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An Assessment of Chemical Contaminants in Biota from the Salt River Bay National Historical Park and Ecological Preserve, St. Croix, US Virgin Islands

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Table of Contents

Appendices

List of Tables

List of Figures

Abstract

This project was requested by the USVI Department of Planning and Natural Resources, and resulted in the collection and analysis of biota for a suite of chemical contaminants within the estuarine portion of the Salt River Bay National Historical Park and Ecological Preserve or SARI. The project added to work published in 2020 by NOAA's NCCOS, to assess chemical contaminants in sediments along with sediment toxicity.

Working closely with partners from the USVI Department of Planning and Natural Resources and the US National Park Service, samples of fish (17) and crabs (5) were collected non-randomly during another NCCOS project to assess fish movements in the SARI.

The biota samples for the project were analyzed for a suite of over 270 organic (e.g., hydrocarbons and pesticides) and inorganic (e.g., metals) chemical contaminants.

To assess human health implications, concentrations of the contaminants were converted to a wet weight basis, and then compared to available USEPA chemical contaminant screening values (SVs) established for subsistence and recreational fishers.

Wet weight concentrations of total PAHs, total DDTs, and butyltins were all below screening values for both subsistence and recreational fishers. However, total PCBs in tissue samples from the marina area, Mangrove Lagoon and Sugar Bay exceeded USEPA screening values for subsistence fishers for both fish and crabs. In the upper part of Sugar Bay, total PCB concentrations approached the recreational fisher guideline, indicating that additional monitoring for PCBs could be warranted.

It is important to quantify concentrations of chemical contaminants, in order to understand how chemical stressors may be impacting the environment and human health. This project resulted in the quantification of chemical contaminants highlighting areas of concern, and provided a baseline that can be used to assess future changes.

INTRODUCTION

Located on the north shore of the island of St. Croix in the US Virgin Islands (USVI), the Salt River Bay National Historical Park and Ecological Preserve or SARI (Figure 1) has an area of approximately 410 hectares (1,015 acres). Throughout this report, the area will be referred to as the SARI (short for Salt River) or the park. The SARI was created in 1992 by Public Law 102-247 of the 102d Congress, in order to "preserve, protect, and interpret for the benefit of present and future generations certain nationally significant historical, cultural, and natural sites" (USC, 1992). The legislation also established that management of the park was to be carried out as a partnership between the federal government and the Government of the USVI.

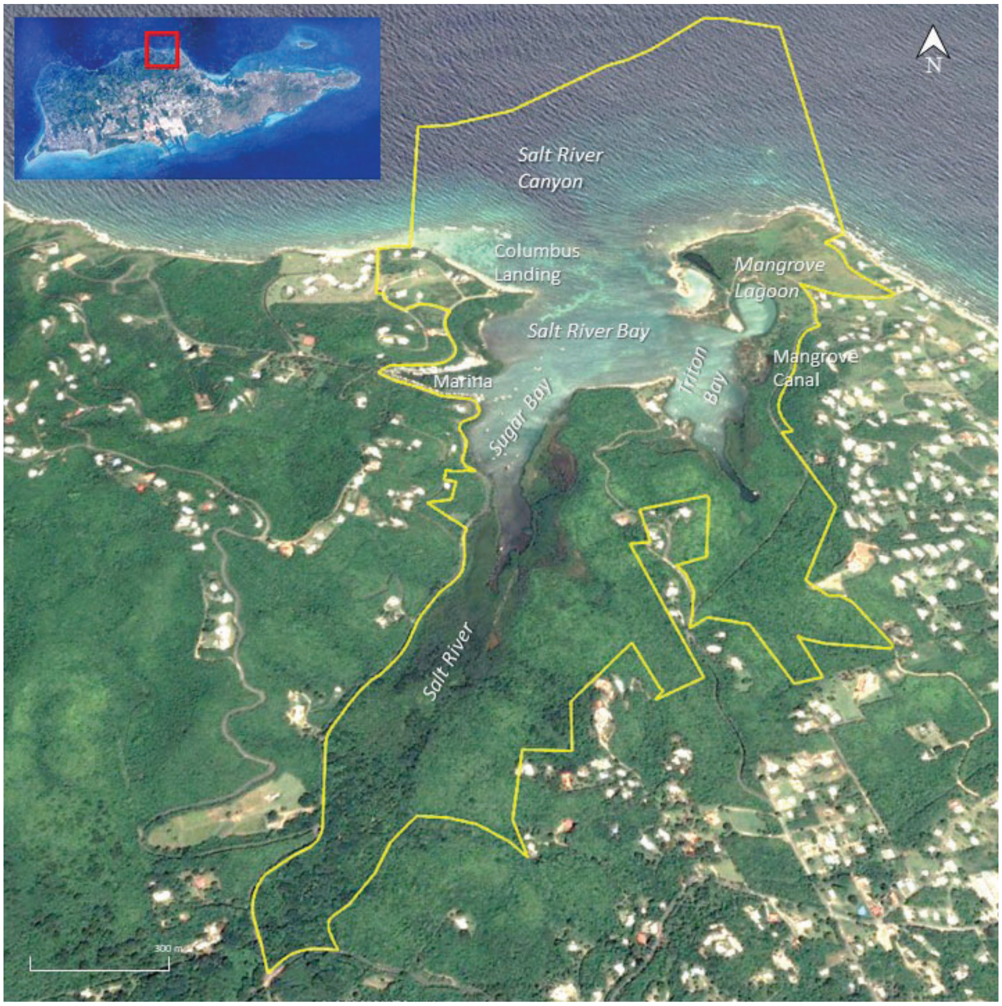

Figure 1. Borders and areas within the Salt River National Historical Park and Ecological Preserve (SARI).

History

The area around the SARI has been occupied by humans for more than 2,000 years. Archaeological evidence indicates that the Igneri, Taino, and Carib civilizations inhabited the area up until the late 15th century. In 1493, on his second voyage to the Americas, Christopher Columbus landed at a point near the entrance to Salt River Bay (Figure 1). In the years following the arrival of Columbus, the island of St. Croix changed hands numerous times, including the Spanish, English, Dutch, French and Danes. In 1916, St. Croix was purchased from Denmark by the US along with St. Thomas and St. John. In addition to the Columbus landing site, prehistoric artifacts from around 350 AD, that included a ceremonial ball court and village along with a burial ground, have been discovered. Remnants of Fort Sale, originally an eleven gun earthen fortification started in 1641 by English colonists were also found in the area, near the Columbus landing site.

Estuary and Watershed

Salt River Bay (Figure 1) along with Triton Bay and Sugar Bay, have been classified as an estuary that drains to a well-developed submarine canyon (Hubbard, 1989). Salt River is the principal gut that drains to the SARI (IRF, 1993). Currently, freshwater flows down into Sugar Bay only during periods of high rainfall, as might occur during thunderstorms or tropical storms (Kendall *et al*., 2005). The watershed (Figure 2), has an area of approximately 1,165 hectares (NPS, 2008), making it the second largest watershed on St. Croix.

Figure 2. Salt River Bay watershed, with an area of approximately 1,165 hectares (2,880 acres), is the second largest on St. Croix (NPS, 2008). The watershed is composed of the Northcentral St. Croix USGS HUC unit (21020002010020).

The estuary is separated from the submarine canyon by a narrow barrier reef. The Salt River Canyon (Figure 1) has a depth of nearly 300 meters. Salinity within the estuary ranges from 33 to 36 parts per thousand (ppt) during most of the year, but drops in salinity, particularly in the upper reaches of Sugar and Triton Bays result from heavy rainfall (Hubbard, 1989). Higher salinities can also occur in these areas, as a result of evaporation and periods of low rainfall.

SARI Habitats and Biota

The SARI contains a variety of habitats including mangrove forests, dry forests, a salt pond, a freshwater marsh, extensive seagrass beds and coral reefs. Salt River Bay has been described as the most productive nursery area for both commercial and recreational species of fish and crustacea on St. Croix, and possibly in the USVI (Sladen, 1988). Factors that have been associated with this productivity include the relatively large area of the estuary, nutrient-rich waters supporting a complex food web, extensive seagrass meadows and mangrove forests providing habitat and food for larval and juvenile species, and adjacent and extensive coral reefs, all in relatively close proximity.

Species of fish found in Salt River Bay include white mullet (*Mugil curema*), dwarf herring (*Jenkinsia lamprotaenia*), bonefish (*Albula vulpes*), schoolmaster snapper (*Lutjanus apodus*), and gray snapper (*Lutjanus griseus)* (IRF, 1993). IRF (1993) also identified queen conch (*Lobatus gigas*), Caribbean spiny lobster (*Panulirus argus*), and the flat tree oyster (*Isognomen allatus*) as inhabitants.

Within the SARI, mangroves were estimated to cover approximately 19 hectares as of 2000 (Kendall *et al.,* 2005). At one time, the highest concentration of mangroves in the USVI could be found in the SARI. However storms, particularly hurricanes, along with development have reduced the amount of mangroves present. Mangroves have a variety of functions including providing habitat for biota, particularly juvenile fish, and are important in trapping sediments. In the St. Thomas East End Reserves (STEER), mangroves were also shown to provide an important buffer, protecting the adjacent marine protected area of the STEER from inputs of terrestrial contaminants (*e.g*., metals) originating from an adjacent landfill, through a process of sediment trapping and slowing of water entering from upland areas (Keller *et al.*, 2017).

In 1988, a year prior to Hurricane Hugo, mangroves within the SARI had an area estimated at 22 hectares. Following Hugo, the area of mangroves within SARI decreased to only 12 hectares, but as of 2000, had recovered 54 percent of the extent of the 1988 forest (Kendall *et al.*, 2005). In September 2017, Irma and then Maria, both Category 5 hurricanes, severely impacted the USVI including St. Croix, and likely again reduced the extent of mangroves in the SARI. During the field work for this project in September 2018, dead mangroves were seen in Sugar Bay and also in Mangrove Lagoon (Figure 3).

The seagrasses in the SARI, primarily turtlegrass (*Thalassia testudinum)* and manatee grass (*Syringodium filiforme)* are found in Salt River Bay and extend out to the barrier reefs, providing shelter for various fish and shellfish species. Further southward in Sugar Bay and Triton Bay, waters are too turbid for seagrasses to flourish. The area of seagrasses in SARI was estimated at 21.6 hectares by Kendall *et al.* (2005) using imagery from 2000.

The barrier reefs at the mouth of the bay mark the beginning of a broad expanse of coral reefs in the SARI. The reefs occur in an east/west axis, and includes Salt River Canyon. The total area of coral reef and hardbottom area in SARI estimated by Kendall *et al.*, (2005), was slightly over 116 hectares. The authors acknowledged this figure is likely an underestimate, as deeper waters, particularly in the northern part of the SARI, precluded visual identification. Much of the floor of the canyon is characterized as uncolonized hardbottom and reef rubble, while the walls are colonized with corals.


Figure 3. Dead mangroves seen in the SARI, possibly related to the effects of Hurricanes Irma and Maria.

Most of the research on the species of coral, fish, crustacea, and other organisms in the reefs in SARI, have taken place in Salt River Canyon. From that work, over 40 species of corals, including *Montastraea cavernosa* (great star coral), *Madracis decactis* (ten-ray star coral), *Porites astreoides* (mustard hill coral), *Siderastrea siderea* (massive starlet coral), *Orbicella* spp. and *Agaricia* species, have been identified. In addition, over 85 species of sponges, along with nearly 200 species of fish have reportedly been recorded over the years in the area of Salt River Canyon (Kendall *et al.,* 2005; Ennis *et al.*, 2019). The west wall of the canyon is steeper than the east wall, and has greater coral coverage (Kendall *et al.,* 2005). It is thought that the longshore (east to west) transport and impact of sediments on organisms on the east wall, is responsible for the lower cover and smaller size of corals present there (Hubbard, 1989).

Water Currents and Sediments

Water currents within the SARI are largely driven by wind and wave action, with a smaller contribution from tides (Kendall *et al.*, 2005). Trade winds blowing from east to west typically transport water over the barrier reef and into Salt River Bay. Depending on the wind and waves, water can pile up in SARI, which then exits through Salt River Canyon once the winds have subsided or during ebb tides. Sediments within the SARI vary greatly in terms of texture and composition. In Salt River Canyon, course-grained carbonate sediments dominate, derived from the bioerosion of corals (Kendall *et al.,* 2005). Carbonate sediments predominate in the main body of Salt River Bay, and along the sides of Sugar Bay. In the central portions of Salt River Bay and also in Sugar Bay, there is a transition to finer sediments, including silts and clays of terrestrial origin.

Hubbard (1989) noted there is little evidence of significant transport of terrigenous sediments out of Salt River Bay and into Salt River Canyon. This has been attributed to the emergent barrier reefs at the mouth of Salt River Bay, which under normal circumstances separate estuarine from open marine sedimentation (Hubbard, 1989). Tropical storms or hurricanes likely result in some terrestrial sediment being transported past the barrier reefs and out into Salt River Canyon. Williams (1988) noted, however, that even after winds from a tropical storm in 1984 that produced three meter high waves breaking over the barrier reefs, there was only a thin brown layer of terrestrially-derived sediment on the marine sediments in Salt River Canyon, indicating how effectively the barrier reefs function in preventing the transport of sediments out of the estuary and into the canyon. Because of this, it would appear that the finer-grained sediments transported from terrestrial sources would likely tend to remain in the estuarine portion of the SARI, along with any attached chemical contaminants that could then be accumulated in biota.

Moving further up into Sugar Bay, terrestrial sediments tend to dominate. Sediments with higher silt and clay content readily accumulate contaminants, including organic (carbon-containing) chemical contaminants and metals that may be present, compared to larger grained sediments such as sand or gravel found further out in Salt River Bay. The reason for this is that finer grain size sediments (silt and clay) have correspondingly higher surface areas, along with sediment particle characteristics (*e.g.*, typically higher organic carbon content) that increase the adsorption of chemical contaminants. IRF (1993) noted that the relatively poor flushing capacity of this estuary, particularly in the back waters of Sugar Bay and Triton Bay, makes these areas more vulnerable to the effects of pollution.

Land Use and Land Cover

Using aerial photography, Kendall *et al.*, (2005) estimated the coverage of various land cover/land uses. The total land area within SARI was estimated at 145 hectares. The underwater benthic habitat within the SARI is larger, with an area of approximately 250 hectares. There has been substantial modification of the shoreline in the SARI (IRF, 1993; Kendall *et al*., 2005; NPS, 2008) Dredging activities have been used to create a number of features within the SARI including the marina, Mangrove Lagoon, and Mangrove Canal. Located on the east side of Triton Bay, Mangrove Canal is the result of an abandoned marina project (Figure 1). Dredged material has also been placed at several locations around the perimeter of the SARI creating new land and influencing the composition (*e.g.*, salt content) of the soils (NPS, 2008).

Figure 4. Boat provided by the National Park Service for the collection of biota in the SARI.

The largest land cover within the SARI has been identified as dry forest. Kendall *et al.* (2005) estimated total forest cover at 106 hectares, or roughly 73 percent of the land area in the SARI from 2000 imagery. As noted in NPS (2008), the bulk of the semi-deciduous dry forest is located in the southern inland portions of the SARI. Naturally vegetated fields accounted for approximately 14 hectares in 2000, concentrated in the northeastern and northwestern portions of the park (Kendall *et al.*, 2005). Shrubs and bushes accounted for roughly 11 hectares, concentrated mostly in the northern part of the SARI, on either side of the mouth of Salt River Bay. IRF (1993) indicated some agricultural activity in the lower reaches of the Salt River floodplain at the time. Kendall *et al.* (2005) estimated approximately 1.4 hectares of what appeared to be crop rows. In the current project, no clear evidence of agricultural row crop activity could be seen in this area or other parts of the SARI.

Developed area in 2000 accounted for 3.1 hectares, or 2 percent of the land area in the SARI (Kendall *et al.*, 2005). Developed residential areas accounted for 1.7 hectares; developed commercial areas accounted for 1.4 hectares. At the writing of their report, the authors noted land clearing on the bay slopes of Estate Judith's Fancy which borders SARI on the east side. More recently, NPS (2008), indicated over 30 residential homes were in this area. There are also residential developments in other areas in or bordering the SARI including Estate Salt River on the northwest side, Estate St. John in the southeast, Estate Morningstar in the southwest, and Estate Montpelier to the south.

Human Population

The total population in the vicinity of the SARI using 2000 US Census data was 773 (NPS, 2008). Septic systems are used to treat wastewater in the residences adjacent to the SARI (NPS, 2008). McKinzie *et al.* (1965) noted that the types of soils found in this part of St. Croix have severe limitations in terms of their use for septic systems, which could increase the likelihood of increased input to the SARI.

Water Quality

DPNR has established Areas of Particular Concern or APCs in the USVI. While recognizing the importance of all areas within the coastal zone, APCs are defined as those areas of greater significance. Among the factors considered for designation include significant natural, culturally important, and recreational areas. In 1991, the Coastal Zone Management (CZM) Commission of DPNR adopted 18 APCs. The SARI and the surrounding watershed are one of the APCs in the USVI. Salt River has also been highlighted by the Virgin Islands Coral Reef Advisory Group (VICRAG) for management intervention and protection (Rothenberger and Henderson, 2019).

As noted, the SARI has been subject to a variety of human activities, including dredging, along with commercial and residential development. Upland erosion from both development and land clearing activities within the watershed, some of which appears to have been abandoned, have likely increased sediment delivery, accompanied by turbidity and sedimentation within the estuarine waters of the SARI.

In accordance with the Clean Water Act, the USVI has designated waters as Class A, B or C based on their desired use. Each class has associated with it water quality criteria concentrations that should not be exceeded if the water body is to meet a designated class. The water quality criteria for the USVI include dissolved oxygen, enterococcus bacteria, phosphorus and turbidity (USVI, 2015). The waters in the SARI are designated as Class B, which sets specific maximum concentrations of the above listed parameters.


Figure 5. NCCOS scientist Matt Kendall preparing a fish trap for deployment in the SARI.

The Division of Environmental Protection of DPNR has conducted regular monitoring in the SARI over the years. Kendall *et al.* (2005) analyzed data collected from 1981 - 2002, mostly from USEPA's (US Environmental Protection Agency) STORET data base, for a number of monitoring stations within SARI for dissolved oxygen, fecal coliform, salinity, temperature, and turbidity. The USVI water quality criteria for dissolved oxygen in Class B waters is 5.5 mg/L. Results from the analysis of the 1981 - 2002 data by Kendall *et al.* (2005) indicated the mean dissolved oxygen concentration at the marina was 5.3 ±0.1 mg/L, below the criteria. At 5.4 ± 0.3 mg/L, the mean Sugar Bay dissolved oxygen concentration was also slightly below the water quality criteria.

In general, monitoring stations further upstream in the estuarine portion of the SARI had lower dissolved oxygen levels and higher turbidity levels. Kendall *et al.* (2005) also found that turbidity was elevated in Sugar Bay and Triton Bay, above the turbidity criteria of 3.0 NTU (nephelometric turbidity unit), however, Sugar Bay is exempted from this criteria due to naturally occurring conditions (USVI, 2015). The mean fecal coliform bacteria concentration (50.5 ±24.5 bacterial colonies/ 100 mL) also appeared elevated, however, the USVI criteria is for enterococcus bacteria and not for the fecal coliform bacteria measurement.

Assessments of chemical contaminants in the SARI appear to be limited. Pait *et al.* (2020) sampled sediments in the SARI for the presence of chemical contaminants and toxicity. Thirteen sediment samples were sampled randomly from four strata. The results of the contaminant analysis indicated low to moderate concentrations of the contaminants analyzed relative to published sediment quality guidelines (SQG). The only contaminants which exceeded a published sediment quality guideline were zinc and copper, both in the Marina stratum. Copper was close to a concentration at which impacts to sediment dwelling organisms can occur. In 2017, Bayless (2019) sampled sediments in Salt River Bay for organic chemical contaminants. Total PAHs at a site in the Sugar Bay stratum, near where Salt River enters the SARI, had a total PAH concentration of over 3,800 ng/g. Oostdam (1986) sampled sediments in Salt River Bay for the presence of metals. Copper was found at a concentration slightly higher than an established SQG.

NCCOS Involvement

In 2013, Woodley *et al*. (2016) investigated the reproductive health of elkhorn coral (*Acropora palmat*a) in the US Caribbean, and included sites within the SARI. Reproductive health at four sites within the SARI was found to be poor, as 20% or less of the colonies had gametes present. Beginning in 2014, DPNR and the US National Park Service (NPS) requested that NOAA's National Centers for Coastal Ocean Science (NCCOS) conduct follow up chemical contaminants assessments in the estuarine portion of the SARI, to see if contaminants were present at concentrations that could impact coral health and the health of other biota.

Working with local partners DPNR and NPS, a sampling strategy was developed for this project, and implemented to collect samples of fish and crabs for chemical contaminant analysis in the SARI. NCCOS has worked closely with DPNR on a number of contaminant-related projects in the past including in Coral Bay on St. John, and in the STEER on St. Thomas, and currently in the St. Croix East End Marine Park (STXEEMP). In addition and as noted, NCCOS' Biogeography Branch worked closely with NPS to conduct an ecological characterization of Salt River in 2005.

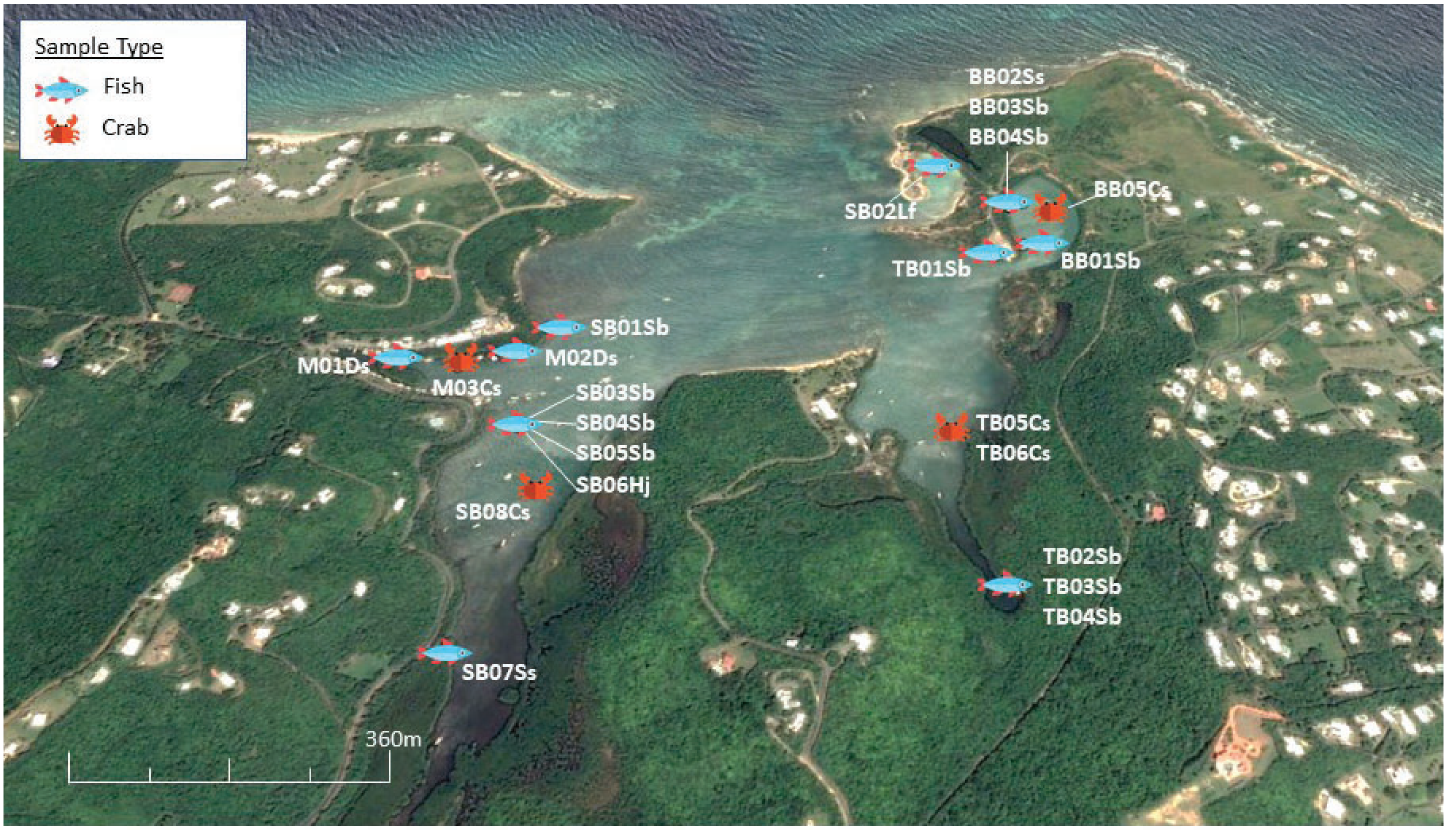

Figure 6. Location and type of biota samples collected in the SARI.

The goal of this project was to address concerns by DPNR regarding the chemical contaminants that might be present in fish and crabs, and if the concentrations exceeded established guidelines.

MATERIALS AND METHODS

Collection of Biota

The field work for this project was carried out using a boat provided by the National Park Service in St. Croix (Figure 4). A series of fish traps (Figure 5) were placed in the estuarine portion of the SARI to collect both the fish and crabs. The traps deployed were the same as those used to collect fish for a concurrent project to track the spatial and temporal movements of fish in the SARI (Kendall *et al.*, 2021a,b).

The traps were not placed randomly, but rather targeted in locations where it was thought that fish were likely to be found. Targeted sampling provides a means to assess chemical contaminants in organisms from a particular location, while randomized sampling allows for an assessment of contaminants in a predefined spatial area. In randomized sampling, the predefined area is often termed a stratum, and statistical comparisons of contaminant concentrations can then be made between strata.

The sampling of fish and crabs occurred in April 2018, September 2018, and then again in February 2019. Multiple sampling events were necessary to increase the number of sites that were sampled within the SARI. Because of multiple sampling events, a comparison of differences in contaminant concentrations in fish collected in April 2018 and in February 2019, can be made.

The traps used to collect biota were rectangular in shape with a funnel opening, and were of the same construction as those used in earlier work by Adams and Tobias (1999), who assessed mangrove prop root habitats as nursery areas for finfish in the SARI. Trap dimensions were 92 x 57 x 19 cm, and were constructed of vinyl-coated wire with a mesh size of 1.3 cm. Traps were baited with local frozen herring and placed against mangrove prop roots, parallel to the shoreline, where they remained for 24 hours (Kendall *et al.*, 2021c). Fish collected in the traps were identified to the lowest possible taxonomic level. Crabs were identified down to the genus *Callinectes*, but because the different species of this genus are difficult to distinguish without additional detailed measurements, the crabs were grouped as *Callinectes sp*. Once removed from the traps, biota were placed on ice in a cooler, and subsequently placed in a freezer at the NPS Headquarters in Christiansted. Samples were then shipped overnight to TDI-Brooks in Texas for analysis.

A total of 22 fish and crab samples were collected from Sugar Bay, Triton Bay, Mangrove Lagoon and from the marina area (Figure 6). Fish collected for analysis included schoolmaster snapper (*Lutjanus apodus*), horse-eye jack (*Caranx latus*), sea bream (*Archosargus rhomboidalis*), and dog snapper (*Lutjanus jocu*), in addition to the crabs. A list of the biota collected and analyzed for this project can be found in Table 1. The latitude and longitude coordinates where the biota were collected are included in Appendix A.

Table 1. Biota collected for analysis of chemical contaminants in the SARI.

Sample ID	Common Name	Species	Location
SB01Sb	Sea Bream	*Archosargus rhomboidalis*	Sugar Bay
TB01Sb	Sea Bream	*Archosargus rhomboidalis*	Triton Bay
TB02Sb	Sea Bream	*Archosargus rhomboidalis*	Triton Bay
BB01Sb	Sea Bream	*Archosargus rhomboidalis*	Mangrove Lagoon (Bio Bay)
TB03Sb	Sea Bream	*Archosargus rhomboidalis*	Triton Bay
TB04Sb	Sea Bream	*Archosargus rhomboidalis*	Triton Bay
SB02Lf	Lionfish	*Pterois volitans (species not certain)*	Sugar Bay
SB03Sb	Sea Bream	*Archosargus rhomboidalis*	Sugar Bay
SB04Sb	Sea Bream	*Archosargus rhomboidalis*	Sugar Bay
SB05Sb	Sea Bream	*Archosargus rhomboidalis*	Sugar Bay
SB06Hj	Horseye Jack	*Caranx latus*	Sugar Bay
BB02Ss	Schoolmaster Snapper	*Lutjanus apodus*	Mangrove Lagoon (Bio Bay)
BB03Sb	Sea Bream	*Archosargus rhomboidalis*	Mangrove Lagoon (Bio Bay)
BB04Sb	Sea Bream	*Archosargus rhomboidalis*	Mangrove Lagoon (Bio Bay)
SB07Ss	Schoolmaster Snapper	*Lutjanus apodus*	Sugar Bay
M01Ds	Dog Snapper	*Lutjanus jocu*	Marina
M02Ds	Dog Snapper	*Lutjanus jocu*	Marina
M03Cs	Crab	*Callinectes sp.*	Marina
SB08Cs	Crab	*Callinectes sp.*	Sugar Bay
BB05Cs	Crab	*Callinectes sp.*	Mangrove Lagoon (Bio Bay)
TB05Cs	Crab	*Callinectes sp.*	Triton Bay
TB06Cs	Crab	*Callinectes sp.*	Triton Bay

Tissue Chemical Contaminants

The fish and crabs collected for this project were analyzed for a suite of over 270 chemical contaminants, including organic (*e.g*., hydrocarbons and pesticides) compounds by TDI-Brooks International, and for major and trace elements (*e.g*., metals) by the NCCOS Charleston laboratory, using protocols established by NOAA's National Status and Trends (NS&T) Program. Whole organisms were analyzed. The list of chemical contaminants analyzed in the biota is shown in Table 2. The 64 polycyclic aromatic hydrocarbons (PAHs) were analyzed using gas chromatography/mass spectrometry in the selected ion monitoring mode. The 33 organochlorine pesticides and 157 polychlorinated biphenyls (PCBs) were analyzed using gas chromatography/electron capture detection. Four butyltins were analyzed using gas chromatography/flame photometric detection after derivatization. The 16 major and trace elements were analyzed using inductively coupled plasma mass spectrometry and atomic-fluorescence spectroscopy. Detailed descriptions of the NS&T protocols, including quality assurance/quality control (QA/QC) used in the analysis of the organic contaminants, can be found in Kimbrough *et al.* (2006); for inorganic analyses, Kimbrough and Lauenstein (2006). Each of these contaminant classes contains individual compounds or elements shown to be toxic to aquatic biota. A brief summary of the generation, use and impacts of these chemical contaminants follows.

Polycyclic Aromatic Hydrocarbons. Also referred to as PAHs, polycyclic aromatic hydrocarbons are associated with the use and combustion of fossil fuels (*e.g*., oil and gas) and other organic materials (*e.g*., wood and trash). Natural sources of PAHs include forest fires and the decay of vegetation. The PAHs analyzed are two to six ring aromatic compounds. A number of PAHs bioaccumulate in aquatic and terrestrial organisms, are toxic, and some including 1-methylphenanthrene, benzo[a]pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, and indeno[1,2,3-c,d]pyrene, are likely carcinogens (USDHHS, 1995).

Alkylated Hydrocarbons. In addition to the PAHs, another group of hydrocarbons, alkylated hydrocarbons, were analyzed in tissues. Alkylated hydrocarbons are straight chain or branched nonaromatic structures. Aliphatic hydrocarbons are typically associated with uncombusted fuels such gasoline, diesel or oil.

Polychlorinated Biphenyls. Commonly referred to as PCBs, polychlorinated biphenyls are synthetic compounds which have been used in numerous applications ranging from electrical transformers and capacitors, to hydraulic and heat transfer fluids, to pesticides and paints. Approximately 60 percent of PCBs manufactured in the US were used in electrical applications (EPA, 1997). PCBs have a biphenyl ring structure (two benzene rings with a carbon

Table 2. Chemical contaminants analyzed in the biota samples from the SARI.

PAHs - Low MW	PAHs - High MW	Organochlorine Pesticides	PCBs	PCBs (continued)	PCBs (continued)	PCBs (continued)	PCBs (continued)
cis/trans Decalin	Fluoranthene	Aldrin	PCB 1	PCB 51	PCB 88	PCB 134/133	PCB 170/190
C1-Decalins	Pyrene	Dieldrin	PCB 2	PCB 45	PCB 91	PCB 165/131	PCB 189
C2-Decalins	C1-Fluoranthenes/Pyrenes	Endrin	PCB 3	PCB 46/69/73	PCB 92	PCB 142/146/161	PCB 202
C3-Decalins	C2-Fluoranthenes/Pyrenes	Endrin Aldehyde	PCB 4/10	PCB 52	PCB 101/84/90	PCB 153/168	PCB 201
C4-Decalins	C3-Fluoranthenes/Pyrenes	Endrin Ketone	PCB 7/9	PCB 43	PCB 89/113	PCB 132	PCB 204
Naphthalene	C4-Fluoranthenes/Pyrenes	Heptachlor	PCB 6	PCB 49	PCB 99	PCB 141	PCB 197
C1-Naphthalenes	Naphthobenzothiophene	Heptachlor-Epoxide	PCB 8/5	PCB 48/75/47	PCB 119	PCB 137	PCB 200
C2-Naphthalenes	C1-Naphthobenzothiophenes	Oxychlordane	PCB 14	PCB 65	PCB 112	PCB 130	PCB 198
C3-Naphthalenes	C2-Naphthobenzothiophenes	Alpha-Chlordane	PCB 11	PCB 62	PCB 120/83	PCB 138/164/163	PCB 199
C4-Naphthalenes	C3-Naphthobenzothiophenes	Gamma-Chlordane	PCB 12	PCB 44	PCB 97/125/86	PCB 160/158	PCB 203/196
Benzothiophene	C4-Naphthobenzothiophenes	Trans-Nonachlor	PCB 13	PCB 59	PCB 116/117	PCB 129	PCB 195
C1-Benzothiophenes	Benz(a)anthracene	Cis-Nonachlor	PCB 15	PCB 42	PCB 111/115/87	PCB 166	PCB 194
C2-Benzothiophenes	Chrysene/Triphenylene	Alpha-HCH	PCB 19	PCB 72	PCB 109	PCB 159	PCB 205
C3-Benzothiophenes	C1-Chrysenes	Beta-HCH	PCB 30	PCB 71	PCB 85	PCB 162	PCB 208
C4-Benzothiophenes	C2-Chrysenes	Delta-HCH	PCB 18	PCB 68/41/64	PCB 110	PCB 128/167	PCB 207
Biphenyl	C3-Chrysenes	Gamma-HCH	PCB 17	PCB 40/57	PCB 82	PCB 156	PCB 206
Acenaphthylene	C4-Chrysenes	DDMU	PCB 27	PCB 67	PCB 124	PCB 157	PCB 209
Acenaphthene	Benzo(b)fluoranthene	2,4'-DDD	PCB 24	PCB 58	PCB 106/107	PCB 169	
Dibenzofuran	Benzo(k,j)fluoranthene	4,4'-DDD	PCB 16/32	PCB 63	PCB 123	PCB 188	Major and Trace Elements
Fluorene	Benzo(a)fluoranthene	2,4'-DDE	PCB 34	PCB 61/74	PCB 118/108	PCB 184	Aluminum (Al)
C1-Fluorenes	Benzo(e)pyrene	4,4'-DDE	PCB 23	PCB 76/70	PCB 114/122	PCB 179	Antimony (Sb)
C2-Fluorenes	Benzo(a)pyrene	2,4'-DDT	PCB 29	PCB 66/80	PCB 105/127	PCB 176	Arsenic (As)
C3-Fluorenes	Perylene	4,4'-DDT	PCB 26	PCB 55	PCB 126	PCB 186/178	Cadmium (Cd)
Carbazole	Indeno(1,2,3-c,d)pyrene	1,2,3,4-Tetrachlorobenzene	PCB 25	PCB 56	PCB 155	PCB 175	Chromium (Cr)
Anthracene	Dibenzo(a,h)anthracene	1,2,4,5-Tetrachlorobenzene	PCB 28/31	PCB 60	PCB 150	PCB 187/182	Copper (Cu)
Phenanthrene	C1-Dibenzo(a,h)anthracenes	Hexachlorobenzene	PCB 21/20/33	PCB 79	PCB 152	PCB 183	Iron (Fe)
C1-Phenanthrenes/Anthracenes	C2-Dibenzo(a,h)anthracenes	Pentachloroanisole	PCB 22	PCB 78	PCB 148/145	PCB 185	Lead (Pb)
C2-Phenanthrenes/Anthracenes	C3-Dibenzo(a,h)anthracenes	Pentachlorobenzene	PCB 36	PCB 81	PCB 136/154	PCB 174	Manganese (Mn)
C3-Phenanthrenes/Anthracenes	Benzo(g,h,i)perylene	Endosulfan II	PCB 39	PCB 77	PCB 151	PCB 181	Mercury (Hg)
C4-Phenanthrenes/Anthracenes		Endosulfan I	PCB 38	PCB 104	PCB 135	PCB 177	Nickel (Ni)
Dibenzothiophene	Butyltins	Endosulfan Sulfate	PCB 35	PCB 96/103	PCB 144	PCB 171	Selenium (Se)
C1-Dibenzothiophenes	Monobutyltin	Mirex	PCB 37	PCB 100	PCB 147	PCB 173	Silicon (Si)
C2-Dibenzothiophenes	Dibutyltin	Chlorpyrifos	PCB 54	PCB 94	PCB 149/139	PCB 192/172	Silver (Ag)
C3-Dibenzothiophenes	Tributyltin		PCB 50	PCB 102/98	PCB 140	PCB 180/193	Tin (Sn)
C4-Dibenzothiophenes	Tetrabutyltin		PCB 53	PCB 121/93/95	PCB 143	PCB 191	Zinc (Zn)

Abbreviations: MW, molecular weight; PAH, polycyclic aromatic hydrocarbons; HCH, hexachlorocyclohexane; DDMU, 1-chloro-2,2- (p-chlorophenyl)ethylene; DDT, dichlorodiphenyltrichloroethane; DDD, dichlorodiphenyldichloroethane; DDE, dichlorodiphenyldichloroethylene; PCB, polychlorinated biphenyl to carbon bond) and a varying number of chlorine atoms. There are 209 PCB congeners possible. PCBs were manufactured in the US between 1929 and 1977. In the US, all PCBs were produced by a single manufacturer, and the commercial products were referred to as Aroclors. Aroclors are mixtures of PCB congeners. Because PCBs bioaccumulate and degradation in the environment proceeds only slowly, they are now ubiquitous contaminants. Exposure to PCBs in fish has been linked to reduced growth, reproductive impairment and vertebral abnormalities (EPA, 1997). PCBs are also probably carcinogenic to humans (ATSDR, 2000). The manufacture of PCBs in the US was banned in 1979 due to their toxicity.

Organochlorine Pesticides. Beginning in the 1950s and continuing into the early 1970s, a series of chlorine containing hydrocarbon insecticides were used to control mosquitoes and agricultural pests. One of the best known of the organochlorine pesticides was the insecticide DDT (dichlorodiphenyltrichloroethane). Other organochlorine insecticides included aldrin, dieldrin, and chlordane.

The use of many of the organochlorine pesticides, including DDT, was banned due to their environmental persistence, potential to bioaccumulate, and in particular the chronic (*i.e.*, longer-term) effects on nontarget organisms. Organochlorine pesticides are typically neurotoxins, and DDT along with PCBs have also been shown to interfere with the endocrine system. The DDT metabolite DDE, for example, was specifically linked to eggshell thinning in birds, particularly raptors, but also in pelicans (Lincer, 1975). A number of organochlorine pesticides are toxic to nontarget aquatic life as well, including crayfish, shrimp and some species of fish. While DDT was banned by the USEPA for most uses in the US in 1972, it is still effectively used in some developing countries, particularly on the inside of living areas, to help control mosquitoes that can transmit malaria. Most uses of the organochlorine insecticide chlordane were canceled in 1978, and all uses were canceled by 1988. A primary non-agricultural use of chlordane was in the treatment of wooden structures to prevent damage by termites. Because of their persistence and heavy use in the past, residues of organochlorine pesticides can be found in the environment, including in biota. The persistence of these compounds and toxicity to nontarget organisms continues to be an environmental concern.

Butyltins. This compound class has had a range of uses, from biocides to catalysts to glass coatings. In the 1950s, tributyltin, or TBT, was first shown to have biocidal properties (Bennett, 1996). In the late 1960s, TBT was incorporated into an antifoulant paint system, quickly becoming one of the most effective paints ever used on boat hulls (Birchenough *et al*., 2002). TBT was incorporated into a polymer paint system that released the biocide at a constant and minimal rate, to control fouling organisms such as barnacles, mussels, weeds, and algae (Bennett, 1996). TBT, however, was linked to endocrine disruption, specifically an imposex (females developing male characteristics) condition in marine gastropods, and in other mollusks (*e.g.*, oysters) abnormal shell development and poor weight gain (Batley, 1996). Beginning in 1989, the use of TBT as an antifouling agent was banned in the US on non-aluminum vessels smaller than 25 meters in length (Gibbs and Bryan, 1996). In a survey of TBT in the USVI, Strand *et al.* (2009) found evidence of elevated levels of TBT and its degradation products in gastropod species, as well as imposex at several locations, including the harbor in Charlotte Amalie, St. Thomas. In the aquatic environment, TBT is degraded by microorganisms and sunlight (Bennett, 1996). The transformation involves sequential debutylization resulting in dibutyltin, monobutyltin, and finally inorganic (elemental) tin (Batley, 1996).

Trace and Major Elements. All of the major and trace elements occur naturally to some extent in the environment. Aluminum, iron, and silicon are major elements in the Earth's crust. As their name implies, trace elements occur at lower concentrations in crustal material, however, mining and manufacturing processes along with the use and disposal of products containing trace elements can lead to elevated concentrations in the environment. A number of trace elements are toxic at low concentrations. Cadmium, used in metal plating and solders, has been shown to impair development and reproduction in several invertebrate species, and osmoregulation in herring larvae (USDHHS, 1999; Eisler, 1985). Mercury is volatile and can enter the atmosphere through processes including mining, manufacturing, combustion of coal and volcanic eruptions (Eisler, 1987). Mercury is currently used in compact and other fluorescent light bulbs, electrical switches and relays, thermostats and in some dental amalgams. Effects of mercury on copepods include reduced growth and rates of reproduction (Eisler, 1987). Chromium is used in stainless steel production, chromium plating and wood preservation, to name a few applications. Chromium has been shown to reduce survival and fecundity in the cladoceran *Daphnia magna*, and reduced growth in fingerling chinook salmon (*Oncorhynchus tshawytscha*) (Eisler, 1986). Copper has a number of uses, such as in antifouling paints for boats, wood preservatives, heat exchangers in power plants, electrical wires, coinage, and in agricultural fungicides. While an essential biological element, elevated levels of copper can impact aquatic organisms, including the functioning of gills along with reproduction and development (Eisler, 1998).

Table 3. Mean, minimum, and maximum concentrations for organic compounds in SARI biota.

Compound Class	Overall Mean ±SE	Fish Mean ±SE	Crab Mean ±SE	Minimum Fish	Minimum Crab	Maximum Fish	Maximum Crab
Total PAHs	15.98 ±2.00	14.33 ±2.31	21.62 ±3.14	4.08	13.4	40.5	30.4
Total PCBs	14.58 ±3.86	14.10 ±4.21	16.23 ±10.16	0	0.88	72.2	52.4
Total DDT	0.74 ±0.18	0.64 ±0.21	1.08 ±0.33	0	0	3.34	1.82
Tributyltin (TBT)	4.18 ±1.14	5.33 ±1.38	0.52 ±0.23	0.60	0	16.9	1.19

PAHs, polycyclic aromatic hydrocarbons; PCBs, polychlorinated biphenyls; DDT, dichlorodiphenyltrichloroethane

Most of the current uses of lead appear to be in lead-acid batteries, although other uses include oxides in glass and ceramics. In the past, lead was used in paints and also in gasoline, however, these uses have ended due to environmental and human health concerns. Nickel has many applications in both industrial and consumer products. Approximately 65 percent of the nickel in the US is used to make stainless steel. Other uses include its incorporation into a series of alloys, in rechargeable batteries (Ni-Cd), catalysts, coins, plating, and in foundry products. Corrosion-resistant zinc plating of steel (hot-dip galvanization) is an important application, accounting for roughly 50 percent of zinc use. In the marine industry, zinc anodes are used to protect vital engine and boat parts (*e.g.*, propellers, struts, rudders, and outboard and inboard engines), and is a component in some antifoulant paint formulations. Zinc is also used in batteries, and in alloys such as brass.

RESULTS AND DISCUSSION

A summary of the results of the organic chemical contaminants analysis in fish and crabs from the SARI can be seen in Table 3. Additional, more detailed information on the results of the organic contaminant analysis can be seen in Appendices B - F.

Polycyclic Aromatic Hydrocarbons (PAHs)

The mean concentration of total PAHs (sum of the 64 compounds analyzed) in fish sampled from the SARI was 14.33 ±2.31 ng/g, the mean total PAH concentration in crab tissue was slightly higher, 21.62 ±3.14 ng/g (Table 3). A nonparametric Wilcoxon statistical test indicated no significant difference (Chi Square = 3.3898, *p* = 0.0656) in total PAH concentrations between fish and crabs collected for this project. The maximum concentration of total PAHs was 40.5 ng/g found in a sea bream (*Archosargus rhomboidalis*) from Mangrove Lagoon (Figure 7). More detailed results from the analysis of total PAHs in the biota analyzed can be found in Appendix B. The highest concentration in the crabs *Callinectes sp.* was similar, 30.4 ng/g from Sugar Bay.

Fish, like other vertebrate organisms, have a well developed enzyme system that can metabolize xenobiotics, including alkanes, PAHs, and pesticides (Parkinson and Ogilvie, 2008). Found primarily in the liver of vertebrate organisms, the cytochrome P450-dependent mixed function oxidase or P450 system, initiates the metabolism of these various lipophilic compound classes as well as others (Neff, 1985). In general, the transformations that occur as a result of the P450 system tend to make the compounds more water soluble, so that they can be excreted (Lech and Vodicnik, 1985). Because of their well developed cytochrome P450 system, fish typically accumulate relatively low levels of PAHs. In this project, the highest concentration of total PAHs in fish was similar to what was found in the crabs.

Because fish were collected in both April 2018 and then again in February 2019, a comparison can be made in the chemical contaminant concentrations found during these two samplings. In April 2018, the mean concentration of total PAHs in all the fish collected was 9.27 ±1.73 ng/g. In February 2019, the mean concentration of total PAHs in the fish was 20.4 ±4.20 ng/g, more than two times higher than in April 2018. A Wilcoxon nonparametric statistical test indicated this difference was significant (Chi Square = 5.6723, *p* = 0.0172).


Figure 7 Entrance to Mangrove Lagoon in the SARI.

It is not clear why there would be a difference in the mean concentration of total PAHs between these two time periods in the fish. One possibility is that the fish collected in February 2019 were collected before spawning while the fish collected in April 2018 had already spawned. Larsson *et al.* (1991) have shown that fish can pass along chemical contaminants in spawned eggs. Additional work would be needed, however, to confirm differences in total PAHs between seasons in fish in the SARI. As will be seen, several other contaminant classes also showed evidence of seasonal differences in concentration.

Table 4. USFDA Action and Tolerance levels and USEPA Screening Values for chemical contaminants in fish and shellfish. All values are wet weight concentrations (*e.g.*, ng/g wet weight).

Analyte	USFDA Action Level	USFDA Tolerance Level	USEPA Recreational Fishers Screening Value		USEPA Subsistence Fishers Screening Value	
			Noncarcinogenic	Carcinogenic	Noncarcinogenic	Carcinogenic
Organic Chemicals (ng/g)						
Aldrin or Dieldrin	300	–	–	2.5	–	0.307
Chlorpyrifos	–	–	1,200	–	147	–
Endosulfan (I and II)	–	–	24,000	–	2,949	–
Endrin	–	–	1,200	–	147	–
Heptachlor/Heptachlor epoxide	300	–	–	4.39	–	0.54
Hexachlorobenzene	–	–	–	250	–	3.07
Lindane	–	–	–	30.7	–	3.78
Mirex	100	–	800	–	98	
PAHs (benzo(a)pyrene)	–		–	5.47	–	0.673
Total Chlordane	300	–	–	114	–	14
Total DDT	5,000	–	–	117	–	14.4
Total PCBs	–	2,000	–	20	–	2.45
Tributyltin	–	–	1,200	–	147	–
Trace Elements (µg/g)						
Arsenic (inorganic)[1]	–	–	–	0.026	–	–
Cadmium	–	–	4	–	0.491	–
Mercury (methyl)	1	–	0.4	–	0.049	–

Note: all concentrations in wet weight; USFDA, US Food and Drug Administration; USEPA, US Environmental Protection Agency; toxic element guidance levels for arsenic, cadmium, lead, and nickel are no longer listed by the USFDA (USFDA, 2011).

[1] USEPA Guideline is for total inorganic arsenic rather than total arsenic; NOAA measures total arsenic.

In the St. Thomas East End Reserves (STEER), Apeti *et al*. (2016) found a mean concentration of 15.0 ± 0.97 ng/g total PAHs in fish, similar to what was found in the current study. The mean concentration of total PAHs in the tissues of schoolmaster snapper *Lutjanus apodus* in the STEER was 16.5 ± 1.16 ng/g, while those for longspine squirrelfish *Holocentrus rufus*, was 13.5 ± 1.20 ng/g.

Fish Consumption Guidelines

NOAA does not have guidelines to assess risk to fish species from chemical contaminants. Instead, possible risk to humans was evaluated by comparing the concentrations of chemical contaminants found in the fish and crabs with USEPA Screening Values for seafood, and where available USFDA (US Food and Drug Administration) Action and Tolerance levels. Table 4 includes both the USFDA and the USEPA values. The USFDA Action and Tolerance levels represent concentrations at which USFDA will take legal action to remove products from the market (USFDA, 2011). The USFDA Action Levels are established according to criteria established in the Code of Federal Regulations, and then subsequently revoked once a regulation establishing a Tolerance Level becomes effective.

The USEPA Screening Values (SVs) in Table 4 were developed to provide guidance to state, local, regional, and tribal environmental health officials for their contaminant monitoring programs, and for issuing fish and shellfish consumption advisories (USEPA, 2000).

The SVs represent a threshold concentration of concern for a chemical contaminant in fish and shellfish tissue for a critical toxic or a carcinogenic effect in humans. The SVs are based on a 70 kg body weight and for carcinogens, risk is defined as one excess cancer case per 100,000 individuals, resulting from consumption of fish contaminated with the identified contaminant. In cases where there were both carcinogenic and noncarcinogenic SVs available, the SV for the carcinogenic effect was used and included in Table 4, as recommended by the USEPA. The SVs were developed using an average fish consumption rate of 17.5 grams/day for recreational fishers, and 142.4 grams/day for subsistence fishers. Subsistence fisher SVs (contaminant concentrations) are lower than those for recreational fishers, as subsistence fishers consume fish at a higher rate (i.e., they eat more fish), and therefore would potentially accumulate higher amounts of a chemical contaminant over time. Exceedances of the SVs provide an indication of when more intensive site-specific monitoring and/or evaluation of human health risk should be conducted (USEPA, 2000).

In order to compare the concentrations of total PAHs and other chemical contaminants analyzed in this study to available USEPA SVs, the contaminant concentrations from the laboratory analysis were first converted from a dry weight measurement (*i.e.*, ng/g dry wt.) to a wet weight measurement (*i.e.*, ng/g wet wt.). The results received from the analytical laboratory are typically on a dry weight basis. The conversion from a dry weight to a wet weight basis is based on the amount of water originally in each tissue sample.

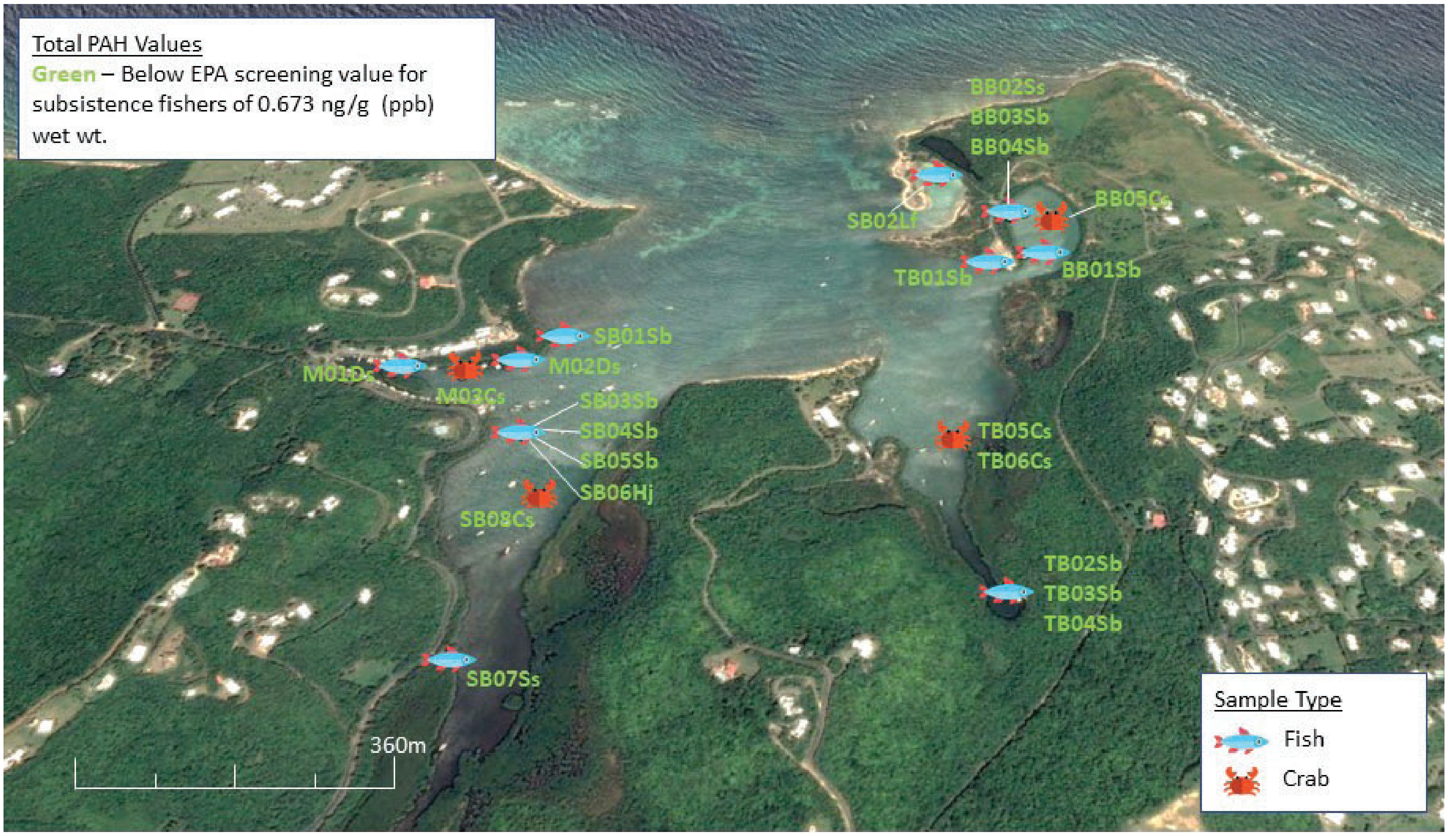

Figure 8. Total PAHs in biota collected in the SARI compared to USEPA Screening Values.

For PAHs, the USEPA has established an SV for PAHs of 5.47 ng/g wet wt. for recreational fishers, and 0.673 ng/g wet wt. for subsistence fishers (Table 4). To compare PAH concentrations in a sample to the SV, the USEPA also recommends using a series of Toxicity Equivalency Factors or TEFs, to calculate a potency-weighted total concentration or Potency Equivalency Concentration (PEC) for 14 PAHs. Toxicity is in terms of carcinogenic potential relative to the PAH benzo(a)pyrene, which has a TEF of one (1). The results of carrying out these calculations for total PAHs in the biota analyzed from the SARI can be seen in Figure 8. None of the biota (fish or crabs) sampled from the SARI, exceeded the USEPA subsistence or recreational fisher SVs for PAHs. As noted, fish have a well developed enzyme system that can metabolize xenobiotics, including PAHs. In addition, the concentration of total PAHs found in the sediment by Pait *et al.* (2020) were fairly low to begin with. Overall, these results indicate that the risk to humans from consuming fish and crabs in the SARI from PAHs would likely be low.

Polychlorinated Biphenyls (PCBs)

The overall mean concentration of total PCBs (sum of the 157 congeners analyzed) in biota from the SARI was 14.58 ±3.86 ng/g (Table 3). In fish, the mean concentration was 14.10 ±4.21 ng/g, and in crabs, the mean was 16.23 ±10.16 ng/g. The median for total PCBs in fish was 13.65 ng/g; in crabs the median total PCBs concentration was 1.78 ng/g. A Wilcoxon nonparametric test indicated no significant difference (Chi Square = 0.0015, $p = 0.9688$) in the concentration of total PCBs between the fish and crabs sampled. The highest concentration of total PCBs found in biota from the SARI was 72.2 ng/g, in a schoolmaster snapper from Sugar Bay (SB07Ss). The highest total PCB concentration in crabs was also from Sugar Bay (SB08Cs) at a concentration of 52.4 ng/g.

As with PAHs, a comparison can be made in terms of the concentration of total PCBs in fish collected in April 2018, and then in February 2019. In April 2018, the mean concentration of total PCBs in the fish collected was 6.82 ±2.98 ng/g. In February 2019, the mean concentration of total PCBs was 25.4 ±7.90 ng/g. A Wilcoxon nonparametric statistical test indicated this difference was significant (Chi Square = 5.1793, $p = 0.0229$). As with PAHs, additional work would be needed to confirm any seasonal differences in total PCBs between seasons in fish, and possible causes (e.g., effect of spawning). In the STEER, Apeti *et al*. (2016) found a mean concentration of 65.9 ± 50.1 ng/g total PCBs in fish (schoolmaster snapper and longspine squirrelfish), higher than the mean found in the SARI.

As with total PAHs, the dry weight concentrations of total PCBs can be converted to a wet weight basis, and compared to the USFDA Tolerance and Action Levels, and USEPA Screening Values. All wet weight concentrations

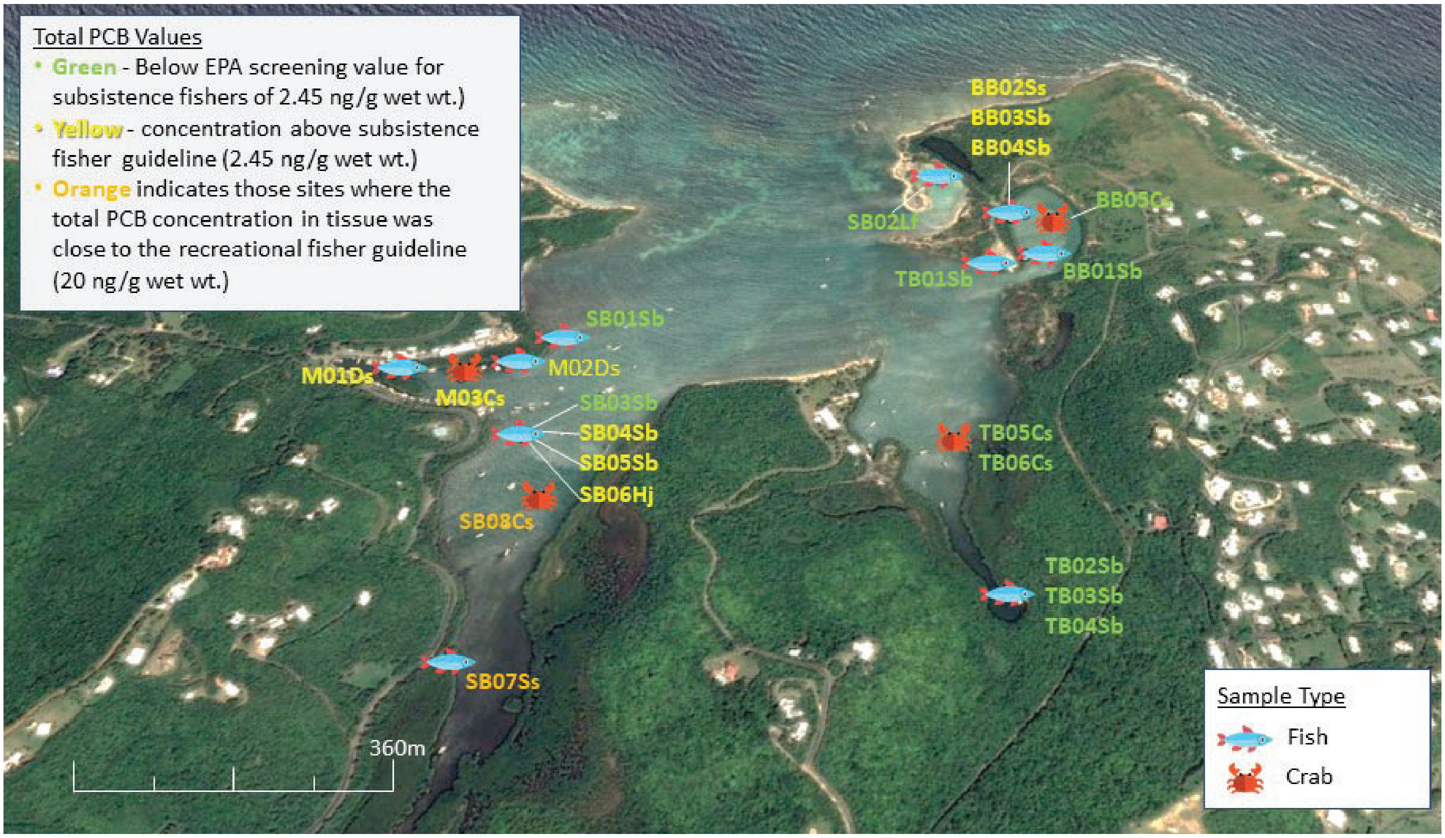

Figure 9. Total PCBs in biota collected in the SARI compared to USEPA Screening Values.

were far below the USFDA Tolerance level of 2,000 ng/g (Table 4). A comparison of the wet weight concentrations of total PCBs to the USEPA subsistence and recreational fisher SVs can be seen in Figure 9. The sites are color coded relative to the SVs. Green denotes those sites below the subsistence guideline of 2.45 ng/g wet wt. total PCBs. Yellow denotes those samples where total PCBs were above the subsistence fisher value, and orange denotes a concentration approaching the recreational fisher guideline.

Unlike total PAHs, the wet weight total PCB concentrations were in some cases above the SVs. In the marina area, dog snappers (M01Ds and M02Ds), along with the crab sample (M03Cs) were above the subsistence fisher SV. Just outside the marina area in Sugar Bay, two sea bream (SB04Sb, SB05Sb) and a horseye jack (SB06Hj) were also above the SV for subsistence fishers. In Mangrove Lagoon (Bio Bay), three fish including a schoolmaster snapper (BB02Ss), and two sea bream (BB03Sb, BB04Sb) were above the PCB SV for subsistence fishers.

In the upper part of Sugar Bay, the wet weight total PCBs tissue concentrations were even higher; a schoolmaster snapper (SB07Ss) had a total PCB concentration of 17.93 ng/g wet wt., close to the recreational fisher SV of 20 ng/g wet weight. In the crab from that area (SB08Cs), the concentration of total PCBs was 13.01 ng/g wet wt.

The concentrations of total PCBs suggest a need for more intensive site-specific evaluation of human health risk in the upper part of Sugar Bay, particularly if any subsistence fishing occurs there. Interestingly, the concentration of total PCBs found in the sediments in the upper part of Sugar Bay by Pait *et al.* (2020) were fairly low. The mean concentration of total PCBs in the sediments from the SARI was 3.63 ±.1.77 ng/g. The concentrations of total PCBs in the sediment at the sites sampled in the upper part of Sugar Bay were between 1 and 3 ng/g. The maximum concentration found in the sediments was 19.6 ng/g in the Marina stratum. PCBs readily accumulate in biota (USDHHS, 2000). The source of the PCBs in the SARI is not clear. Historically, PCBs had a wide range of uses including in electrical insulators, capacitors, and even electric appliances, until they were banned, beginning in 1979.

DDT

Total DDT (sum of seven degradation products as well as the parent compound 4,4'-DDT), was detected in some of the fish and crabs collected in the SARI. The overall mean concentration was 0.74 ±0.18 ng/g (Table 3); in fish the mean was 0.64 ±0.21 ng/g; in crabs 1.08 ±0.33 ng/g. The maximum concentration detected was 3.34 ng/g in a schoolmaster snapper from Sugar Bay (SB07Ss). There was also a significant difference (Chi Square = 6.2212, p = 0.0126) in the concentration of total DDT in fish from

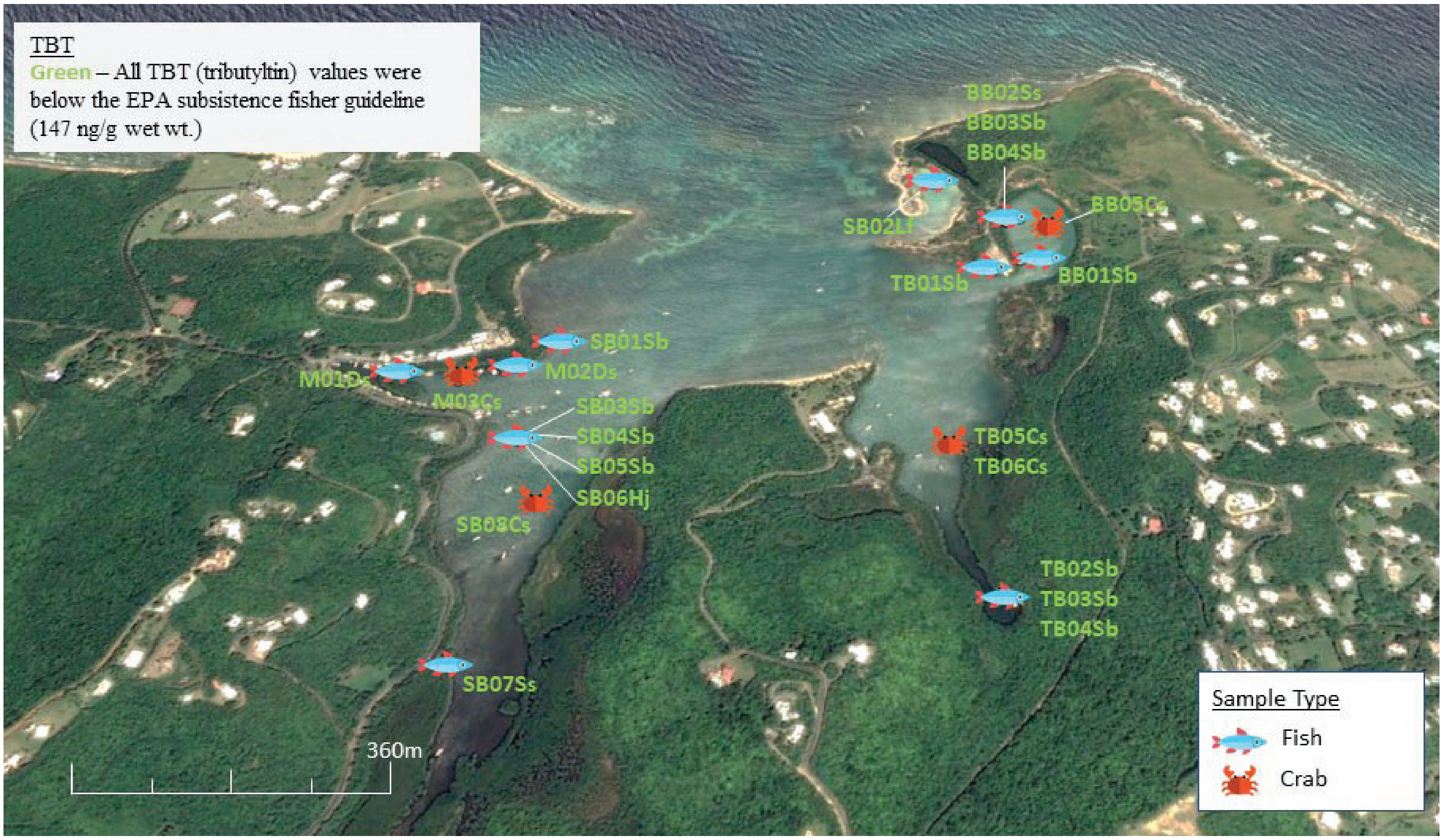

Figure 10. Tributyltin (TBT) in biota collected in the SARI compared to USEPA Screening Values.

February 2019 and April 2018, with fish from the February 2019 sampling having a higher concentration.

In the STEER, Apeti *et al.* (2016), found total DDTs in only one fish (squirrelfish) at a concentration of 16.5 ng/g. In the current study, the wet weight concentrations of total DDT in the fish and crabs were far below the USFDA Action level of 5,000 ng/g. In addition, none of the biota sampled in the SARI exceeded the USEPA subsistence or recreational fisher SV for DDT, indicating that the risk to humans consuming fish or crabs from the SARI from DDT would likely be low.

Butyltins

Environmental contamination by butyltins consists of the parent compound tributyltin or TBT, which was the active ingredient incorporated into antifouling paints for boat hulls, followed by the primary degradation products dibutyltin, monobutyltin, and finally elemental tin. TBT was banned in the US beginning in 1989, although it has been reported that TBT is still sold and used in some parts of the Caribbean (Uc-Peraza *et al.*, 2022).

The overall mean of TBT in biota collected from the SARI was 4.18 ±1.14 ng/g. The mean concentration in fish was 5.33 ±1.38, in crabs the mean concentration was lower, 0.52 ±0.23 ng/g. A Wilcoxon nonparametric test indicated a significant difference (Chi Square = 6.9864, $p = 0.0082$) in the TBT concentration between fish and crabs, with fish having a higher TBT concentration. The maximum TBT concentration was 16.9 ng/g in sea bream from Sugar Bay (SB04Sb) (Appendix F).

In the STEER, Apeti *et al*. (2016) found a mean concentration of TBT in the fish of 9.37 ng/g, a little higher than the mean found in the SARI. In the STEER, a higher percentage of the butyltins in the schoolmaster snapper was also TBT.

Pait *et al.* (2020) noted that TBT only accounted for approximately 27 percent of the butyltin present in the sediments. It is not clear why the fish would have relatively higher percentages of TBT over the other butyltins, especially since dibutyltin and monobutyltin were more prevalent in the sediments. Takahashi *et al.* (1999) also found higher concentrations of TBT in fish, and suggested that certain fish species may have less capacity to degrade TBT, resulting in its accumulation. None of the biota (fish or crabs) sampled in the SARI, however, exceeded the USEPA subsistence or recreational fisher SV for TBT (Figure 10), indicating that the risk to humans consuming fish or crabs from the SARI would likely be low.

Trace and Major Elements

A summary of the trace and major element analysis in the fish and crabs can be found in Table 5 and in Appendix G. The highest concentrations detected were for the major earth elements iron (1,977 µg/g) and aluminum (1,166 µg/g). The third highest element was zinc (164.3 µg/g). The three highest concentrations of zinc were found in crabs (*Callinectes sp.*) in Triton Bay, (164.31 µg/g) Sugar Bay (163.19 µg/g) and Mangrove Lagoon (161.18 µg/g). Zinc is typically considered a trace element, is essential for maintaining cellular function, and is integral to components of numerous metal-containing enzymes (Rajkowska and Protasowicki, 2013).

Table 5. Mean (µg/g), minimum and maximum concentrations of trace and major elements in biota from the SARI.

Element	Symbol	Mean ±SE	Minimum	Maximum
Silver	Ag	0.14 ±0.02	0.05	0.53
Aluminum	Al	219.3 ±75.2	5.05	1,166
Arsenic	As	11.8 ±2.56	1.50	45.0
Barium	Ba	2.79 ±0.38	0.49	7.47
Beryllium	Be	0.04 ±0.00	0.02	0.08
Cadmium	Cd	0.20 ±0.06	0.04	1.14
Cobalt	Co	0.45 ±0.05	0.20	1.02
Chromium	Cr	6.67 ±2.78	0.54	45.1
Copper	Cu	27.3 ±9.76	1.51	115.9
Iron	Fe	365.5 ±105.5	52.60	1,977
Mercury	Hg	0.14 ±0.03	0.01	0.46
Lithium	Li	0.70 ±0.08	0.19	1.46
Manganese	Mn	23.3 ±6.64	1.97	126.7
Nickel	Ni	3.58 ±0.44	1.29	9.53
Lead	Pb	0.28 ±0.10	0.01	1.94
Selenium	Se	2.36 ±0.29	0.82	4.92
Tin	Sn	0.10 ±0.01	0.04	0.21
Titanium	Ti	0.06 ±0.01	0.03	0.13
Uranium	U	0.15 ±0.01	0.06	0.32
Vanadium	V	2.04 ±0.47	0.35	7.42
Zinc	Zn	97.6 ±8.52	45.08	164.3

Abbreviation: SE, standard error.

The mean copper concentration found in biota was 27.3 µg/g. Copper also appeared to be elevated in some of the biota, particularly in crabs. The highest concentration of copper (115.9 µg/g) from this study was found in a crab (TB05Cs) from Triton Bay (Figure 6). The five highest copper concentrations were all found in crabs, from Triton Bay, Sugar Bay, Mangrove Lagoon, and the marina area.

A Wilcoxon nonparametric test to assess the difference in the concentration indicated that crabs had higher levels of copper than the fish (Chi Square = 10.9091, *p* = 0.0010), opposite of what was found for TBT. Zhang *et al.* (2019) have shown that crabs readily accumulate copper from the environment. Pait *et al.* (2020) found elevated levels of copper in the sediment, with the highest concentration (244.1 µg/g) found in the Marina stratum. In the current study, the highest concentration in biota was not found in the marina area, but rather in Triton Bay in crabs. There is currently no USEPA SV for copper.

The mean concentration of chromium found in biota from the SARI was 6.67 µg/g. For chromium, the highest concentrations appeared to occur in the fish. The highest concentration found in any sample was in a horseye jack (SB06) from Sugar Bay, at 45.1 µg/g. The second highest concentration 42.5 µg/g, was found in a sea bream (BB-03Sb) from Mangrove Lagoon (Appendix G). There was also a significant (Chi Square = 4.7087, *p* = 0.0300) difference in the concentration of chromium in fish tissue between April 2018, and February 2019, with higher concentrations found in fish collected in February 2019.

The highest concentration of chromium in sediments found by Pait *et al*. (2020) was in the Marina stratum, at a concentration of 27.2 µg/g. Also, Pait *et al*. (2020) found there were no differences in the concentration of chromium in the sediments between strata.

Unfortunately, the USFDA no longer lists guidance levels for arsenic, cadmium, lead, and nickel (USFDA, 2011). The USEPA has established SV (Screening Values) for cadmium. The recreational guideline for cadmium is 4 µg/g, the subsistence guideline is 0.491 µg/g. None of the samples exceeded the subsistence or recreational SVs for cadmium on a wet weight basis.

Sea Bream Study in the SARI

Kendall *et al.* (2021a) conducted a study to assess the movement of sea bream (*Archosargus rhomboidalis)* in the SARI. They found that sea bream tended to stay in the same small core areas during most of the year, although the sea bream did change bays within the SARI during the winter months. From this, it appears that sea bream inhabit the same parts of the SARI during much of the year.

If the contamination in the tissues of the sea bream are examined, some patterns appear to emerge. For example, somewhat elevated concentrations of total PCBs were found in sediments in the Marina stratum by Pait *et al*. (2020), and upper Sugar Bay areas. A number of sea bream caught just outside of the marina area had elevated levels of total PCBs, above the subsistence fisher guideline (Figure 8). This would be consistent with the sea bream inhabiting a core area (*e.g.*, marina and upper Sugar Bay areas) during much of the year. The highest levels of total PCBs in biota, approaching the recreational fisher guideline, were found in the schoolmaster snapper and in the crabs from the upper part of Sugar Bay. Sea bream were not found in the traps in the upper part of Sugar Bay.

As noted earlier, fish including sea bream have the ability to metabolize PAHs. Although somewhat higher concentrations of total PAHs were seen in sediments in the Marina stratum by Pait *et al*. (2020), the concentration of total PAHs in sea bream just outside the marina area and across the SARI were consistently low (Figure 8), likely due to their ability to metabolize the PAHs. For TBT, Pait *et al*. (2020) found elevated concentrations in the Marina stratum. While all of the wet weight concentrations found in the fish and crabs in the current study were below the subsistence fisher SV of 147 ng/g for TBT, sea bream caught outside of the marina area appeared to have somewhat elevated concentrations.

SUMMARY AND CONCLUSIONS

The goal of this project was to address the questions posed by DPNR, regarding the presence of chemical contaminants in fish and crabs in the SARI, and the likelihood that concentrations exceed established guidelines. This project built upon work conducted by Pait *et al.* (2020) to quantify chemical contaminants and toxicity of the sediments, and others, to characterize ecological aspects of this valuable natural resource.

For the field work, we partnered with NCCOS' Biogeography Branch who were conducting a study to quantify the spatial and temporal aspects of fish movements in the SARI. The traps used in that project were also used to collect fish for the analysis of chemical contaminants. A total of 22 fish and crab samples were collected throughout the portion of the SARI inside the barrier reefs. The samples collected were sent to TDI-Brooks, International in College Station, Texas, a NOAA contract laboratory, for analysis. The samples were analyzed for over 270 chemical contaminants, including total PAHs, legacy pesticides such as DDT, chlorpyrifos, chlordane and endosulfan, along with PCBs, butyltins, and a suite of trace and major elements (metals).

Overall, the concentrations of chemical contaminants in the fish and crabs collected from the SARI were fairly low. To compare the concentrations of the contaminants with levels that may be of concern to human health, a series of USEPA Screening Values (SVs) for subsistence and recreational fishers were used. The SVs represent a threshold concentration of concern for a chemical contaminant in fish and shellfish tissue, for a toxic or a carcinogenic effect in humans. Wet weight concentrations of the chemical contaminants analyzed were compared to the available SVs.

Most of the chemical contaminants analyzed in the fish and crabs were below the SVs, including PAHs, DDT, butyltins, and cadmium. The only contaminant class that exceeded an established USEPA SV guideline were total PCBs. The exceedances (above the subsistence fisher guideline) occurred in several areas. Schoolmaster snapper and a crab sample collected in the upper part of Sugar Bay, had total wet weight PCBs concentrations close to the recreational SV, and may indicate that more intensive monitoring of PCBs in the SARI is warranted.

It is important to quantify the concentrations of chemical contaminants present in managed areas, in order to understand if these stressors may be impacting aquatic biota. High levels of chemical contaminants can impact the ecology of an area by affecting the organisms that can live and reproduce in an environment, and as a result, may also impact the efficacy of management strategies. Without this data, natural resource managers may be missing critical information needed to enhance or in some cases restore the functioning of a managed area or even an ecosystem.

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Appendix A. Location data for fish and crab collections in the SARI, St. Croix.

Site and Sample Name	Sample ID	Genus/Species	Latitude (DD)	Longitude (DD)	Collection Date
Sugar Bay 01, Sea Bream	SB01Sb	*Archosargus rhomboidalis*	17.77564	-64.75904	4/17/2018
Triton Bay 01, Sea Bream	TB01Sb	*Archosargus rhomboidalis*	17.77734	-64.75200	4/19/2018
Triton Bay 02, Sea Bream	TB02Sb	*Archosargus rhomboidalis*	17.77097	-64.75257	4/19/2018
Mangrove Lagoon (Bio Bay) 01, Sea Bream	BB01Sb	*Archosargus rhomboidalis*	17.77761	-64.75151	4/20/2018
Triton Bay 03, Sea Bream	TB03Sb	*Archosargus rhomboidalis*	17.77097	-64.75257	4/20/2018
Triton Bay 04, Sea Bream	TB04Sb	*Archosargus rhomboidalis*	17.77097	-64.75257	4/20/2018
Sugar Bay 02, Lionfish	SB02Lf	*Pterois volitans*	17.77969	-64.75278	4/20/2018
Sugar Bay 03, Sea Bream	SB03Sb	*Archosargus rhomboidalis*	17.77361	-64.75920	4/20/2018
Sugar Bay 04, Sea Bream	SB04Sb	*Archosargus rhomboidalis*	17.77361	-64.75920	4/20/2018
Sugar Bay 05, Sea Bream	SB05Sb	*Archosargus rhomboidalis*	17.77361	-64.75920	4/20/2018
Sugar Bay 06, Horseye Jack	SB06Hj	*Caranx latus*	17.77364	-64.75914	2/6/2019
Mangrove Lagoon (Bio Bay) 02, Schoolmaster Snapper	BB02Ss	*Lutjanus apodus*	17.77862	-64.75163	2/6/2019
Mangrove Lagoon (Bio Bay) 03, Sea Bream	BB03Sb	*Archosargus rhomboidalis*	17.77862	-64.75163	2/6/2019
Mangrove Lagoon (Bio Bay) 04, Sea Bream	BB04Sb	*Archosargus rhomboidalis*	17.77862	-64.75163	2/6/2019
Sugar Bay 07, Schoolmaster Snapper	SB07Ss	*Lutjanus apodus*	17.76992	-64.75948	2/7/2019
Marina 01, Dog Snapper	M01Ds	*Lutjanus jocu*	17.77501	-64.76102	2/7/2019
Marina 02, Dog Snapper	M02Ds	*Lutjanus jocu*	17.77509	-64.75942	2/7/2019
Marina 03, Crab	M03Cs	*Callinectes* sp.	17.77481	-64.76029	9/6/2018
Sugar Bay 08, *Callinectes* sp.	SB08Cs	*Callinectes* sp.	17.77243	-64.75878	9/6/2018
Mangrove Lagoon (Bio Bay) 05, *Callinectes* sp.	BB05Cs	*Callinectes* sp.	17.77871	-64.75138	9/4/2018
Triton Bay 05, *Callinectes* sp.	TB05Cs	*Callinectes* sp.	17.77349	-64.75307	9/5/2018
Triton Bay 06, *Callinectes* sp.	TB06Cs	*Callinectes* sp.	17.77349	-64.75307	9/5/2018

Note: DD, decimal degrees.

Appendix B. Total PAHs in the biota samples from the SARI, St. Croix.

Sample ID	SB01Sb		TB01Sb		TB02Sb		BB01Sb		TB03Sb		TB04Sb	
Common Name	Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream	
Genus	*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*	
Species	*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*	
cis/trans Decalin	0.0	U	0.0	U	10.3		0.0	U	0.0	U	0.0	U
C1-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Naphthalene	5.4		5.3		5.4		4.3		3.7		3.8	
C1-Naphthalenes	1.4	J	1.1	J	1.1	J	0.9	J	1.3	J	1.3	J
C2-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Biphenyl	0.0	U	0.0	U	3.6	J	0.0	U	3.3	J	4.5	J
Acenaphthylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Acenaphthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzofuran	0.0	U	0.0	U	0.6	J	0.0	U	0.0	U	0.0	U
Fluorene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Carbazole	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Phenanthrene	0.0	U	0.0	U	0.7	J	0.0	U	0.0	U	0.8	J
C1-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Naphthobenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benz(a)anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Chrysene/Triphenylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(b)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(k,j)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(a)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(e)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(a)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Perylene	0.0	U	3.4	J	0.0	U	0.0	U	2.6	J	0.0	U
Indeno(1,2,3-c,d)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzo(a,h)anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(g,h,i)perylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Total PAHs	6.81		9.83		21.6		5.17		10.9		10.4	

Notes: J, below method detection level, MDL; U, not detected

Appendix B. Total PAHs in the biota samples from the SARI, St. Croix (cont.).

Sample ID	SB02Lf		SB03Sb		SB04Sb		SB05Sb		SB06Hj		BB02Ss	
Common Name	Lionfish		Sea Bream		Sea Bream		Sea Bream		Horseye Jack		Schoolmaster Snapper	
Genus	*Pterois*		*Archosargus*		*Archosargus*		*Archosargus*		*Caranx*		*Lutjanus*	
Species	*volitans*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*latus*		*apodus*	
cis/trans Decalin	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Naphthalene	6.7		2.9		2.4		2.6		4.4		4.0	
C1-Naphthalenes	2.8	J	0.9	J	1.2	J	0.8	J	1.6	J	2.7	J
C2-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Biphenyl	7.9	J	2.7	J	3.4	J	0.0	U	6.1	J	2.6	J
Acenaphthylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Acenaphthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzofuran	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Fluorene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Carbazole	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Phenanthrene	0.0	U	0.0	U	1.2	J	0.6	J	1.0	J	0.0	U
C1-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Naphthobenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benz(a)anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Chrysene/Triphenylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(b)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(k,j)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(a)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(e)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(a)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Perylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Indeno(1,2,3-c,d)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzo(a,h)anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(g,h,i)perylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Total PAHs	17.4		6.52		8.16		4.08		13.1		9.31	

Notes: J, below method detection level, MDL; U, not detected

Appendix B. Total PAHs in the biota samples from the SARI, St. Croix (cont.).

Sample ID	BB03Sb		BB04Sb		SB07Ss		M01Ds		M02Ds		M03Cs	
Common Name	Sea Bream		Sea Bream		Schoolmaster Snapper		Dog Snapper		Dog Snapper		Crab	
Genus	*Archosargus*		*Archosargus*		*Lutjanus*		*Lutjanus*		*Lutjanus*		*Callinectes*	
Species	*rhomboidalis*		*rhomboidalis*		*apodus*		*jocu*		*jocu*		*sp.*	
cis/trans Decalin	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Decalins	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Naphthalene	8.0		4.3		4.7		4.8		4.8		7.1	
C1-Naphthalenes	2.3	J	2.0	J	1.8	J	4.2		3.1	J	1.8	J
C2-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Biphenyl	5.4		3.9	J	2.8	J	2.9	J	3.8	J	3.8	J
Acenaphthylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Acenaphthene	10.5		0.0	U	3.3		4.5		6.3		0.0	U
Dibenzofuran	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Fluorene	14.2		0.0	U	5.8		4.6		7.7		0.0	U
C1-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Carbazole	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Phenanthrene	0.0	U	0.0	U	0.0	U	1.2	J	0.0	U	2.2	J
C1-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.8	
Pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	1.7	J
C1-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Naphthobenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benz(a)anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Chrysene/Triphenylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C4-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(b)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(k,j)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(a)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(e)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(a)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Perylene	0.0	U	0.0	U	0.0	U	3.0	J	0.0	U	6.0	J
Indeno(1,2,3-c,d)pyrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzo(a,h)anthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C1-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C2-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C3-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(g,h,i)perylene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Total PAHs	40.5		10.3		18.3		25.4		25.8		23.4	

Notes: J, below method detection level, MDL; U, not detected

Appendix B. Total PAHs in the biota samples from the SARI, St. Croix (cont.).

Sample ID	SB08Cs		BB05Cs		TB05Cs		TB06Cs	
Common Name	Crab		Crab		Crab		Crab	
Genus	*Callinectes*		*Callinectes*		*Callinectes*		*Callinectes*	
Species	*sp.*		*sp.*		*sp.*		*sp.*	
cis/trans Decalin	0.0	U	0.0	U	0.0	U	0.0	U
C1-Decalins	0.0	U	0.0	U	0.0	U	0.0	U
C2-Decalins	0.0	U	0.0	U	0.0	U	0.0	U
C3-Decalins	0.0	U	0.0	U	0.0	U	0.0	U
C4-Decalins	0.0	U	0.0	U	0.0	U	0.0	U
Naphthalene	7.6		8.5		9.6		10.4	
C1-Naphthalenes	2.5	J	3.2	J	1.7	J	2.4	J
C2-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U
C4-Naphthalenes	0.0	U	0.0	U	0.0	U	0.0	U
Benzothiophene	0.0	U	0.0	U	0.0	U	0.0	U
C1-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C2-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C4-Benzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
Biphenyl	3.3	J	3.9	J	2.0	J	3.6	J
Acenaphthylene	0.0	U	0.0	U	0.0	U	0.0	U
Acenaphthene	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzofuran	0.0	U	0.0	U	0.0	U	2.6	J
Fluorene	0.0	U	0.0	U	0.0	U	0.0	U
C1-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U
C2-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Fluorenes	0.0	U	0.0	U	0.0	U	0.0	U
Carbazole	6.9		0.0	U	0.0	U	6.2	
Anthracene	0.0	U	0.0	U	0.0	U	0.0	U
Phenanthrene	2.8	J	0.0	U	0.0	U	2.5	J
C1-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U
C2-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U
C4-Phenanthrenes/Anthracenes	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U
C1-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C2-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C4-Dibenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
Fluoranthene	0.6	J	0.0	U	0.0	U	0.8	
Pyrene	1.7	J	0.0	U	0.0	U	1.8	J
C1-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U
C2-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U
C4-Fluoranthenes/Pyrenes	0.0	U	0.0	U	0.0	U	0.0	U
Naphthobenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U
C1-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C2-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
C4-Naphthobenzothiophenes	0.0	U	0.0	U	0.0	U	0.0	U
Benz(a)anthracene	0.0	U	0.0	U	0.0	U	0.0	U
Chrysene/Triphenylene	0.0	U	0.0	U	0.0	U	0.0	U
C1-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U
C2-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U
C4-Chrysenes	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(b)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(k,j)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(a)fluoranthene	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(e)pyrene	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(a)pyrene	0.0	U	0.0	U	0.0	U	0.0	U
Perylene	0.0	U	0.0	U	0.0	U	0.0	U
Indeno(1,2,3-c,d)pyrene	0.0	U	0.0	U	0.0	U	0.0	U
Dibenzo(a,h)anthracene	0.0	U	0.0	U	0.0	U	0.0	U
C1-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U
C2-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U
C3-Dibenzo(a,h)anthracenes	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(g,h,i)perylene	0.0	U	0.0	U	0.0	U	0.0	U
Total PAHs	25.3		15.6		13.4		30.4	

Notes: J, below method detection level, MDL; U, not detected

Appendix C. Alkylated PAHs in the biota samples from the SARI, St. Croix.

Sample ID	SB01Sb		TB01Sb		TB02Sb		BB01Sb		TB03Sb		TB04Sb	
Common Name	Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream	
Genus	*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*	
Species	*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*	
2-Methylnaphthalene	1.3		0.9		1.0		0.9		1.2		1.2	
1-Methylnaphthalene	0.8	J	0.7	J	0.7	J	0.5	J	0.8	J	0.8	J
2,6-Dimethylnaphthalene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1,6,7-Trimethylnaphthalene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methylfluorene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
4-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2/3-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
3-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylanthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
4/9-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
3,6-Dimethylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Retene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylfluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(b)fluorene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C29-Hopane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
18a-Oleanane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C30-Hopane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C20-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C21-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C26(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C26(20R)/C27(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C28(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C27(20R)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C28(20R)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U

Notes: J, below method detection level, MDL; U, not detected

Appendix C. Alkylated PAHs in the biota samples from the SARI, St. Croix (cont.).

Sample ID	SB02Lf		SB03Sb		SB04Sb		SB05Sb		SB06Hj		BB02Ss	
Common Name	Lionfish		Sea Bream		Sea Bream		Sea Bream		Horseye Jack		Schoolmaster Snapper	
Genus	*Pterois*		*Archosargus*		*Archosargus*		*Archosargus*		*Caranx*		*Lutjanus*	
Species	*volitans*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*latus*		*apodus*	
2-Methylnaphthalene	3.1		0.9		1.3		0.8		1.6		2.7	
1-Methylnaphthalene	1.3	J	0.6	J	0.6	J	0.5	J	0.9	J	1.5	
2,6-Dimethylnaphthalene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1,6,7-Trimethylnaphthalene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methylfluorene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
4-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2/3-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
3-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylanthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
4/9-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
3,6-Dimethylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Retene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylfluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(b)fluorene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C29-Hopane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
18a-Oleanane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C30-Hopane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C20-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C21-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C26(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C26(20R)/C27(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C28(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C27(20R)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C28(20R)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U

Notes: J, below method detection level, MDL; U, not detected

Appendix C. Alkylated PAHs in the biota samples from the SARI, St. Croix (cont.).

Sample ID	BB03Sb		BB04Sb		SB07Ss		M01Ds		M02Ds		M03Cs	
Common Name	Sea Bream		Sea Bream		Schoolmaster Snapper		Dog Snapper		Dog Snapper		Crab	
Genus	*Archosargus*		*Archosargus*		*Lutjanus*		*Lutjanus*		*Lutjanus*		*Callinectes*	
Species	*rhomboidalis*		*rhomboidalis*		*apodus*		*jocu*		*jocu*		*sp.*	
2-Methylnaphthalene	2.2		2.0		1.8		4.4		3.2		1.8	
1-Methylnaphthalene	1.3		1.2		1.0		2.1		1.7		1.1	J
2,6-Dimethylnaphthalene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1,6,7-Trimethylnaphthalene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methylfluorene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
4-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2/3-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
3-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylanthracene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
4/9-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
1-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
3,6-Dimethylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Retene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylfluoranthene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(b)fluorene	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C29-Hopane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
18a-Oleanane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C30-Hopane	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C20-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C21-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C26(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C26(20R)/C27(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C28(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C27(20R)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U
C28(20R)-TAS	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U	0.0	U

Notes: J, below method detection level, MDL; U, not detected

Appendix C. Alkylated PAHs in the biota samples from the SARI, St. Croix (cont.).

Sample ID	SB08Cs		BB05Cs		TB05Cs		TB06Cs	
Common Name	Crab		Crab		Crab		Crab	
Genus	*Callinectes*		*Callinectes*		*Callinectes*		*Callinectes*	
Species	*sp.*		*sp.*		*sp.*		*sp.*	
2-Methylnaphthalene	2.4		3.4		1.6		2.3	
1-Methylnaphthalene	1.6		1.7		1.1	J	1.5	J
2,6-Dimethylnaphthalene	0.0	U	0.0	U	0.0	U	0.0	U
1,6,7-Trimethylnaphthalene	0.0	U	0.0	U	0.0	U	0.0	U
1-Methylfluorene	0.0	U	0.0	U	0.0	U	0.0	U
4-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U
2/3-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U
1-Methyldibenzothiophene	0.0	U	0.0	U	0.0	U	0.0	U
3-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylanthracene	0.0	U	0.0	U	0.0	U	0.0	U
4/9-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U
1-Methylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U
3,6-Dimethylphenanthrene	0.0	U	0.0	U	0.0	U	0.0	U
Retene	0.0	U	0.0	U	0.0	U	0.0	U
2-Methylfluoranthene	0.0	U	0.0	U	0.0	U	0.0	U
Benzo(b)fluorene	0.0	U	0.0	U	0.0	U	0.0	U
C29-Hopane	0.0	U	0.0	U	0.0	U	0.0	U
18a-Oleanane	0.0	U	0.0	U	0.0	U	0.0	U
C30-Hopane	0.0	U	0.0	U	0.0	U	0.0	U
C20-TAS	0.0	U	0.0	U	0.0	U	0.0	U
C21-TAS	0.0	U	0.0	U	0.0	U	0.0	U
C26(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U
C26(20R)/C27(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U
C28(20S)-TAS	0.0	U	0.0	U	0.0	U	0.0	U
C27(20R)-TAS	0.0	U	0.0	U	0.0	U	0.0	U
C28(20R)-TAS	0.0	U	0.0	U	0.0	U	0.0	U

Notes: J, below method detection level, MDL; U, not detected

Appendix D. Organochlorine pesticides in biota samples from the SARI, St. Croix.

Sample ID	SB01Sb		TB01Sb		TB02Sb		BB01Sb		TB03Sb		TB04Sb	
Common Name	Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream	
Genus	*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*	
Species	*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*	
Aldrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Dieldrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin Aldehyde	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin Ketone	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Heptachlor	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Heptachlor-Epoxide	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Oxychlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Alpha-Chlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Gamma-Chlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Trans-Nonachlor	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Cis-Nonachlor	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Alpha-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Beta-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Delta-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Gamma-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
DDMU	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
2,4'-DDD	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDD	0.40	J	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
2,4'-DDE	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDE	0.51	J	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
2,4'-DDT	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDT	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
1,2,3,4-Tetrachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
1,2,4,5-Tetrachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Hexachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Pentachloroanisole	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Pentachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan II	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan I	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan Sulfate	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Mirex	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Chlorpyrifos	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Total HCH	0.00		0.00		0.00		0.00		0.00		0.00	
Total Chlordane	0.00		0.00		0.00		0.00		0.00		0.00	
Total DDT	0.91		0.00		0.00		0.00		0.00		0.00	

Notes: J, below method detection level, MDL; U, not detected

Appendix D. Organochlorine pesticides in biota samples from the SARI, St. Croix (cont.).

Sample ID	SB02Lf		SB03Sb		SB04Sb		SB05Sb		SB06Hj		BB02Ss	
Common Name	Lionfish		Sea Bream		Sea Bream		Sea Bream		Horseye Jack		Schoolmaster Snapper	
Genus	*Pterois*		*Archosargus*		*Archosargus*		*Archosargus*		*Caranx*		*Lutjanus*	
Species	*volitans*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*latus*		*apodus*	
Aldrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Dieldrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin Aldehyde	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin Ketone	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Heptachlor	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Heptachlor-Epoxide	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Oxychlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Alpha-Chlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Gamma-Chlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Trans-Nonachlor	0.00	U	0.00	U	0.00	U	1.02		0.00	U	0.00	U
Cis-Nonachlor	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Alpha-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Beta-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Delta-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Gamma-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
DDMU	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
2,4'-DDD	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDD	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
2,4'-DDE	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDE	0.00	U	0.00	U	0.91	J	0.63	J	0.00	U	0.97	J
2,4'-DDT	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDT	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
1,2,3,4-Tetrachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
1,2,4,5-Tetrachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Hexachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Pentachloroanisole	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Pentachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan II	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan I	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan Sulfate	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Mirex	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Chlorpyrifos	20.46		3.60		0.00	U	0.00	U	0.00	U	0.00	U
Total HCH	0.00		0.00		0.00		0.00		0.00		0.00	
Total Chlordane	0.00		0.00		0.00		1.02		0.00		0.00	
Total DDT	0.00		0.00		0.91		0.63		0.00		0.97	

Notes: J, below method detection level, MDL; U, not detected

Appendix D. Organochlorine pesticides in biota samples from the SARI, St. Croix (cont.).

Sample ID	BB03Sb		BB04Sb		SB07Ss		M01Ds		M02Ds		M03Cs	
Common Name	Sea Bream		Sea Bream		Schoolmaster Snapper		Dog Snapper		Dog Snapper		Crab	
Genus	*Archosargus*		*Archosargus*		*Lutjanus*		*Lutjanus*		*Lutjanus*		*Callinectes*	
Species	*rhomboidalis*		*rhomboidalis*		*apodus*		*jocu*		*jocu*		*sp.*	
Aldrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Dieldrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin Aldehyde	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endrin Ketone	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Heptachlor	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Heptachlor-Epoxide	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Oxychlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Alpha-Chlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Gamma-Chlordane	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Trans-Nonachlor	0.00	U	0.00	U	0.00	U	0.86		0.68		0.00	U
Cis-Nonachlor	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Alpha-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Beta-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Delta-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Gamma-HCH	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
DDMU	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
2,4'-DDD	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDD	0.00	U	0.00	U	1.40		0.00	U	0.45		0.00	U
2,4'-DDE	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDE	0.67	J	0.91	J	1.94		1.33		0.79	J	1.21	J
2,4'-DDT	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDT	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
1,2,3,4-Tetrachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
1,2,4,5-Tetrachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Hexachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Pentachloroanisole	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Pentachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan II	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan I	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan Sulfate	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Mirex	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Chlorpyrifos	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Total HCH	0.00		0.00		0.00		0.00		0.00		0.00	
Total Chlordane	0.00		0.00		0.00		0.86		0.68		0.00	
Total DDT	0.67		0.91		3.34		1.33		1.23		1.21	

Notes: J, below method detection level, MDL; U, not detected

Appendix D. Organochlorine pesticides in biota samples from the SARI, St. Croix (cont.).

Sample ID	SB08Cs		BB05Cs		TB05Cs		TB06Cs	
Common Name	Crab		Crab		Crab		Crab	
Genus	*Callinectes*		*Callinectes*		*Callinectes*		*Callinectes*	
Species	*sp.*		*sp.*		*sp.*		*sp.*	
Aldrin	0.00	U	0.00	U	0.00	U	0.00	U
Dieldrin	0.00	U	0.00	U	0.00	U	0.00	U
Endrin	0.00	U	0.00	U	0.00	U	0.00	U
Endrin Aldehyde	0.00	U	0.00	U	0.00	U	0.00	U
Endrin Ketone	0.00	U	0.00	U	0.00	U	0.00	U
Heptachlor	0.00	U	0.00	U	0.00	U	0.00	U
Heptachlor-Epoxide	0.00	U	0.00	U	0.00	U	0.00	U
Oxychlordane	0.00	U	0.00	U	0.00	U	0.00	U
Alpha-Chlordane	0.00	U	0.00	U	0.00	U	0.00	U
Gamma-Chlordane	0.00	U	0.00	U	0.00	U	0.00	U
Trans-Nonachlor	1.15		0.00	U	0.00	U	0.00	U
Cis-Nonachlor	0.00	U	0.00	U	0.00	U	0.00	U
Alpha-HCH	0.00	U	0.00	U	0.00	U	0.00	U
Beta-HCH	0.00	U	0.00	U	0.00	U	0.00	U
Delta-HCH	0.00	U	0.00	U	0.00	U	0.00	U
Gamma-HCH	0.00	U	0.00	U	0.00	U	0.00	U
DDMU	0.00	U	0.00	U	0.00	U	0.00	U
2,4'-DDD	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDD	0.61		0.00	U	0.70		0.69	
2,4'-DDE	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDE	1.21	J	0.00	U	0.00	U	0.97	J
2,4'-DDT	0.00	U	0.00	U	0.00	U	0.00	U
4,4'-DDT	0.00	U	0.00	U	0.00	U	0.00	U
1,2,3,4-Tetrachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U
1,2,4,5-Tetrachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U
Hexachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U
Pentachloroanisole	0.00	U	0.00	U	0.00	U	0.00	U
Pentachlorobenzene	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan II	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan I	0.00	U	0.00	U	0.00	U	0.00	U
Endosulfan Sulfate	0.00	U	0.00	U	0.00	U	0.00	U
Mirex	0.00	U	0.00	U	0.00	U	0.00	U
Chlorpyrifos	0.00	U	0.00	U	0.00	U	0.00	U
Total HCH	0.00		0.00		0.00		0.00	
Total Chlordane	1.15		0.00		0.00		0.00	
Total DDT	1.82		0.00		0.70		1.66	

Notes: J, below method detection level, MDL; U, not detected

Appendix E. Polychlorinated biphenyls (PCBs) in biota samples from the SARI, St. Croix.

Sample ID	SB01Sb		TB01Sb		TB02Sb		BB01Sb		TB03Sb		TB04Sb	
Common Name	Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream	
Genus	*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*	
Species	*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*	
PCB 1	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 2	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 3	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 4/10	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 7/9	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 6	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 8/5	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 14	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 11	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 12	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 13	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 15	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 19	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 30	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 18	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 17	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 27	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 24	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 16/32	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 34	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 23	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 29	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 26	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 25	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 28/31	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 21/20/33	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 22	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 36	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 39	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 38	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 35	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 37	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 54	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 50	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 53	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 51	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 45	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 46/69/73	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 52	0.15	J	0.00	U	0.00	U	0.00	U	0.35		0.25	J
PCB 43	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 49	0.07	J	0.00	U	0.00	U	0.00	U	0.13	J	0.16	J
PCB 48/75/47	0.00	U	0.00	U	0.00	U	0.00	U	0.06	J	0.04	J
PCB 65	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 62	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 44	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 59	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 42	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 72	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 71	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 68/41/64	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 40/57	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 67	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 58	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 63	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 61/74	0.00	U	0.00	U	0.00	U	0.00	U	0.12	J	0.00	U
PCB 76/70	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 66/80	0.00	U	0.00	U	0.00	U	0.00	U	0.21	J	0.13	J
PCB 55	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 56	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 60	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 79	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 78	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 81	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 77	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 104	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 96/103	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 100	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 94	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 102/98	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 121/93/95	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 88	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 91	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 92	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 101/84/90	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.31	J
PCB 89/113	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 99	0.00	U	0.00	U	0.00	U	0.00	U	1.03		0.87	
PCB 119	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 112	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 120/83	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U

Notes: J, below method detection level, MDL; U, not detected

Appendix E. Polychlorinated biphenyls (PCBs) in biota samples from the SARI, St. Croix (cont.).

Sample ID	SB01Sb		TB01Sb		TB02Sb		BB01Sb		TB03Sb		TB04Sb	
Common Name	Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream		Sea Bream	
Genus	*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*		*Archosargus*	
Species	*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*	
PCB 97/125/86	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 116/117	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 111/115/87	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 109	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 85	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 110	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 82	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 124	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 106/107	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 123	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 118/108	0.59		0.00	U	0.00	U	0.00	U	0.78		0.60	
PCB 114/122	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 105/127	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 126	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 155	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 150	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 152	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 148/145	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 136/154	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 151	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 135	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 144	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 147	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 149/139	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 140	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 143	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 134/133	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 165/131	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 142/146/161	0.00	U	0.00	U	0.00	U	0.00	U	0.22	J	0.00	U
PCB 153/168	0.92		0.37		0.58		0.00	U	1.75		1.16	
PCB 132	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 141	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 137	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 130	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 138/164/163	0.66		0.18	J	0.51		0.00	U	1.12		0.86	
PCB 160/158	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 129	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 166	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 159	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 162	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 128/167	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 156	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 157	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 169	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 188	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 184	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 179	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 176	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 186/178	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 175	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 187/182	0.23	J	0.15	J	0.13	J	0.00	U	0.39	J	0.22	J
PCB 183	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 185	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 174	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 181	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 177	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 171	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 173	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 192/172	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 180/193	0.25		0.09	J	0.00	U	0.00	U	0.20	J	0.24	
PCB 191	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 170/190	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 189	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 202	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 201	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 204	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 197	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 200	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 198	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 199	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 203/196	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 195	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 194	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 205	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 208	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 207	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 206	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 209	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Total PCB	2.87		0.78		1.21		0.00		6.34		4.82	

Notes: J, below method detection level, MDL; U, not detected

Appendix E. Polychlorinated biphenyls (PCBs) in biota samples from the SARI, St. Croix (cont.).

Sample ID	SB02Lf		SB03Sb		SB04Sb		SB05Sb		SB06Hj		BB02Ss	
Common Name	Lionfish		Sea Bream		Sea Bream		Sea Bream		Horseye Jack		Schoolmaster Snapper	
Genus	*Pterois*		*Archosargus*		*Archosargus*		*Archosargus*		*Caranx*		*Lutjanus*	
Species	*volitans*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*latus*		*apodus*	
PCB 1	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 2	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 3	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 4/10	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 7/9	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 6	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 8/5	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 14	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 11	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 12	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 13	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 15	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 19	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 30	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 18	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 17	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 27	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 24	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 16/32	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 34	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 23	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 29	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 26	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 25	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 28/31	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 21/20/33	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 22	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 36	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 39	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 38	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 35	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 37	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 54	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 50	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 53	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 51	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 45	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 46/69/73	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 52	0.00	U	0.15	J	0.83		0.73		0.36		0.38	
PCB 43	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 49	0.00	U	0.06	J	0.00	U	0.23	J	0.20	J	0.39	
PCB 48/75/47	0.00	U	0.00	U	0.45		0.00	U	0.00	U	0.72	
PCB 65	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 62	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 44	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 59	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 42	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 72	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 71	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 68/41/64	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 40/57	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 67	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 58	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 63	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 61/74	0.00	U	0.00	U	0.45		0.53		0.00	U	0.22	J
PCB 76/70	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.22	J
PCB 66/80	0.00	U	0.00	U	0.42		0.33		0.00	U	0.31	
PCB 55	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 56	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 60	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 79	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 78	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 81	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 77	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 104	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 96/103	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 100	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 94	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 102/98	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 121/93/95	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 88	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 91	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 92	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 101/84/90	0.00	U	0.00	U	0.75		1.10		0.00	U	0.00	U
PCB 89/113	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 99	0.00	U	0.00	U	1.69		1.73		1.27		2.19	
PCB 119	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 112	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 120/83	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U

Notes: J, below method detection level, MDL; U, not detected

Appendix E. Polychlorinated biphenyls (PCBs) in biota samples from the SARI, St. Croix (cont.).

Sample ID	SB02Lf		SB03Sb		SB04Sb		SB05Sb		SB06Hj		BB02Ss	
Common Name	Lionfish		Sea Bream		Sea Bream		Sea Bream		Horseye Jack		Schoolmaster Snapper	
Genus	*Pterois*		*Archosargus*		*Archosargus*		*Archosargus*		*Caranx*		*Lutjanus*	
Species	*volitans*		*rhomboidalis*		*rhomboidalis*		*rhomboidalis*		*latus*		*apodus*	
PCB 97/125/86	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 116/117	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 111/115/87	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 109	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 85	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 110	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 82	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 124	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 106/107	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 123	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 118/108	0.00	U	0.00	U	2.65		3.47		1.03		1.56	
PCB 114/122	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 105/127	0.00	U	0.00	U	1.27		1.35		0.00	U	0.33	
PCB 126	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 155	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 150	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 152	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 148/145	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 136/154	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 151	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 135	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 144	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 147	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 149/139	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 140	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 143	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 134/133	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 165/131	0.00	U	0.00	U	0.00	U	0.89		0.70		0.00	U
PCB 142/146/161	0.00	U	0.00	U	0.59		0.00	U	0.00	U	0.42	J
PCB 153/168	0.39	J	0.45		4.19		3.96		4.24		6.60	
PCB 132	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 141	0.00	U	0.00	U	0.00	U	0.33	J	0.00	U	0.00	U
PCB 137	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 130	0.00	U	0.00	U	0.00	U	0.40	J	0.00	U	0.00	U
PCB 138/164/163	0.11	J	0.37	J	3.53		4.25		2.83		2.59	
PCB 160/158	0.00	U	0.00	U	0.44	J	0.77		0.26	J	0.24	J
PCB 129	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 166	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 159	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 162	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 128/167	0.00	U	0.00	U	0.37		0.00	U	0.40		0.56	
PCB 156	0.00	U	0.00	U	0.00	U	0.72		0.00	U	0.00	U
PCB 157	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 169	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 188	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 184	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 179	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 176	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 186/178	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 175	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 187/182	0.00	U	0.00	U	1.04		0.67		0.93		0.33	
PCB 183	0.00	U	0.00	U	0.65		0.25		0.00	U	0.30	
PCB 185	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 174	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 181	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 177	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 171	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 173	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 192/172	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 180/193	0.00	U	0.10	J	1.13		1.02		0.85		0.94	
PCB 191	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 170/190	0.00	U	0.00	U	0.22	J	0.82		0.25	J	0.37	
PCB 189	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 202	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 201	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 204	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 197	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 200	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 198	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 199	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 203/196	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 195	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 194	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 205	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 208	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 207	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 206	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 209	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Total PCB	0.50		1.13		20.6		23.6		13.3		18.7	

Notes: J, below method detection level, MDL; U, not detected

Appendix E. Polychlorinated biphenyls (PCBs) in biota samples from the SARI, St. Croix (cont.).

Sample ID	BB03Sb		BB04Sb		SB07Ss		M01Ds		M02Ds		M03Cs	
Common Name	Sea Bream		Sea Bream		Schoolmaster Snapper		Dog Snapper		Dog Snapper		Crab	
Genus	*Archosargus*		*Archosargus*		*Lutjanus*		*Lutjanus*		*Lutjanus*		*Callinectes*	
Species	*rhomboidalis*		*rhomboidalis*		*apodus*		*jocu*		*jocu*		*sp.*	
PCB 1	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 2	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 3	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 4/10	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 7/9	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 6	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 8/5	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.76	
PCB 14	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 11	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 12	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 13	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 15	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 19	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 30	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 18	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 17	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 27	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 24	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 16/32	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 34	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 23	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 29	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 26	0.00	U	0.00	U	0.53		0.00	U	0.00	U	0.00	U
PCB 25	0.00	U	0.00	U	0.31	J	0.00	U	0.00	U	0.00	U
PCB 28/31	0.00	U	0.00	U	1.45		0.21		0.00	U	3.55	
PCB 21/20/33	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 22	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 36	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 39	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 38	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 35	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 37	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	2.02	
PCB 54	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 50	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 53	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 51	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 45	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 46/69/73	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 52	0.68		0.95		2.02		0.49		0.76		0.00	U
PCB 43	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 49	0.50		0.93		1.99		0.55		0.95		0.00	U
PCB 48/75/47	0.30		0.36		3.55		0.84		0.90		1.05	
PCB 65	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 62	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 44	0.00	U	0.00	U	0.00	U	0.00	U	0.11	J	0.00	U
PCB 59	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 42	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 72	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 71	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 68/41/64	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 40/57	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 67	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 58	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 63	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 61/74	0.27		0.38		1.14		0.43		0.36		2.71	
PCB 76/70	0.27		0.30		0.72		0.28		0.32		0.00	U
PCB 66/80	0.27		0.49		2.31		0.59		0.50		2.49	
PCB 55	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 56	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 60	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	2.38	
PCB 79	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 78	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 81	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 77	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.44	
PCB 104	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 96/103	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 100	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 94	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 102/98	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 121/93/95	0.24	J	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 88	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 91	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 92	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 101/84/90	0.45		1.43		1.63		0.74		0.79		0.00	U
PCB 89/113	0.00	U	0.00	U	0.00	U	0.00	U	0.95		0.00	U
PCB 99	1.69		1.79		8.27		1.97		1.65		1.04	
PCB 119	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 112	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 120/83	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U

Notes: J, below method detection level, MDL; U, not detected

Appendix E. Polychlorinated biphenyls (PCBs) in biota samples from the SARI, St. Croix (cont.).

Sample ID	BB03Sb		BB04Sb		SB07Ss		M01Ds		M02Ds		M03Cs	
Common Name	Sea Bream		Sea Bream		Schoolmaster Snapper		Dog Snapper		Dog Snapper		Crab	
Genus	*Archosargus*		*Archosargus*		*Lutjanus*		*Lutjanus*		*Lutjanus*		*Callinectes*	
Species	*rhomboidalis*		*rhomboidalis*		*apodus*		*jocu*		*jocu*		*sp.*	
PCB 97/125/86	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 116/117	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 111/115/87	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 109	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 85	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 110	0.00	U	0.00	U	0.53		0.00	U	0.00	U	0.00	U
PCB 82	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 124	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 106/107	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 123	0.00	U	0.00	U	0.00	U	0.00	U	0.28	J	0.00	U
PCB 118/108	0.84		1.28		12.24		2.49		2.27		1.96	
PCB 114/122	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 105/127	0.00	U	0.00	U	2.70		0.89		0.69		1.86	
PCB 126	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 155	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 150	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 152	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 148/145	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 136/154	0.00	U	0.00	U	0.23	J	0.00	U	0.11	J	0.00	U
PCB 151	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 135	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 144	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 147	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 149/139	0.43		0.44		0.17	J	0.19	J	0.28	J	0.00	U
PCB 140	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 143	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 134/133	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 165/131	0.54		0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 142/146/161	0.00	U	0.48		0.48		0.23	J	0.44	J	0.00	U
PCB 153/168	3.48		3.78		13.84		4.36		4.13		2.47	
PCB 132	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 141	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 137	0.00	U	0.00	U	0.45		0.00	U	0.00	U	0.00	U
PCB 130	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 138/164/163	2.13		2.34		7.86		2.69		2.67		1.29	
PCB 160/158	0.00	U	0.00	U	1.17		0.47		0.38	J	0.00	U
PCB 129	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 166	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 159	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 162	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 128/167	0.16	J	0.32		2.77		0.75		0.94		0.00	U
PCB 156	0.00	U	0.00	U	1.48		0.48		0.37	J	0.00	U
PCB 157	0.00	U	0.00	U	0.78		0.00	U	0.00	U	0.00	U
PCB 169	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 188	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 184	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 179	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 176	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 186/178	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 175	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 187/182	0.84		0.97		0.23	J	0.30	J	0.29	J	0.00	U
PCB 183	0.31		0.00	U	0.46		0.26		0.26		0.00	U
PCB 185	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 174	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 181	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 177	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 171	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 173	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 192/172	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 180/193	0.50		0.58		1.63		1.28		1.19		1.09	
PCB 191	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 170/190	0.16	J	0.00	U	1.30		0.39		0.31		0.00	U
PCB 189	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 202	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 201	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 204	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 197	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 200	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 198	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 199	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 203/196	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 195	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 194	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 205	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 208	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 207	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 206	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
PCB 209	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U
Total PCB	14.0		16.8		72.2		20.9		21.9		25.1	

Notes: J, below method detection level, MDL; U, not detected

Appendix E. Polychlorinated biphenyls (PCBs) in biota samples from the SARI, St. Croix (cont.).

Sample ID	SB08Cs		BB05Cs		TB05Cs		TB06Cs	
Common Name	Crab		Crab		Crab		Crab	
Genus	*Callinectes*		*Callinectes*		*Callinectes*		*Callinectes*	
Species	*sp.*		*sp.*		*sp.*		*sp.*	
PCB 1	0.00	U	0.00	U	0.00	U	0.00	U
PCB 2	0.00	U	0.00	U	0.00	U	0.00	U
PCB 3	0.00	U	0.00	U	0.00	U	0.00	U
PCB 4/10	0.00	U	0.00	U	0.00	U	0.00	U
PCB 7/9	0.00	U	0.00	U	0.00	U	0.00	U
PCB 6	0.00	U	0.00	U	0.00	U	0.00	U
PCB 8/5	2.44		0.00	U	0.00	U	0.00	U
PCB 14	0.00	U	0.00	U	0.00	U	0.00	U
PCB 11	0.00	U	0.00	U	0.00	U	0.00	U
PCB 12	0.00	U	0.00	U	0.00	U	0.00	U
PCB 13	0.00	U	0.00	U	0.00	U	0.00	U
PCB 15	1.46		0.00	U	0.00	U	0.00	U
PCB 19	0.00	U	0.00	U	0.00	U	0.00	U
PCB 30	0.00	U	0.00	U	0.00	U	0.00	U
PCB 18	0.00	U	0.00	U	0.00	U	0.00	U
PCB 17	0.00	U	0.00	U	0.00	U	0.00	U
PCB 27	0.00	U	0.00	U	0.00	U	0.00	U
PCB 24	0.00	U	0.00	U	0.00	U	0.00	U
PCB 16/32	0.00	U	0.00	U	0.00	U	0.00	U
PCB 34	0.00	U	0.00	U	0.00	U	0.00	U
PCB 23	0.00	U	0.00	U	0.00	U	0.00	U
PCB 29	0.00	U	0.00	U	0.00	U	0.00	U
PCB 26	0.00	U	0.00	U	0.00	U	0.00	U
PCB 25	0.00	U	0.00	U	0.00	U	0.00	U
PCB 28/31	16.99		0.00	U	0.00	U	0.00	U
PCB 21/20/33	0.00	U	0.00	U	0.00	U	0.00	U
PCB 22	4.06		0.00	U	0.00	U	0.00	U
PCB 36	0.00	U	0.00	U	0.00	U	0.00	U
PCB 39	0.00	U	0.00	U	0.00	U	0.00	U
PCB 38	0.00	U	0.00	U	0.00	U	0.00	U
PCB 35	0.00	U	0.00	U	0.00	U	0.00	U
PCB 37	2.80		0.00	U	0.00	U	0.00	U
PCB 54	0.00	U	0.00	U	0.00	U	0.00	U
PCB 50	0.00	U	0.00	U	0.00	U	0.00	U
PCB 53	0.00	U	0.00	U	0.00	U	0.00	U
PCB 51	0.00	U	0.00	U	0.00	U	0.00	U
PCB 45	0.00	U	0.00	U	0.00	U	0.00	U
PCB 46/69/73	0.00	U	0.00	U	0.00	U	0.00	U
PCB 52	0.00	U	0.00	U	0.00	U	0.00	U
PCB 43	0.00	U	0.00	U	0.00	U	0.00	U
PCB 49	0.00	U	0.00	U	0.00	U	0.00	U
PCB 48/75/47	2.46		0.00	U	0.00	U	0.00	U
PCB 65	0.00	U	0.00	U	0.00	U	0.00	U
PCB 62	0.00	U	0.00	U	0.00	U	0.00	U
PCB 44	0.00	U	0.00	U	0.00	U	0.00	U
PCB 59	0.00	U	0.00	U	0.00	U	0.00	U
PCB 42	0.00	U	0.00	U	0.00	U	0.00	U
PCB 72	0.00	U	0.00	U	0.00	U	0.00	U
PCB 71	0.00	U	0.00	U	0.00	U	0.00	U
PCB 68/41/64	0.00	U	0.00	U	0.00	U	0.00	U
PCB 40/57	0.00	U	0.00	U	0.00	U	0.00	U
PCB 67	0.00	U	0.00	U	0.00	U	0.00	U
PCB 58	0.00	U	0.00	U	0.00	U	0.00	U
PCB 63	0.00	U	0.00	U	0.00	U	0.00	U
PCB 61/74	5.21		0.00	U	0.00	U	0.00	U
PCB 76/70	0.00	U	0.00	U	0.00	U	0.00	U
PCB 66/80	3.70		0.00	U	0.00	U	0.00	U
PCB 55	0.00	U	0.00	U	0.00	U	0.00	U
PCB 56	0.00	U	0.00	U	0.00	U	0.00	U
PCB 60	1.99		0.00	U	0.00	U	0.00	U
PCB 79	0.00	U	0.00	U	0.00	U	0.00	U
PCB 78	0.00	U	0.00	U	0.00	U	0.00	U
PCB 81	0.00	U	0.00	U	0.00	U	0.00	U
PCB 77	0.45		0.00	U	0.00	U	0.00	U
PCB 104	0.00	U	0.00	U	0.00	U	0.00	U
PCB 96/103	0.00	U	0.00	U	0.00	U	0.00	U
PCB 100	0.00	U	0.00	U	0.00	U	0.00	U
PCB 94	0.00	U	0.00	U	0.00	U	0.00	U
PCB 102/98	0.00	U	0.00	U	0.00	U	0.00	U
PCB 121/93/95	0.00	U	0.00	U	0.00	U	0.00	U
PCB 88	0.00	U	0.00	U	0.00	U	0.00	U
PCB 91	0.00	U	0.00	U	0.00	U	0.00	U
PCB 92	0.00	U	0.00	U	0.00	U	0.00	U
PCB 101/84/90	0.00	U	0.00	U	0.00	U	0.00	U
PCB 89/113	0.00	U	0.00	U	0.00	U	0.00	U
PCB 99	1.69		0.00	U	0.00	U	0.00	U
PCB 119	0.00	U	0.00	U	0.00	U	0.00	U
PCB 112	0.00	U	0.00	U	0.00	U	0.00	U
PCB 120/83	0.00	U	0.00	U	0.00	U	0.00	U

Notes: J, below method detection level, MDL; U, not detected

Appendix E. Polychlorinated biphenyls (PCBs) in biota samples from the SARI, St. Croix (cont.).

Sample ID	SB08Cs		BB05Cs		TB05Cs		TB06Cs	
Common Name	Crab		Crab		Crab		Crab	
Genus	*Callinectes*		*Callinectes*		*Callinectes*		*Callinectes*	
Species	*sp.*		*sp.*		*sp.*		*sp.*	
PCB 97/125/86	0.00	U	0.00	U	0.00	U	0.00	U
PCB 116/117	0.00	U	0.00	U	0.00	U	0.00	U
PCB 111/115/87	0.00	U	0.00	U	0.00	U	0.00	U
PCB 109	0.00	U	0.00	U	0.00	U	0.00	U
PCB 85	0.00	U	0.00	U	0.00	U	0.00	U
PCB 110	0.00	U	0.00	U	0.00	U	0.00	U
PCB 82	0.00	U	0.00	U	0.00	U	0.00	U
PCB 124	0.00	U	0.00	U	0.00	U	0.00	U
PCB 106/107	0.00	U	0.00	U	0.00	U	0.00	U
PCB 123	0.00	U	0.00	U	0.00	U	0.00	U
PCB 118/108	3.31		0.00	U	0.00	U	0.00	U
PCB 114/122	0.00	U	0.00	U	0.00	U	0.00	U
PCB 105/127	1.34		0.00	U	0.00	U	0.00	U
PCB 126	0.00	U	0.00	U	0.00	U	0.00	U
PCB 155	0.00	U	0.00	U	0.00	U	0.00	U
PCB 150	0.00	U	0.00	U	0.00	U	0.00	U
PCB 152	0.00	U	0.00	U	0.00	U	0.00	U
PCB 148/145	0.00	U	0.00	U	0.00	U	0.00	U
PCB 136/154	0.00	U	0.00	U	0.00	U	0.00	U
PCB 151	0.00	U	0.00	U	0.00	U	0.00	U
PCB 135	0.00	U	0.00	U	0.00	U	0.00	U
PCB 144	0.00	U	0.00	U	0.00	U	0.00	U
PCB 147	0.00	U	0.00	U	0.00	U	0.00	U
PCB 149/139	0.00	U	0.00	U	0.00	U	0.00	U
PCB 140	0.00	U	0.00	U	0.00	U	0.00	U
PCB 143	0.00	U	0.00	U	0.00	U	0.00	U
PCB 134/133	0.00	U	0.00	U	0.00	U	0.00	U
PCB 165/131	0.00	U	0.00	U	0.00	U	0.00	U
PCB 142/146/161	0.00	U	0.00	U	0.00	U	0.00	U
PCB 153/168	2.31		0.68		0.98		0.65	
PCB 132	0.00	U	0.00	U	0.00	U	0.00	U
PCB 141	0.00	U	0.00	U	0.00	U	0.00	U
PCB 137	0.00	U	0.00	U	0.00	U	0.00	U
PCB 130	0.00	U	0.00	U	0.00	U	0.00	U
PCB 138/164/163	1.30		0.20	J	0.80		0.33	J
PCB 160/158	0.00	U	0.00	U	0.00	U	0.00	U
PCB 129	0.00	U	0.00	U	0.00	U	0.00	U
PCB 166	0.00	U	0.00	U	0.00	U	0.00	U
PCB 159	0.00	U	0.00	U	0.00	U	0.00	U
PCB 162	0.00	U	0.00	U	0.00	U	0.00	U
PCB 128/167	0.00	U	0.00	U	0.00	U	0.00	U
PCB 156	0.00	U	0.00	U	0.00	U	0.00	U
PCB 157	0.00	U	0.00	U	0.00	U	0.00	U
PCB 169	0.00	U	0.00	U	0.00	U	0.00	U
PCB 188	0.00	U	0.00	U	0.00	U	0.00	U
PCB 184	0.00	U	0.00	U	0.00	U	0.00	U
PCB 179	0.00	U	0.00	U	0.00	U	0.00	U
PCB 176	0.00	U	0.00	U	0.00	U	0.00	U
PCB 186/178	0.00	U	0.00	U	0.00	U	0.00	U
PCB 175	0.00	U	0.00	U	0.00	U	0.00	U
PCB 187/182	0.45		0.00	U	0.00	U	0.00	U
PCB 183	0.00	U	0.00	U	0.00	U	0.00	U
PCB 185	0.00	U	0.00	U	0.00	U	0.00	U
PCB 174	0.00	U	0.00	U	0.00	U	0.00	U
PCB 181	0.00	U	0.00	U	0.00	U	0.00	U
PCB 177	0.00	U	0.00	U	0.00	U	0.00	U
PCB 171	0.00	U	0.00	U	0.00	U	0.00	U
PCB 173	0.00	U	0.00	U	0.00	U	0.00	U
PCB 192/172	0.00	U	0.00	U	0.00	U	0.00	U
PCB 180/193	0.47		0.00	U	0.00	U	0.00	U
PCB 191	0.00	U	0.00	U	0.00	U	0.00	U
PCB 170/190	0.00	U	0.00	U	0.00	U	0.00	U
PCB 189	0.00	U	0.00	U	0.00	U	0.00	U
PCB 202	0.00	U	0.00	U	0.00	U	0.00	U
PCB 201	0.00	U	0.00	U	0.00	U	0.00	U
PCB 204	0.00	U	0.00	U	0.00	U	0.00	U
PCB 197	0.00	U	0.00	U	0.00	U	0.00	U
PCB 200	0.00	U	0.00	U	0.00	U	0.00	U
PCB 198	0.00	U	0.00	U	0.00	U	0.00	U
PCB 199	0.00	U	0.00	U	0.00	U	0.00	U
PCB 203/196	0.00	U	0.00	U	0.00	U	0.00	U
PCB 195	0.00	U	0.00	U	0.00	U	0.00	U
PCB 194	0.00	U	0.00	U	0.00	U	0.00	U
PCB 205	0.00	U	0.00	U	0.00	U	0.00	U
PCB 208	0.00	U	0.00	U	0.00	U	0.00	U
PCB 207	0.00	U	0.00	U	0.00	U	0.00	U
PCB 206	0.00	U	0.00	U	0.00	U	0.00	U
PCB 209	0.00	U	0.00	U	0.00	U	0.00	U
Total PCB	52.4		0.88		1.78		0.98	

Notes: J, below method detection level, MDL; U, not detected

Appendix F. Butyltins in biota samples from the SARI, St. Croix.

Sample	SB01Sb	TB01Sb	TB02Sb	BB01Sb	TB03Sb	TB04Sb
Common Name	Sea Bream	Sea Bream	Sea Bream	Sea Bream	Sea Bream	Sea Bream
Genus	*Archosargus*	*Archosargus*	*Archosargus*	*Archosargus*	*Archosargus*	*Archosargus*
Species	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*
Monobutyltin	1.781	0.000 U	0.000 U	0.000 U	0.000 U	0.000 U
Dibutyltin	3.104	0.554 J	0.000 U	0.000 U	0.557 J	0.726 J
Tributyltin	12.670	1.336 J	0.674 J	1.143 J	1.505 J	1.614
Tetrabutyltin	0.000 U	0.000 U	0.000 U	0.000 U	0.000 U	0.000 U

Notes: N/A, not enough sample available for analysis; J, below method detection level, MDL; U, not detected

Sample	SB02Lf	SB03Sb	SB04Sb	SB05Sb	SB06Sb	BB02Ss
Common Name	Lionfish	Sea Bream	Sea Bream	Sea Bream	Horseye Jack	Schoolmaster Snapper
Genus	*Pterois*	*Archosargus*	*Archosargus*	*Archosargus*	*Caranx*	*Lutjanus*
Species	*volitans*	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*	*latus*	*apodus*
Monobutyltin	N/A	0.000 U	1.942	0.000 U	2.220	0.000 U
Dibutyltin	N/A	1.292 J	4.019	3.678	3.491	0.000 U
Tributyltin	N/A	6.118	16.945	15.631	6.540	0.596 J
Tetrabutyltin	N/A	0.000 U	0.000 U	0.000 U	0.000 U	0.000 U

Notes: N/A, not enough sample available for analysis; J, below method detection level, MDL; U, not detected

Sample	BB03Sb	BB04Sb	SB07Ss	M01Ds	M02Ds	M03Cs
Common Name	Sea Bream	Sea Bream	Schoolmaster Snapper	Dog Snapper	Dog Snapper	Crab
Genus	*Archosargus*	*Archosargus*	*Lutjanus*	*Lutjanus*	*Lutjanus*	*Callinectes*
Species	*rhomboidalis*	*rhomboidalis*	*apodus*	*jocu*	*jocu*	*sp.*
Monobutyltin	0.000 U	0.000 U	0.000 U	0.000 U	0.692 J	0.000 U
Dibutyltin	0.000 U	0.734 J	1.011 J	2.542	2.405	0.000 U
Tributyltin	0.869 J	1.138 J	2.908	7.664	7.908	0.651 J
Tetrabutyltin	0.000 U	0.000 U	0.000 U	0.000 U	0.000 U	0.000 U

Notes: N/A, not enough sample available for analysis; J, below method detection level, MDL; U, not detected

Sample	SB08Cs	BB05Cs	TB05Cs	TB06Cs
Common Name	Crab	Crab	Crab	Crab
Genus	*Callinectes*	*Callinectes*	*Callinectes*	*Callinectes*
Species	*sp.*	*sp.*	*sp.*	*sp.*
Monobutyltin	0.627 J	0.000 U	0.000 U	0.000 U
Dibutyltin	0.973 J	0.000 U	0.000 U	0.000 U
Tributyltin	1.190 J	0.000 U	0.000 U	0.768 J
Tetrabutyltin	0.000 U	0.000 U	0.000 U	0.000 U

Notes: N/A, not enough sample available for analysis; J, below method detection level, MDL; U, not detected

Appendix G. Trace and major elements in biota samples from the SARI, St. Croix.

Sample ID	SB01Sb	TB01Sb	TB02Sb	BB01Sb	TB03Sb	TB04Sb	SB03Sb
Common Name	Sea Bream	Sea Bream	Sea Bream	Sea Bream	Sea Bream	Sea Bream	Sea Bream
Genus	*Archosargus*	*Archosargus*	*Archosargus*	*Archosargus*	*Archosargus*	*Archosargus*	*Archosargus*
Species	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*	*rhomboidalis*
Silver (Ag)	0.081	0.128	0.100	0.122	0.135	0.050	0.084
Aluminum (Al)	64.77	171.80	475.28	474.90	100.65	67.91	142.67
Arsenic (As)	4.055	2.985	3.544	2.937	8.101	1.496	2.160
Barium (Ba)	3.874	3.640	7.472	4.007	0.750	2.198	3.711
Beryllium Be)	0.027	0.043	0.034	0.041	0.045	0.017	0.028
Cadmium (Cd)	0.071	0.111	0.087	0.106	0.117	0.044	0.073
Cobalt (Co)	0.394	0.499	0.447	0.816	0.278	0.225	0.447
Chromium (Cr)	0.631	0.990	0.969	0.953	6.570	0.545	0.682
Copper (Cu)	4.337	2.573	3.545	2.235	7.243	1.728	2.144
Iron (Fe)	92.92	219.23	442.85	425.80	133.84	79.14	101.12
Mercury (Hg)	0.040	0.036	0.046	0.072	0.074	0.027	0.063
Lithium (Li)	0.760	0.715	0.990	1.279	0.416	0.366	0.887
Manganese (Mn)	14.35	18.14	24.62	58.46	3.748	10.11	30.25
Nickel (Ni)	5.339	4.648	5.079	6.267	1.295	2.698	5.466
Lead (Pb)	0.114	0.100	0.131	0.201	0.030	0.049	0.084
Selenium (Se)	1.490	1.414	1.225	1.772	1.974	0.816	1.405
Tin (Sn)	0.068	0.106	0.143	0.101	0.112	0.042	0.070
Titanium (Ti)	0.041	0.064	0.051	0.062	0.068	0.025	0.043
Uranium (U)	0.105	0.164	0.129	0.157	0.173	0.065	0.108
Vanadium (V)	0.917	1.137	6.109	5.453	0.462	1.198	1.736
Zinc (Zn)	107.15	106.98	91.69	100.66	83.18	55.06	87.92

Note - Not enough tissue from SB02Lf (lionfish) was available for analysis.

Appendix G. Trace and major elements in biota samples from the SARI, St. Croix (cont.).

Sample	SB04Sb	SB05Sb	SB06Hj	BB02Ss	BB03Sb	BB04Sb	SB07Ss
Common Name	Sea Bream	Sea Bream	Horseye Jack	Schoolmaster Snapper	Sea Bream	Sea Bream	Schoolmaster Snapper
Genus	*Archosargus*	*Archosargus*	*Caranx*	*Lutjanus*	*Archosargus*	*Archosargus*	*Lutjanus*
Species	*rhomboidalis*	*rhomboidalis*	*latus*	*apodus*	*rhomboidalis*	*rhomboidalis*	*apodus*
Silver (Ag)	0.088	0.078	0.133	0.103	0.144	0.062	0.057
Aluminum (Al)	112.58	12.574	6.397	9.312	1166.0	5.046	58.540
Arsenic (As)	3.766	1.836	6.049	16.542	11.465	10.750	3.887
Barium (Ba)	6.254	3.367	0.495	0.823	2.887	1.593	1.835
Beryllium Be)	0.030	0.026	0.045	0.035	0.048	0.021	0.019
Cadmium (Cd)	0.076	0.068	0.116	0.089	0.125	0.054	0.050
Cobalt (Co)	0.557	0.241	0.315	0.213	1.022	0.577	0.215
Chromium (Cr)	9.520	0.662	45.143	2.737	42.469	12.066	0.771
Copper (Cu)	2.205	1.569	4.472	1.514	11.845	6.655	1.818
Iron (Fe)	287.53	68.470	477.22	137.49	1436.7	151.94	106.40
Mercury (Hg)	0.073	0.014	0.177	0.183	0.142	0.087	0.123
Lithium (Li)	1.308	0.415	0.412	0.326	1.003	0.192	0.468
Manganese (Mn)	22.780	6.979	4.597	3.023	75.572	8.528	4.014
Nickel (Ni)	9.526	2.679	2.410	2.399	3.406	1.895	2.783
Lead (Pb)	0.121	0.062	0.026	0.269	0.302	0.012	0.161
Selenium (Se)	1.473	0.836	1.911	1.880	2.746	2.106	2.268
Tin (Sn)	0.073	0.065	0.111	0.085	0.120	0.052	0.048
Titanium (Ti)	0.044	0.040	0.067	0.052	0.073	0.031	0.029
Uranium (U)	0.113	0.101	0.172	0.132	0.185	0.080	0.074
Vanadium (V)	1.981	0.941	0.941	0.838	5.765	1.503	0.417
Zinc (Zn)	111.56	54.267	46.307	45.084	109.15	91.687	49.728

Appendix G. Trace and major elements in biota samples from the SARI, St. Croix (cont.).

Sample	M01Ds	M02Ds	M03Cs	SB08Cs	BB05Cs	TB05Cs	TB06Cs
Common Name	Dog Snapper	Dog Snapper	Crab	Crab	Crab	Crab	Crab
Genus	*Lutjanus*	*Lutjanus*	*Callinectes*	*Callinectes*	*Callinectes*	*Callinectes*	*Callinectes*
Species	*jocu*	*jocu*	*sp.*	*sp.*	*sp.*	*sp.*	*sp.*
Silver (Ag)	0.089	0.252	0.085	0.148	0.225	0.188	0.529
Aluminum (Al)	13.029	29.979	24.151	63.964	57.940	1147.7	400.23
Arsenic (As)	8.246	44.952	14.982	18.470	26.371	34.725	20.323
Barium (Ba)	2.006	2.002	1.342	1.694	2.345	3.937	2.451
Beryllium Be)	0.030	0.085	0.023	0.046	0.055	0.052	0.066
Cadmium (Cd)	0.078	0.220	0.077	0.375	0.910	0.282	1.142
Cobalt (Co)	0.196	0.443	0.204	0.408	0.430	0.795	0.724
Chromium (Cr)	2.088	3.112	0.674	3.686	1.758	1.927	2.127
Copper (Cu)	1.887	4.691	55.444	114.78	111.69	115.88	114.82
Iron (Fe)	109.58	282.64	52.60	208.46	177.67	1976.6	707.25
Mercury (Hg)	0.107	0.284	0.081	0.266	0.294	0.459	0.321
Lithium (Li)	0.385	0.779	0.269	0.569	0.698	1.458	0.932
Manganese (Mn)	1.969	4.993	5.548	12.195	37.661	126.75	15.590
Nickel (Ni)	2.794	5.802	1.311	2.419	3.003	1.809	2.234
Lead (Pb)	0.147	0.422	0.037	0.599	0.193	1.944	0.942
Selenium (Se)	1.951	4.528	1.884	4.203	4.210	4.918	4.632
Tin (Sn)	0.074	0.210	0.057	0.114	0.136	0.127	0.163
Titanium (Ti)	0.045	0.127	0.035	0.069	0.082	0.077	0.099
Uranium (U)	0.115	0.325	0.088	0.177	0.210	0.197	0.253
Vanadium (V)	0.350	0.750	0.509	0.747	1.156	7.423	2.532
Zinc (Zn)	61.559	116.49	84.160	163.19	161.18	157.59	164.31

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