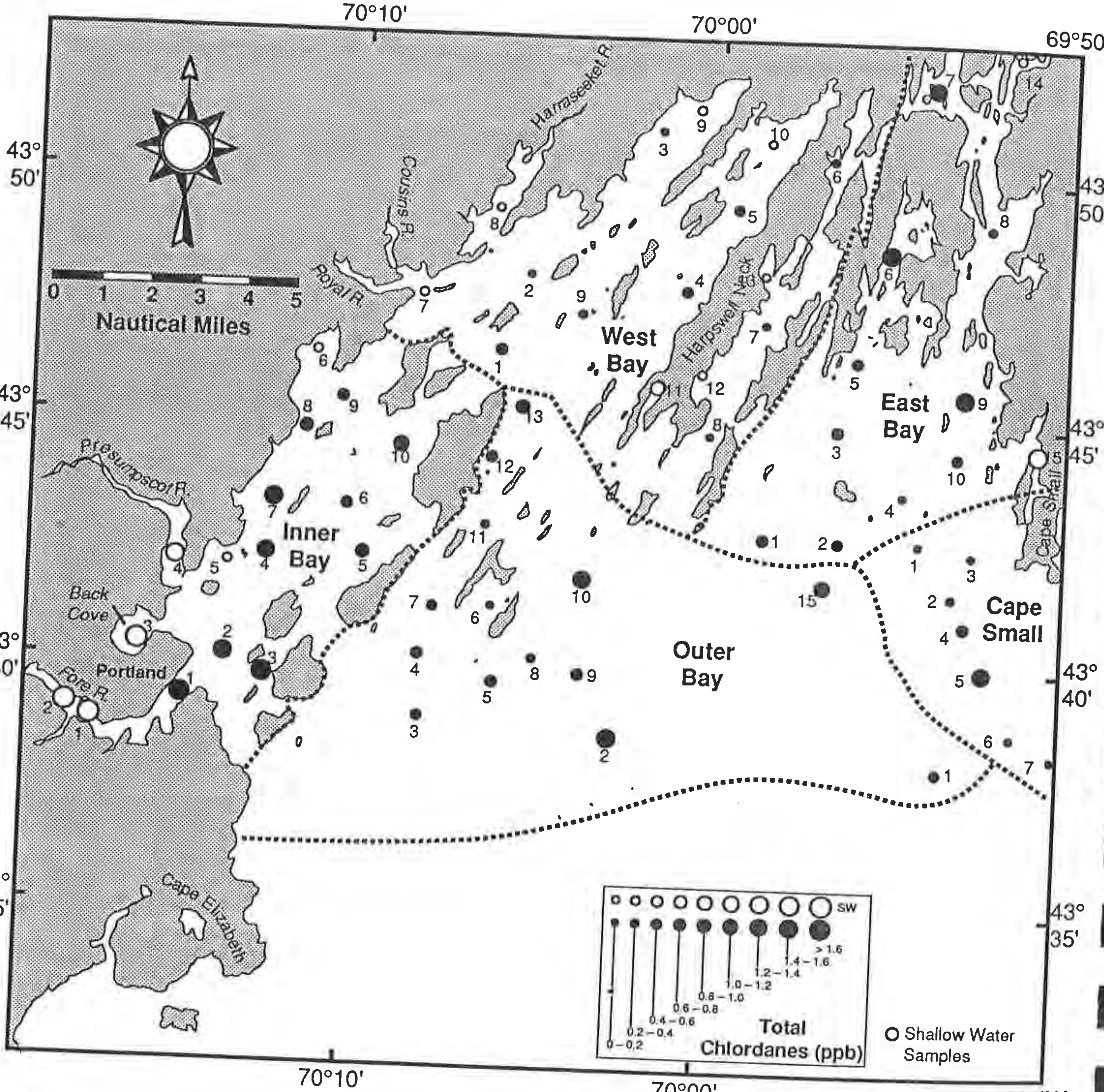

Figure 29. Regional distribution of total chlordane concentrations (ppb dry weight, surrogate corrected) in sediments from Casco Bay.

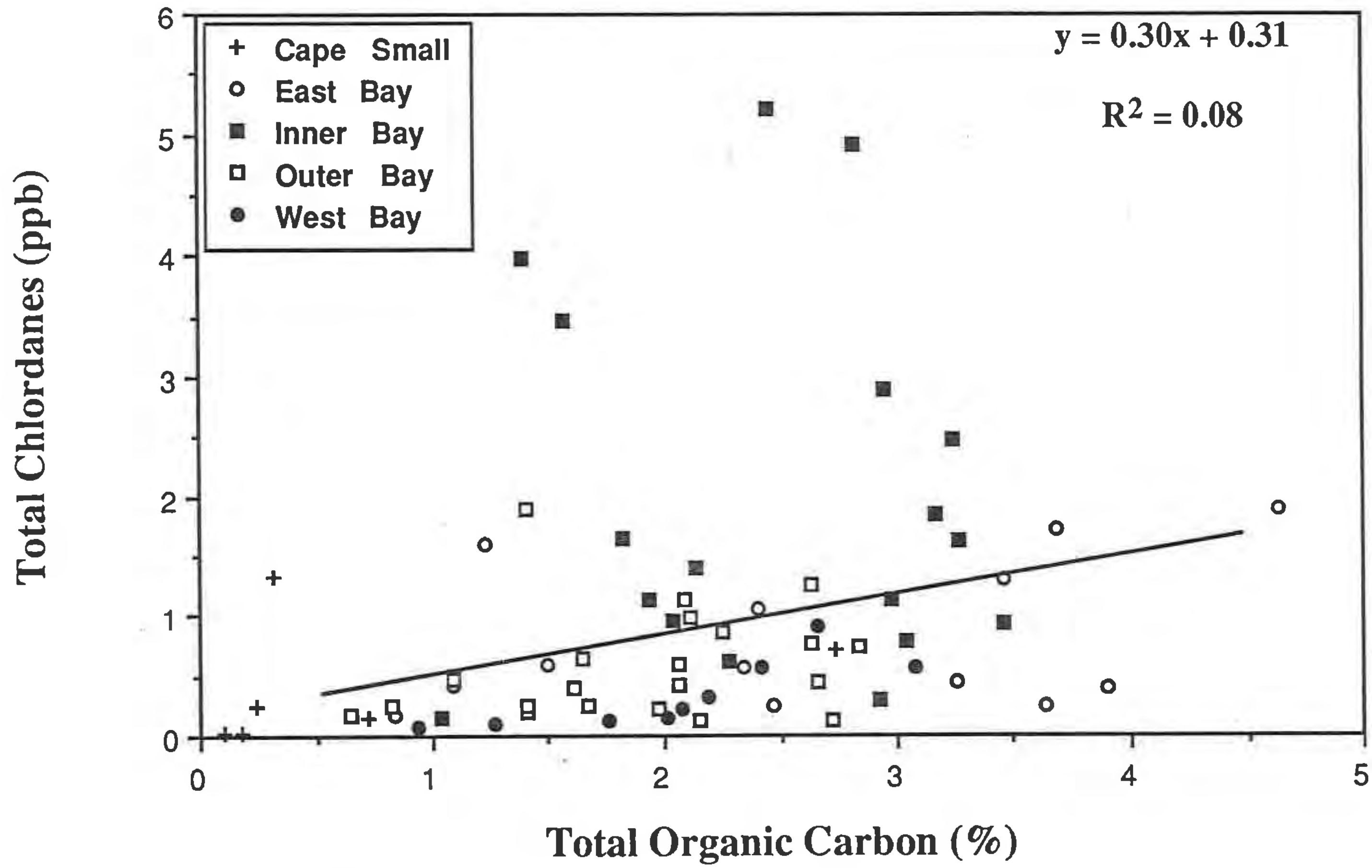

Figure 30. The relationship between total chlordane concentration and total organic carbon content (%) of sediments from Casco Bay.

4.2.2 Comparisons With Other U.S. Coastal Waters

Total PCB concentrations in sediments measured as part of the NOAA NS&T program for the U.S. east coast have a median concentration between 30 and 60 ppb dry wt. (Figure 31). Based on NOAA NS&T sediments for all U.S. coastal areas, O'Connor (1990) defines concentrations of total PCB of 120 ppb dry wt. or more as high. Thus less than 25% of east coast sites are defined as high by O'Connor (1990). On comparison, it is clear that Casco Bay sediments are generally lower in PCB contamination than most east coast NOAA NS&T sites (Figure 32). Only one (SW-2) of sixty-five sites sampled in Casco Bay has a concentration that would be defined as high. The next highest PCB concentration in Casco Bay is 93 ppb dry wt. surrogate corrected. Total DDT concentrations for NOAA NS&T sites have a median concentration between 4 and 6 ppb dry wt. (Figure 33). The Casco Bay median total DDT concentration is ~2 ppb dry wt. surrogate corrected. Frequency distributions illustrate that Casco Bay sediments have lower total DDT contamination than most east coast NOAA NS&T sites (Figure 34).

The NOAA NS&T program does not measure all of the components of technical chlordane. Only alpha chlordane, trans nonachlor and heptachlor epoxide are quantified. The NOAA NS&T total chlordane measured for the east coast has a median concentration between 1 and 2 ppb dry wt. (Figure 35). The median concentration for the sum of alpha chlordane, trans nonachlor and heptachlor epoxide for Casco Bay sediments is below the detection limit. Therefore less than 50% of the sediments from Casco Bay have detectable chlordane. Concentrations of chlordane in Casco Bay are lower than most other east coast locations in the NOAA NS&T program (Figure 36).

4.3 Trace Metals

4.3.1 Geographic and Historical Comparisons

Sediment trace metal data measured during the Casco Bay Estuary Program are summarized in Appendix C. These data, like data from previous studies of Casco Bay sediments, show considerable variation from place to

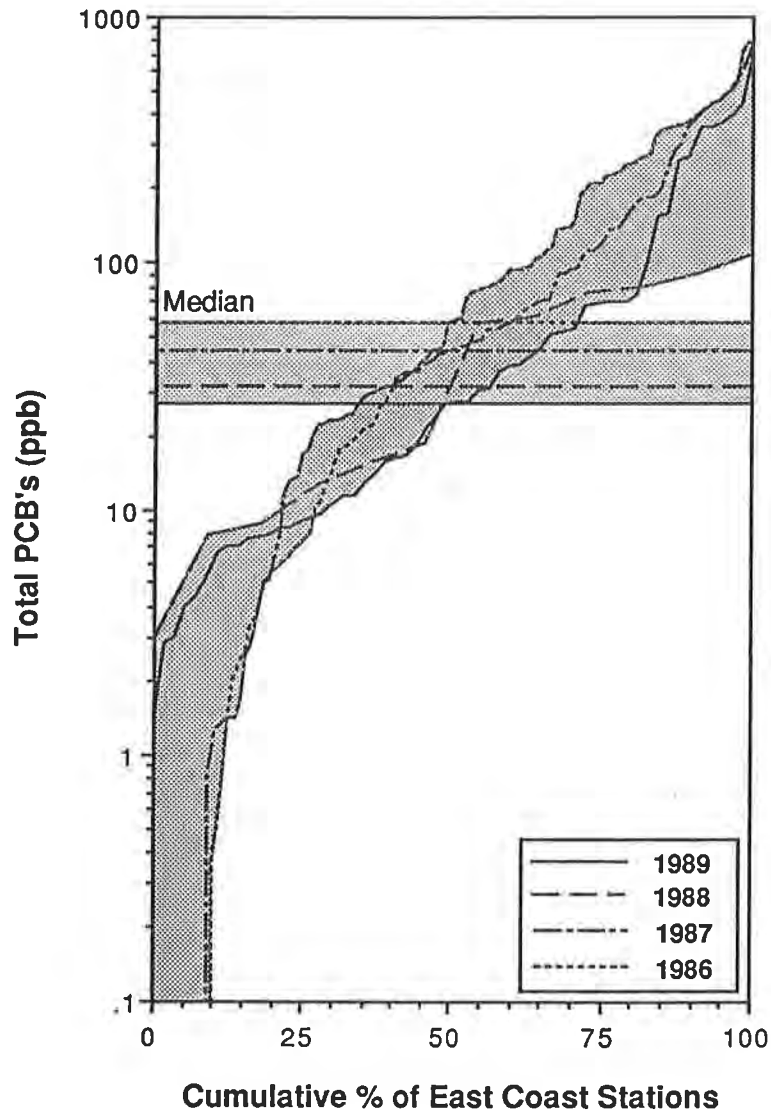

Figure 31. Summary of PCB concentrations in sediments from the East Coast of the U.S. sampled during the NOAA Status and Trends Program between 1986 and 1989.

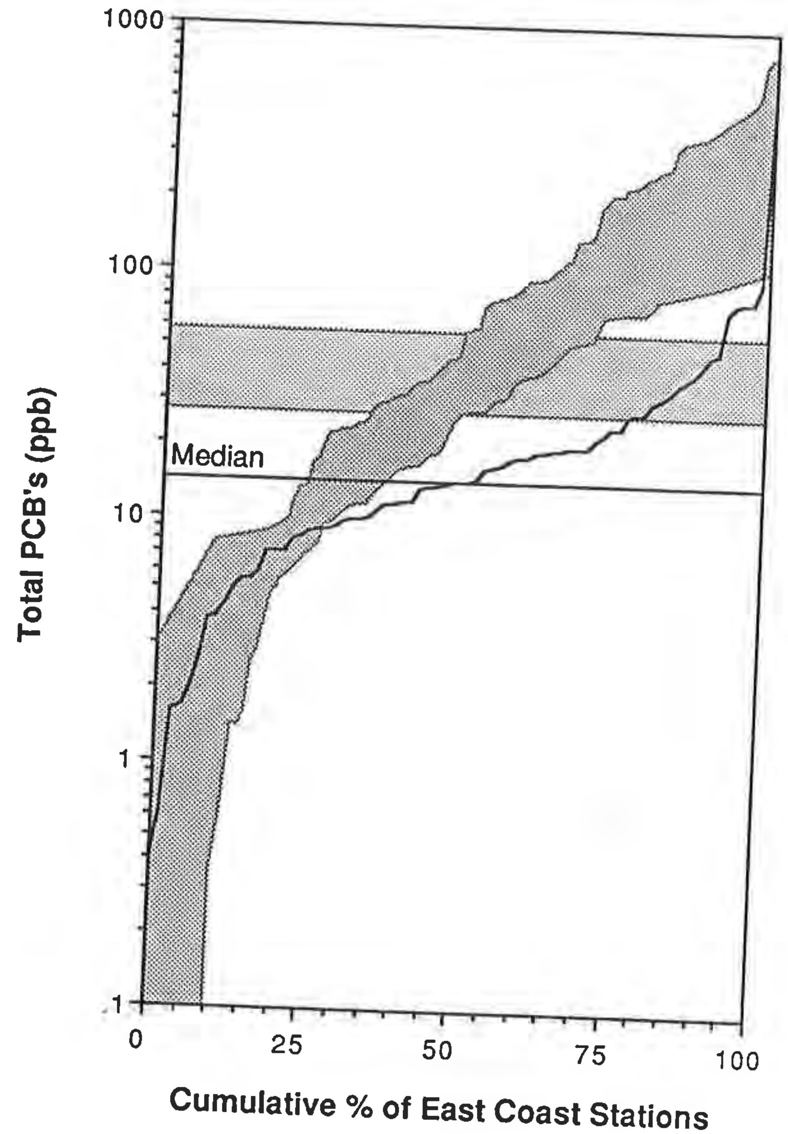

Figure 32. Comparison of total PCBs (ppb dry weight, surrogate corrected) in sediments from Casco Bay and NOAA Status and Trends stations along the East Coast.

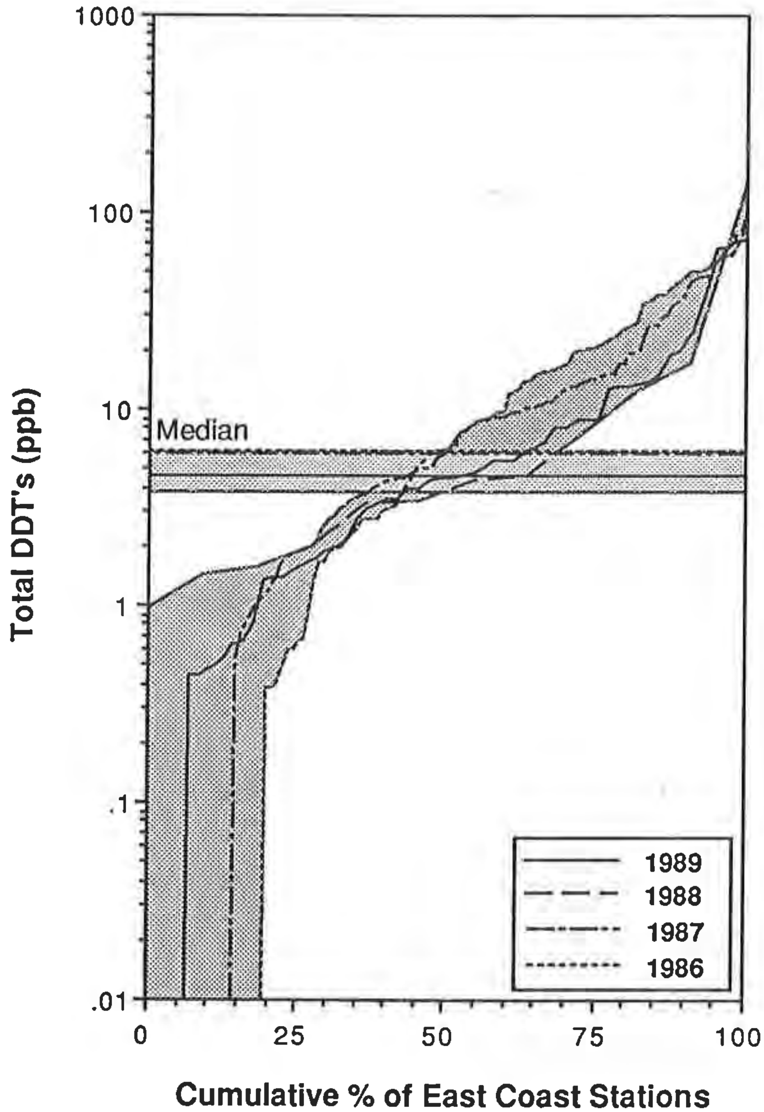

Figure 33. Summary of total DDT concentrations (ppb dry weight, surrogate corrected) in sediments from the East Coast of the U.S. sampled during the NOAA Status and Trends Program between 1986 and 1989.

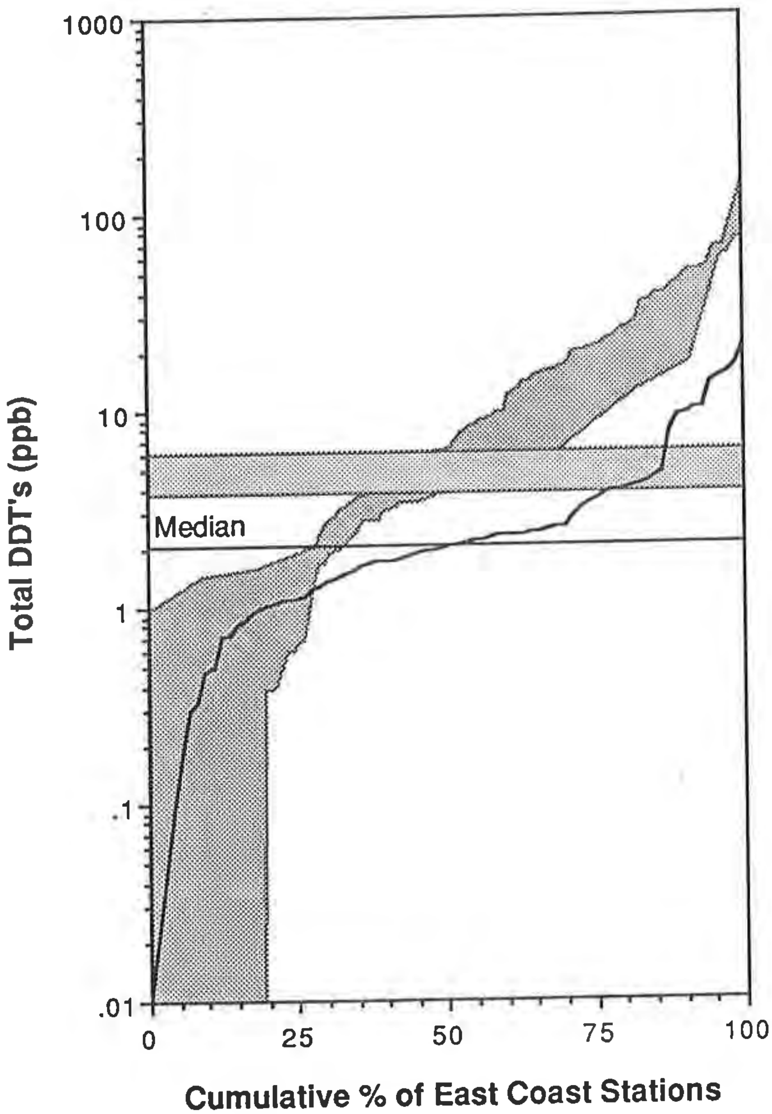

Figure 34. Comparison of total DDT concentrations (ppb dry weight, surrogate corrected) in sediments from Casco Bay and NOAA Status and Trends stations along the East Coast.

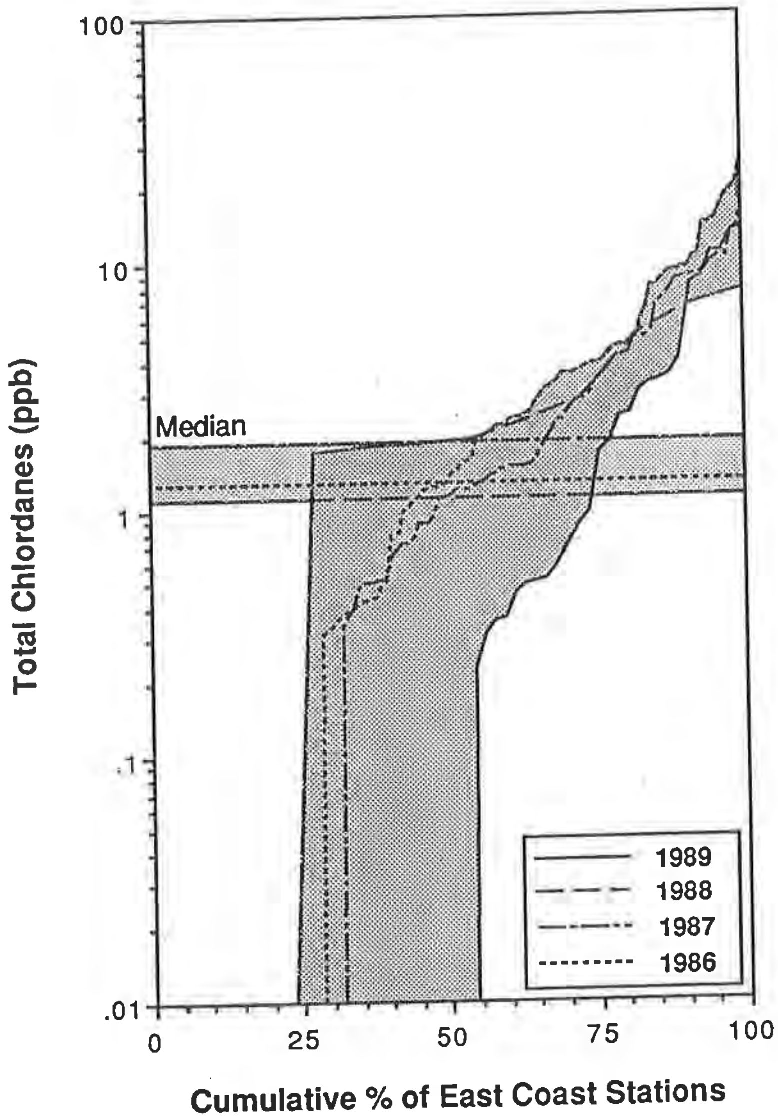

Figure 35. Summary of total chlordane concentrations (ppb dry weight, surrogate corrected) in sediments from the East Coast of the U.S. sampled during the NOAA Status and Trends Program between 1986 and 1989.

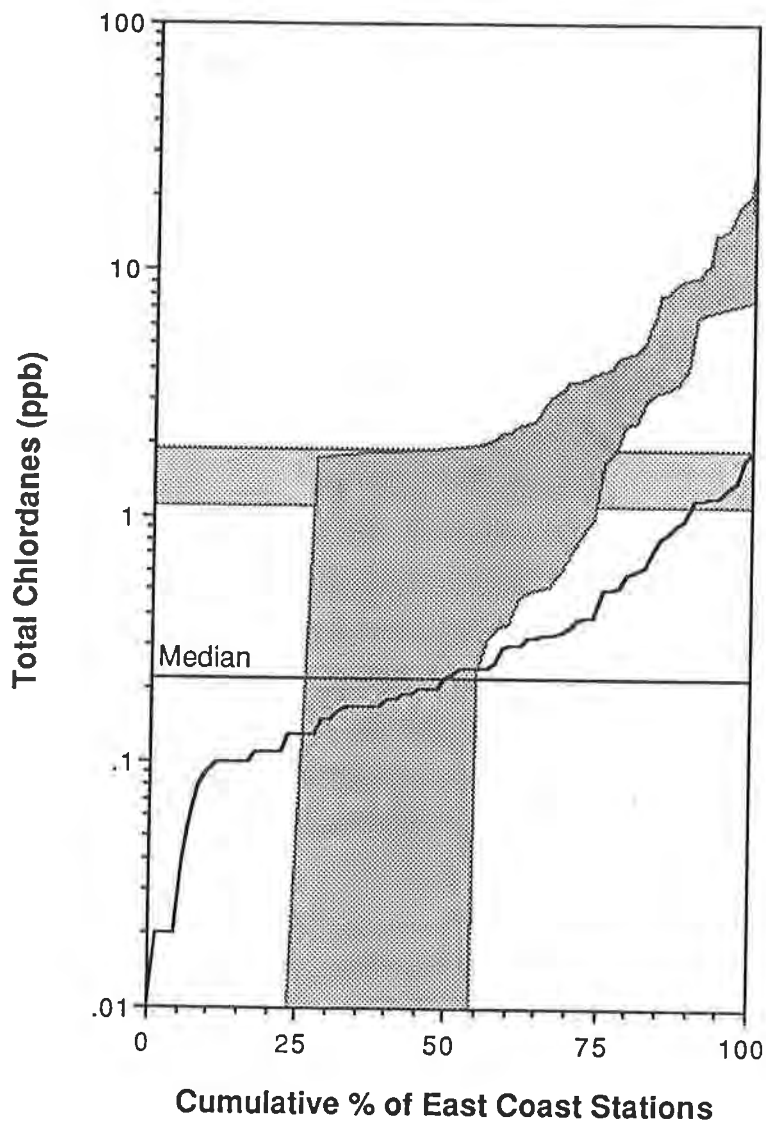

Figure 36. Comparison of total chlordane concentrations (ppb dry weight, surrogate corrected) in sediments from Casco Bay and NOAA Status and Trends stations along the East Coast.

place with generally higher values in the inner bay. The data for Ag, Cd, Pb and Hg show positive skewness on frequency plots (Figures 37, 38, and 39), whereas the other metals are more normally distributed or, as in the case of Cr and Ni, exhibit negative skewness (Figures 38 and 39). Positive skewness suggests additions of metals by humans to normally distributed backgrounds. Negative skewness is most likely caused by the uneven distribution of naturally occurring trace metal-rich heavy minerals from volcanic or metamorphic rocks.

All sediment will vary in its content of all trace elements, largely due to natural variations in mineralogy and grain size but sometimes due to human activity. Frequency plots can help to distinguish natural from human influences but scatter plots are perhaps more useful. Scatter plots of Fe or Al versus trace metals, for example, often highlight anomalous data because they do not lie on a best fit line through the background data (Figures 40-42). When the Casco Bay Cr and Ni data are plotted vs Fe in the same samples (Figure 41) most of the data falls along a best fit line with an approximately 0 intercept suggesting a natural distribution. On the other hand, the Zn vs Fe and especially the Pb vs Fe plots show more scatter and more of an indication of samples enriched above what would be expected at a given Fe concentration (Figures 40 and 42). As would be expected if the enriched samples are due to human activity, they all come from the Inner Bay.

Scatter plots similar to the Fe vs trace metal plots result if percent finer (silt + clay) or total organic carbon are used instead of Fe, because fine-grained sediment is Fe rich, organic carbon rich and trace metal rich. The percent finer and percent carbon plots show somewhat more natural scatter than do the Fe plots, however, probably because the data come from a different aliquot of the sample.

The geographic distribution of metals that appear to be enriched at a few locations are presented in Figures 43-47. The anomalous samples highlighted in scatter plots of metal versus iron primarily occur in Inner Bay locations close to Portland. These metals are Ag, Cd, Hg, Pb, and Zn.

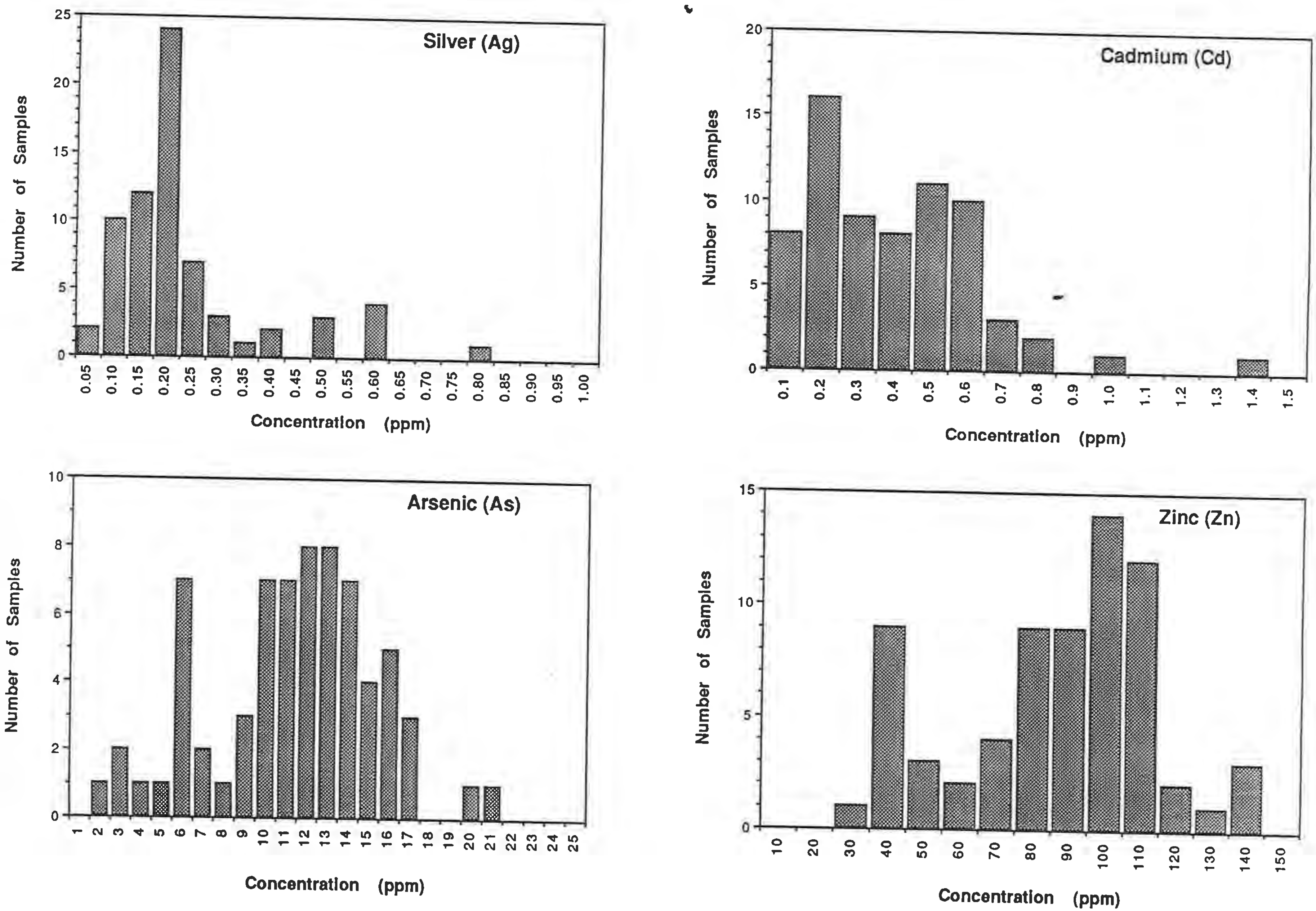

Figure 37. Frequency plots of silver, cadmium, arsenic and zinc concentrations (ppm dry weight) in sediments from Casco Bay.

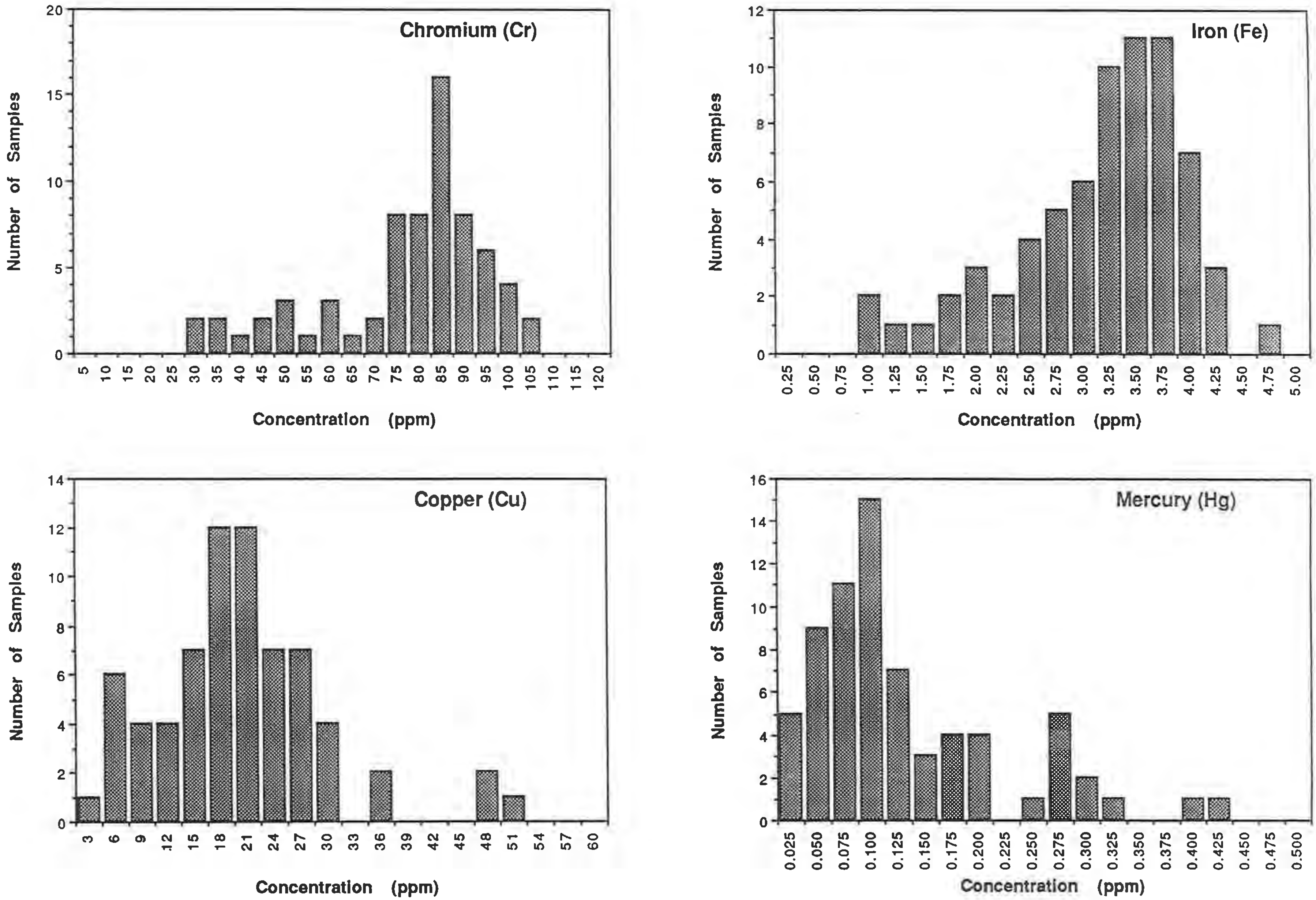

Figure 38. Frequency plots of chromium, iron, copper and mercury concentrations (ppm dry weight) in sediments from Casco Bay.

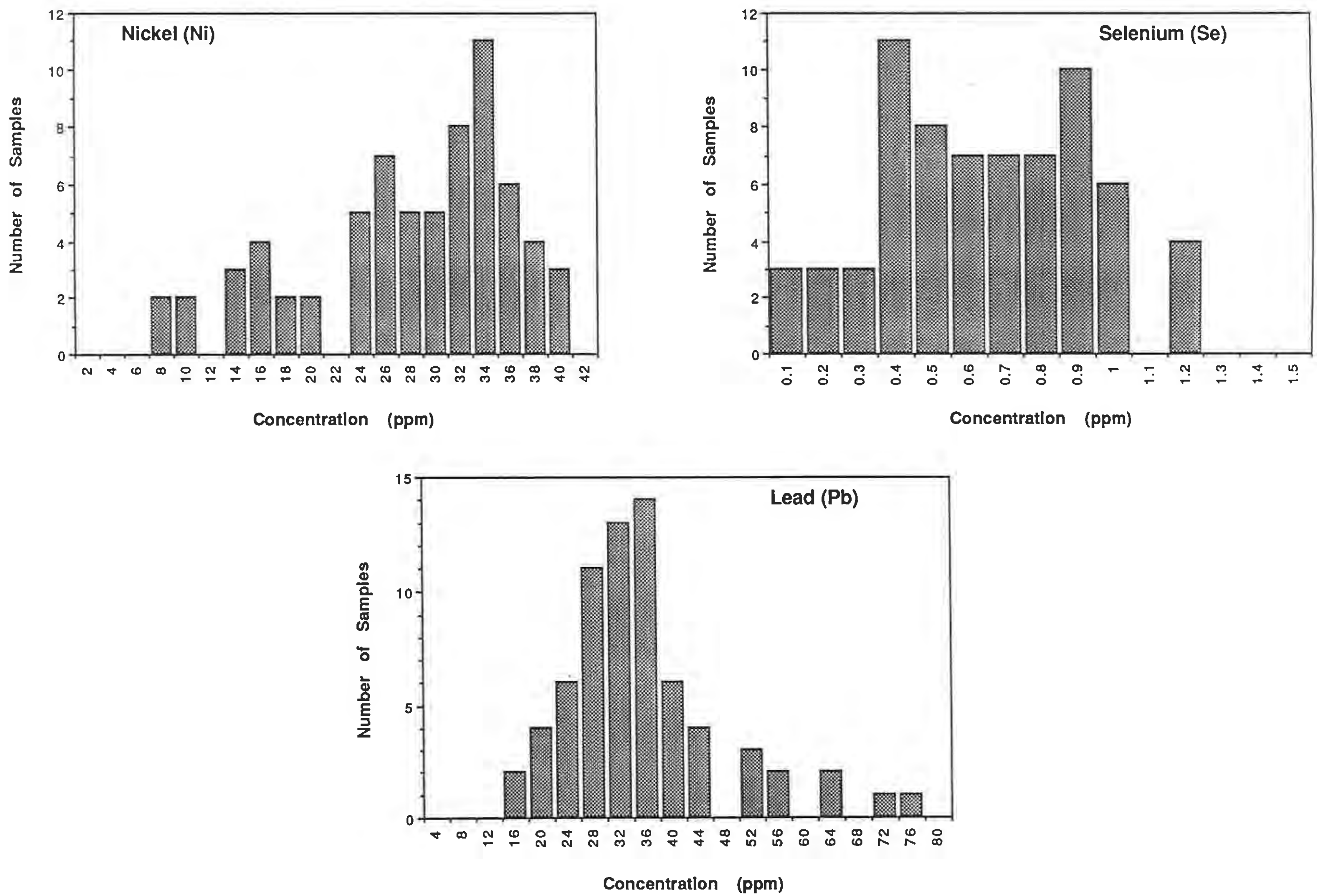

Figure 39. Frequency plots of nickel, selenium and lead concentrations (ppm dry weight) in sediments from Casco Bay.

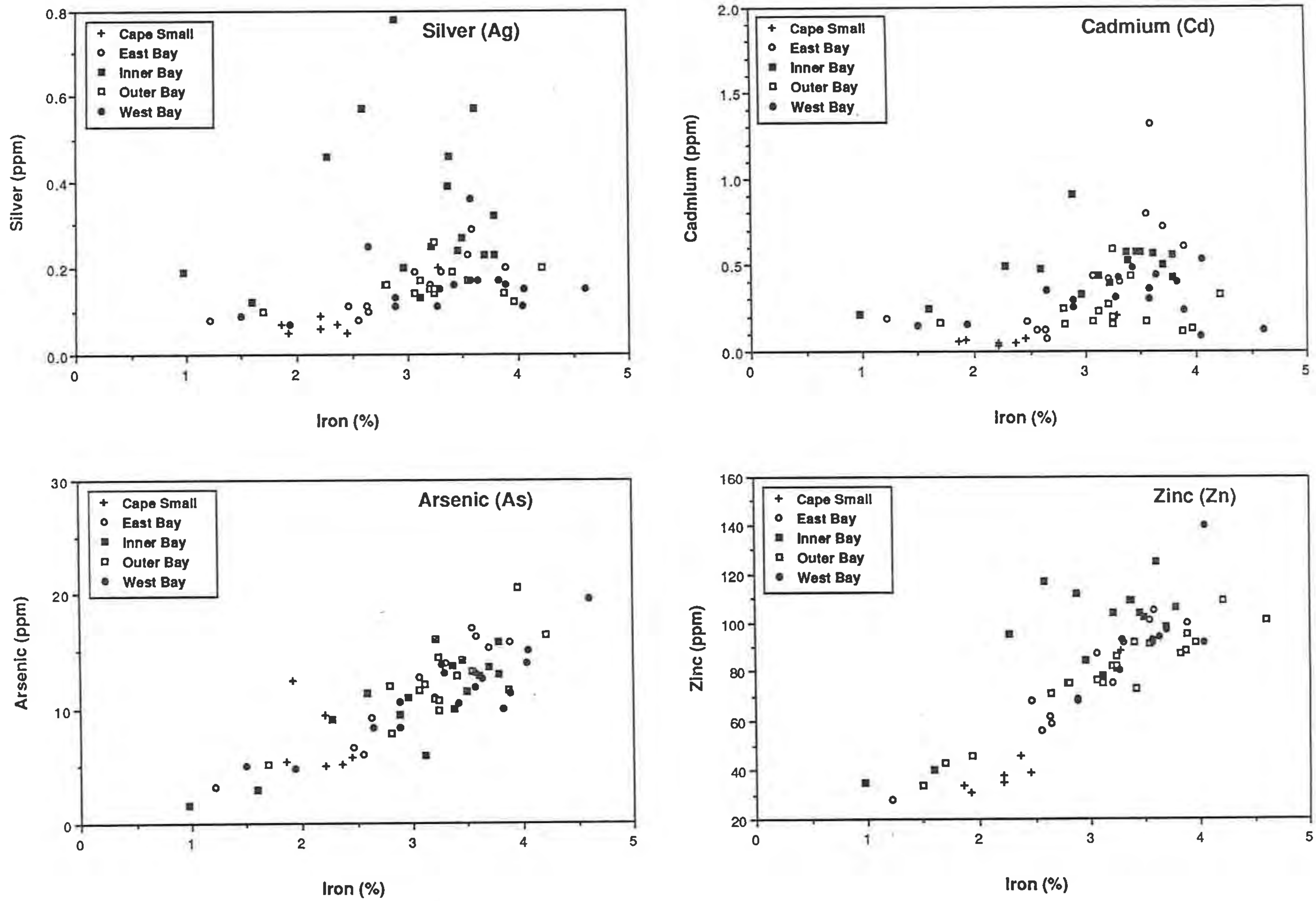

Figure 40. The relationship between silver, cadmium, arsenic and zinc concentrations (ppm dry weight) and iron content (% dry weight) in sediments from Casco Bay.

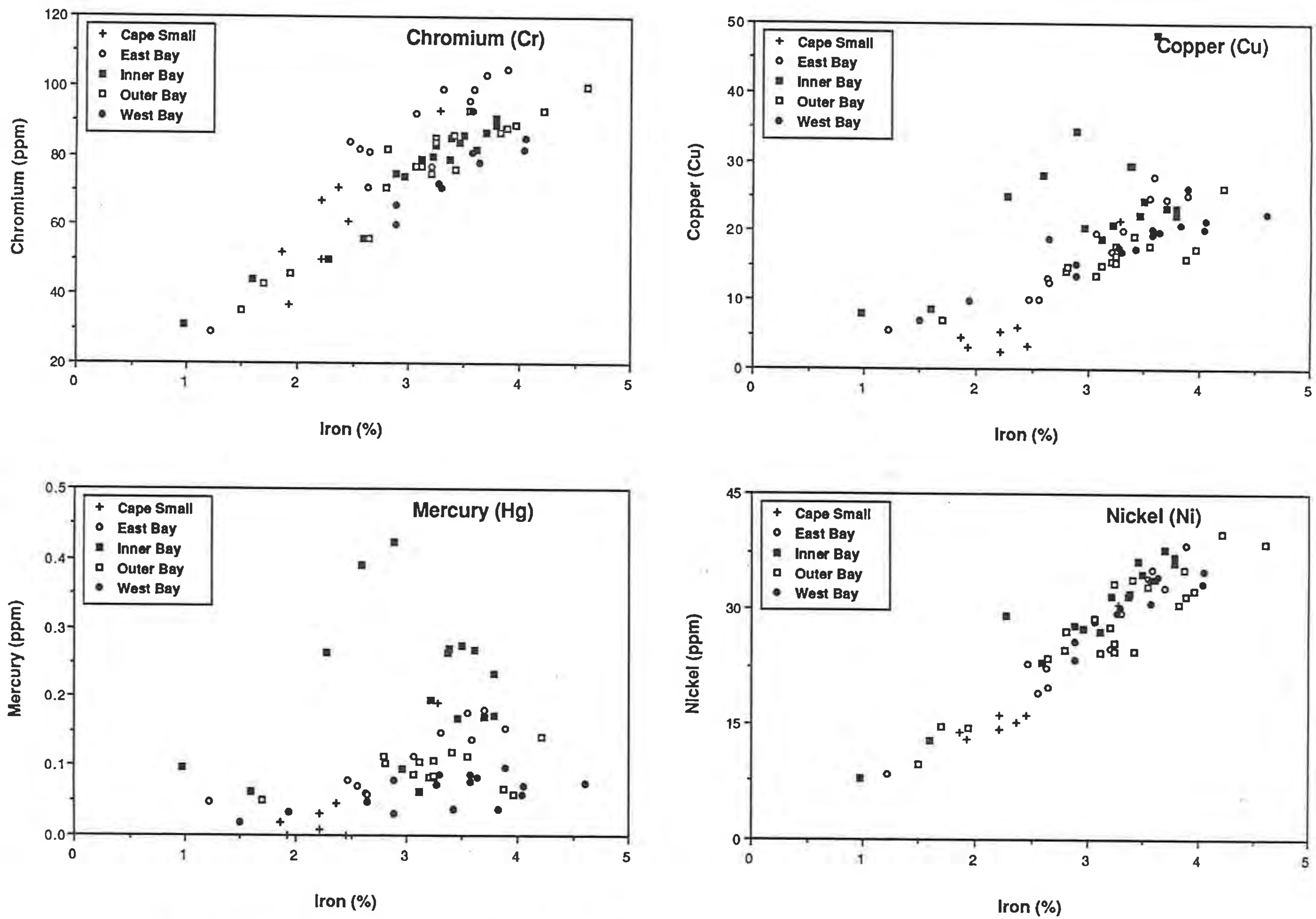

Figure 41. The relationship between chromium, copper, mercury and nickel concentrations (ppm dry weight) and iron content (% dry weight) in sediments from Casco Bay.

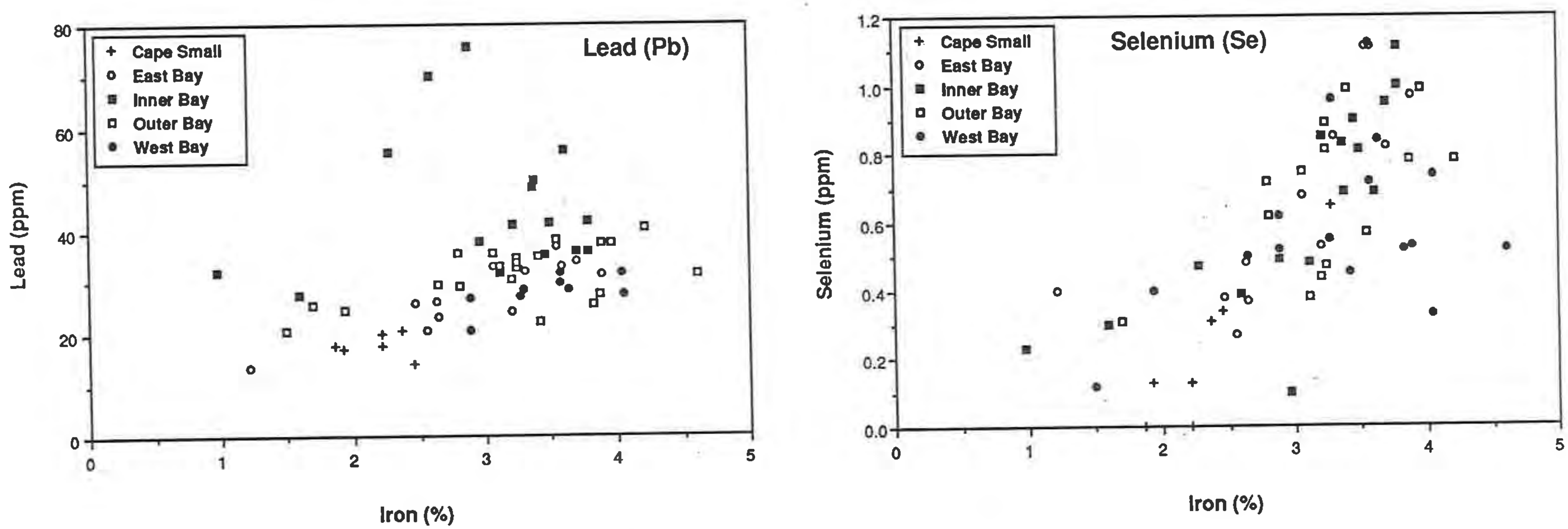

Figure 42. The relationship between lead and selenium concentrations (ppm dry weight) and iron content (% dry weight) in sediments from Casco Bay.

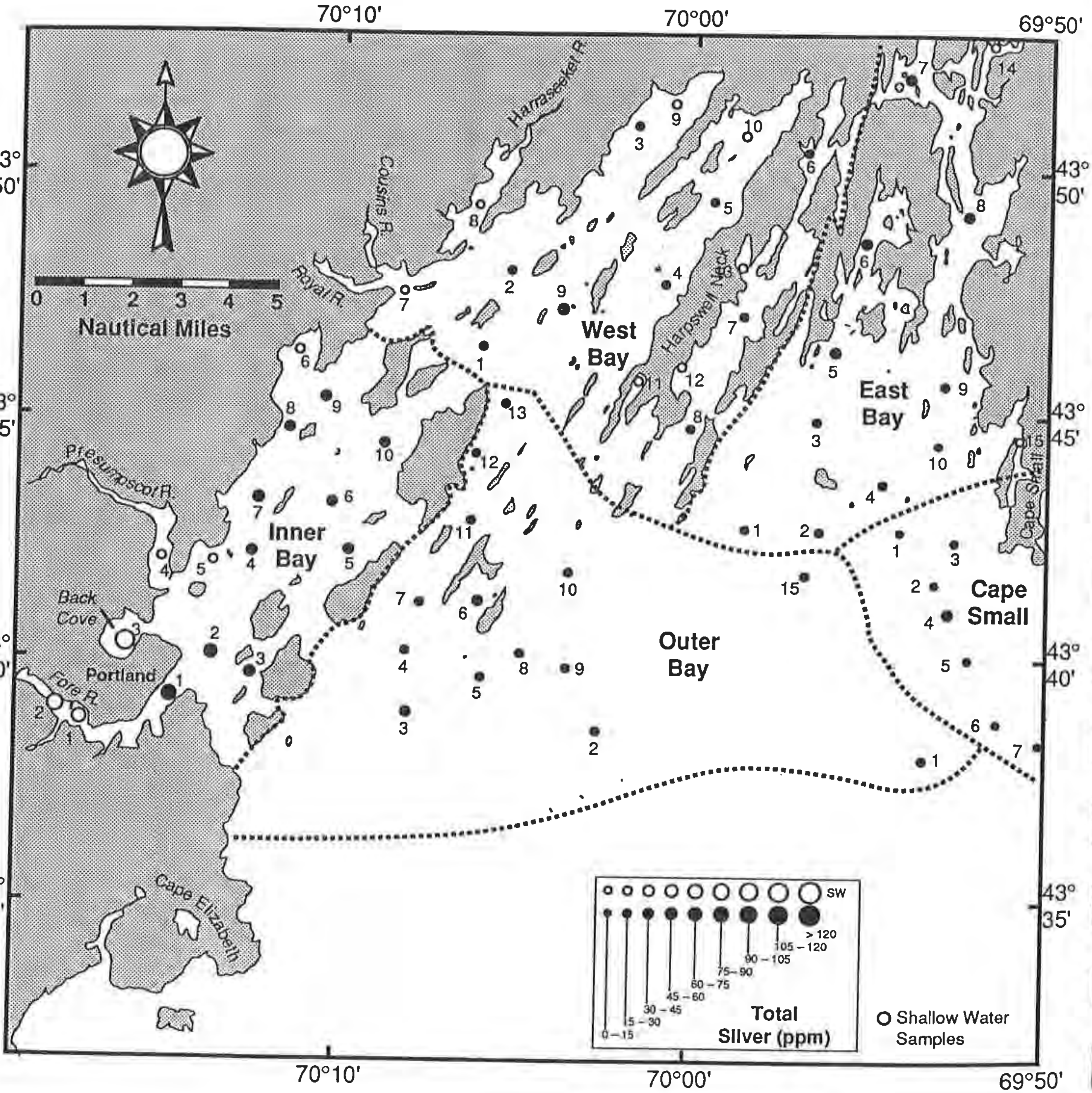

Figure 43. Regional distribution of silver concentrations (ppm dry weight) in sediments from Casco Bay.

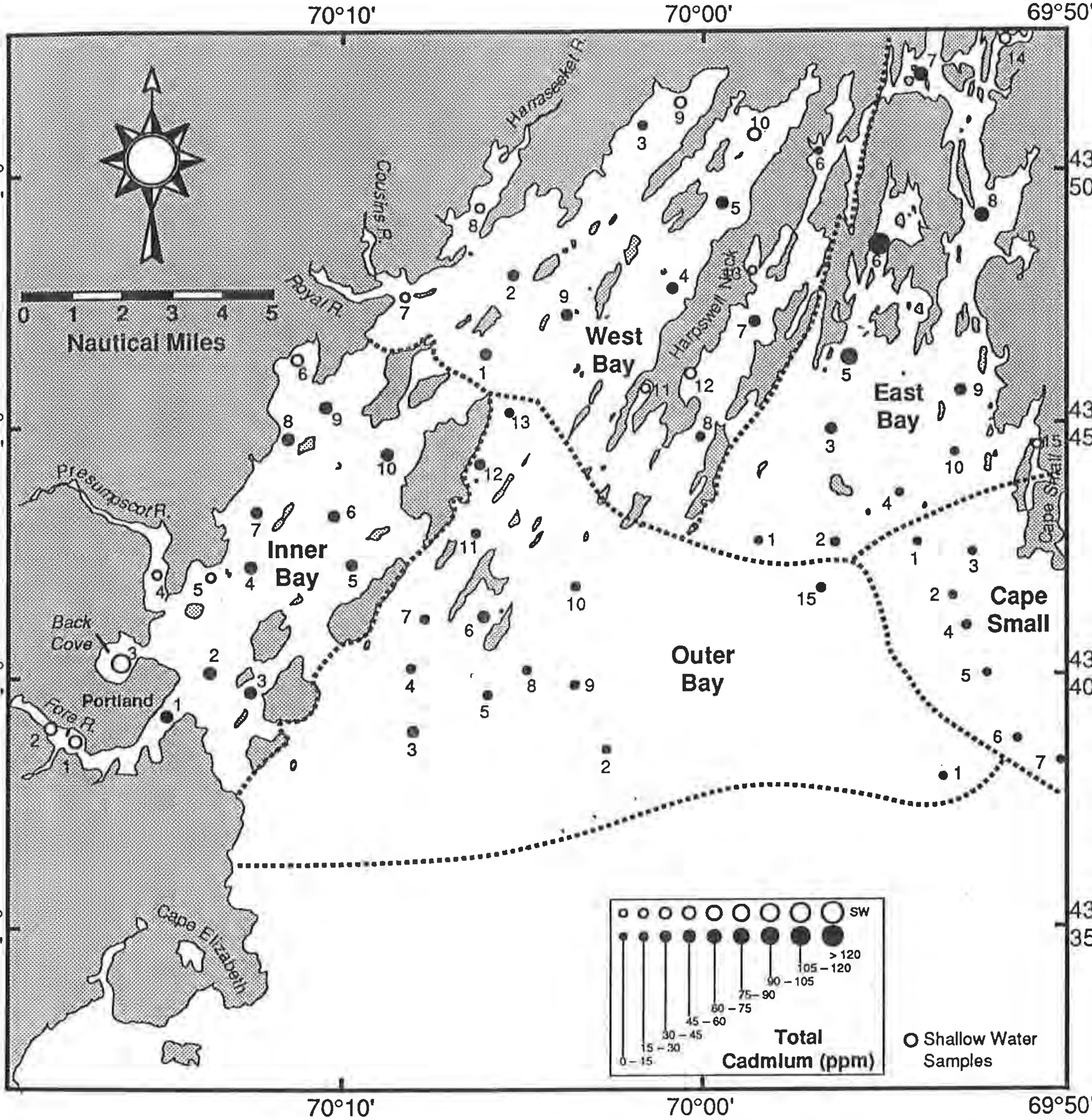

Figure 44. Regional distribution of cadmium concentrations (ppm dry weight) in sediments from Casco Bay.

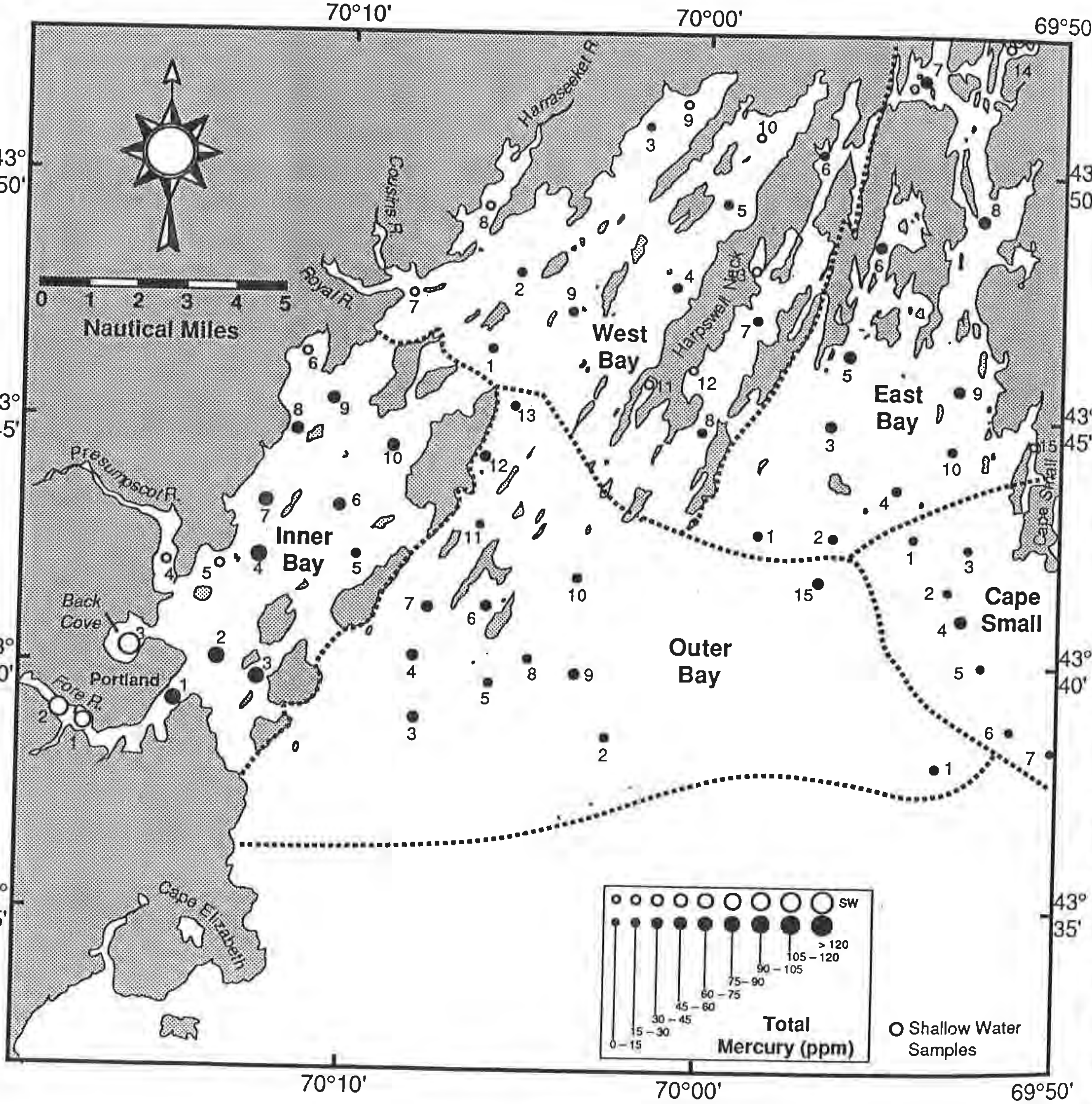

Figure 45. Regional distribution of mercury concentrations (ppm dry weight) in sediments from Casco Bay.

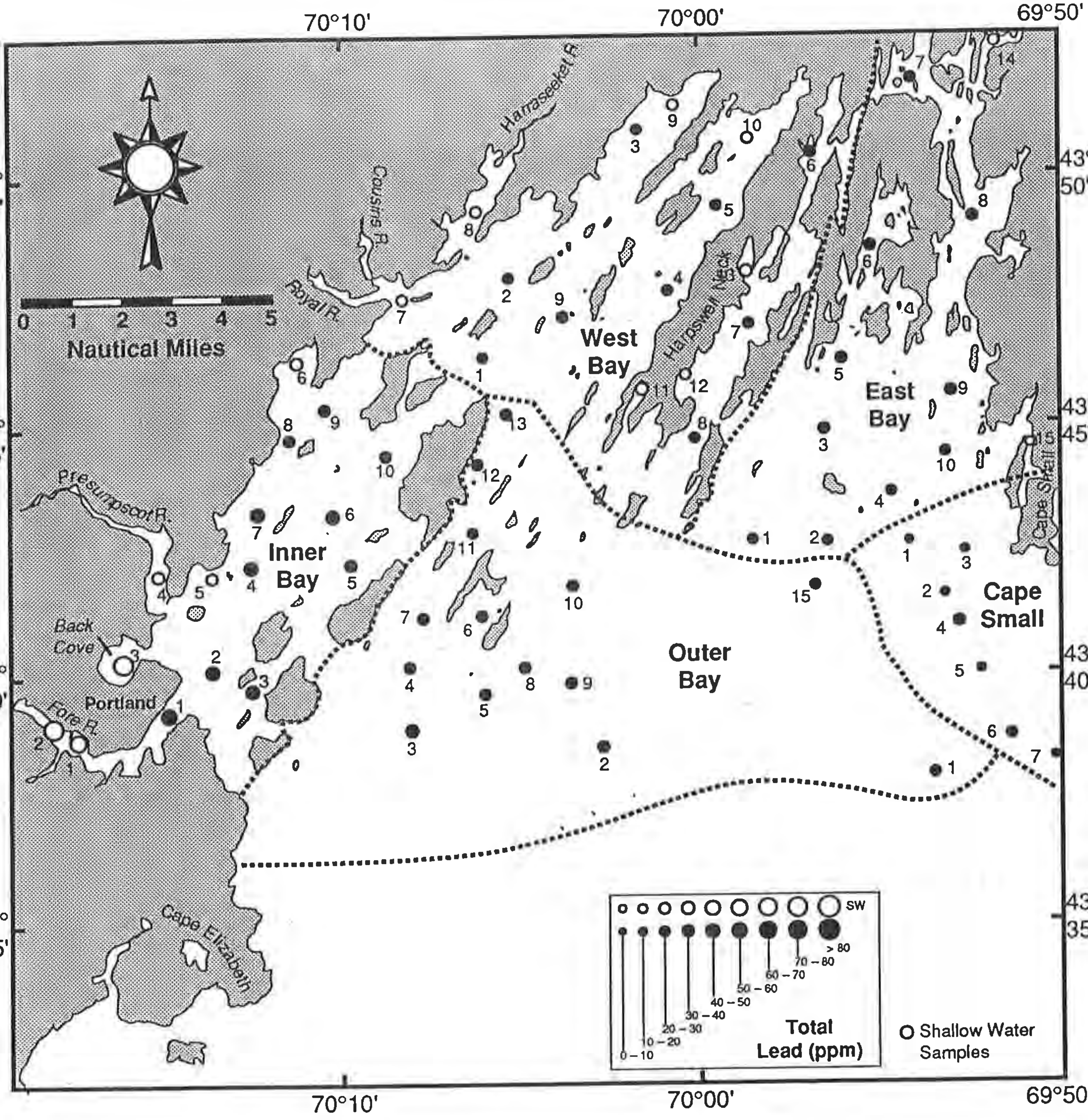

Figure 46. Regional distribution of lead concentrations (ppm dry weight) in sediments from Casco Bay.

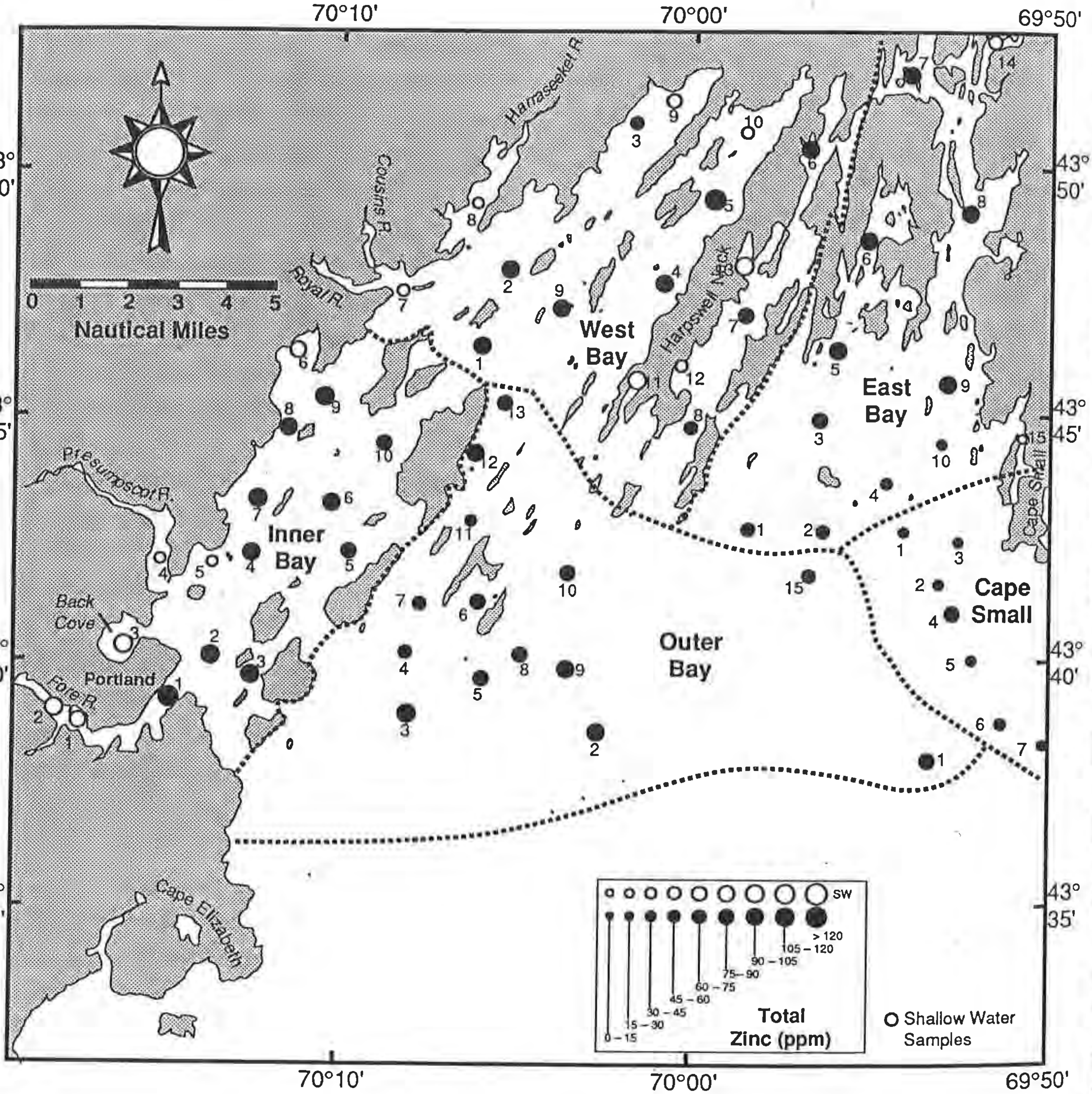

Figure 47. Regional distribution of zinc concentrations (ppm dry weight) in sediments from Casco Bay.

4.3.2 Comparison With Other U.S. Coastal Waters

O'Connor (1990) examined data produced by NOAA's Status and Trends and Benthic Surveillance Programs for 1986-89. In this data set, there was a tendency for metals such as Cd, Hg and Pb to be strongly positively skewed on a frequency plot. On the other hand, the data tended to be normally distributed when plotted as logarithms. Based on this log-normal distribution, O'Connor (1990) defined "high" concentrations of several trace metals as those greater than the average plus one standard deviation of the logarithm of the average. O'Connor's "high" values include Cd (0.7 ppm), Cr (135 ppm), Cu (55 ppm), Pb (52 ppm), Hg (0.30 ppm), Ag (0.74 ppm) and Zn (172 ppm) unadjusted for sand content of the sediment. For a sediment consisting partly of quartz sand, these values would be reduced proportionally (e.g. multiplied by 0.75 for a sediment with 25% sand). Almost none of the metal concentrations detected during this study would be classified as "high" by O'Connor's (1990) definition, i.e., few would rank in the top 17% of values for coastal sediments from major U.S. bays and estuaries. The sites O'Connor (1990) considered (the NOAA Status and Trends sites) within these bays and estuaries were chosen away from obvious sources of anthropogenic metal inputs. Whereas some of the Cd, Pb, Ag, Zn, and Hg values found in Casco Bay sediments suggest an influence by humans, they are not "high" on a national scale, even when compared to samples collected away from obvious point sources of pollutant inputs.

5.0 SUMMARY CONCLUSIONS

One or more anthropogenic contaminants; trace metals, PCBs, DDTs, chlordane or PAH; are detectable at all locations sampled in Casco Bay. The geographic distributions of contaminants is primarily controlled by the location of sources and secondarily by sediment texture and oceanographic conditions. The most elevated contaminants are derived from the utilization of fossil fuels. The predominant sources of PAH are combustion processes associated with urban and industrial locations. The Inner Bay region directly offshore of Portland contains the highest levels of trace metals, PCBs, DDTs, chlordane and hydrocarbons. In general, for contaminants other than PAH, the levels of contamination are not considered high on a national basis. PAH are high in concentration in the Inner Bay and are comparable to other contaminated estuaries (O'Connor, 1990; Long and Morgan, 1990). Historical changes in contaminant concentrations are difficult to assess due to variations in methodologies, analytes measured, and variable station locations.

To compare the distribution of all of the contaminants measured, each site was ranked from 1 to 65 based on the abundance of each suite of contaminants. If a contaminant was below the MDL it was given a ranking of 1. If multiple stations had the same concentrations they were given the same relative ranking. Organic and inorganic contaminants were assessed separately, the cumulative rankings for each site were summed, and the sites were sorted from low to high values (Tables 17 and 18). Based on this summation the highest 25% of organic contaminants are located at 10 Inner Bay, 2 Outer Bay, 3 East Bay, and 1 Cape Small sites. Eight of the ten most highly contaminated stations are located in the Inner Bay region including the six highest stations. The lowest levels of organic contaminants are in the Cape Small and West Bay regions. High levels of a variety of organic contaminants tend to occur at the same location.

For inorganic contamination only those metals believed to be influenced by anthropogenic inputs were used to rank the sample locations, i.e., Ag, Cd, Pb, Zn, and Hg. Based on the summation of inorganic contaminant rankings the locations with the 25% highest levels were at 12 Inner Bay, 3 East Bay, and 1 Outer Bay location. Nine of the ten highest locations are in the Inner Bay region including the eight highest stations. Lowest metal concentrations occur in the Cape Small region. Eleven stations are ranked in the highest 25% on both the inorganic and organic contaminant rankings. They are almost exclusively Inner Bay locations, i.e., nine of eleven.

Biological effects or sediment quality were not directly measured in this study. However, the concentrations of most organic contaminants detected are below the concentration levels that are believed to evoke toxic responses in marine benthic organisms (Tables 18, 19 and 20). Long and Morgan (1990) conducted an extensive literature review of articles giving

Table 17. Casco Bay Estuary Program Site Rankings Based on Organic Contaminant Data - 1991 (ppb dry wt. surrogate corrected).

Sta #	Total PAH's (ppb)	Total PAH's Ranking	Total Chlordane (ppb)	Total Chlordane Ranking	Total DDT'S (ppb)	Total DDT'S Ranking	Total PCB'S (ppb)	Total PCB'S Ranking	Total Organic Ranking
CS-1	93.40	2	0.01	1	0.01	1	0.6	2	6
CS-7	16.35	1	0.02	3	0.02	2	0.4	1	7
CS-3	514.89	6	0.02	2	0.10	4	2.0	5	17
WB-3	420.57	4	0.07	4	0.18	5	2.6	6	19
SW-8	445.27	5	0.16	12	0.47	8	1.6	3	28
SW-10	595.33	8	0.11	6	0.30	6	4.5	9	29
CS-2	362.06	3	0.24	19	0.04	3	1.7	4	29
CS-6	672.02	9	0.15	10	0.50	9	3.8	7	35
SW-12	1093.80	16	0.23	16	0.72	10	5.5	11	53
WB-6	774.36	11	0.23	15	0.94	14	6.0	13	53
SW-9	734.37	10	0.23	17	0.73	11	8.1	17	55
WB-2	1467.16	22	0.16	11	1.01	15	7.2	14	62
SW-5	910.62	13	0.15	9	1.63	26	7.3	16	64
WB-8	1111.55	18	0.11	5	1.52	25	8.4	18	66
SW-7	807.08	12	0.25	20	1.70	29	5.2	10	71
SW-13	961.48	14	0.19	14	1.23	21	9.8	23	72
CS-5	546.22	7	1.32	53	0.33	7	3.9	8	75
WB-7	1328.63	20	0.12	7	1.36	23	10.2	25	75
OB-1	1432.62	21	0.41	27	1.09	18	7.2	15	81
OB-11	1312.17	19	0.24	18	1.11	19	11.6	28	84
OB-7	1650.23	30	0.45	30	1.03	16	5.5	12	88
SW-14	1059.12	15	0.25	21	1.94	34	9.1	21	91
EB-1	2230.05	37	0.60	35	0.86	13	9.0	20	105
EB-2	2874.51	45	0.57	33	0.82	12	8.9	19	109
WB-4	1494.59	24	0.56	31	1.83	31	11.5	27	113
SW-6	1526.07	26	0.30	23	2.29	41	10.0	24	114
WB-5	1101.75	17	0.57	32	1.91	33	14.1	34	116
EB-4	2791.39	44	0.16	13	1.37	24	14.3	35	116
OB-4	1964.06	36	0.64	37	1.26	22	9.6	22	117
OB-6	1531.22	28	0.13	8	2.33	43	18.8	42	121
OB-13	1567.58	29	0.85	42	1.69	28	11.5	26	125
OB-8	1865.48	33	0.39	25	1.72	30	17.4	39	127
EB-10	4545.30	55	0.43	28	1.12	20	13.5	31	134
WB-9	1900.64	34	0.33	24	2.28	40	16.3	38	136
WB-1	1490.07	23	0.91	43	2.42	45	11.8	29	140
OB-12	1696.01	31	0.74	39	2.00	35	14.4	36	141
SW-11	1501.35	25	0.98	46	3.10	49	13.9	32	152
OB-5	2964.25	48	0.60	34	1.65	27	18.9	43	152
IB-9	1944.80	35	0.78	41	3.56	50	13.4	30	156
EB-3	2938.97	46	1.06	47	2.26	39	14.0	33	165
IB-5	2545.34	40	0.96	45	2.40	44	15.8	37	166
OB-9	2705.92	41	0.77	40	2.08	36	22.2	49	166
EB-8	3458.65	52	0.26	22	2.81	48	19.6	46	168
EB-5	2943.78	47	0.40	26	2.55	47	23.7	50	170
SW-15	7179.50	59	1.60	55	1.07	17	17.9	40	171
SW-4	1530.28	27	1.12	48	3.93	54	19.1	44	173
OB-2	1817.31	32	1.89	59	2.31	42	18.1	41	174
OB-10	2268.53	39	1.25	51	2.09	37	20.0	48	175
IB-6	3068.24	49	0.62	36	2.53	46	27.9	53	184
OB-15	4004.42	54	1.13	49	2.17	38	19.4	45	186
IB-8	2723.07	42	0.93	44	4.44	57	19.9	47	190
CS-4	7453.68	61	0.71	38	1.89	32	40.0	59	190
OB-3	3726.51	53	0.43	29	4.12	55	30.7	54	191
IB-10	2737.43	43	1.13	50	3.69	51	27.9	52	196
EB-6	2232.73	38	1.72	57	3.86	52	35.7	57	204
EB-7	4871.74	56	1.30	52	3.86	53	23.9	51	212
IB-4	3273.08	51	1.39	54	7.63	59	31.8	55	219
IB-7	3109.16	50	1.84	58	4.70	58	33.7	56	222
EB-9	7340.36	60	1.91	60	4.16	56	37.3	58	234
IB-2	6392.30	58	1.63	56	9.91	61	47.6	61	236
IB-3	5058.83	57	2.49	61	9.02	60	42.2	60	238
SW-1	20747.58	65	3.47	63	10.10	62	72.3	62	252
IB-1	9174.43	63	2.89	62	14.50	63	79.2	64	252
SW-3	7516.93	62	4.91	65	20.42	65	77.1	63	255
SW-2	12588.31	64	3.98	64	16.81	64	485.0	65	257

Table 18. Casco Bay Estuary Program Site Rankings based on Selected Metal Data - 1991 (ppm dry wt.).

Sta#	Ag (ug/g)	Ag Ranking	Cd (ug/g)	Cd Ranking	Hg (ug/g)	Hg Ranking	Pb (ug/g)	Pb Ranking	Zn (ug/g)	Zn Ranking	Total Ranking
CS-7	0.05	1	0.069	5	<0.006	1	17.1	3	31	2	12
CS-3	0.06	1	0.053	3	0.008	1	17.6	4	35	4	13
CS-2	0.07	1	0.060	4	0.019	2	17.8	5	34	3	15
CS-1	0.05	1	0.071	6	<0.006	1	14.1	2	39	6	16
CS-5	0.09	3	0.036	1	0.031	3	20.0	6	38	5	18
CS-6	0.07	1	0.051	2	0.046	6	20.8	9	46	9	27
SW-8	0.09	3	0.150	14	0.019	2	20.5	7	34	3	29
SW-15	0.08	2	0.192	21	0.048	7	13.6	1	28	1	32
SW-7	0.07	1	0.155	15	0.032	4	24.7	13	46	9	42
EB-4	0.10	4	0.076	7	0.058	10	23.3	11	59	11	43
EB-10	0.08	2	0.121	10	0.069	15	20.6	8	56	10	45
OB-11	0.10	4	0.168	17	0.049	8	25.5	14	43	8	51
EB-1	0.11	5	0.127	12	0.059	11	26.2	16	62	12	56
WB-3	0.11	5	0.258	28	0.031	3	20.5	7	69	14	57
EB-2	0.11	5	0.175	19	0.077	20	25.8	15	68	13	72
SW-5	0.12	6	0.245	27	0.062	13	27.5	20	40	7	73
OB-1	0.14	8	0.118	9	0.065	14	27.7	21	88	27	79
WB-6	0.11	5	0.088	8	0.057	9	31.7	30	92	29	81
WB-8	0.13	7	0.293	30	0.077	20	26.8	17	68	13	87
SW-10	0.16	10	0.486	48	0.037	5	22.2	10	73	16	89
WB-7	0.11	5	0.312	32	0.071	17	27.1	18	80	20	92
SW-9	0.17	11	0.400	38	0.037	5	25.5	14	87	25	93
OB-15	0.16	10	0.155	15	0.102	28	29.3	24	75	17	94
SW-12	0.25	16	0.355	35	0.048	7	29.4	25	71	15	98
SW-4	0.19	12	0.213	24	0.097	27	32.0	32	35	4	99
SW-14	0.16	10	0.414	40	0.082	22	24.3	12	75	17	101
SW-13	0.15	9	0.125	11	0.073	18	31.5	28	101	36	102
OB-10	0.14	8	0.156	16	0.081	21	33.8	38	82	22	105
OB-2	0.12	6	0.133	13	0.058	10	37.7	49	92	29	107
OB-13	0.15	9	0.268	29	0.082	22	30.6	27	82	22	109
OB-8	0.14	8	0.176	20	0.087	24	35.7	43	76	18	113
SW-6	0.13	7	0.435	45	0.061	12	31.7	30	78	19	113
OB-5	0.15	9	0.200	22	0.085	23	34.7	40	81	21	115
OB-4	0.17	11	0.226	25	0.104	29	33.1	36	75	17	118
WB-2	0.17	11	0.358	36	0.076	19	29.7	26	92	29	121
WB-1	0.15	9	0.430	42	0.087	24	28.4	22	93	30	127
OB-7	0.16	10	0.245	27	0.113	32	35.8	44	75	17	130
WB-4	0.17	11	0.444	46	0.082	22	28.6	23	94	31	133
WB-9	0.36	21	0.302	31	0.087	24	31.9	31	93	30	137
OB-9	0.17	11	0.174	18	0.113	32	38.3	51	91	28	140
CS-4	0.20	13	0.208	23	0.190	43	32.4	34	88	27	140
WB-5	0.15	9	0.529	52	0.069	16	27.4	19	140	45	141
SW-11	0.16	10	0.239	26	0.096	26	37.6	48	95	32	142
IB-5	0.20	13	0.325	33	0.094	25	38.1	50	84	23	144
EB-3	0.19	12	0.431	43	0.112	31	33.2	37	87	26	149
EB-9	0.19	12	0.401	39	0.148	36	32.1	33	92	29	149
OB-12	0.19	12	0.434	44	0.118	33	35.1	41	92	29	159
OB-6	0.26	17	0.592	58	0.106	30	32.8	35	86	24	164
EB-7	0.20	13	0.608	59	0.153	37	31.6	29	100	35	173
OB-3	0.20	13	0.327	34	0.141	35	40.7	52	109	41	175
IB-10	0.23	14	0.501	50	0.170	39	36.0	45	98	34	182
EB-8	0.23	14	0.720	60	0.181	42	34.1	39	97	33	188
IB-6	0.25	16	0.392	37	0.195	44	41.2	53	104	38	188
IB-8	0.24	15	0.573	56	0.168	38	35.3	42	104	38	189
EB-6	0.29	19	1.320	63	0.137	34	33.2	37	105	39	192
IB-9	0.23	14	0.557	53	0.173	40	36.2	46	106	40	193
EB-5	0.23	14	0.794	61	0.176	41	37.0	47	101	36	199
IB-7	0.32	20	0.424	41	0.234	45	42.1	55	106	40	201
SW-1	0.46	23	0.488	49	0.264	46	55.5	58	95	32	208
IB-4	0.27	18	0.571	55	0.274	49	41.5	54	102	37	213
IB-2	0.46	23	0.524	51	0.271	48	49.9	57	109	41	220
IB-3	0.39	22	0.574	57	0.264	46	48.5	56	109	41	222
SW-2	0.57	24	0.478	47	0.392	50	70.3	60	117	43	224
IB-1	0.57	24	0.564	54	0.269	47	55.6	59	125	44	228
SW-3	0.78	25	0.908	62	0.424	51	75.6	61	112	42	241

Table 19. Comparison of ER-L, ER-M, apparent effects thresholds, and Washington State Sediment Quality Criteria concentrations for selected chemicals in sediments and the values measured in Casco Bay (after Long and Morgan, 1990; Washington State Dept. of Ecology Sediment Management Standards, Chapter 173-204 WAC).

						Casco Bay Regions[6]									
Chemical Analyte	ER-L[1]	ER-M[2]	AET[3]	Degree of Confidence[4]	WSSQC[5]	Inner Bay Min	Inner Bay Max	West Bay Min	West Bay Max	East Bay Min	East Bay Max	Cape Small Min	Cape Small Max	Outer Bay Min	Outer Bay Max
Trace Elements (ppm dry wt.)															
Arsenic	33	85	50	L/M	5.7	1.62	16.00	4.76	19.60	3.20	19.60	5.03	13.70	5.03	20.50
Cadmium	5	9	5	H/H	5.1	0.213	0.908	0.088	0.529	0.076	1.320	0.036	0.208	0.036	0.592
Chromium	80	145	No	M/M	26.0	31.00	91.00	35.00	100.00	29.00	105.00	37.00	93.00	43.00	93.00
Copper	70	390	300	H/H	390	7.92	48.40	6.98	26.20	5.59	27.90	2.52	21.60	6.94	26.20
Lead	35	110	300	M/H	450	27.50	75.60	20.50	37.60	13.60	37.00	14.10	32.40	25.50	40.70
Mercury	0.15	1.3	1	M/H	0.41	0.061	0.424	0.019	0.096	0.048	0.181	< 0.010	0.190	0.049	0.141
Nickel	30	50	NSD[7]	M/M	---	7.81	37.80	9.67	38.60	8.36	38.40	12.90	30.60	14.50	39.80
Silver	1	2.2	1.7	M/M	6.1	0.12	0.78	0.07	0.36	0.08	0.29	< 0.07	0.20	0.10	0.26
Zinc	120	270	160	H/H	410	35.00	125.00	34.00	140.00	28.00	105.00	31.00	88.00	43.00	109.00

(see footnote on Table 20)

Table 20. Comparison of ER-L, ER-M, apparent effects thresholds, and Washington State Sediment Quality Criteria concentrations for selected chemicals in sediments and the values measured in Casco Bay (after Long and Morgan, 1990; Washington State Dept. of Ecology Sediment Management Standards, Chapter 173-204 WAC).

						Casco Bay Regions[6]									
Chemical Analyte	ER-L[1]	ER-M[2]	AET[3]	Degree of Confidence[4]	WSSQC[5]	Inner Bay Min	Inner Bay Max	West Bay Min	West Bay Max	East Bay Min	East Bay Max	Cape Small Min	Cape Small Max	Outer Bay Min	Outer Bay Max
Polychlorinated Biphenyls (ppb)															
Total PCBs	50	400	370	M/M	240	7.31	484.97	1.58	16.32	8.89	37.30	0.44	40.02	5.50	30.67
DDT and Metabolites (ppb)															
DDT	1	7	6	L/L	---	0.49	4.28	< 0.20	0.96	0.40	2.01	< 0.20	0.86	0.47	1.52
DDD	2	20	NSD	M/L	---	0.67	15.09	0.08	1.49	0.31	1.98	< 0.07	0.62	0.34	2.04
DDE	2	15	NSD	L/L	---	0.18	3.84	< 0.06	1.14	0.07	0.48	< 0.06	0.40	0.06	0.63
Total DDT	3	350	No	M/M	---	1.63	20.42	< 0.20	3.10	0.82	4.16	< 0.20	1.89	1.03	4.12
Other Pesticides (ppb)															
Lindane	NA	NA	NSD	NA[8]	---	< 0.07	0.48	< 0.07	0.22	< 0.07	0.35	< 0.07	0.11	< 0.07	0.34
Chlordane	0.5	6	2	L/L	---	0.15	4.91	0.07	0.98	0.16	1.91	< 0.07	1.32	0.13	1.89
Heptachlor	NA	NA	NSD	NA	---	0.08	0.13	< 0.04	0.05	< 0.04	0.13	< 0.04	< 0.04	< 0.04	0.04
Dieldrin	0.02	8	No	L/L	---	< 0.16	0.94	< 0.16	< 0.16	< 0.16	0.43	< 0.16	2.46	< 0.16	1.40
Aldrin	NA	NA	NSD	NA	---	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28
Endrin	0.02	45	NSD	L/L	---	< 0.06	0.84	< 0.06	0.21	< 0.06	0.17	< 0.06	< 0.06	< 0.06	0.55
Mirex	NA	NA	NSD	NA	---	< 0.04	0.29	< 0.04	0.08	< 0.04	0.49	< 0.04	0.66	< 0.04	0.16

[1]ER-L - Effects Range-Low
[2]ER-M - Effects Range-Median
[3]AET - Apparent Effects Threshold
[4]L - Low, M-Medium, H-High
[5]WSSQC - Washington State Sediment Quality Criteria calculated ppb dry wt. based on 2% TOC
[6]ppm dry weight
[7]NSD - Not Sufficient Data
[8]NA - Not Available

both concentrations of contaminants in sediments and observed biological effects. Six different approaches used in these studies were briefly described and reviewed. It is concluded that each approach has strengths and weaknesses, i.e., there is no perfect method for determining sediment toxicity. They therefore tried to arrive at consensus values by considering data from all the studies. Sediment concentrations shown by the studies to cover biological effects, and judged to be valid, were ranked from low to high. A 10th and 50th percentile were then determined. Those were designated "Effects Range Low" and "Effects Range Median" (ER-L and ER-M). The Washington State Sediment Quality Criteria, the summary of data from Long and Morgan (1990) and the Casco Bay results are compared in Tables 19 and 20.

The "high" total PAH values present in Inner Bay sediments are nearly an order of magnitude lower than PAH concentrations thought to produce toxic responses in marine benthic organisms, i.e., total PAH ≥ 35,000 ppb produces toxic responses (Table 21; Long and Morgan, 1990). Bioavailability is also a factor in determining whether a sediment contaminant evokes a biological response. For example the mode of occurrence of PAH has been shown to vary widely depending on the original source (McElroy *et al.*, 1989). Coal or soot associated pyrogenic or combustion PAH are often tightly bound or occur in the interiors of particles. This mode of occurrence renders these PAH largely inert as far as biological exposure. In contrast liquid hydrocarbons such as oil or creosote contain PAH that are readily available to organisms and would be expected to induce toxicological effects in organisms if present at high concentrations. A majority of PAH in this study are most likely combustion related and thus sequestered in particulates reducing their apparent toxicity.

Long and Morgan (1990) estimated that median concentrations of total PCB above 400 ppb dry wt. would elicit a toxic response in most benthic organisms. For this study only the SW-2 site is above this threshold. The DDT concentrations are low compared to concentrations known to cause a toxic response in most benthic organisms (Long and Morgan, 1990). Chlordane concentrations are "low" based on the definition of O'Connor (1990) and should pose little or no threat of toxic biological effects (Long and Morgan, 1990).

Table 21. Comparison of ER-L, ER-M, apparent effects thresholds, and Washington State Sediment Quality Criteria concentrations for selected chemicals in sediments and the values measured in Casco Bay (after Long and Morgan, 1990; Washington State Dept. of Ecology Sediment Management Standards, Chapter 173-204 WAC).

Chemical Analyte	ER-L[1]	ER-M[2]	AET[3]	Degree of Confidence[4]	WSSQC[5]	Casco Bay Regions[6] Inner Bay Min	Inner Bay Max	West Bay Min	West Bay Max	East Bay Min	East Bay Max	Cape Small Min	Cape Small Max	Outer Bay Min	Outer Bay Max
Polynuclear Aromatic Hydrocarbons (ppb dry wt. surrogated corrected)															
Acenaphthene	150	650	150	L/L	320	1.69	80.95	< 0.68	2.63	1.50	19.36	< 0.68	13.41	2.47	6.31
Anthracene	85	960	300	L/M	4400	5.56	254.89	2.79	14.59	7.67	106.89	< 0.93	98.04	14.11	50.41
Benzo(a)anthracene	230	1600	550	L/M	2200	29.51	655.45	11.93	56.13	34.13	481.07	0.96	360.32	47.81	173.28
Benzo(a)pyrene	400	2500	700	M/M	1980	42.69	740.58	17.05	100.13	49.88	497.55	1.12	432.52	61.97	208.85
Benzo(e)pyrene	NA[8]	NA	NSD[7]	NA	---	37.11	513.87	13.86	74.13	37.14	275.53	0.98	270.75	48.14	140.28
Biphenyl	NA	NA	NSD	NA	---	3.13	29.20	< 1.74	6.91	3.51	12.46	< 1.74	10.11	3.73	12.46
Chrysene	400	2800	900	M/M	2200	43.81	766.30	18.56	73.88	47.03	530.29	1.23	398.01	52.88	192.33
Dibenz(a,h)anthracene	60	260	100	M/M	240	3.18	105.28	2.85	41.31	7.40	58.35	< 0.44	63.58	11.13	72.59
2,6-dimethylnaphthylene	NA	NA	NSD	NA	---	3.99	129.70	1.41	8.81	3.31	27.76	< 0.52	17.30	5.26	14.01
Fluoranthene	600	3600	1000	H/H	3200	90.06	1444.32	33.52	144.12	82.14	639.22	1.65	522.15	118.32	304.17
Fluorene	35	640	350	L/L	460	4.12	201.16	1.43	7.41	4.13	95.56	< 0.98	26.68	6.16	14.92
1-methylnaphthalene	NA	NA	NSD	NA	---	2.91	81.24	1.38	7.23	3.16	31.15	< 0.76	19.82	5.00	11.40
2-methylnaphthalene	65	670	300	L/M	760	5.01	94.88	1.76	10.66	5.24	36.58	< 0.61	33.51	7.95	17.19
1-methylphenanthrene	NA	NA	NSD	NA	---	9.79	310.58	5.18	13.51	0.00	68.45	< 0.71	49.03	8.06	33.01
Naphthalene	340	2100	500	M/H	7400	7.94	134.83	2.36	13.75	7.17	45.79	< 1.53	41.38	11.56	26.19
Perylene	NA	NA	NSD	NA	---	17.30	215.71	8.91	55.81	30.55	109.88	< 3.62	94.47	20.91	77.39
Phenanthrene	225	1380	260	M/M	2,000	41.61	1035.82	16.84	70.64	41.43	549.74	0.95	268.90	56.71	159.88
Pyrene	350	2200	1000	M/M	20,000	81.61	1551.51	31.39	136.55	78.33	560.38	1.64	561.64	111.97	302.07
2,3,5-trimethylnaphthalene	NA	NA	NSD	NA	---	2.94	186.82	0.75	3.62	1.85	34.23	< 0.56	9.83	3.27	5.98
Total PAH	4000	35000	22000	L/L	---	910.62	20747.58	420.57	1900.64	1059.12	7340.36	16.35	7453.68	1312.17	4004.42

[1]ER-L - Effects Range-Low
[2]ER-M - Effects Range-Median
[3]AET - Apparent Effects Threshold
[4]L - Low, M-Medium, H-High
[5]WSSQC - Washington State Sediment Quality Criteria calculated ppb dry wt. based on 2% TOC
[6]ppm dry weight
[7]NSD - Not Sufficient Data
[8]NA - Not Available

While Casco Bay sediments are not considered "high" in trace metal content on a national scale it is important to determine if harmful effects would occur in organisms living in contact with these sediments. A number of different approaches to determining the trace metal concentrations in sediments which lead to a biological response have been used, resulting in a large and confusing literature. Thomas (1989) briefly describes eight different approaches to setting sediment criteria which have been considered in EPA programs but gives no actual data. Pavlov (1987) compared results from one of these approaches, the equilibrium partitioning approach, to results from other commonly used methods. He shows that the concentration of a given metal needed to elicit a biological response, as determined by equilibrium partitioning and other methods, does not vary widely (except for Hg). The needed concentrations are, furthermore, much higher than those found in Casco Bay sediment.

None of the metal concentrations in the Casco Bay sediments are as high as Long and Morgan's (1990) ER-M and only a few are as high as the ER-L's. For example, Casco Bay chromium concentrations are as high as 105 ppm whereas the ER-L is 80 ppm. Many uncontaminated sediments from other parts of the world, however, contain chromium concentrations higher than 105 ppm and it is unlikely that chromium in Casco Bay sediment would cause a biological effect. The same can be said for nickel and zinc, where Casco Bay concentrations are as high as 40 and 140 ppm compared to ER-L's of 30 and 120 ppm. A few mercury concentrations in Casco Bay are also higher than the ER-L but are much lower than those of highly contaminated sediments from Hudson-Raritan, Long Island Sound, Boston Harbor and elsewhere (Long and Morgan, 1990). It is unlikely that mercury in Casco Bay sediment is causing an effect on marine organisms. As with PAH, bioavailability may also be a significant issue in determining trace metal contamination toxicity.

In conclusion, anthropogenic contaminants are widespread throughout Casco Bay but in most cases occur at exceedingly low levels. The focus of contamination is in the Inner Bay region directly associated with the densest population centers and industrialization. Multiple processes release contaminants to Casco Bay and these chemicals have accumulated in bay sediments. Localized "hot spots" for various chemicals do occur but even these areas are mostly below levels suspected of evoking toxic biological responses. In order to more directly assign the sources of specific contaminants intensified localized sampling and analysis of effluents and run-off patterns would be needed. To determine sediment quality direct assays of sediments from localized hot spots should be conducted to determine the potential for biological effects.

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7.0 GLOSSARY OF TERMS

Aliphatic Hydrocarbons — Saturated straight-chain or branched chain hydrocarbons. Used in this report as all non-aromatic hydrocarbons.

Aliphatic Hydrocarbons	CAS Number
n-decane	124-18-5
n-docosane	629-97-0
n-dodecane	112-40-3
n-dotriacontane	544-85-4
n-eicosane	112-95-8
n-heneicosane	629-94-7
n-hentriacontane	630-04-6
n-heptacosane	593-49-7
n-heptadecane	629-78-7
n-hexacosane	630-01-3
n-hexadecane	544-75-3
n-nonacosane	630-03-5
n-nonadecane	629-92-5
n-octacosane	630-02-4
n-octadecane	593-45-3
n-pentacosane	629-99-2
n-pentadecane	629-62-9
n-tetracosane	643-31-1
n-tetradecane	629-59-4
n-tetratriacontane	14167-59-0
n-triacontane	638-68-6
n-tricosane	638-67-5
n-tridecane	629-50-5
n-tritriacontane	630-05-7
n-undecane	1120-21-4
nonylcyclohexane	2883-02-5
octylcyclohexane	1795-15-9
phytane	638-36-8
pristane	1921-70-6

Alkanes (paraffins) — Hydrocarbons found in oil and produced by the biota that contain only carbon (C) and hydrogen (H) atoms with no unsaturated bonds. Alkanes can be straight-chain (normal) or branched (isoprenoid).

Akyl Homologs — A series of structurally similar compounds that differ from the succeeding member by one carbon atom and two hydrogen atoms.

All Metals — The sum of silver, arsenic, cadmium, chromium, copper, iron, mercury, nickel, lead, selenium, and zinc

Anthropogenic — Pertaining to the introduction of matter into the environment by human activities.

Aroclors	Cas Number
PCB-1242	53469-21-9
PCB-1248	12672-29-6
PCB-1254	11097-69-1
PCB-1260	11096-82-5

Aromatic Hydrocarbons — Hydrocarbons that contain one or more benzene rings in their molecular structure.

Aromatic Hydrocarbons	CAS Number
1-methylnaphthalene	90-12-0
1-methylphenanthrene	832-69-9
2,3,5-trimethylnaphthalene	2245-38-7
2,6-dimethylnaphthalene	581-42-0
2-methylnaphthalene	91-57-6
acenaphthalene	208-96-8
acenaphthene	83-32-9
anthracene	120-12-7
benz(a)anthracene	56-55-3
benzo(a)pyrene	50-32-8
benzo(b)fluoranthene	205-99-2
benzo(e)pyrene	192-97-2
benzo(k)fluoranthene	207-08-9
biphenyl	92-52-4
C1-chrysenes	N/A
C1-dibenzothiophenes	N/A
C1-fluorenes	N/A
(C1-fluoranthenes+C1-pyrenes)	N/A
C1-naphthalenes	N/A
C1-phenanthrenes	N/A
C2-chrysenes	N/A
C2-dibenzothiophenes	N/A
C2-fluorenes	N/A
C2-naphthalenes	N/A
C2-phenanthrenes	N/A
C3-chrysenes	N/A

C3-dibenzothiophenes	N/A
C3-fluorenes	N/A
C3-naphthalenes	N/A
C3-phenanthrenes	N/A
C4-chrysenes	N/A
C4-naphthalenes	N/A
C4-phenanthrenes	N/A
chrysene	218-01-9
dibenz(a,h)anthracene	53-70-3
dibenzothiophene	132-65-0
fluoranthene	206-44-0
fluorene	86-73-2
indeno(1,2,3-cd)pyrene	193-39-5
naphthalene	91-20-3
perylene	198-55-0

Atomic Absorption Spectrometry (AAS) — Analytical instrument that uses absorption of light of a characteristic wavelength to quantitate amount of an element in a solution.

Background — Natural concentrations existing before any influence by humans.

Biodegradation — Generally refers to the breaking down of substances by bacteria.

Biogeochemical Cycle — The sum total of the biological, geological, and chemical reactions and processes that control the distribution of an element or compound.

Bioturbation — The mixing of sediments by living (burrowing) organisms. Generally occurs only in the upper tens of centimeters of subtidal sediments.

Biowaxes — Long-chained, natural hydrocarbons that act to form a protective outer layer on terrestrial plants to retard the evaporative loss of water.

Branched Alkanes — Aliphatic hydrocarbons when one carbon or more hase more than one carbon bonded to it (i.e., iso-octane).

Capillary Gas Chromatography — An analytical technique for the separation of compounds in a mixture based on boiling-point.

Congener	Member of the same group (i.e., PCB, biphenyls, containing differing amounts of chlorine).
Diagenetic	The processes of biological, physical and chemical alteration of organic materials in sediments.
Diffusion	A process whereby liquids and gases move from one place to another.
EOM (Extractable Organic Matter)	The organic matter which can be separated from a sediment by dissolution in an organic solvent such as methylene chloride or acetone.
Flame Ionization Detector	A detector used with a gas chromatograph to detect hydrocarbon components.
Grain Size	Distribution of partical size in a sediment sample (i.e., sand, silt, clay).
Heterocompounds	Organic compounds containing atoms other than carbon and hydrogen such as oxygen, nitrogen, and sulfur. Common non-hydrocarbon and other chemical constituents of oil.
Isomer	Different compounds with the same molecular formula.
Lattice	An element that is part of the essential framework of a compound as opposed to being loosely bound to the surface or interior.
Leach	Removal of part of a polid sample by working it with a solvent.
Lipid Content	Operationally the amount of organic matter that can be extracted by organic solvents. Lipids are a generic term for fats, waxes and related products of living tissues.
Mass Spectrometric Detection	The use of a mass spectrometer to detect the chemical components of a sample. The technique provides detailed structural identification and quantification of organic compounds.

n-Alkanes — Normal alkanes; straight-chained aliphatic hydrocarbons.

Nepheloid Layer — A layer of enhanced particulate matter in the water column directly above the sea floor.

Organochlorines — Synthetic organic compounds that contain one or more chlorine groups. Generally manufactured from petroleum products for a wide range of uses.

Chemical	CAS Number
alpha chlordane	5103-71-9
beta BHC	319-85-7
BHC (Total)	608-73-1
delta BHC	319-86-8
dieldrin	60-57-1
endosulfan I	959-98-9
endosulfan II	33213-65-9
endosulfan sulfate	1031-07-8
endrin	72-20-8
gamma BHC	58-89-9
gamma chlordane	5103-74-2
HCB	118-74-1
heptachlor epoxide	1024-57-3
o,p'-DDD	53-19-0
o,p'-DDE	3424-82-6
o,p'-DDT	789-02-6
p,p'-DDD	72-54-8
p,p'-DDE	72-55-9
p,p'DDT	50-29-3
PCB-TOTAL	N/A
toxaphene	8001-35-2

Organic Nitrogen

PAH (Polycyclic Aromatic Hydrocarbons) — Aromatic hydrocarbons containing two or more benzene rings.

Percent Solids — Total sample weight minus weight of water divided by the total sample weight times 100.

Petrogenic — Of a petroleum origin.

Phytane — A branched-chain saturated hydrocarbon (isoprenoid) containing 20 carbon atoms.

Planktonic	Minute free-floating plants and animals.
Pristane	A branched-chain saturated hydrocarbon (isoprenoid) containing 19 carbon atoms.
Pyrolytic Hydrocarbon	A hydrocarbon produced at high temperature such as in an internal combustion engine or forest fire.
Riverine Transport	The movement of materials by the action of rivers.
Rotoevaporation	The evaporative removal of solvents under reduced pressure and, often, increased temperature. The method is used in hydrocarbon analyses to concentrate the hydrocarbons in a smaller volume of solvent.
Sediment	The sea floor material consisting of accumulations of inorganic and organic materials.
Solvent Extraction	The selective removal of components from a matrix based on preferential solubility, or partitioning into an extraction fluid.
Subtidal	The ocean environment below low tide which is always covered by water.
Surficial Sediments	Sediments from the top few centimeters of the sea floor.
Terrestrial	From, or derived from, the land.
Terrigenous	Derived from the land, synonymous with terrestrial.
Total Organic Carbon (TOC)	The amount of carbon in a matrix ultimately derived from biologically synthesized compounds (includes detritus and living material). Separate from total carbon in a matrix that includes inorganic (e.g., calcium carbonate) carbon.

Trace Metals

Metal	Symbol	CAS Number
Silver	Ag	7440-22-4
Arsenic	As	7440-38-2
Cadmium	Cd	7440-43-9
Chromium	Cr	7440-47-3
Copper	Cu	7440-50-8
Iron	Fe	7439-97-6
Mercury	Hg	7439-97-6
Nickel	Ni	7440-02-0
Lead	Pb	7439-92-1
Selenium	Se	7782-49-2
Zinc	Zn	7440-66-6

UCM (Unresolved Complex Mixture) — The mixture of many individual compounds that cannot be gas chromatographically resolved or separated into its component parts under given analytical conditions.

Volatile Components — Those components that readily partition (evaporate) into the atmosphere at room temperature.

QUALITY ASSURANCE DATA SUMMARIES FOR TRACE ORGANICS

GENERAL INFORMATION AND BULK PARAMETERS

FIELD DUPLICATES

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

	Field Duplicates			
INVEST#:	EB-3	EB-3	IB-1	IB-1
ID:	ORIGINAL SAMPLE	FIELD DUPLICATE	ORIGINAL SAMPLE	FIELD DUPLICATE
LABSAMNO:	C3079	C3193	C3095	C3195
QCBATCH:	M436	M433	M435	M436
LAB:	GERG	GERG	GERG	GERG
MATRIX:	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
EXTRACTION DATE:	10/18/91	10/15/91	10/17/91	10/18/91
METHOD:	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM
ANALYSIS DATE:	11/16/91	11/06/91	11/04/91	11/16/91
METHOD:	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD
ANALYSIS DATE:	11/02/91	10/30/91	11/13/91	11/02/91
METHOD:	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID
ANALYSIS DATE:	11/12/91	11/11/91	11/04/91	11/12/91
%MOISTURE	65.4	65.4	67.1	67.1
DRYWT:	10.3	10.4	10.1	10.2
WTUNITS:	GRAMS	GRAMS	GRAMS	GRAMS
VOL:				
VOLUNITS:	LITERS	LITERS	LITERS	LITERS
Surrogate Recoveries				
ACEND10:	78.0	60.0	94.0	81.3
BENAD12:				
CHRYD12:	71.4	51.1	70.1	63.1
FLUOD10:				
NAPHD8:	73.0	43.3	81.8	65.7
PERYD12:	98.1	60.9	102.0	118.3
PHEND10:	76.2	54.3	79.0	70.7
C12ALKD:	92.2	93.2	96.4	93.1
C20ALKD:	100.0	92.9	75.9	107.5
C24ALKD:	92.7	96.1	100.0	110.2
C30ALKD:	80.5	83.8	72.3	76.5
DBOFB:	99.4	81.9	94.1	95.8
e-HCH:	NA	NA	NA	NA
PCB#103:	91.1	64.4	99.9	66.5
PCB#198:	78.4	37.7	148.3	75.2
Bulk Parameters				
TOC (%):	2.4	3.3	3.0	2.5
ORG NITROGEN (ppm):	2392	2504	2383	2485
% SAND:	25.1	25.0	6.3	7.2
% SILT:	42.1	40.6	57.7	54.1
%CLAY:	32.9	34.4	36.0	38.8

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

	Field Duplicates	
INVEST#:	SW-4	SW-4D
ID:	ORIGINAL SAMPLE	FIELD DUPLICATE
LABSAMNO:	C3149	C3151
QCBATCH:	M434	M434
LAB:	GERG	GERG
MATRIX:	SEDIMENT	SEDIMENT
EXTRACTION DATE:	10/16/91	10/16/91
METHOD:	PAH's/GCMS/SIM	PAH's/GCMS/SIM
ANALYSIS DATE:	11/03/91	11/03/91
METHOD:	PES & PCB'S/GCECD	PES & PCB'S/GCECD
ANALYSIS DATE:	10/28/91	10/28/91
METHOD:	ALIPHAT/GCFID	ALIPHAT/GCFID
ANALYSIS DATE:	11/03/91	11/03/91
%MOISTURE	29.2	29.2
DRYWT:	10.7	10.2
WTUNITS:	GRAMS	GRAMS
VOL:		
VOLUNITS:	LITERS	LITERS
Surrogate Recoveries		
ACEND10:	88.2	74.6
BENAD12:		
CHRYD12:	85.3	74.7
FLUOD10:		
NAPHD8:	69.2	67.3
PERYD12:	74.9	59.6
PHEND10:	87.1	76.0
C12ALKD:	87.3	84.2
C20ALKD:	78.1	83.5
C24ALKD:	85.2	93.9
C30ALKD:	75.2	79.5
DBOFB:	81.3	71.7
e-HCH:	NA	NA
PCB#103:	82.0	73.7
PCB#198:	119.5	100.3
Bulk Parameters		
TOC (%):	1.9	1.8
ORG NITROGEN (ppm):	766	546
% SAND:	68.6	65.3
% SILT:	21.7	26.4
%CLAY:	9.7	8.4

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB QA DUPLICATES

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-4	EB-4	SW-5	SW-5	EB-3
ID:	ORIGINAL SAMPLE	LAB QA DUPLICATE	ORIGINAL SAMPLE	LAB QA DUPLICATE	ORIGINAL SAMPLE
LABSAMNO:	C3081	Q2087	C3153	Q2090	C3079
QCBATCH:	M429	M429	M430	M430	M436
LAB:	GERG	GERG	GERG	GERG	GERG
MATRIX:	SEDIMENT	QCSEDIMENT	SEDIMENT	QCSEDIMENT	SEDIMENT
EXTRACTION DATE:	10/10/91	10/10/91	10/11/91	10/11/91	10/18/91
METHOD:	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM
ANALYSIS DATE:	10/30/91	10/30/91	10/31/91	10/31/91	11/16/91
METHOD:	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD
ANALYSIS DATE:	11/02/91	11/02/91	11/07/91	11/07/91	11/02/91
METHOD:	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID
ANALYSIS DATE:	11/01/91	11/01/91	11/02/91	11/02/91	11/12/91
%MOISTURE	46.3	46.3	42.2	42.2	65.4
DRYWT:	10.1	10.1	11.2	10.1	10.3
WTUNITS:	GRAMS	GRAMS	GRAMS	GRAMS	GRAMS
VOL:					
VOLUNITS:	LITERS	LITERS	LITERS	LITERS	LITERS
Surrogate Recoveries					
ACEND10:	92.3	85.5	70.1	69.2	78.0
BENAD12:					
CHRYD12:	91.0	90.5	88.6	79.2	71.4
FLUOD10:					
NAPHD8:	72.6	65.7	76.4	69.1	73.0
PERYD12:	79.5	92.8	64.4	55.0	98.1
PHEND10:	84.3	79.7	81.4	71.5	76.2
C12ALKD:	79.4	84.0	77.2	92.3	92.2
C20ALKD:	86.2	89.1	76.4	89.0	100.0
C24ALKD:	81.0	85.7	81.9	91.6	92.7
C30ALKD:	50.4	75.7	74.7	82.7	80.5
DBOFB:	89.2	87.8	79.0	85.2	99.4
e-HCH:	NA	NA	NA	NA	NA
PCB#103:	95.6	95.4	78.9	87.1	91.1
PCB#198:	151.3	158.9	73.9	121.4	78.4
Bulk Parameters					
TOC (%):	0.8		1.0		2.4
ORG NITROGEN (ppm):	1087		435		2392
% SAND:	62.3		48.8		25.1
% SILT:	21.0		38.5		42.1
%CLAY:	16.7		12.7		32.9

Data reported on a dry weight basis

LABNAME: GERG/TAMU   DATE: 05-May-92   LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

Lab QA Duplicates

INVEST#:	EB-3	WB-1	WB-1	IB-3	IB-3
ID:	LAB QA DUPLICATE	ORIGINAL SAMPLE	LAB QA DUPLICATE	ORIGINAL SAMPLE	LAB QA DUPLICATE
LABSAMNO:	Q2121	C3175	Q2129	C3099	Q2135
QCBATCH:	M433	M434	M434	M435	M435
LAB:	GERG	GERG	GERG	GERG	GERG
MATRIX:	QCSEDIMENT	SEDIMENT	QCSEDIMENT	SEDIMENT	QCSEDIMENT
EXTRACTION DATE:	10/15/91	10/16/91	10/16/91	10/17/91	10/17/91
METHOD:	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM
ANALYSIS DATE:	11/06/91	11/03/91	11/03/91	11/04/91	11/04/91
METHOD:	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD
ANALYSIS DATE:	10/30/91	10/28/91	10/28/91	11/13/91	11/13/91
METHOD:	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID
ANALYSIS DATE:	11/11/91	11/03/91	11/03/91	11/04/91	11/04/91
%MOISTURE	65.4	70.1	70.1	70.9	70.9
DRYWT:	10.5	10.1	10.1	10.2	10.2
WTUNITS:	GRAMS	GRAMS	GRAMS	GRAMS	GRAMS
VOL:					
VOLUNITS:	LITERS	LITERS	LITERS	LITERS	LITERS
Surrogate Recoveries					
ACEND10:	62.8	82.5	81.1	87.1	84.5
BENAD12:					
CHRYD12:	59.2	79.9	79.1	82.4	85.4
FLUOD10:					
NAPHD8:	55.2	75.1	70.3	67.1	71.6
PERYD12:	64.7	76.4	72.7	105.8	106.7
PHEND10:	65.1	82.1	82.8	86.5	87.9
C12ALKD:	89.8	94.7	93.2	83.9	86.6
C20ALKD:	91.2	96.0	83.6	87.6	89.7
C24ALKD:	87.9	93.7	90.8	92.6	95.2
C30ALKD:	81.2	87.6	83.9	72.1	70.1
DBOFB:	89.2	79.1	82.7	93.3	95.0
e-HCH:	NA	NA	NA	NA	NA
PCB#103:	75.9	79.3	82.5	98.0	102.5
PCB#198:	63.5	125.9	121.9	139.5	149.6
Bulk Parameters					
TOC (%):		2.7		3.2	
ORG NITROGEN (ppm):		3096		2270	
% SAND:		9.9		6.8	
% SILT:		48.9		69.7	
%CLAY:		41.1		23.5	

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

	Lab QA Duplicates	
INVEST#:	IB-1	IB-1
ID:	ORIGINAL SAMPLE	LAB QA DUPLICATE
LABSAMNO:	C3095	Q2139
QCBATCH:	M435	M436
LAB:	GERG	GERG
MATRIX:	SEDIMENT	QCSEDIMENT
EXTRACTION DATE:	10/17/91	10/18/91
METHOD:	PAH's/GCMS/SIM	PAH's/GCMS/SIM
ANALYSIS DATE:	11/04/91	11/16/91
METHOD:	PES & PCB'S/GCECD	PES & PCB'S/GCECD
ANALYSIS DATE:	11/13/91	11/02/91
METHOD:	ALIPHAT/GCFID	ALIPHAT/GCFID
ANALYSIS DATE:	11/04/91	11/12/91
%MOISTURE	67.1	67.1
DRYWT:	10.1	10.2
WTUNITS:	GRAMS	GRAMS
VOL:		
VOLUNITS:	LITERS	LITERS
Surrogate Recoveries		
ACEND10:	94.0	79.5
BENAD12:		
CHRYD12:	70.1	63.9
FLUOD10:		
NAPHD8:	81.8	70.7
PERYD12:	102.0	111.8
PHEND10:	79.0	72.6
C12ALKD:	96.4	90.9
C20ALKD:	75.9	82.3
C24ALKD:	100.0	92.2
C30ALKD:	72.3	73.7
DBOFB:	94.1	94.5
e-HCH:	NA	NA
PCB#103:	99.9	66.7
PCB#198:	148.3	76.2
Bulk Parameters		
TOC (%):	3.0	
ORG NITROGEN (ppm):	2383	
% SAND:	6.3	
% SILT:	57.7	
%CLAY:	36.0	

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB PROCEDURAL BLANKS

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

	Lab Procedural Blanks				
INVEST#:	BLANK	BLANK	BLANK	BLANK	BLANK
ID:					
LABSAMNO:	Q2088	Q2092	Q2122	Q2126	Q2132
QCBATCH:	M429	M430	M433	M434	M435
LAB:	GERG	GERG	GERG	GERG	GERG
MATRIX:	QCBLANK	QCBLANK	QCBLANK	QCBLANK	QCBLANK
EXTRACTION DATE:	10/10/91	10/11/91	10/15/91	10/16/91	10/17/91
METHOD:	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM
ANALYSIS DATE:	10/30/91	10/31/91	11/06/91	11/03/91	11/04/91
METHOD:	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD
ANALYSIS DATE:	11/02/91	11/07/91	10/30/91	10/28/91	11/13/91
METHOD:	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID
ANALYSIS DATE:	11/01/91	11/02/91	11/11/91	11/03/91	11/04/91
%MOISTURE					
DRYWT:	10.0	10.0	10.0	10.0	10.0
WTUNITS:	GRAMS	GRAMS	GRAMS	GRAMS	GRAMS
VOL:					
VOLUNITS:	LITERS	LITERS	LITERS	LITERS	LITERS
Surrogate Recoveries					
ACEND10:	82.2	72.6	62.0	88.5	89.6
BENAD12:					
CHRYD12:	71.1	55.2	51.8	67.4	75.7
FLUOD10:					
NAPHD8:	73.4	68.8	60.5	78.2	84.0
PERYD12:	2.8	4.8	2.8	2.2	28.5
PHEND10:	72.9	77.3	63.8	75.7	92.5
C12ALKD:	84.2	80.3	83.2	90.7	91.0
C20ALKD:	77.6	72.9	77.8	84.7	83.2
C24ALKD:	81.0	76.7	85.3	86.9	85.8
C30ALKD:	26.1	44.3	84.7	84.7	81.3
DBOFB:	88.9	89.9	82.5	73.5	86.6
e-HCH:	NA	NA	NA	NA	NA
PCB#103:	109.4	100.7	82.4	77.1	105.5
PCB#198:	160.6	130.5	66.4	86.1	137.2
Bulk Parameters					
TOC (%):					
ORG NITROGEN (ppm):					
% SAND:					
% SILT:					
%CLAY:					

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

	Lab Procedural Blanks
INVEST#:	BLANK
ID:	
LABSAMNO:	Q2136
QCBATCH:	M436
LAB:	GERG
MATRIX:	QCBLANK
EXTRACTION DATE:	10/18/91
METHOD:	PAH's/GCMS/SIM
ANALYSIS DATE:	11/16/91
METHOD:	PES & PCB'S/GCECD
ANALYSIS DATE:	11/02/91
METHOD:	ALIPHAT/GCFID
ANALYSIS DATE:	11/12/91
%MOISTURE	
DRYWT:	10.0
WTUNITS:	GRAMS
VOL:	
VOLUNITS:	LITERS
Surrogate Recoveries	
ACEND10:	71.9
BENAD12:	
CHRYD12:	64.5
FLUOD10:	
NAPHD8:	74.2
PERYD12:	7.9
PHEND10:	70.7
C12ALKD:	88.1
C20ALKD:	81.2
C24ALKD:	85.7
C30ALKD:	79.4
DBOFB:	92.0
e-HCH:	NA
PCB#103:	93.0
PCB#198:	98.5
Bulk Parameters	
TOC (%):	
ORG NITROGEN (ppm):	
% SAND:	
% SILT:	
%CLAY:	

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

MATRIX SPIKES

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

	Matrix Spikes
INVEST#:	IB-1
ID:	SPIKE SAMPLE
LABSAMNO:	Q2137
QCBATCH:	M436
LAB:	GERG
MATRIX:	QCSEDIMENT
EXTRACTION DATE:	10/18/91
METHOD:	PAH's/GCMS/SIM
ANALYSIS DATE:	11/16/91
METHOD:	PES & PCB'S/GCECD
ANALYSIS DATE:	11/02/91
METHOD:	ALIPHAT/GCFID
ANALYSIS DATE:	11/12/91
%MOISTURE	67.1
DRYWT:	10.2
WTUNITS:	GRAMS
VOL:	
VOLUNITS:	LITERS
Surrogate Recoveries	
ACEND10:	75.7
BENAD12:	
CHRYD12:	65.7
FLUOD10:	
NAPHD8:	64.5
PERYD12:	105.7
PHEND10:	80.3
C12ALKD:	93.3
C20ALKD:	86.3
C24ALKD:	112.3
C30ALKD:	79.8
DBOFB:	95.8
e-HCH:	NA
PCB#103:	70.4
PCB#198:	73.8
Bulk Parameters	
TOC (%):	
ORG NITROGEN (ppm):	
% SAND:	
% SILT:	
%CLAY:	

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - GENERAL INFORMATION - CASCO BAY - 1991

	Matrix Spikes				
INVEST#:	EB-4	SW-5	EB-3	WB-1	IB-3
ID:	SPIKE SAMPLE	SPIKE SAMPLE	SPIKE SAMPLE	SPIKE SAMPLE	SPIKE SAMPLE
LABSAMNO:	Q2089	Q2093	Q2123	Q2127	Q2133
QCBATCH:	M429	M430	M433	M434	M435
LAB:	GERG	GERG	GERG	GERG	GERG
MATRIX:	QCSEDIMENT	QCSEDIMENT	QCSEDIMENT	QCSEDIMENT	QCSEDIMENT
EXTRACTION DATE:	10/10/91	10/11/91	10/15/91	10/16/91	10/17/91
METHOD:	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM	PAH's/GCMS/SIM
ANALYSIS DATE:	10/30/91	10/31/91	11/06/91	11/03/91	11/04/91
METHOD:	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD	PES & PCB'S/GCECD
ANALYSIS DATE:	11/02/91	11/07/91	10/30/91	10/28/91	11/13/91
METHOD:	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID	ALIPHAT/GCFID
ANALYSIS DATE:	11/01/91	11/02/91	11/11/91	11/03/91	11/04/91
%MOISTURE	46.3	42.2	65.4	70.1	70.9
DRYWT:	10.3	10.2	9.9	10.2	10.0
WTUNITS:	GRAMS	GRAMS	GRAMS	GRAMS	GRAMS
VOL:					
VOLUNITS:	LITERS	LITERS	LITERS	LITERS	LITERS
Surrogate Recoveries					
ACEND10:	70.6	70.3	61.0	81.2	91.3
BENAD12:					
CHRYD12:	84.3	82.1	61.9	89.9	99.0
FLUOD10:					
NAPHD8:	62.7	56.9	50.2	64.5	75.1
PERYD12:	87.1	66.1	61.5	87.5	106.9
PHEND10:	71.5	81.6	67.5	96.4	99.8
C12ALKD:	80.7	89.3	85.3	92.5	88.1
C20ALKD:	85.3	84.0	82.4	83.2	93.5
C24ALKD:	83.2	88.8	87.0	91.9	91.4
C30ALKD:	69.8	81.8	78.0	87.1	71.0
DBOFB:	85.2	89.5	81.7	85.9	100.2
e-HCH:	NA	NA	NA	NA	NA
PCB#103:	87.1	100.1	67.4	84.9	104.7
PCB#198:	121.4	122.8	43.3	125.5	133.5
Bulk Parameters					
TOC (%):					
ORG NITROGEN (ppm):					
% SAND:					
% SILT:					
%CLAY:					

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

ALIPHATIC HYDROCARBON DATA

FIELD DUPLICATES

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

	Field Duplicates			
INVEST#:	EB-3	EB-3	IB-1	IB-1
LABSAMNO:	C3079	C3193	C3095	C3195
Alkanes and Isoprenoids	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
UNIT:	ppb	ppb	ppb	ppb
C10	8 J	7 J	34	14
C11	10	8	43	21
C12	19	9	35	21
C13	34	110	158	27
C14	26	63	98	23
C15	20	59	124	98
C16	11	14	46	29
C17	166	212	384	405
PRISTANE	47	64	228	244
C18	16	21	62	40
PHYTANE	13	28	148	142
C19	40	55	162	147
C20	34	62	165	86
C21	110	149	286	212
C22	66	83	137	90
C23	198	228	306	214
C24	93	86	180	129
C25	326	373	454	437
C26	160	168	227	151
C27	631	742	793	624
C28	209	217	236	169
C29	1040	1260	1396	1107
C30	233	228	291	239
C31	989	1205	1437	1143
C32	232	254	321	287
C33	392	478	568	434
C34	108	116	218	166
TOT ALKANES	5228	6299	8535	6696
UNIT:	ppm	ppm	ppm	ppm
UCM	74.7	92.6	281.1	225.8
Surrogate Recoveries				
C12ALKD:	92.2	93.2	96.4	93.1
C20ALKD:	100.0	92.9	75.9	107.5
C24ALKD:	92.7	96.1	100.0	110.2
C30ALKD:	80.5	83.8	72.3	76.5

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

	Field Duplicates	
INVEST#:	SW-4	SW-4D
LABSAMNO:	C3149	C3151
Alkanes and Isoprenoids	Conc DB QUAL	Conc DB QUAL
UNIT:	ppb	ppb
C10	14	19
C11	26	15
C12	14	20
C13	48	28
C14	33	24
C15	34	27
C16	9	9
C17	124	118
PRISTANE	39	43
C18	8	7
PHYTANE	44	47
C19	35	30
C20	29	34
C21	51	50
C22	27	26
C23	60	54
C24	22	24
C25	63	77
C26	37	34
C27	138	136
C28	27	37
C29	317	282
C30	62	54
C31	328	295
C32	66	56
C33	109	103
C34	21	17
TOT ALKANES	1783	1664
UNIT:	ppm	ppm
UCM	91.5	80.6
Surrogate Recoveries		
C12ALKD:	87.3	84.2
C20ALKD:	78.1	83.5
C24ALKD:	85.2	93.9
C30ALKD:	75.2	79.5

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB QA DUPLICATES

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-4	EB-4	SW-5	SW-5	EB-3
LABSAMNO:	C3081	Q2087	C3153	Q2090	C3079
Alkanes and Isoprenoids	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
UNIT:	ppb	ppb	ppb	ppb	ppb
C10	7 J	7 J	17	18	8 J
C11	5	6	18	20	10
C12	8	8	18	17	19
C13	22	24	28	28	34
C14	15	17	24	24	26
C15	11	12	28	30	20
C16	8	10	9	9	11
C17	86	87	122	121	166
PRISTANE	25	21	10	12	47
C18	11	12	8	7	16
PHYTANE	10	10	15	15	13
C19	17	24	37	26	40
C20	19	20	20	18	34
C21	53	69	55	46	110
C22	32	32	23	20	66
C23	89	92	72	66	198
C24	38	40	23	21	93
C25	142	139	96	85	326
C26	59	57	33	32	160
C27	265	274	164	150	631
C28	71	80	45	39	209
C29	360	451	322	296	1040
C30	50	74	47	39	233
C31	120	334	268	214	989
C32	33	62	44	32	232
C33	1 J	27	36	19	392
C34	4 J	ND	ND	1 J	108
TOT ALKANES	1560	1989	1579	1403	5228
UNIT:	ppm	ppm	ppm	ppm	ppm
UCM	47.1	42.2	34.5	38.7	74.7
Surrogate Recoveries					
C12ALKD:	79.4	84.0	77.2	92.3	92.2
C20ALKD:	86.2	89.1	76.4	89.0	100.0
C24ALKD:	81.0	85.7	81.9	91.6	92.7
C30ALKD:	50.4	75.7	74.7	82.7	80.5

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-3	WB-1	WB-1	IB-3	IB-3
LABSAMNO:	Q2121	C3175	Q2129	C3099	Q2135
Alkanes and Isoprenoids	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
UNIT:	ppb	ppb	ppb	ppb	ppb
C10	9 J	31	37	ND	19
C11	7	34	38	22	23
C12	9	34	39	36	35
C13	103	87	98	53	55
C14	60	72	82	43	41
C15	45	75	85	118	113
C16	14	16	19	35	33
C17	197	102	129	746	675
PRISTANE	53	29	14	179	145
C18	19	17	20	49	43
PHYTANE	26	19	22	132	120
C19	51	69	80	142	131
C20	60	47	54	92	103
C21	143	130	149	189	218
C22	75	54	61	105	97
C23	213	181	204	271	245
C24	82	49	55	111	105
C25	338	220	262	420	430
C26	157	67	87	192	204
C27	669	404	451	750	707
C28	201	99	110	223	184
C29	1196	697	785	1377	1251
C30	217	90	103	313	285
C31	1138	626	707	1337	1211
C32	241	101	114	312	274
C33	454	229	249	500	421
C34	107	37	44	173	144
TOT ALKANES	5885	3615	4095	7919	7310
UNIT:	ppm	ppm	ppm	ppm	ppm
UCM	73.4	39.7	39.2	174.7	211.7
Surrogate Recoveries					
C12ALKD:	89.8	94.7	93.2	83.9	86.6
C20ALKD:	91.2	96.0	83.6	87.6	89.7
C24ALKD:	87.9	93.7	90.8	92.6	95.2
C30ALKD:	81.2	87.6	83.9	72.1	70.1

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

	Lab QA Duplicates	
INVEST#:	IB-1	IB-1
LABSAMNO:	C3095	Q2139
Alkanes and Isoprenoids	Conc DB QUAL	Conc DB QUAL
UNIT:	ppb	ppb
C10	34	ND
C11	43	27
C12	35	28
C13	158	36
C14	98	30
C15	124	127
C16	46	37
C17	384	503
PRISTANE	228	296
C18	62	51
PHYTANE	148	185
C19	162	165
C20	165	114
C21	286	257
C22	137	115
C23	306	272
C24	180	155
C25	454	524
C26	227	217
C27	793	792
C28	236	232
C29	1396	1459
C30	291	373
C31	1437	1456
C32	321	356
C33	568	519
C34	218	129
TOT ALKANES	8535	8455
UNIT:	ppm	ppm
UCM	281.1	290.9
Surrogate Recoveries		
C12ALKD:	96.4	90.9
C20ALKD:	75.9	82.3
C24ALKD:	100.0	92.2
C30ALKD:	72.3	73.7

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB PROCEDURAL BLANKS

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

Lab Procedural Blanks

INVEST#:	BLANK	BLANK	BLANK	BLANK	BLANK
LABSAMNO:	Q2088	Q2092	Q2122	Q2126	Q2132
Alkanes and Isoprenoids	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
UNIT:	ppb	ppb	ppb	ppb	ppb
C10	ND	ND	ND	2 J	ND
C11	ND	3 J	ND	ND	6
C12	ND	2 J	ND	ND	ND
C13	ND	ND	ND	ND	ND
C14	ND	2 J	1 J	ND	1 J
C15	ND	1 J	ND	ND	11
C16	2 J	3 J	ND	2 J	7
C17	1 J	1 J	1 J	2 J	2 J
PRISTANE	ND	ND	1 J	1 J	ND
C18	1 J	ND	1 J	1 J	1 J
PHYTANE	ND	ND	ND	2 J	ND
C19	ND	3	4	1 J	1 J
C20	1 J	3	1 J	2 J	1 J
C21	2	4	1 J	3	2 J
C22	3	4	1 J	6	2
C23	2	4	1 J	4	2
C24	3	2	1 J	3	2 J
C25	ND	1 J	ND	1 J	1 J
C26	1 J	1 J	1 J	1 J	1 J
C27	ND	ND	ND	ND	ND
C28	ND	ND	ND	ND	1
C29	ND	ND	ND	ND	1
C30	ND	ND	ND	7	ND
C31	ND	ND	ND	ND	ND
C32	ND	ND	ND	ND	ND
C33	ND	ND	ND	ND	ND
C34	ND	ND	ND	ND	ND
TOT ALKANES	16	33	13	37	42
UNIT:	ppm	ppm	ppm	ppm	ppm
UCM	ND	1.8	3.5	0.7	0.0
Surrogate Recoveries					
C12ALKD:	84.2	80.3	83.2	90.7	91.0
C20ALKD:	77.6	72.9	77.8	84.7	83.2
C24ALKD:	81.0	76.7	85.3	86.9	85.8
C30ALKD:	26.1	44.3	84.7	84.7	81.3

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

	Lab Procedural Blanks
INVEST#:	BLANK
LABSAMNO:	Q2136
Alkanes and Isoprenoids	Conc DB QUAL
UNIT:	ppb
C10	ND
C11	ND
C12	ND
C13	ND
C14	1 J
C15	22
C16	16
C17	1 J
PRISTANE	1 J
C18	ND
PHYTANE	ND
C19	3
C20	1 J
C21	1 J
C22	1 J
C23	1 J
C24	1 J
C25	1 J
C26	ND
C27	1 J
C28	ND
C29	ND
C30	5
C31	5
C32	ND
C33	ND
C34	ND
TOT ALKANES	60
UNIT:	ppm
UCM	ND

Surrogate Recoveries	
C12ALKD:	88.1
C20ALKD:	81.2
C24ALKD:	85.7
C30ALKD:	79.4

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

MATRIX SPIKES

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

	Matrix Spikes									
INVEST#:	EB-4		SW-5		EB-3		WB-1		IB-3	
LABSAMNO:	Q2089		Q2093		Q2123		Q2127		Q2133	
Alkanes and Isoprenoids	% Recov	DB QUAL	% Recov	DB QUAL	% Recov	DB QUAL	% Recov	DB QUAL	% Recov	DB QUAL
UNIT:	%		%		%		%		%	
C10		NA		NA		NA		NA		NA
C11		NA		NA		NA		NA		NA
C12	86.3		93.1		89.8		97.2		85.4	
C13		NA		NA		NA		NA		NA
C14		NA		NA		NA		NA		NA
C15	81.9		85.2		90.7		93.7		81.3	
C16		NA		NA		NA		NA		NA
C17	91.0		94.5		98.2		106.0		86.6	
PRISTANE	93.4		96.5		99.0		107.7		90.7	
C18	88.6		91.6		94.1		99.8		86.9	
PHYTANE		NA		NA		NA		NA		NA
C19		NA		NA		NA		NA		NA
C20	93.1		97.1		99.0		104.9		90.1	
C21	91.5		96.9		98.7		104.2		89.3	
C22		NA		NA		NA		NA		NA
C23		NA		NA		NA		NA		NA
C24	90.5		96.6		96.1		101.1		93.8	
C25		NA		NA		NA		NA		NA
C26		NA		NA		NA		NA		NA
C27		NA		NA		NA		NA		NA
C28	86.7		93.9		95.3		101.1		88.6	
C29		NA		NA		NA		NA		NA
C30	80.0		93.2		99.8		104.2		84.1	
C31		NA		NA		NA		NA		NA
C32	38.4		65.6		112.6		117.8		100.1	
C33		NA		NA		NA		NA		NA
C34	3.5		7.8		95.8		99.7		83.8	
TOT ALKANES		NA		NA		NA		NA		NA
UNIT:	ppm		ppm		ppm		ppm		ppm	
UCM		NA		NA		NA		NA		NA
Surrogate Recoveries										
C12ALKD:	80.7		89.3		85.3		92.5		88.1	
C20ALKD:	85.3		84.0		82.4		83.2		93.5	
C24ALKD:	83.2		88.8		87.0		91.9		91.4	
C30ALKD:	69.8		81.8		78.0		87.1		71.0	

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - ALIPHATIC HYDROCARBON DATA - CASCO BAY - 1991

	Matrix Spikes	
INVEST#:	IB-1	
LABSAMNO:	Q2137	
Alkanes and Isoprenoids	% Recov	DB QUAL
UNIT:	%	
C10		NA
C11		NA
C12	94.4	
C13		NA
C14		NA
C15	91.5	
C16		NA
C17	104.0	
PRISTANE	103.2	
C18	98.1	
PHYTANE		NA
C19		NA
C20	101.3	
C21	102.6	
C22		NA
C23		NA
C24	101.9	
C25		NA
C26		NA
C27		NA
C28	99.5	
C29		NA
C30	102.5	
C31		NA
C32	118.5	
C33		NA
C34	106.3	
TOT ALKANES		NA
UNIT:	ppm	
UCM		NA
Surrogate Recoveries		
C12ALKD:	93.3	
C20ALKD:	86.3	
C24ALKD:	112.3	
C30ALKD:	79.8	

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

POLYNUCLEAR AROMATIC HYDROCARBON DATA

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

	Field Duplicates			
INVEST#:	EB-3	EB-3	IB-1	IB-1
LABSAMNO:	C3079	C3193	C3095	C3195
UNIT:	ppb	ppb	ppb	ppb
PNA Analyte	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
NAPHTHALENE	23.6	23.6	82.7	92.9
C1-NAPHTHALENES	26.7	30.2	77.5	88.2
C2-NAPHTHALENES	22.8	28.4	75.0	85.1
C3-NAPHTHALENES	21.4	25.2	80.5	107.0
C4-NAPHTHALENES	14.7	17.1	83.4	84.3
BIPHENYL	5.4	7.5	15.9	13.6
ACENAPHTHYLENE	29.8	26.1	43.3	54.8
ACENAPHTHENE	5.8	4.6	33.6	35.5
FLUORENE	14.8	14.0	49.3	53.5
C1-FLUORENES	14.0	16.7	40.5	39.4
C2-FLUORENES	20.3	31.8	77.8	62.8
C3-FLUORENES	20.1	54.2	107.9	64.3
PHENANTHRENE	139.4	146.4	508.9	448.1
ANTHRACENE	39.9	39.9	145.0	158.9
C1-PHEN_ANTHR	115.7	131.6	339.6	292.2
C2-PHEN_ANTHR	106.3	137.4	348.2	252.3
C3-PHEN_ANTHR	68.9	93.2	264.4	173.4
C4-PHEN_ANTHR	33.6	42.4	168.3	129.6
DIBENZOTHIO	7.8	7.4	26.3	29.7
C1-DIBEN	13.3	16.2	35.7	35.1
C2-DIBEN	24.7	33.1	74.8	68.3
C3-DIBEN	21.8	28.2	73.3	69.8
FLUORANTHENE	263.9	269.1	802.8	542.7
PYRENE	262.9	245.2	771.2	529.2
C1-FLUORAN_PYR	236.3	199.9	562.8	569.8
BENaANTHRACENE	141.3	133.1	423.9	358.4
CHRYSENE	177.8	159.3	519.8	435.1
C1-CHRYSENES	147.9	128.4	363.6	265.7
C2-CHRYSENES	98.8	90.1	228.3	138.2
C3-CHRYSENES	49.8	28.4	71.2	67.5
C4-CHRYSENES	36.8	33.3	98.9	47.7
BENbFLUORAN	200.4	131.8	543.0	380.7
BENkFLUORAN	91.9	143.3	398.1	228.0
BENePYRENE	114.4	110.2	363.3	221.7
BENaPYRENE	153.3	147.7	466.5	288.2
PERYLENE	58.5	65.3	96.3	89.5
I123cdPYRENE	78.4	104.3	374.1	98.7
DBahANTHRA	19.6	23.9	105.3	25.7
BghiPERYLENE	74.9	93.3	329.9	85.6

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA (CONT)- CASCO BAY - 1991

	Field Duplicates			
INVEST#:	EB-3	EB-3	IB-1	IB-1
LABSAMNO:	C3079	C3193	C3095	C3195
UNIT:	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
2-METHYLNAPH	16.7	18.7	47.6	53.5
1-METHYLNAPH	10.0	11.4	29.9	34.8
2,6-DIMETHNAPH	9.6	11.1	34.1	32.0
2,3,5-TRIMETHNAPH	5.5	4.9	21.6	24.5
1-METHYLPHEN	16.1	27.8	65.1	67.3
Surrogate Recoveries				
NAPHD8:	73.0	43.3	81.8	65.7
ACEND10:	78.0	60.0	94.0	81.3
PHEND10:	76.2	54.3	79.0	70.7
CHRYD12:	71.4	51.1	70.1	63.1
PERYD12:	98.1	60.9	102.0	118.3

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

	Field Duplicates	
INVEST#:	SW-4	SW-4D
LABSAMNO:	C3149	C3151
UNIT:	ppb	ppb
PNA Analyte	Conc DB QUAL	Conc DB QUAL
NAPHTHALENE	21.9	20.4
C1-NAPHTHALENES	26.8	24.1
C2-NAPHTHALENES	31.3	26.2
C3-NAPHTHALENES	45.8	38.8
C4-NAPHTHALENES	54.7	45.9
BIPHENYL	4.7	4.1
ACENAPHTHYLENE	6.1	6.8
ACENAPHTHENE	2.6	3.3
FLUORENE	6.1	6.5
C1-FLUORENES	12.0	12.6
C2-FLUORENES	40.2	41.6
C3-FLUORENES	65.2	64.2
PHENANTHRENE	64.3	68.8
ANTHRACENE	10.1	11.4
C1-PHEN_ANTHR	59.4	58.5
C2-PHEN_ANTHR	124.9	118.8
C3-PHEN_ANTHR	104.8	100.2
C4-PHEN_ANTHR	55.9	54.5
DIBENZOTHIO	4.5	4.6
C1-DIBEN	15.8	15.4
C2-DIBEN	41.9	40.5
C3-DIBEN	39.7	37.7
FLUORANTHENE	100.9	110.9
PYRENE	91.4	98.4
C1-FLUORAN_PYR	71.3	75.0
BENaANTHRACENE	39.6	42.4
CHRYSENE	54.9	65.4
C1-CHRYSENES	44.8	42.7
C2-CHRYSENES	35.6	32.3
C3-CHRYSENES	11.0	10.3
C4-CHRYSENES	10.1	8.3
BENbFLUORAN	53.2	78.0
BENkFLUORAN	32.8	116.6
BENePYRENE	37.1	38.1
BENaPYRENE	42.7	45.5
PERYLENE	20.5	22.4
I123cdPYRENE	29.4	31.8
DBahANTHRA	7.0	6.3
BghiPERYLENE	30.0	31.6

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA (CONT)- CASCO BAY - 1991

	Field Duplicates	
INVEST#:	SW-4	SW-4D
LABSAMNO:	C3149	C3151
UNIT:	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL
2-METHYLNAPH	17.6	15.9
1-METHYLNAPH	9.1	8.2
2,6-DIMETHNAPH	15.5	14.8
2,3,5-TRIMETHNAPH	10.6	10.4
1-METHYLPHEN	17.6	17.0
Surrogate Recoveries		
NAPHD8:	69.2	67.3
ACEND10:	88.2	74.6
PHEND10:	87.1	76.0
CHRYD12:	85.3	74.7
PERYD12:	74.9	59.6

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

FIELD DUPLICATES

LAB QA DUPLICATES

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-4	EB-4	SW-5	SW-5	EB-3
LABSAMNO:	C3081	Q2087	C3153	Q2090	C3079
UNIT:	ppb	ppb	ppb	ppb	ppb
PNA Analyte	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
NAPHTHALENE	19.0	19.7	7.9	8.9	23.6
C1-NAPHTHALENES	25.2	24.3	7.9	9.1	26.7
C2-NAPHTHALENES	21.1	21.2	9.5	10.7	22.8
C3-NAPHTHALENES	22.2	26.9	11.7	12.4	21.4
C4-NAPHTHALENES	17.2	20.3	12.2	10.9	14.7
BIPHENYL	4.1	3.8	3.1	2.9	5.4
ACENAPHTHYLENE	25.4	31.2	4.9	6.4	29.8
ACENAPHTHENE	5.9	10.8	1.7	1.7	5.8
FLUORENE	12.7	20.2	4.1	4.3	14.8
C1-FLUORENES	11.7	25.8	6.7	6.4	14.0
C2-FLUORENES	18.8	24.9	12.6	13.4	20.3
C3-FLUORENES	22.1	28.4	21.0	25.1	20.1
PHENANTHRENE	108.6	165.2	41.6	40.3	139.4
ANTHRACENE	37.1	69.8	5.6	6.4	39.9
C1-PHEN_ANTHR	103.5	173.1	43.7	42.7	115.7
C2-PHEN_ANTHR	117.4	180.5	52.4	50.1	106.3
C3-PHEN_ANTHR	83.1	106.4	40.8	31.8	68.9
C4-PHEN_ANTHR	71.6	42.7	20.9	15.6	33.6
DIBENZOTHIO	5.5	8.3	2.4	2.5	7.8
C1-DIBEN	11.0	17.1	6.3	6.3	13.3
C2-DIBEN	22.7	31.9	13.6	12.9	24.7
C3-DIBEN	24.4	27.0	12.7	11.4	21.8
FLUORANTHENE	222.1	348.1	90.1	81.5	263.9
PYRENE	222.5	365.6	81.6	74.8	262.9
C1-FLUORAN_PYR	238.5	386.9	55.8	34.7	236.3
BENaANTHRACENE	130.0	202.7	29.5	26.0	141.3
CHRYSENE	142.0	214.5	43.8	40.6	177.8
C1-CHRYSENES	152.5	195.5	30.8	28.6	147.9
C2-CHRYSENES	116.5	129.5	22.4	22.5	98.8
C3-CHRYSENES	23.9	32.3	6.0	7.2	49.8
C4-CHRYSENES	31.9	52.9	6.0	7.5	36.8
BENbFLUORAN	155.7	181.3	18.1	56.2	200.4
BENkFLUORAN	54.5	123.3	18.8	30.1	91.9
BENePYRENE	111.4	154.3	40.7	37.6	114.4
BENaPYRENE	167.1	244.9	52.2	49.0	153.3
PERYLENE	41.2	47.5	17.3	15.7	58.5
I123cdPYRENE	108.2	152.3	2.9	79.0	78.4
DBahANTHRA	27.1	36.8	3.2	19.8	19.6
BghiPERYLENE	97.6	136.3	65.5	68.2	74.9

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA (CONT)- CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-4	EB-4	SW-5	SW-5	EB-3
LABSAMNO:	C3081	Q2087	C3153	Q2090	C3079
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
2-METHYLNAPH	15.8	15.2	5.0	5.6	16.7
1-METHYLNAPH	9.4	9.2	2.9	3.5	10.0
2,6-DIMETHNAPH	7.8	8.2	4.0	3.8	9.6
2,3,5-TRIMETHNAPH	5.4	6.2	2.9	2.8	5.5
1-METHYLPHEN	ND	38.9	9.8	6.2	16.1
Surrogate Recoveries					
NAPHD8:	72.6	65.7	76.4	69.1	73.0
ACEND10:	92.3	85.5	70.1	69.2	78.0
PHEND10:	84.3	79.7	81.4	71.5	76.2
CHRYD12:	91.0	90.5	88.6	79.2	71.4
PERYD12:	79.5	92.8	64.4	55.0	98.1

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-3	WB-1	WB-1	IB-3	IB-3
LABSAMNO:	Q2121	C3175	Q2129	C3099	Q2135
UNIT:	ppb	ppb	ppb	ppb	ppb
PNA Analyte	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
NAPHTHALENE	19.8	13.2	12.8	48.3	52.1
C1-NAPHTHALENES	26.2	12.8	13.4	53.9	55.6
C2-NAPHTHALENES	2.2	14.3	14.6	49.0	49.6
C3-NAPHTHALENES	19.5	13.1	9.8	60.2	61.7
C4-NAPHTHALENES	17.0	13.4	12.5	58.6	58.3
BIPHENYL	7.9	6.3	5.9	8.4	9.3
ACENAPHTHYLENE	28.2	10.7	9.9	35.0	42.0
ACENAPHTHENE	5.0	2.2	2.3	15.1	17.8
FLUORENE	13.7	7.1	6.6	29.3	33.5
C1-FLUORENES	15.1	12.1	11.7	25.7	28.1
C2-FLUORENES	33.6	27.6	27.6	58.2	63.2
C3-FLUORENES	53.7	46.6	44.9	76.8	94.4
PHENANTHRENE	116.3	65.7	59.8	257.5	266.1
ANTHRACENE	31.0	12.7	11.7	80.0	84.8
C1-PHEN_ANTHR	118.7	68.3	45.9	220.1	229.4
C2-PHEN_ANTHR	122.3	79.4	69.1	212.3	221.7
C3-PHEN_ANTHR	89.1	47.5	50.7	174.8	180.1
C4-PHEN_ANTHR	45.8	20.9	24.6	110.9	112.2
DIBENZOTHIO	6.4	4.0	3.8	14.7	15.7
C1-DIBEN	15.3	10.4	8.9	24.7	24.7
C2-DIBEN	31.5	20.9	21.4	51.3	51.7
C3-DIBEN	27.1	16.8	16.2	47.3	58.7
FLUORANTHENE	232.5	128.3	119.2	362.1	393.4
PYRENE	219.0	115.5	108.6	397.4	414.0
C1-FLUORAN_PYR	183.3	84.0	81.7	330.1	358.7
BENaANTHRACENE	120.6	50.0	48.7	218.1	234.1
CHRYSENE	142.9	68.1	67.1	263.0	274.2
C1-CHRYSENES	110.6	52.2	42.0	193.7	192.5
C2-CHRYSENES	85.2	43.9	39.8	124.2	135.7
C3-CHRYSENES	21.8	12.3	11.7	38.9	17.1
C4-CHRYSENES	31.6	28.5	26.5	43.1	44.8
BENbFLUORAN	177.5	61.5	56.7	275.0	289.3
BENkFLUORAN	80.0	73.3	77.9	414.5	141.5
BENePYRENE	104.7	51.8	51.0	166.0	177.0
BENaPYRENE	144.1	62.9	62.7	214.5	230.5
PERYLENE	65.6	42.5	43.2	65.0	68.1
I123cdPYRENE	103.4	63.0	56.8	146.8	148.4
DBahANTHRA	19.7	12.4	11.5	33.6	56.1
BghiPERYLENE	93.0	56.7	51.3	125.9	129.5

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA (CONT)- CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-3	WB-1	WB-1	IB-3	IB-3
LABSAMNO:	Q2121	C3175	Q2129	C3099	Q2135
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
2-METHYLNAPH	16.3	8.1	8.4	34.0	34.8
1-METHYLNAPH	10.0	4.7	5.0	19.8	20.8
2,6-DIMETHNAPH	11.7	6.4	6.3	20.5	22.3
2,3,5-TRIMETHNAPH	4.9	3.1	2.8	14.7	15.7
1-METHYLPHEN	15.6	10.8	14.4	45.1	45.6
Surrogate Recoveries					
NAPHD8:	55.2	75.1	70.3	67.1	71.6
ACEND10:	62.8	82.5	81.1	87.1	84.5
PHEND10:	65.1	82.1	82.8	86.5	87.9
CHRYD12:	59.2	79.9	79.1	82.4	85.4
PERYD12:	64.7	76.4	72.7	105.8	106.7

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

	Lab QA Duplicates	
INVEST#:	IB-1	IB-1
LABSAMNO:	C3095	Q2139
UNIT:	ppb	ppb
PNA Analyte	Conc DB QUAL	Conc DB QUAL
NAPHTHALENE	82.7	96.4
C1-NAPHTHALENES	77.5	92.5
C2-NAPHTHALENES	75.0	85.9
C3-NAPHTHALENES	80.5	107.4
C4-NAPHTHALENES	83.4	85.5
BIPHENYL	15.9	14.8
ACENAPHTHYLENE	43.3	58.3
ACENAPHTHENE	33.6	36.2
FLUORENE	49.3	56.9
C1-FLUORENES	40.5	42.2
C2-FLUORENES	77.8	62.7
C3-FLUORENES	107.9	104.6
PHENANTHRENE	508.9	453.7
ANTHRACENE	145.0	164.9
C1-PHEN_ANTHR	339.6	295.8
C2-PHEN_ANTHR	348.2	263.4
C3-PHEN_ANTHR	264.4	177.4
C4-PHEN_ANTHR	168.3	103.7
DIBENZOTHIO	26.3	29.3
C1-DIBEN	35.7	33.5
C2-DIBEN	74.8	63.6
C3-DIBEN	73.3	67.4
FLUORANTHENE	802.8	610.4
PYRENE	771.2	602.0
C1-FLUORAN_PYR	562.8	583.8
BENaANTHRACENE	423.9	384.9
CHRYSENE	519.8	473.7
C1-CHRYSENES	363.6	287.7
C2-CHRYSENES	228.3	162.1
C3-CHRYSENES	71.2	64.8
C4-CHRYSENES	98.9	43.6
BENbFLUORAN	543.0	461.1
BENkFLUORAN	398.1	199.9
BENePYRENE	363.3	240.4
BENaPYRENE	466.5	291.3
PERYLENE	96.3	92.1
I123cdPYRENE	374.1	109.1
DBahANTHRA	105.3	30.0
BghiPERYLENE	329.9	98.8

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA (CONT)- CASCO BAY - 1991

	Lab QA Duplicates	
INVEST#:	IB-1	IB-1
LABSAMNO:	C3095	Q2139
UNIT:	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL
2-METHYLNAPH	47.6	55.7
1-METHYLNAPH	29.9	36.7
2,6-DIMETHNAPH	34.1	35.9
2,3,5-TRIMETHNAPH	21.6	26.8
1-METHYLPHEN	65.1	35.8
Surrogate Recoveries		
NAPHD8:	81.8	70.7
ACEND10:	94.0	79.5
PHEND10:	79.0	72.6
CHRYD12:	70.1	63.9
PERYD12:	102.0	111.8

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB PROCEDURAL BLANKS

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

Lab Procedural Blanks

INVEST#:	BLANK	BLANK	BLANK	BLANK	BLANK
LABSAMNO:	Q2088	Q2092	Q2122	Q2126	Q2132
UNIT:	ppb	ppb	ppb	ppb	ppb
PNA Analyte	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
NAPHTHALENE	1.2 J	1.2 J	0.6 J	0.7 J	0.4 J
C1-NAPHTHALENES	1.2 J	1.0 J	0.8	1.4	1.0
C2-NAPHTHALENES	ND	ND	ND	ND	ND
C3-NAPHTHALENES	ND	ND	ND	ND	ND
C4-NAPHTHALENES	ND	ND	ND	ND	ND
BIPHENYL	0.3 J	0.2 J	0.3 J	0.2 J	0.4 J
ACENAPHTHYLENE	0.1 J	0.1 J	0.1 J	0.3 J	0.1 J
ACENAPHTHENE	0.1 J	0.2 J	0.2 J	0.6 J	0.2 J
FLUORENE	0.4 J	0.2 J	0.1 J	0.4 J	0.1 J
C1-FLUORENES	ND	ND	ND	ND	ND
C2-FLUORENES	ND	ND	ND	ND	ND
C3-FLUORENES	ND	ND	ND	ND	ND
PHENANTHRENE	0.9	0.2 J	0.1 J	0.4 J	0.1 J
ANTHRACENE	0.1 J	0.1 J	ND	0.3 J	0.1 J
C1-PHEN_ANTHR	ND	ND	ND	ND	ND
C2-PHEN_ANTHR	ND	ND	ND	ND	ND
C3-PHEN_ANTHR	ND	ND	ND	ND	ND
C4-PHEN_ANTHR	ND	ND	ND	ND	ND
DIBENZOTHIO	ND	ND	ND	0.2 J	ND
C1-DIBEN	ND	ND	ND	ND	ND
C2-DIBEN	ND	ND	ND	ND	ND
C3-DIBEN	ND	ND	ND	ND	ND
FLUORANTHENE	0.1 J	0.1 J	0.1 J	0.4 J	0.1 J
PYRENE	0.1 J	0.1 J	ND	0.3 J	0.1 J
C1-FLUORAN_PYR	ND	ND	ND	ND	ND
BENaANTHRACENE	0.1 J	0.1 J	ND	0.1 J	ND
CHRYSENE	0.1 J	ND	0.1 J	0.1 J	0.1 J
C1-CHRYSENES	ND	ND	ND	ND	ND
C2-CHRYSENES	ND	ND	ND	ND	ND
C3-CHRYSENES	ND	ND	ND	ND	ND
C4-CHRYSENES	ND	ND	ND	ND	ND
BENbFLUORAN	ND	ND	ND	0.2 J	ND
BENkFLUORAN	ND	ND	ND	0.2 J	ND
BENePYRENE	ND	0.1 J	ND	0.4 J	ND
BENaPYRENE	0.1 J	0.1 J	ND	0.2 J	ND
PERYLENE	0.7 J	0.5 J	0.5 J	5.3	0.2 J
I123cdPYRENE	ND	0.1 J	ND	0.2 J	ND
DBahANTHRA	ND	0.1 J	ND	0.1 J	ND
BghiPERYLENE	ND	ND	ND	0.1 J	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA (CONT)- CASCO BAY - 1991

	Lab Procedural Blanks				
INVEST#:	BLANK	BLANK	BLANK	BLANK	BLANK
LABSAMNO:	Q2088	Q2092	Q2122	Q2126	Q2132
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
2-METHYLNAPH	0.9	0.6 J	0.6 J	0.9	0.4 J
1-METHYLNAPH	0.4 J	0.4 J	0.2 J	0.5 J	0.6 J
2,6-DIMETHNAPH	0.3 J	0.2 J	0.2 J	0.9	0.2 J
2,3,5-TRIMETHNAPH	0.1 J	0.3 J	0.1 J	0.8	0.1 J
1-METHYLPHEN	0.1 J	0.1 J	ND	0.6 J	0.1 J
Surrogate Recoveries					
NAPHD8:	73.4	68.8	60.5	78.2	84.0
ACEND10:	82.2	72.6	62.0	88.5	89.6
PHEND10:	72.9	77.3	63.8	75.7	92.5
CHRYD12:	71.1	55.2	51.8	67.4	75.7
PERYD12:	2.8	4.8	2.8	2.2	28.5

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

	Lab Procedural Blanks
INVEST#:	BLANK
LABSAMNO:	Q2136
UNIT:	ppb
PNA Analyte	Conc DB QUAL
NAPHTHALENE	0.6 J
C1-NAPHTHALENES	0.8
C2-NAPHTHALENES	ND
C3-NAPHTHALENES	ND
C4-NAPHTHALENES	ND
BIPHENYL	0.4 J
ACENAPHTHYLENE	0.1 J
ACENAPHTHENE	0.1 J
FLUORENE	0.1 J
C1-FLUORENES	ND
C2-FLUORENES	ND
C3-FLUORENES	ND
PHENANTHRENE	0.2 J
ANTHRACENE	0.1 J
C1-PHEN_ANTHR	ND
C2-PHEN_ANTHR	ND
C3-PHEN_ANTHR	ND
C4-PHEN_ANTHR	ND
DIBENZOTHIO	0.1 J
C1-DIBEN	ND
C2-DIBEN	ND
C3-DIBEN	ND
FLUORANTHENE	0.1 J
PYRENE	0.1 J
C1-FLUORAN_PYR	ND
BENaANTHRACENE	0.1 J
CHRYSENE	0.1 J
C1-CHRYSENES	ND
C2-CHRYSENES	ND
C3-CHRYSENES	ND
C4-CHRYSENES	ND
BENbFLUORAN	ND
BENkFLUORAN	ND
BENePYRENE	0.1 J
BENaPYRENE	0.1 J
PERYLENE	0.3 J
I123cdPYRENE	ND
DBahANTHRA	0.1 J
BghiPERYLENE	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

	Lab Procedural Blanks
INVEST#:	BLANK
LABSAMNO:	Q2136
UNIT:	ppb
Analyte (Cont)	Conc DB QUAL
2-METHYLNAPH	0.4 J
1-METHYLNAPH	0.5 J
2,6-DIMETHNAPH	0.3 J
2,3,5-TRIMETHNAPH	0.2 J
1-METHYLPHEN	0.1 J

Surrogate Recoveries	
NAPHD8:	74.2
ACEND10:	71.9
PHEND10:	70.7
CHRYD12:	64.5
PERYD12:	7.9

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

MATRIX SPIKES

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

	Matrix Spikes				
INVEST#:	EB-4	SW-5	EB-3	WB-1	IB-3
LABSAMNO:	Q2089	Q2093	Q2123	Q2127	Q2133
UNIT:	%	%	%	%	%
PNA Analyte	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL
NAPHTHALENE	86.8 M	108.3 M	98.1 M	120.7 M	M
C1-NAPHTHALENES	NA	NA	NA	NA	NA
C2-NAPHTHALENES	NA	NA	NA	NA	NA
C3-NAPHTHALENES	NA	NA	NA	NA	NA
C4-NAPHTHALENES	NA	NA	NA	NA	NA
BIPHENYL	111.6 M	101.1 M	96.9 M	94.9 M	90.1 M
ACENAPHTHYLENE	156.0 M	113.5 M	74.3 M	86.1 M	M
ACENAPHTHENE	65.0 M	87.3 M	88.4 M	94.8 M	M
FLUORENE	94.2 M	97.7 M	105.4 M	97.3 M	M
C1-FLUORENES	NA	NA	NA	NA	NA
C2-FLUORENES	NA	NA	NA	NA	NA
C3-FLUORENES	NA	NA	NA	NA	NA
PHENANTHRENE	M	M	M	M	M
ANTHRACENE	M	90.0 M	86.3 M	59.1 M	29.5 M
C1-PHEN_ANTHR	NA	NA	NA	NA	NA
C2-PHEN_ANTHR	NA	NA	NA	NA	NA
C3-PHEN_ANTHR	NA	NA	NA	NA	NA
C4-PHEN_ANTHR	NA	NA	NA	NA	NA
DIBENZOTHIO	52.7 M	81.2 M	72.6 M	63.1 M	49.5 M
C1-DIBEN	NA	NA	NA	NA	NA
C2-DIBEN	NA	NA	NA	NA	NA
C3-DIBEN	NA	NA	NA	NA	NA
FLUORANTHENE	M	M	M	M	M
PYRENE	M	M	M	M	M
C1-FLUORAN_PYR	NA	NA	NA	NA	NA
BENaANTHRACENE	M	M	M	103.6 M	M
CHRYSENE	M	M	M	118.1 M	M
C1-CHRYSENES	NA	NA	NA	NA	NA
C2-CHRYSENES	NA	NA	NA	NA	NA
C3-CHRYSENES	NA	NA	NA	NA	NA
C4-CHRYSENES	NA	NA	NA	NA	NA
BENbFLUORAN	M	M	M	193.7 M	M
BENkFLUORAN	M	M	M	83.2 M	M
BENePYRENE	M	M	113.5 M	111.3 M	M
BENaPYRENE	M	M	118.3 M	96.2 M	M
PERYLENE	112.9 M	85.5 M	M	M	M
I123cdPYRENE	M	M	78.5 M	130.6 M	M
DBahANTHRA	M	M	94.5 M	89.7 M	M
BghiPERYLENE	M	M	66.8 M	112.5 M	M

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU   DATE: 05-May-92   LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA (CONT)- CASCO BAY - 1991

	Matrix Spikes				
INVEST#:	EB-4	SW-5	EB-3	WB-1	IB-3
LABSAMNO:	Q2089	Q2093	Q2123	Q2127	Q2133
UNIT:	%	%	%	%	%
Analyte (Cont)	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL
2-METHYLNAPH	92.1 M	109.8 M	104.9 M	115.9 M	66.0 M
1-METHYLNAPH	102.6 M	121.0 M	110.5 M	124.3 M	80.8 M
2,6-DIMETHNAPH	110.1 M	84.0 M	91.1 M	91.1 M	71.9 M
2,3,5-TRIMETHNAPH	126.1 M	106.6 M	99.2 M	102.5 M	82.1 M
1-METHYLPHEN	M	M	M	M	M
Surrogate Recoveries					
NAPHD8:	62.7	56.9	50.2	64.5	75.1
ACEND10:	70.6	70.3	61.0	81.2	91.3
PHEND10:	71.5	81.6	67.5	96.4	99.8
CHRYD12:	84.3	82.1	61.9	89.9	99.0
PERYD12:	87.1	66.1	61.5	87.5	106.9

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

	Matrix Spikes
INVEST#:	IB-1
LABSAMNO:	Q2137
UNIT:	%
Analyte (Cont)	% Recov DB QUAL
2-METHYLNAPH	65.0 M
1-METHYLNAPH	84.3 M
2,6-DIMETHNAPH	63.2 M
2,3,5-TRIMETHNAPH	92.0 M
1-METHYLPHEN	M
Surrogate Recoveries	
NAPHD8:	64.5
ACEND10:	75.7
PHEND10:	80.3
CHRYD12:	65.7
PERYD12:	105.7

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - AROMATIC HYDROCARBON DATA - CASCO BAY - 1991

	Matrix Spikes	
INVEST#:	IB-1	
LABSAMNO:	Q2137	
UNIT:	%	
PNA Analyte	% Recov	DB QUAL
NAPHTHALENE	88.9	M
C1-NAPHTHALENES		NA
C2-NAPHTHALENES		NA
C3-NAPHTHALENES		NA
C4-NAPHTHALENES		NA
BIPHENYL	86.3	M
ACENAPHTHYLENE		M
ACENAPHTHENE		M
FLUORENE		M
C1-FLUORENES		NA
C2-FLUORENES		NA
C3-FLUORENES		NA
PHENANTHRENE		M
ANTHRACENE		M
C1-PHEN_ANTHR		NA
C2-PHEN_ANTHR		NA
C3-PHEN_ANTHR		NA
C4-PHEN_ANTHR		NA
DIBENZOTHIO	37.7	M
C1-DIBEN		NA
C2-DIBEN		NA
C3-DIBEN		NA
FLUORANTHENE		M
PYRENE		M
C1-FLUORAN_PYR		NA
BENaANTHRACENE		M
CHRYSENE		M
C1-CHRYSENES		NA
C2-CHRYSENES		NA
C3-CHRYSENES		NA
C4-CHRYSENES		NA
BENbFLUORAN		M
BENkFLUORAN		M
BENePYRENE		M
BENaPYRENE		M
PERYLENE	125.9	M
I123cdPYRENE		M
DBahANTHRA	102.2	M
BghiPERYLENE		M

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

PESTICIDE DATA

FIELD DUPLICATES

NATIONAL ESTUARY PROGRAM - PESTICIDE DATA - CASCO BAY - 1991

	Field Duplicates			
INVEST#:	EB-3	EB-3	IB-1	IB-1
LABSAMNO:	C3079	C3193	C3095	C3195
UNIT:	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
TOTAL BHC'S	0.17	0.53	ND	0.33
TOTAL CHLORDANES	1.06	0.43	ND	5.21
TOTAL DDT'S	2.26	2.07	ND	13.46
ENDOSULFAN I	ND	ND	ND	ND
ENDOSULFAN II	0.12 M	0.08 M	1.48 M	1.49 M
ENDOSULFAN SULFATE	ND	ND	ND	ND
ENDRIN ALDEHYDE	ND	ND	0.06	0.26
TOXAPHENE	ND	ND	ND	ND
ALPHA-BHC	0.17	0.40	0.23	0.32
HCB	0.04 J	0.04 J	0.03 J	0.08 J
BETA-BHC	ND	0.07	0.03 J	ND
GAMMA-BHC	ND	0.03 J	0.13	0.01 J
DELTA-BHC	ND	0.03 J	ND	ND
HEPTACHLOR	0.07	0.03 J	ND	0.09
HEPTA-EPOXIDE	0.04 J	0.07	ND	0.29
OXYCHLORDANE	ND	0.01 J	ND	0.13
GAMMA-CHLORDANE	0.83	0.07	1.82	3.88
ALPHA-CHLORDANE	0.08	0.14	0.38	0.40
TRANS-NONACHLOR	0.04	0.09	0.34	0.26
CIS-NONACHLOR	0.01 J	0.03 J	0.35	0.16
ALDRIN	ND	ND	ND	ND
DIELDRIN	0.24 J	0.20 J	0.72	0.87
ENDRIN	0.04 J	0.04 J	ND	ND
MIREX	0.10	0.09	ND	0.31
2,4'DDE (O,P'DDE)	0.01 J	0.03 J	ND	0.10 J
4,4'DDE (P,P'DDE)	1.22	1.17	3.16	3.91
2,4'DDD (O,P'DDD)	0.25 J	0.18	1.58	1.53
4,4'DDD (P,P'DDD)	0.56	0.54	9.05	6.49
2,4'DDT (O,P'DDT)	0.04 J	0.05 J	0.08	0.12
4,4'DDT (P,P'DDT)	0.18 J	0.11 J	0.63	1.32

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PESTICIDE DATA - CASCO BAY - 1991

	Field Duplicates					
INVEST#:	SW-4			SW-4D		
LABSAMNO:	C3149			C3151		
UNIT:	ppb			ppb		
Analyte (Cont)	Conc	DB	QUAL	Conc	DB	QUAL
TOTAL BHC'S	0.54			0.32		
TOTAL CHLORDANES	1.12			1.64		
TOTAL DDT'S	3.93			3.27		
ENDOSULFAN I		ND			ND	
ENDOSULFAN II	0.09	M		0.23	M	
ENDOSULFAN SULFATE		ND			ND	
ENDRIN ALDEHYDE	0.05				ND	
TOXAPHENE		ND			ND	
ALPHA-BHC		ND		0.09		
HCB	0.03	J		0.04	J	
BETA-BHC	0.33				ND	
GAMMA-BHC	0.05	J		0.07	J	
DELTA-BHC	0.17			0.16		
HEPTACHLOR		ND		0.12		
HEPTA-EPOXIDE		ND			ND	
OXYCHLORDANE	0.30			0.28		
GAMMA-CHLORDANE	0.23			0.57		
ALPHA-CHLORDANE	0.21			0.28		
TRANS-NONACHLOR	0.08			0.13		
CIS-NONACHLOR	0.31			0.26		
ALDRIN		ND			ND	
DIELDRIN	0.10	J		0.07	J	
ENDRIN		ND			ND	
MIREX		ND			ND	
2,4'DDE (O,P'DDE)	0.03	J			ND	
4,4'DDE (P,P'DDE)	0.83			0.72		
2,4'DDD (O,P'DDD)	0.31			0.29		
4,4'DDD (P,P'DDD)	2.17			1.88		
2,4'DDT (O,P'DDT)	0.12			0.12		
4,4'DDT (P,P'DDT)	0.47			0.25	J	

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB QA DUPLICATES

NATIONAL ESTUARY PROGRAM - PESTICIDE DATA - CASCO BAY - 1991

Lab QA Duplicates

INVEST#:	EB-4	EB-4	SW-5	SW-5	EB-3
LABSAMNO:	C3081	Q2087	C3153	Q2090	C3079
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
TOTAL BHC'S	0.33	0.30	0.15	0.16	0.17
TOTAL CHLORDANES	0.16	0.15	0.15	0.46	1.06
TOTAL DDT'S	1.37	1.48	1.63	1.77	2.26
ENDOSULFAN I	ND	ND	ND	ND	ND
ENDOSULFAN II	0.11 M	0.16 M	ND	ND	0.12 M
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	0.08	0.09	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND
ALPHA-BHC	0.12	0.11	0.11	0.08 J	0.17
HCB	0.01 J	0.01 J	ND	ND	0.04 J
BETA-BHC	ND	ND	0.02 J	ND	ND
GAMMA-BHC	0.17	0.14	0.02 J	0.05 J	ND
DELTA-BHC	0.03 J	0.05 J	0.01 J	0.03 J	ND
HEPTACHLOR	ND	ND	ND	ND	0.07
HEPTA-EPOXIDE	ND	ND	ND	ND	0.04 J
OXYCHLORDANE	ND	ND	ND	ND	ND
GAMMA-CHLORDANE	ND	ND	0.01 J	0.32	0.83
ALPHA-CHLORDANE	0.10	0.10	0.07	0.07	0.08
TRANS-NONACHLOR	0.03 J	0.02 J	0.03 J	0.04 J	0.04 J
CIS-NONACHLOR	0.04 J	0.02 J	0.03 J	0.03 J	0.01 J
ALDRIN	0.04 J	0.05 J	ND	ND	ND
DIELDRIN	0.11 J	0.17 J	0.04 J	0.09 J	0.24 J
ENDRIN	0.06 J	0.06 J	0.02 J	0.04 J	0.04 J
MIREX	0.07	0.09	ND	ND	0.10
2,4'DDE (O,P'DDE)	ND	0.02 J	ND	ND	0.01 J
4,4'DDE (P,P'DDE)	0.64	0.65	0.49	0.51	1.22
2,4'DDD (O,P'DDD)	ND	ND	0.06 J	0.08 J	0.25
4,4'DDD (P,P'DDD)	0.40	0.45	0.61	0.67	0.56
2,4'DDT (O,P'DDT)	0.08	0.07 J	0.03	0.02 J	0.04 J
4,4'DDT (P,P'DDT)	0.25 J	0.30 J	0.43	0.49	0.18 J

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU   DATE: 05-May-92   LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PESTICIDE DATA - CASCO BAY - 1991

Lab QA Duplicates

INVEST#:	EB-3	WB-1	WB-1	IB-3	IB-3
LABSAMNO:	Q2121	C3175	Q2129	C3099	Q2135
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
TOTAL BHC'S	0.43	0.55	0.66	0.36	0.36
TOTAL CHLORDANES	0.38	0.91	0.67	2.49	2.93
TOTAL DDT'S	2.35	2.42	2.16	9.02	9.28
ENDOSULFAN I	ND	ND	ND	ND	ND
ENDOSULFAN II	0.12 M	0.31 M	0.19 M	1.11 M	1.44 M
ENDOSULFAN SULFATE	ND	ND	0.00	ND	ND
ENDRIN ALDEHYDE	ND	ND	0.09	0.14	0.21
TOXAPHENE	ND	ND	ND	ND	ND
ALPHA-BHC	0.36	0.23	0.33	0.07 J	0.07 J
HCB	0.03 J	ND	ND	0.05 J	0.04 J
BETA-BHC	0.06 J	0.13	0.16	ND	ND
GAMMA-BHC	0.01 J	0.15	0.12	0.19	0.21
DELTA-BHC	ND	0.04 J	0.04 J	0.09	0.08
HEPTACHLOR	0.01 J	ND	ND	0.03 J	0.01 J
HEPTA-EPOXIDE	0.06 J	ND	ND	ND	ND
OXYCHLORDANE	ND	0.04 J	0.02 J	ND	ND
GAMMA-CHLORDANE	0.06 J	0.53	0.38	1.92	2.35
ALPHA-CHLORDANE	0.12	0.22	0.19	0.25	0.26
TRANS-NONACHLOR	0.10	0.06	0.04 J	0.12	0.12
CIS-NONACHLOR	0.03 J	0.05 J	0.04 J	0.17	0.19
ALDRIN	ND	0.01 J	0.02 J	ND	ND
DIELDRIN	0.26 J	0.14 J	0.09 J	0.32 J	0.29 J
ENDRIN	0.03 J	ND	0.07	ND	ND
MIREX	0.08	ND	ND	ND	ND
2,4'DDE (O,P'DDE)	0.02 J	ND	ND	0.10 J	0.11 J
4,4'DDE (P,P'DDE)	1.25	0.92	0.90	2.13	2.05
2,4'DDD (O,P'DDD)	0.19 J	0.18 J	0.13 J	0.85	0.96
4,4'DDD (P,P'DDD)	0.67	0.79	0.64	5.06	5.24
2,4'DDT (O,P'DDT)	0.06 J	0.01 J	0.03 J	0.01 J	0.03 J
4,4'DDT (P,P'DDT)	0.14 J	0.52	0.46	0.87	0.88

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PESTICIDE DATA - CASCO BAY - 1991

	Lab QA Duplicates	
INVEST#:	IB-1	IB-1
LABSAMNO:	C3095	Q2139
UNIT:	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL
TOTAL BHC'S	0.39	0.38
TOTAL CHLORDANES	2.89	1.86
TOTAL DDT'S	14.50	15.16
ENDOSULFAN I	ND	ND
ENDOSULFAN II	1.48 M	1.14 M
ENDOSULFAN SULFATE	ND	ND
ENDRIN ALDEHYDE	0.06	0.17
TOXAPHENE	ND	ND
ALPHA-BHC	0.23	0.34
HCB	0.03 J	0.09 J
BETA-BHC	0.03 J	0.03 J
GAMMA-BHC	0.13	0.01 J
DELTA-BHC	ND	ND
HEPTACHLOR	ND	0.08
HEPTA-EPOXIDE	ND	0.35
OXYCHLORDANE	ND	0.15
GAMMA-CHLORDANE	1.82	0.22
ALPHA-CHLORDANE	0.38	0.47
TRANS-NONACHLOR	0.34	0.33
CIS-NONACHLOR	0.35	0.26
ALDRIN	ND	ND
DIELDRIN	0.72 J	0.80 J
ENDRIN	ND	ND
MIREX	ND	0.30
2,4'DDE (O,P'DDE)	ND	0.14 J
4,4'DDE (P,P'DDE)	3.16	4.30
2,4'DDD (O,P'DDD)	1.58	1.68
4,4'DDD (P,P'DDD)	9.05	7.22
2,4'DDT (O,P'DDT)	0.08	0.30
4,4'DDT (P,P'DDT)	0.63	1.52

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB PROCEDURAL BLANKS

NATIONAL ESTUARY PROGRAM - PESTICIDE DATA - CASCO BAY - 1991

Lab Procedural Blanks

INVEST#:	BLANK	BLANK	BLANK	BLANK	BLANK
LABSAMNO:	Q2088	Q2092	Q2122	Q2126	Q2132
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
TOTAL BHC'S	ND	ND	ND	ND	ND
TOTAL CHLORDANES	ND	ND	ND	0.02	ND
TOTAL DDT'S	ND	ND	ND	ND	ND
ENDOSULFAN I	ND	ND	ND	ND	ND
ENDOSULFAN II	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND
ENDRIN ALDEHYDE	ND	ND	ND	ND	ND
TOXAPHENE	ND	ND	ND	ND	ND
ALPHA-BHC	ND	ND	ND	ND	ND
HCB	ND	ND	ND	ND	ND
BETA-BHC	ND	ND	ND	ND	ND
GAMMA-BHC	ND	ND	ND	ND	ND
DELTA-BHC	ND	ND	ND	ND	ND
HEPTACHLOR	ND	ND	ND	ND	ND
HEPTA-EPOXIDE	ND	ND	ND	ND	ND
OXYCHLORDANE	ND	ND	ND	ND	ND
GAMMA-CHLORDANE	ND	ND	ND	0.02 J	ND
ALPHA-CHLORDANE	ND	ND	ND	ND	ND
TRANS-NONACHLOR	ND	ND	ND	ND	ND
CIS-NONACHLOR	ND	ND	ND	ND	ND
ALDRIN	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	ND
ENDRIN	ND	ND	ND	ND	ND
MIREX	ND	ND	ND	ND	ND
2,4'DDE (O,P'DDE)	ND	ND	ND	ND	ND
4,4'DDE (P,P'DDE)	ND	ND	ND	ND	ND
2,4'DDD (O,P'DDD)	ND	ND	ND	ND	ND
4,4'DDD (P,P'DDD)	ND	ND	ND	ND	ND
2,4'DDT (O,P'DDT)	ND	ND	ND	ND	ND
4,4'DDT (P,P'DDT)	ND	ND	ND	ND	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

MATRIX SPIKES

	Lab Procedural Blanks
INVEST#:	BLANK
LABSAMNO:	Q2136
UNIT:	ppb
Analyte (Cont)	Conc DB QUAL
TOTAL BHC'S	ND
TOTAL CHLORDANES	ND
TOTAL DDT'S	ND
ENDOSULFAN I	ND
ENDOSULFAN II	ND
ENDOSULFAN SULFATE	ND
ENDRIN ALDEHYDE	ND
TOXAPHENE	ND
ALPHA-BHC	ND
HCB	ND
BETA-BHC	ND
GAMMA-BHC	ND
DELTA-BHC	ND
HEPTACHLOR	ND
HEPTA-EPOXIDE	ND
OXYCHLORDANE	ND
GAMMA-CHLORDANE	ND
ALPHA-CHLORDANE	ND
TRANS-NONACHLOR	ND
CIS-NONACHLOR	ND
ALDRIN	ND
DIELDRIN	ND
ENDRIN	ND
MIREX	ND
2,4'DDE (O,P'DDE)	ND
4,4'DDE (P,P'DDE)	ND
2,4'DDD (O,P'DDD)	ND
4,4'DDD (P,P'DDD)	ND
2,4'DDT (O,P'DDT)	ND
4,4'DDT (P,P'DDT)	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PESTICIDE DATA - CASCO BAY - 1991

	Matrix Spikes
INVEST#:	IB-1
LABSAMNO:	Q2137
UNIT:	%
Analyte (Cont)	% Recov DB QUAL
TOTAL BHC'S	NA
TOTAL CHLORDANES	NA
TOTAL DDT'S	NA
ENDOSULFAN I	NA
ENDOSULFAN II	NA
ENDOSULFAN SULFATE	NA
ENDRIN ALDEHYDE	NA
TOXAPHENE	NA
ALPHA-BHC	106
HCB	62
BETA-BHC	42
GAMMA-BHC	98
DELTA-BHC	93
HEPTACHLOR	107
HEPTA-EPOXIDE	98
OXYCHLORDANE	
GAMMA-CHLORDANE	89
ALPHA-CHLORDANE	88
TRANS-NONACHLOR	109
CIS-NONACHLOR	NA
ALDRIN	93
DIELDRIN	101
ENDRIN	36
MIREX	83
2,4'DDE (O,P'DDE)	105
4,4'DDE (P,P'DDE)	107
2,4'DDD (O,P'DDD)	107
4,4'DDD (P,P'DDD)	85
2,4'DDT (O,P'DDT)	107
4,4'DDT (P,P'DDT)	96

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PESTICIDE DATA - CASCO BAY - 1991

Matrix Spikes

INVEST#:	EB-4	SW-5	EB-3	WB-1	IB-3
LABSAMNO:	Q2089	Q2093	Q2123	Q2127	Q2133
UNIT:	%	%	%	%	%
Analyte (Cont)	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL
TOTAL BHC'S	NA	NA	NA	NA	NA
TOTAL CHLORDANES	NA	NA	NA	NA	NA
TOTAL DDT'S	NA	NA	NA	NA	NA
ENDOSULFAN I	NA	NA	NA	NA	NA
ENDOSULFAN II	NA	NA	NA	NA	NA
ENDOSULFAN SULFATE	NA	NA	NA	NA	NA
ENDRIN ALDEHYDE	NA	NA	NA	NA	NA
TOXAPHENE	NA	NA	NA	NA	NA
ALPHA-BHC	83	75	114	77	79 M
HCB	45	42	31	31	49 M
BETA-BHC	29	26	37	30	30 M
GAMMA-BHC	98	82	111	90	93 M
DELTA-BHC	95	84	99	74	96 M
HEPTACHLOR	89	92	98	83	68 M
HEPTA-EPOXIDE	81	69	98	78	96 M
OXYCHLORDANE					M
GAMMA-CHLORDANE	101	89	103	89	56 M
ALPHA-CHLORDANE	106	94	105	108	88 M
TRANS-NONACHLOR	103	88	94	98	97 M
CIS-NONACHLOR	NA	NA	NA	NA	NA
ALDRIN	100	96	100	94	104 M
DIELDRIN	104	101	106	105	101 M
ENDRIN	99	103	107	118	52 M
MIREX	100	92	64	93	91 M
2,4'DDE (O,P'DDE)	81	94	104	107	89 M
4,4'DDE (P,P'DDE)	83	99	100	119	94 M
2,4'DDD (O,P'DDD)	104	86	93	87	115 M
4,4'DDD (P,P'DDD)	107	100	87	93	161 M
2,4'DDT (O,P'DDT)	112	104	97	104	55 M
4,4'DDT (P,P'DDT)	101	102	81	109	32 M

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

PCB DATA

FIELD DUPLICATES

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

	Field Duplicates			
INVEST#:	EB-3	EB-3	IB-1	IB-1
LABSAMNO:	C3079	C3193	C3095	C3195
UNIT:	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
TOTAL PCB'S	14.0	21.1	79.2	79.4
AROCHLOR MIXTURE				
PCB 1242 (%)	ND	ND	ND	ND
PCB 1248 (%)	ND	ND	ND	ND
PCB 1254 (%)	97	98	98	98
PCB 1260 (%)	3	2	2	2
PCB # (CLORINATION)				
8 (CL2)	ND	ND	0.3	ND
18 (CL3)	0.1 J	0.1 J	0.1 J	ND
28 (CL3)	0.2	2.1	0.8	2.3
44 (CL4)	0.3	0.4	0.9	1.5
52 (CL4)	0.4	0.9	2.2	4.0
66 (CL4)	0.1 J	0.3	1.1	0.3
101 (CL5)	0.9	1.0	3.3	4.2
105 (CL5)	0.3	0.5	1.9	3.0
110/77 (CL5/4)	0.6	0.7	5.1	4.7
118/108/149(CL5/5/6)	0.6	0.6	4.4	3.0
128 (CL6)	0.6	0.9	0.8	2.0
138 (CL6)	0.6	0.8	6.2	4.1
126 (CL5)	0.7	0.7	2.5	2.9
153 (CL6)	0.8	0.8	5.2	4.0
170 (CL7)	0.4	0.2	ND	1.7
180 (CL7)	0.5	0.4	2.7	1.7
187/182/159(CL7/7/6)	0.3	0.3	1.1	0.6
195 (CL8)	0.1	0.1 J	0.4	0.3
206 (CL9)	ND	0.1 J	1.2	ND
209 (CL10)	ND	0.2	1.4	1.2
Surrogate Recoveries				
DBOFB%:	99.4	81.9	94.1	95.8
e-HCH%:	NA	NA	NA	NA
PCB#103%:	91.1	64.4	99.9	66.5
PCB#198%:	78.4	37.7	148.3	75.2

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

	Field Duplicates	
INVEST#:	SW-4	SW-4D
LABSAMNO:	C3149	C3151
UNIT:	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL
TOTAL PCB'S	19.0	13.0
AROCHLOR MIXTURE		
PCB 1242 (%)	ND	ND
PCB 1248 (%)	ND	ND
PCB 1254 (%)	97	95
PCB 1260 (%)	3	5
PCB # (CLORINATION)		
8 (CL2)	ND	0.1 J
18 (CL3)	ND	ND
28 (CL3)	0.2	0.2
44 (CL4)	0.2	0.2
52 (CL4)	0.9	0.7
66 (CL4)	0.4	0.2
101 (CL5)	0.6	0.7
105 (CL5)	0.7	0.4
110/77 (CL5/4)	1.4	0.9
118/108/149(CL5/5/6)	0.6	0.5
128 (CL6)	0.1 J	0.1 J
138 (CL6)	1.0	1.0
126 (CL5)	0.4	0.3
153 (CL6)	0.9	0.7
170 (CL7)	ND	ND
180 (CL7)	0.5	0.5
187/182/159(CL7/7/6)	0.3	0.2
195 (CL8)	0.1	0.1
206 (CL9)	ND	ND
209 (CL10)	1.5	0.1
Surrogate Recoveries		
DBOFB%:	81.3	71.7
e-HCH%:	NA	NA
PCB#103%:	82.0	73.7
PCB#198%:	119.5	100.3

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB QA DUPLICATES

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-4	EB-4	SW-5	SW-5	EB-3
LABSAMNO:	C3081	Q2087	C3153	Q2090	C3079
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
TOTAL PCB'S	14.3	16.7	7.3	8.8	14.0
AROCHLOR MIXTURE					
PCB 1242 (%)	ND	ND	ND	ND	ND
PCB 1248 (%)	ND	ND	ND	ND	ND
PCB 1254 (%)	91	89	97	95	97
PCB 1260 (%)	9	11	3	5	3
PCB # (CLORINATION)					
8 (CL2)	0.1 J	0.2	0.1	0.1 J	ND
18 (CL3)	ND	ND	ND	ND	0.1 J
28 (CL3)	0.1 J	0.2	0.1 J	0.1 J	0.2
44 (CL4)	0.1 J	0.1 J	0.1 J	0.1 J	0.3
52 (CL4)	0.1 J	0.1	0.3	0.1 J	0.3
66 (CL4)	0.1	0.3	0.1	0.2	0.4
101 (CL5)	0.1	0.2	0.4	0.1 J	0.1 J
105 (CL5)	0.3	0.2	0.2	0.2	0.9
110/77 (CL5/4)	ND	ND	0.4	0.1	0.3
118/108/149(CL5/5/6)	0.3	0.4	0.3	0.3	0.6
128 (CL6)	ND	ND	0.1 J	0.3	0.6
138 (CL6)	1.8	1.4	0.8	0.1 J	0.6
126 (CL5)	1.2	1.6	ND	1.5	0.6
153 (CL6)	0.7	0.8	0.4	0.1	0.7
170 (CL7)	0.7	0.9	ND	0.4	0.8
180 (CL7)	0.7	0.8	0.2	ND	0.4
187/182/159(CL7/7/6)	0.4	0.4	0.2	0.3	0.5
195 (CL8)	0.2	0.3	0.1 J	0.2	0.3
206 (CL9)	0.1	0.1 J	ND	0.1	0.1
209 (CL10)	0.5	0.7	0.1	0.1	ND
				0.3	ND
Surrogate Recoveries					
DBOFB%:	89.2	87.8	79.0	85.2	99.4
e-HCH%:	NA	NA	NA	NA	NA
PCB#103%:	95.6	95.4	78.9	87.1	91.1
PCB#198%:	151.3	158.9	73.9	121.4	78.4

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-3	WB-1	WB-1	IB-3	IB-3
LABSAMNO:	Q2121	C3175	Q2129	C3099	Q2135
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
TOTAL PCB'S	27.1	11.7	10.8	42.1	48.7
AROCHLOR MIXTURE					
PCB 1242 (%)	ND	ND	ND	ND	ND
PCB 1248 (%)	ND	ND	ND	ND	ND
PCB 1254 (%)	97	96	95	97	98
PCB 1260 (%)	3	4	5	3	2
PCB # (CLORINATION)					
8 (CL2)	ND	0.2	0.3	0.1 J	0.1 J
18 (CL3)	ND	ND	ND	ND	ND
28 (CL3)	3.1	0.3	0.3	1.2	ND
44 (CL4)	0.4	0.2	0.2	0.1	0.2
52 (CL4)	0.9	0.3	0.3	1.1	1.8
66 (CL4)	0.4	0.3	0.3	0.7	0.7
101 (CL5)	1.1	0.3	0.2	1.4	1.9
105 (CL5)	0.5	0.2	0.2	1.1	1.2
110/77 (CL5/4)	0.7	0.3	0.3	2.2	3.4
118/108/149(CL5/5/6)	0.8	0.4	0.4	2.0	2.5
128 (CL6)	1.2	0.1	0.1	ND	0.1
138 (CL6)	1.1	1.0	0.7	3.6	4.2
126 (CL5)	0.9	0.7	0.6	1.2	1.5
153 (CL6)	1.2	0.7	0.6	2.9	3.3
170 (CL7)	0.4	ND	ND	ND	ND
180 (CL7)	0.6	0.4	0.5	1.6	1.6
187/182/159(CL7/7/6)	0.4	0.1	0.1 J	0.7	0.7
195 (CL8)	0.1 J	0.2	0.2	0.4	0.4
206 (CL9)	0.2	0.1	0.1	0.7	0.8
209 (CL10)	0.4	0.3	0.2	1.0	1.1
Surrogate Recoveries					
DBOFB%:	89.2	79.1	82.7	93.3	95.0
e-HCH%:	NA	NA	NA	NA	NA
PCB#103%:	75.9	79.3	82.5	98.0	102.5
PCB#198%:	63.5	125.9	121.9	139.5	149.6

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

	Lab QA Duplicates					
INVEST#:	IB-1			IB-1		
LABSAMNO:	C3095			Q2139		
UNIT:	ppb			ppb		
Analyte (Cont)	Conc	DB	QUAL	Conc	DB	QUAL
TOTAL PCB'S	79.2			93.1		
AROCHLOR MIXTURE						
PCB 1242 (%)		ND			ND	
PCB 1248 (%)		ND			ND	
PCB 1254 (%)	98			99		
PCB 1260 (%)	2			1		
PCB # (CLORINATION)						
8 (CL2)	0.3				ND	
18 (CL3)	0.1	J			ND	
28 (CL3)	0.8			2.0		
44 (CL4)	0.9			1.2		
52 (CL4)	2.2			3.9		
66 (CL4)	1.1			0.8		
101 (CL5)	3.3			4.9		
105 (CL5)	1.9			3.0		
110/77 (CL5/4)	5.1			6.4		
118/108/149(CL5/5/6)	4.4			4.3		
128 (CL6)	0.8			2.7		
138 (CL6)	6.2			5.6		
126 (CL5)	2.5			3.0		
153 (CL6)	5.2			4.6		
170 (CL7)		ND		1.6		
180 (CL7)	2.7			2.1		
187/182/159(CL7/7/6)	1.1			1.1		
195 (CL8)	0.4			0.3		
206 (CL9)	1.2			0.4		
209 (CL10)	1.4			1.1		
Surrogate Recoveries						
DBOFB%:	94.1			94.5		
e-HCH%:		NA			NA	
PCB#103%:	99.9			66.7		
PCB#198%:	148.3			76.2		

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU   DATE: 05-May-92   LAB APPROVAL: Terry L. Wade

LAB PROCEDURAL BLANKS

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

Lab Procedural Blanks

INVEST#:	BLANK	BLANK	BLANK	BLANK	BLANK
LABSAMNO:	Q2088	Q2092	Q2122	Q2126	Q2132
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
TOTAL PCB'S	1.3	1.6	0.1	0.6	0.4
AROCHLOR MIXTURE					
PCB 1242 (%)	NA	NA	NA	NA	NA
PCB 1248 (%)	NA	NA	NA	NA	NA
PCB 1254 (%)	NA	NA	NA	NA	NA
PCB 1260 (%)	NA	NA	NA	NA	NA
PCB # (CLORINATION)					
8 (CL2)	ND	ND	ND	ND	ND
18 (CL3)	ND	ND	ND	ND	ND
28 (CL3)	ND	ND	ND	ND	ND
44 (CL4)	ND	ND	ND	ND	ND
52 (CL4)	ND	ND	ND	ND	ND
66 (CL4)	ND	ND	ND	ND	ND
101 (CL5)	ND	ND	ND	ND	ND
105 (CL5)	ND	ND	ND	ND	ND
110/77 (CL5/4)	ND	ND	ND	ND	ND
118/108/149(CL5/5/6)	ND	ND	ND	ND	ND
128 (CL6)	ND	ND	ND	ND	ND
138 (CL6)	0.7	0.8	ND	0.3	0.2
126 (CL5)	ND	ND	ND	ND	ND
153 (CL6)	ND	ND	ND	ND	ND
170 (CL7)	ND	ND	0.1 J	ND	ND
180 (CL7)	ND	ND	ND	ND	ND
187/182/159(CL7/7/6)	ND	ND	ND	ND	ND
195 (CL8)	ND	ND	ND	ND	ND
206 (CL9)	ND	ND	ND	ND	ND
209 (CL10)	ND	ND	ND	ND	ND
Surrogate Recoveries					
DBOFB%:	88.9	89.9	82.5	73.5	86.6
e-HCH%:	NA	NA	NA	NA	NA
PCB#103%:	109.4	100.7	82.4	77.1	105.5
PCB#198%:	160.6	130.5	66.4	86.1	137.2

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

	Lab Procedural Blanks
INVEST#:	BLANK
LABSAMNO:	Q2136
UNIT:	ppb
Analyte (Cont)	Conc DB QUAL
TOTAL PCB'S	0.1
AROCHLOR MIXTURE	
PCB 1242 (%)	NA
PCB 1248 (%)	NA
PCB 1254 (%)	NA
PCB 1260 (%)	NA
PCB # (CLORINATION)	
8 (CL2)	ND
18 (CL3)	ND
28 (CL3)	ND
44 (CL4)	ND
52 (CL4)	ND
66 (CL4)	ND
101 (CL5)	ND
105 (CL5)	ND
110/77 (CL5/4)	ND
118/108/149(CL5/5/6)	ND
128 (CL6)	ND
138 (CL6)	ND
126 (CL5)	ND
153 (CL6)	ND
170 (CL7)	0.1
180 (CL7)	ND
187/182/159(CL7/7/6)	ND
195 (CL8)	ND
206 (CL9)	ND
209 (CL10)	ND
Surrogate Recoveries	
DBOFB%:	92.0
e-HCH%:	NA
PCB#103%:	93.0
PCB#198%:	98.5

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

MATRIX SPIKES

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

	Matrix Spikes				
INVEST#:	EB-4	SW-5	EB-3	WB-1	IB-3
LABSAMNO:	Q2089	Q2093	Q2123	Q2127	Q2133
UNIT:	%	%	%	%	%
Analyte (Cont)	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL
TOTAL PCB'S	98	103	84	108	112 M
AROCHLOR MIXTURE					
PCB 1242 (%)	NA	NA	NA	NA	NA
PCB 1248 (%)	NA	NA	NA	NA	NA
PCB 1254 (%)	NA	NA	NA	NA	NA
PCB 1260 (%)	NA	NA	NA	NA	NA
PCB # (CLORINATION)					
8 (CL2)	82	100	129	102	88 M
18 (CL3)	36	55	59	51	45 M
28 (CL3)	86	103	120	119	108 M
44 (CL4)	90	108	163	117	106 M
52 (CL4)	79	96	116	103	98 M
66 (CL4)	125	155	234	127	178 M
101 (CL5)	91	95	99	86	88 M
105 (CL5)	137	140	214	136	163 M
110/77 (CL5/4)	80	97	66	110	88 M
118/108/149(CL5/5/6)	120	121	143	111	123 M
128 (CL6)	131	116	179	127	155 M
138 (CL6)	95	139	140	109	107 M
126 (CL5)	113	125	115	116	131 M
153 (CL6)	91	93	68	93	92 M
170 (CL7)	126	116	74	0	0 M
180 (CL7)	109	101	68	108	112 M
187/182/159(CL7/7/6)	85	100	45	114	90 M
195 (CL8)	114	105	73	124	111 M
206 (CL9)	91	106	45	92	104 M
209 (CL10)	129	113	31	113	125 M
Surrogate Recoveries					
DBOFB%:	85.2	89.5	81.7	85.9	100.2
e-HCH%:	NA	NA	NA	NA	NA
PCB#103%:	87.1	100.1	67.4	84.9	104.7
PCB#198%:	121.4	122.8	43.3	125.5	133.5

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - PCB DATA - CASCO BAY - 1991

	Matrix Spikes	
INVEST#:	IB-1	
LABSAMNO:	Q2137	
UNIT:	%	
Analyte (Cont)	% Recov	DB QUAL
TOTAL PCB'S	109	
AROCHLOR MIXTURE		
PCB 1242 (%)		NA
PCB 1248 (%)		NA
PCB 1254 (%)		NA
PCB 1260 (%)		NA
PCB # (CLORINATION)		
8 (CL2)	168	
18 (CL3)	50	
28 (CL3)	141	
44 (CL4)	187	
52 (CL4)	124	
66 (CL4)	309	
101 (CL5)	78	
105 (CL5)	263	
110/77 (CL5/4)	108	
118/108/149(CL5/5/6)	146	
128 (CL6)	188	
138 (CL6)	95	
126 (CL5)	148	
153 (CL6)	70	
170 (CL7)	126	
180 (CL7)	97	
187/182/159(CL7/7/6)	53	
195 (CL8)	101	
206 (CL9)	76	
209 (CL10)	98	
Surrogate Recoveries		
DBOFB%:	95.8	
e-HCH%:		NA
PCB#103%:	70.4	
PCB#198%:	73.8	

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

ADDITIONAL PCB DATA

FIELD DUPLICATES

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA - CASCO BAY - 1991

	Field Duplicates			
INVEST#:	EB-3	EB-3	IB-1	IB-1
LABSAMNO:	C3079	C3193	C3095	C3195
UNIT:	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
Other PCB Congeners				
7 (CL2)	ND	ND	ND	ND
15 (CL2)	0.1 J	0.4	0.1 J	ND
24 (CL3)	0.1	ND	0.1 J	0.2
16/32 (CL3)	0.9	ND	1.2	3.6
29 (CL3)	0.1 J	ND	ND	ND
26 (CL3)	ND	ND	ND	0.1
25 (CL3)	ND	0.1	0.2	0.1 J
50 (CL4)	0.1 J	0.8	0.5	0.5
31 (CL3)	ND	ND	ND	ND
33 (CL3)	ND	0.2	0.3	0.4
22 (CL3)	0.4	0.5	0.7	0.8
45 (CL4)	0.1	0.2	ND	0.2
46 (CL4)	ND	0.9	0.1	ND
49 (CL4)	ND	0.5	0.6	1.3
47/48 (CL4)	ND	ND	0.1	ND
37/42 (CL4)	0.1	0.2	0.4	0.6
41/64 (CL4)	0.1 J	0.2	0.2	ND
40 (CL4)		ND		ND
100 (CL5)		ND		ND
74 (CL4)	1.4	0.9	3.5	6.3
70 (CL4)	0.1	0.5	1.8	1.1
88 (CL5)	ND	0.1 J	0.2	0.3
60/56 (CL5)	0.1 J	0.4	0.6	0.4
92? (CL5)	ND	0.2	0.2	0.1 J
84? (CL5)	ND	0.1 J	0.6	ND
99 (CL5)	4.2	0.3	1.5	6.8
83 (CL5)	0.3	0.3	0.9	1.1
97 (CL5)	0.1	0.5	0.6	0.7
87 (CL5)	0.4	0.3	1.4	1.5
85 (CL5)	0.1	0.1 J	0.3	0.4
136 (CL6)	ND	ND	0.3	ND
82 (CL5)	0.1	0.2	2.6	ND
151 (CL6)	0.1	0.1	0.9	0.7
107/108/144(CL5/5/6)	0.1 J	0.2	0.5	0.3
149 (CL6)	0.4	0.3	2.7	1.2
188 (CL7)	ND	ND	ND	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA (CONT)- CASCO BAY - 1991

	Field Duplicates											
INVEST#:	EB-3			EB-3			IB-1			IB-1		
LABSAMNO:	C3079			C3193			C3095			C3195		
UNIT:	ppb			ppb			ppb			ppb		
Analyte (Cont)	Conc	DB	QUAL	Conc	DB	QUAL	Conc	DB	QUAL	Conc	DB	QUAL
146 (CL6)	0.2			0.2			0.6			0.7		
141 (CL6)		ND			ND		0.7				ND	
137 (CL6)		ND		0.1	J		0.2			0.2		
UNK (CL6)		ND			ND		0.1	J		0.1		
158 (CL7)	0.7			0.5			5.4			1.5		
129 (CL6)		ND			ND		0.2				ND	
178 (CL7)		ND			ND			ND			ND	
183 (CL7)	0.1			0.1	J		0.6			0.1		
167 (CL6)		ND			ND		0.3				ND	
185 (CL7)		ND			ND		2.3				ND	
174 (CL7)	0.2			0.1	J		1.1			1.0		
177 (CL7)	0.4			0.3			0.8			1.8		
156/171/202(CL6/7/8)	7.8				ND		0.9			21.6		
200 (CL8)		ND			ND		0.4			0.2		
172 (CL7)	0.3			0.1			1.3			0.7		
191 (CL7)		ND			ND			ND			ND	
201 (CL8)	0.2			0.1			1.2			0.8		
196 (CL8)	0.3			0.1			1.4			0.7		
189 (CL7)		ND			ND		0.2				ND	
194 (CL8)	0.1				ND		0.7			0.2		
205 (CL9)		ND		0.5			0.7			10.3		

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PESTICIDE & PCB DATA - CASCO BAY - 1991

	Field Duplicates					
INVEST#:	SW-4			SW-4D		
LABSAMNO:	C3149			C3151		
UNIT:	ppb			ppb		
Analyte (Cont)	Conc	DB	QUAL	Conc	DB	QUAL
Other PCB Congeners						
7 (CL2)		ND			ND	
15 (CL2)	0.1			0.1	J	
24 (CL3)	0.1	J			ND	
16/32 (CL3)	0.3			0.3		
29 (CL3)		ND			ND	
26 (CL3)		ND			ND	
25 (CL3)		ND		0.1		
50 (CL4)	0.3			0.3		
31 (CL3)		ND			ND	
33 (CL3)	0.2			0.1		
22 (CL3)	0.4			0.3		
45 (CL4)		ND			ND	
46 (CL4)		ND		0.1	J	
49 (CL4)	0.4			0.3		
47/48 (CL4)	0.2			0.8		
37/42 (CL4)	0.2			0.2		
41/64 (CL4)		ND		1.0		
40 (CL4)		ND			ND	
100 (CL5)		ND			ND	
74 (CL4)	0.9			0.6		
70 (CL4)	0.7			0.3		
88 (CL5)	0.1	J			ND	
60/56 (CL5)	0.2			0.7		
92? (CL5)	0.1	J		0.1		
84? (CL5)	0.2			0.2		
99 (CL5)	0.3			0.3		
83 (CL5)	0.1			0.1	J	
97 (CL5)		ND			ND	
87 (CL5)	0.3			0.2		
85 (CL5)	0.1	J			ND	
136 (CL6)		ND			ND	
82 (CL5)	0.2			0.1		
151 (CL6)	0.2			0.1	J	
107/108/144(CL5/5/6)		ND			ND	
149 (CL6)	0.5			0.3		
188 (CL7)		ND			ND	

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA (CONT)- CASCO BAY - 1991

	Field Duplicates					
INVEST#:	SW-4			SW-4D		
LABSAMNO:	C3149			C3151		
UNIT:	ppb			ppb		
Analyte (Cont)	Conc	DB	QUAL	Conc	DB	QUAL
146 (CL6)	0.3			0.2		
141 (CL6)	0.2			0.1	J	
137 (CL6)	0.2			0.1		
UNK (CL6)	0.1	J		0.1	J	
158 (CL7)	0.9			0.7		
129 (CL6)		ND			ND	
178 (CL7)		ND			ND	
183 (CL7)		ND			ND	
167 (CL6)		ND			ND	
185 (CL7)		ND			ND	
174 (CL7)	0.2				ND	
177 (CL7)	0.2			0.2		
156/171/202(CL6/7/8)	0.2			0.1	J	
200 (CL8)		ND		0.1	J	
172 (CL7)	0.3			0.2		
191 (CL7)		ND			ND	
201 (CL8)	0.2			0.1	J	
196 (CL8)	0.3			0.4		
189 (CL7)	0.1				ND	
194 (CL8)	0.1			0.1		
205 (CL9)	0.4			0.1		

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB QA DUPLICATES

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA (CONT)- CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-4	EB-4	SW-5	SW-5	EB-3
LABSAMNO:	C3081	Q2087	C3153	Q2090	C3079
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
146 (CL6)	0.2	0.2	ND	ND	0.2
141 (CL6)	ND	ND	0.1 J	ND	ND
137 (CL6)	ND	ND	ND	ND	ND
UNK (CL6)	ND	ND	0.1 J	ND	ND
158 (CL7)	1.2	1.8	ND	0.7	0.7
129 (CL6)	ND	ND	ND	ND	ND
178 (CL7)	ND	ND	ND	ND	ND
183 (CL7)	0.1	0.1	ND	0.1 J	0.1 J
167 (CL6)	0.1 J	0.1	ND	ND	ND
185 (CL7)	0.2	0.1 J	ND	ND	ND
174 (CL7)	0.2	0.2	ND	0.1 J	0.2
177 (CL7)	0.4	0.6	0.3	0.3	0.4
156/171/202(CL6/7/8)	0.2	0.4	ND	0.1 J	7.8
200 (CL8)	0.2	0.2	ND	ND	ND
172 (CL7)	0.5	0.6	ND	0.2	0.3
191 (CL7)	ND	ND	ND	ND	ND
201 (CL8)	0.3	0.4	0.1 J	0.1	0.2
196 (CL8)	0.7	0.7	0.2	0.3	0.3
189 (CL7)	ND	ND	ND	ND	ND
194 (CL8)	0.1	0.2	0.1	ND	0.1
205 (CL9)	0.3	0.3	ND	0.6	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-4	EB-4	SW-5	SW-5	EB-3
LABSAMNO:	C3081	Q2087	C3153	Q2090	C3079
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
Other PCB Congeners					
7 (CL2)	ND	ND	ND	ND	ND
15 (CL2)	ND	ND	ND	ND	0.1 J
24 (CL3)	ND	ND	ND	ND	0.1
16/32 (CL3)	0.2	0.2	ND	ND	0.9
29 (CL3)	ND	ND	ND	ND	0.1 J
26 (CL3)	ND	ND	ND	ND	ND
25 (CL3)	0.1 J	0.1	ND	ND	ND
50 (CL4)	0.2	0.3	0.1 J	0.1 J	0.1 J
31 (CL3)	ND	ND	ND	ND	ND
33 (CL3)	ND	ND	ND	ND	ND
22 (CL3)	0.1 J	0.1	0.1 J	ND	0.4
45 (CL4)	ND	ND	ND	ND	0.1
46 (CL4)	0.1 J	0.1 J	ND	ND	ND
49 (CL4)	0.1 J	0.1	0.1 J	0.1	ND
47/48 (CL4)	0.1 J	0.1 J	ND	ND	ND
37/42 (CL4)	0.1	0.1	ND	ND	0.1
41/64 (CL4)	0.1	0.3	0.1	ND	0.1 J
40 (CL4)	ND	ND	ND	ND	ND
100 (CL5)	ND	ND	ND	ND	ND
74 (CL4)	0.2	0.2	ND	ND	1.4
70 (CL4)	0.2	0.3	0.1 J	0.1	0.1
88 (CL5)	ND	ND	ND	ND	ND
60/56 (CL5)	ND	0.1	ND	ND	0.1 J
92? (CL5)	ND	ND	ND	ND	ND
84? (CL5)	ND	0.1 J	0.1 J	ND	ND
99 (CL5)	0.1	0.2	0.2	0.2	4.2
83 (CL5)	0.2	0.4	ND	ND	0.3
97 (CL5)	ND	ND	0.1 J	ND	0.1
87 (CL5)	ND	0.1 J	0.1	0.1	0.4
85 (CL5)	ND	ND	0.1 J	ND	0.1
136 (CL6)	ND	ND	ND	ND	ND
82 (CL5)	0.2	0.4	0.1 J	ND	0.1
151 (CL6)	ND	0.1 J	ND	ND	0.1
107/108/144(CL5/5/6)	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J
149 (CL6)	0.5	0.8	0.3	0.2	0.4
188 (CL7)	ND	ND	ND	ND	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA (CONT)- CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-3	WB-1	WB-1	IB-3	IB-3
LABSAMNO:	Q2121	C3175	Q2129	C3099	Q2135
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
146 (CL6)	0.2	0.1 J	0.1 J	0.2	0.3
141 (CL6)	ND	ND	ND	0.5	0.5
137 (CL6)	0.1	ND	ND	0.1	0.2
UNK (CL6)	0.1 J	ND	ND	0.1 J	0.1 J
158 (CL7)	0.9	1.2	0.9	3.5	3.9
129 (CL6)	ND	ND	ND	0.1 J	0.1 J
178 (CL7)	ND	ND	ND	ND	ND
183 (CL7)	0.1	0.1 J	0.1 J	0.3	0.3
167 (CL6)	ND	ND	ND	ND	ND
185 (CL7)	ND	0.3	0.3	1.5	1.6
174 (CL7)	0.2	0.1	0.1	0.4	0.5
177 (CL7)	0.4	0.2	0.1	0.6	0.8
156/171/202(CL6/7/8)	ND	0.2	0.3	0.5	0.6
200 (CL8)	ND	0.1	0.1	0.2	0.3
172 (CL7)	0.2	0.5	0.4	0.8	0.9
191 (CL7)	ND	ND	0.1 J	0.1 J	0.1 J
201 (CL8)	0.2	0.1	0.1 J	0.7	0.9
196 (CL8)	0.1	0.1 J	0.3	1.0	0.8
189 (CL7)	ND	0.1	0.2	0.1	0.1 J
194 (CL8)	0.1	0.1	0.1	0.4	0.4
205 (CL9)	1.0	0.2	0.2	0.4	0.5

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA - CASCO BAY - 1991

	Lab QA Duplicates				
INVEST#:	EB-3	WB-1	WB-1	IB-3	IB-3
LABSAMNO:	Q2121	C3175	Q2129	C3099	Q2135
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
Other PCB Congeners					
7 (CL2)	ND	ND	ND	ND	ND
15 (CL2)	ND	0.1	0.1	0.1	0.1 J
24 (CL3)	ND	ND	ND	0.1 J	ND
16/32 (CL3)	ND	0.3	0.3	0.6	0.6
29 (CL3)	ND	ND	ND	ND	ND
26 (CL3)	ND	0.1 J	0.1	ND	ND
25 (CL3)	0.1	0.1	0.1 J	ND	0.2
50 (CL4)	0.5	1.2	1.0	0.1	ND
31 (CL3)	ND	ND	ND	ND	ND
33 (CL3)	0.1 J	0.1 J	0.1	0.1 J	ND
22 (CL3)	0.4	0.2	0.2	0.3	0.4
45 (CL4)	0.2	ND	ND	ND	ND
46 (CL4)	0.6	0.1	0.1	0.6	ND
49 (CL4)	0.2	0.2	0.2	0.1	0.2
47/48 (CL4)	ND	1.5	1.3	ND	ND
37/42 (CL4)	0.2	0.1 J	0.1 J	0.1	0.2
41/64 (CL4)	0.1	ND	ND	0.1	0.2
40 (CL4)	ND	ND	ND	0.1 J	0.1 J
100 (CL5)	ND	ND	ND	ND	ND
74 (CL4)	1.1	0.9	0.7	2.1	2.4
70 (CL4)	0.4	0.3	0.3	0.7	0.9
88 (CL5)	0.1 J	ND	ND	0.1 J	0.1 J
60/56 (CL5)	0.5	0.4	0.5	1.9	2.2
92? (CL5)	0.1	ND	0.1	0.6	0.6
84? (CL5)	0.1 J	ND	ND	0.3	0.4
99 (CL5)	0.3	0.3	0.2	3.6	4.2
83 (CL5)	0.4	0.3	0.2	0.4	0.5
97 (CL5)	0.2	ND	ND	0.2	0.4
87 (CL5)	0.4	0.1	0.1	0.6	0.8
85 (CL5)	0.1 J	ND	ND	0.1	0.1
136 (CL6)	ND	ND	ND	0.3	0.3
82 (CL5)	0.2	0.4	0.3	1.8	2.1
151 (CL6)	0.2	0.1	0.1	0.2	0.4
107/108/144(CL5/5/6)	0.2	0.4	0.2	ND	0.2
149 (CL6)	0.4	0.4	0.4	1.2	1.7
188 (CL7)	ND	ND	ND	ND	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA (CONT)- CASCO BAY - 1991

	Lab QA Duplicates	
INVEST#:	IB-1	IB-1
LABSAMNO:	C3095	Q2139
UNIT:	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL
146 (CL6)	0.6	0.5
141 (CL6)	0.7	ND
137 (CL6)	0.2	0.4
UNK (CL6)	0.1 J	0.6
158 (CL7)	5.4	5.4
129 (CL6)	0.2	ND
178 (CL7)	ND	ND
183 (CL7)	0.6	0.5
167 (CL6)	0.3	ND
185 (CL7)	2.3	0.4
174 (CL7)	1.1	1.1
177 (CL7)	0.8	2.0
156/171/202(CL6/7/8)	0.9	2.1
200 (CL8)	0.4	0.3
172 (CL7)	1.3	0.9
191 (CL7)	ND	ND
201 (CL8)	1.2	0.6
196 (CL8)	1.4	0.2
189 (CL7)	0.2	ND
194 (CL8)	0.7	0.2
205 (CL9)	0.7	7.6

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

	Lab QA Duplicates	
INVEST#:	IB-1	IB-1
LABSAMNO:	C3095	Q2139
UNIT:	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL
Other PCB Congeners		
7 (CL2)	ND	ND
15 (CL2)	0.1 J	0.1 J
24 (CL3)	0.1 J	0.2
16/32 (CL3)	1.2	3.2
29 (CL3)	ND	0.1 J
26 (CL3)	ND	0.1 J
25 (CL3)	0.2	0.2
50 (CL4)	0.5	0.6
31 (CL3)	ND	ND
33 (CL3)	0.3	0.4
22 (CL3)	0.7	0.7
45 (CL4)	ND	0.1
46 (CL4)	0.1	ND
49 (CL4)	0.6	1.1
47/48 (CL4)	0.1	ND
37/42 (CL4)	0.4	0.9
41/64 (CL4)	0.2	ND
40 (CL4)	ND	ND
100 (CL5)	ND	ND
74 (CL4)	3.5	5.4
70 (CL4)	1.8	1.7
88 (CL5)	0.2	0.5
60/56 (CL5)	0.6	0.8
92? (CL5)	0.2	1.1
84? (CL5)	0.6	ND
99 (CL5)	1.5	9.9
83 (CL5)	0.9	1.1
97 (CL5)	0.6	0.8
87 (CL5)	1.4	1.8
85 (CL5)	0.3	0.6
136 (CL6)	0.3	ND
82 (CL5)	2.6	0.9
151 (CL6)	0.9	0.7
107/108/144(CL5/5/6)	0.5	0.3
149 (CL6)	2.7	2.1
188 (CL7)	ND	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

LAB PROCEDURAL BLANKS

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA - CASCO BAY - 1991

	Lab Procedural Blanks				
INVEST#:	BLANK	BLANK	BLANK	BLANK	BLANK
LABSAMNO:	Q2088	Q2092	Q2122	Q2126	Q2132
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
Other PCB Congeners					
7 (CL2)	ND	ND	ND	ND	ND
15 (CL2)	ND	ND	ND	ND	ND
24 (CL3)	ND	ND	ND	ND	ND
16/32 (CL3)	ND	ND	ND	ND	ND
29 (CL3)	ND	ND	ND	ND	ND
26 (CL3)	ND	ND	ND	ND	ND
25 (CL3)	ND	ND	ND	ND	ND
50 (CL4)	0.1 J	ND	0.4	ND	ND
31 (CL3)	ND	ND	ND	ND	ND
33 (CL3)	ND	ND	ND	ND	ND
22 (CL3)	ND	ND	0.2	ND	ND
45 (CL4)	ND	ND	ND	ND	ND
46 (CL4)	ND	ND	ND	ND	ND
49 (CL4)	ND	ND	ND	ND	ND
47/48 (CL4)	ND	ND	ND	ND	ND
37/42 (CL4)	ND	ND	ND	ND	ND
41/64 (CL4)	ND	ND	ND	ND	ND
40 (CL4)	ND	ND	ND	ND	ND
100 (CL5)	ND	ND	ND	ND	ND
74 (CL4)	ND	ND	ND	ND	ND
70 (CL4)	ND	ND	ND	ND	ND
88 (CL5)	ND	ND	ND	ND	ND
60/56 (CL5)	ND	ND	ND	0.2	ND
92? (CL5)	ND	ND	ND	ND	ND
84? (CL5)	ND	ND	ND	ND	ND
99 (CL5)	ND	ND	ND	ND	ND
83 (CL5)	ND	ND	ND	ND	ND
97 (CL5)	ND	ND	ND	ND	ND
87 (CL5)	ND	ND	ND	ND	ND
85 (CL5)	ND	ND	ND	ND	ND
136 (CL6)	ND	ND	ND	ND	ND
82 (CL5)	ND	ND	ND	ND	ND
151 (CL6)	ND	ND	ND	ND	ND
107/108/144(CL5/5/6)	ND	ND	ND	ND	ND
149 (CL6)	ND	ND	ND	ND	ND
188 (CL7)	ND	ND	ND	ND	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

	Lab Procedural Blanks
INVEST#:	BLANK
LABSAMNO:	Q2136
UNIT:	ppb
Analyte (Cont)	Conc DB QUAL
Other PCB Congeners	
7 (CL2)	ND
15 (CL2)	ND
24 (CL3)	ND
16/32 (CL3)	ND
29 (CL3)	ND
26 (CL3)	ND
25 (CL3)	ND
50 (CL4)	0.2
31 (CL3)	ND
33 (CL3)	ND
22 (CL3)	0.3
45 (CL4)	ND
46 (CL4)	ND
49 (CL4)	ND
47/48 (CL4)	ND
37/42 (CL4)	ND
41/64 (CL4)	ND
40 (CL4)	ND
100 (CL5)	ND
74 (CL4)	ND
70 (CL4)	ND
88 (CL5)	ND
60/56 (CL5)	ND
92? (CL5)	ND
84? (CL5)	ND
99 (CL5)	ND
83 (CL5)	ND
97 (CL5)	ND
87 (CL5)	ND
85 (CL5)	ND
136 (CL6)	ND
82 (CL5)	ND
151 (CL6)	ND
107/108/144(CL5/5/6)	ND
149 (CL6)	ND
188 (CL7)	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA (CONT)- CASCO BAY - 1991

Lab Procedural Blanks

INVEST#:	BLANK	BLANK	BLANK	BLANK	BLANK
LABSAMNO:	Q2088	Q2092	Q2122	Q2126	Q2132
UNIT:	ppb	ppb	ppb	ppb	ppb
Analyte (Cont)	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL	Conc DB QUAL
146 (CL6)	ND	ND	ND	ND	ND
141 (CL6)	ND	ND	ND	ND	ND
137 (CL6)	ND	ND	ND	ND	ND
UNK (CL6)	ND	ND	ND	ND	ND
158 (CL7)	ND	ND	ND	ND	ND
129 (CL6)	ND	ND	ND	ND	ND
178 (CL7)	ND	ND	ND	ND	ND
183 (CL7)	ND	ND	ND	ND	ND
167 (CL6)	ND	ND	ND	ND	ND
185 (CL7)	ND	ND	ND	ND	ND
174 (CL7)	ND	ND	ND	ND	ND
177 (CL7)	ND	ND	ND	ND	ND
156/171/202(CL6/7/8)	ND	ND	ND	ND	ND
200 (CL8)	ND	ND	ND	ND	ND
172 (CL7)	ND	ND	ND	ND	ND
191 (CL7)	ND	ND	ND	ND	ND
201 (CL8)	ND	ND	ND	ND	ND
196 (CL8)	0.2	0.2	0.1 J	0.1	0.2
189 (CL7)	ND	ND	ND	ND	ND
194 (CL8)	ND	ND	ND	ND	ND
205 (CL9)	ND	ND	ND	ND	ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

	Lab Procedural Blanks	
INVEST#:	BLANK	
LABSAMNO:	Q2136	
UNIT:	ppb	
Analyte (Cont)	Conc	DB QUAL
146 (CL6)		ND
141 (CL6)		ND
137 (CL6)		ND
UNK (CL6)		ND
158 (CL7)	0.1	
129 (CL6)		ND
178 (CL7)		ND
183 (CL7)		ND
167 (CL6)		ND
185 (CL7)		ND
174 (CL7)		ND
177 (CL7)		ND
156/171/202(CL6/7/8)		ND
200 (CL8)		ND
172 (CL7)		ND
191 (CL7)		ND
201 (CL8)		ND
196 (CL8)	0.1	J
189 (CL7)		ND
194 (CL8)		ND
205 (CL9)		ND

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

MATRIX SPIKES

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA - CASCO BAY - 1991

	Matrix Spikes				
INVEST#:	EB-4	SW-5	EB-3	WB-1	IB-3
LABSAMNO:	Q2089	Q2093	Q2123	Q2127	Q2133
UNIT:	%	%	%	%	%
Analyte (Cont)	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL
Other PCB Congeners					
7 (CL2)	NA	NA	NA	NA	NA
15 (CL2)	NA	NA	NA	NA	NA
24 (CL3)	NA	NA	NA	NA	NA
16/32 (CL3)	NA	NA	NA	NA	NA
29 (CL3)	NA	NA	NA	NA	NA
26 (CL3)	NA	NA	NA	NA	NA
25 (CL3)	NA	NA	NA	NA	NA
50 (CL4)	NA	NA	NA	NA	NA
31 (CL3)	NA	NA	NA	NA	NA
33 (CL3)	NA	NA	NA	NA	NA
22 (CL3)	NA	NA	NA	NA	NA
45 (CL4)	NA	NA	NA	NA	NA
46 (CL4)	NA	NA	NA	NA	NA
49 (CL4)	NA	NA	NA	NA	NA
47/48 (CL4)	NA	NA	NA	NA	NA
37/42 (CL4)	NA	NA	NA	NA	NA
41/64 (CL4)	NA	NA	NA	NA	NA
40 (CL4)	NA	NA	NA	NA	NA
100 (CL5)	NA	NA	NA	NA	NA
74 (CL4)	NA	NA	NA	NA	NA
70 (CL4)	NA	NA	NA	NA	NA
88 (CL5)	NA	NA	NA	NA	NA
60/56 (CL5)	NA	NA	NA	NA	NA
92? (CL5)	NA	NA	NA	NA	NA
84? (CL5)	NA	NA	NA	NA	NA
99 (CL5)	NA	NA	NA	NA	NA
83 (CL5)	NA	NA	NA	NA	NA
97 (CL5)	NA	NA	NA	NA	NA
87 (CL5)	NA	NA	NA	NA	NA
85 (CL5)	NA	NA	NA	NA	NA
136 (CL6)	NA	NA	NA	NA	NA
82 (CL5)	NA	NA	NA	NA	NA
151 (CL6)	NA	NA	NA	NA	NA
107/108/144(CL5/5/6)	NA	NA	NA	NA	NA
149 (CL6)	NA	NA	NA	NA	NA
188 (CL7)	NA	NA	NA	NA	NA

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA (CONT)- CASCO BAY - 1991

	Matrix Spikes				
INVEST#:	EB-4	SW-5	EB-3	WB-1	IB-3
LABSAMNO:	Q2089	Q2093	Q2123	Q2127	Q2133
UNIT:	%	%	%	%	%
Analyte (Cont)	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL	% Recov DB QUAL
146 (CL6)	NA	NA	NA	NA	NA
141 (CL6)	NA	NA	NA	NA	NA
137 (CL6)	NA	NA	NA	NA	NA
UNK (CL6)	NA	NA	NA	NA	NA
158 (CL7)	NA	NA	NA	NA	NA
129 (CL6)	NA	NA	NA	NA	NA
178 (CL7)	NA	NA	NA	NA	NA
183 (CL7)	NA	NA	NA	NA	NA
167 (CL6)	NA	NA	NA	NA	NA
185 (CL7)	NA	NA	NA	NA	NA
174 (CL7)	NA	NA	NA	NA	NA
177 (CL7)	NA	NA	NA	NA	NA
156/171/202(CL6/7/8)	NA	NA	NA	NA	NA
200 (CL8)	NA	NA	NA	NA	NA
172 (CL7)	NA	NA	NA	NA	NA
191 (CL7)	NA	NA	NA	NA	NA
201 (CL8)	NA	NA	NA	NA	NA
196 (CL8)	NA	NA	NA	NA	NA
189 (CL7)	NA	NA	NA	NA	NA
194 (CL8)	NA	NA	NA	NA	NA
205 (CL9)	NA	NA	NA	NA	NA

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA - CASCO BAY - 1991

	Matrix Spikes
INVEST#:	IB-1
LABSAMNO:	Q2137
UNIT:	%
Analyte (Cont)	% Recov DB QUAL
Other PCB Congeners	
7 (CL2)	NA
15 (CL2)	NA
24 (CL3)	NA
16/32 (CL3)	NA
29 (CL3)	NA
26 (CL3)	NA
25 (CL3)	NA
50 (CL4)	NA
31 (CL3)	NA
33 (CL3)	NA
22 (CL3)	NA
45 (CL4)	NA
46 (CL4)	NA
49 (CL4)	NA
47/48 (CL4)	NA
37/42 (CL4)	NA
41/64 (CL4)	NA
40 (CL4)	NA
100 (CL5)	NA
74 (CL4)	NA
70 (CL4)	NA
88 (CL5)	NA
60/56 (CL5)	NA
92? (CL5)	NA
84? (CL5)	NA
99 (CL5)	NA
83 (CL5)	NA
97 (CL5)	NA
87 (CL5)	NA
85 (CL5)	NA
136 (CL6)	NA
82 (CL5)	NA
151 (CL6)	NA
107/108/144(CL5/5/6)	NA
149 (CL6)	NA
188 (CL7)	NA

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - OTHER PCB CONGENER DATA (CONT)- CASCO BAY - 1991

	Matrix Spikes
INVEST#:	IB-1
LABSAMNO:	Q2137
UNIT:	%
Analyte (Cont)	% Recov DB QUAL
146 (CL6)	NA
141 (CL6)	NA
137 (CL6)	NA
UNK (CL6)	NA
158 (CL7)	NA
129 (CL6)	NA
178 (CL7)	NA
183 (CL7)	NA
167 (CL6)	NA
185 (CL7)	NA
174 (CL7)	NA
177 (CL7)	NA
156/171/202(CL6/7/8)	NA
200 (CL8)	NA
172 (CL7)	NA
191 (CL7)	NA
201 (CL8)	NA
196 (CL8)	NA
189 (CL7)	NA
194 (CL8)	NA
205 (CL9)	NA

Data reported on a dry weight basis and corrected for surrogate recovery

LABNAME: GERG/TAMU DATE: 05-May-92 LAB APPROVAL: Terry L. Wade

QUALITY ASSURANCE DATA SUMMARIES FOR TRACE METALS

FIELD DUPLICATES

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Field Duplicates				
STATION ID:	IB-1-A	IB-1-B	IB-1-C	IB-2-A	IB-2-B
LABSAMNO:	910841	910842	910845	910843	910844
ANALYTE:	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL
Bulk Parameters					
TOC (%):	3.0	NA	NA	3.3	NA
ORG NITROGEN (ppm):	2383	NA	NA	2278	NA
% SAND:	6.3	AN	NA	11.5	NA
% SILT:	57.7	NA	NA	46.8	NA
% CLAY:	36.0	NA	NA	41.7	NA
Elemental Analyses					
UNITS:	ppm	ppm	ppm	ppm	ppm
Ag:	0.57	0.59	0.59	0.46	0.49
As:	12.80	15.60	14.70	9.90	10.30
Cd:	0.564	0.631	0.620	0.524	0.527
Cr:	82	83	84	85	81
Cu:	48.40	46.60	47.80	29.60	33.70
Hg:	0.269	0.289	0.300	0.271	0.284
Ni:	34.0	32.5	33.6	32.1	30.8
Pb:	55.6	63.3	61.9	49.9	50.1
Se:	0.69	0.76	0.87	0.69	0.67
Zn:	125	139	135	109	110
UNITS:	%	%	%	%	%
Fe:	3.61	3.60	3.56	3.38	3.43

Data reported on a dry weight basis

LABNAME: GERG/TAMU   DATE: 17-Apr-92   LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Field Duplicates	
STATION ID:	SW-4	SW-4-D
LABSAMNO:	910809	910810
ANALYTE:	CONC DB QUAL	CONC DB QUAL
Bulk Parameters		
TOC (%):	1.9	1.8
ORG NITROGEN (ppm):	766	546
% SAND:	68.6	65.3
% SILT:	21.7	26.4
% CLAY:	9.7	8.4
Elemental Analyses		
UNITS:	ppm	ppm
Ag:	0.19	0.19
As:	1.62	2.84
Cd:	0.213	0.197
Cr:	31	26
Cu:	7.92	9.86
Hg:	0.097	0.075
Ni:	7.8	6.4
Pb:	32.0	30.1
Se:	0.23	0.22
Zn:	35	35
UNITS:	%	%
Fe:	0.98	0.89

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

LAB QA DUPLICATES

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Lab QA Duplicates				
STATION ID:	OB-7	OB-7	CS-6	CS-6	WB-5
LABSAMNO:	910791-A	910791-B	910804-A	910804-B	910826-A
ANALYTE:	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL
Bulk Parameters					
TOC (%):	NA	NA	NA	NA	NA
ORG NITROGEN (ppm):	NA	NA	NA	NA	NA
% SAND:	NA	NA	NA	NA	NA
% SILT:	NA	NA	NA	NA	NA
% CLAY:	NA	NA	NA	NA	NA
Elemental Analyses					
UNITS:	ppm	ppm	ppm	ppm	ppm
Ag:	0.14	0.17	0.08	0.07	0.16
As:	11.2	12.5	4.81	5.49	15.3
Cd:	0.240	0.251	0.050	0.053	0.536
Cr:	NA	NA	NA	NA	NA
Cu:	14.4	13.8	5.96	6.04	21.1
Hg:	NA	NA	NA	NA	0.069
Ni:	24.7	24.7	14.9	15.5	36.1
Pb:	36.4	35.3	20.5	20.9	28.2
Se:	0.75	0.69	0.32	0.31	0.71
Zn:	75	75	47	45	149
UNITS:	%	%	%	%	%
Fe:	NA	NA	NA	NA	NA

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

Lab QA Duplicates

STATION ID:	WB-5	CS-5	CS-5	OB-4	OB-4
LABSAMNO:	910826-B	910803-A	910803-B	910788-A	910788-B
ANALYTE:	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL
Bulk Parameters					
TOC (%):	NA	NA	NA	NA	NA
ORG NITROGEN (ppm):	NA	NA	NA	NA	NA
% SAND:	NA	NA	NA	NA	NA
% SILT:	NA	NA	NA	NA	NA
% CLAY:	NA	NA	NA	NA	NA
Elemental Analyses					
UNITS:	ppm	ppm	ppm	ppm	ppm
Ag:	0.15	0.08	0.11	NA	NA
As:	14.8	5.07	5.00	NA	NA
Cd:	0.522	0.036	0.035	NA	NA
Cr:	NA	NA	NA	NA	NA
Cu:	22.0	5.58	5.03	NA	NA
Hg:	0.070	NA	NA	0.109	0.099
Ni:	34.0	15.8	16.4	NA	NA
Pb:	26.5	20.3	19.8	NA	NA
Se:	0.76	0.11	0.16	NA	NA
Zn:	130	38	38	NA	NA
UNITS:	%	%	%	%	%
Fe:	NA	NA	NA	NA	NA

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Lab QA Duplicates				
STATION ID:	OB-5	OB-5	WB-4	WB-4	OB-1
LABSAMNO:	910789-A	910789-B	910825-A	910825-B	910785-A
ANALYTE:	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL
Bulk Parameters					
TOC (%):	NA	NA	NA	NA	NA
ORG NITROGEN (ppm):	NA	NA	NA	NA	NA
% SAND:	NA	NA	NA	NA	NA
% SILT:	NA	NA	NA	NA	NA
% CLAY:	NA	NA	NA	NA	NA
Elemental Analyses					
UNITS:	ppm	ppm	ppm	ppm	ppm
Ag:	NA	NA	NA	NA	NA
As:	NA	NA	NA	NA	NA
Cd:	NA	NA	NA	NA	NA
Cr:	NA	NA	NA	NA	86
Cu:	NA	NA	NA	NA	NA
Hg:	0.089	0.082	0.081	0.084	NA
Ni:	NA	NA	NA	NA	NA
Pb:	NA	NA	NA	NA	NA
Se:	NA	NA	NA	NA	NA
Zn:	NA	NA	NA	NA	NA
UNITS:	%	%	%	%	%
Fe:	NA	NA	NA	NA	3.88

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Lab QA Duplicates				
STATION ID:	OB-1	CS-3	CS-3	WB-1	WB-1
LABSAMNO:	910785-B	910801-A	910801-B	910822-A	910822-B
ANALYTE:	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL
Bulk Parameters					
TOC (%):	NA	NA	NA	NA	NA
ORG NITROGEN (ppm):	NA	NA	NA	NA	NA
% SAND:	NA	NA	NA	NA	NA
% SILT:	NA	NA	NA	NA	NA
% CLAY:	NA	NA	NA	NA	NA
Elemental Analyses					
UNITS:	ppm	ppm	ppm	ppm	ppm
Ag:	NA	NA	NA	NA	NA
As:	NA	NA	NA	NA	NA
Cd:	NA	NA	NA	NA	NA
Cr:	90	54	45	73	68
Cu:	NA	NA	NA	NA	NA
Hg:	NA	NA	NA	NA	NA
Ni:	NA	NA	NA	NA	NA
Pb:	NA	NA	NA	NA	NA
Se:	NA	NA	NA	NA	NA
Zn:	NA	NA	NA	NA	NA
UNITS:	%	%	%	%	%
Fe:	3.87	2.20	2.24	3.30	3.28

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Lab QA Duplicates	
STATION ID:	EB-9	EB-9
LABSAMNO:	910838-A	910838-B
ANALYTE:	CONC DB QUAL	CONC DB QUAL
Bulk Parameters		
TOC (%):	NA	NA
ORG NITROGEN (ppm):	NA	NA
% SAND:	NA	NA
% SILT:	NA	NA
% CLAY:	NA	NA
Elemental Analyses		
UNITS:	ppm	ppm
Ag:	NA	NA
As:	NA	NA
Cd:	NA	NA
Cr:	101	96
Cu:	NA	NA
Hg:	NA	NA
Ni:	NA	NA
Pb:	NA	NA
Se:	NA	NA
Zn:	NA	NA
UNITS:	%	%
Fe:	3.30	3.31

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

MATRIX SPIKES

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

Matrix Spikes

STATION ID:	OB-2		OB-4		EB-1		OB-6		OB-1	
LABSAMNO:	910786-SPK		910788-SPK		910831-SPK		910790-SPK		910785-SPK	
ANALYTE:	% RECOV	DB QUAL	% RECOV	DB QUAL	% RECOV	DB QUAL	% RECOV	DB QUAL	% RECOV	DB QUAL
Bulk Parameters										
TOC (%):		NA		NA		NA		NA		NA
ORG NITROGEN (ppm):		NA		NA		NA		NA		NA
% SAND:		NA		NA		NA		NA		NA
% SILT:		NA		NA		NA		NA		NA
% CLAY:		NA		NA		NA		NA		NA
Elemental Analyses										
UNITS:	%		%		%		%		%	
Ag:	90.1		84.0		87.3		91.9			NA
As:	84.1		98.9		107.0		82.7			NA
Cd:	108.0		100.0		104.0		94.4			NA
Cr:		NA		NA		NA		NA		NA
Cu:	103.0		99.7		82.6		89.0			NA
Hg:	101	NA		NA		NA		NA	98.5	
Ni:	101.0		90.5		103.0		96.8			NA
Pb:	114.0		110.0		105.0		114.0			NA
Se:	99.3		75.2		90.0		81.9			NA
Zn:	96.0		112.0		99.0		93.0			NA
UNITS:	%		%		%		%		%	
Fe:		NA		NA		NA		NA		NA

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Matrix Spikes									
STATION ID:	SW-15		WB-1		WB-9		SW-4		IB-3	
LABSAMNO:	910821-SPK		910822-SPK		910830-SPK		910809-SPK		910846-SPK	
ANALYTE:	% RECOV	DB QUAL	% RECOV	DB QUAL	% RECOV	DB QUAL	% RECOV	DB QUAL	% RECOV	DB QUAL
Bulk Parameters										
TOC (%):		NA		NA		NA		NA		NA
ORG NITROGEN (ppm):		NA		NA		NA		NA		NA
% SAND:		NA		NA		NA		NA		NA
% SILT:		NA		NA		NA		NA		NA
% CLAY:		NA		NA		NA		NA		NA
Elemental Analyses										
UNITS:	%		%		%		%		%	
Ag:		NA		NA		NA		NA		NA
As:		NA		NA		NA		NA		NA
Cd:		NA		NA		NA		NA		NA
Cr:		NA		NA	102		88		103	
Cu:		NA		NA		NA		NA		NA
Hg:	105		107			NA		NA		NA
Ni:		NA		NA		NA		NA		NA
Pb:		NA		NA		NA		NA		NA
Se:		NA		NA		NA		NA		NA
Zn:		NA		NA		NA		NA		NA
UNITS:	%		%		%		%		%	
Fe:		NA		NA	105		95.6		106	

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Matrix Spikes	
STATION ID:	OB-9	
LABSAMNO:	910793-SPK	
ANALYTE:	% RECOV	DB QUAL
Bulk Parameters		
TOC (%):		NA
ORG NITROGEN (ppm):		NA
% SAND:		NA
% SILT:		NA
% CLAY:		NA
Elemental Analyses		
UNITS:	%	
Ag:		NA
As:		NA
Cd:		NA
Cr:	92	
Cu:		NA
Hg:		NA
Ni:		NA
Pb:		NA
Se:		NA
Zn:		NA
UNITS:	%	
Fe:	96.4	

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

STANDARD REFERENCE MATERIALS

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

STATION ID:	Reference Materials REPORTED VALUES		SRM			SRM			SRM			SRM		
LABSAMNO:	BEST		BEST-1			BEST-2			BEST-3			BEST-4		
ANALYTE:	CONC	+/-	CONC	DB	QUAL	CONC	DB	QUAL	CONC	DB	QUAL	CONC	DB	QUAL
Bulk Parameters														
TOC (%):				NA			NA			NA			NA	
ORG NITROGEN (ppm):				NA			NA			NA			NA	
% SAND:				NA			NA			NA			NA	
% SILT:				NA			NA			NA			NA	
% CLAY:				NA			NA			NA			NA	
Elemental Analyses														
UNITS:	ppm	ppm	ppm			ppm			ppm			ppm		
Ag:				NA			NA			NA			NA	
As:				NA			NA			NA			NA	
Cd:				NA			NA			NA			NA	
Cr:				NA			NA			NA			NA	
Cu:				NA			NA			NA			NA	
Hg:	0.092	0.009	0.078			0.085			0.088			0.082		
Ni:				NA			NA			NA			NA	
Pb:				NA			NA			NA			NA	
Se:				NA			NA			NA			NA	
Zn:				NA			NA			NA			NA	
UNITS:	%	%	%			%			%			%		
Fe:				NA			NA			NA			NA	

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

STATION ID:	Reference Materials REPORTED VALUES		SRM	SRM	SRM	SRM
LABSAMNO:	NBS-1646		NBS-1646-1	NBS-1646-2	NBS-1646-3	NBS-1646-4
ANALYTE:	CONC	+/-	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL
Bulk Parameters						
TOC (%):			NA	NA	NA	NA
ORG NITROGEN (ppm):			NA	NA	NA	NA
% SAND:			NA	NA	NA	NA
% SILT:			NA	NA	NA	NA
% CLAY:			NA	NA	NA	NA
Elemental Analyses						
UNITS:	ppm	ppm	ppm	ppm	ppm	ppm
Ag:			NA	NA	NA	NA
As:			NA	NA	NA	NA
Cd:			NA	NA	NA	NA
Cr:	76	3	75	74	75	76
Cu:			NA	NA	NA	NA
Hg:			NA	NA	NA	NA
Ni:			NA	NA	NA	NA
Pb:			NA	NA	NA	NA
Se:			NA	NA	NA	NA
Zn:			NA	NA	NA	NA
UNITS:	%	%	%	%	%	%
Fe:	3.35	0.100	3.34	3.31	3.32	3.32

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Reference Materials					
STATION ID:	REPORTED VALUES		SRM	SRM	SRM	SRM
LABSAMNO:	NBS-1646		NBS-1646-1	NBS-1646-2	NBS-1646-3	NBS-1646-4
ANALYTE:	CONC	+/-	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL
Bulk Parameters						
TOC (%):			NA	NA	NA	NA
ORG NITROGEN (ppm):			NA	NA	NA	NA
% SAND:			NA	NA	NA	NA
% SILT:			NA	NA	NA	NA
% CLAY:			NA	NA	NA	NA
Elemental Analyses						
UNITS:	ppm	ppm	ppm	ppm	ppm	ppm
Ag:			NA	NA	NA	NA
As:			NA	NA	NA	NA
Cd:			NA	NA	NA	NA
Cr:	76	3	75	74	75	76
Cu:			NA	NA	NA	NA
Hg:			NA	NA	NA	NA
Ni:			NA	NA	NA	NA
Pb:			NA	NA	NA	NA
Se:			NA	NA	NA	NA
Zn:			NA	NA	NA	NA
UNITS:	%	%	%	%	%	%
Fe:	3.35	0.100	3.34	3.31	3.32	3.32

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

STATION ID:	SRM
LABSAMNO:	NBS-1646-5
ANALYTE:	CONC DB QUAL

Bulk Parameters

TOC (%):	NA
ORG NITROGEN (ppm):	NA
% SAND:	NA
% SILT:	NA
% CLAY:	NA

Elemental Analyses

UNITS:	ppm
Ag:	NA
As:	NA
Cd:	NA
Cr:	79
Cu:	NA
Hg:	NA
Ni:	NA
Pb:	NA
Se:	NA
Zn:	NA
UNITS:	%
Fe:	3.45

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

	Reference Materials				
STATION ID:	REPORTED VALUES		SRM	SRM	SRM
LABSAMNO:	BCSS		MESS A-100	MESS B-129	MESS-1 126
ANALYTE:	CONC	+/-	CONC DB QUAL	CONC DB QUAL	CONC DB QUAL
Bulk Parameters					
TOC (%):			NA	NA	NA
ORG NITROGEN (ppm):			NA	NA	NA
% SAND:			NA	NA	NA
% SILT:			NA	NA	NA
% CLAY:			NA	NA	NA
Elemental Analyses					
UNITS:	ppm	ppm	ppm	ppm	ppm
Ag:			0.15	0.15	0.15
As:	10.6	1.20	9.36	10.0	10.0
Cd:	0.590	0.100	0.653	0.604	0.698
Cr:			NA	NA	NA
Cu:	25.1	3.80	24.5	24.9	25.1
Hg:			NA	NA	NA
Ni:	29.5	2.70	25.9	27.5	25.8
Pb:	34.0	6.1	33.5	35.3	33.4
Se:	0.34	0.06	0.42	0.45	0.47
Zn:	191	17	168	170	169
UNITS:	%	%	%	%	%
Fe:			NA	NA	NA

Data reported on a dry weight basis

LABNAME: GERG/TAMU   DATE: 17-Apr-92   LAB APPROVAL: Terry L. Wade

NATIONAL ESTUARY PROGRAM - METAL QA DATA - CASCO BAY - 1991

STATION ID:	SRM
LABSAMNO:	NBS-1646-5
ANALYTE:	CONC DB QUAL

Bulk Parameters

TOC (%):	NA
ORG NITROGEN (ppm):	NA
% SAND:	NA
% SILT:	NA
% CLAY:	NA

Elemental Analyses

UNITS:	ppm
Ag:	NA
As:	NA
Cd:	NA
Cr:	79
Cu:	NA
Hg:	NA
Ni:	NA
Pb:	NA
Se:	NA
Zn:	NA
UNITS:	%
Fe:	3.45

Data reported on a dry weight basis

LABNAME: GERG/TAMU DATE: 17-Apr-92 LAB APPROVAL: Terry L. Wade