Lower Passaic River Restoration Project

2009 FISH AND BLUE CRAB TISSUE CHEMISTRY DATA FOR THE LOWER PASSAIC RIVER STUDY AREA

FINAL

Prepared for:

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Acronyms

AES	atomic emission spectrometry
BERA	baseline ecological risk assessment
BHC	benzene hexachloride
CARB	California Air Resources Board
CPG	Cooperating Parties Group
CRM	certified reference material
CSO	combined sewer overflow
CVAFS	cold vapor atomic fluorescence spectrometer
CWCM	chemical water column monitoring
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
ECD	electron capture detection
EMPC	estimated maximum possible concentration
FS	feasibility study
GC	gas chromatography
GFAAS	graphite furnace atomic absorption spectrometer
GPC	gel permeation chromatography
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
HpCDD	heptachlorodibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran
HRGC	high-resolution gas chromatograph
HRMS	high-resolution mass spectrometer
HxCDD	hexachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran
ICP	inductively coupled plasma
ID	identification
J-qualifier	estimated concentration
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LDC	Laboratory Data Consultants

LPAH	low-molecular-weight polycyclic aromatic hydrocarbon
LPRSA	Lower Passaic River Study Area
LRC	low resolution coring
MS	mass spectrometry
MS/MSD	matrix spike / matrix spike duplicate
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NOAA	National Oceanic and Atmospheric Administration
OCDD	octachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran
PA	Partner Agencies
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-*p*-dioxin
PCDF	polychlorinated dibenzofuran
PeCDD	pentachlorodibenzo-*p*-dioxin
PeCDF	pentachlorodibenzofuran
PMF	protocol modification form
PWCM	physical water column monitoring
QAPP	quality assurance project plan
R-qualifier	rejected
RI	remedial investigation
RL	reporting limit
RM	river mile
RPD	relative percent difference
SDG	sample delivery group
SIM	selective ion monitoring
SOP	standard operating procedure
St Dev	standard deviation
SVOC	semivolatile organic compound
TCDD	tetrachlorodibenzo-*p*-dioxin
TCDF	tetrachlorodibenzofuran
TEF	toxic equivalency factor

total DDx	sum of all six DDT isomers (2,4′-DDD, 4,4′-DDD, 2,4′-DDE, 4,4′-DDE, 2,4′-DDT and 4,4′-DDT)
U-qualifier	not detected at given concentration
USEPA	US Environmental Protection Agency
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
WHO	World Health Organization
Windward	Windward Environmental LLC
ww	wet weight

1 Introduction

This report presents the chemistry results for tissue samples of ten fish species (i.e., white perch [*Morone americana*], brown bullhead [*Ameiurus nebulosus*], channel catfish [*Ictalurus punctatus*], white catfish [*Ameiurus catus*], common carp [*Cyprinus carpio*], white sucker [*Catastomus commersoni*], American eel [*Anguilla rostrata*], largemouth bass [*Micropterus salmoides*], smallmouth bass [*Micropterus dolomieu*], and northern pike [*Esox lucius*]), and blue crab (*Callinectes sapidus*) collected from the Lower Passaic River Study Area (LPRSA) in the late summer / early fall of 2009. The lipid results for mummichog (*Fundulus heteroclitus*) egg samples collected in spring 2010 are also presented. These data will be used to support the LPRSA baseline ecological and human health risk assessments and other remedial investigation / feasibility study (RI / FS) tasks.

The tissue chemistry data presented in this report represent the results for the fish and blue crab samples collected from the LPRSA between August 10 and September 19, 2009, following the methods presented in the *Lower Passaic River Restoration Project Quality Assurance Project Plan: Fish and Decapod Crustacean Tissue Collection for Chemical Analysis and Fish Community Survey* (Windward 2009a), hereafter referred to as the Fish / Decapod Quality Assurance Project Plan (QAPP). The mummichog egg lipid data presented in this report were collected on May 25, 2010, also following the methods presented in the Fish / Decapod QAPP (Windward 2009a), as well as the USEPA-approved Reconnaissance for Small Forage Fish Memorandum (Windward 2010i). These field efforts were conducted pursuant to the May 2007 Settlement Agreement and Order on Consent (Section IX.37.d.) (USEPA 2007) between the US Environmental Protection Agency (USEPA) and the Cooperating Parties Group (CPG), a consortium of approximately 70 companies that agreed to complete the RI / FS of the 17.4-mile stretch of the Passaic River between Newark Bay and Dundee Dam.

1.1 Overview of LPRSA Sampling Programs

CPG has implemented several sampling programs in order to obtain site-specific data to support the RI / FS, including the risk assessments. These assessments have followed the overarching sampling design presented in the *Lower Passaic River Restoration Project Draft Field Sampling Plan, Volume 2* (hereafter referred to as FSP2) (Malcolm Pirnie et al. 2006), which was prepared for USEPA and its Partner Agencies (PA).[1] A summary of the field efforts conducted or planned by CPG from 2008 to 2012 to generate analytical data are presented in Table 1-1.

[1] The PA includes the US Army Corps of Engineers (USACE), the New Jersey Department of Environmental Protection (NJDEP), the New Jersey Department of Transportation (NJDOT), the National Oceanic and Atmospheric Administration (NOAA), and the US Fish and Wildlife Service (USFWS).

Table 1-1. Summary of CPG field efforts

Data Collection Effort	Data Type	QAPP/Sampling Plan Citation
2008 LRC sediment sampling	surface and subsurface sediment chemistry data	ENSR et al. (2008)
2009 water column monitoring and sampling	surface water physical parameter data	AECOM (2009)
2009 fish and decapod tissue sampling[a]	fish/decapod tissue chemistry data	Windward (2009a)
2009 late summer/early fall fish and decapod tissue community survey	fish community survey data	
2009 sediment sampling	surface sediment chemistry data	Windward (2009b)
2009 bioaccumulation tissue testing	bioaccumulation tissue chemistry data	
2009 toxicity testing	surface sediment toxicity data	
2009 benthic invertebrate community survey	benthic community survey (taxonomy) data	
2010 spring benthic invertebrate community survey	benthic community survey (taxonomy) data	Windward (2010j)
2010 summer benthic invertebrate community survey	benthic community survey (taxonomy) data	Windward (2010j)
2010 winter fish community survey	fish community survey data	Windward (2010k)
2010 reconnaissance small forage fish sampling[a]	mummichog egg lipid data	Windward (2010i)
2010 late spring/early summer fish community survey	fish community survey data	Windward (2010e)
2010 late spring/early summer fish tissue sampling[b]	fish tissue chemistry data	Windward (2010f)
2010 focused small forage fish tissue sampling[b]	fish tissue chemistry data	Windward (2010b)
2010 sediment sampling	surface sediment chemistry data	Windward (2010b)
2010 avian seasonal community surveys	avian community survey data	Windward (2010a)
2010 habitat identification survey	habitat survey data	Windward (2010d)
2010 PWCM sampling	surface water physical parameter data	AECOM (2010b)
2011 *in situ* caged bivalve study	bivalve tissue chemistry data	Windward (2011a)
2011 CSO/stormwater outfall sampling	CSO and stormwater chemistry data	Tierra Solutions (2011)
2011/2012 RM 10.9 characterization	surface and subsurface sediment chemistry data from RM 10.9	AECOM (2011a, 2012b)
2011 RM 10.9 hydrodynamic field investigation	sediment movement	AECOM (2011a)
2011 bathymetric survey	periodic survey of river depth	AECOM (2010a)
2011/2012 small volume CWCM sampling	surface water chemistry data	AECOM (2011b)
2012 high-volume CWCM sampling	surface water chemistry data	AECOM (2012a)
2012 supplemental sediment sampling (LRC)	surface and subsurface sediment chemistry data	AECOM (2012a)

[a] The fish/blue crab and mummichog egg tissue chemistry results from these sampling events are presented in this report.

[b] The small forage fish whole-body tissue chemistry results (including the mummichog whole-body tissue data) are not presented in this report because these samples were collected during separate sampling events in the summer of 2010. The mummichog/small forage fish tissue results are presented in the *2010 Small Forage Fish Tissue Chemistry Data for the Lower Passaic River Study Area* (Windward [in prep]).

CPG – Cooperating Parties Group
CSO – combined sewer overflow
CWCM – chemical water column monitoring
LRC – low resolution coring
PWCM – physical water column monitoring
QAPP – quality assurance project plan
RM – river mile

1.2 TISSUE DATA USE

The detailed sampling objectives for the 2009 tissue collection effort and 2010 mummichog egg tissue collection effort are presented in the Fish/Decapod QAPP (Windward 2009a). As stated in the Fish/Decapod QAPP, the tissue data collected from these sampling efforts, in conjunction with data collected from other sampling efforts, will be used to support various components of the RI/FS, including the human health and ecological risk assessments.

1.3 DOCUMENT ORGANIZATION

The remainder of this report is organized as follows:

- Section 2 – Field Sampling Methods
- Section 3 – Laboratory Methods
- Section 4 – Results
- Section 5 – Data Validation
- Section 6 – References

The text of this report is supported by the following appendices:

- Appendix A – Fish and Blue Crab Compositing Memoranda
- Appendix B – Protocol Modification Forms
- Appendix C – Chain-of-Custody Forms
- Appendix D – Samples and Analyses by Analytical Laboratory and Sample Delivery Group
- Appendix E – Data Management
- Appendix F – Sample Results Table
- Appendix G – Laboratory Form 1s
- Appendix H – Full Laboratory Data Reports (on CD)
- Appendix I – Data Validation Reports
- Appendix J – Comparison of Laboratory Reporting Limits with Data Quality Levels

- Appendix K – Fish and Blue Crab Whole-Body Size Evaluation
- Appendix L – Tissue Sampling Location Coordinates

2 Field Sampling Methods

The sampling design and methodology for the late summer / early fall 2009 fish and decapod tissue collection field effort is presented in the Fish / Decapod QAPP (Windward 2009a). The *Fish and Decapod Field Report for the Late Summer/Early Fall 2009 Field Effort* (Windward 2010c), hereafter referred to as the 2009 Fish / Decapod Field Report, provides a summary of the fish and decapod species collected, as well as the locations sampled and sample collection methods for the 2009 fish and decapod tissue data. The sampling design and methodology for the collection of mummichog eggs is presented in the Fish / Decapod QAPP, as well as the Reconnaissance for Small Forage Fish Memorandum (Windward 2010i). The *Fish Community Survey and Tissue Collection Data Report for the Lower Passaic River Study Area 2010 Field Efforts* (Windward 2011b), hereafter referred to as the 2010 Fish Data Report, provides a summary of the locations sampled, fish and decapod species collected, and sample collection methods for the 2010 fish tissue data (reported separately), including the mummichog egg tissue data (presented in this report). This section presents a brief overview of the field sampling locations and methods for the 2009 and 2010 tissue collection efforts.

2.1 SAMPLING LOCATIONS

Several fish species and blue crab were collected between August 10 and September 19, 2009; mummichog were collected on May 25, 2010, for the evaluation of egg lipid content. Target tissue sampling locations for the late summer / early fall 2009 field effort were presented in the Fish / Decapod QAPP (Windward 2009a), and the mummichog sampling locations were presented in the Reconnaissance for Small Forage Fish Memorandum (Windward 2010i). Fish and blue crab tissue sampling locations were distributed in known or likely habitat areas through the LPRSA within seven 2-mile reaches (i.e., River Mile [RM] 0 to RM 2, RM 2 to RM 4, RM 4 to RM 6, RM 6 to RM 8, RM 8 to RM 10, RM 10 to RM 12, RM 12 to RM 14) and one 3.4-mile reach (RM 14 to RM 17.4). Additional sampling locations were identified in the field. Sampling locations are presented in the 2009 Fish / Decapod Field Report (Windward 2010c) and the 2010 Fish Data Report (Windward 2011b). In accordance with the Fish / Decapod QAPP, when traps were used (i.e., minnow, crab, crayfish, or eel traps), three traps were placed at each sampling location. Three trotlines were also set at each sampling location.

Only a subset of fish and blue crab collected during the sampling effort were selected for chemical analysis.[2] Table 2-1 summarizes the reaches from which tissue samples were collected and analyzed by species and tissue type. Not all fish species samples that underwent analysis were from all reaches; only white perch, American eel, and blue crab samples were collected from all eight reaches of the LPRSA (i.e., from RM 0 to RM 17.4). For those reaches and species for which there is no analytical sample, either insufficient mass was available for chemistry analysis, or no fish were collected. A summary of the sampling locations and compositing processes for fish, blue crab, and mummichog eggs that underwent chemical analysis are presented in Section 3.

[2] Although crayfish was a proposed freshwater decapod receptor (Windward 2009a), insufficient numbers of crayfish (i.e., a total of 7 crayfish) for chemical analysis were collected during the 2009 sampling effort. USEPA and CPG agreed during the January 20, 2010, meeting that blue crab would be used as the proposed decapod species for the freshwater portion of the LPRSA in place of crayfish (Windward 2010g).

Table 2-1. Summary of LPRSA reaches where fish and blue crab tissue samples were collected for analysis

Species	Type of Sample	Reaches Where Tissue Samples Were Collected for Analysis							
		Reach 1 (RM 0 to RM 2)	Reach 2 (RM 2 to RM 4)	Reach 3 (RM 4 to RM 6)	Reach 4 (RM 6 to RM 8)	Reach 5 (RM 8 to RM 10)	Reach 6 (RM 10 to RM 12)	Reach 7 (RM 12 to RM 14)	Reach 8 (RM 14 to RM 17.4)
Benthic Omnivore – Forage Fish									
Mummichog	egg		X[a]	X[a]					
Invertivore/Omnivore									
White perch	skin-on fillet	X		X	X	X	X		X
	carcass	X							
	whole body	X	X	X	X	X	X	X	X
Brown bullhead	whole body			X	X		X	X	
Channel catfish	skinless fillet/carcass with skin					X	X	X	X
White catfish	skinless fillet/carcass with skin		X	X	X	X	X	X	X
Common carp	skin-on fillet/whole body			X	X	X	X	X	X
White sucker	skin-on fillet/carcass				X	X			X
Piscivore									
American eel	skinless fillet	X	X	X	X	X	X	X	X
	carcass with skin	X	X						
	whole body	X		X	X	X	X	X	X
Largemouth bass	skin-on fillet/carcass					X			X
Smallmouth bass	skin-on fillet/carcass				X	X			X
Northern pike	skin-on fillet/carcass						X		
Epibenthic Omnivore									
Blue crab	muscle/hepatopancreas	X	X	X	X	X	X	X	X
	carcass	X	X	X	X	X			
	muscle-only	X	X	X		X	X	X	X
	hepatopancreas-only	X	X	X			X[b]	X[b]	X

Note: "X" indicates that at least one sample from a given reach was analyzed. Where there is no "X," no analytical sample was available.

[a] One composite sample was composed of eggs from mummichog collected in Reaches 2 and 3combined.

[b] One composite sample was composed of hepatopancreas tissue from blue crab collected from Reaches 6 and 7 combined.

LPRSA – Lower Passaic River Study Area RM – river mile

2.2 SAMPLE COLLECTION AND PROCESSING

Several methods were used to collect fish and blue crab throughout the LPRSA. These methods are detailed in standard operating procedures (SOPs) included as attachments to the Fish / Decapod QAPP (Windward 2009a). The 2009 Fish / Decapod Field Report (Windward 2010c) provides details on all of the locations sampled during the 2009 late summer / early fall fish and decapod community survey. This section provides a brief overview of the various sampling methods used to collect fish, blue crab, and crayfish throughout the LPRSA.

All fishing attempts were bank-specific, occurring on either side of the river, with the exception of two gillnet locations (i.e., LPR8S and LPR8R), which were positioned mid-channel because shallow water along the shoreline prevented the deployment of gillnets.

Minnow traps, crab traps, trotlines, and gillnets were used to collect fish and blue crab in all reaches of the LPRSA during the 2009 sampling effort. Eel traps were used in Reaches 1 through 5 (RM 0 to RM 10). Crayfish traps were used in Reaches 6 through 8 (RM 10 to RM 17.4). A limited number of attempts were made using dip nets in two locations (one in Reach 1 and one in Reach 2). Cast nets and minnow traps were used to catch mummichog during the May 2010 small forage fish reconnaissance effort.

Traps, trotlines, and gillnets were deployed during the afternoon or early evening and retrieved the following morning or when practicable given the tide level. Up to five attempts per sampling method were specified in the Fish / Decapod QAPP (Windward 2009a). Per agreement between USEPA and CPG, additional attempts were conducted at specific locations within Reaches 1, 4, and 5 to supplement the catch from the first five attempts. Bait varied by method. Traps were baited with bologna, cheese dough, chicken legs, blood dough, commercially processed blue crab, and sardines. Trotlines were baited with shrimp, worms, and chicken livers.

Boat electrofishing was conducted in Reaches 4 through 8; backpack electrofishing was conducted only in Reach 8. Water quality parameters, (i.e., salinity, conductivity, and temperature) and water depth were recorded during electrofishing attempts, and these parameters are summarized in the 2009 Fish / Decapod Field Report (Windward 2010c).

2.3 FIELD DEVIATIONS FROM THE QAPP

Deviations from the Fish / Decapod QAPP (Windward 2009a) were implemented during the late summer / early fall 2009 tissue sampling effort for some sampling, processing, and analytical methods. Deviations from the Fish / Decapod QAPP were documented in the field notebook and on protocol modification forms (PMFs), when necessary. PMFs related to the field sampling effort are discussed (and presented in Appendix B) in the 2009 Fish / Decapod Field Report (Windward 2010c). The

remaining PMFs related to chemical analyses are addressed in this report (see Section 3.5).

3 Laboratory Methods

This section briefly describes the methods used to analyze tissue samples and present the number of samples that were submitted for each analysis. This section also summarizes laboratory deviations from the Fish / Decapod QAPP (Windward 2009a).

3.1 SAMPLE PROCESSING AND COMPOSITING

All tissue samples retained for possible chemical analysis were couriered frozen from the CPG field facility in Rutherford, New Jersey, to Alpha Analytical in Mansfield, Massachusetts, as documented in the Fish and Decapod Field Report (Windward 2010c). The compositing plan for each of the species was agreed upon by CPG and USEPA during multiple meetings from January through June of 2010, as documented in multiple memoranda (listed below). Appendix A presents the USEPA-approved compositing memoranda and tables that provide a complete list of the analytical samples and the individual specimens in each composite, including details on the sizes of fish and blue crab that were analyzed. Fish and blue crab were composited at Alpha Analytical according to the following USEPA-approved compositing memoranda and tables (Appendix A):

- The Revised Sample Analysis Plan for Blue Crab Tissue for the Lower Passaic River Restoration Project Memorandum (Windward 2010g) (approved by USEPA on February 8, 2010)
- The Revised Sample Analysis Plan for Catfish / Bullhead, Carp, Bass, White Sucker, and Northern Pike Tissue for the Lower Passaic River Restoration Project (Revised Fish Sample Analysis Plan, Part 1) Memorandum (Windward 2010h) (approved by USEPA on May 21, 2010)
- The final white perch and American eel analytical plan tables (approved by USEPA on June 14 and 18, 2010, respectively)

Mummichog egg tissue samples collected in May 2010 were prepared according to the Fish / Decapod QAPP (Windward 2009a).

Windward Environmental LLC (Windward) personnel oversaw the compositing at Alpha Analytical to ensure that the correct specimens were included in the tissue composite samples. Table 3-1 presents a summary of the compositing information. The following summarize the overall compositing scheme for the various species:

- **Mummichog (egg lipid analysis) –** In accordance with the Fish / Decapod QAPP (Windward 2009a), each mummichog composite egg sample was prepared using eggs collected from two to four fish to achieve the minimum required mass of 5 g. Figure 3-1 presents the mummichog egg sampling locations; sampling location coordinates for each mummichog egg tissue sample are provided in Appendix L.

- **White perch and American eel** – In accordance with USEPA direction, white perch and American eel samples were analyzed as individual fish as well as composite samples. Most white perch and American eel composite samples were composed of fish collected from the same sampling location (see Figures 3-2 and 3-3 for the locations where analyzed samples of white perch and American eel samples, respectively, were collected); sampling location coordinates for each fish tissue sample are provided in Appendix L. White perch and American eel were analyzed as two different tissue types: whole body and fillet. In addition, one white perch carcass (i.e., all tissue that remains once the fillet has been removed) sample and two American eel carcass samples were analyzed; carcass and fillet samples (either for individuals or composites) were collected from the same fish. Reconstituted whole-body concentrations will be calculated for paired fillet and carcass samples for use in the baseline ecological risk assessment (BERA).
- **Brown bullhead** – Brown bullhead were analyzed as individual whole-body samples. No individual brown bullhead fish were greater than 450 g;[3] therefore, no brown bullhead fillet samples were analyzed. Figure 3-4 presents the brown bullhead sampling locations; sampling location coordinates for each fish tissue sample are provided in Appendix L.
- **White catfish, channel catfish, and white sucker** – White catfish, channel catfish, and white sucker were analyzed as individual fish samples. All fish were greater than 450 g, with the exception of one white catfish (weight was 422 g) and one white sucker (weight was 434 g). Each individual fish was analyzed as two samples: one fillet sample and one carcass sample. Reconstituted whole-body concentrations will be calculated for paired fillet and carcass samples for use in the BERA. Figure 3-5 presents the catfish and white sucker sampling locations; sampling location coordinates for each fish tissue sample are provided in Appendix L.
- **Carp** – Carp were analyzed as individual fish. Individual carp were analyzed either as whole-body or fillet samples. Figure 3-6 presents the carp sampling locations; sampling location coordinates for each fish tissue sample are provided in Appendix L.
- **Largemouth bass, smallmouth bass, and northern pike** – Two individual samples of largemouth bass were analyzed (as fillet and carcass samples), and four largemouth bass composite samples were analyzed (as fillet and carcass samples). Smallmouth bass were analyzed as composite samples (as fillet and carcass samples), and one individual northern pike was analyzed (as fillet and carcass samples). Reconstituted whole-body concentrations will be calculated

[3] As discussed in Appendix A, to meet the analytical mass requirements, the minimum required size of a fish to be analyzed as a fillet sample was 450 g.

for paired fillet and carcass samples for use in the BERA. Figure 3-7 presents the sampling locations for all bass that were submitted for analysis; sampling location coordinates for each fish tissue sample are provided in Appendix L.

- **Blue crab** – Blue crab were analyzed as composite samples. Composite samples were analyzed as one or more of the following tissue types: muscle / hepatopancreas, carcass (non-muscle / hepatopancreas), muscle-only, or hepatopancreas-only samples. Paired carcass and muscle / hepatopancreas samples were collected from the same blue crab composite samples. Reconstituted whole-body concentrations will be calculated for paired muscle / hepatopancreas and carcass samples for use in the BERA. Figure 3-8 presents the blue crab sampling locations; sampling location coordinates for each blue crab tissue sample are provided in Appendix L.

Table 3-1. Number of fish and blue crab samples analyzed

Species	Type of Tissue Sample	Sample Type	Number of Samples Analyzed								
			Reach 1 (RM 0 to RM 2)	Reach 2 (RM 2 to RM 4)	Reach 3 (RM 4 to RM 6)	Reach 4 (RM 6 to RM 8)	Reach 5 (RM 8 to RM 10)	Reach 6 (RM 10 to RM 12)	Reach 7 (RM 12 to RM 14)	Reach 8 (RM 14 to RM 17.4)	Reaches 1 to 8 (RM 0 to RM 17.4)
Benthic Omnivore – Forage Fish											
Mummichog	egg tissue	composite		9	1						**10**
Invertivore/Omnivore											
White perch	carcass	individual	1								**1**
	fillet (with skin)	composite	1		7	2	3	1		3	**17**
		individual	1					1			**2**
	whole body	composite			6	2	3		1	3	**15**
		individual	1	1				1	1		**4**
Brown bullhead	whole body	individual			1	1		3	1		**6**
Channel catfish	carcass	individual					1	2	2	6	**11**
	fillet (skinless)	individual					1	2	2	6	**11**
White catfish	carcass	individual		1	4	1	2	5	2	4	**19**
	fillet (skinless)	individual		1	4	1	2	5	2	4	**19**
Carp	fillet (with skin)	individual			2	2	2	2	2	2	**12**
	whole body	individual			2	2	2	2	2	2	**12**
White sucker	carcass	individual				1	2			2	**5**
	fillet (with skin)	individual				1	2			2	**5**

Table 3-1. Number of fish and blue crab samples analyzed

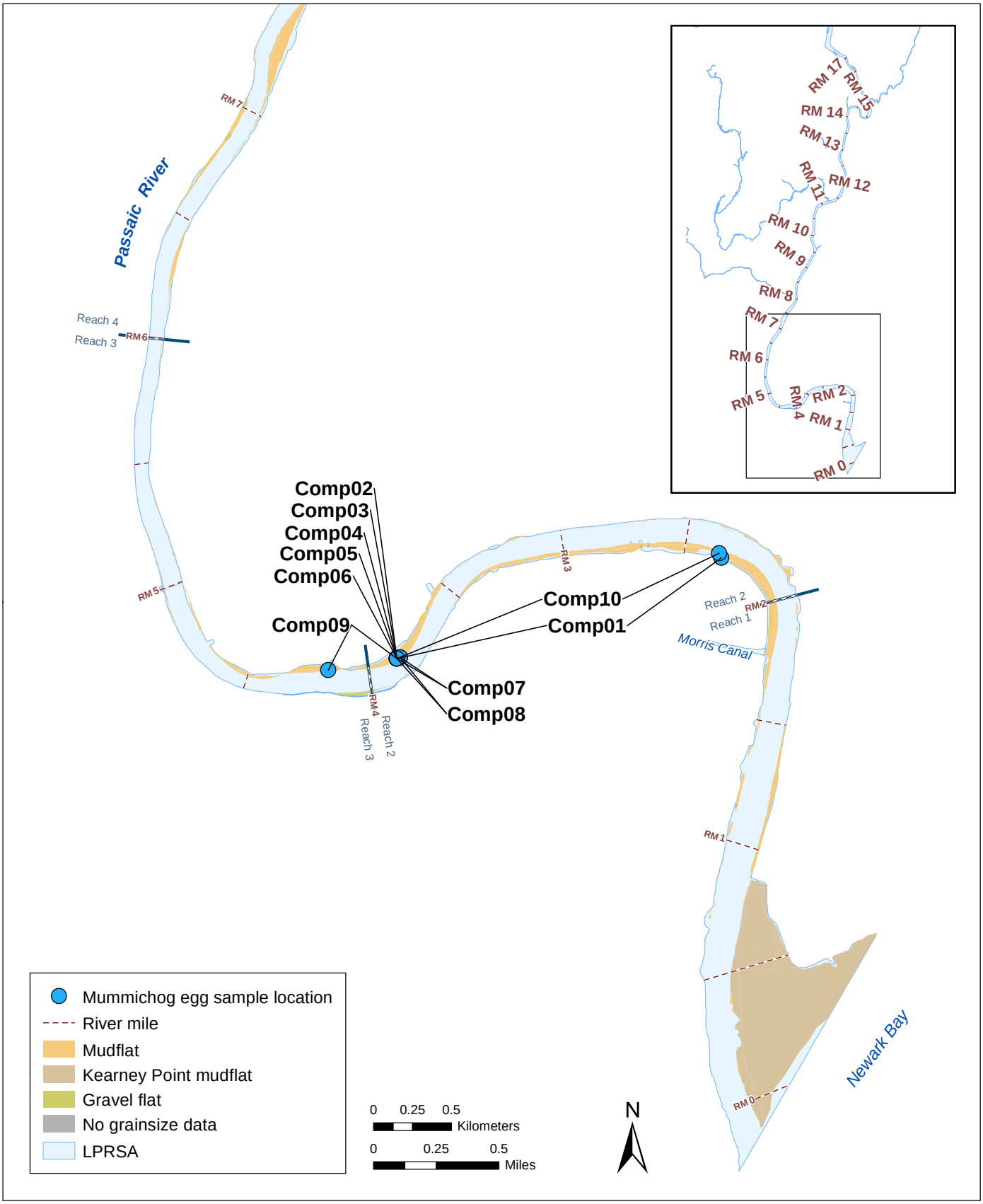
Species	Type of Tissue Sample	Sample Type	Number of Samples Analyzed								
			Reach 1 (RM 0 to RM 2)	Reach 2 (RM 2 to RM 4)	Reach 3 (RM 4 to RM 6)	Reach 4 (RM 6 to RM 8)	Reach 5 (RM 8 to RM 10)	Reach 6 (RM 10 to RM 12)	Reach 7 (RM 12 to RM 14)	Reach 8 (RM 14 to RM 17.4)	Reaches 1 to 8 (RM 0 to RM 17.4)
Piscivore											
American eel	carcass	composite		1							**1**
		individual	1								**1**
	fillet (skinless)	composite	2	1	3	2	3			4	**15**
		individual	1		3	4	6	2	1		**17**
	whole body	composite	1				1			5	**7**
		individual			3	4	2	2	1		**12**
Largemouth bass	carcass	composite					1				**1**
		individual					1			1	**2**
	fillet (with skin)	composite					1				**1**
		individual					1			1	**2**
Smallmouth bass	carcass	composite				1	1			1	**3**
	fillet (with skin)	composite				1	1			1	**3**
Northern pike	carcass	individual						1			**1**
	fillet (with skin)	individual						1			**1**
Epibenthic Omnivore											
Blue crab	carcass	composite	8	6	4	4	2				**24**
	hepatopancreas only	composite	2	2	1				1	1	**7**
	muscle only	composite	5	4	2		1	3	3	3	**21**
	muscle/ hepatopancreas	composite	8	6	4	4	2	5	6	6	**41**

Table 3-1. Number of fish and blue crab samples analyzed

Species	Type of Tissue Sample	Sample Type	Number of Samples Analyzed								
			Reach 1 (RM 0 to RM 2)	Reach 2 (RM 2 to RM 4)	Reach 3 (RM 4 to RM 6)	Reach 4 (RM 6 to RM 8)	Reach 5 (RM 8 to RM 10)	Reach 6 (RM 10 to RM 12)	Reach 7 (RM 12 to RM 14)	Reach 8 (RM 14 to RM 17.4)	Reaches 1 to 8 (RM 0 to RM 17.4)
Total											**309[a]**

[a] Includes 299 analytical samples for lipids, percent moisture, and chemical analysis (including the following analyte groups: metals, butyltins, PAHs, alkylated PAHs, other SVOCs, PCB Aroclors, PCB congeners, PCDDs/PCDFs, and organochlorine pesticides), and 10 mummichog egg samples for lipid analysis.

PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
RM – river mile
SVOC – semivolatile organic compound



Mudflat and gravel flat locations are determined as those areas where the river bottom slope is ≤6° and the depth is ≥-4.5 ft NGVD29 (i.e. -2 ft ft MLLW). LPRSA bathymetry is taken from the 2007 bathymetric survey conducted by Gahagan & Bryant Associates, Inc. (GBA), except for the area outside Kearny Point; bathymetry in the southeast part of this area is estimated based on NOAA data. In the GBA survey area, multibeam data are used where available and single-beam data are used where they are not.

Figure 3-1. 2010 LPRSA sampling locations for mummichog egg composite samples

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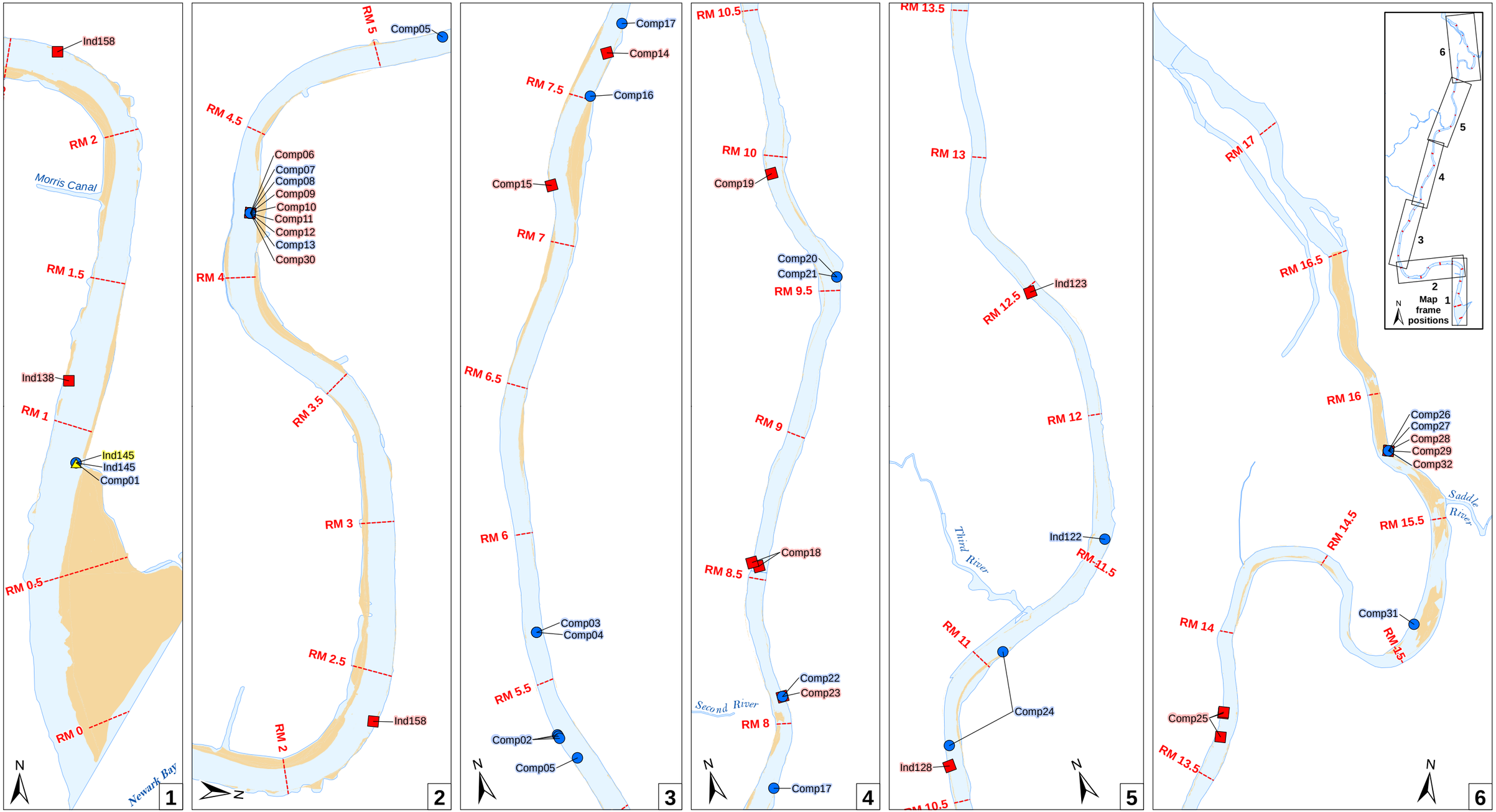

Wind Ward environmental LLC

0 0.5 Kilometers

0 0.25 Miles

TissueType
- Carcass
- Fillet (with skin)
- Whole body

Mudflat or gravel flat
River mile
LPRSA

Mudflat and gravel flat locations are determined as those areas where the river bottom slope is ≤6° and the depth is ≥-4.5 ft NGVD29 (i.e. -2 ft ft MLLW). LPRSA bathymetry is taken from the 2007 bathymetric survey conducted by Gahagan & Bryant Associates, Inc. (GBA), except for the area outside Kearny Point; bathymetry in the southeast part of this area is estimated based on NOAA data. In the GBA survey area, multibeam data are used where available and single-beam data are used where they are not.

Figure 3-2. 2009 sampling locations for white perch tissue samples

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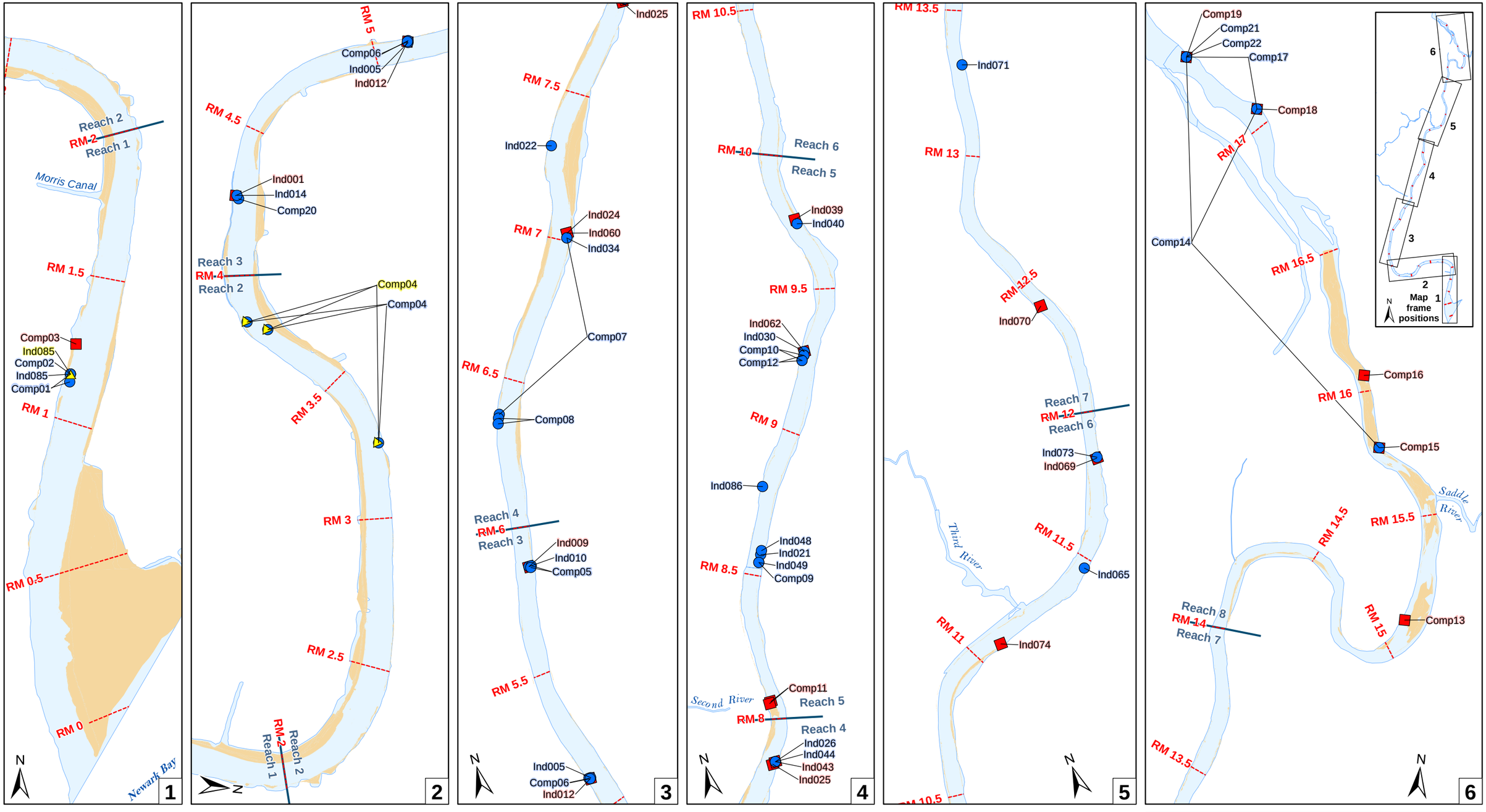

0 0.5 Kilometers

0 0.25 Miles

TissueType
- Carcass
- Fillet (skinless)
- Whole body

Mudflat or gravel flat
River mile
LPRSA

Mudflat and gravel flat locations are determined as those areas where the river bottom slope is ≤6° and the depth is ≥-4.5 ft NGVD29 (i.e. -2 ft ft MLLW). LPRSA bathymetry is taken from the 2007 bathymetric survey conducted by Gahagan & Bryant Associates, Inc. (GBA), except for the area outside Kearny Point; bathymetry in the southeast part of this area is estimated based on NOAA data. In the GBA survey area, multibeam data are used where available and single-beam data are used where they are not.

Figure 3-3. 2009 LPRSA sampling locations for American eel tissue samples

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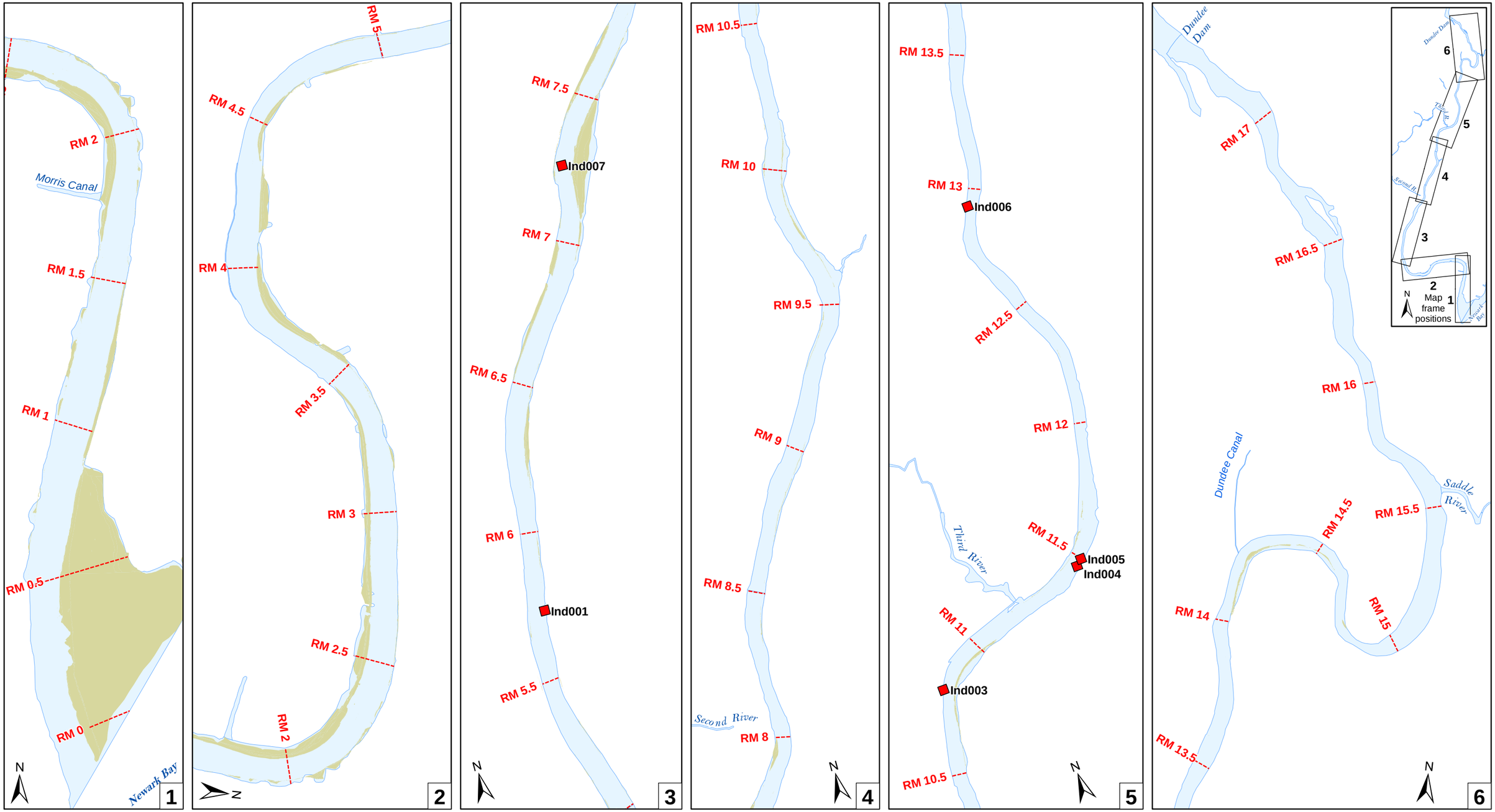

Wind Ward environmental LLC

0 0.5 1 Kilometers

0 0.25 0.5 Miles

- Brown bullhead - whole body
- River mile
- Mudflat
- LPRSA

Mudflat locations are determined as those areas of fine (i.e., silt or sand) sediment substrate, where the river bottom slope is ≤6°and the depth is ≥-4.5 ft NGVD29 (i.e. -2 ft MLLW). LPRSA sediment grain size is based on map layers from the Draft Technical Report, Geophysical Survey (Aqua Survey, Inc., 2005a). LPRSA bathymetry is taken from the 2007 bathymetric survey conducted by Gahagan & Bryant Associates, Inc. (GBA), except for the area outside Kearny Point; bathymetry in the southeast part of this area is estimated based on NOAA data. In the GBA survey area, multibeam data are used where available and single-beam data are used where they are not.

Figure 3-4. 2009 LPRSA sampling locations for brown bullhead tissue samples

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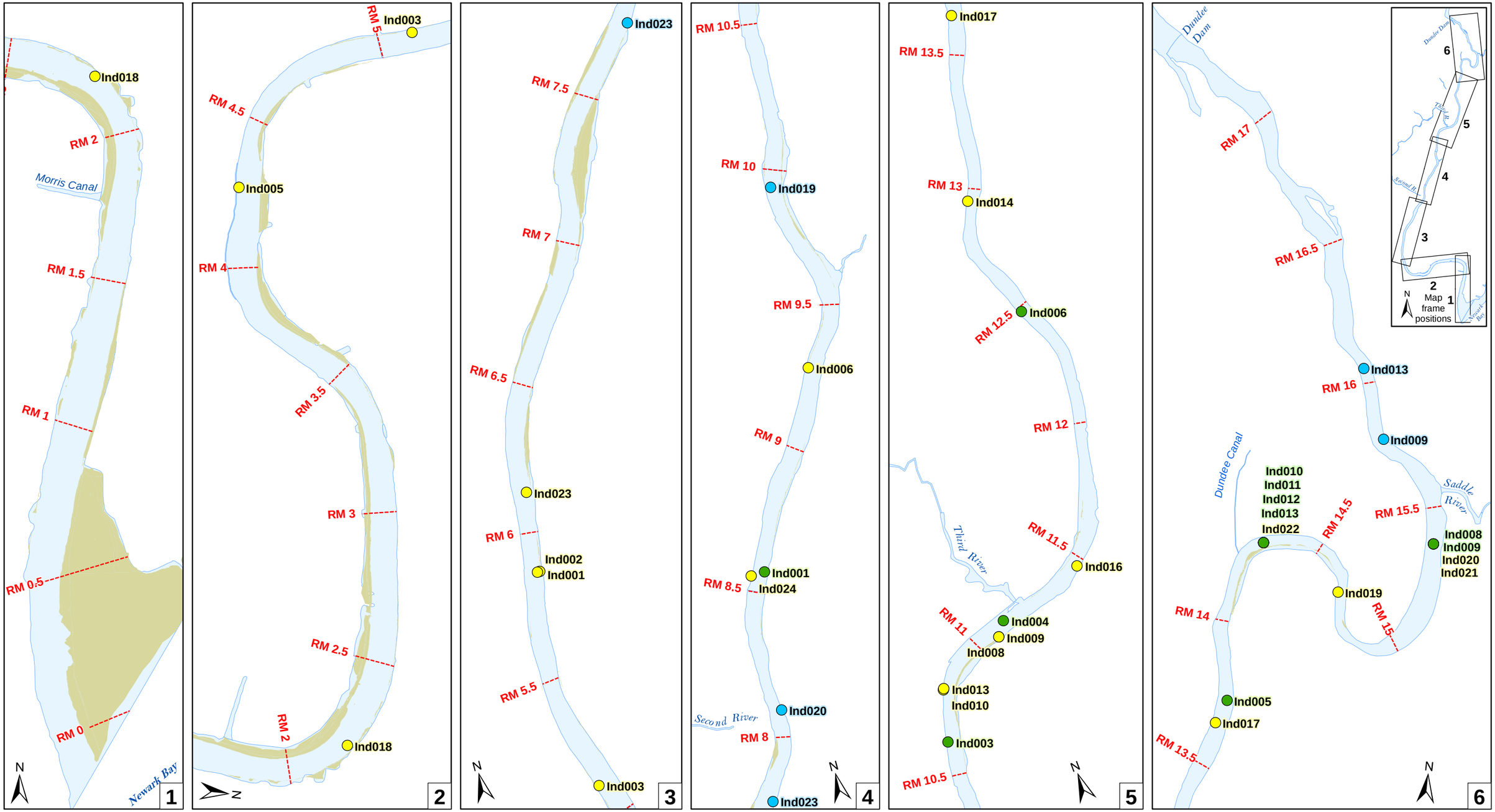

0 0.5 1 Kilometers

0 0.25 0.5 Miles

Species
- Channel catfish - fillet (skinless) and carcass
- White catfish - fillet (skinless) and carcass
- White sucker - fillet (with skin) and carcass

River mile
Mudflat
LPRSA

Mudflat locations are determined as those areas of fine (i.e., silt or sand) sediment substrate, where the river bottom slope is ≤6° and the depth is ≥-4.5 ft NGVD29 (i.e. -2 ft MLLW). LPRSA sediment grain size is based on map layers from the Draft Technical Report, Geophysical Survey (Aqua Survey, Inc., 2005a). LPRSA bathymetry is taken from the 2007 bathymetric survey conducted by Gahagan & Bryant Associates, Inc. (GBA), except for the area outside Kearny Point; bathymetry in the southeast part of this area is estimated based on NOAA data. In the GBA survey area, multibeam data are used where available and single-beam data are used where they are not.

Figure 3-5. 2009 LPRSA sampling locations for channel catfish, white catfish, and white sucker tissue samples

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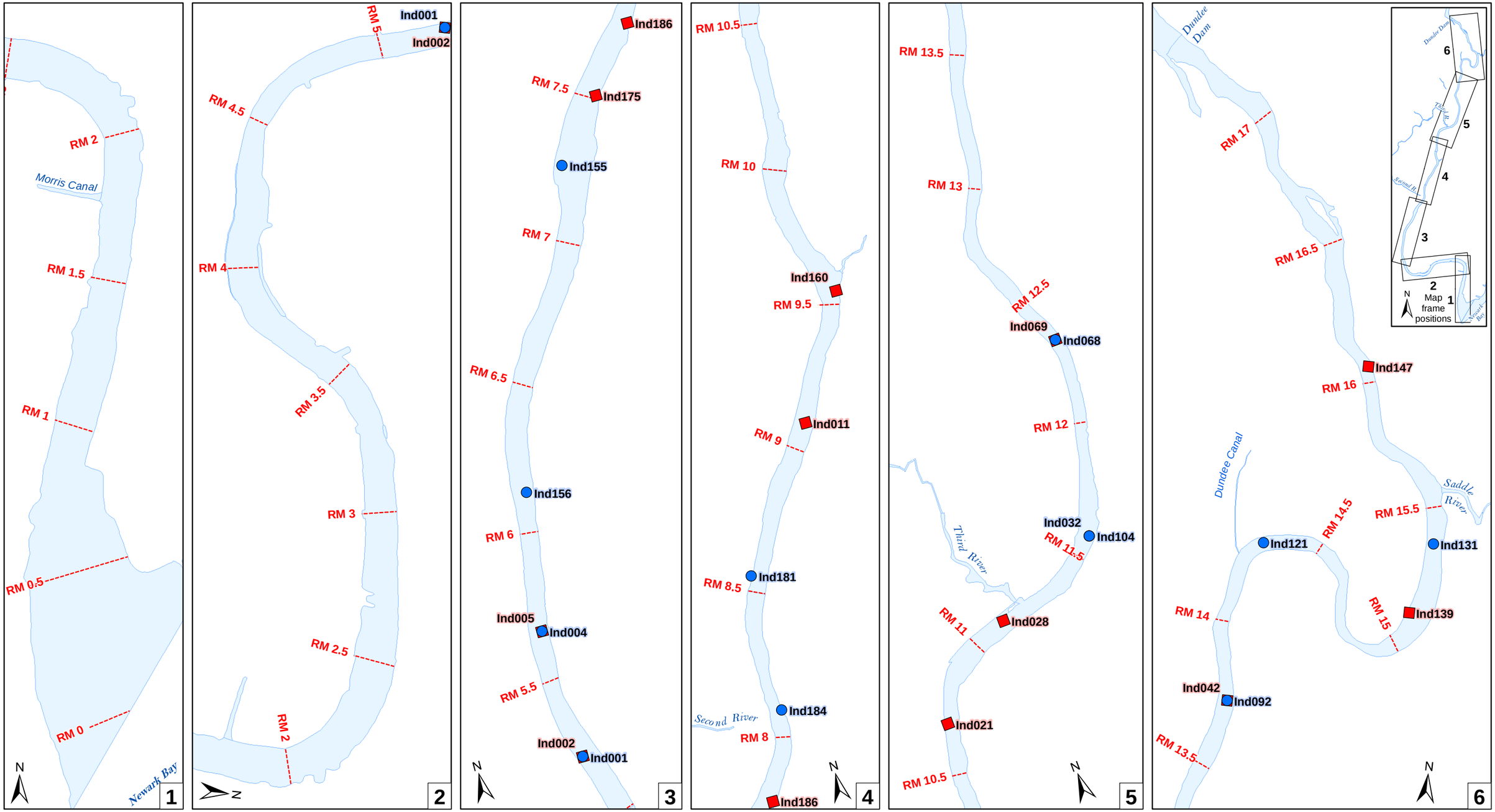

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Figure 3-6. 2009 LPRSA sampling locations for carp tissue samples

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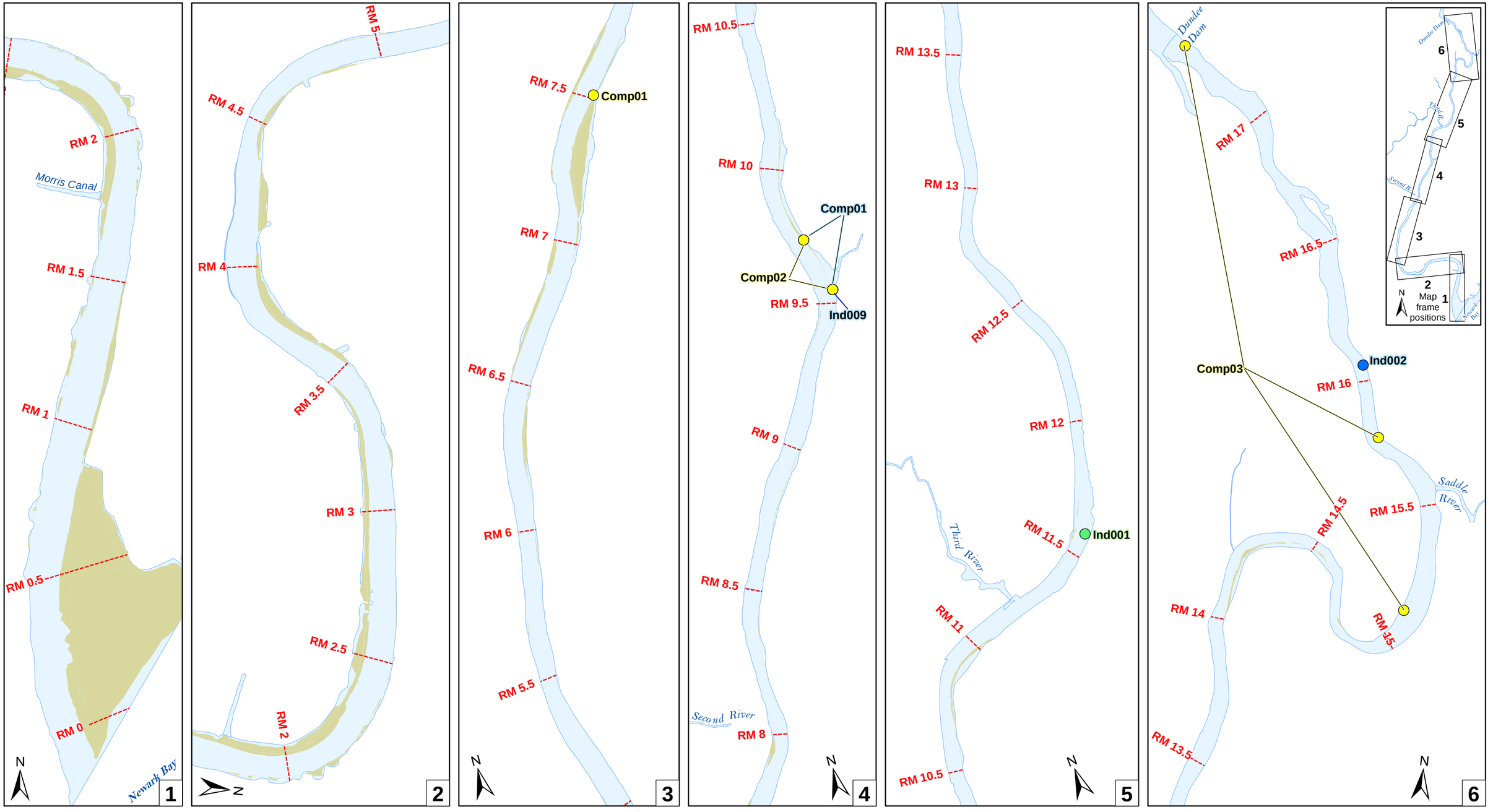

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Mudflat locations are determined as those areas of fine (i.e., silt or sand) sediment substrate, where the river bottom slope is ≤6°and the depth is ≥-4.5 ft NGVD29 (i.e. -2 ft MLLW). LPRSA sediment grain size is based on map layers from the Draft Technical Report, Geophysical Survey (Aqua Survey, Inc., 2005a). LPRSA bathymetry is taken from the 2007 bathymetric survey conducted by Gahagan & Bryant Associates, Inc. (GBA), except for the area outside Kearny Point; bathymetry in the southeast part of this area is estimated based on NOAA data. In the GBA survey area, multibeam data are used where available and single-beam data are used where they are not.

Figure 3-7. 2009 LPRSA sampling locations for largemouth bass, smallmouth bass, and northern pike tissue samples

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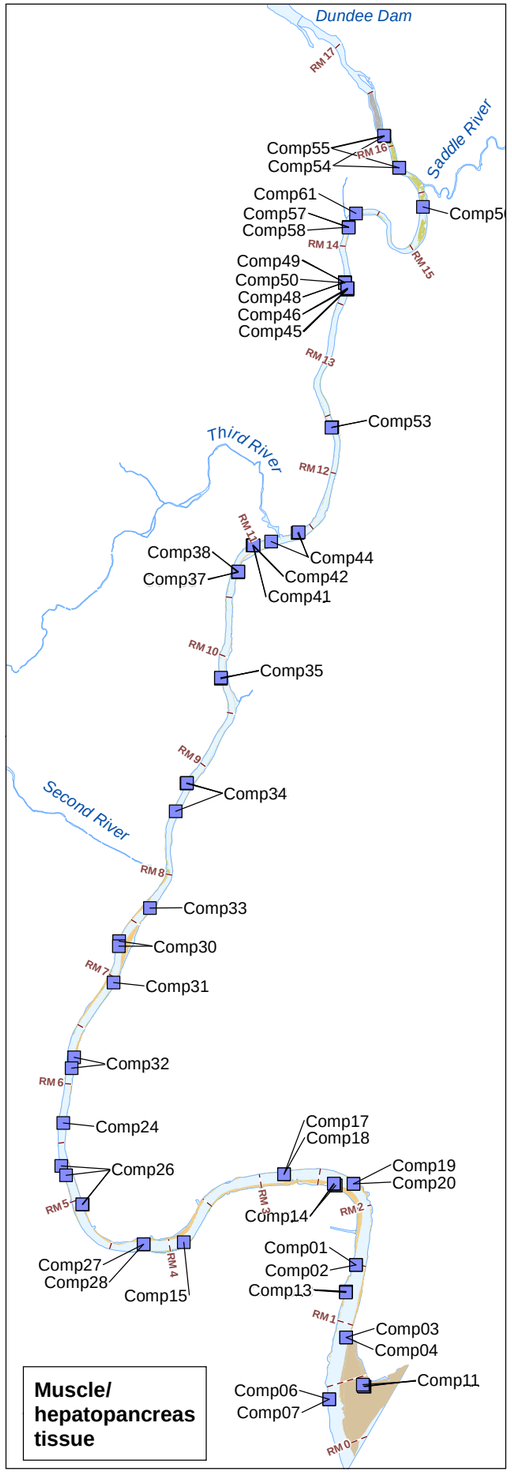

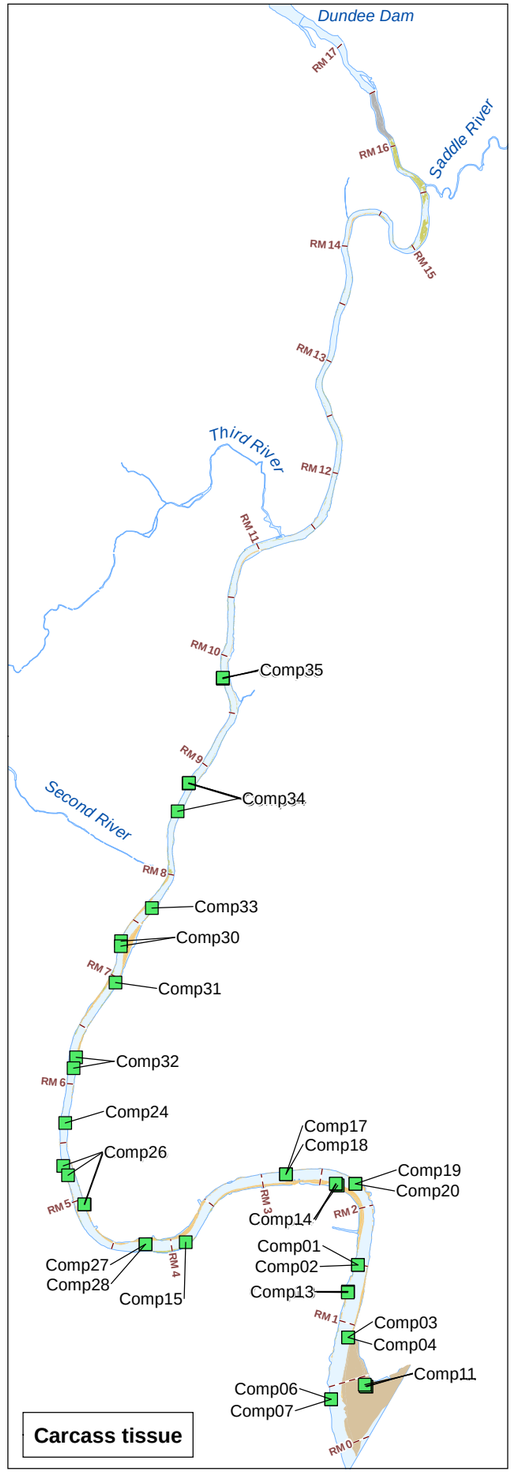

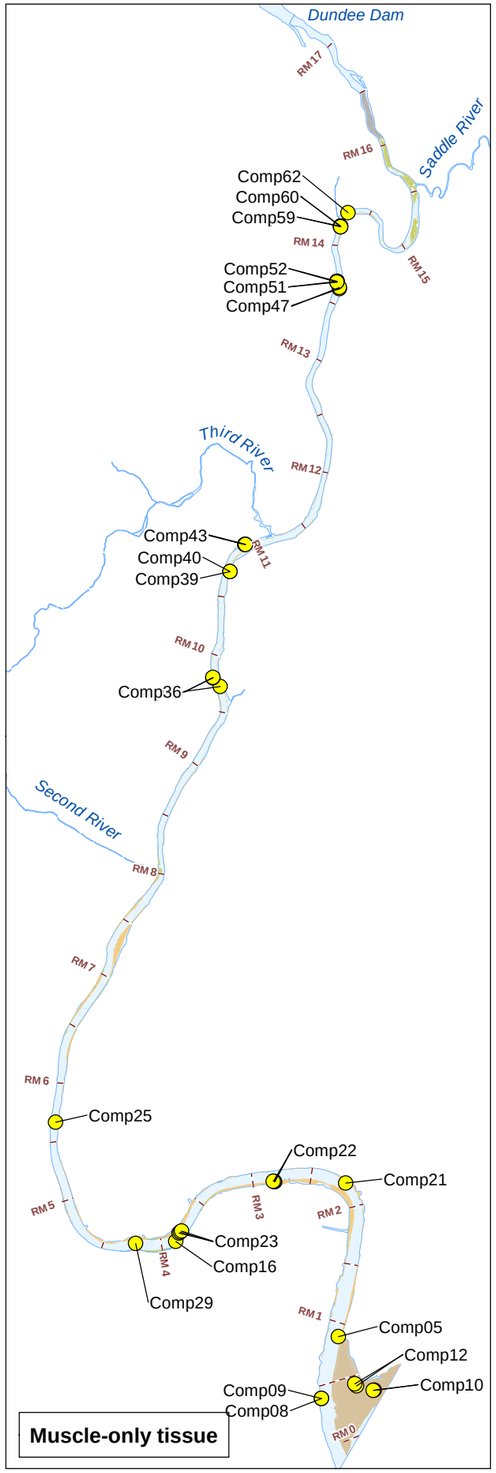

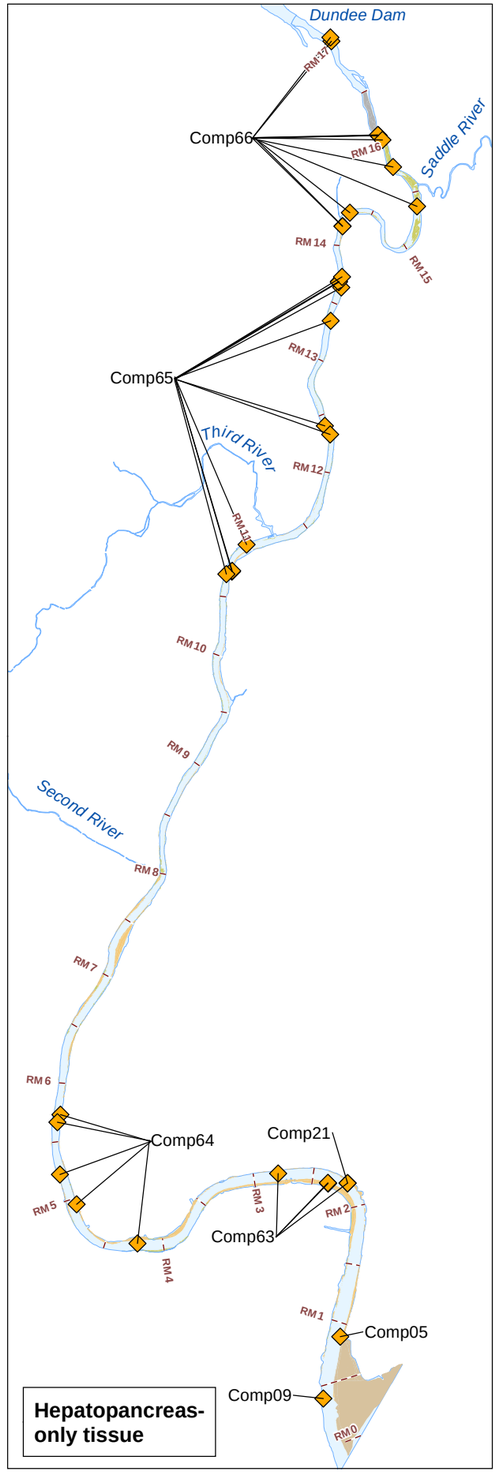

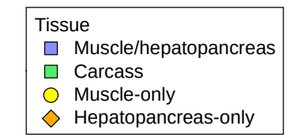

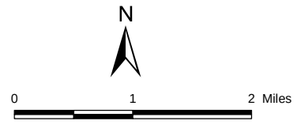

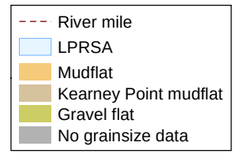

Mudflat and gravel flat locations are determined as those areas where the river bottom slope is ≤6°and the depth is ≥-4.5 ft NGVD29 (i.e. -2 ft ft MLLW). LPRSA bathymetry is taken from the 2007 bathymetric survey conducted by Gahagan & Bryant Associates, Inc. (GBA), except for the area outside Kearny Point; bathymetry in the southeast part of this area is estimated based on NOAA data. In the GBA survey area, multibeam data are used where available and single-beam data are used where they are not.

Figure 3-8. 2009 LPRSA sampling locations for blue crab tissue samples

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3.2 SAMPLE IDENTIFICATION SCHEME

Per the Fish / Decapod QAPP (Windward 2009a), each analytical sample was assigned a unique sampling identification (ID) number. For fish whole-body, fillet, and carcass samples; blue crab carcass, muscle / hepatopancreas, muscle only, and hepatopancreas only samples; and mummichog egg analytical samples, the sample identification scheme was as follows:

- The first five characters were "LPR" to identify the project area (Lower Passaic River) and 2-mile reach segment (i.e., 1 to 8).
- The next set of characters identified the fish or blue crab species based on a two-letter code for the scientific (Latin binomial) name and two-letter code for the tissue type. Table 3-2 provides a key of the species and tissue type sample ID codes.
- The next set of alphanumeric characters was "Comp" or "Ind" to identify the composite or individual sample type, respectively, followed by a unique two- or three-digit sequential number. For example, the smallmouth bass fillet and carcass tissue composite samples from Reach 4 were called "LPR4-MDFT-Comp01" and "LPR4-MDCT-Comp01," respectively.

Table 3-2. Sample ID code definitions

ID Code	Definition
Species Name	
AC	white catfish (*Ameiurus catus*)
AN	brown bullhead (*Ameiurus nebulosus*)
AR	American eel (*Anguilla rostrata*)
CC	carp (*Cyprinus carpio*)
CS	blue crab (*Callinectes sapidus*)
EL	northern pike (*Esox lucius*)
FH	mummichog (*Fundulus heteroclitus*)
IP	channel catfish (*Ictalurus punctatus*)
MA	white perch (*Morone americana*)
MD	smallmouth bass (*Micropterus dolomieu*)
MS	largemouth bass (*Micropterus salmoides*)
WS	white sucker (*Catastomus commersoni*)
Tissue Type	
ET	egg
CT	carcass
FT	fillet

Table 3-2. Sample ID code definitions

ID Code	Definition
HT	hepatopancreas only
MH	muscle/hepatopancreas
MT	muscle only
WB	whole body

ID – identification

There were five deviations to the compositing plans, as described in Table 3-3. Four of the deviations did not impact the planned analyses; one deviation resulted in the loss of an eel fillet sample. The deviations were communicated to USEPA oversight personnel.

Table 3-3. Deviations from the compositing plans

Individual Specimen ID	Composite ID	Reason for Exclusion from Composite Samples	Adequate Analytical Mass for All Analyses Without Excluded Specimen?
LPR8S-CS796	LPR8-CSMH-Comp61	The crab's stomach ruptured, and the contents appeared to have leaked onto other internal tissue. The hepatopancreas tissue was also discolored.	yes
LPR1M-CS492	LPR1-CSMH-Comp11, LPR1-CSCT-Comp11	When the crab was opened, no muscle, hepatopancreas, or internal organs were present. The gills were present but were dried. The specimen mass as determined by Alpha Analytical (32 g) was consistent with the mass determined at the time of collection (38 g); therefore, it appears that the crab was not alive at the time of collection.	yes
LPR2J-CS629	LPR2-CSHT-Comp63	The crab had a strong odor, and the tissue inside was discolored (brownish red).	yes
LPR3M-MA028	LPR3-MAFT-Comp04	A white perch had a ruptured stomach, and the contents appeared to have leaked onto the fillet tissue.	yes
LPR4M-AR035	LPR4-ARFT-Ind035[a]	The eel had a strong odor and discoloration of the skin, and a portion of the fillet was missing on one side.	no; no analytical sample was created

[a] Individual sample, not intended to be included in a composite sample.

ID – identification

3.3 TISSUE HOMOGENIZATION

Samples were homogenized consistent with the protocols outlined in the Fish / Decapod QAPP (Windward 2009a) and PMFs 10 and 11 (Appendix B). Windward and AECOM personnel oversaw the initial processing (including weighing) and initial homogenization procedures for a subset of the samples for each of the three compositing plans. The homogenization of blue crab began on March 3, 2010; the homogenization of fish (Part 1) began on May 18, 2010; and the homogenization of American eel / white perch (Part 2) began on June 24, 2010. After homogenization, each tissue sample was partitioned into five containers, one for each of the five analytical laboratories. Frozen tissue was shipped overnight (to Analytical Perspectives, Brooks Rand Labs, or Columbia Analytical Services) or couriered (to Maxxam Analytics) on wet and dry ice. Chain-of-custody forms (Appendix C) document the transfer of custody for the tissue samples. Samples were batched into sample delivery groups (SDGs) for chemical analysis. Appendix D provides a cross reference for each sample presented by laboratory, analysis type, and SDG.

3.4 METHODS FOR CHEMICAL ANALYSIS

The methods and procedures used to chemically analyze the fish and blue crab tissue samples are identified in Table 3-4 and described in detail in the Fish / Decapod QAPP (Windward 2009a). All tissue samples, except those mentioned in Table 3-3, had sufficient mass to be analyzed for all of the analytes listed in Footnote a of Table 3-1. The data validation reports (Appendix I) provide a complete list of the individual samples in each SDG.

Table 3-4. Analytical methods for fish and blue crab tissue analyses

Laboratory	Analyte	Instrument/Method	Method Reference
Alpha Analytical	alkylated PAHs	GC/MS-SIM	USEPA SW-846 8270C
	PCB Aroclors	GC/ECD	USEPA SW-846 8082
	percent moisture	oven	SM2540G Mod
	SVOCs	GC/MS	USEPA SW-846 8270C
Analytical Perspectives	PCB congeners	HRGC/HRMS	USEPA 1668B
	PCDDs/PCDFs	HRGC/HRMS	USEPA 1613B
Brooks Rand Labs	inorganic arsenic	ICP-MS	USEPA 1632
	methyl mercury	CVAFS	USEPA 1630
	total mercury	CVAFS	USEPA 1631
Columbia Analytical Services, Kelso	butyltins	GC/MS-SIM	Krone
	lipids	analytical balance	Bligh-Dyer
	metals	ICP-AES/ICP-MS/GFAAS	USEPA SW-846 6010B/6020/7742

Table 3-4. Analytical methods for fish and blue crab tissue analyses

Laboratory	Analyte	Instrument/Method	Method Reference
Maxxam Analytics	organochlorine pesticides	HRGC/HRMS	USEPA 1699 Mod
	PAHs	HRGC/HRMS	CARB 429 Mod

AES – atomic emission spectrometry
CARB – California Air Resources Board
CVAFS – cold vapor atomic fluorescence spectrometer
ECD – electron capture detection
GC– gas chromatography
GFAAS – graphite furnace atomic absorption spectrometer
HRGC – high-resolution gas chromatograph
HRMS – high-resolution mass spectrometer
ICP– inductively coupled plasma
MS – mass spectrometry
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
SIM – selective ion monitoring
SVOC – semivolatile organic compound
USEPA – US Environmental Protection Agency

3.5 LABORATORY DEVIATIONS FROM QAPP

Deviations from the Fish / Decapod QAPP (Windward 2009a) that were related to the chemical analysis of the fish and blue crab tissue samples were documented in PMFs, which were provided to USEPA. The PMFs related to tissue chemical analyses are presented in Appendix B and include the following:

- **PMF Fish/Decapod QAPP No. 1** – clarification of the use of certified reference materials for semivolatile organic compounds (SVOCs) and alkylated polycyclic aromatic hydrocarbons (PAHs)
- **PMF Fish/Decapod QAPP No. 7** – clarification of the method used for the analysis of alkylated PAHs and revised SOP
- **PMF Fish/Decapod QAPP No. 8** – documentation of matrix spike addition procedure for selenium analysis and revised SOP
- **PMF Fish/Decapod QAPP No. 9** – clarification of methods used for total metals analysis
- **PMF Fish/Decapod QAPP No. 10** – clarification of tissue processing procedure and revision to addendum to Attachment O of the Fish / Decapod QAPP
- **PMF Fish/Decapod QAPP No. 11** – clarification of tissue processing procedure and revision to Attachment O of the Fish / Decapod QAPP
- **PMF Fish/Decapod QAPP No. 14** – clarification of polychlorinated biphenyl (PCB) congener method and revised SOP
- **PMF Fish/Decapod QAPP No. 15** – clarification of metals spiking procedures
- **PMF Fish/Decapod QAPP No. 16** – clarification of quality control samples for butyltin analysis

4 Results

This section presents a summary of the 2009 fish and blue crab tissue and 2010 mummichog egg lipid data chemistry results. Data management rules, including the protocol for the calculation of chemical sums and the treatment of non-detected results for presentation in this report, are presented in Appendix E. Data tables that contain all chemical results by sample are presented in Appendix F. Laboratory data summary forms are presented in Appendix G, and full laboratory data packages are presented in Appendix H.

A subset of analytes were selected for presentation in this report (Table 4-1), and the complete dataset for all analytes is provided in Appendix F. This subset of analytes represents a range of analyte groups that have been the focus of previous reports on the LPRSA, including most notably USEPA Region 2's *Remedial Investigation Report for the Focused Feasibility Study of the Lower Eight Miles of the Lower Passaic River* (Louis Berger et al. 2014; see Table 4-1) and the *Low Resolution Coring Characterization Summary* (AECOM 2014), hereafter referred to as the Low Resolution Coring (LRC) Report.

Table 4-1. Analytes selected for detailed presentation

Analyte Group	Analyte
Metals	cadmium
	chromium
	copper
	lead
	mercury
PAHs	LPAHs[a]
	HPAHs[b]
	total PAHs[c, d]
PCBs	total PCB congeners[e]
	total PCB Aroclors[d, f]
PCDDs/PCDFs	2,3,7,8-TCDD
Organochlorine pesticides	total DDx[g]
	total chlordane[h]
	dieldrin
General chemistry	lipid

[a] Calculated as the sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene (see Appendix E for more details).

[b] Calculated as the sum of benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, and pyrene (see Appendix E for more details).

[c] Calculated as the sum of acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene (see Appendix E for more details).

[d] Analyte is presented only in tables (not figures).

[e] Calculated as the sum of 209 PCB congeners (see Appendix E for more details).

[f] Calculated as the sum of Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262, and Aroclor 1268 (see Appendix E for more details).

[g] Calculated as the sum of 2,4′-DDD; 2,4′-DDE; 2,4′-DDT; 4,4′-DDD; 4,4′-DDE; and 4,4′-DDT (see Appendix E for more details).

[h] Calculated as the sum of alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor (see Appendix E for more details).

DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethylene
DDT – dichlorodiphenyltrichloroethane
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
TCDD – tetrachlorodibenzo-*p*-dioxin
total DDx – sum of all six DDT isomers (2,4′-DDD, 4,4′-DDD, 2,4′-DDE, 4,4′-DDE, 2,4′-DDT and 4,4′-DDT)

The data for all analytes are summarized in the following subsections with detailed discussions provided for the analytes identified in Table 4-1. For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), figures are presented to show tissue concentrations by reach.[4] Summary tables of the other analytes that were detected in tissue are also included.

In the summary tables that follow, calculated total concentrations are presented three ways based on the treatment of non-detected components: non-detected concentrations are set equal to zero, equal to one-half the reporting limit [RL], or equal to the full RL. For the purpose of text summary and for graphical presentation, the totals presented are based on non-detected values set equal to zero. The method for calculating the totals that will be used in the risk assessments is presented in the *Revised Data Usability and Data Evaluation Plan for the Lower Passaic River Study Area Risk Assessments* (Windward and AECOM 2015). Additional details on summation calculations are provided in Appendix E.

[4] Blue crab hepatopancreas results are not presented on maps because there were a limited number of samples, and four of the seven samples were not location-specific (Figure 3-8).

4.1 METALS

Table 4-2 presents a summary of the detected concentrations of metals in each tissue type, including the number of detections, the range of detected concentrations, and the RL or range of RLs for samples reported as non-detects. Data tables that contain metals concentrations for each sample, including non-detected sample results, are presented in Appendix F. All 26 metals were detected in all fish species and blue crab, except for the following:

- Total arsenic (not detected in largemouth bass)
- Inorganic arsenic (not detected in channel catfish, smallmouth bass, or northern pike)
- Beryllium (not detected in brown bullhead, white sucker, smallmouth bass, or northern pike)
- Silver (not detected in brown bullhead, largemouth bass, smallmouth bass, or northern pike)
- Thallium (not detected in brown bullhead, largemouth bass, smallmouth bass, or northern pike)
- Vanadium (not detected in largemouth bass or northern pike)

The metals identified in Table 4-1 (i.e., cadmium, chromium, copper, lead, and mercury) are discussed in further detail in the subsections that follow Table 4-2.

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Aluminum (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.63	23.8	8.2	10	na
Carp	fillet (with skin)	12/12	100	0.31 J	2.7	0.86	0.71	na
	whole body	12/12	100	0.97	19.8	6.2	6.6	na
Channel catfish	carcass	11/11	100	0.71 J	7.9	4.0	2.4	na
	fillet (skinless)	10/11	91	0.10 J	0.28 J	0.17	0.072	0.09
White catfish	carcass	19/19	100	1.4	80.6 J	9.9	19	na
	fillet (skinless)	11/19	58	0.09 J	1.6	0.50	0.47	0.09 – 0.44
White sucker	carcass	5/5	100	1.4	42.0	16	16	na
	fillet (with skin)	5/5	100	0.16 J	0.51	0.33	0.15	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Aluminum (mg/kg ww) (cont.)								
Blue crab	carcass	24/24	100	37.2 J	102 J	59.8	12.8	na
	hepatopancreas only	7/7	100	3.2	8.3	4.6	1.7	na
	muscle only	21/21	100	1.6	7.9	4.1	1.7	na
	muscle/hepatopancreas	41/41	100	2.4	13.1	5.2	2.3	na
White perch	carcass	1/1	100	2.5 J	2.5 J	na	na	na
	fillet (with skin)	19/19	100	0.19 J	11.5	0.97	2.6	na
	whole body	19/19	100	1.2 J	31.9 J	12	9.6	na
American eel	carcass	2/2	100	3.8	7.0	5.4	2.3	na
	fillet (skinless)	25/32	78	0.12 J	2.0	0.43	0.40	0.12 – 0.58
	whole body	19/19	100	0.74	50.2	9.1	12	na
Largemouth bass	carcass	3/3	100	0.63	4.3	2.4	1.8	na
	fillet (with skin)	3/3	100	0.11 J	0.22 J	0.15	0.061	na
Northern pike	carcass	1/1	100	4.0	4.0	na	na	na
	fillet (with skin)	1/1	100	0.19 J	0.19 J	na	na	na
Smallmouth bass	carcass	3/3	100	2.8	8.5	5.8	2.9	na
	fillet (with skin)	3/3	100	0.25 J	0.61	0.38	0.20	na
Antimony (mg/kg ww)								
Brown bullhead	whole body	1/6	17	0.006 J	0.006 J	na	na	0.005 – 0.008
Carp	fillet (with skin)	4/12	33	0.007 J	0.092	0.040	0.039	0.005 – 0.009
	whole body	2/12	17	0.006 J	0.012 J	0.0090	0.0042	0.006 – 0.008
Channel catfish	carcass	1/11	9	0.022 J	0.022 J	na	na	0.006 – 0.008
	fillet (skinless)	2/11	18	0.004 J	0.010 J	0.0070	0.0042	0.004 – 0.005
White catfish	carcass	3/19	16	0.018 J	0.029 J	0.024	0.0055	0.005 – 0.017
	fillet (skinless)	3/19	16	0.005 J	0.007 J	0.0057	0.0012	0.003 – 0.011
White sucker	fillet (with skin)	1/5	20	0.007 J	0.007 J	na	na	0.004
Blue crab	carcass	23/24	96	0.0043 J	0.037	0.014	0.0097	0.005
	hepatopancreas only	6/7	86	0.0079 J	0.017	0.012	0.0033	0.013
	muscle only	6/21	29	0.010	0.027	0.017	0.0061	0.0028 – 0.0044
	muscle/hepatopancreas	22/41	54	0.0067 J	0.060 J	0.028	0.014	0.003 – 0.011
White perch	carcass	1/1	100	0.020 J	0.020 J	na	na	na
	fillet (with skin)	3/19	16	0.015 J	0.021 J	0.018	0.0031	0.004 – 0.014
	whole body	3/19	16	0.007 J	0.072 J	0.030	0.036	0.005 – 0.006
American eel	fillet (skinless)	4/32	13	0.006 J	0.020 J	0.012	0.0060	0.004 – 0.006
	whole body	1/19	5	0.014 J	0.014 J	na	na	0.005 – 0.008

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Antimony (mg/kg ww) (cont.)								
Largemouth bass	carcass	3/3	100	0.010 J	0.020	0.013	0.0058	na
	fillet (with skin)	3/3	100	0.006 J	0.029	0.019	0.012	na
Northern pike	carcass	1/1	100	0.017	0.017	na	na	na
	fillet (with skin)	1/1	100	0.008 J	0.008 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.008 J	0.012 J	0.010	0.0021	na
	fillet (with skin)	3/3	100	0.037	0.046	0.040	0.0052	na
Arsenic (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.031 J	0.19 J	0.080	0.062	na
Carp	fillet (with skin)	3/12	25	0.095 J	0.16	0.14	0.035	0.11 – 0.19
	whole body	11/12	92	0.064 J	0.21	0.12	0.048	0.18
Channel catfish	carcass	11/11	100	0.026 J	0.086 J	0.049	0.019	na
	fillet (skinless)	11/11	100	0.022 J	0.050 J	0.034	0.0097	na
White catfish	carcass	19/19	100	0.017 J	0.19	0.065	0.047	na
	fillet (skinless)	19/19	100	0.011 J	0.25	0.061	0.061	na
White sucker	carcass	5/5	100	0.061 J	0.16 J	0.091	0.044	na
	fillet (with skin)	5/5	100	0.040 J	0.080 J	0.062	0.016	na
Blue crab	carcass	24/24	100	0.34 J	1.6 J	0.99	0.40	na
	hepatopancreas only	7/7	100	0.37 J	2.0 J	1.4	0.66	na
	muscle only	21/21	100	0.13	2.0	0.67	0.65	na
	muscle/hepatopancreas	41/41	100	0.16 J	2.1 J	0.70	0.56	na
White perch	carcass	1/1	100	0.43	0.43	na	na	na
	fillet (with skin)	19/19	100	0.057 J	0.24	0.12	0.048	na
	whole body	18/19	95	0.11 J	0.26	0.19	0.052	0.15
American eel	carcass	2/2	100	0.20	0.43	0.32	0.16	na
	fillet (skinless)	32/32	100	0.030 J	0.49	0.14	0.12	na
	whole body	17/19	90	0.054 J	0.61	0.14	0.13	0.16 – 0.17
Northern pike	fillet (with skin)	1/1	100	0.17	0.17	na	na	na
Smallmouth bass	carcass	3/3	100	0.16	0.21	0.19	0.026	na
	fillet (with skin)	3/3	100	0.17	0.32	0.25	0.076	na
Arsenic (inorganic) (mg/kg ww)								
Brown bullhead	whole body	3/6	50	0.007	0.012	0.010	0.0026	0.01
Carp	whole body	2/12	17	0.011	0.011	na	na	0.01
White catfish	carcass	2/19	11	0.019	0.043	0.031	0.017	0.008 – 0.01
White sucker	carcass	1/5	20	0.024	0.024	na	na	0.009 – 0.01

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Arsenic (inorganic) (mg/kg ww) (cont.)								
Blue crab	carcass	24/24	100	0.032	0.11	0.072	0.028	na
	hepatopancreas only	7/7	100	0.017 J	0.062	0.042	0.017	na
	muscle only	7/21	33	0.012 J	0.028	0.019	0.0055	0.009 – 0.01
	muscle/hepatopancreas	36/41	88	0.007 J	0.040	0.013	0.0069	0.009 – 0.01
White perch	whole body	10/19	53	0.010	0.024	0.015	0.0051	0.008 – 0.01
American eel	whole body	5/19	26	0.005	0.011	0.0066	0.0025	0.009 – 0.01
Largemouth bass	carcass	1/3	33	0.013	0.013	na	na	0.009 – 0.01
Barium (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.44	2.3	1.4	0.70	na
Carp	fillet (with skin)	12/12	100	0.045	0.42	0.099	0.10	na
	whole body	12/12	100	0.63	2.3	1.4	0.47	na
Channel catfish	carcass	11/11	100	0.40 J	0.95 J	0.68	0.21	na
	fillet (skinless)	11/11	100	0.011	0.18	0.079	0.046	na
White catfish	carcass	19/19	100	0.25 J	1.4 J	0.56	0.25	na
	fillet (skinless)	18/19	95	0.008 J	0.094 J	0.070	0.027	0.008
White sucker	carcass	5/5	100	1.0 J	1.8 J	1.4	0.30	na
	fillet (with skin)	5/5	100	0.14	0.24	0.18	0.044	na
Blue crab	carcass	24/24	100	6.6	45.8	18	11	na
	hepatopancreas only	7/7	100	1.0	3.1	1.8	0.79	na
	muscle only	21/21	100	0.24 J	2.1 J	1.1	0.62	na
	muscle/hepatopancreas	41/41	100	0.37	3.9	1.7	1.0	na
White perch	carcass	1/1	100	1.2 J	1.2 J	na	na	na
	fillet (with skin)	19/19	100	0.022 J	0.11 J	0.048	0.025	na
	whole body	19/19	100	0.97 J	2.6 J	1.9	0.49	na
American eel	fillet (skinless)	19/19[d]	100[d]	0.023 J	0.10 J	0.036	0.019	na
	whole body	14/14[d]	100[d]	0.16 J	0.92 J	0.53	0.30	na
Largemouth bass	carcass	3/3	100	0.93	1.6	1.3	0.34	na
	fillet (with skin)	3/3	100	0.036	0.088	0.054	0.029	na
Northern pike	carcass	1/1	100	0.72	0.72	na	na	na
	fillet (with skin)	1/1	100	0.073	0.073	na	na	na
Smallmouth bass	carcass	3/3	100	0.91	2.4	1.4	0.85	na
	fillet (with skin)	3/3	100	0.042	0.20	0.10	0.086	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Beryllium (mg/kg ww)								
Carp	fillet (with skin)	1/12	8	0.0087	0.0087	na	na	0.0009 – 0.0017
	whole body	2/12	17	0.0017 J	0.0018 J	0.0018	0.000071	0.0012 – 0.0016
Channel catfish	fillet (skinless)	1/11	9	0.0020 J	0.0020 J	na	na	0.0007 – 0.001
White catfish	carcass	1/19	5	0.0070	0.0070	na	na	0.0009 – 0.0061
	fillet (skinless)	3/19	16	0.0008 J	0.0026 J	0.0016	0.00093	0.0006 – 0.0009
Blue crab	carcass	24/24	100	0.0018 J	0.0061	0.0028	0.00085	na
	hepatopancreas only	7/7	100	0.0013 J	0.011	0.0033	0.0035	na
	muscle only	1/21	5	0.00093 J	0.00093 J	na	na	0.00056 – 0.00087
	muscle/hepatopancreas	4/41	10	0.00062 J	0.0056	0.0023	0.0023	0.00055 – 0.0043
White perch	carcass	1/1	100	0.0032 J	0.0032 J	na	na	na
	whole body	2/19	11	0.0016 J	0.0056 J	0.0036	0.0028	0.0011 – 0.0013
American eel	carcass	1/2	50	0.0017 J	0.0017 J	na	na	0.0014
	fillet (skinless)	3/32	9	0.0010 J	0.0016 J	0.0013	0.00031	0.0009 – 0.0012
	whole body	3/19	16	0.0014 J	0.0019 J	0.0016	0.00025	0.001 – 0.0015
Largemouth bass	fillet (with skin)	1/3	33	0.0010 J	0.0010 J	na	na	0.0008
Cadmium (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.005 J	0.031 J	0.018	0.0099	na
Carp	fillet (with skin)	5/12	42	0.001 J	0.010 J	0.0034	0.0037	0.001 – 0.002
	whole body	12/12	100	0.005 J	0.054 J	0.024	0.016	na
Channel catfish	carcass	11/11	100	0.009 J	0.025 J	0.017	0.0054	na
	fillet (skinless)	1/11	9	0.002 J	0.002 J	na	na	0.001
White catfish	carcass	19/19	100	0.005 J	0.036 J	0.015	0.0086	na
	fillet (skinless)	6/19	32	0.001 J	0.003 J	0.0018	0.00075	0.001
White sucker	carcass	5/5	100	0.005 J	0.023 J	0.013	0.0082	na
Blue crab	carcass	24/24	100	0.052 J	0.18	0.11	0.033	na
	hepatopancreas only	7/7	100	0.32	0.78	0.56	0.18	na
	muscle only	21/21	100	0.012	0.052	0.028	0.012	na
	muscle/hepatopancreas	41/41	100	0.044	0.21	0.10	0.043	na
White perch	carcass	1/1	100	0.025 J	0.025 J	na	na	na
	fillet (with skin)	14/19	74	0.001 J	0.012 J	0.0034	0.0032	0.001
	whole body	19/19	100	0.003 J	0.031 J	0.011	0.0070	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Cadmium (mg/kg ww) (cont.)								
American eel	carcass	2/2	100	0.010 J	0.017 J	0.014	0.0049	na
	fillet (skinless)	12/32	38	0.001 J	0.006 J	0.0032	0.0020	0.001
	whole body	19/19	100	0.004 J	0.27 J	0.059	0.069	na
Largemouth bass	carcass	3/3	100	0.005 J	0.062 J	0.034	0.029	na
	fillet (with skin)	1/3	33	0.004 J	0.004 J	na	na	0.001
Northern pike	carcass	1/1	100	0.006 J	0.006 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.007 J	0.013 J	0.011	0.0032	na
Calcium (mg/kg ww)								
Brown bullhead	whole body	6/6	100	3,800	13,100	10,100	3,580	na
Carp	fillet (with skin)	12/12	100	178 J	399 J	287	78.4	na
	whole body	12/12	100	5,060	20,500	9,730	3,840	na
Channel catfish	carcass	11/11	100	7,330	19,700	13,000	3,740	na
	fillet (skinless)	11/11	100	50	149	73.6	29.8	na
White catfish	carcass	19/19	100	8,730	19,300	12,800	2,940	na
	fillet (skinless)	19/19	100	48	188	102	43.9	na
White sucker	carcass	5/5	100	11,100	13,600	12,500	904	na
	fillet (with skin)	5/5	100	194	528	345	155	na
Blue crab	carcass	24/24	100	19,100	29,700	24,500	2,720	na
	hepatopancreas only	7/7	100	2,440	10,600	6,270	3,140	na
	muscle only	21/21	100	1,140	2,660	1,780	399	na
	muscle/hepatopancreas	41/41	100	1,660	3,980	2,460	558	na
White perch	carcass	1/1	100	28,300	28,300	na	na	na
	fillet (with skin)	19/19	100	203	877	394	163	na
	whole body	19/19	100	15,100	22,500	17,900	2,440	na
American eel	carcass	2/2	100	4,840 J	6,460 J	5,650	1,150	na
	fillet (skinless)	32/32	100	135	435 J	239	68.2	na
	whole body	19/19	100	2,920	7,060	5,050	1,090	na
Largemouth bass	carcass	3/3	100	16,400	17,900	17,100	755	na
	fillet (with skin)	3/3	100	154	321	224	86.7	na
Northern pike	carcass	1/1	100	14,300	14,300	na	na	na
	fillet (with skin)	1/1	100	196	196	na	na	na
Smallmouth bass	carcass	3/3	100	17,900	21,600	19,900	1,880	na
	fillet (with skin)	3/3	100	401	600	481	105	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Chromium (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.12	0.94	0.50	0.34	na
Carp	fillet (with skin)	12/12	100	0.06	0.22	0.11	0.054	na
	whole body	12/12	100	0.14	6.6	1.3	1.8	na
Channel catfish	carcass	11/11	100	0.05 J	1.1 J	0.44	0.30	na
	fillet (skinless)	10/11	91	0.02 J	0.11	0.058	0.031	0.02
White catfish	carcass	19/19	100	0.15 J	2.5 J	0.68	0.65	na
	fillet (skinless)	17/19	90	0.02 J	0.40	0.084	0.094	0.02
White sucker	carcass	5/5	100	0.12 J	3.7 J	1.3	1.5	na
	fillet (with skin)	5/5	100	0.03 J	0.33	0.13	0.13	na
Blue crab	carcass	24/24	100	1.0	3.8	2.1	0.72	na
	hepatopancreas only	6/7	86	0.26 J	2.8 J	1.3	1.2	0.37
	muscle only	12/21	57	0.53	3.3	1.8	0.83	0.016 – 0.078
	muscle/hepatopancreas	29/41	71	0.090 J	4.2	1.0	0.87	0.016 – 0.065
White perch	carcass	1/1	100	0.94 J	0.94 J	na	na	na
	fillet (with skin)	19/19	100	0.06 J	0.74 J	0.24	0.16	na
	whole body	19/19	100	0.77 J	8.2 J	2.7	2.1	na
American eel	carcass	1/2	50	0.20	0.20	na	na	0.03
	fillet (skinless)	11/32	34	0.05 J	0.15	0.085	0.039	0.02 – 0.06
	whole body	18/19	95	0.04 J	4.5 J	1.3	1.5	0.02
Largemouth bass	carcass	3/3	100	0.10 J	0.26 J	0.21	0.092	na
	fillet (with skin)	3/3	100	0.18 J	0.22 J	0.19	0.023	na
Northern pike	carcass	1/1	100	2.0 J	2.0 J	na	na	na
	fillet (with skin)	1/1	100	0.11 J	0.11 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.24 J	0.64 J	0.42	0.20	na
	fillet (with skin)	3/3	100	0.10 J	0.32 J	0.22	0.11	na
Cobalt (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.016 J	0.054 J	0.034	0.014	na
Carp	fillet (with skin)	12/12	100	0.0049 J	0.096 J	0.015	0.026	na
	whole body	12/12	100	0.019 J	0.10 J	0.047	0.021	na
Channel catfish	carcass	11/11	100	0.013 J	0.034 J	0.023	0.0061	na
	fillet (skinless)	1/11	9	0.020 J	0.020 J	na	na	0.0037 – 0.0048
White catfish	carcass	19/19	100	0.021 J	0.098 J	0.034	0.018	na
	fillet (skinless)	16/19	84	0.0039 J	0.0089 J	0.0061	0.0016	0.0032 – 0.0044

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Cobalt (mg/kg ww) (cont.)								
White sucker	carcass	5/5	100	0.020 J	0.095 J	0.049	0.031	na
	fillet (with skin)	4/5	80	0.0054 J	0.0087 J	0.0069	0.0016	0.0043
Blue crab	carcass	24/24	100	0.089	0.15	0.12	0.016	na
	hepatopancreas only	7/7	100	0.11 J	0.26 J	0.18	0.058	na
	muscle only	21/21	100	0.011	0.038	0.022	0.0080	na
	muscle/hepatopancreas	41/41	100	0.024	0.11 J	0.042	0.016	na
White perch	carcass	1/1	100	0.077 J	0.077 J	na	na	na
	fillet (with skin)	18/19	95	0.0051 J	0.011 J	0.0083	0.0018	0.0055
	whole body	19/19	100	0.032 J	0.14 J	0.064	0.031	na
American eel	fillet (skinless)	17/19[e]	89[e]	0.0060 J	0.024 J	0.012	0.0048	0.0052 – 0.0058
	whole body	14/14[e]	100[e]	0.016 J	0.096 J	0.048	0.028	na
Largemouth bass	carcass	3/3	100	0.030 J	0.039 J	0.035	0.0046	na
	fillet (with skin)	3/3	100	0.0045 J	0.0098 J	0.0071	0.0027	na
Northern pike	carcass	1/1	100	0.042 J	0.042 J	na	na	na
	fillet (with skin)	1/1	100	0.0045 J	0.0045 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.040 J	0.047 J	0.043	0.0038	na
	fillet (with skin)	3/3	100	0.0044 J	0.0080 J	0.0057	0.0020	na
Copper (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.55 J	0.94 J	0.74	0.14	na
Carp	fillet (with skin)	12/12	100	0.33 J	0.95 J	0.51	0.19	na
	whole body	12/12	100	0.60 J	1.6 J	0.93	0.25	na
Channel catfish	carcass	11/11	100	0.30 J	3.2 J	0.72	0.83	na
	fillet (skinless)	11/11	100	0.24 J	0.34 J	0.26	0.030	na
White catfish	carcass	19/19	100	0.37 J	0.99 J	0.73	0.15	na
	fillet (skinless)	19/19	100	0.25 J	0.59 J	0.35	0.084	na
White sucker	carcass	5/5	100	1.1 J	1.6 J	1.4	0.19	na
	fillet (with skin)	5/5	100	0.25 J	0.43 J	0.34	0.064	na
Blue crab	carcass	24/24	100	20.2	36.7	27.0	4.88	na
	hepatopancreas only	7/7	100	42.2	104	64.3	25.9	na
	muscle only	21/21	100	10.0	20.3	16	2.9	na
	muscle/hepatopancreas	41/41	100	13.1	37.4	22.8	5.75	na
White perch	carcass	1/1	100	50.5 J	50.5 J	na	na	na
	fillet (with skin)	19/19	100	0.26 J	0.50 J	0.39	0.061	na
	whole body	19/19	100	2.3 J	50.9 J	10	10	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Copper (mg/kg ww) (cont.)								
American eel	carcass	2/2	100	1.1 J	1.3 J	1.2	0.14	na
	fillet (skinless)	32/32	100	0.15 J	0.40 J	0.24	0.056	na
	whole body	19/19	100	0.52 J	7.8 J	1.2	1.6	na
Largemouth bass	carcass	3/3	100	0.46 J	0.79 J	0.59	0.17	na
	fillet (with skin)	3/3	100	0.30 J	0.31 J	0.30	0.0058	na
Northern pike	carcass	1/1	100	0.86 J	0.86 J	na	na	na
	fillet (with skin)	1/1	100	0.22 J	0.22 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.50 J	0.96 J	0.65	0.27	na
	fillet (with skin)	3/3	100	0.25 J	0.47 J	0.33	0.12	na
Iron (mg/kg ww)								
Brown bullhead	whole body	6/6	100	18.4	77.4	39.5	23.7	na
Carp	fillet (with skin)	12/12	100	8.9	22.8	14	4.1	na
	whole body	12/12	100	20.2	98.6	42.5	22.7	na
Channel catfish	carcass	11/11	100	15.5	36.8	24.9	6.89	na
	fillet (skinless)	11/11	100	2.7	4.2	3.3	0.50	na
White catfish	carcass	19/19	100	22.9	98.6	37.6	19.4	na
	fillet (skinless)	19/19	100	2.1	10	4.9	1.8	na
White sucker	carcass	5/5	100	21.2	125	58.7	40.9	na
	fillet (with skin)	5/5	100	3.6	6.5	5.0	1.2	na
Blue crab	carcass	24/24	100	67.0	139	106	20.2	na
	hepatopancreas only	7/7	100	37.1 J	59.0 J	47.3	7.52	na
	muscle only	21/21	100	5.8	22.3	13	5.1	na
	muscle/hepatopancreas	41/41	100	8.4	30.2	17	5.3	na
White perch	carcass	1/1	100	29.8	29.8	na	na	na
	fillet (with skin)	19/19	100	3.0	6.2	4.2	0.84	na
	whole body	19/19	100	16.5	78.6	38.7	19.0	na
American eel	carcass	2/2	100	28.1	40.5	34.3	8.77	na
	fillet (skinless)	32/32	100	1.5	9.7 J	3.0	1.8	na
	whole body	19/19	100	16.2	99.4	34.0	21.2	na
Largemouth bass	carcass	3/3	100	21.5	22.5	22.0	0.500	na
	fillet (with skin)	3/3	100	3.3	4.0	3.5	0.40	na
Northern pike	carcass	1/1	100	30.4	30.4	na	na	na
	fillet (with skin)	1/1	100	2.6	2.6	na	na	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Iron (mg/kg ww) (cont.)								
Smallmouth bass	carcass	3/3	100	22.7	25.0	24.2	1.27	na
	fillet (with skin)	3/3	100	3.8	4.9	4.3	0.56	na
Lead (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.15 J	0.83 J	0.59	0.25	na
Carp	fillet (with skin)	12/12	100	0.019 J	0.12 J	0.037	0.027	na
	whole body	12/12	100	0.21 J	0.96 J	0.66	0.24	na
Channel catfish	carcass	11/11	100	0.074 J	0.53 J	0.32	0.15	na
	fillet (skinless)	11/11	100	0.007 J	0.025 J	0.010	0.0050	na
White catfish	carcass	19/19	100	0.39 J	2.9 J	0.77	0.55	na
	fillet (skinless)	18/19	95	0.003 J	0.019 J	0.0078	0.0040	0.004
White sucker	carcass	5/5	100	0.22 J	0.47 J	0.38	0.099	na
	fillet (with skin)	5/5	100	0.009 J	0.028 J	0.017	0.0076	na
Blue crab	carcass	24/24	100	0.39 J	1.3 J	0.66	0.23	na
	hepatopancreas only	7/7	100	0.15	1.5	0.51	0.46	na
	muscle only	21/21	100	0.019	0.191	0.046	0.038	na
	muscle/hepatopancreas	41/41	100	0.027	2.5	0.14	0.38	na
White perch	carcass	1/1	100	0.38 J	0.38 J	na	na	na
	fillet (with skin)	19/19	100	0.005 J	0.018 J	0.0097	0.0029	na
	whole body	19/19	100	0.17 J	0.51 J	0.35	0.11	na
American eel	fillet (skinless)	19/19[f]	100[f]	0.007 J	0.046 J	0.027	0.0093	na
	whole body	14/14[f]	100[f]	0.18 J	1.4 J	0.65	0.45	na
Largemouth bass	carcass	3/3	100	0.024 J	0.21 J	0.13	0.096	na
	fillet (with skin)	3/3	100	0.009 J	0.014 J	0.012	0.0026	na
Northern pike	carcass	1/1	100	0.057 J	0.057 J	na	na	na
	fillet (with skin)	1/1	100	0.005 J	0.005 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.085 J	0.15 J	0.13	0.035	na
	fillet (with skin)	3/3	100	0.005 J	0.012 J	0.0083	0.0035	na
Magnesium (mg/kg ww)								
Brown bullhead	whole body	6/6	100	244	456	392	80.5	na
Carp	fillet (with skin)	12/12	100	197	259	228	18.4	na
	whole body	12/12	100	284	563	375	70.0	na
Channel catfish	carcass	11/11	100	266	441	342	49.9	na
	fillet (skinless)	11/11	100	196	236	213	13.7	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Magnesium (mg/kg ww) (cont.)								
White catfish	carcass	19/19	100	287	462	362	47.1	na
	fillet (skinless)	19/19	100	182	261	223	20.3	na
White sucker	carcass	5/5	100	352	416	389	24.6	na
	fillet (with skin)	5/5	100	233	278	265	18.2	na
Blue crab	carcass	24/24	100	791	1490	1,170	214	na
	hepatopancreas only	7/7	100	283	997	633	284	na
	muscle only	21/21	100	301	522	416	61.1	na
	muscle/hepatopancreas	41/41	100	321	532	421	60.9	na
White perch	carcass	1/1	100	684	684	na	na	na
	fillet (with skin)	19/19	100	240	316	288	19.1	na
	whole body	19/19	100	430	578	490	42.8	na
American eel	carcass	2/2	100	292	324	308	22.6	na
	fillet (skinless)	32/32	100	194	260	235	15.1	na
	whole body	19/19	100	242	345	295	30.4	na
Largemouth bass	carcass	3/3	100	470	485	476	7.94	na
	fillet (with skin)	3/3	100	273	296	286	11.7	na
Northern pike	carcass	1/1	100	396	396	na	na	na
	fillet (with skin)	1/1	100	271	271	na	na	na
Smallmouth bass	carcass	3/3	100	515	611	557	49.0	na
	fillet (with skin)	3/3	100	295	311	301	8.72	na
Manganese (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.62 J	12.5 J	5.8	4.5	na
Carp	fillet (with skin)	12/12	100	0.096 J	0.26 J	0.18	0.050	na
	whole body	12/12	100	0.82 J	4.4 J	2.6	1.1	na
Channel catfish	carcass	11/11	100	1.5 J	8.2 J	3.3	2.2	na
	fillet (skinless)	11/11	100	0.096 J	0.16 J	0.12	0.021	na
White catfish	carcass	19/19	100	2.0 J	9.8 J	5.3	2.1	na
	fillet (skinless)	19/19	100	0.10 J	0.23 J	0.15	0.034	na
White sucker	carcass	5/5	100	4.2 J	32.4 J	13	12	na
	fillet (with skin)	5/5	100	0.21 J	0.68 J	0.36	0.19	na
Blue crab	carcass	24/24	100	36.9	91.1	56.4	15.7	na
	hepatopancreas only	7/7	100	6.0	18.1	10	4.5	na
	muscle only	21/21	100	1.3 J	8.5 J	3.9	2.0	na
	muscle/hepatopancreas	41/41	100	1.6	21.9 J	7.0	5.1	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Manganese (mg/kg ww) (cont.)								
White perch	carcass	1/1	100	4.5 J	4.5 J	na	na	na
	fillet (with skin)	19/19	100	0.16 J	0.34 J	0.23	0.052	na
	whole body	19/19	100	2.3 J	11.4 J	5.1	2.7	na
American eel	carcass	2/2	100	0.64 J	1.1 J	0.87	0.33	na
	fillet (skinless)	32/32	100	0.13 J	1.4 J	0.32	0.29	na
	whole body	19/19	100	0.80 J	11.4 J	3.2	3.2	na
Largemouth bass	carcass	3/3	100	1.7 J	2.6 J	2.1	0.47	na
	fillet (with skin)	3/3	100	0.12 J	0.14 J	0.13	0.010	na
Northern pike	carcass	1/1	100	9.3 J	9.3 J	na	na	na
	fillet (with skin)	1/1	100	0.19 J	0.19 J	na	na	na
Smallmouth bass	carcass	3/3	100	1.3 J	4.9 J	3.0	1.8	na
	fillet (with skin)	3/3	100	0.13 J	0.30 J	0.23	0.087	na
Mercury (µg/kg ww)								
Brown bullhead	whole body	6/6	100	48	140	77	36	na
Carp	fillet (with skin)	12/12	100	71	310	140	78	na
	whole body	12/12	100	42	110	67	24	na
Channel catfish	carcass	11/11	100	29	190	100	49	na
	fillet (skinless)	11/11	100	41	360	170	91	na
White catfish	carcass	19/19	100	64	540	170	120	na
	fillet (skinless)	19/19	100	120	990	340	240	na
White sucker	carcass	5/5	100	50	87	71	14	na
	fillet (with skin)	5/5	100	110	210	160	38	na
Blue crab	carcass	24/24	100	46	110	81	18	na
	hepatopancreas only	7/7	100	32	70	56	15	na
	muscle only	21/21	100	70	320	180	70	na
	muscle/hepatopancreas	41/41	100	69	250	140	51	na
White perch	carcass	1/1	100	400	400	na	na	na
	fillet (with skin)	19/19	100	150	740	280	170	na
	whole body	19/19	100	48	310	140	65	na
American eel	carcass	2/2	100	210	220	220	7.1	na
	fillet (skinless)	32/32	100	160	860	400	170	na
	whole body	19/19	100	74	390	220	99	na
Largemouth bass	carcass	3/3	100	110	570	270	260	na
	fillet (with skin)	3/3	100	190	880	430	390	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Mercury (µg/kg ww) (cont.)								
Northern pike	carcass	1/1	100	160	160	na	na	na
	fillet (with skin)	1/1	100	300	300	na	na	na
Smallmouth bass	carcass	3/3	100	130	240	180	57	na
	fillet (with skin)	3/3	100	250	410	320	81	na
Methyl Mercury (µg/kg ww)								
Brown bullhead	whole body	6/6	100	39	120	65	32	na
Carp	fillet (with skin)	12/12	100	69	280	120	68	na
	whole body	12/12	100	39	90	54	16	na
Channel catfish	carcass	11/11	100	22	190	91	48	na
	fillet (skinless)	11/11	100	49	370	150	93	na
White catfish	carcass	19/19	100	51	460	170	110	na
	fillet (skinless)	19/19	100	100	830	300	180	na
White sucker	carcass	5/5	100	39	78	61	14	na
	fillet (with skin)	5/5	100	110	200	160	33	na
Blue crab	carcass	24/24	100	31	86	56	15	na
	hepatopancreas only	7/7	100	15	60	37	16	na
	muscle only	21/21	100	67	270	160	66	na
	muscle/hepatopancreas	41/41	100	66	230	130	46	na
White perch	carcass	1/1	100	280	280	na	na	na
	fillet (with skin)	19/19	100	85	550	170	120	na
	whole body	19/19	100	62	330	150	70	na
American eel	carcass	2/2	100	220	240	230	14	na
	fillet (skinless)	32/32	100	170	1,100 J	420	190	na
	whole body	19/19	100	92	470	230	110	na
Largemouth bass	carcass	3/3	100	83	420	200	190	na
	fillet (with skin)	3/3	100	140	700	350	310	na
Northern pike	carcass	1/1	100	150	150	na	na	na
	fillet (with skin)	1/1	100	220	220	na	na	na
Smallmouth bass	carcass	3/3	100	92	170	130	39	na
	fillet (with skin)	3/3	100	210	320	250	64	na
Nickel (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.18 J	0.84 J	0.51	0.24	na
Carp	fillet (with skin)	8/12	67	0.072 J	0.20 J	0.12	0.051	0.056 – 0.085
	whole body	12/12	100	0.23 J	4.2 J	1.0	1.1	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Nickel (mg/kg ww) (cont.)								
Channel catfish	carcass	11/11	100	0.18 J	0.71 J	0.40	0.15	na
	fillet (skinless)	5/11	46	0.038 J	0.080 J	0.056	0.018	0.039 – 0.045
White catfish	carcass	19/19	100	0.20 J	1.5 J	0.51	0.37	na
	fillet (skinless)	15/19	79	0.012 J	0.14 J	0.043	0.033	0.038 – 0.043
White sucker	carcass	5/5	100	0.20 J	1.7 J	0.76	0.66	na
	fillet (with skin)	3/5	60	0.050 J	0.19 J	0.13	0.071	0.042 – 0.043
Blue crab	carcass	24/24	100	1.0	2.6	1.6	0.41	na
	hepatopancreas only	7/7	100	0.30 J	1.9 J	0.92	0.69	na
	muscle only	13/21	62	0.11 J	1.4	0.73	0.38	0.034 – 0.099
	muscle/hepatopancreas	33/41	81	0.092	2.3	0.62	0.55	0.049 – 0.092
White perch	carcass	1/1	100	1.0 J	1.0 J	na	na	na
	fillet (with skin)	19/19	100	0.062 J	0.53 J	0.16	0.10	na
	whole body	19/19	100	0.69 J	4.9 J	1.8	1.2	na
American eel	carcass	2/2	100	0.14 J	0.24 J	0.19	0.071	na
	fillet (skinless)	29/32	91	0.050 J	0.14 J	0.085	0.026	0.049 – 0.059
	whole body	19/19	100	0.11 J	2.8 J	0.82	0.88	na
Largemouth bass	carcass	3/3	100	0.41 J	0.50 J	0.47	0.049	na
	fillet (with skin)	3/3	100	0.12 J	0.20 J	0.15	0.044	na
Northern pike	carcass	1/1	100	0.86 J	0.86 J	na	na	na
	fillet (with skin)	1/1	100	0.092 J	0.092 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.50 J	0.74 J	0.58	0.14	na
	fillet (with skin)	3/3	100	0.094 J	0.29 J	0.17	0.10	na
Potassium (mg/kg ww)								
Brown bullhead	whole body	6/6	100	2,470	3,050	2,830	207	na
Carp	fillet (with skin)	12/12	100	2,510	3,430	3,060	284	na
	whole body	12/12	100	2,100	2,970	2,520	258	na
Channel catfish	carcass	11/11	100	2,030	2,620	2,270	176	na
	fillet (skinless)	11/11	100	3,160	4,350	3,610	345	na
White catfish	carcass	19/19	100	2,010	2,660	2,380	196	na
	fillet (skinless)	19/19	100	2,850	4,340	3,710	417	na
White sucker	carcass	5/5	100	2,230	2,650	2,440	204	na
	fillet (with skin)	5/5	100	3,240	4,160	3,850	360	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Potassium (mg/kg ww) (cont.)								
Blue crab	carcass	24/24	100	1,260	2,230	1,800	241	na
	hepatopancreas only	7/7	100	1,300	2,100	1,780	295	na
	muscle only	21/21	100	1,670	3,050	2,330	361	na
	muscle/hepatopancreas	41/41	100	1,570	3,000	2,310	401	na
White perch	carcass	1/1	100	2,540	2,540	na	na	na
	fillet (with skin)	19/19	100	3,120	3,930	3,570	199	na
	whole body	19/19	100	2,480	3,160	2,810	187	na
American eel	carcass	2/2	100	2,820	2,880	2,850	42.4	na
	fillet (skinless)	32/32	100	2,600	3,810	3,290	288	na
	whole body	19/19	100	2,500	3,590	2,920	306	na
Largemouth bass	carcass	3/3	100	2,450	2,720	2,600	137	na
	fillet (with skin)	3/3	100	3,670	3,990	3,850	165	na
Northern pike	carcass	1/1	100	2,400	2,400	na	na	na
	fillet (with skin)	1/1	100	3,980	3,980	na	na	na
Smallmouth bass	carcass	3/3	100	2,740	2,940	2,820	108	na
	fillet (with skin)	3/3	100	3,790	4,230	4,000	221	na
Selenium (mg/kg ww)								
Brown bullhead	whole body	6/6	100	0.40	0.90	0.61	0.19	na
Carp	fillet (with skin)	12/12	100	0.41	0.95	0.58	0.17	na
	whole body	12/12	100	0.35	0.98	0.73	0.18	na
Channel catfish	carcass	11/11	100	0.28	0.39	0.34	0.039	na
	fillet (skinless)	11/11	100	0.12	0.21	0.16	0.032	na
White catfish	carcass	19/19	100	0.16	0.84	0.38	0.17	na
	fillet (skinless)	19/19	100	0.10	0.25	0.16	0.040	na
White sucker	carcass	5/5	100	0.24	0.52	0.41	0.14	na
	fillet (with skin)	5/5	100	0.27	0.43	0.36	0.066	na
Blue crab	carcass	24/24	100	0.30	0.89 J	0.62	0.14	na
	hepatopancreas only	7/7	100	0.46 J	1.1 J	0.74	0.23	na
	muscle only	21/21	100	0.21	1.3 J	0.64	0.26	na
	muscle/hepatopancreas	41/41	100	0.32	1.5 J	0.70	0.25	na
White perch	carcass	1/1	100	1.9	1.9	1.9	na	na
	fillet (with skin)	19/19	100	0.37	1.7	0.97	0.33	na
	whole body	19/19	100	0.37	3.0	1.2	0.7	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Selenium (mg/kg ww) (cont.)								
American eel	carcass	2/2	100	0.82	0.95	0.89	0.092	na
	fillet (skinless)	32/32	100	0.26	2.8	0.51	0.42	na
	whole body	19/19	100	0.33	1.2	0.66	0.26	na
Largemouth bass	carcass	3/3	100	0.41	0.81	0.58	0.21	na
	fillet (with skin)	3/3	100	0.28	0.50	0.36	0.12	na
Northern pike	carcass	1/1	100	0.55	0.55	na	na	na
	fillet (with skin)	1/1	100	0.55	0.55	na	na	na
Smallmouth bass	carcass	3/3	100	0.55	0.71	0.65	0.090	na
	fillet (with skin)	3/3	100	0.46	0.65	0.57	0.097	na
Silver (mg/kg ww)								
Carp	fillet (with skin)	1/12	8	0.014 J	0.014 J	0.014	na	0.004 – 0.009
	whole body	3/12	25	0.007 J	0.015 J	0.011	0.0040	0.006 – 0.008
Channel catfish	carcass	1/11	9	0.019 J	0.019 J	na	na	0.0025 – 0.0034
White catfish	carcass	7/19	37	0.0029 J	0.010 J	0.0059	0.0024	0.0027 – 0.0061
White sucker	carcass	5/5	100	0.0037 J	0.0069 J	0.0056	0.0013	na
Blue crab	carcass	24/24	100	0.27 J	0.99 J	0.65	0.23	na
	hepatopancreas only	7/7	100	0.97	2.0	1.5	0.42	na
	muscle only	21/21	100	0.10	0.52	0.24	0.15	na
	muscle/hepatopancreas	41/41	100	0.16 J	0.67 J	0.37	0.17	na
White perch	carcass	1/1	100	0.86 J	0.86 J	na	na	na
	fillet (with skin)	1/19	5	0.0062 J	0.0062 J	na	na	0.0019 – 0.0055
	whole body	19/19	100	0.025 J	0.64 J	0.13	0.14	na
American eel	carcass	2/2	100	0.019 J	0.035 J	0.027	0.011	na
	fillet (skinless)	3/32	9	0.005 J	0.18 J	0.065	0.10	0.004 – 0.006
	whole body	16/19	84	0.007 J	0.062 J	0.021	0.017	0.005 – 0.008
Sodium (mg/kg ww)								
Brown bullhead	whole body	6/6	100	671	1,170	1,020	189	na
Carp	fillet (with skin)	12/12	100	300	561	410	82.8	na
	whole body	12/12	100	652	1010	842	116	na
Channel catfish	carcass	11/11	100	937	1,260	1,120	108	na
	fillet (skinless)	11/11	100	369	629	506	86.8	na
White catfish	carcass	19/19	100	1,130	1,660	1,400	166	na
	fillet (skinless)	19/19	100	478	928	626	103	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Sodium (mg/kg ww) (cont.)								
White sucker	carcass	5/5	100	807	1,250	1,140	185	na
	fillet (with skin)	5/5	100	227	570	470	138	na
Blue crab	carcass	24/24	100	3,170	4,370	3,610	288	na
	hepatopancreas only	7/7	100	3,780	4,360	4,120	197	na
	muscle only	21/21	100	2,880	4,380	3,450	396	na
	muscle/hepatopancreas	41/41	100	2,880	4,440	3,680	396	na
White perch	carcass	1/1	100	2,010	2,010	na	na	na
	fillet (with skin)	19/19	100	417	876	616	103	na
	whole body	19/19	100	1,020	1,480	1,170	137	na
American eel	carcass	2/2	100	1,030	1,210	1,120	127	na
	fillet (skinless)	32/32	100	499	888	701	103	na
	whole body	19/19	100	772	1,150	966	87.1	na
Largemouth bass	carcass	3/3	100	1,310	1,400	1,360	45.1	na
	fillet (with skin)	3/3	100	580	630	610	26.3	na
Northern pike	carcass	1/1	100	1,070	1,070	na	na	na
	fillet (with skin)	1/1	100	480	480	na	na	na
Smallmouth bass	carcass	3/3	100	1,390	1,470	1,430	40.4	na
	fillet (with skin)	3/3	100	571	637	595	36.7	na
Thallium (mg/kg ww)								
Carp	fillet (with skin)	6/12	50	0.0005 J	0.029	0.0057	0.011	0.0005 – 0.0007
	whole body	2/12	17	0.0008 J	0.0051 J	0.0030	0.0030	0.0007 – 0.0061
Channel catfish	carcass	1/11	9	0.0081	0.0081	na	na	0.0007 – 0.0076
	fillet (skinless)	5/11	46	0.0004 J	0.0069	0.0018	0.0029	0.0004 – 0.0005
White catfish	carcass	1/19	5	0.014	0.014	na	na	0.0005 – 0.0061
	fillet (skinless)	4/19	21	0.0006 J	0.0054	0.0023	0.0023	0.0003 – 0.0044
White sucker	carcass	1/5	20	0.0059	0.0059	na	na	0.0006 – 0.0062
	fillet (with skin)	2/5	40	0.0006 J	0.0010 J	0.00080	0.00028	0.0004
Blue crab	carcass	2/24	8	0.0080	0.011	0.0095	0.0021	0.00047 – 0.0053
	hepatopancreas only	1/7	14	0.0050	0.0050	na	na	0.00049 – 0.0049
	muscle only	3/21	14	0.0028 J	0.0054	0.0042	0.0013	0.00028 – 0.00044
	muscle/hepatopancreas	12/41	29	0.00036 J	0.014	0.0022	0.0039	0.00027 – 0.0021

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Thallium (mg/kg ww) (cont.)								
White perch	carcass	1/1	100	0.015 J	0.015 J	na	na	na
	whole body	1/19	5	0.024 J	0.024 J	na	na	0.0005 – 0.0065
American eel	fillet (skinless)	2/32	6	0.0062 J	0.0063 J	0.0063	0.000071	0.0004 – 0.0057
	whole body	2/19	11	0.0093 J	0.014 J	0.012	0.0033	0.0005 – 0.0068
Titanium (mg/kg ww)								
Brown bullhead	whole body	3/6	50	0.04 J	1.1 J	0.69	0.57	0.02 – 0.03
Carp	fillet (with skin)	12/12	100	0.03 J	0.31	0.070	0.079	na
	whole body	12/12	100	0.05 J	1.7 J	0.39	0.49	na
Channel catfish	carcass	7/11	64	0.03 J	0.56 J	0.25	0.20	0.03
	fillet (skinless)	3/11	27	0.02 J	0.13 J	0.057	0.064	0.02
White catfish	carcass	10/19	53	0.07 J	2.9 J	0.72	1.0	0.02 – 0.03
	fillet (skinless)	8/19	42	0.02 J	0.04 J	0.024	0.0074	0.01 – 0.02
White sucker	carcass	5/5	100	0.08 J	1.9 J	0.72	0.75	na
	fillet (with skin)	4/5	80	0.02 J	0.03 J	0.023	0.0050	0.02
Blue crab	carcass	24/24	100	2.7 J	6.4 J	3.7	0.78	na
	hepatopancreas only	7/7	100	0.12 J	0.22 J	0.18	0.037	na
	muscle only	3/21	14	0.28 J	0.40 J	0.32	0.069	0.057 – 0.18
	muscle/hepatopancreas	18/41	44	0.24 J	0.44 J	0.31	0.054	0.08 – 0.26
White perch	fillet (with skin)	6/19	32	0.02 J	0.27 J	0.067	0.10	0.02 – 0.03
	whole body	15/19	79	0.07 J	1.2 J	0.54	0.38	0.02 – 0.03
American eel	carcass	2/2	100	0.12 J	0.24 J	0.18	0.085	na
	fillet (skinless)	2/32	6	0.03 J	0.04 J	0.035	0.0071	0.02 – 0.03
	whole body	19/19	100	0.05 J	2.1 J	0.40	0.52	na
Largemouth bass	carcass	2/3	67	0.05 J	0.12 J	0.085	0.049	0.03
	fillet (with skin)	2/3	67	0.02 J	0.02 J	na	na	0.02
Northern pike	carcass	1/1	100	0.09	0.09	na	na	na
	fillet (with skin)	1/1	100	0.02 J	0.02 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.05 J	0.11 J	0.087	0.032	na
	fillet (with skin)	2/3	67	0.03 J	0.03 J	0.030	na	0.02
Vanadium (mg/kg ww)								
Brown bullhead	whole body	5/6	83	0.12	0.20	0.17	0.036	0.03
Carp	whole body	12/12	100	0.03 J	0.21	0.094	0.051	na
Channel catfish	carcass	11/11	100	0.04 J	0.08	0.067	0.016	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Vanadium (mg/kg ww) (cont.)								
White catfish	carcass	19/19	100	0.06 J	0.32	0.16	0.065	na
	fillet (skinless)	9/19	47	0.01 J	0.02 J	0.016	0.0053	0.01 – 0.02
White sucker	carcass	5/5	100	0.12	0.31	0.18	0.077	na
	fillet (with skin)	2/5	40	0.01 J	0.02 J	0.015	0.0071	0.01 – 0.02
Blue crab	carcass	24/24	100	0.15	0.28	0.23	0.029	na
	hepatopancreas only	7/7	100	0.054	0.10	0.077	0.018	na
	muscle only	16/21	76	0.014 J	0.033 J	0.020	0.0059	0.013 – 0.015
	muscle/hepatopancreas	21/41	51	0.014 J	0.048	0.030	0.0086	0.033 – 0.055
White perch	carcass	1/1	100	0.15	0.15	na	na	na
	whole body	19/19	100	0.04 J	0.15	0.098	0.030	na
American eel	carcass	1/2	50	0.08 J	0.08 J	na	na	0.07
	fillet (skinless)	13/32	41	0.02 J	0.04 J	0.029	0.0076	0.02
	whole body	10/19	53	0.05	0.12	0.087	0.024	0.02 – 0.07
Smallmouth bass	carcass	3/3	100	0.02 J	0.04 J	0.027	0.012	na
Zinc (mg/kg ww)								
Brown bullhead	whole body	6/6	100	15.0 J	41.4 J	20.2	10.4	na
Carp	fillet (with skin)	12/12	100	10.4 J	22.1 J	17.0	4.07	na
	whole body	12/12	100	47.6 J	104 J	67.0	15.7	na
Channel catfish	carcass	11/11	100	20.6 J	26.7 J	23.5	1.81	na
	fillet (skinless)	11/11	100	5.3 J	8.5 J	6.3	0.94	na
White catfish	carcass	19/19	100	13.9 J	24.3 J	19.6	2.82	na
	fillet (skinless)	19/19	100	4.5 J	7.1 J	5.8	0.73	na
White sucker	carcass	5/5	100	17.7 J	25.2 J	21.5	2.90	na
	fillet (with skin)	5/5	100	10 J	14.3 J	11	1.8	na
Blue crab	carcass	24/24	100	21.5	30.9	26.0	2.35	na
	hepatopancreas only	7/7	100	30.7	39.9	35.0	3.47	na
	muscle only	21/21	100	28.6	47.3	38.0	5.50	na
	muscle/hepatopancreas	41/41	100	31.0	50.4	39.9	5.15	na
White perch	carcass	1/1	100	30.7	30.7	na	na	na
	fillet (with skin)	19/19	100	9.0 J	14.3	11	1.4	na
	whole body	19/19	100	19.9	30.7	24.3	3.08	na
American eel	carcass	2/2	100	37.1 J	53.3 J	45.2	11.5	na
	fillet (skinless)	32/32	100	11.7 J	24.4 J	17.9	3.28	na
	whole body	19/19	100	23.1 J	33.8 J	28.6	3.06	na

Table 4-2. Summary of detected metals results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Zinc (mg/kg ww) (cont.)								
Largemouth bass	carcass	3/3	100	17.0 J	20.9 J	19.2	2.00	na
	fillet (with skin)	3/3	100	8.5 J	12.6 J	11	2.1	na
Northern pike	carcass	1/1	100	56.2 J	56.2 J	na	na	na
	fillet (with skin)	1/1	100	8.2 J	8.2 J	na	na	na
Smallmouth bass	carcass	3/3	100	19.1 J	23.4 J	20.9	2.22	na
	fillet (with skin)	3/3	100	9.8 J	12.5 J	11	1.4	na

[a] Only chemicals with detected results are presented. If the chemical was not detected in any samples for a given species and tissue type, the analyte is not presented in the table. Data tables that contain results for each sample, including non-detected sample results, are presented in Appendix F.

[b] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviation) include data only for detected results. Non-detected data are not included in summary statistics.

[c] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

[d] Detection frequency does not include thirteen fillet and five whole body samples analyzed for barium that were rejected during data validation (see Section 5 for more details).

[e] Detection frequency does not include thirteen fillet and five whole body samples analyzed for cobalt that were rejected during data validation (see Section 5 for more details).

[f] Detection frequency does not include thirteen fillet and five whole body samples analyzed for lead that were rejected during data validation (see Section 5 for more details).

J – estimated concentration
Max – maximum
Min – minimum
na – not applicable
RL – reporting limit
St Dev – standard deviation
ww – wet weight

4.1.1 Cadmium

Cadmium was detected in all blue crab samples and in all fish whole-body and carcass samples analyzed (Table 4-2). The detection frequency for fish fillet samples ranged from 9 to 74%. Cadmium concentrations ranged from 0.001 to 0.78 mg/kg wet weight (ww) across all fish and blue crab samples. The highest cadmium concentration was measured in a blue crab hepatopancreas-only sample (LPR8-CSHT-Comp66) from Reach 8. Figure 4-1 defines the elements of the box and whisker plots, which are used to show the distribution of chemical concentrations for fish whole-body, fillet, and carcass samples and for blue crab muscle/hepatopancreas and carcass samples. The distributions of cadmium concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-2.[5] The following summarize cadmium concentrations for fish and blue crab by tissue type, as shown in Figure 4-2:

- **Fish whole body –** Cadmium was detected in all fish whole-body samples. Fish whole-body cadmium concentrations ranged from 0.003 to 0.27 mg/kg ww. The highest whole-body cadmium concentration was measured in an individual American eel whole-body sample (LPR7-ARWB-Ind070) collected from Reach 7 (0.27 mg/kg ww).
- **Fish fillet and blue crab muscle/hepatopancreas –** Cadmium was detected in 39 of 105 fish fillet samples and in all 41 of the blue crab muscle/hepatopancreas samples. Fish fillet cadmium concentrations ranged from 0.001 to 0.012 mg/kg ww, and the highest fish fillet cadmium concentration (0.012 mg/kg ww) was measured in a white perch fillet composite sample (LPR1-MAFT-Comp01) from Reach 1. Blue crab muscle/hepatopancreas cadmium concentrations ranged from 0.044 to 0.21 mg/kg ww, and the highest blue crab muscle/hepatopancreas cadmium concentration (0.21 mg/kg ww) was measured in a composite sample (LPR8-CSMH-Comp54) from Reach 8.
- **Fish and blue crab carcass –** Cadmium was detected in all fish and blue crab carcass samples. Fish carcass cadmium concentrations across species ranged from 0.005 to 0.062 mg/kg ww, and the highest cadmium concentration (0.062 mg/kg ww) was measured in an individual largemouth bass sample (LPR5-MSCT-Ind009) from Reach 5. Cadmium concentrations in blue crab carcass samples ranged from 0.052 to 0.18 mg/kg ww, and the highest blue crab muscle/hepatopancreas cadmium concentration (0.18 mg/kg ww) was measured in a composite sample (LPR1-CSCT-Comp11) from Reach 1.

[5] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

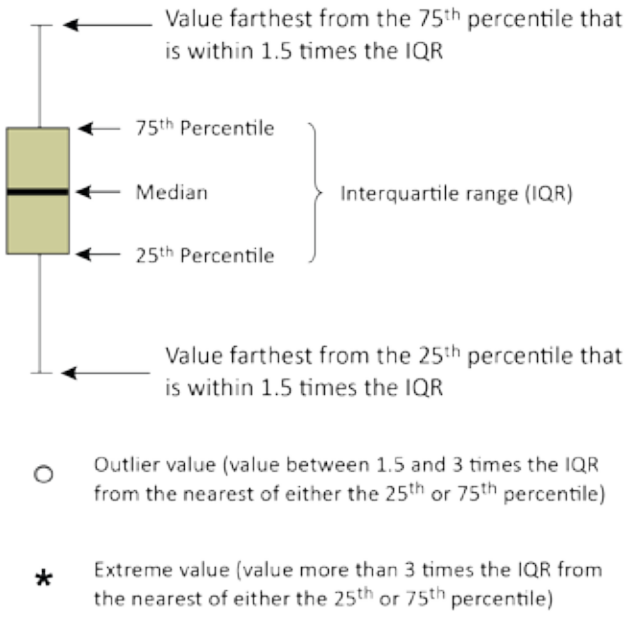
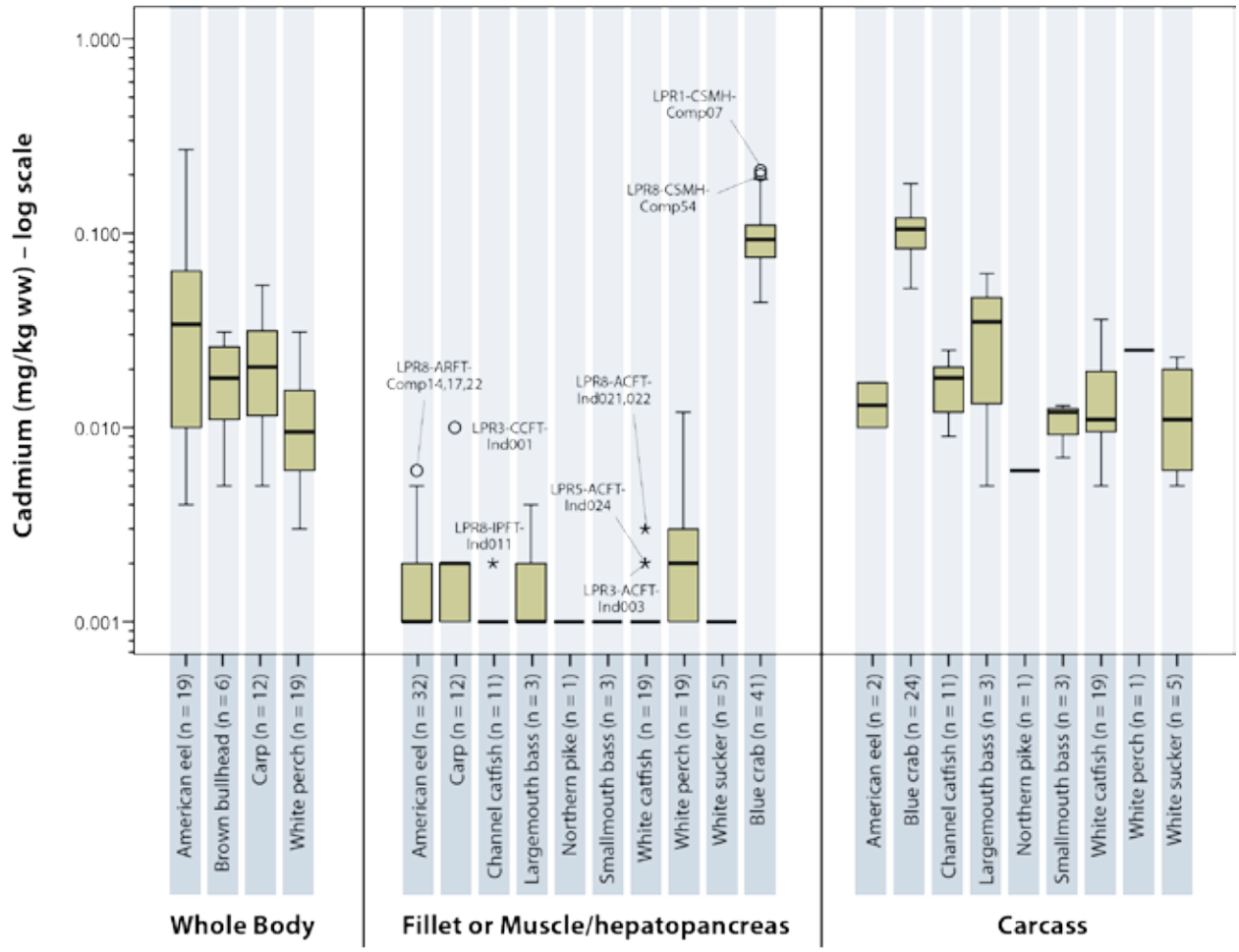


Figure 4-1. Elements of the box and whisker plots

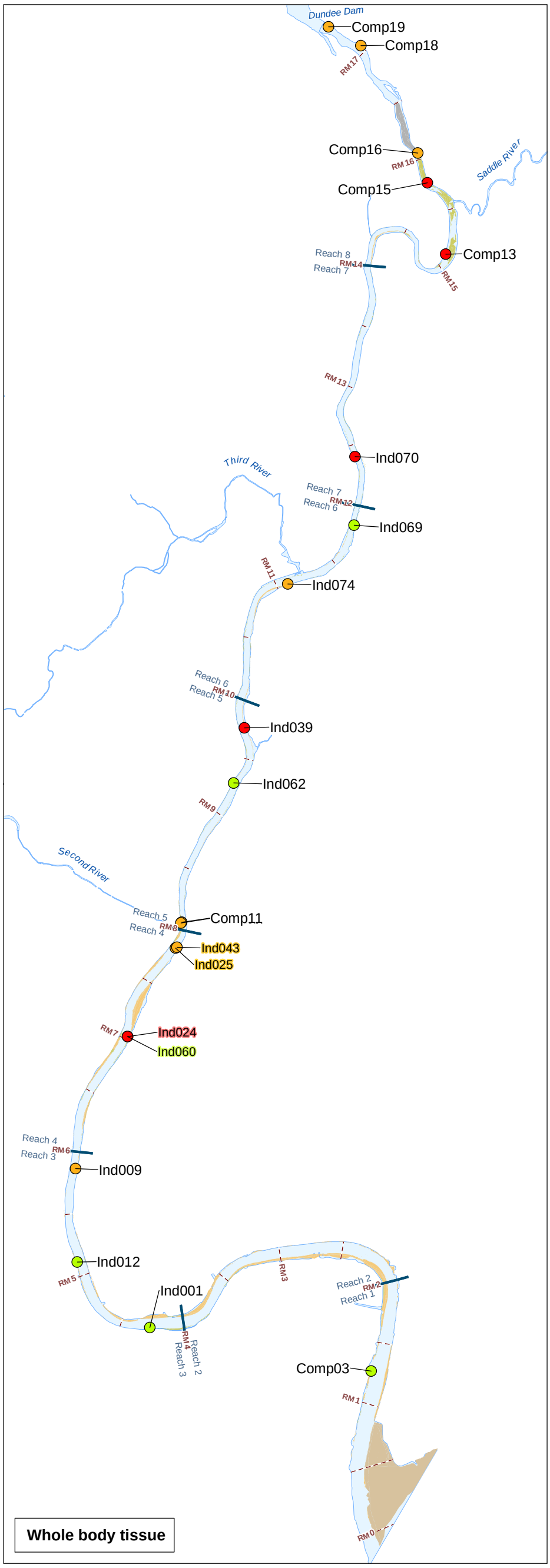


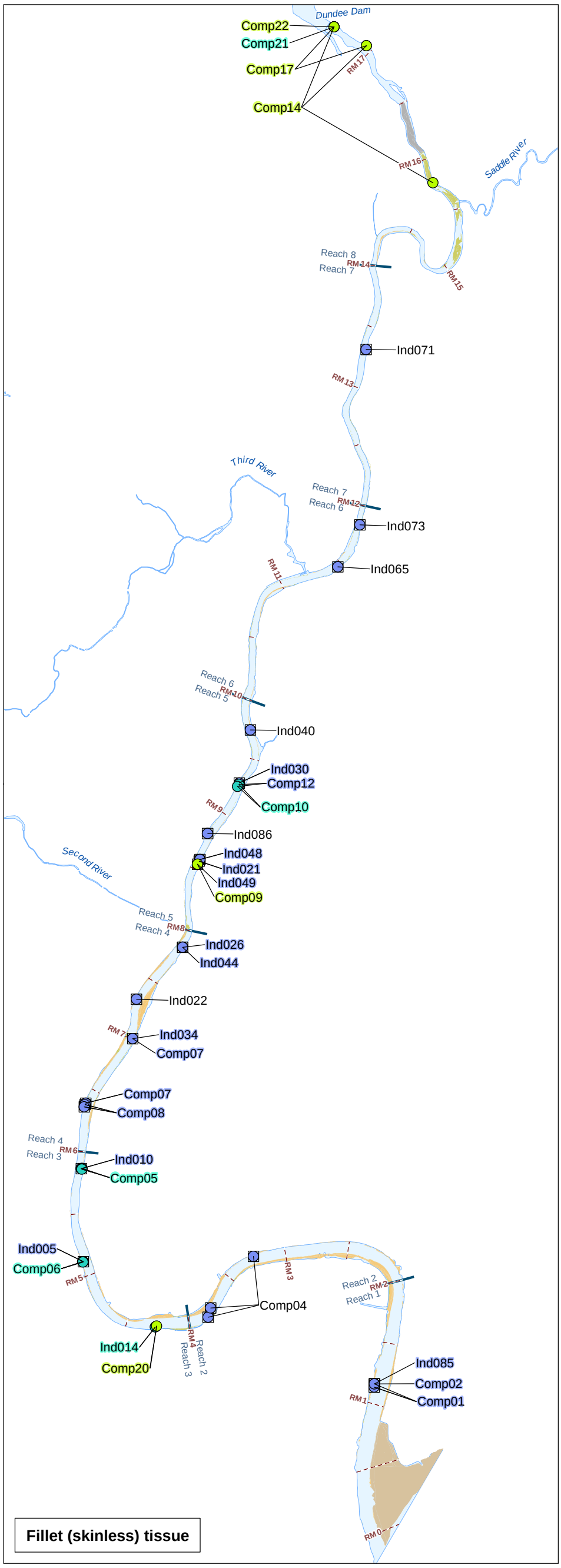
Note: The RL is displayed for non-detected concentrations.

Figure 4-2. Cadmium concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue cadmium concentrations are shown by percentile range and reach in Figures 4-3 through 4-5, respectively. The highest American eel cadmium concentration was measured in an individual whole-body sample (LPR7-ARWB-Ind070) from Reach 7 (0.27 mg/kg ww) (Figure 4-3). The highest white perch cadmium concentration (0.031 mg/kg ww) was measured in an individual whole-body sample (LPR7-MAWB-Ind123) from Reach 7 (Figure 4-4). The highest blue crab cadmiumconcentration was measured in a hepatopancreas-only sample (LPR8-CSHT-Comp66) from Reache8. Of the 93 blue crab samples, the 7 hepatopancreas-only samples had the highest cadmium concentrations (ranging from 0.78 to 0.32 mg/kg ww). The highest blue crab cadmium concentration, excluding hepatopancreas-only samples (0.21 mg/kg ww), was measured in a

muscle / hepatopancreas composite sample (LPR8-CSMH-Comp54) from Reach 8 (Figure 4-5).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Cadmium (mg/kg)	(Percentile)
> 0.064	(> 90th)
> 0.014 and ≤ 0.064	(> 75th and ≤ 90th)
> 0.0020 and ≤ 0.014	(> 50th and ≤ 75th)
> 0.0010 and ≤ 0.0020	(> 25th and ≤ 50th)
≤ 0.0010	(≤ 25th)
Non-detected	

The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-3. Cadmium concentrations in American eel 2009 tissue samples from the LPRSA

FINAL

Wind Ward environmental LLC

Dundee Dam
RM17
RM16
Saddle River
Comp32
Comp29
Comp28
Reach 8
Reach 7
RM14
RM15
Comp25
RM13
Ind123
Third River
Reach 7
Reach 6
RM12
RM11
Ind128
Reach 6
Reach 5
RM10
Comp19
RM9
Second River
Comp18
Reach 5
Reach 4
RM8
Comp23
Comp14
Comp15
RM7
Reach 4
Reach 3
RM6
Comp06
Comp09
Comp10
Comp11
Comp12
Comp30
RM5
RM4
RM3
Reach 3
Reach 2
Reach 2
Reach 1
RM2
Ind158
Ind138
RM1
RM0

Whole body tissue

Dundee Dam
RM17
RM16
Saddle River
Comp27
Comp26
Reach 8
Reach 7
RM14
RM15
Comp31
RM13
Third River
Reach 7
Reach 6
RM12
RM11
Ind122
Comp24
Reach 6
Reach 5
RM10
Comp20
Comp21
RM9
Second River
Reach 5
Reach 4
RM8
Comp22
Comp17
Comp16
RM7
Reach 4
Reach 3
RM6
Comp04
Comp03
Comp02
Comp05
Comp13
Comp08
Comp07
RM5
RM4
RM3
Reach 3
Reach 2
Reach 2
Reach 1
RM2
Ind145
Comp01
RM1
RM0

Fillet (with skin) tissue

- River mile
- Sampling reach boundary
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data
- LPRSA

N

0 0.5 1 Miles

Cadmium (mg/kg)	(Percentile)
> 0.015	(> 90th)
> 0.010 and ≤ 0.015	(> 75th and ≤ 90th)
> 0.0050 and ≤ 0.010	(> 50th and ≤ 75th)
> 0.0020 and ≤ 0.0050	(> 25th and ≤ 50th)
≤ 0.0020	(≤ 25th)
Non-detected	

The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-4. Cadmium concentrations in white perch 2009 tissue samples from the LPRSA

FINAL

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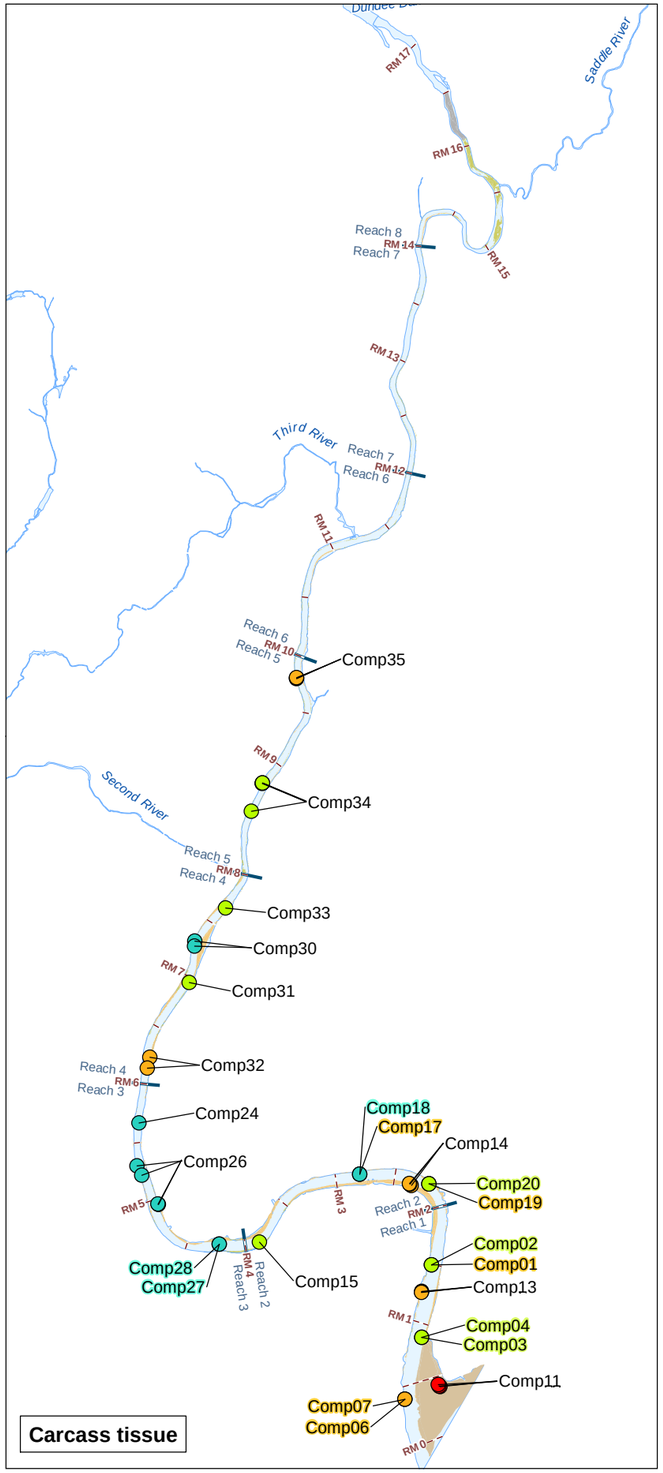
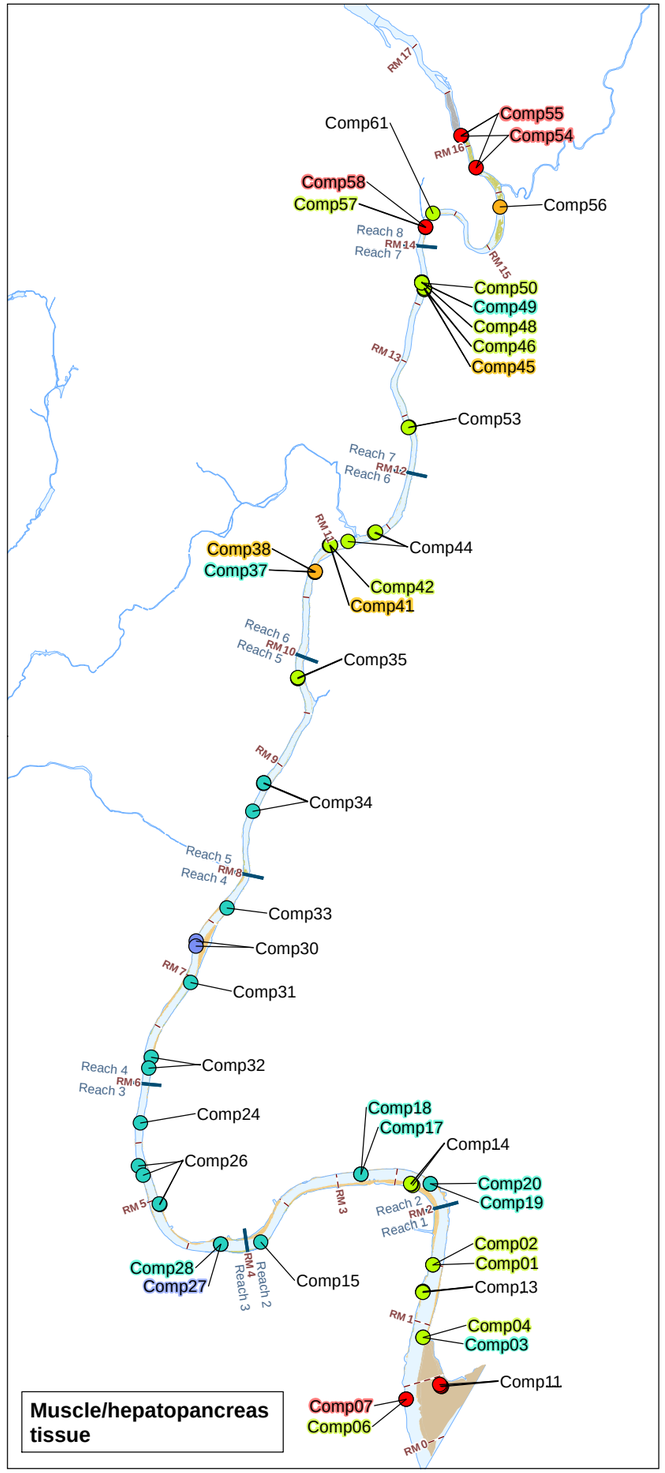
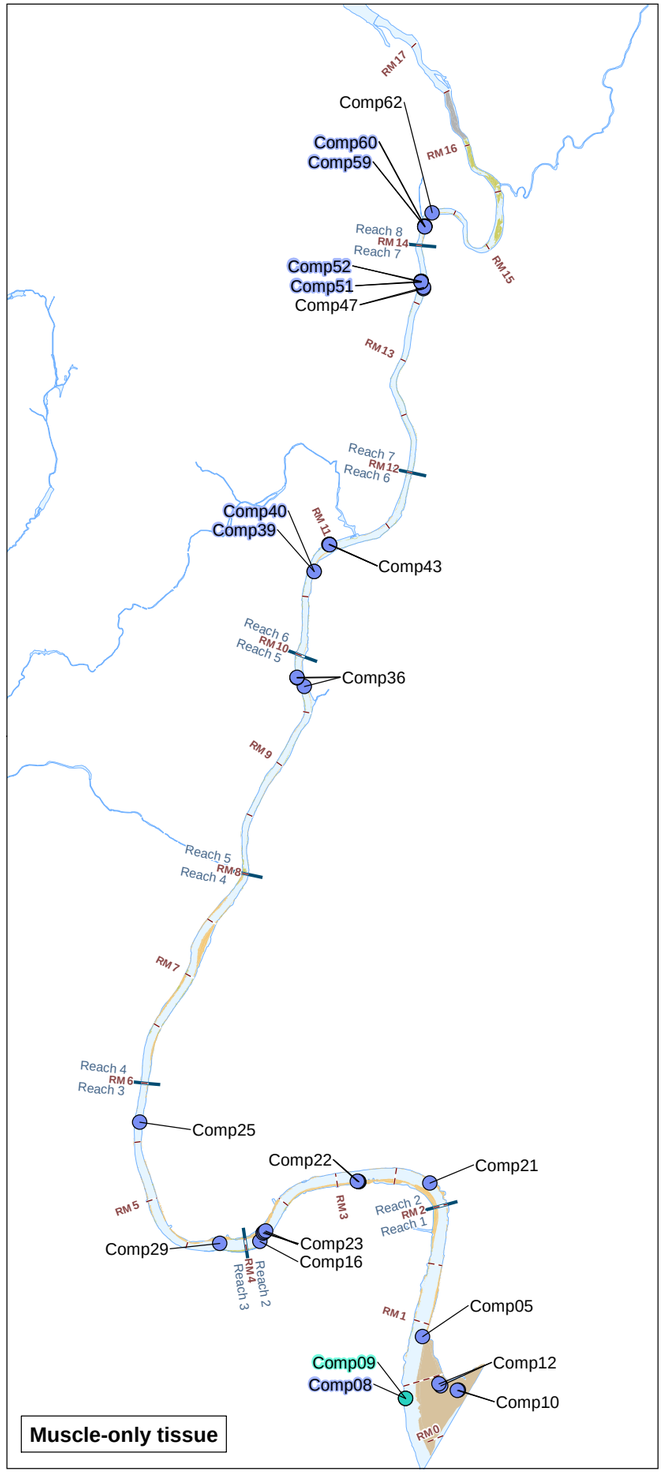
Prepared by LSM 5/10/2011, map 4625; W:\Projects\06-58-01 Passaic RI\Data\GIS\Maps_and_Analysis\FishData







Cadmium (mg/kg)	(Percentile)
> 0.16	(> 90th)
> 0.11 and ≤ 0.16	(> 75th and ≤ 90th)
> 0.082 and ≤ 0.11	(> 50th and ≤ 75th)
> 0.047 and ≤ 0.082	(> 25th and ≤ 50th)
≤ 0.047	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

N

0 1 2 Miles

- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grainsize data

Figure 4-5. Cadmium concentrations in blue crab 2009 tissue samples from the LPRSA

FINAL

Wind Ward environmental LLC

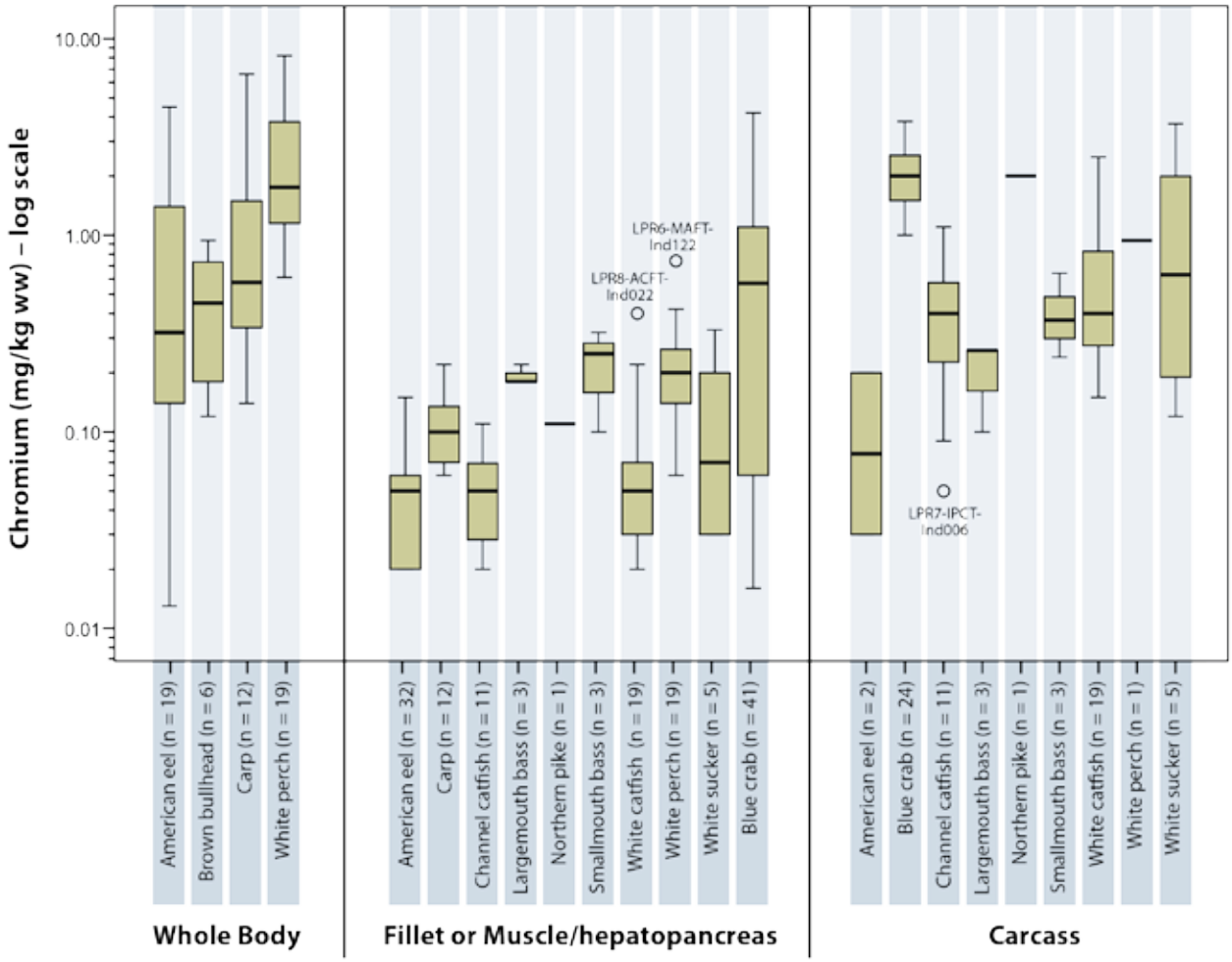
Prepared by LSM 4/11/2011, map 4626: W:\Projects\06-58-01 Passaic RI\Data\GIS\deliverInternal\FishTissue

4.1.2 Chromium

The detection frequency of chromium ranged from 34 to 100% across all fish and blue crab samples (Table 4-2). Detected chromium concentrations ranged from 0.02 to 8.2 mg/kg ww across all fish and blue crab samples. The highest chromium concentration (8.2 mg/kg ww) was measured in a whole-body white perch composite sample (LPR8-MAWB-Comp29) from Reach 8. The distributions of chromium concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples, and blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-6.[6] The following summarize chromium concentrations for fish and blue crab by tissue type, as shown in Figure 4-6:

- **Fish whole body –** The detection frequency for chromium in fish whole-body samples ranged from 95 to 100% across all fish species. Detected chromium concentrations in fish whole-body samples ranged from 0.04 to 8.2 mg/kg ww, and the highest chromium concentration (8.2 mg/kg ww) was measured in a white perch whole-body composite sample (LPR8-MAWB-Comp29) from Reach 8.
- **Fish fillet and blue crab muscle/hepatopancreas –** Chromium was detected in 81 of 105 fish fillet samples and in 29 of 41 blue crab muscle/hepatopancreas samples. Detected chromium concentrations ranged from 0.02 to 0.74 mg/kg ww in fish fillet samples, and the highest fish fillet chromium concentration (0.74 mg/kg ww) was measured in an individual white perch sample (LPR6-MAFT-Ind122) from Reach 6. Detected chromium concentrations in blue crab muscle/hepatopancreas samples ranged from 0.090 to 4.2 mg/kg ww, and the highest blue crab muscle/hepatopancreas chromium concentration (4.2 mg/kg ww) was measured in a composite sample (LPR3-CSMH-Comp24) from Reach 3.
- **Fish and blue crab carcass –** Chromium was detected in all 45 fish carcass samples, except for one American eel carcass sample. Chromium was detected in all 24 of the blue crab carcass samples. Detected chromium concentrations in fish carcass samples ranged from 0.05 to 3.7 mg/kg ww, and the highest fish carcass chromium concentration (3.7 mg/kg ww) was measured in an individual white sucker carcass sample (LPR8-WSCT-Ind013) from Reach 8. Chromium concentrations in blue crab carcass samples ranged from 1.0 to 3.8 mg/kg ww, and the highest blue crab carcass chromium concentration was measured in a composite sample (LPR1-CSCT-Comp03) from Reach 1.

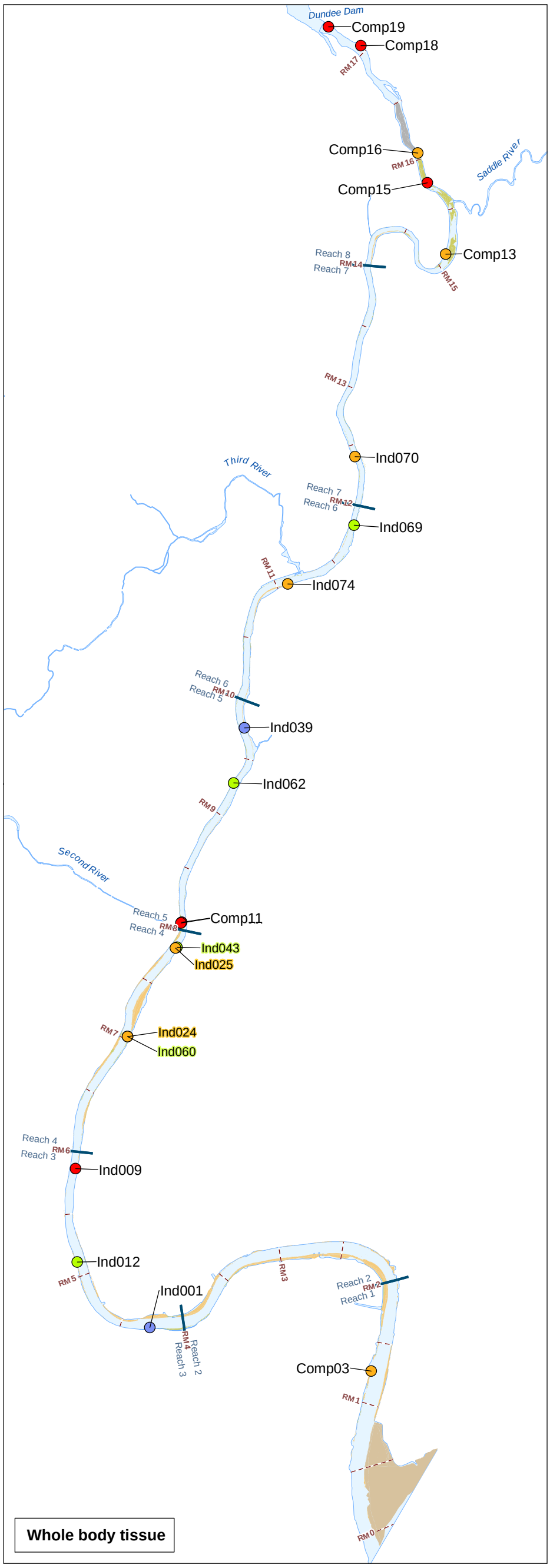
[6] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

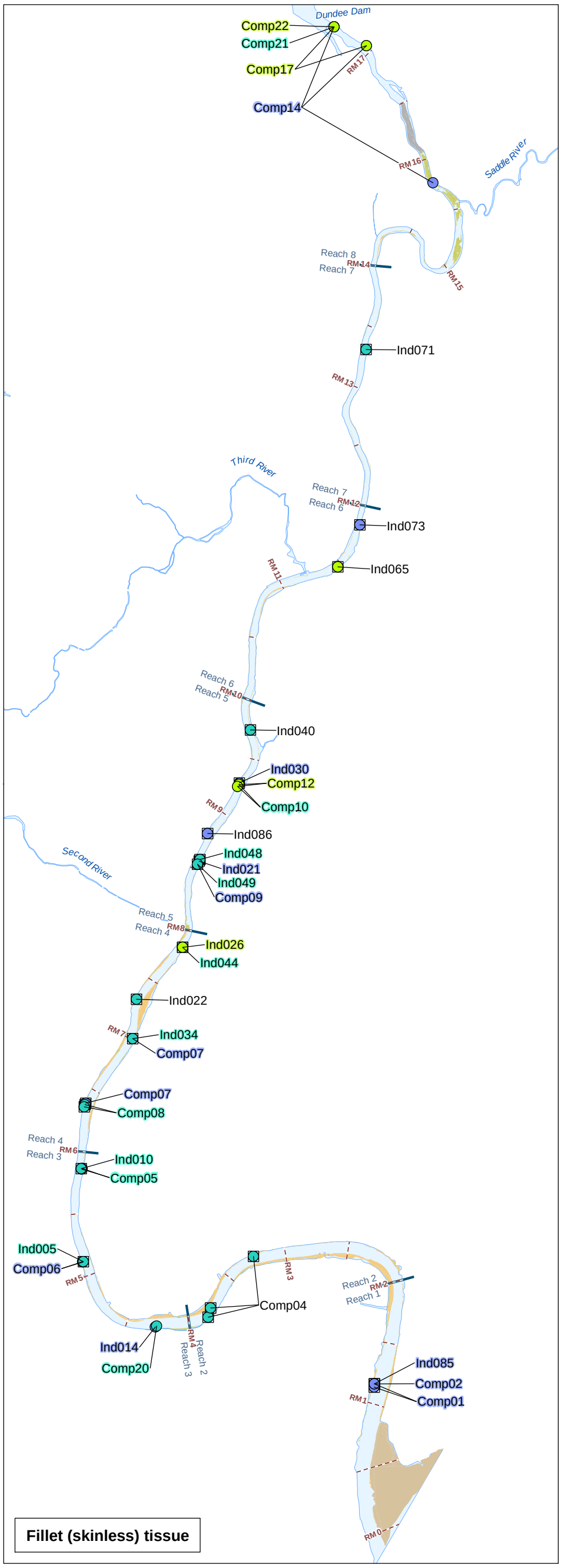


Note: The RL is displayed for non-detected concentrations.

Figure 4-6. Chromium concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue chromium concentrations are shown by percentile range and reach in Figures 4-7 through 4-9, respectively. The highest American eel chromium concentration (4.5 mg/kg ww) was measured in a whole-body composite sample (LPR8-ARWB-Comp18) from Reach 8 (Figure 4-7). The highest white perch chromium concentration (8.2 mg/kg ww) was measured in a whole-body composite sample (LPR8-MAWB-Comp29) from Reach 8 (Figure 4-8). The highest blue crab chromium concentration (4.2 mg/kg ww) was measured in a muscle/hepatopancreas composite sample (LPR3-CSMH-Comp24) from Reach 3 (Figure 4-9).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grainsize data
LPRSA

N

0 0.5 1 Miles

Chromium (mg/kg)	(Percentile)
> 1.4	(> 90th)
> 0.19 and ≤ 1.4	(> 75th and ≤ 90th)
> 0.060 and ≤ 0.19	(> 50th and ≤ 75th)
> 0.040 and ≤ 0.060	(> 25th and ≤ 50th)
≤ 0.040	(≤ 25th)
Non-detected	

The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-7. Chromium concentrations in American eel 2009 tissue samples from the LPRSA

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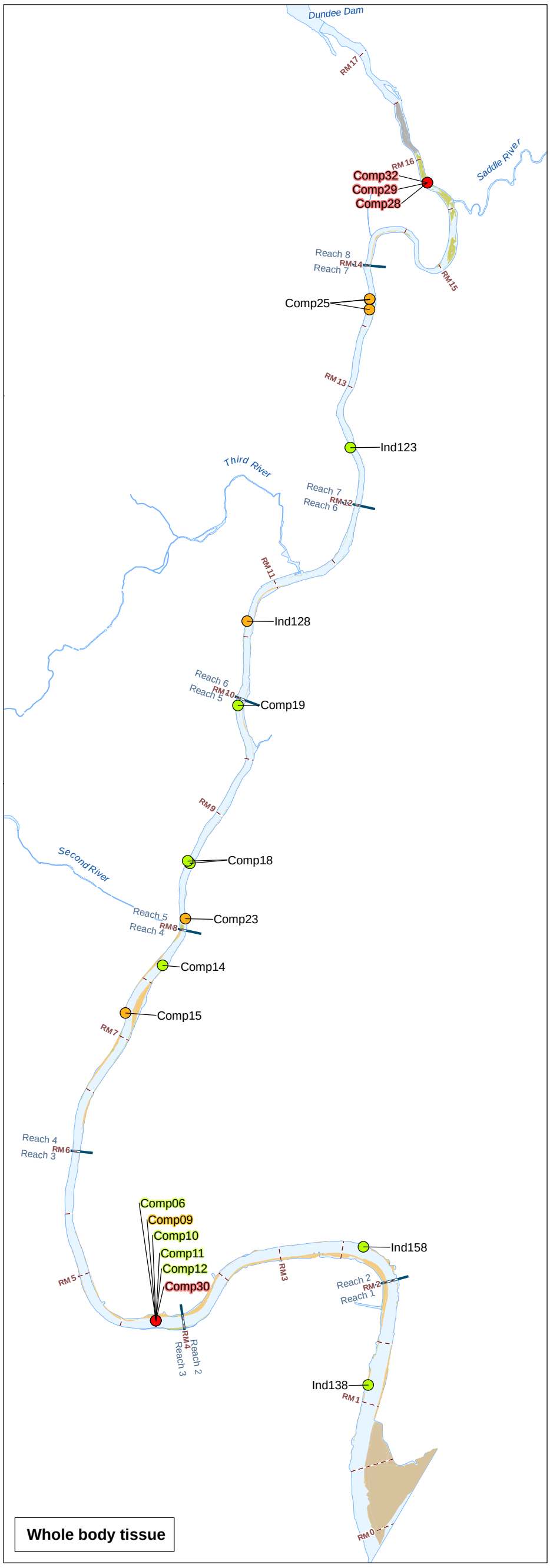

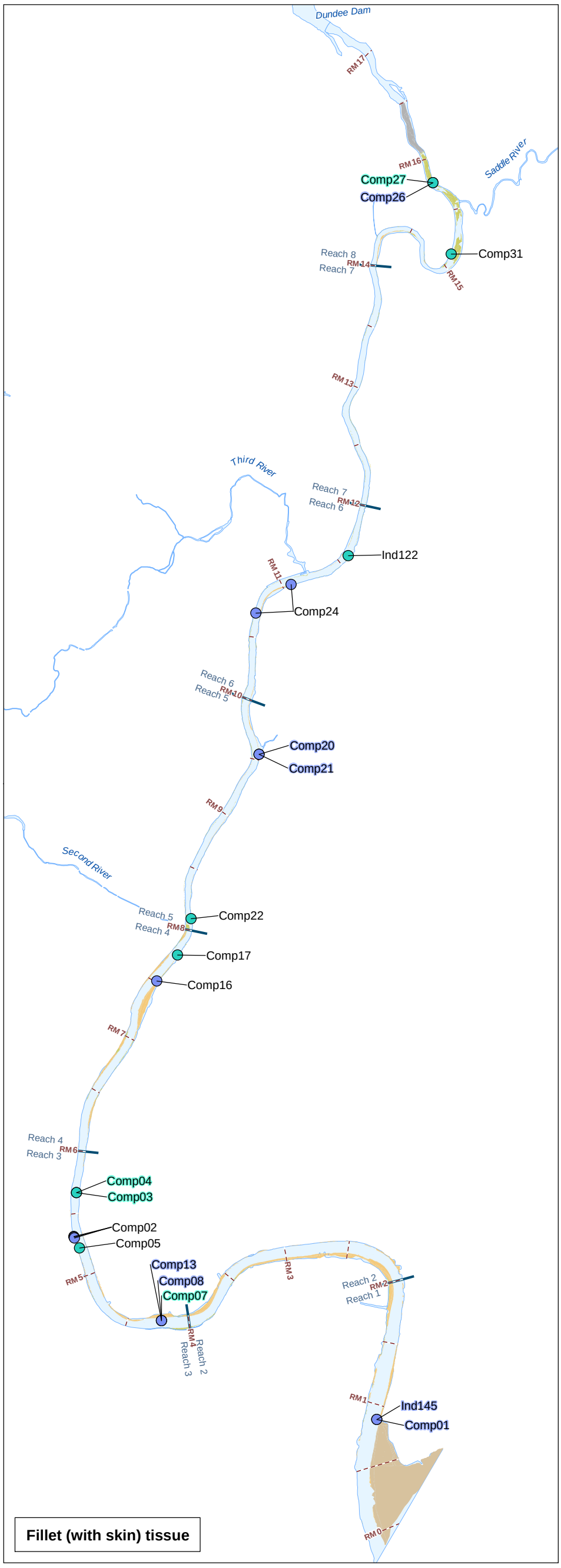

River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grainsize data
LPRSA

N

0 0.5 1 Miles

Chromium (mg/kg)	(Percentile)
> 4.3	(> 90th)
> 1.8 and ≤ 4.3	(> 75th and ≤ 90th)
> 0.76 and ≤ 1.8	(> 50th and ≤ 75th)
> 0.20 and ≤ 0.76	(> 25th and ≤ 50th)
≤ 0.20	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-8. Chromium concentrations in white perch 2009 tissue samples from the LPRSA

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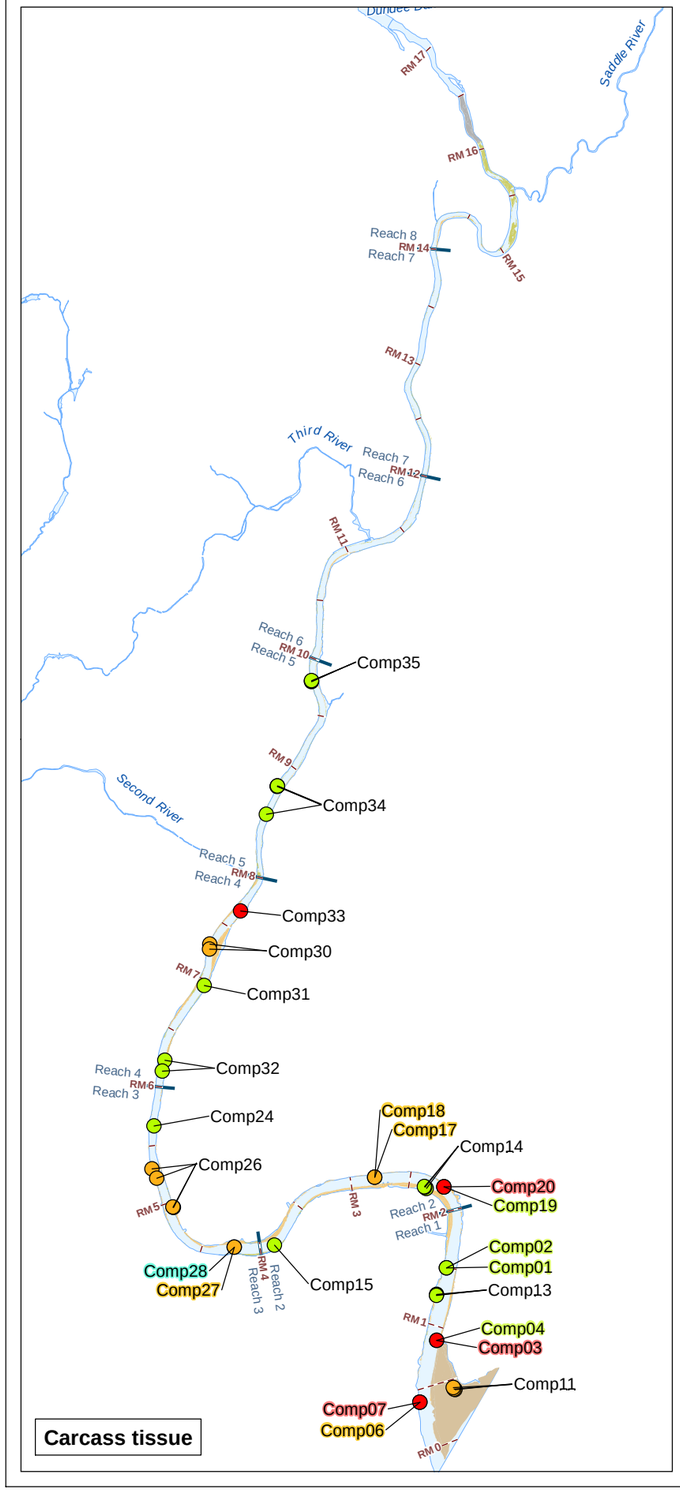

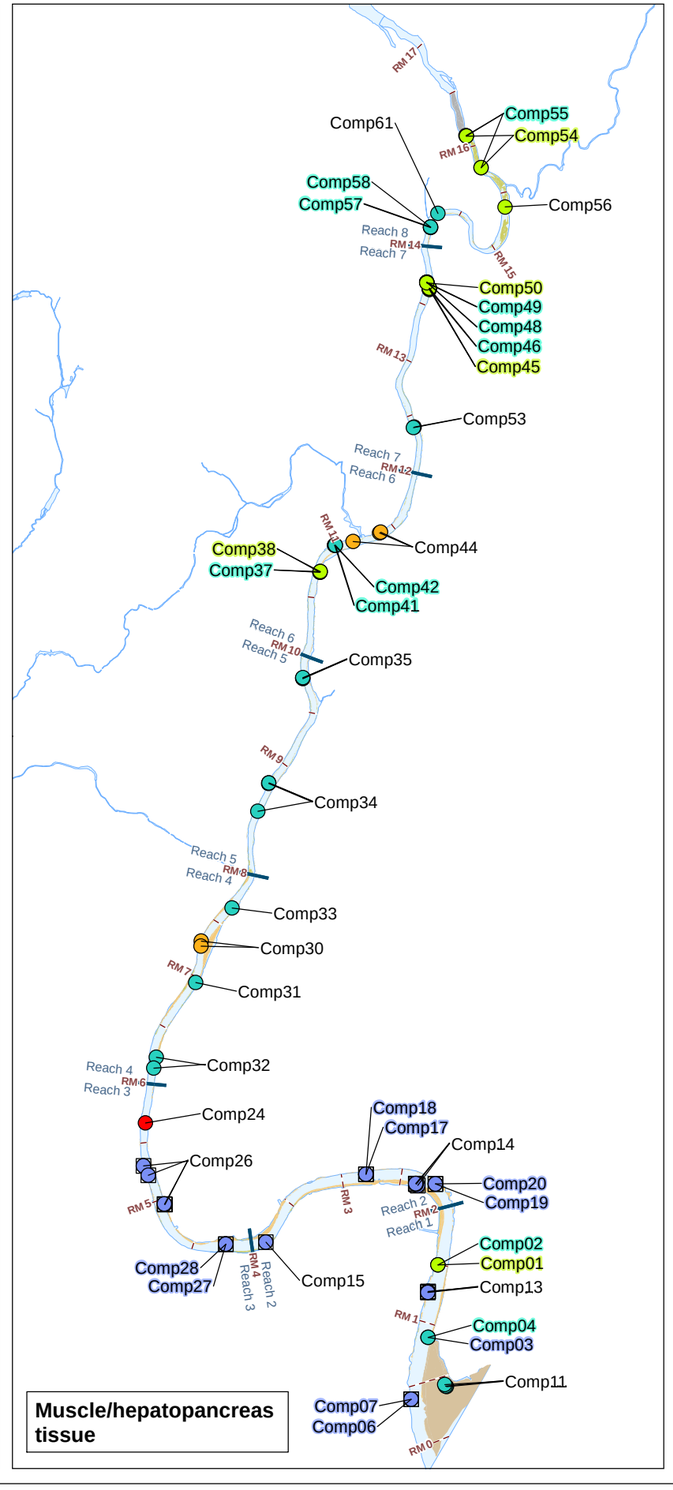

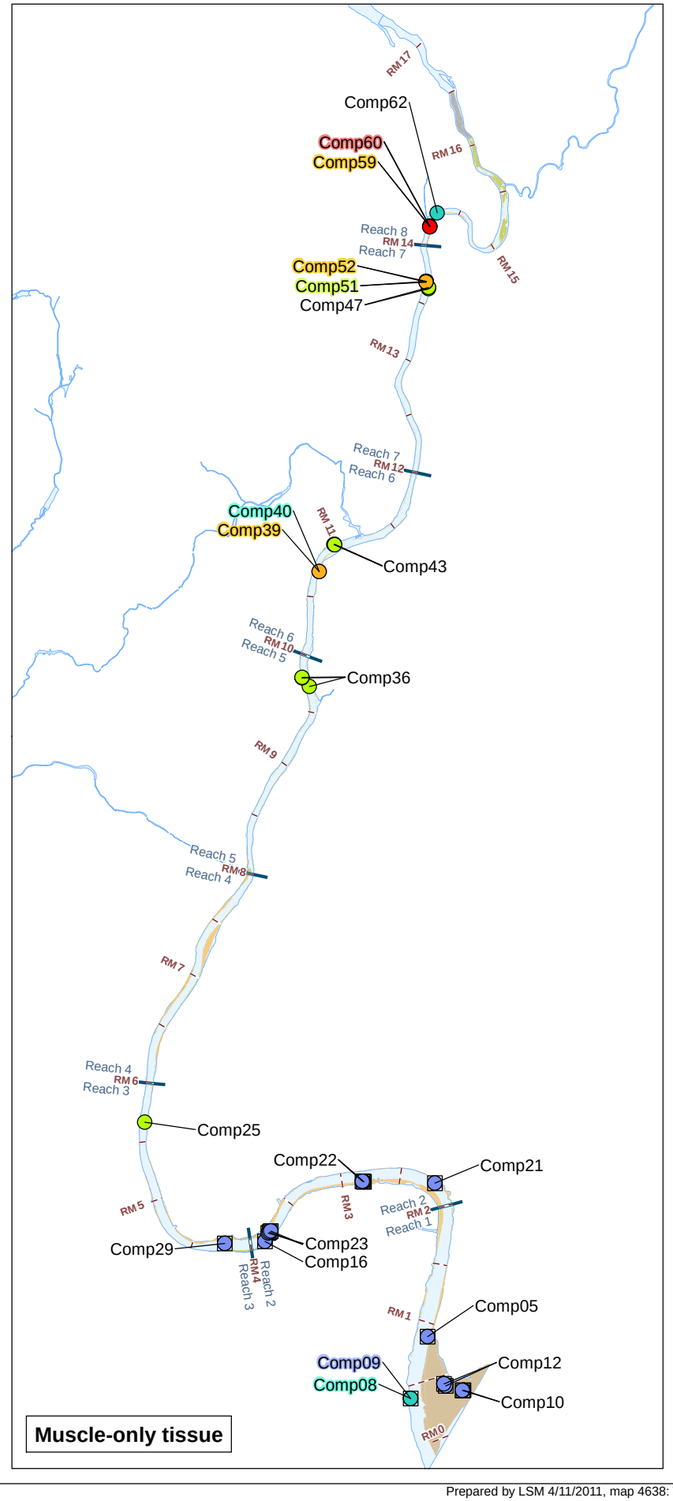

Chromium (mg/kg) (Percentile)

- > 2.6 (> 90th)
- > 2.0 and ≤ 2.6 (> 75th and ≤ 90th)
- > 1.1 and ≤ 2.0 (> 50th and ≤ 75th)
- > 0.098 and ≤ 1.1 (> 25th and ≤ 50th)
- ≤ 0.098 (≤ 25th)
- Non-detected

The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

N

0 1 2 Miles

- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-9. Chromium concentrations in blue crab 2009 tissue samples from the LPRSA

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4.1.3 Copper

Copper was detected in all fish and blue crab samples analyzed (Table 4-2). Copper concentrations ranged from 0.15 to 104 mg/kg ww across all fish and blue crab samples. The highest copper concentration (104 mg/kg ww) was measured in a blue crab hepatopancreas-only composite sample (LPR8-CSHT-Comp66) from Reach 8. The distributions of copper concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-10.[7] The following summarize copper concentrations for fish and blue crab by tissue type, as shown in Figure 4-10:

- **Fish whole body** – Copper was detected in all fish whole-body samples. Fish whole-body copper concentrations ranged from 0.52 to 50.9 mg/kg ww. The highest fish whole-body copper concentration (50.9 mg/kg ww) was measured in an individual white perch whole-body sample (LPR2-MAWB-Ind158) from Reach 2.
- **Fish fillet and blue crab muscle/hepatopancreas** – Copper was detected in all fish fillet and blue crab muscle/hepatopancreas samples. Fish fillet copper concentrations ranged from 0.15 to 0.95 mg/kg ww, and the highest fish fillet copper concentration (0.95 mg/kg ww) was measured in an individual carp sample (LPR3-CCFT-Ind001) from Reach 3. Blue crab muscle/hepatopancreas copper concentrations ranged from 13.1 to 37.4 mg/kg ww, and the highest blue crab muscle/hepatopancreas copper concentration (37.4 mg/kg ww) was measured in a composite sample (LPR8-CSMH-Comp54) from Reach 8.
- **Fish and blue crab carcass** – Copper was detected in all fish and blue crab carcass samples. Fish carcass copper concentrations ranged from 0.30 to 50.5 mg/kg ww, and the highest fish carcass copper concentration (50.5 mg/kg ww) was measured in an individual white perch carcass sample (LPR1-MACT-Ind145) from Reach 1. Blue crab carcass copper concentrations ranged from 20.2 to 36.7 mg/kg ww, and the highest blue crab carcass copper concentration (36.7 mg/kg ww) was measured in a composite sample (LPR4-CSCT-Comp33) from Reach 4.

[7] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

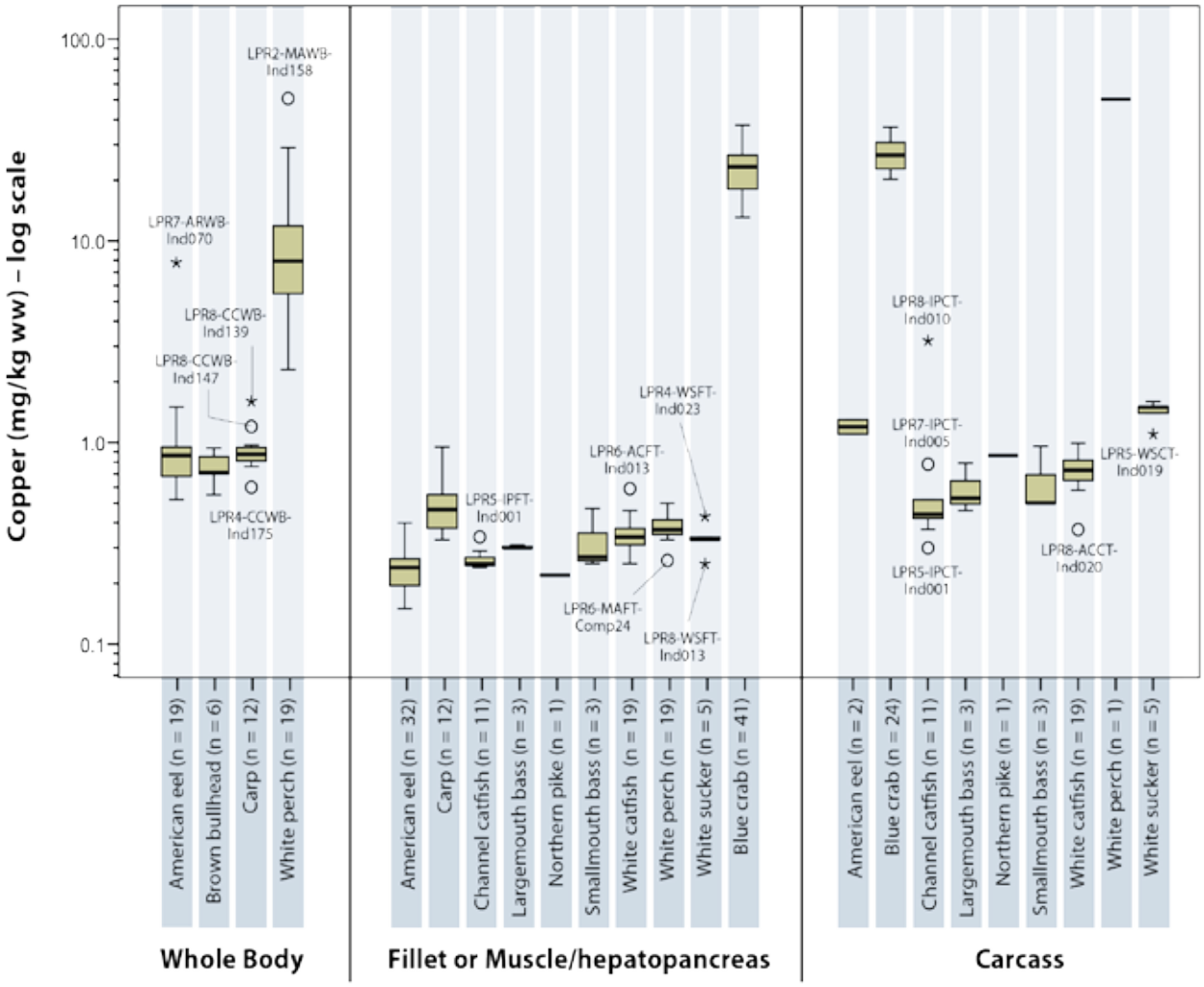
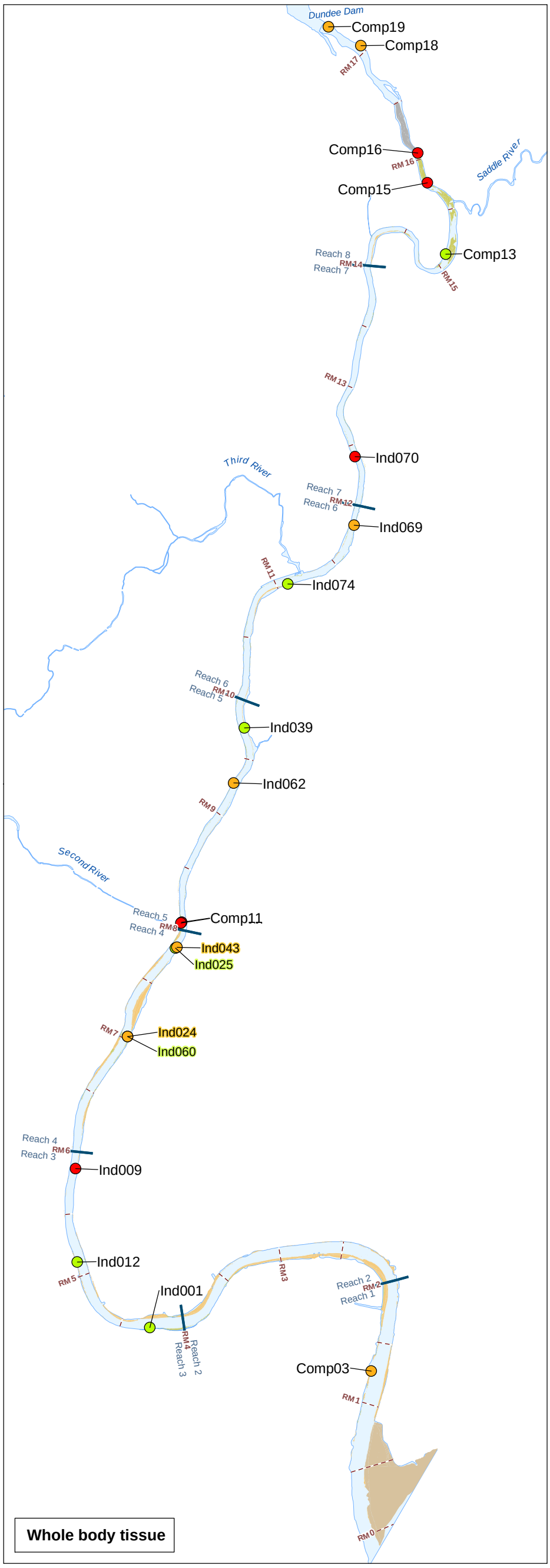
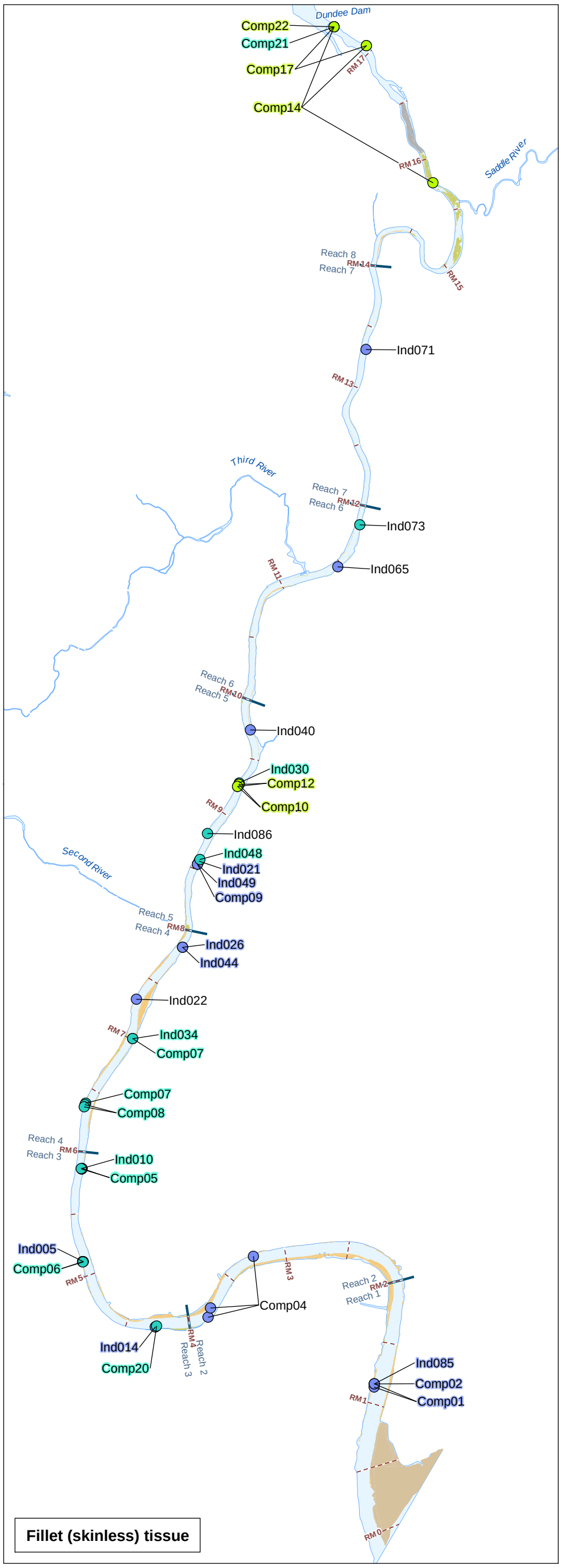


Figure 4-10. Copper concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue copper concentrations by percentile range and reach are shown in Figures 4-11 through 4-13, respectively. The highest American eel copper concentration (7.8 mg/kg ww) was measured in an individual whole-body sample (LPR7-ARWB-Ind070) from Reach 7 (Figure 4-11). The highest white perch copper concentrations were measured in an individual whole-body sample (LPR2-MAWB-Ind158) from Reach 2 (50.9 mg/kg ww) and an individual carcass sample from Reach 1 (50.5 mg/kg ww) (Figure 4-12). The highest blue crab copper concentration (104 mg/kg ww) was measured in a hepatopancreas-only composite

sample (LPR8-CSHT-Comp66) from Reach 8. Of the 93 blue crab samples, the 7 hepatopancreas-only samples had the highest copper concentrations (ranging from 104 to 42.2 m/kg ww). The highest blue crab copper concentration, excluding hepatopancreas-only samples (37.4 mg/kg ww), was measured in a muscle/hepatopancreas composite sample (LPR8-CSMH-Comp54) from Reach 8 (Figure 4-5).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Copper (mg/kg)	(Percentile)
> 0.93	(> 90th)
> 0.69 and ≤ 0.93	(> 75th and ≤ 90th)
> 0.29 and ≤ 0.69	(> 50th and ≤ 75th)
> 0.23 and ≤ 0.29	(> 25th and ≤ 50th)
≤ 0.23	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-11. Copper concentrations in American eel 2009 tissue samples from the LPRSA

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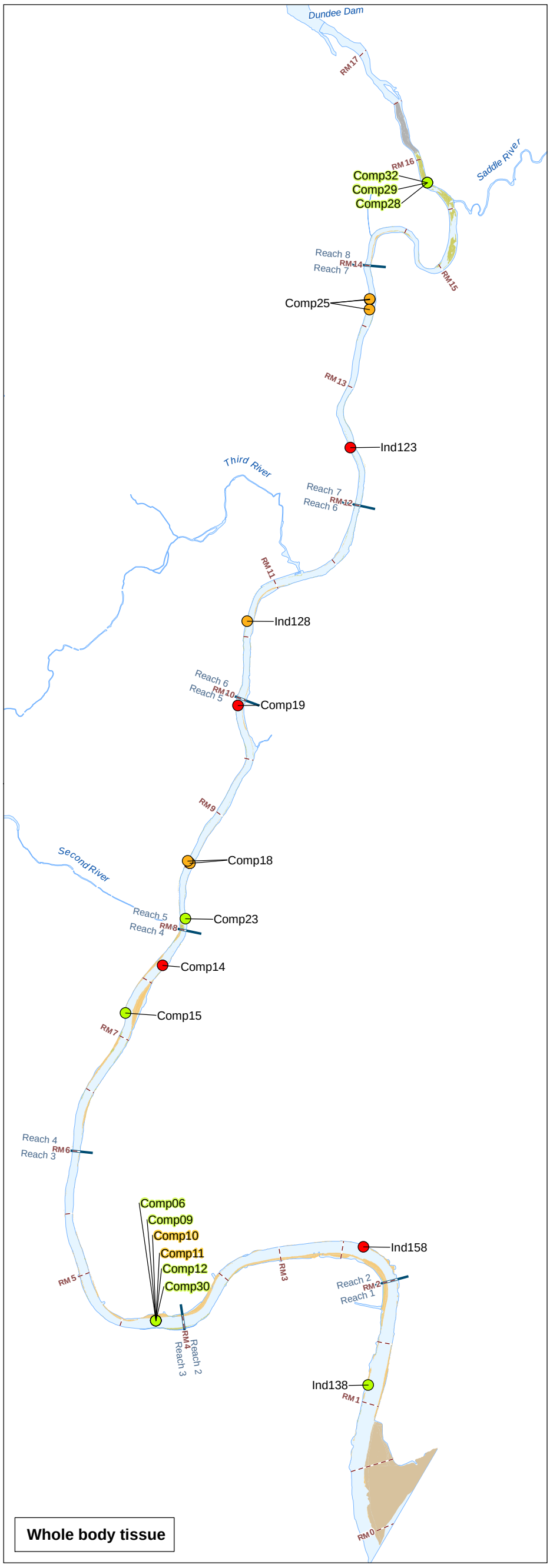

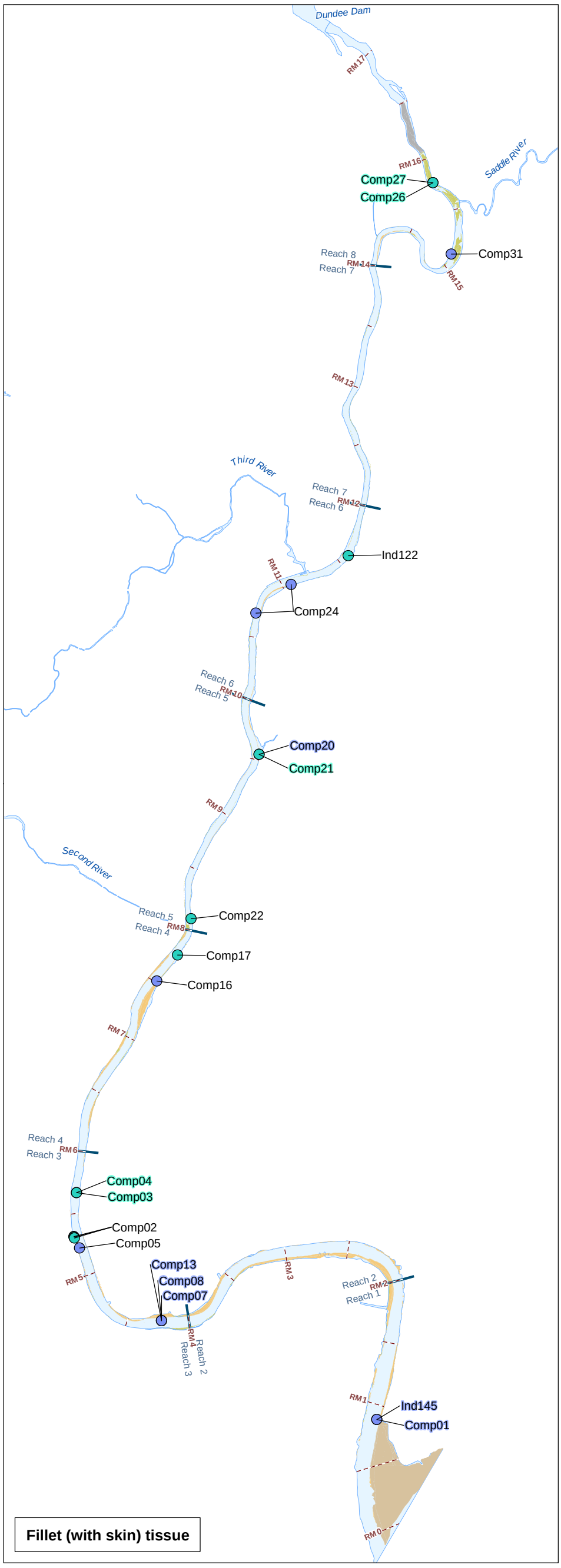

River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Copper (mg/kg)	(Percentile)
> 11.5	(> 90th)
> 7.6 and ≤ 11.5	(> 75th and ≤ 90th)
> 1.4 and ≤ 7.6	(> 50th and ≤ 75th)
> 0.37 and ≤ 1.4	(> 25th and ≤ 50th)
≤ 0.37	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-12. Copper concentrations in white perch 2009 tissue samples from the LPRSA

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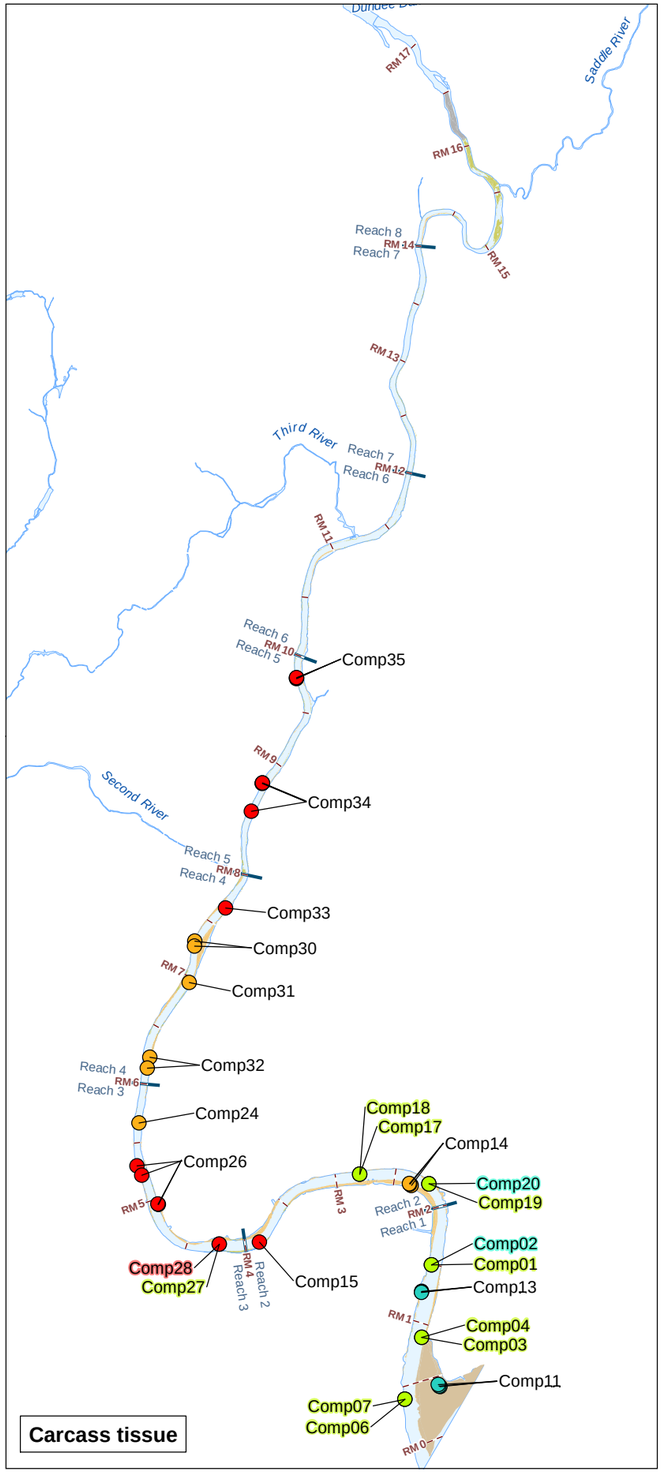

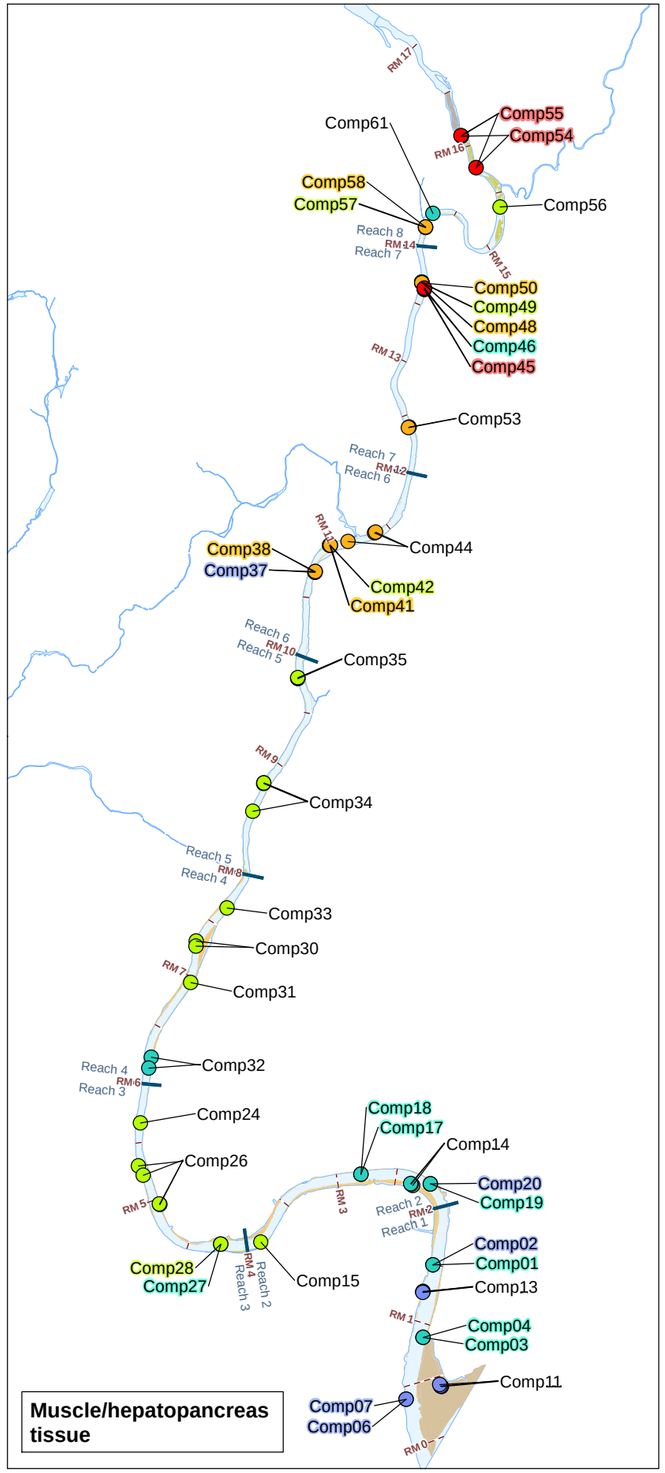

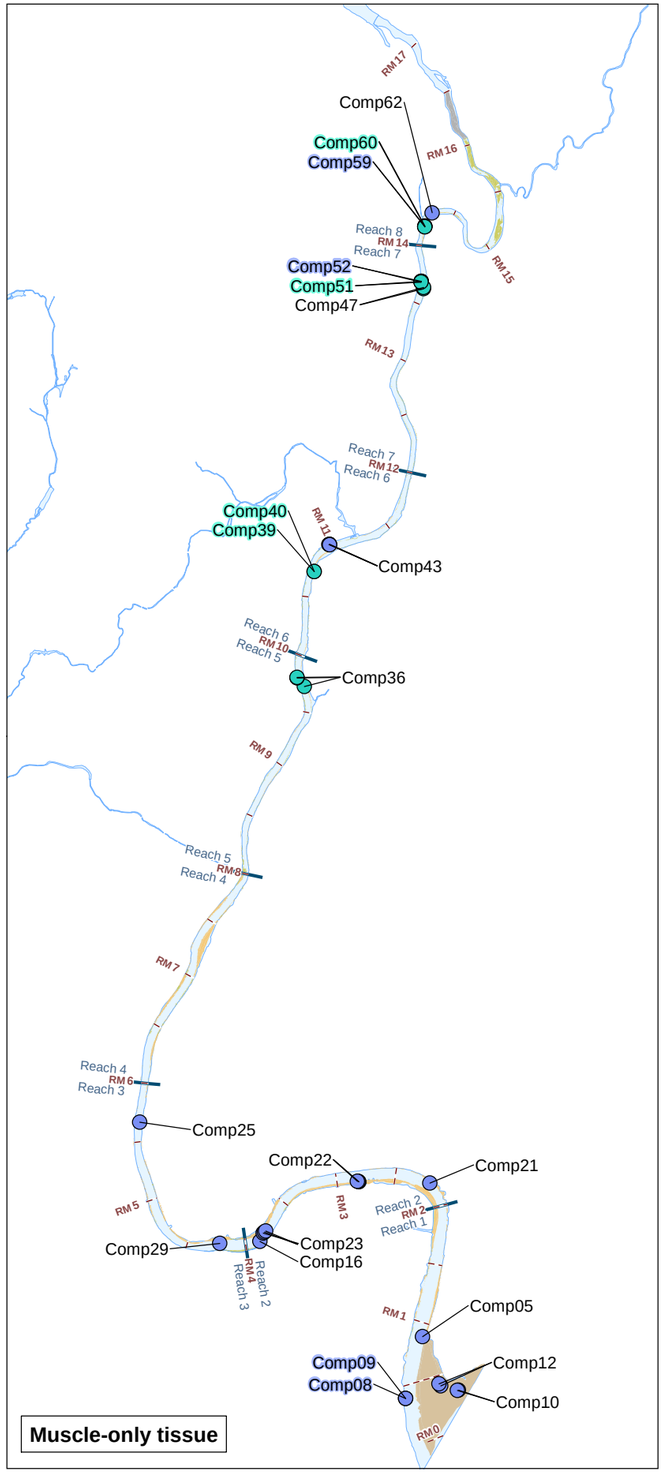

Copper (mg/kg) | (Percentile)

- > 31.0 | (> 90th)
- > 26.8 and ≤ 31.0 | (> 75th and ≤ 90th)
- > 21.8 and ≤ 26.8 | (> 50th and ≤ 75th)
- > 17.2 and ≤ 21.8 | (> 25th and ≤ 50th)
- ≤ 17.2 | (≤ 25th)

All samples were detected.
The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

N

0 1 2 Miles

- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-13. Copper concentrations in blue crab 2009 tissue samples from the LPRSA

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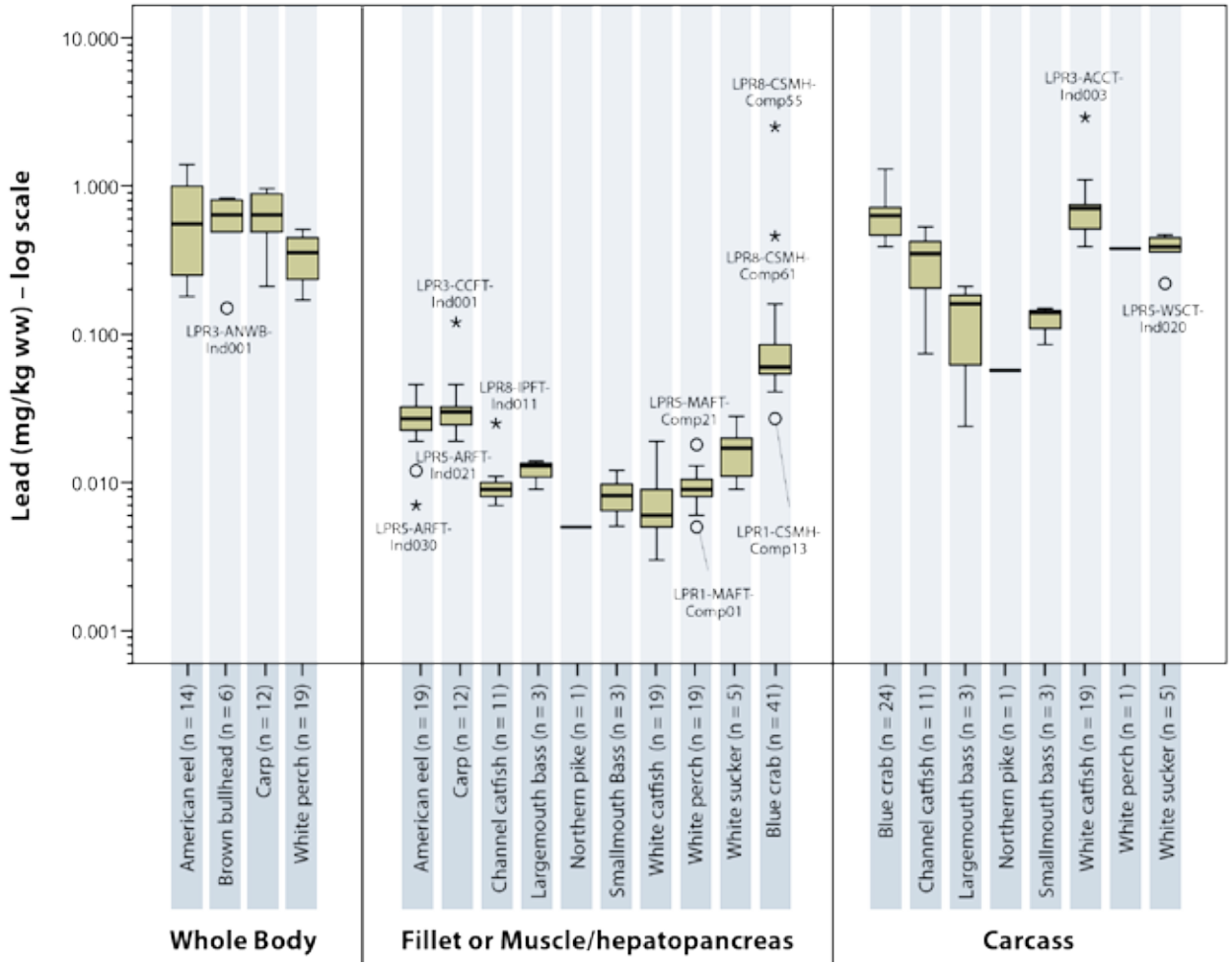
4.1.4 Lead

Lead was detected in all blue crab samples and all fish whole-body and carcass samples analyzed (Table 4-2). The detection frequency for fish fillet samples ranged from 95 to 100%. Detected lead concentrations ranged from 0.003 to 2.9 mg/kg ww across all fish and blue crab samples. The highest lead concentration (2.9 mg/kg ww) was measured in an individual white catfish carcass sample (LPR3-ACCT-Ind003) from Reach 3. The distributions of lead concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-14.[8] The following summarize lead concentrations for fish and blue crab by tissue type, as shown in Figure 4-14:

- **Fish whole body** – Lead was detected in all fish whole-body samples. Fish whole-body lead concentrations ranged from 0.15 to 1.4 mg/kg ww. The highest whole-body lead concentration (1.4 mg/kg ww) was measured in an individual American eel whole-body sample (LPR7-ARWB-Ind070) from Reach 7.
- **Fish fillet and blue crab muscle/hepatopancreas** – Lead was detected in 91 of 92 fish fillet samples and all 41 of the blue crab muscle/hepatopancreas samples.[9] Detected lead concentrations in fish fillet samples ranged from 0.003 to 0.12 mg/kg ww, and the highest fish fillet lead concentration (0.12 mg/kg ww) was measured in an individual carp fillet sample (LPR3-CCFT-Ind001) from Reach 3. Blue crab muscle/hepatopancreas lead concentrations ranged from 0.027 to 2.5 mg/kg ww, and the highest blue crab muscle/hepatopancreas lead concentration (2.5 mg/kg ww) was measured in a composite sample (LPR8-CSMH-Comp55) from Reach 8.
- **Fish and blue crab carcass** – Lead was detected in all fish and blue crab carcass samples. Fish carcass lead concentrations across species ranged from 0.024 to 2.9 mg/kg ww, and the highest fish carcass lead concentration (2.9 mg/kg ww) was measured in an individual white catfish sample (LPR3-ACCT-Ind003) from Reach 3. Blue crab carcass lead concentrations ranged from 0.39 to 1.3 mg/kg ww, and the highest blue crab carcass lead concentration (1.3 mg/kg ww) was measured in a composite sample (LPR1-CSCT-Comp01) from Reach 1.

[8] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

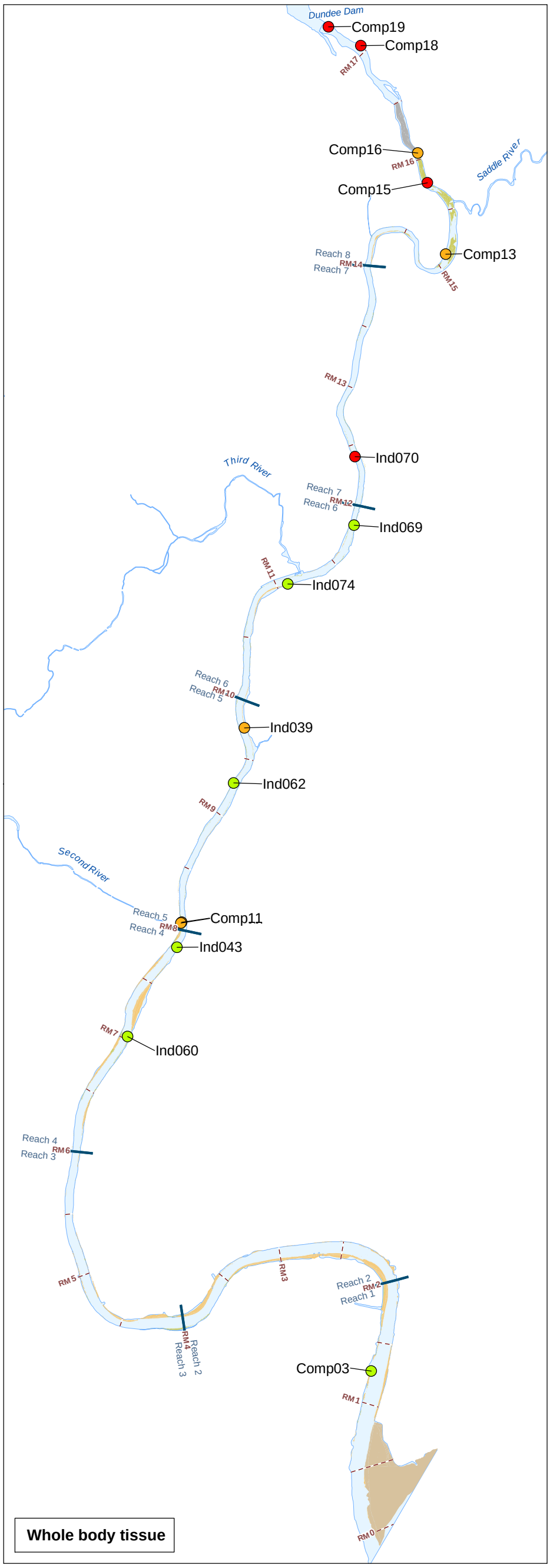
[9] A total of 105 fish fillet samples were analyzed; however, 13 fillet samples had rejected lead results (see Section 5 for more details).

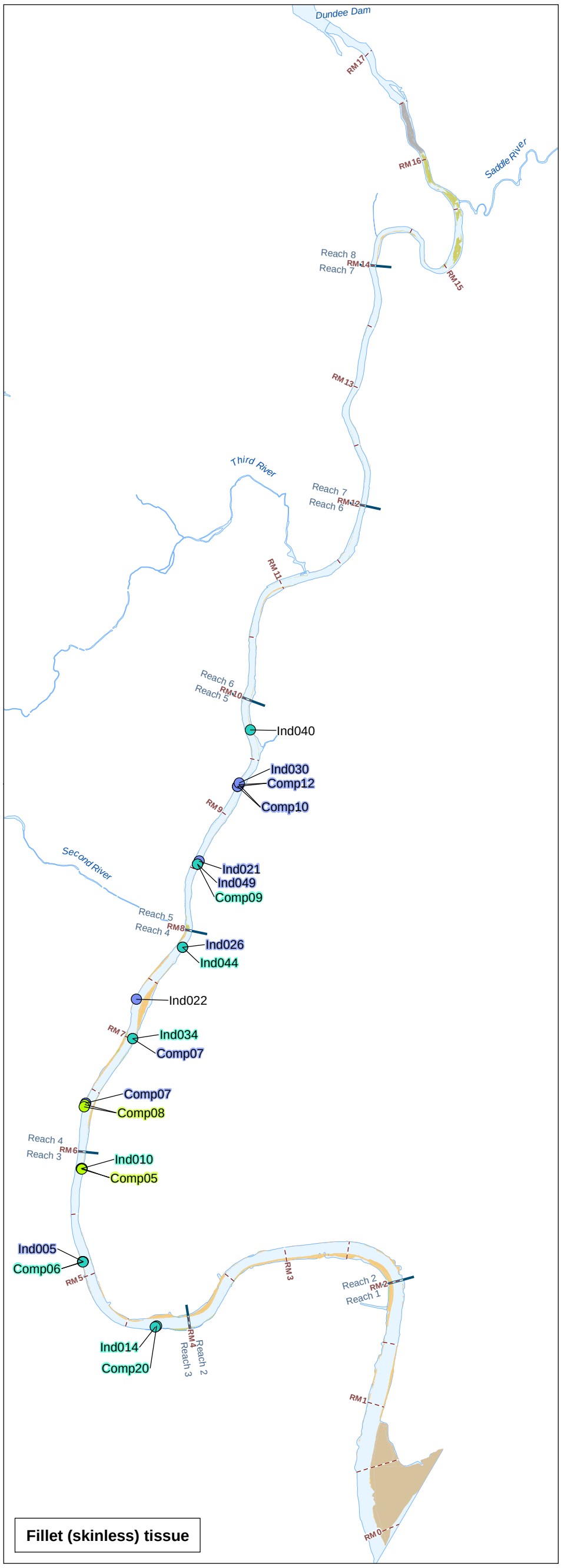


Note: The RL is displayed for non-detected concentrations.

Figure 4-14. Lead concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue lead concentrations by percentile range and reach are shown in Figures 4-15 through 4-17, respectively. The highest American eel lead concentration (1.4 mg/kg ww) was measured in an individual American eel whole-body sample (LPR7-ARWB-Ind070) from Reach 7 (Figure 4-15). The highest white perch lead concentration (0.51 mg/kg ww) was measured in an individual white perch whole-body sample (LPR2-MAWB-Ind158) from Reach 2 (Figure 4-16). The highest blue crab lead concentration (2.5 mg/kg ww) was measured in a muscle/hepatopancreas composite sample (LPR8-CSMH-Comp55) from Reach 8.





- River mile
- Sampling reach boundary
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data
- LPRSA

N

0 0.5 1 Miles

Lead (mg/kg)	(Percentile)
≤ 1.4	(> 90th)
> 0.27 and ≤ 0.97	(> 75th) and ≤ 90th)
> 0.038 and ≤ 0.27	(> 50th) and ≤ 75th)
> 0.026 and ≤ 0.038	(> 25th) and ≤ 50th)
> 0.0070 and ≤ 0.026	(< 25th)

Five whole body and 19 fillet lead samples were rejected.
All accepted samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-15. Lead concentrations in American eel 2009 tissue samples from the LPRSA

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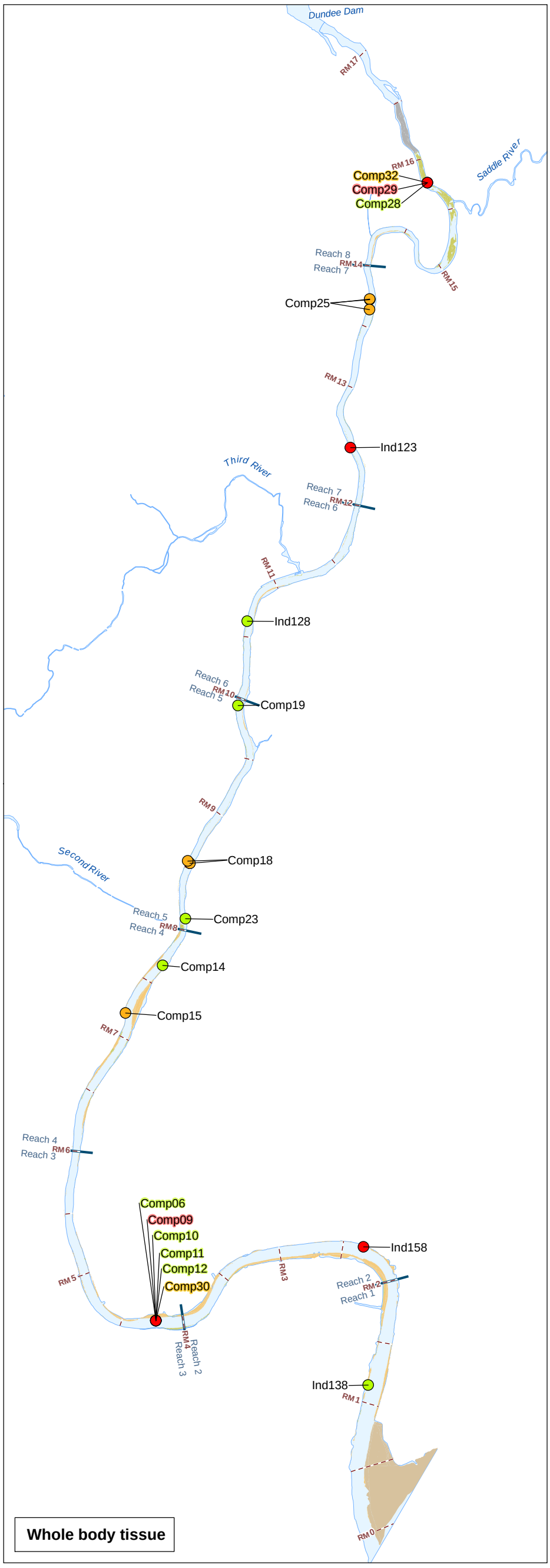

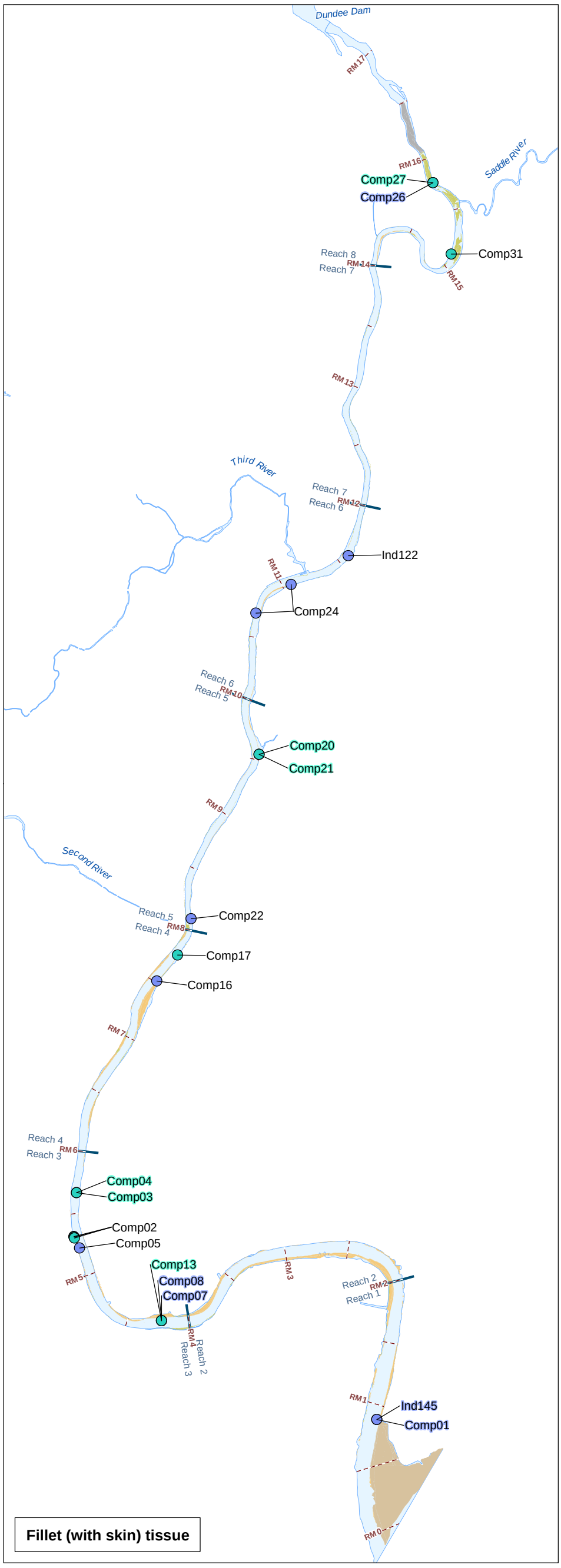

- River mile
- Sampling reach boundary
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data
- LPRSA

N

0 0.5 1 Miles

Lead (mg/kg)	(Percentile)
> 0.45	(> 90th)
> 0.36 and ≤ 0.45	(> 75th and ≤ 90th)
> 0.094 and ≤ 0.36	(> 50th and ≤ 75th50
> 0.0090 and ≤ 0.094	(> 25th and ≤ 50th)
≤ 0.0090	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-16. Lead concentrations in white perch 2009 tissue samples from the LPRSA

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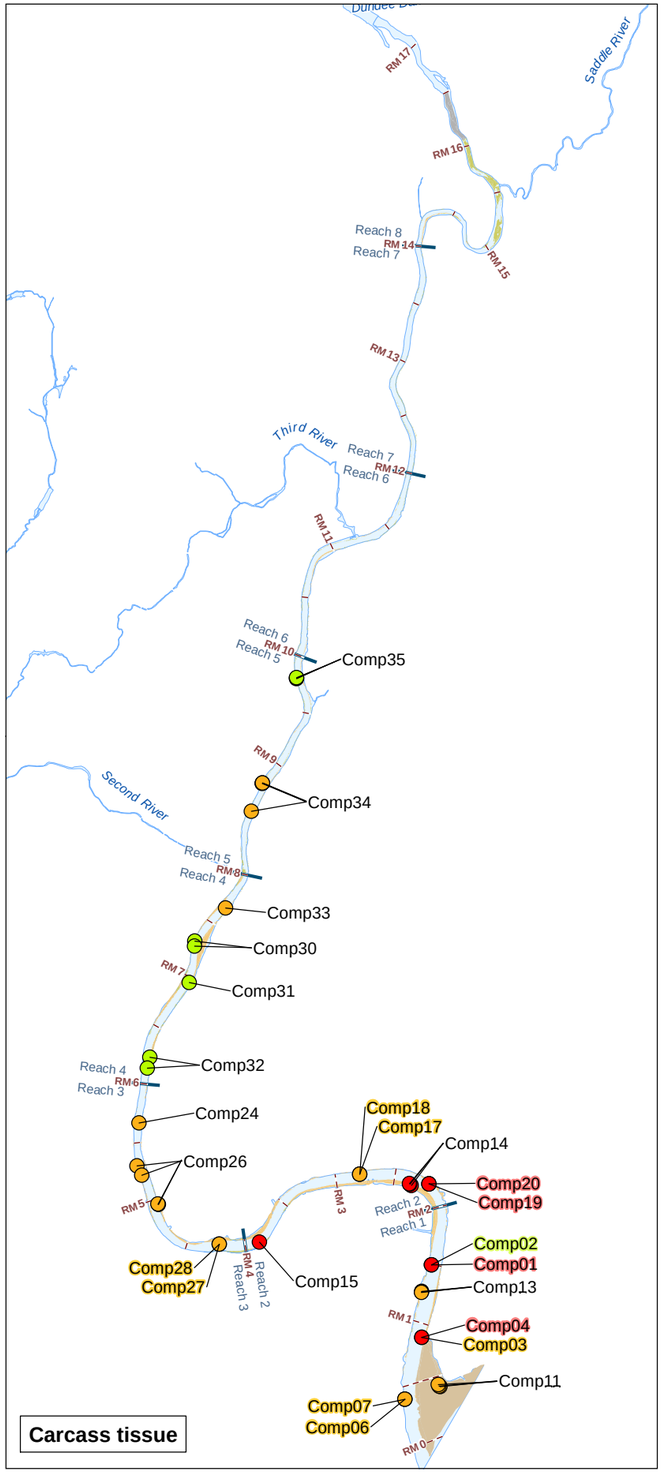
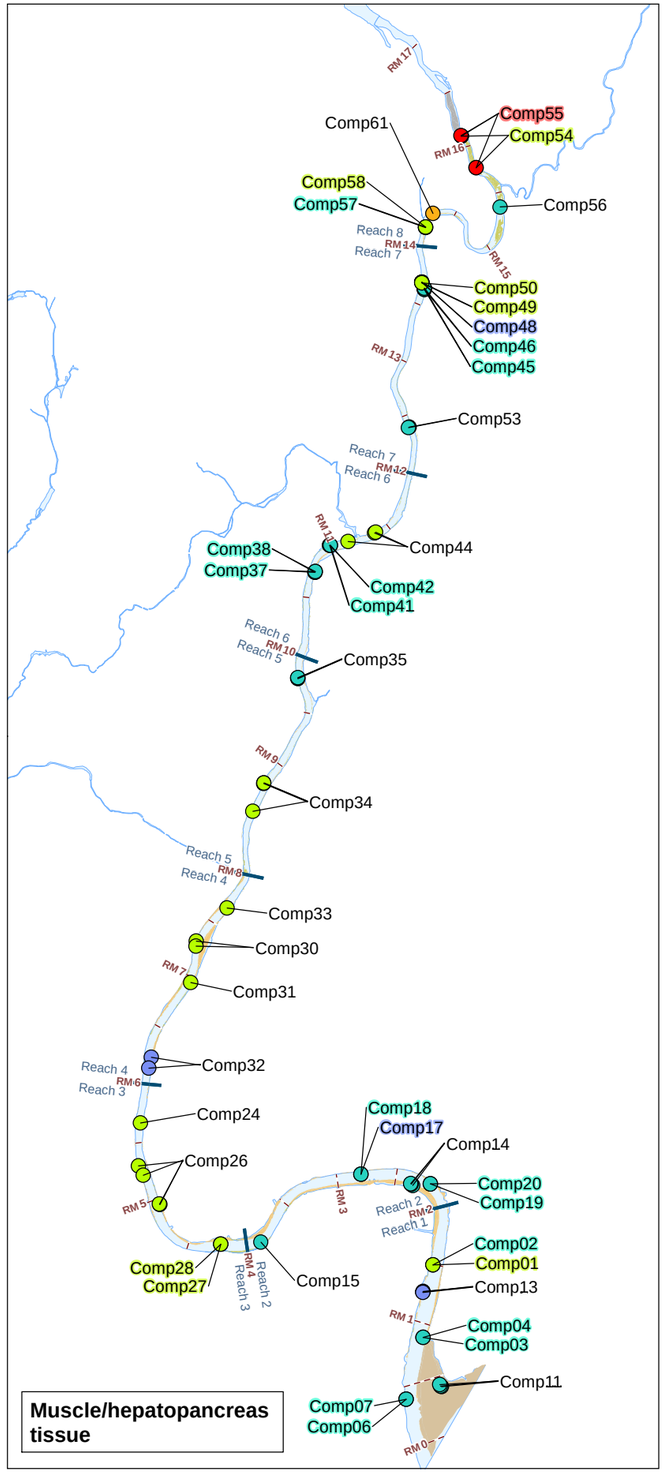
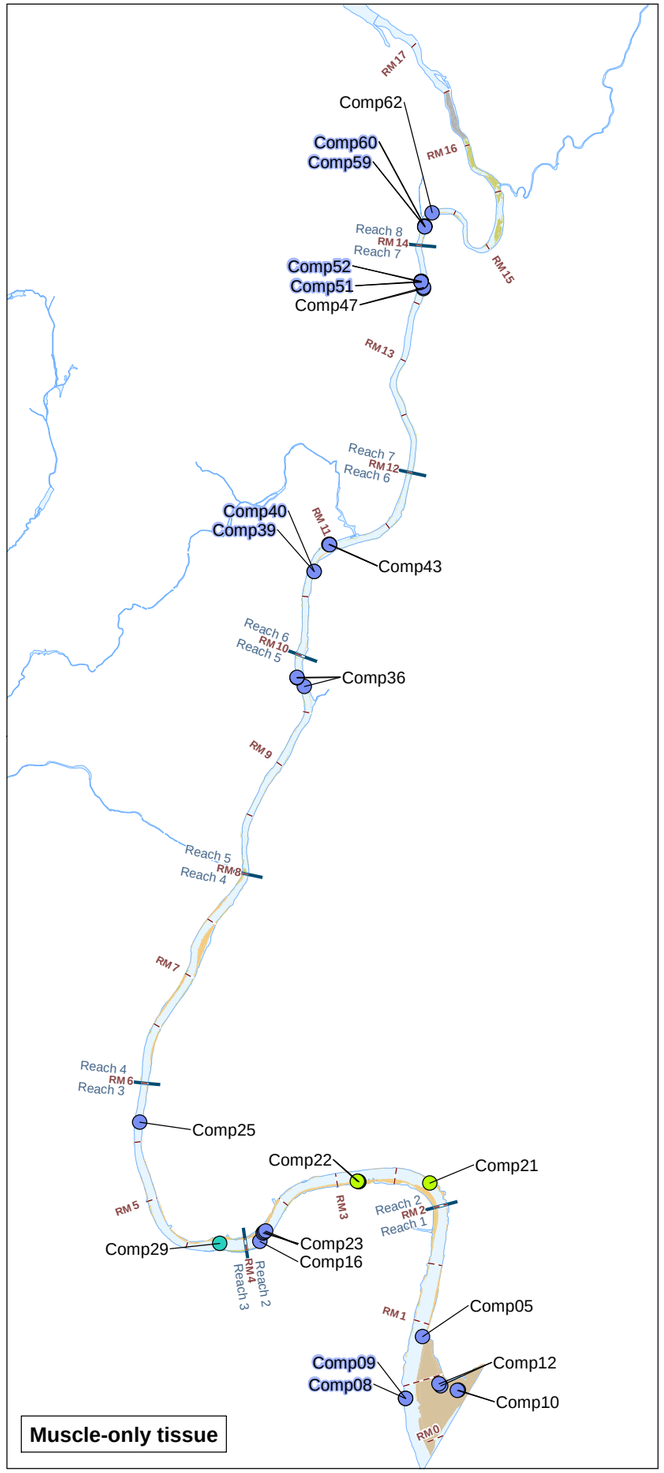
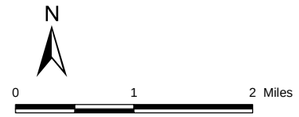






Lead (mg/kg)	(Percentile)
> 0.69	(> 90th)
> 0.45 and ≤ 0.69	(> 75th and ≤ 90th)
> 0.065 and ≤ 0.45	(> 50th and ≤ 75th)
> 0.050 and ≤ 0.065	(> 25th and ≤ 50th)
≤ 0.050	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.



- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-17. Lead concentrations in blue crab 2009 tissue samples from the LPRSA

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4.1.5 Total mercury and methyl mercury

Total mercury and methyl mercury were detected in all fish and blue crab samples analyzed (Table 4-2). Total mercury concentrations ranged from 29 to 990 µg/kg ww, and methyl mercury concentrations ranged from 15 to 1,110 µg/kg ww across all fish and blue crab samples. The highest total mercury concentration (990 µg/kg ww) was measured in an individual white catfish fillet sample (LPR3-ACFT-Ind005) from Reach 3. The highest methyl mercury concentration (1,100 µg/kg ww) was measured in an individual American eel fillet sample (LPR5-ARFT-Ind040) from Reach 5. The distributions of total mercury and methyl mercury concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-18 and 4-19, respectively.[10] The following summarize total and methyl mercury concentrations for fish and blue crab by tissue type, as shown in Figure 4-18 and 4-19:

- **Fish whole body** – Total mercury and methyl mercury were detected in all fish whole-body samples. Fish whole-body total mercury and methyl mercury concentrations ranged from 42 to 390 µg/kg ww and from 39 to 470 µg/kg ww, respectively. The highest fish whole-body total mercury and methyl mercury concentrations (390 and 470 µg/kg ww, respectively) were measured in individual American eel whole-body samples (LPR3-ARWB-Ind009 and LPR3-ARWB-Ind001, respectively) from Reach 3.
- **Fish fillet and blue crab muscle/hepatopancreas** – Total mercury and methyl mercury were detected in all fish fillet and blue crab muscle/hepatopancreas samples. Fish fillet total mercury and methyl mercury concentrations ranged from 41 to 990 µg/kg ww and from 49 to 1,100 µg/kg ww, respectively. The highest fish fillet total mercury concentration (990 µg/kg ww) was measured in an individual white catfish fillet sample (LPR3-ACFT-Ind005) from Reach 3, and the highest fish fillet methyl mercury concentration (1,100 µg/kg ww) was measured in an individual American eel fillet sample (LPR5-ARFT-Ind040) from Reach 5. Blue crab muscle/hepatopancreas total mercury and methyl mercury concentrations ranged from 69 to 250 µg/kg ww and from 66 to 230 µg/kg ww, respectively. The highest blue crab muscle/hepatopancreas total mercury concentration (250 µg/kg ww) was measured in a composite sample (LPR2-CSMH-Comp19) from Reach 2, and the highest blue crab muscle/hepatopancreas methyl mercury concentration (230 µg/kg ww) was measured in a composite sample (LPR1-CSMH-Comp03) from Reach 1.

[10] Log scale was used on the y-axis of the figures to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figures resulted in clustering of the data, making it more difficult to see the distribution of the data.

- **Fish and blue crab carcass** – Total mercury and methyl mercury were detected in all fish and blue crab carcass samples. Fish carcass total mercury and methyl mercury concentrations ranged from 29 to 570 µg/kg ww and from 22 to 460 µg/kg ww, respectively. The highest fish carcass total mercury concentration (570 µg/kg ww) was measured in an individual largemouth bass sample (LPR8-MSCT-Ind002) from Reach 8, and the highest fish carcass methyl mercury concentration (460 µg/kg ww) was measured in an individual white catfish carcass sample (LPR3-ACCT-Ind005) from Reach 3. Blue crab total mercury and methyl mercury concentration ranged from 46 to 110 µg/kg ww and from 31 to 86 µg/kg ww, respectively. The highest blue crab carcass total mercury concentrations (110 µg/kg ww) were measured in two composite samples (LPR2-CSCT-Comp15 and LPR2-CSCT-Comp19) from Reach 2, and the highest blue crab carcass methyl mercury concentration (86 µg/kg ww) was measured in a composite sample (LPR1-CSCT-Comp03) from Reach 1.

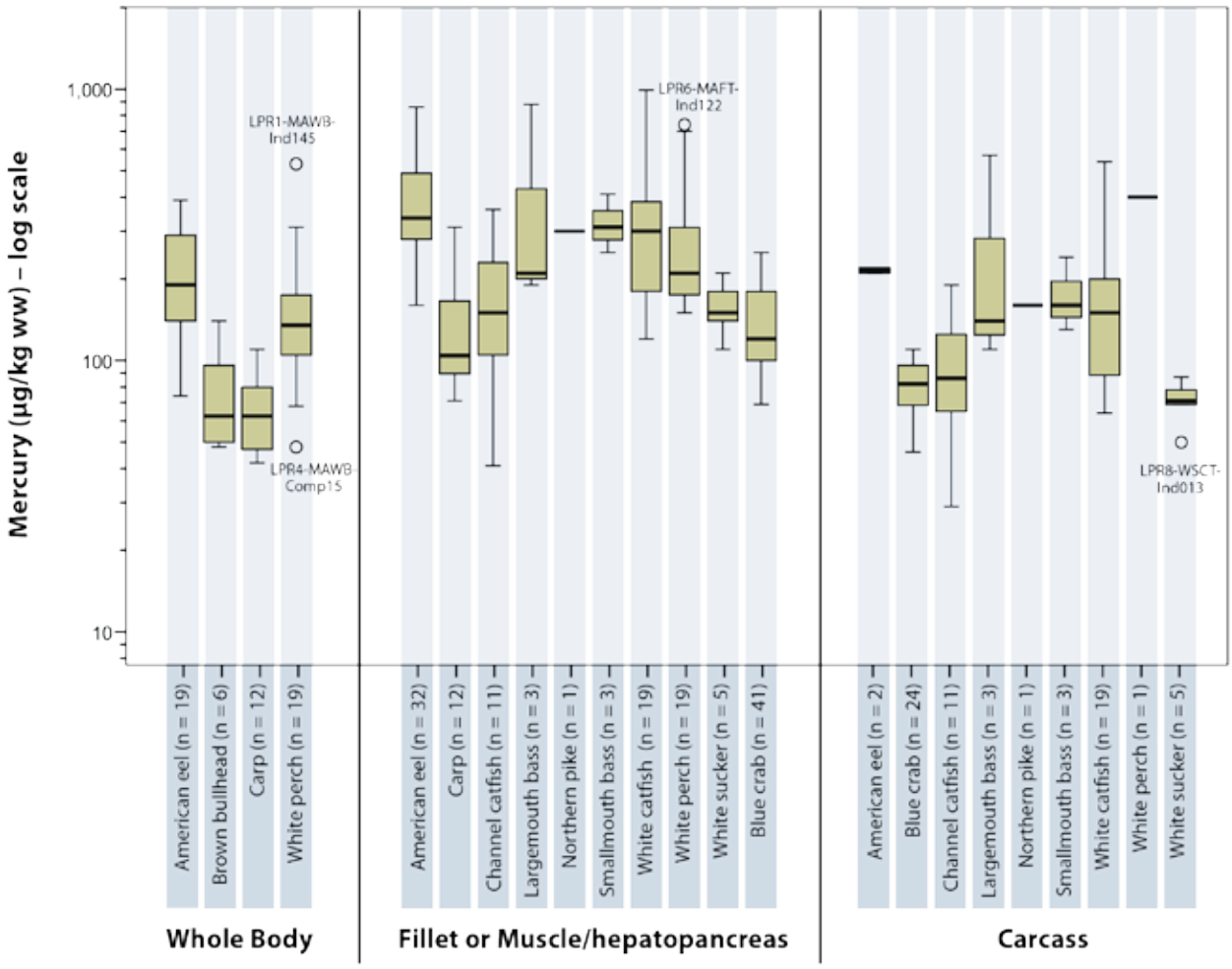


Figure 4-18. Total mercury concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

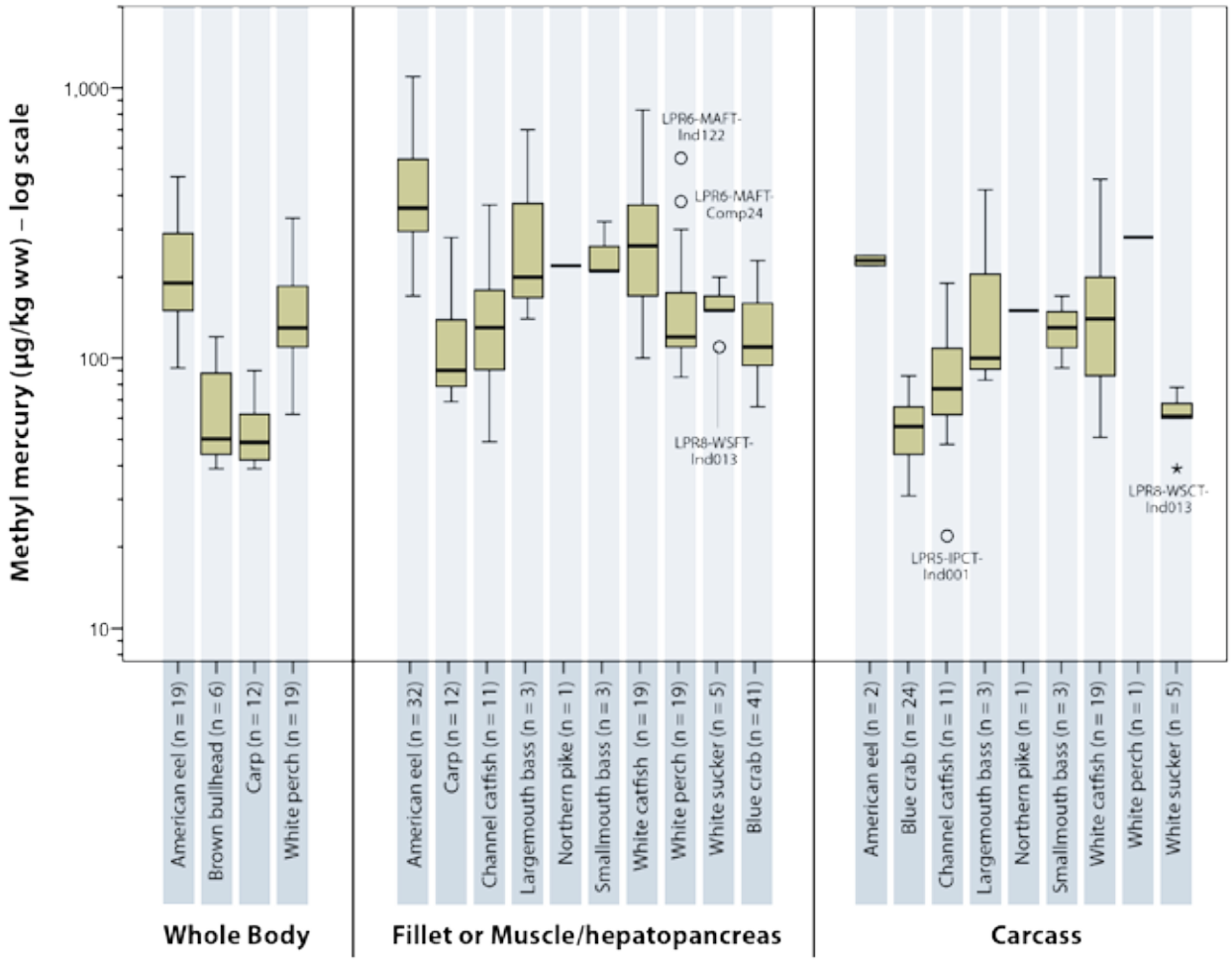
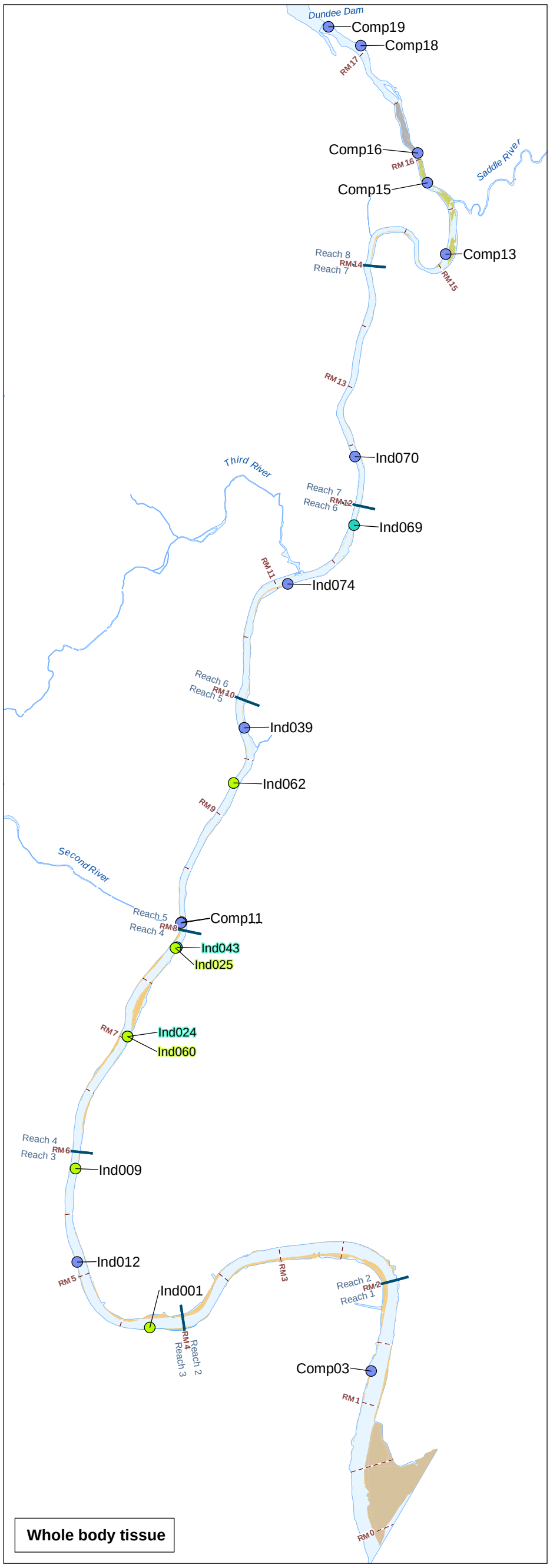
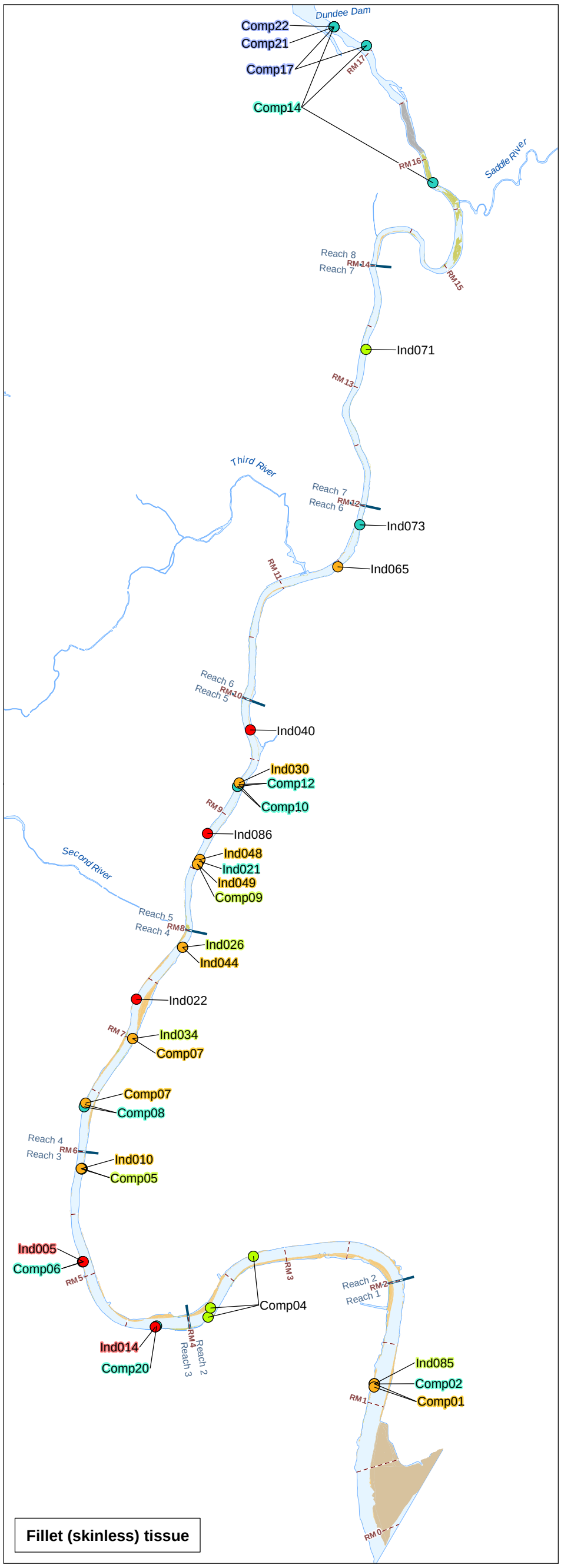


Figure 4-19. Methyl mercury concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue concentrations for total mercury by percentile range are shown in Figures 4-20 through 4-22. The highest American eel total mercury concentration (860 µg/kg ww) was measured in an individual fillet sample (LPR5-ARFT-Ind040) from Reach 5 (Figure 4-20). The highest white perch total mercury concentration (740 µg/kg ww) was measured in an individual fillet sample (LPR6-MAFT-Ind122) from Reach 6 (Figure 4-21). The highest blue crab total mercury concentration (320 µg/kg ww) was measured in a muscle-only composite sample (LPR1-CSMT-Comp10) from Reach 1 (Figure 4-22).

Tissue concentrations for methyl mercury in American eel, white perch, and blue crab are shown by percentile range and reach in Figures 4-23 through 4-25, respectively. The highest American eel methyl mercury concentration (1,100 µg/kg ww) was measured in an individual fillet sample (LPR5-ARFT-Ind040) from Reach 5 (Figure 4-23). The highest white perch methyl mercury concentration (550 µg/kg ww) was measured in an individual fillet sample (LPR6-MAFT-Ind122) from Reach 6 (Figure 4-24). The highest blue crab methyl mercury concentration (270 µg/kg ww) was measured in a muscle-only composite sample (LPR1-CSMT-Comp10) from Reach 1 (Figure 4-25).





- River mile
- Sampling reach boundary
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data
- LPRSA

N

0 0.5 1 Miles

Total mercury (µg/kg)	(Percentile)
> 530	(≤ 90th)
> 420 and ≤ 530	(> 75th and ≤ 90th)
> 300 and ≤ 420	(> 50th and ≤ 75th)
> 190 and ≤ 300	(> 25th and ≤ 50th)
≤ 190	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-20. Total mercury concentrations in American eel 2009 tissue samples from the LPRSA

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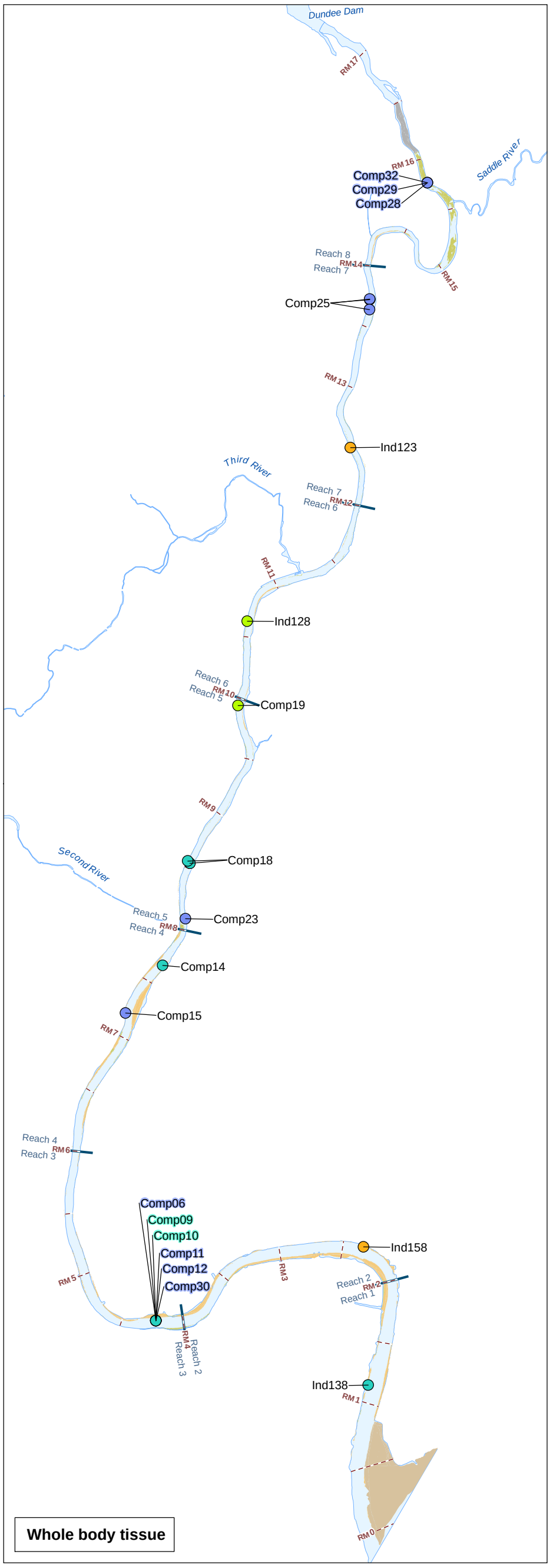

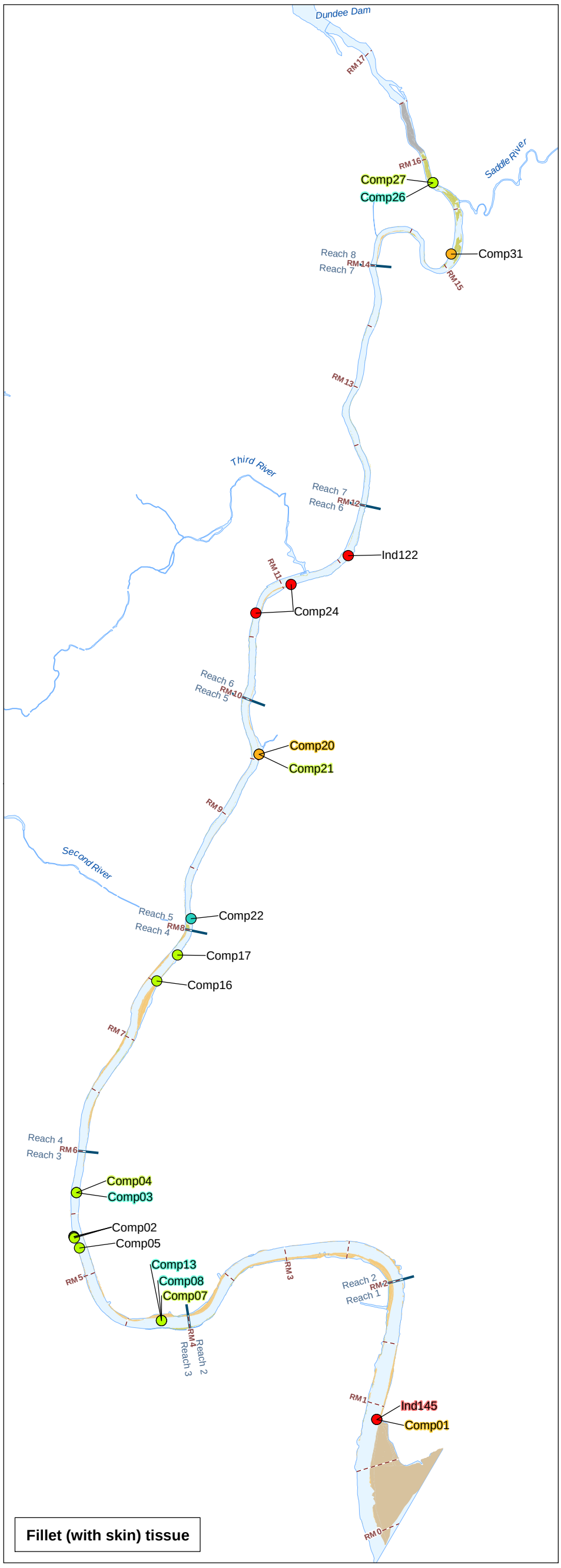

River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Mercury (µg/kg)	(Percentile)
> 320	(≤ 90th)
> 260 and ≤ 320	(> 75th and ≤ 90th)
> 170 and ≤ 260	(> 50th and ≤ 75th)
> 130 and ≤ 170	(> 25th and ≤ 50th)
≤ 130	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-21. Total mercury concentrations in white perch 2009 tissue samples from the LPRSA

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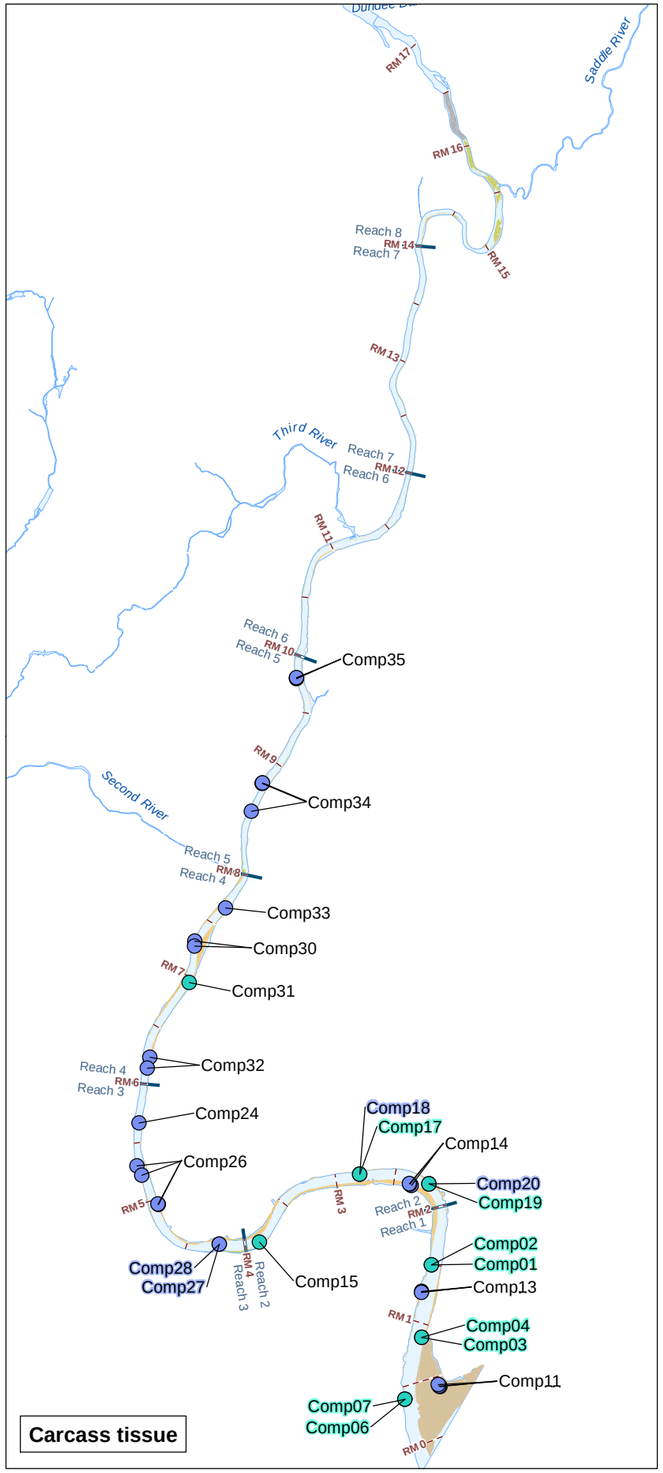

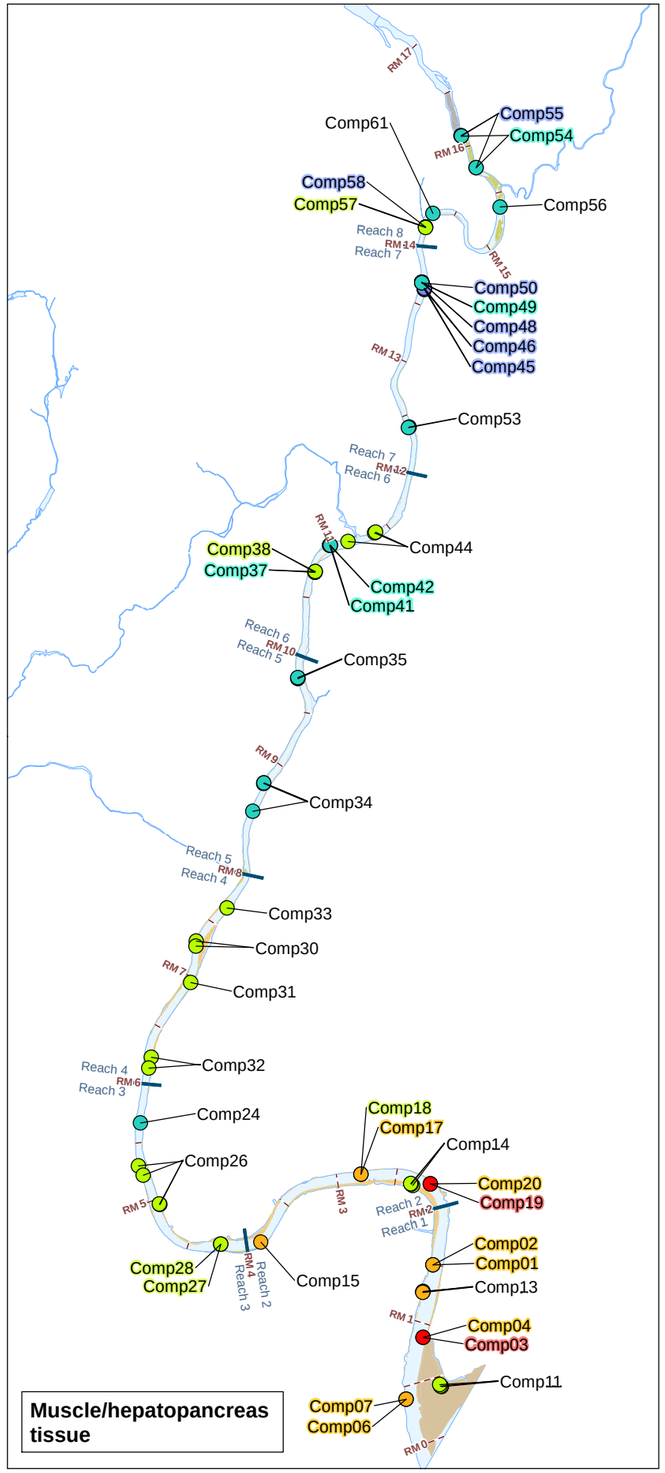

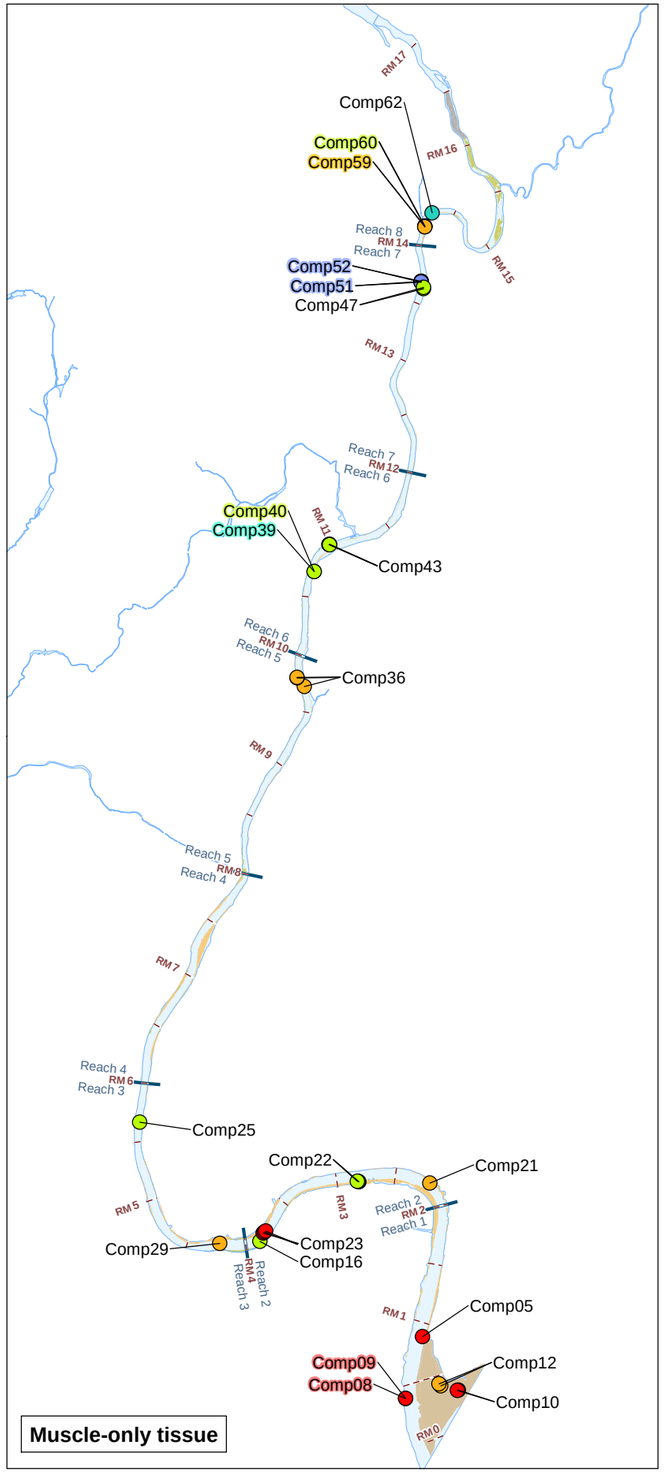

Total mercury (µg/kg)	(Percentile)
> 230	(> 90th)
> 170 and ≤ 230	(> 75th and ≤ 90th)
> 110 and ≤ 170	(> 50th and ≤ 75th)
> 86 and ≤ 110	(> 25th and ≤ 50th)
≤ 86	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

N

0 1 2 Miles

- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-22. Total mercury concentrations in blue crab 2009 tissue samples from the LPRSA

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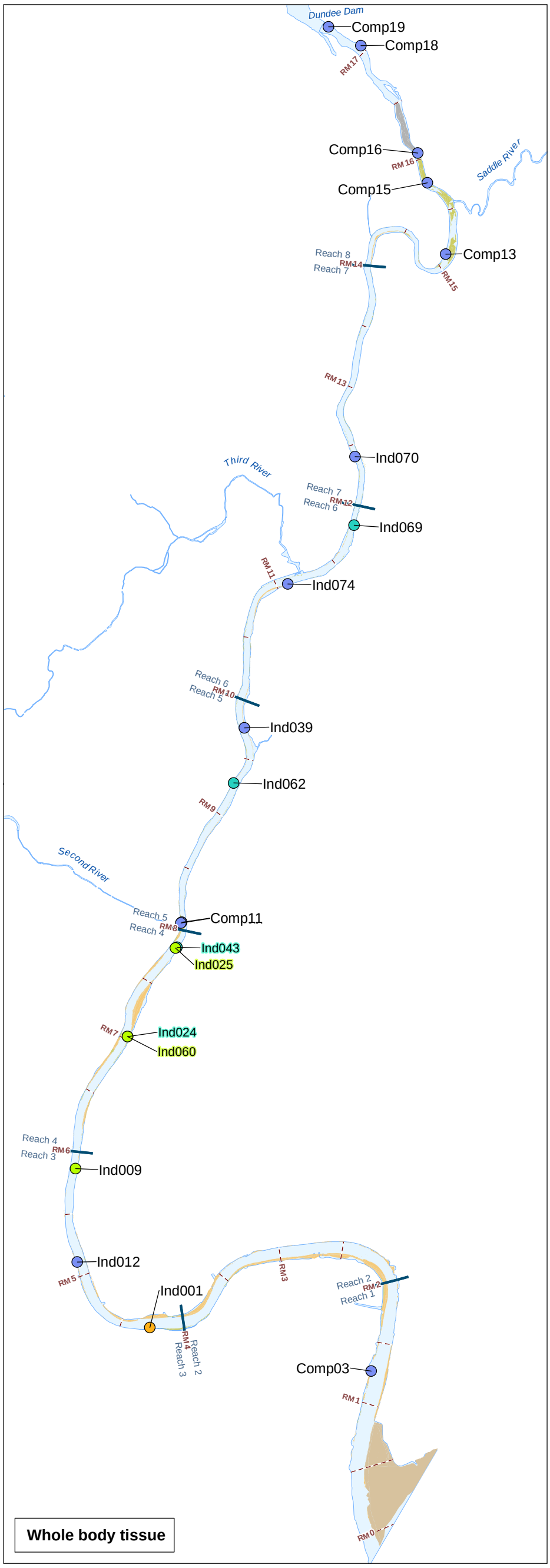

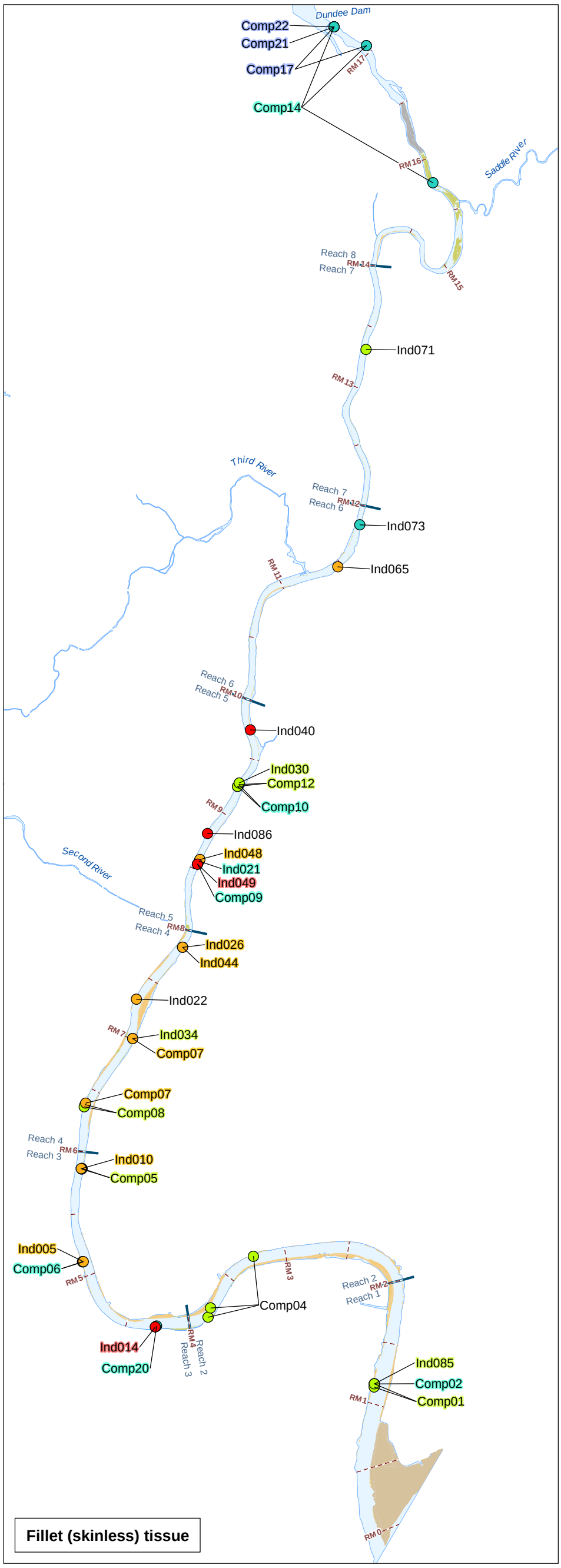

River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Methyl mercury	(Percentile)
> 610	(> 90th)
> 460 and ≤ 610	(> 75th and ≤ 90th)
> 330 and ≤ 460	(> 50th and ≤ 75th)
> 190 and ≤ 330	(> 25th and ≤ 50th)
≤ 190	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-23. Methyl mercury concentrations in American eel 2009 tissue samples from the LPRSA

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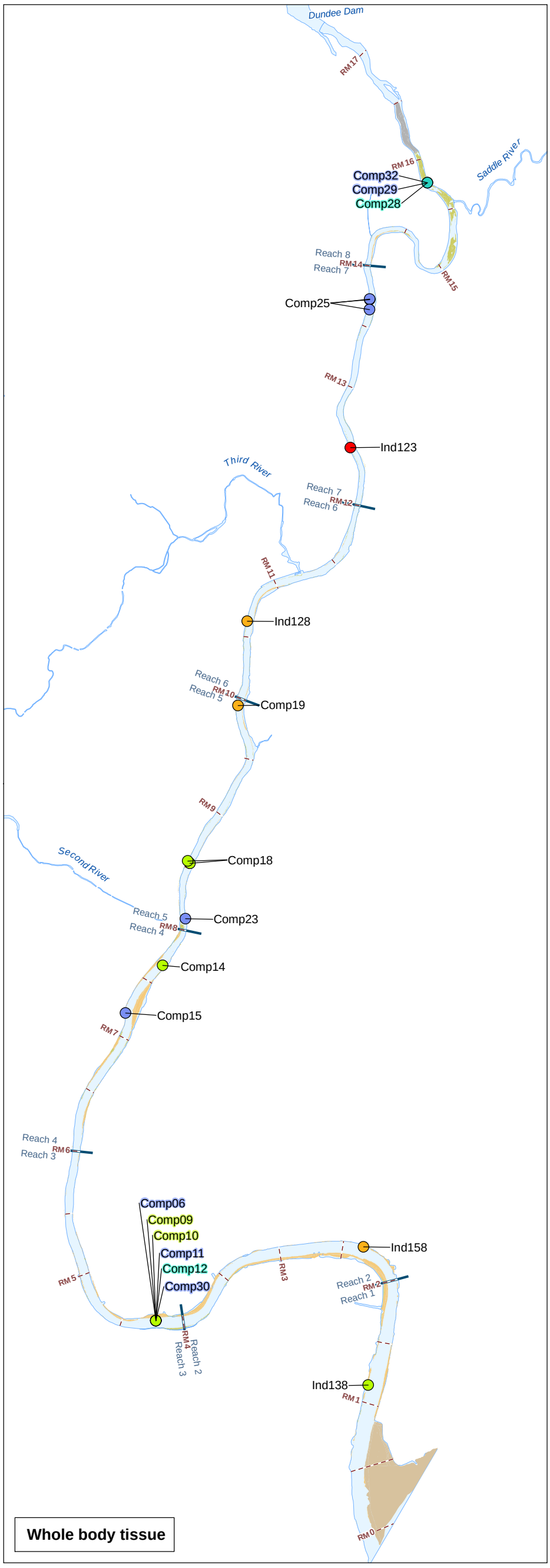

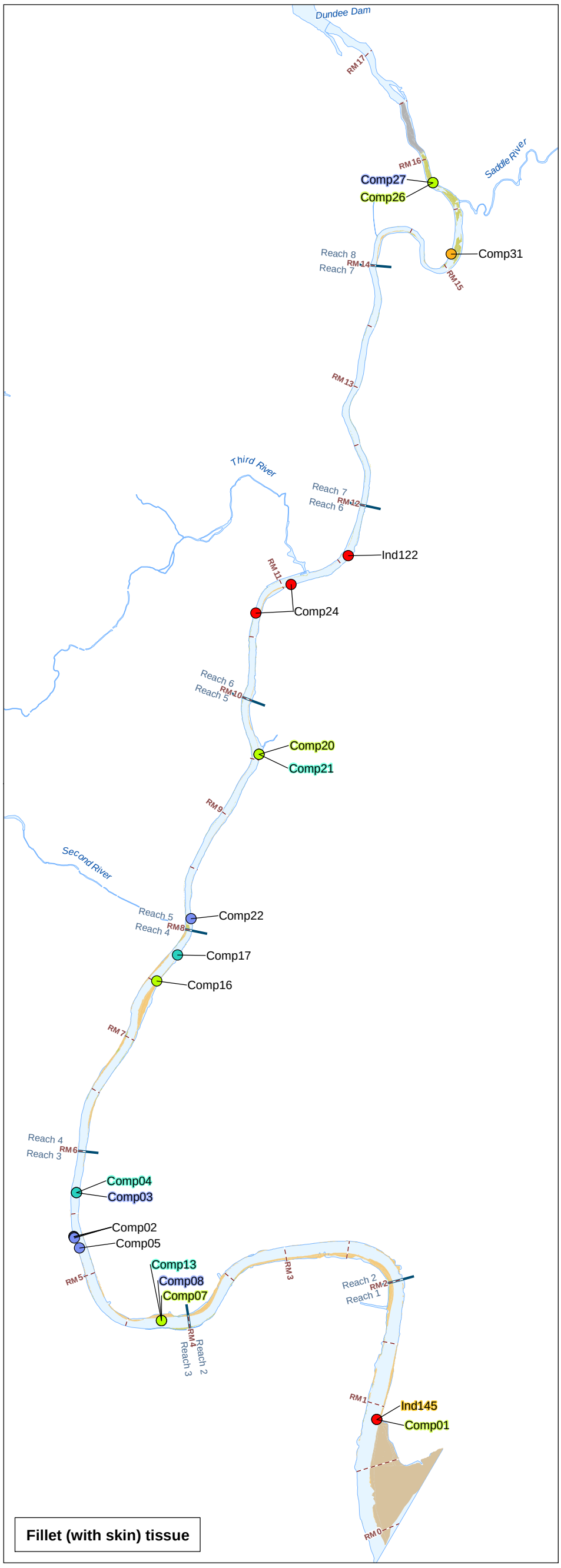

River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Methyl mercury (µg/kg)	(Percentile)
> 280	(> 90th)
> 180 and ≤ 280	(> 75th and ≤ 90th)
> 120 and ≤ 180	(> 50th and ≤ 75th)
> 110 and ≤ 120	(> 25th and ≤ 50th)
≤ 110	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-24. Methyl mercury concentrations in white perch 2009 tissue samples from the LPRSA

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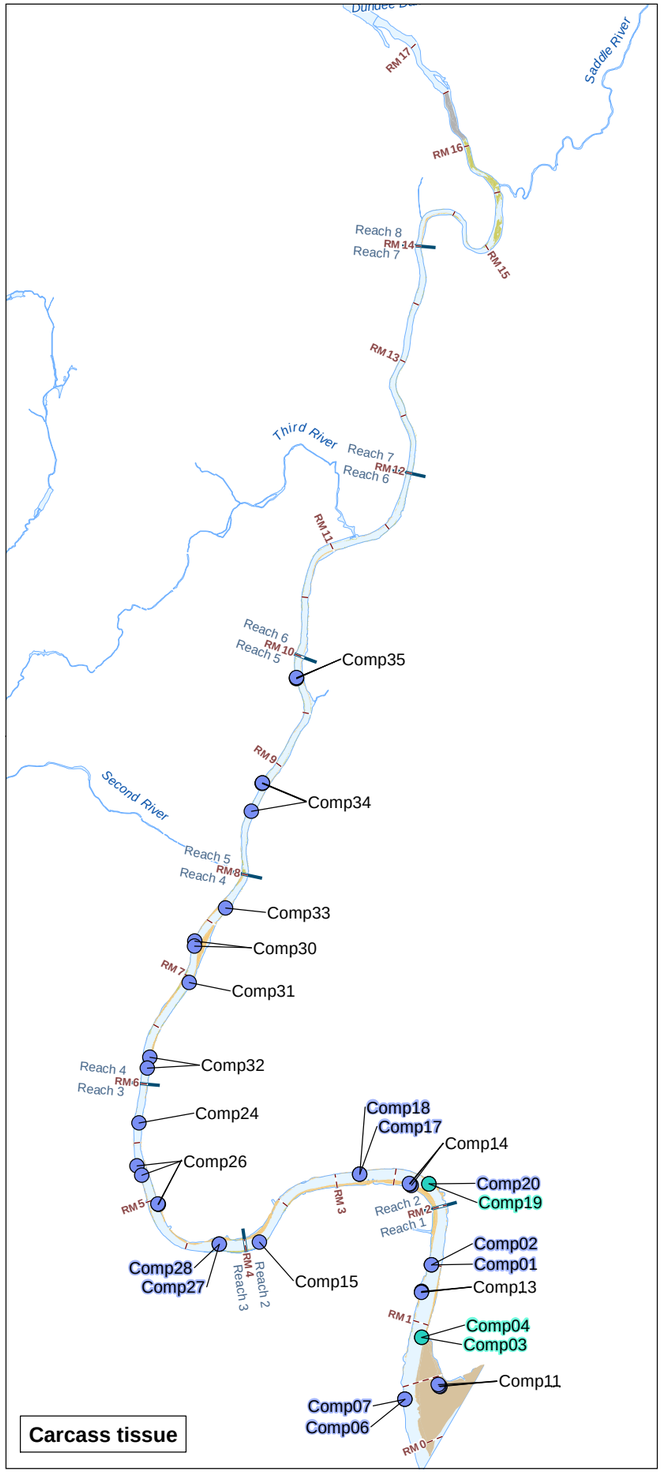
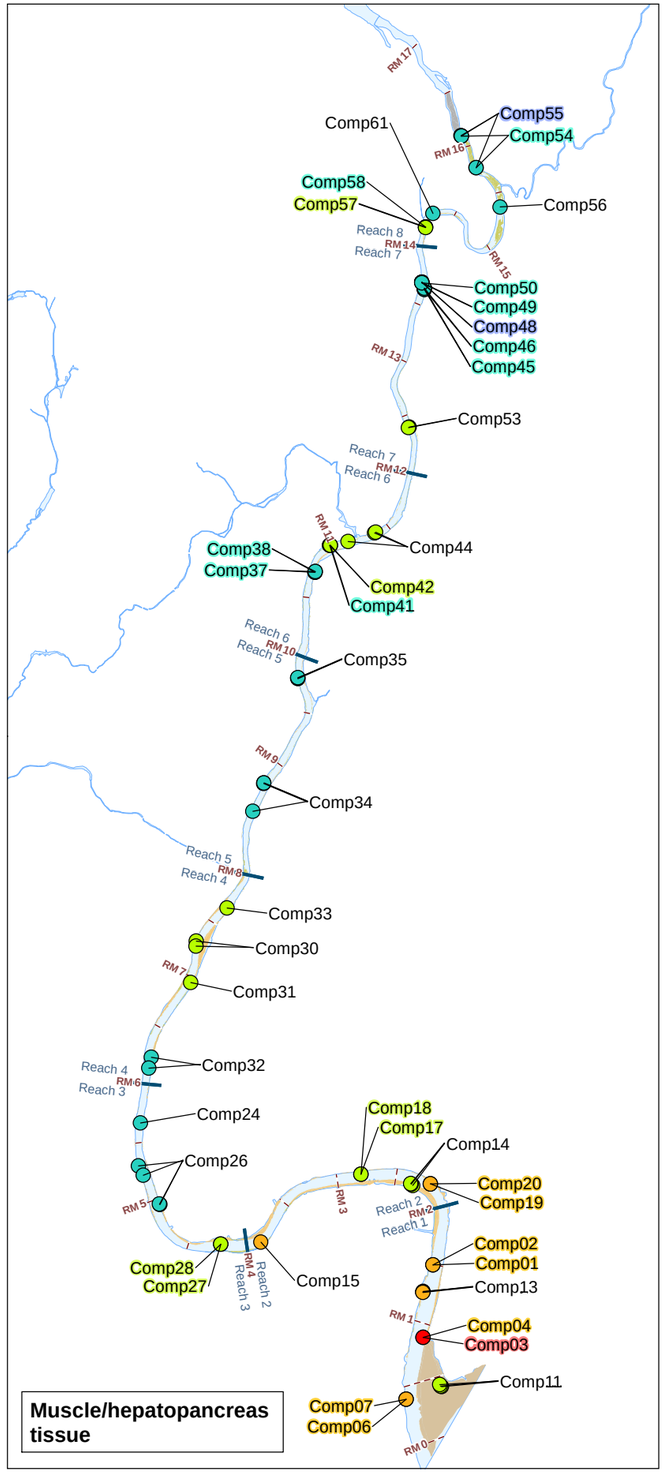
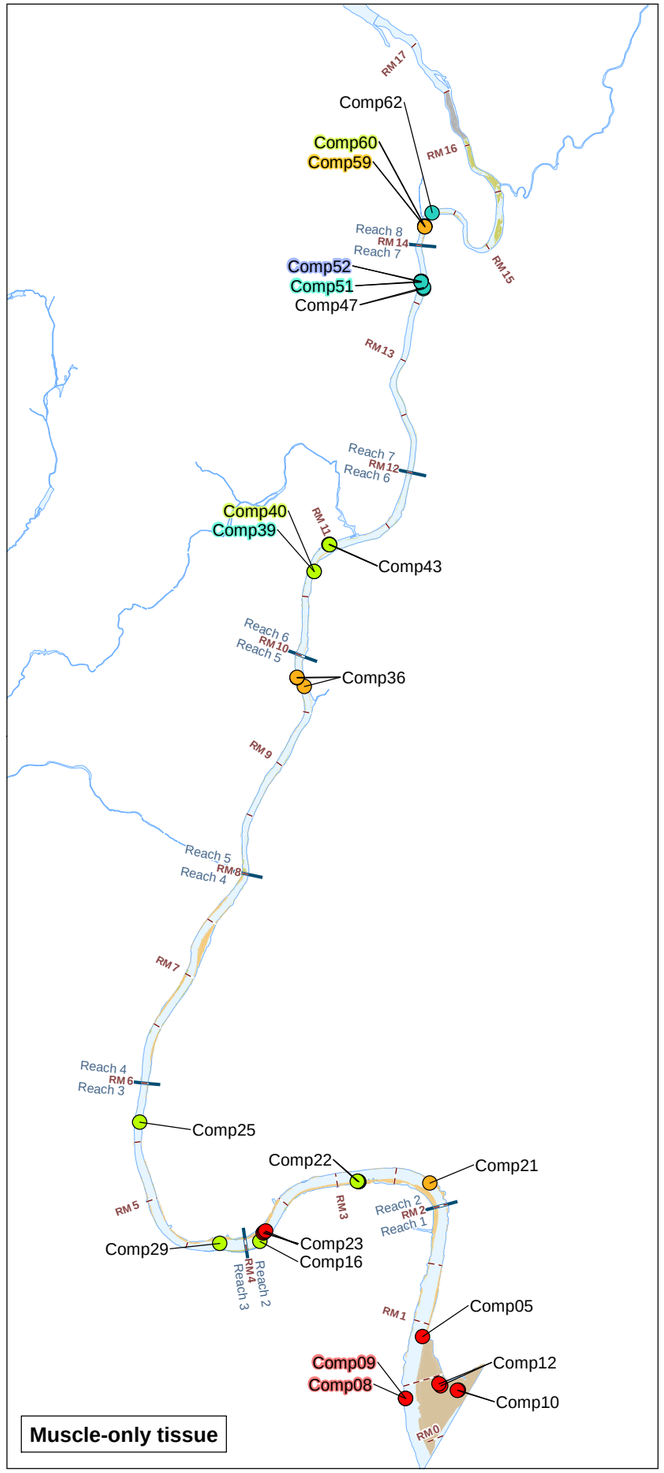
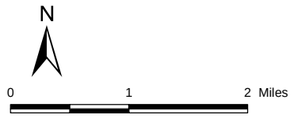






Methyl mercury	(Percentile)
≤ 270	(> 90th)
> 160 and ≤ 210	(> 75th and ≤ 90th)
> 100 and ≤ 160	(> 50th and ≤ 75th)
> 69 and ≤ 100	(> 25th and ≤ 50th)
≤ 69	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.



- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-25. Methyl mercury concentrations in blue crab 2009 tissue samples from the LPRSA

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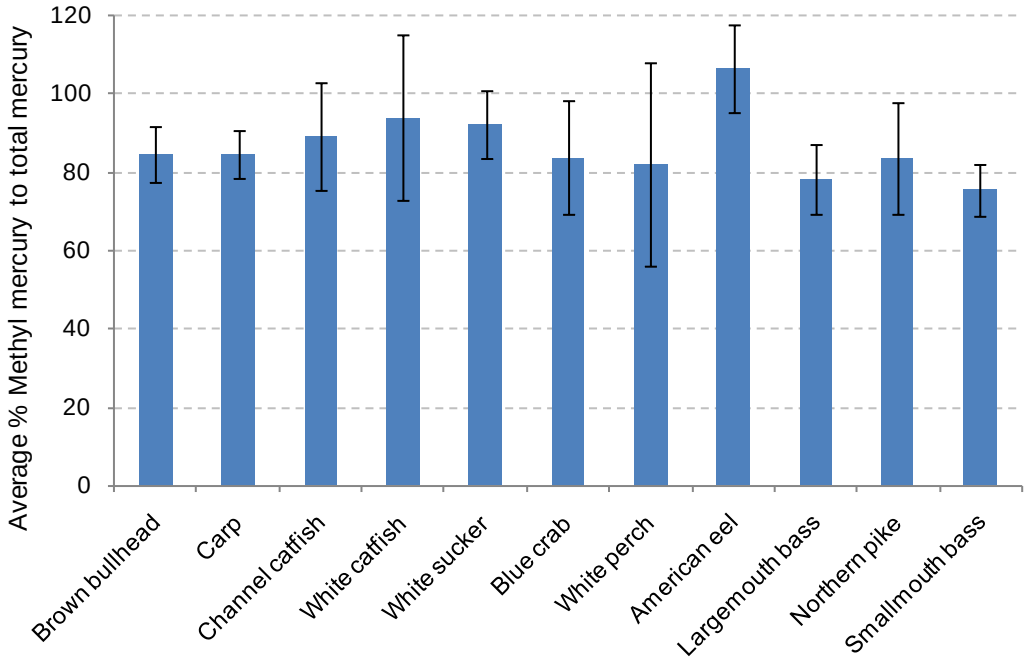
The average percentage of total mercury represented by methyl mercury is presented, by species, in Figure 4-26.[11]



Note: Error bars represent ± one standard deviation from the mean.

Figure 4-26. Average proportion of methyl mercury relative to total mercury for fish and blue crab tissue samples from the LPRSA

4.2 BUTYLTINS

Table 4-3 presents a summary of the four butyltins analyzed, by tissue type, including the number of detections, range of detected concentrations, and RL or range of RLs for samples reported as non-detects. Tributyltin was the most frequently detected butyltin with detection frequencies across species and sample types ranging from 57 to 100%. Data tables that contain butyltin concentrations for each sample, including non-detected sample results, are presented in Appendix F.

[11] For American eel, the average proportion of methyl mercury relative to total mercury was greater than 100% because of analytical variability between the methyl mercury and total mercury analysis.

Table 4-3. Summary of detected butyltin results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Monobutyltin (µg/kg ww)								
Brown bullhead	whole body	1/6	17	0.53 J	0.53 J	na	na	0.97 – 20
Carp	fillet (with skin)	1/12	8	0.33 J	0.33 J	na	na	0.93 – 20
	whole body	2/12	17	0.36 J	1.3 J	0.83	0.66	0.95 – 25
White catfish	carcass	7/19	37	0.23 NJ	0.62 J	0.37	0.13	0.92 – 1
	fillet (skinless)	8/19	42	0.25 J	13 J	3.4	4.7	0.97 – 1
Blue crab	carcass	19/24	79	0.30 J	1.6 J	0.85	0.33	0.95 – 1
	hepatopancreas only	2/7	29	1.4 J	1.7 J	1.6	0.21	4.9 – 5
	muscle only	1/21	5	0.42 J	0.42 J	na	na	0.93 – 1
	muscle/hepatopancreas	11/41	27	0.20 J	1.4 J	0.58	0.32	0.92 – 1
White perch	carcass	1/1	100	0.3 J	0.3 J	na	na	na
	fillet (with skin)	3/19	16	0.22 J	0.65 J	0.41	0.22	0.98 – 2
American eel	carcass	1/2	50	0.28 J	0.28 J	na	na	0.97
	fillet (skinless)	1/32	3	0.28 J	0.28 J	na	na	0.98 – 2
	whole body	8/19	42	0.19 J	0.52 J	0.32	0.11	0.99 – 2
Smallmouth bass	carcass	3/3	100	0.57 J	1.1 J	0.88	0.28	na
Dibutyltin (µg/kg ww)								
Brown bullhead	whole body	3/6	50	0.12 J	1.5 J	0.62	0.77	0.97 – 20
Carp	fillet (with skin)	1/12	8	0.22 J	0.22 J	na	na	0.93 – 20
	whole body	3/12	25	0.48 J	0.62 J	0.57	0.078	0.95 – 25
Channel catfish	carcass	2/11	18	0.12 J	0.26 J	0.19	0.099	0.94 – 2
	fillet (skinless)	2/11	18	0.18 J	0.43 J	0.31	0.18	0.96 – 1
White catfish	carcass	19/19	100	0.17 J	1.6 J	0.51	0.36	na
	fillet (skinless)	14/19	74	0.12 J	7.2 J	1.5	2.4	0.97 – 0.99
White sucker	carcass	5/5	100	0.24 J	0.57 J	0.36	0.12	na
	fillet (with skin)	1/5	20	0.12 J	0.12 J	na	na	0.99 – 1
Blue crab	carcass	24/24	100	0.19 J	3.8	0.89	0.77	na
	hepatopancreas only	5/7	71	2.7 J	5.5	4.2	1.2	4.9 – 5
	muscle only	10/21	48	0.13 J	0.83 J	0.47	0.22	0.95 – 1
	muscle/hepatopancreas	32/41	78	0.15 J	3.6 J	0.78	0.66	0.96 – 1
White perch	carcass	1/1	100	0.33 J	0.33 J	na	na	na
	fillet (with skin)	4/19	21	0.12 J	0.27 J	0.17	0.069	0.98 – 2
	whole body	12/19	63	0.12 J	0.68 J	0.37	0.19	0.96 – 2.4

Table 4-3. Summary of detected butyltin results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Dibutyltin (µg/kg ww) (cont.)								
American eel	carcass	2/2	100	0.25 J	0.33 J	0.29	0.057	na
	whole body	5/19	26	0.13 J	0.79 J	0.36	0.25	0.99 – 2
Largemouth bass	carcass	2/3	67	0.45 J	0.59 J	0.52	0.099	0.99
	fillet (with skin)	2/3	67	0.15 J	0.19 J	0.17	0.028	0.99
Northern pike	carcass	1/1	100	0.77 J	0.77 J	na	na	na
	fillet (with skin)	1/1	100	0.25 J	0.25 J	na	na	na
Smallmouth bass	carcass	2/3	67	0.25 J	0.39 J	0.32	0.099	1
	fillet (with skin)	2/3	67	0.25 J	0.25 J	na	na	1
Tributyltin (µg/kg ww)								
Brown bullhead	whole body	5/6	83	0.54 J	2.7 J	1.4	0.79	20
Carp	fillet (with skin)	10/12	83	0.29 NJ	1.9 J	1.2	0.62	0.97 – 20
	whole body	9/12	75	0.81 J	3.1	2.0	0.78	20 – 25
Channel catfish	carcass	8/11	73	0.34 J	0.89 J	0.59	0.19	0.95 – 2
	fillet (skinless)	11/11	100	0.14 NJ	1.8 J	0.84	0.52	na
White catfish	carcass	19/19	100	0.39 J	2.7	1.5	0.76	na
	fillet (skinless)	16/19	84	0.27 J	10 J	1.5	2.3	0.97 – 0.98
White sucker	carcass	5/5	100	1.1 J	2.7	1.9	0.78	na
	fillet (with skin)	5/5	100	0.32 J	2.4 J	1.3	0.84	na
Blue crab	carcass	23/24	96	0.32 J	2.7	1.6	0.85	0.95
	hepatopancreas only	5/7	71	3.5 J	8.2	6.0	2.0	4.9 – 5
	muscle only	12/21	57	0.17 J	1.8 J	0.91	0.60	0.96 – 1
	muscle/hepatopancreas	30/41	73	0.23 J	5.1	1.5	1.3	0.96 – 1
White perch	carcass	1/1	100	5.9 J	5.9 J	na	na	na
	fillet (with skin)	19/19	100	0.36 J	2.7 J	1.4	0.65	na
	whole body	19/19	100	0.80 J	16 J	6.8	4.9	na
American eel	carcass	2/2	100	1.7	2.2	2.0	0.35	na
	fillet (skinless)	19/32	59	0.14 J	1.6	0.63	0.36	0.98 – 2
	whole body	15/19	79	0.23 J	4.5 J	1.1	1.1	0.99 – 2
Largemouth bass	carcass	2/3	67	1.3 J	3.1 J	2.2	1.3	0.99
	fillet (with skin)	2/3	67	0.56 J	0.75 J	0.66	0.13	0.99
Northern pike	carcass	1/1	100	1.3	1.3	na	na	na
	fillet (with skin)	1/1	100	1.5	1.5	na	na	na

Table 4-3. Summary of detected butyltin results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Tributyltin (µg/kg ww)								
Smallmouth bass	carcass	2/3	67	1.7 J	1.7 J	1.7	na	0.99
	fillet (with skin)	3/3	100	0.19 J	0.61 J	0.42	0.21	na
Tetrabutyltin (µg/kg ww)								
Carp	fillet (with skin)	1/12	8	0.73 J	0.73 J	na	na	0.93 – 20
	whole body	2/12	17	0.39 J	0.48 J	0.44	0.064	0.95 – 25
White catfish	fillet (skinless)	2/19	11	0.92 J	1.4	1.2	0.34	0.97 – 1

[a] Only those analytes with detected results are presented. If the analyte was not detected in any samples for a given species and tissue type, the analyte is not presented in the table. Data tables that contain results for each sample, including non-detected sample results, are presented in Appendix F.

[b] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviation) include data only for detected results. Non-detected data are not included in summary statistics.

[c] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

J – estimated concentration
Max – maximum
Min – minimum
N – tentative identification
na – not applicable
RL – reporting limit
St Dev – standard deviation
ww – wet weight

4.3 PAHs

The detection frequency for PAH compounds ranged from 0 to 100%. Table 4-4 presents a summary of the PAH results for the PAHs detected in each tissue type, including the number of detections, the range of detected concentrations, and the RL or range of RLs for samples reported as non-detects. Data tables that contain PAH concentrations for each sample, including non-detected sample results, are presented in Appendix F. Results for low-molecular-weight PAHs (LPAHs) and high-molecular-weight PAHs (HPAHs) are discussed further in the subsections that follow Table 4-4.

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
1-Methylnaphthalene (µg/kg ww)								
Brown bullhead	whole body	5/6	83	11 J	14 J	13	1.1	16
Carp	fillet (with skin)	10/12	83	11 J	47 J	21	11	13 – 15
	whole body	10/12	83	10 J	37 J	21	8.4	14 – 16

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
1-Methylnaphthalene (µg/kg ww) (cont.)								
Channel catfish	carcass	10/11	83	11 J	20 J	15	2.7	6.7
	fillet (skinless)	5/11	46	3.7 J	7.8 J	5.5	1.8	2.3 – 6.3
White catfish	carcass	15/19	79	2.8 J	23 J	10	5.6	6.8 – 12
	fillet (skinless)	9/19	47	2.4 J	15 J	6.8	4.6	2.5 – 6.8
White sucker	carcass	3/5	60	8.8 J	17 J	13	4.1	6.5 – 6.9
	fillet (with skin)	3/5	60	4.9 J	8.1 J	6.1	1.7	2.2 – 3.3
Blue crab	carcass	15/24	63	2.5 J	15 J	7.3	3.6	3.6 – 13
	hepatopancreas only	5/7	71	6.6 J	70 J	21	28	3.9 – 4.5
	muscle only	6/21	29	3.2 J	5.4 J	4.0	0.86	2.1 – 8.4
	muscle/hepatopancreas	13/41	32	1.3 J	4.6 J	2.4	1.1	1 – 1,100
White perch	carcass	1/1	100	13 J	13 J	na	na	na
	fillet (with skin)	8/19	42	4.6 J	9.0 J	6.2	1.5	2.2 – 9.2
	whole body	15/19	79	5.9 J	24 J	14	5.3	2.8 – 10
American eel	carcass	2/2	100	4.8 J	20 J	12	11	na
	fillet (skinless)	16/32	50	3.4 J	19 J	6.9	4.4	2.3 – 11
	whole body	11/19	58	3.9 J	23 J	9.2	5.3	5 – 12
Largemouth bass	fillet (with skin)	1/3	33	6.9 J	6.9 J	na	na	16 – 18
Northern pike	carcass	1/1	100	42 J	42 J	na	na	na
1-Methylphenanthrene (µg/kg ww)								
Brown bullhead	whole body	5/6	83	3.6 J	12 J	8.3	3.0	4.1
Carp	fillet (with skin)	12/12	100	5.8 J	26 J	14	6.4	na
	whole body	11/12	92	1.9 J	27 J	14	7.4	2.7
Channel catfish	carcass	11/11	100	1.6 J	15 J	5.9	5.0	na
	fillet (skinless)	6/11	55	1.4 J	7.2 J	3.4	2.0	0.66 – 1.9
White catfish	carcass	19/19	100	2.5 J	24 J	9.4	5.6	na
	fillet (skinless)	12/19	63	1.3 J	9.1 J	3.6	2.3	1 – 2.1
White sucker	carcass	1/5	20	5.2 J	5.2 J	na	na	1.7 – 3.3
Blue crab	carcass	16/24	67	0.72 J	31 J	4.5	7.3	0.53 – 3.4
	hepatopancreas only	2/7	29	2.7 J	10 J	6.4	5.2	1.4 – 9.1
	muscle only	2/21	10	0.79 J	0.94 J	0.87	0.11	0.77 – 2.7
	muscle/hepatopancreas	6/41	15	0.75 J	3.2 J	1.4	0.92	0.68 – 2.3
White perch	carcass	1/1	100	16 J	16 J	na	na	na
	fillet (with skin)	13/19	69	1.5 J	7.9 J	3.8	1.6	1 – 1.9
	whole body	16/19	84	2.0 J	25 J	9.4	5.5	2.1 – 2.8

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
1-Methylphenanthrene (µg/kg ww) (cont.)								
American eel	carcass	1/2	50	3.0 J	3.0 J	na	na	2.6
	fillet (skinless)	19/32	59	1.1 J	3.5 J	2.2	0.75	0.77 – 4
	whole body	11/19	58	1.4 J	5.6 J	3.2	1.4	0.93 – 3.1
Largemouth bass	carcass	1/3	33	2.9 J	2.9 J	na	na	2.5 – 5.1
Northern pike	carcass	1/1	100	13 J	13 J	na	na	na
Smallmouth bass	carcass	1/3	33	6.0 J	6.0 J	na	na	5.7 – 7.4
2,3,5-Trimethylnaphthalene (µg/kg ww)								
Brown bullhead	whole body	5/6	83	1.8 J	8.4 J	3.7	2.7	5.6
Carp	fillet (with skin)	12/12	100	1.5 J	11 J	4.4	2.4	na
	whole body	2/12	17	3.1 J	5.0 J	4.1	1.3	2.4 – 7.3
Channel catfish	carcass	9/11	82	2.6 J	15 J	7.0	3.5	1.8 – 3.5
	fillet (skinless)	6/11	55	1.5 J	5.6 J	3.0	1.5	1.1 – 2.1
White catfish	carcass	9/19	47	2.9 J	13 J	5.4	3.3	1.6 – 6.4
	fillet (skinless)	5/19	26	1.2 J	5.6 J	2.9	1.7	0.98 – 2.6
White sucker	carcass	3/5	60	3.3 J	6.6 J	4.7	1.7	3 – 4.6
	fillet (with skin)	3/5	60	1.8 J	2.5 J	2.2	0.38	1.3 – 2
Blue crab	carcass	12/24	50	0.49 J	2.4 J	1.2	0.68	0.76 – 2.5
	hepatopancreas only	6/7	86	1.1 J	7.0 J	3.0	2.2	1.7
	muscle only	1/21	5	0.70 J	0.70 J	na	na	1.3 – 4.6
	muscle/hepatopancreas	3/41	7	0.46 J	0.81 J	0.58	0.20	0.088 – 3.1
White perch	carcass	1/1	100	6.6 J	6.6 J	na	na	na
	fillet (with skin)	4/19	21	1.7 J	3.6 J	2.4	0.85	1.1 – 6.8
	whole body	11/19	58	2.9 J	12 J	5.1	2.7	1.6 – 7.4
Largemouth bass	fillet (with skin)	1/3	33	1.6 J	1.6 J	na	na	2.8 – 3.7
Northern pike	carcass	1/1	100	14 J	14 J	na	na	na
Smallmouth bass	carcass	1/3	33	15 J	15 J	na	na	10 – 11
2,6-Dimethylnaphthalene (µg/kg ww)								
Brown bullhead	whole body	6/6	100	5.0 J	29 J	13	8.2	na
Carp	fillet (with skin)	9/12	75	3.3 J	12 J	7.1	2.6	4.2 – 4.8
	whole body	12/12	100	5.0 J	28 J	11	6.9	na
Channel catfish	carcass	11/11	100	4.8 J	24 J	9.8	5.5	na
	fillet (skinless)	9/11	82	2.0 J	8.3 J	4.1	2.2	1.9 – 2
White catfish	carcass	18/19	95	4.1 J	36 J	15	11	2.9
	fillet (skinless)	11/19	58	1.6 J	25 J	6.8	6.9	2.2 – 4.4

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
2,6-Dimethylnaphthalene (µg/kg ww) (cont.)								
White sucker	carcass	4/5	80	3.7 J	9.8 J	6.5	2.8	2.6
	fillet (with skin)	2/5	40	3.5 J	4.0 J	3.8	0.35	2.1 – 2.7
Blue crab	carcass	19/24	79	1.6 J	6.4 J	3.6	1.3	1.9 – 4.4
	hepatopancreas only	5/7	71	3.6 J	11 J	5.6	3.1	2 – 2.8
	muscle only	5/21	24	1.7 J	2.7 J	2.0	0.41	1.8 – 4.8
	muscle/hepatopancreas	11/41	27	0.75 J	2.3 J	1.1	0.45	0.6 – 5.8
White perch	carcass	1/1	100	16 J	16 J	na	na	na
	fillet (with skin)	12/19	63	3.3 J	12 J	6.1	2.9	1.7 – 5
	whole body	16/19	84	4.4 J	21 J	12	6.0	2.5 – 4.1
American eel	fillet (skinless)	11/32	34	2.7 J	8.7 J	5.3	2.3	1.7 – 6.3
	whole body	12/19	63	2.4 J	7.3 J	4.9	1.7	2.1 – 6.5
Largemouth bass	carcass	1/3	33	9.2 J	9.2 J	na	na	6.8 – 11
Northern pike	carcass	1/1	100	19 J	19 J	na	na	na
	fillet (with skin)	1/1	100	7.8 J	7.8 J	na	na	na
Smallmouth bass	carcass	1/3	33	5.2 J	5.2 J	na	na	16 – 18
2-Methylnaphthalene (µg/kg ww)								
Brown bullhead	whole body	5/6	83	14 J	24 J	21	3.9	20
Carp	fillet (with skin)	7/12	58	13 J	29 J	17	5.6	9.4 – 14
	whole body	8/12	67	11 J	28 J	18	5.9	19 – 26
Channel catfish	carcass	10/11	91	8.1 J	17 J	12	3.1	12
	fillet (skinless)	5/11	46	4.0 J	6.1 J	5.2	0.84	2.5 – 8.3
White catfish	carcass	12/19	63	6.4 J	38 J	15	11	2.3 – 14
	fillet (skinless)	7/19	37	2.9 J	29 J	12	12	2.6 – 6.7
White sucker	carcass	5/5	100	7.6 J	19 J	14	5.5	na
	fillet (with skin)	3/5	60	7.7 J	15 J	11	3.7	2.7 – 3.9
Blue crab	carcass	4/24	17	5.0 J	14 J	9.6	4.6	3.4 – 12
	hepatopancreas only	5/7	71	5.0 J	48 J	16	18	3.8 – 4.4
	muscle only	8/21	38	2.6 J	8.1 J	4.7	1.9	2.8 – 8.4
	muscle/hepatopancreas	13/41	32	1.2 J	4.0 J	2.3	1.0	1.1 – 14
White perch	carcass	1/1	100	19 J	19 J	na	na	na
	fillet (with skin)	4/19	21	6.5 J	12 J	9.7	2.8	2.2 – 11
	whole body	16/19	84	8.5 J	30 J	14	5.3	2.8 – 19

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
2-Methylnaphthalene (µg/kg ww) (cont.)								
American eel	carcass	2/2	100	3.5 J	14 J	8.8	7.4	na
	fillet (skinless)	15/32	47	2.8 J	21 J	8.0	6.6	2 – 9.9
	whole body	12/19	63	3.1 J	21 J	9.4	6.4	3.5 – 15
Largemouth bass	fillet (with skin)	1/3	33	12 J	12 J	na	na	18 – 20
Northern pike	carcass	1/1	100	35 J	35 J	na	na	na
Acenaphthene (µg/kg ww)								
Brown bullhead	whole body	6/6	100	11 J	83 J	37	30	na
Carp	fillet (with skin)	12/12	100	21 J	74 J	39	17	na
	whole body	12/12	100	21 J	97 J	48	23	na
Channel catfish	carcass	11/11	100	17 J	50 J	37	9.9	na
	fillet (skinless)	11/11	100	4.3 J	23 J	12	4.9	na
White catfish	carcass	19/19	100	8.0 J	100 J	38	27	na
	fillet (skinless)	17/19	90	3.8 J	34 J	14	9.6	2.4 – 2.5
White sucker	carcass	5/5	100	15 J	29 J	21	6.7	na
	fillet (with skin)	5/5	100	2.4 J	10 J	5.1	2.9	na
Blue crab	carcass	23/24	96	5.2 J	45 J	23	11	2.7
	hepatopancreas only	7/7	100	4.3 J	230 J	67	76	na
	muscle only	13/21	62	3.0 J	19 J	10	5.7	1.3 – 3.6
	muscle/hepatopancreas	40/41	98	1.4 J	190 J	18	31	4.1
White perch	carcass	1/1	100	170 J	170 J	na	na	na
	fillet (with skin)	18/19	95	4.5 J	42 J	18	12	2.4
	whole body	19/19	100	4.2 J	100 J	48	33	na
American eel	carcass	2/2	100	53 J	130 J	92	54	na
	fillet (skinless)	31/32	97	4.7 J	87 J	21	17	5
	whole body	18/19	95	9.8 J	76 J	26	21	3.1
Largemouth bass	carcass	3/3	100	14 J	21 J	17	3.5	na
	fillet (with skin)	1/3	33	2.1 J	2.1 J	na	na	5.2 – 6.5
Northern pike	carcass	1/1	100	120 J	120 J	na	na	na
	fillet (with skin)	1/1	100	13 J	13 J	na	na	na
Smallmouth bass	carcass	3/3	100	8.0 J	16 J	13	4.6	na
Acenaphthylene (µg/kg ww)								
Brown bullhead	whole body	5/6	83	6.1 J	27 J	14	8.5	1.9
Carp	fillet (with skin)	12/12	100	8.1 J	68 J	26	17	na
	whole body	12/12	100	5.9 J	27 J	18	6.6	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Acenaphthylene (µg/kg ww) (cont.)								
Channel catfish	carcass	11/11	100	5.7 J	16 J	9.9	3.1	na
	fillet (skinless)	9/11	82	1.7 J	5.0 J	3.3	1.3	2.2 – 2.7
White catfish	carcass	17/19	90	1.9 J	21 J	11	5.7	5.8 – 12
	fillet (skinless)	6/19	32	1.4 J	5.1 J	3.3	1.3	1.6 – 10
White sucker	carcass	4/5	80	3.4 J	8.4 J	5.6	2.1	5.8
Blue crab	carcass	20/24	83	1.5 J	20 J	6.0	5.1	1.8 – 4.9
	hepatopancreas only	5/7	71	5.1 J	23 J	9.7	7.6	2.7 – 2.8
	muscle/hepatopancreas	19/41	46	0.55 J	6.4 J	1.7	1.3	0.44 – 3.9
White perch	carcass	1/1	100	19 J	19 J	na	na	na
	fillet (with skin)	6/19	32	3.1 J	13 J	8.8	3.5	1.7 – 7.5
	whole body	18/19	95	2.3 J	27 J	17	7.6	3.9
American eel	fillet (skinless)	4/32	13	2.6 J	12 J	7.0	4.7	1.1 – 6.9
	whole body	3/19	16	2.9 J	5.4 J	3.9	1.3	1.8 – 9.4
Largemouth bass	carcass	2/3	67	5.4 J	5.4 J	na	na	5
Northern pike	carcass	1/1	100	50 J	50 J	na	na	na
Smallmouth bass	carcass	3/3	100	5.2 J	26 J	12	12	na
Anthracene (µg/kg ww)								
Brown bullhead	whole body	6/6	100	4.4 J	41 J	19	13	na
Carp	fillet (with skin)	12/12	100	13 J	140 J	57	43	na
	whole body	12/12	100	5.5 J	69 J	39	22	na
Channel catfish	carcass	11/11	100	6.6 J	23 J	14	6.5	na
	fillet (skinless)	11/11	100	2.0 J	11 J	5.1	2.6	na
White catfish	carcass	19/19	100	6.3 J	40 J	17	9.9	na
	fillet (skinless)	13/19	68	1.8 J	20 J	8.4	5.9	2.3 – 4
White sucker	carcass	5/5	100	6.6 J	17 J	9.4	4.4	na
	fillet (with skin)	2/5	40	1.9 J	1.9 J	na	na	1.8 – 3.3
Blue crab	carcass	22/24	92	2.3 J	110 J	14	23	1.7 – 4.2
	hepatopancreas only	7/7	100	2.6 J	22 J	8.6	6.6	na
	muscle only	1/21	5	3.1 J	3.1 J	na	na	1.1 – 2.2
	muscle/hepatopancreas	18/41	44	0.51 J	3.6 J	1.6	0.92	0.42 – 2.4
White perch	carcass	1/1	100	56 J	56 J	na	na	na
	fillet (with skin)	18/19	95	2.9 J	25 J	12	5.5	1.5
	whole body	19/19	100	6.0 J	56 J	33	16	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Anthracene (µg/kg ww) (cont.)								
American eel	carcass	1/2	50	5.9 J	5.9 J	na	na	11
	fillet (skinless)	11/32	34	1.3 J	8.4 J	3.3	2.0	1.2 – 4
	whole body	9/19	47	2.5 J	5.0 J	3.6	1.0	1.8 – 4.7
Largemouth bass	carcass	3/3	100	6.1 J	12 J	9.7	3.2	na
Northern pike	carcass	1/1	100	67 J	67 J	na	na	na
	fillet (with skin)	1/1	100	7.6 J	7.6 J	na	na	na
Smallmouth bass	carcass	3/3	100	14 J	51 J	29	20	na
Benzo(a)anthracene (µg/kg ww)								
Brown bullhead	whole body	4/6	67	1.5 J	8.5 J	5.1	2.9	1.2 – 1.5
Carp	fillet (with skin)	12/12	100	1.3 J	11 J	4.6	3.2	na
	whole body	12/12	100	1.3 J	9.8 J	5.1	2.4	na
Channel catfish	carcass	9/11	82	0.55 J	4.8 J	2.0	1.5	1.1 – 1.8
	fillet (skinless)	2/11	18	1.6 J	2.2 J	1.9	0.42	0.44 – 1.5
White catfish	carcass	15/19	79	1.2 J	37 J	5.7	9.7	1.1 – 1.8
	fillet (skinless)	5/19	26	0.98 J	2.4 J	1.5	0.58	0.69 – 2
White sucker	carcass	5/5	100	1.4 J	5.9 J	2.9	2.0	na
	fillet (with skin)	1/5	20	1.7 J	1.7 J	na	na	0.95 – 1.6
Blue crab	carcass	24/24	100	2.8 J	87	15	20	na
	hepatopancreas only	6/7	86	1.7 J	18 J	7.3	5.6	1.2
	muscle only	11/21	52	0.74 J	2.5 J	1.2	0.55	0.46 – 1.3
	muscle/hepatopancreas	40/41	98	0.26 J	13	1.5	2.1	1.4
White perch	fillet (with skin)	4/19	21	1.1 J	1.6 J	1.3	0.22	0.76 – 3.1
	whole body	10/19	53	1.5 J	32 J	6.9	9.0	1.1 – 3.3
American eel	whole body	4/19	21	1.8 J	3.4 J	2.4	0.69	0.8 – 2.9
Northern pike	carcass	1/1	100	3.7 J	3.7 J	na	na	na
Smallmouth bass	carcass	1/3	33	100	100	na	na	2.3 – 2.7
Benzo(a)pyrene (µg/kg ww)								
Brown bullhead	whole body	2/6	33	2.6 J	8.6 J	5.6	4.2	0.68 – 1.8
Carp	whole body	6/12	50	0.80 J	4.9 J	2.0	1.5	0.68 – 2.5
Channel catfish	carcass	1/11	9	1.3 J	1.3 J	na	na	0.5 – 2.8
White catfish	carcass	9/19	48	0.60 J	32 J	6.0	10	0.44 – 2
White sucker	carcass	2/5	40	2.4 J	4.4 J	3.4	1.4	1.2 – 2.1

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Benzo(a)pyrene (µg/kg ww) (cont.)								
Blue crab	carcass	24/24	100	3.3 J	83 J	14	17	na
	hepatopancreas only	4/7	57	4.8 J	10 J	6.9	2.5	2 – 7.1
	muscle only	6/21	29	0.83 J	2.3 J	1.6	0.58	0.64 – 1.6
	muscle/hepatopancreas	16/41	39	0.49 J	12	2.2	2.8	0.31 – 2.1
White perch	fillet (with skin)	2/19	11	0.40 J	0.60 J	0.50	0.14	0.4 – 1.7
	whole body	9/19	48	1.5 J	24 J	4.8	7.3	0.58 – 2.2
American eel	carcass	1/2	50	1.5 J	1.5 J	na	na	2.2
	fillet (skinless)	2/32	6	0.69 J	0.88 J	0.79	0.13	0.45 – 2.5
	whole body	9/19	48	0.55 J	4.5 J	1.9	1.3	0.8 – 2.6
Smallmouth bass	carcass	1/3	33	46 J	46 J	na	na	2.2 – 7.7
Benzo(b/j)fluoranthene (µg/kg ww)								
Brown bullhead	whole body	3/6	50	3.1 J	10 J	5.4	4.0	0.36 – 0.52
Carp	whole body	5/12	42	0.35 J	7.7 J	3.5	2.8	0.36 – 0.98
Channel catfish	carcass	5/11	46	1.0 J	1.2 J	1.1	0.089	0.43 – 3.3
White catfish	carcass	6/19	32	1.4 J	31 J	9.7	12	0.22 – 2.8
	fillet (skinless)	2/19	11	0.74 J	1.1 J	0.92	0.25	0.18 – 1.5
White sucker	carcass	5/5	100	1.3 J	8.8 J	4.0	3.0	na
	fillet (with skin)	3/5	60	0.77 J	1.1 J	0.92	0.17	0.65 – 0.91
Blue crab	carcass	24/24	100	3.6 J	58 J	15	14	na
	hepatopancreas only	7/7	100	2.3 J	23 J	9.3	7.1	na
	muscle only	19/21	91	0.54 J	2.5 J	1.2	0.59	0.37 – 0.62
	muscle/hepatopancreas	41/41	100	0.67 J	16 J	2.3	2.5	na
White perch	fillet (with skin)	3/19	16	0.56 J	1.0 J	0.72	0.25	0.21 – 2.5
	whole body	14/19	74	0.57 J	31 J	4.8	7.7	0.29 – 2.1
American eel	fillet (skinless)	2/32	6	0.49 J	0.76 J	0.63	0.19	0.25 – 1.3
	whole body	8/19	42	0.74 J	3.8 J	2.1	1.1	0.33 – 1.3
Smallmouth bass	carcass	1/3	33	79	79	na	na	1.2 – 3.5
Benzo(e)pyrene (µg/kg ww)								
Brown bullhead	whole body	5/6	83	1.0 J	6.3 J	3.2	2.3	0.63
Carp	whole body	6/12	50	0.54 J	4.7 J	2.0	1.7	0.58 – 2
Channel catfish	carcass	2/11	18	0.58 J	0.76 J	0.67	0.13	0.53 – 4
White catfish	carcass	11/19	58	0.46 J	19 J	3.7	5.8	0.3 – 1.9
	fillet (skinless)	1/19	5	0.88 J	0.88 J	na	na	0.25 – 2.1

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Benzo(e)pyrene (µg/kg ww) (cont.)								
White sucker	carcass	3/5	60	1.9 J	7.7 J	4.7	2.9	0.91 – 1.5
	fillet (with skin)	2/5	40	0.86 J	1.0 J	0.93	0.099	1.5 – 1.7
Blue crab	carcass	9/24	38	3.2 J	43	18	12	3.7 – 12
	hepatopancreas only	7/7	100	3.2 J	21	11	7.1	na
	muscle only	19/21	91	0.83 J	2.9 J	1.6	0.72	0.79 – 0.89
	muscle/hepatopancreas	37/41	90	0.48 J	12	2.1	2.0	0.6 – 1.3
White perch	carcass	1/1	100	2.2 J	2.2 J	na	na	na
	fillet (with skin)	8/19	42	0.39 J	1.0 J	0.67	0.24	0.3 – 1.5
	whole body	14/19	74	0.87 J	17 J	3.5	4.0	0.81 – 1.8
American eel	whole body	6/19	32	0.39 J	2.5 J	1.5	0.71	0.37 – 2.1
Smallmouth bass	carcass	1/3	33	49	49	na	na	2 – 6.8
Benzo(g,h,i)perylene (µg/kg ww)								
Brown bullhead	whole body	2/6	33	2.5 J	4.4 J	3.5	1.3	0.66 – 2.4
Carp	whole body	6/12	50	0.62 J	3.6 J	1.8	1.3	0.39 – 3.3
Channel catfish	carcass	1/11	9	0.52 J	0.52 J	na	na	0.46 – 4
White catfish	carcass	6/19	32	0.32 J	14 J	4.6	5.2	0.28 – 2.9
White sucker	carcass	4/5	80	1.3 J	5.2 J	2.8	1.7	2.5
Blue crab	carcass	8/24	33	2.6 J	28 J	14	9.3	3.3 – 12
	hepatopancreas only	1/7	14	6.2 J	6.2 J	na	na	2.5 – 6.9
	muscle only	15/21	71	0.57 J	2.4 J	1.1	0.50	0.82 – 2.6
	muscle/hepatopancreas	14/41	34	0.79 J	6.6 J	1.8	1.5	0.7 – 5.4
White perch	fillet (with skin)	1/19	5	0.51 J	0.51 J	na	na	0.3 – 2.7
	whole body	5/19	26	1.1 J	13 J	4.8	4.7	0.56 – 3.9
American eel	fillet (skinless)	1/32	3	0.85 J	0.85 J	na	na	0.33 – 2.4
	whole body	5/19	27	0.29 J	2.5 J	1.4	0.80	0.29 – 3.8
Smallmouth bass	carcass	1/3	33	24 J	24 J	na	na	5.4 – 18
Benzo(k)fluoranthene (µg/kg ww)								
Brown bullhead	whole body	3/6	50	1.4 J	3.5 J	2.5	1.1	0.43 – 0.6
Carp	whole body	6/12	50	0.51 J	4.6 J	2.2	1.5	0.41 – 1.3
Channel catfish	carcass	3/11	27	0.36 J	0.50 J	0.44	0.074	0.3 – 1.1
White catfish	carcass	3/19	16	3.3 J	15 J	8.0	6.2	0.24 – 0.81
White sucker	carcass	4/5	80	1.1 J	2.9 J	1.9	0.83	0.81

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Benzo(k)fluoranthene (µg/kg ww) (cont.)								
Blue crab	carcass	24/24	100	2.0 J	44	7.7	9.1	na
	hepatopancreas only	7/7	100	1.0 J	8.9 J	4.8	2.8	na
	muscle only	10/21	48	0.52 J	1.7 J	0.85	0.42	0.42 – 0.81
	muscle/hepatopancreas	33/41	81	0.23 J	7.1 J	1.3	1.2	0.39 – 0.99
White perch	fillet (with skin)	1/19	5	0.41 J	0.41 J	na	na	0.26 – 1.1
	whole body	9/19	47	1.2 J	15 J	3.4	4.4	0.36 – 1.4
American eel	whole body	4/19	21	0.66 J	1.0 J	0.90	0.16	0.24 – 1.6
Smallmouth bass	carcass	1/3	33	32	32	na	na	0.96 – 3.7
Chrysene (µg/kg ww)								
Brown bullhead	whole body	6/6	100	2.0 J	14 J	7.2	4.5	na
Carp	fillet (with skin)	12/12	100	1.7 J	7.9 J	3.9	2.0	na
	whole body	11/12	92	1.9 J	8.9 J	4.7	2.0	0.98
Channel catfish	carcass	11/11	100	4.7 J	16 J	8.9	3.7	na
	fillet (skinless)	10/11	91	2.0 J	7.6 J	3.4	1.6	1.3
White catfish	carcass	18/19	95	3.8 J	33 J	8.7	8.0	2.4
	fillet (skinless)	14/19	74	1.4 J	5.3 J	2.5	1.2	0.9 – 1.7
White sucker	carcass	5/5	100	2.5 J	11 J	5.3	3.6	na
	fillet (with skin)	3/5	60	0.95 J	2.2 J	1.5	0.64	0.9 – 1.1
Blue crab	carcass	24/24	100	5.5 J	74 J	19	16	na
	hepatopancreas only	7/7	100	12 J	72 J	36	25	na
	muscle only	19/21	91	0.97 J	6.1 J	2.4	1.2	0.75 – 1.2
	muscle/hepatopancreas	41/41	100	1.1 J	17 J	5.3	4.1	na
White perch	carcass	1/1	100	30 J	30 J	na	na	na
	fillet (with skin)	15/19	79	1.7 J	5.2 J	3.7	1.1	0.84 – 2
	whole body	17/19	90	2.5 J	38 J	12	8.0	1.3 – 2
American eel	fillet (skinless)	4/32	13	1.0 J	2.7 J	1.6	0.75	0.79 – 16
	whole body	8/19	42	1.5 J	5.0 J	2.9	1.3	0.81 – 3.4
Largemouth bass	carcass	1/3	33	1.5 J	1.5 J	na	na	1.5
Northern pike	carcass	1/1	100	3.4 J	3.4 J	na	na	na
Smallmouth bass	carcass	1/3	33	100 J	100 J	na	na	2.7 – 3.6
Dibenzo(a,h)anthracene (µg/kg ww)								
White catfish	carcass	2/19	11	0.89 J	3.4 J	2.1	1.8	0.21 – 1.2
Blue crab	carcass	13/24	54	0.89 J	7.1 J	3.4	2.3	1.2 – 11

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Dibenzo(a,h)anthracene (µg/kg ww) (cont.)								
White perch	fillet (with skin)	1/19	5	0.38 J	0.38 J	na	na	0.25 – 1.9
	whole body	2/19	11	0.82 J	3.4 J	2.1	1.8	0.46 – 3.3
Smallmouth bass	carcass	1/3	33	9.7 J	9.7 J	na	na	4.9 – 11
Dibenzothiophene (µg/kg ww)								
Brown bullhead	whole body	6/6	100	1.2 J	9.1 J	4.3	2.9	na
Carp	fillet (with skin)	12/12	100	1.4 J	3.4 J	2.1	0.73	na
	whole body	12/12	100	1.7 J	5.2 J	3.0	1.2	na
Channel catfish	carcass	11/11	100	1.4 J	10 J	3.6	2.6	na
	fillet (skinless)	10/11	91	0.45 J	3.7 J	1.3	0.90	0.65
White catfish	carcass	19/19	100	1.2 J	12 J	3.7	3.0	na
	fillet (skinless)	14/19	74	0.41 J	5.9 J	1.6	1.5	0.084 – 0.61
White sucker	carcass	5/5	100	1.0 J	3.0 J	2.2	0.87	na
	fillet (with skin)	4/5	80	0.38 J	0.73 J	0.58	0.15	0.3
Blue crab	carcass	9/24	38	1.4 J	5.2 J	2.4	1.3	0.4 – 1.8
	hepatopancreas only	5/7	71	1.7 J	18 J	6.1	6.8	0.71 – 0.86
	muscle/hepatopancreas	16/41	39	0.42 J	7.9 J	1.4	1.8	0.062 – 0.78
White perch	carcass	1/1	100	8.2 J	8.2 J	na	na	na
	fillet (with skin)	18/19	95	0.74 J	4.7 J	1.9	1.1	0.87
	whole body	19/19	100	0.88 J	9.6 J	4.8	2.8	na
American eel	carcass	1/2	50	1.9 J	1.9 J	na	na	0.15
	fillet (skinless)	30/32	94	0.16 J	2.3 J	0.58	0.40	0.28 – 0.38
	whole body	17/19	90	0.30 J	1.8 J	0.64	0.40	0.057 – 0.28
Largemouth bass	carcass	3/3	100	0.84 J	2.5 J	1.5	0.89	na
	fillet (with skin)	3/3	100	0.089 J	0.17 J	0.14	0.047	na
Northern pike	carcass	1/1	100	4.7 J	4.7 J	na	na	na
	fillet (with skin)	1/1	100	0.85 J	0.85 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.87 J	1.9 J	1.4	0.52	na
	fillet (with skin)	3/3	100	0.16 J	0.43 J	0.28	0.14	na
Fluoranthene (µg/kg ww)								
Brown bullhead	whole body	6/6	100	11 J	60 J	35	17	na
Carp	fillet (with skin)	12/12	100	11 J	49	24	13	na
	whole body	12/12	100	11 J	49 J	26	12	na
Channel catfish	carcass	11/11	100	11 J	62 J	24	14	na
	fillet (skinless)	9/11	82	5.6 J	32 J	9.7	8.4	5.7 – 6.2

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Fluoranthene (µg/kg ww) (cont.)								
White catfish	carcass	19/19	100	8.3 J	140 J	36	34	na
	fillet (skinless)	15/19	79	2.5 J	39 J	11	9.9	6.2 – 6.7
White sucker	carcass	5/5	100	11 J	21 J	17	3.8	na
	fillet (with skin)	5/5	100	2.5 J	3.9 J	3.3	0.63	na
Blue crab	carcass	8/24	33	11 J	160	66	49	9.4 – 36
	hepatopancreas only	6/7	86	23 J	290 J	98	99	11
	muscle only	1/21	5	8.6 J	8.6 J	na	na	3.2 – 16
	muscle/hepatopancreas	23/41	56	4.8 J	57	16	12	1.9 – 16
White perch	carcass	1/1	100	150 J	150 J	na	na	na
	fillet (with skin)	18/19	95	2.8 J	33 J	16	8.7	35
	whole body	19/19	100	13 J	120 J	57	31	na
American eel	carcass	2/2	100	12 J	18 J	15	4.2	na
	fillet (skinless)	29/32	91	2.3 J	14 J	7.4	3.3	1.8 – 5.1
	whole body	18/19	95	2.1 J	24 J	9.6	5.9	3.5
Largemouth bass	carcass	3/3	100	4.4 J	7.8 J	5.8	1.8	na
	fillet (with skin)	2/3	67	0.98 J	1.6 J	1.3	0.44	1.6
Northern pike	carcass	1/1	100	37	37	na	na	na
	fillet (with skin)	1/1	100	4.5 J	4.5 J	na	na	na
Smallmouth bass	carcass	3/3	100	5.2 J	130	48	71	na
	fillet (with skin)	1/3	33	1.6 J	1.6 J	na	na	1.6 – 1.7
Fluorene (µg/kg ww)								
Brown bullhead	whole body	1/6	17	28 J	28 J	na	na	39 – 99
Carp	whole body	3/12	25	11 J	15 J	13	2.1	9.7 – 69
Channel catfish	carcass	3/11	27	16 J	25 J	19	5.2	9.1 – 44
	fillet (skinless)	10/11	91	3.6 J	13 J	6.0	2.8	3.5
White catfish	carcass	7/19	37	6.5 J	140 J	46	55	8.6 – 96
	fillet (skinless)	5/19	26	3.2 J	110 J	26	47	3.8 – 94
White sucker	carcass	3/5	60	6.4 J	17 J	12	5.4	5.2 – 10
	fillet (with skin)	3/5	60	2.2 J	4.5 J	3.3	1.2	1.6
Blue crab	carcass	19/24	79	2.0 J	340 J	24	77	5.8 – 11
	hepatopancreas only	1/7	14	48 J	48 J	na	na	4.5 – 15
	muscle/hepatopancreas	23/41	56	0.71 J	35 J	4.1	6.9	0.66 – 10
White perch	fillet (with skin)	10/19	53	2.6 J	130 J	30	41	4.1 – 34
	whole body	10/19	53	6.0 J	39 J	25	11	11 – 100

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Fluorene (µg/kg ww) (cont.)								
American eel	fillet (skinless)	1/32	3	5.0 J	5.0 J	na	na	1.5 – 110
	whole body	2/19	11	4.9 J	41 J	23	26	1.4 – 68
Indeno(1,2,3-cd)pyrene (µg/kg ww)								
Brown bullhead	whole body	1/6	17	4.1 J	4.1 J	na	na	0.84 – 3.5
Carp	whole body	4/12	33	0.76 J	2.7 J	1.8	0.94	0.37 – 4.5
Channel catfish	carcass	1/11	9	0.41 J	0.41 J	na	na	0.49 – 2.2
White catfish	carcass	4/19	21	0.44 J	14 J	5.7	5.8	0.27 – 1.6
White sucker	carcass	1/5	20	4.1 J	4.1 J	na	na	1 – 5
Blue crab	carcass	16/24	67	4.0 J	46 J	11	10	2.5 – 4
	muscle only	3/21	14	1.2 J	4.0 J	2.2	1.6	0.71 – 5.3
	muscle/hepatopancreas	7/41	17	0.74 J	10 J	2.7	3.4	0.63 – 5.1
White perch	fillet (with skin)	1/19	5	1.1 J	1.1 J	na	na	0.28 – 3.8
	whole body	6/19	32	0.62 J	14 J	3.3	5.2	0.61 – 5.3
American eel	whole body	4/19	21	0.78 J	1.7 J	1.1	0.41	0.31 – 1.8
Smallmouth bass	carcass	1/3	33	34 J	34 J	na	na	6.5 – 17
Naphthalene (µg/kg ww)								
Brown bullhead	whole body	4/6	67	150 J	180 J	160	13	10 – 40
Carp	whole body	4/12	33	19 J	29 J	24	4.6	10 – 84
White catfish	carcass	2/19	11	150 J	170 J	160	14	4.4 – 72
	fillet (skinless)	2/19	11	140 J	150 J	150	7.1	3.4 – 40
Blue crab	carcass	8/24	33	4.6 J	89 J	30	30	5.2 – 23
	hepatopancreas only	1/7	14	37 J	37 J	na	na	3.3 – 7.7
	muscle only	1/21	5	3.4 J	3.4 J	na	na	2.8 – 8.1
White perch	whole body	2/19	11	150 J	170 J	160	14	7.1 – 48
American eel	fillet (skinless)	3/32	9	150 J	170 J	160	10	2.7 – 75
	whole body	3/19	16	140 J	150 J	140	5.8	3.7 – 85
Largemouth bass	fillet (with skin)	1/3	33	90 J	90 J	na	na	37
Northern pike	carcass	1/1	100	180 J	180 J	na	na	na
Smallmouth bass	carcass	1/3	33	25 J	25 J	na	na	51 – 54
Perylene (µg/kg ww)								
Brown bullhead	whole body	2/6	33	0.62 J	1.9 J	1.3	0.91	0.63 – 1.8
White catfish	carcass	3/19	16	1.8 J	7.4 J	4.0	3.0	0.39 – 1.3
White sucker	carcass	1/5	20	0.93 J	0.93 J	na	na	1.3 – 2.6

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Perylene (µg/kg ww) (cont.)								
Blue crab	carcass	22/24	92	1.1 J	20 J	4.5	4.4	1.6 – 2.7
	hepatopancreas only	3/7	43	2.5 J	6.1 J	4.3	1.8	1.7 – 6.6
	muscle only	3/21	14	0.97 J	1.1 J	1.1	0.075	0.62 – 1.3
	muscle/hepatopancreas	9/41	22	0.40 J	3.1 J	1.1	0.82	0.24 – 1.7
White perch	whole body	1/19	5	7.2 J	7.2 J	na	na	0.49 – 2.3
Smallmouth bass	carcass	1/3	33	9.7 J	9.7 J	na	na	1.9 – 8.6
Phenanthrene (µg/kg ww)								
Brown bullhead	whole body	6/6	100	14 J	61 J	37	15	na
Carp	fillet (with skin)	12/12	100	12 J	26	18	5.0	na
	whole body	11/12	92	15 J	45 J	28	9.6	13
Channel catfish	carcass	11/11	100	13 J	58 J	28	16	na
	fillet (skinless)	11/11	100	4.7 J	31 J	9.5	7.4	na
White catfish	carcass	19/19	100	12 J	150 J	37	36	na
	fillet (skinless)	18/19	95	2.8 J	61 J	12	14	3.7
White sucker	carcass	4/5	80	8.5 J	20 J	15	6.0	5.8
	fillet (with skin)	3/5	60	2.3 J	4.6 J	3.5	1.2	1.4 – 2.6
Blue crab	carcass	8/24	33	3.7 J	48 J	28	16	4.6 – 16
	hepatopancreas only	5/7	71	11 J	260 J	65	110	4 – 7.1
	muscle only	11/21	52	1.8 J	4.1 J	2.4	0.64	1.5 – 4.9
	muscle/hepatopancreas	19/41	46	2.1 J	110	11	24	0.62 – 4.5
White perch	carcass	1/1	100	72 J	72 J	na	na	na
	fillet (with skin)	18/19	95	3.6 J	43 J	17	11	5.1
	whole body	19/19	100	13 J	83 J	45	25	na
American eel	carcass	2/2	100	6.2 J	18 J	12	8.3	na
	fillet (skinless)	27/32	84	1.8 J	19 J	6.4	3.4	2.3 – 4.5
	whole body	18/19	95	2.6 J	17 J	7.9	3.9	2.4
Largemouth bass	carcass	3/3	100	6.9 J	14 J	10	3.6	na
	fillet (with skin)	1/3	33	1.4 J	1.4 J	na	na	2.4 – 2.8
Northern pike	carcass	1/1	100	39	39	39	na	na
	fillet (with skin)	1/1	100	7.4 J	7.4 J	na	na	na
Smallmouth bass	carcass	3/3	100	6.0 J	15 J	11	4.6	na
	fillet (with skin)	1/3	33	2.4 J	2.4 J	na	na	2.5 – 3.1

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Pyrene (µg/kg ww)								
Brown bullhead	whole body	6/6	100	8.0 J	40 J	24	11	na
Carp	fillet (with skin)	12/12	100	9.4 J	38	20	11	na
	whole body	12/12	100	8.6 J	35 J	21	9.0	na
Channel catfish	carcass	11/11	100	6.8 J	26 J	15	5.2	na
	fillet (skinless)	7/11	64	3.8 J	17 J	6.4	4.7	3.8 – 5.6
White catfish	carcass	19/19	100	6.6 J	85	24	19	na
	fillet (skinless)	14/19	74	1.3 J	23 J	7.4	5.9	4.7 – 6.2
White sucker	carcass	5/5	100	6.4 J	19 J	12	4.8	na
	fillet (with skin)	5/5	100	1.3 J	2.7 J	2.2	0.57	na
Blue crab	carcass	6/24	25	13 J	110	52	39	8.3 – 58
	hepatopancreas only	5/7	71	56 J	260 J	120	84	18 – 32
	muscle only	1/21	5	13 J	13 J	na	na	4.4 – 20
	muscle/hepatopancreas	21/41	51	9.0 J	67	21	13	2.8 – 20
White perch	carcass	1/1	100	45 J	45 J	na	na	na
	fillet (with skin)	18/19	95	2.4 J	13 J	7.5	3.1	5.3
	whole body	19/19	100	5.6 J	61 J	24	13	na
American eel	carcass	2/2	100	5.2 J	5.4 J	5.3	0.14	na
	fillet (skinless)	24/32	75	2.0 J	9.0 J	4.3	1.9	1.4 – 3
	whole body	18/19	95	1.4 J	16 J	5.9	4.0	2.3
Largemouth bass	carcass	3/3	100	3.4 J	5.3 J	4.5	1.0	na
	fillet (with skin)	2/3	67	0.92 J	1.3 J	1.1	0.27	1.2
Northern pike	carcass	1/1	100	27	27	na	na	na
	fillet (with skin)	1/1	100	2.6 J	2.6 J	2.6	na	na
Smallmouth bass	carcass	3/3	100	4.4 J	110	41	60	na
	fillet (with skin)	1/3	33	2.4 J	2.4 J	na	na	1.3 – 1.4
Total HPAHs (ND = 0) (µg/kg ww)[e]								
Brown bullhead	whole body	6/6	100	21 J	110 J	77	38	na
Carp	fillet (with skin)	12/12	100	24 J	100 J	52	28	na
	whole body	12/12	100	24 J	120 J	62	27	na
Channel catfish	carcass	11/11	100	25 J	110 J	50	24	na
	fillet (skinless)	11/11	100	2.0 J	59 J	15	15	na
White catfish	carcass	19/19	100	21 J	400 J	83	91	na
	fillet (skinless)	19/19	100	1.6 J	67 J	16	17	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total HPAHs (ND = 0) (µg/kg ww) (cont.)[e]								
White sucker	carcass	5/5	100	30 J	82 J	47	22	na
	fillet (with skin)	5/5	100	5.1 J	9.8 J	7.3	1.8	na
Blue crab	carcass	24/24	100	19 J	690 J	120	160	na
	hepatopancreas only	7/7	100	15 J	690 J	230	230	na
	muscle only	20/21	95	0.91 J	28 J	7.2	6.5	9.9
	muscle/hepatopancreas	41/41	100	2.5 J	150 J	32	36	na
White perch	carcass	1/1	100	230 J	230 J	na	na	na
	fillet (with skin)	19/19	100	5.2 J	51 J	26	13	na
	whole body	19/19	100	21 J	340 J	110	71	na
American eel	carcass	2/2	100	19 J	23 J	21	2.8	na
	fillet (skinless)	29/32	91	2.3 J	24 J	11	5.8	1.8 – 5.1
	whole body	19/19	100	3.1 J	49 J	19	13	na
Largemouth bass	carcass	3/3	100	8.6 J	15 J	11	3.5	na
	fillet (with skin)	3/3	100	1.3 J	1.9 J	1.6	0.30	na
Northern pike	carcass	1/1	100	71 J	71 J	na	na	na
	fillet (with skin)	1/1	100	7.1 J	7.1 J	na	na	na
Smallmouth bass	carcass	3/3	100	9.6 J	660 J	230	370	na
	fillet (with skin)	2/3	67	1.6 J	2.4 J	2.0	0.57	5.1
Total HPAHs (ND = 0.5 RL) (µg/kg ww)[f]								
Brown bullhead	whole body	6/6	100	24 J	120 J	80	39	na
Carp	fillet (with skin)	12/12	100	30 J	120 J	62	31	na
	whole body	12/12	100	29 J	120 J	64	27	na
Channel catfish	carcass	11/11	100	26 J	110 J	54	24	na
	fillet (skinless)	11/11	100	11 J	60 J	20	13	na
White catfish	carcass	19/19	100	24 J	400 J	85	90	na
	fillet (skinless)	19/19	100	7.5 J	68 J	21	15	na
White sucker	carcass	5/5	100	31 J	84 J	50	22	na
	fillet (with skin)	5/5	100	11 J	13 J	12	0.71	na
Blue crab	carcass	24/24	100	36 J	690 J	140	150	na
	hepatopancreas only	7/7	100	48 J	700 J	260	220	na
	muscle only	20/21	95	8.4 J	41 J	18	8.3	9.9
	muscle/hepatopancreas	41/41	100	7.5 J	160 J	38	35	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total HPAHs (ND = 0.5 RL) (µg/kg ww) (cont.)[f]								
White perch	carcass	1/1	100	230 J	230 J	na	na	na
	fillet (with skin)	19/19	100	11 J	53 J	30	12	na
	whole body	19/19	100	25 J	340 J	110	70	na
American eel	carcass	2/2	100	23 J	32 J	28	6.4	na
	fillet (skinless)	29/32	90.6	5.7 J	26 J	15	5.6	1.8 – 5.1
	whole body	19/19	100	6.4 J	50 J	22	12	na
Largemouth bass	carcass	3/3	100	27 J	34 J	31	3.8	na
	fillet (with skin)	3/3	100	5.7 J	16 J	12	5.7	na
Northern pike	carcass	1/1	100	90 J	90 J	na	na	na
	fillet (with skin)	1/1	100	20 J	20 J	na	na	na
Smallmouth bass	carcass	3/3	100	23 J	660 J	240	360	na
	fillet (with skin)	2/3	67	11 J	12 J	12	0.71	5.1
Total HPAHs (ND = RL) (µg/kg ww)[g]								
Brown bullhead	whole body	6/6	100	27 J	120 J	81	37	na
Carp	fillet (with skin)	12/12	100	36 J	140 J	72	36	na
	whole body	12/12	100	30 J	120 J	66	26	na
Channel catfish	carcass	11/11	100	27 J	110 J	57	24	na
	fillet (skinless)	11/11	100	18 J	62 J	25	12	na
White catfish	carcass	19/19	100	26 J	400 J	87	90	na
	fillet (skinless)	19/19	100	9.1 J	69 J	25	14	na
White sucker	carcass	5/5	100	32 J	85 J	53	21	na
	fillet (with skin)	5/5	100	14 J	19 J	17	2.4	na
Blue crab	carcass	24/24	100	49 J	690 J	160	150	na
	hepatopancreas only	7/7	100	80 J	720 J	280	220	na
	muscle only	20/21	95	15 J	67 J	30	12	9.9
	muscle/hepatopancreas	41/41	100	12 J	160 J	43	33	na
White perch	carcass	1/1	100	230 J	230 J	na	na	na
	fillet (with skin)	19/19	100	16 J	62 J	35	12	na
	whole body	19/19	100	28 J	340 J	110	70	na
American eel	carcass	2/2	100	28 J	40 J	34	8.5	na
	fillet (skinless)	29/32	91	9.2 J	34 J	19	6.0	1.8 – 5.1
	whole body	19/19	100	9.8 J	50 J	26	11	na
Largemouth bass	carcass	3/3	100	45 J	60 J	52	7.5	na
	fillet (with skin)	3/3	100	9.5 J	31 J	23	12	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total HPAHs (ND = RL) (µg/kg ww) (cont.)[g]								
Northern pike	carcass	1/1	100	110 J	110 J	na	na	na
	fillet (with skin)	1/1	100	33 J	33 J	na	na	na
Smallmouth bass	carcass	3/3	100	36 J	660 J	260	350	na
	fillet (with skin)	2/3	67	19 J	22 J	21	2.1	5.1
Total LPAHs (ND = 0) (µg/kg ww)[h]								
Brown bullhead	whole body	6/6	100	180 J	260 J	220	32	na
Carp	fillet (with skin)	12/12	100	54 J	310 J	140	80	na
	whole body	12/12	100	93 J	250 J	140	47	na
Channel catfish	carcass	11/11	100	46 J	170 J	94	37	na
	fillet (skinless)	11/11	100	15 J	83 J	35	18	na
White catfish	carcass	19/19	100	41 J	510 J	140	130	na
	fillet (skinless)	19/19	100	5.1 J	370 J	53	90	na
White sucker	carcass	5/5	100	25 J	78 J	54	21	na
	fillet (with skin)	5/5	100	4.5 J	15 J	10	4.5	na
Blue crab	carcass	23/24	96	12 J	490 J	82	100	11
	hepatopancreas only	7/7	100	7.2 J	620 J	140	210	na
	muscle only	18/21	86	1.8 J	26 J	9.4	7.4	5.9 – 10
	muscle/hepatopancreas	40/41	98	1.8 J	350 J	27	55	4.1
White perch	carcass	1/1	100	320 J	320 J	320	na	na
	fillet (with skin)	19/19	100	6.2 J	180 J	63	50	na
	whole body	19/19	100	36 J	300 J	170	83	na
American eel	carcass	2/2	100	65 J	150 J	110	60	na
	fillet (skinless)	32/32	100	4.7 J	260 J	43	57	na
	whole body	19/19	100	15 J	170 J	59	49	na
Largemouth bass	carcass	3/3	100	37 J	44 J	41	3.5	na
	fillet (with skin)	1/3	33	94 J	94 J	na	na	37
Northern pike	carcass	1/1	100	460 J	460 J	na	na	na
	fillet (with skin)	1/1	100	28 J	28 J	na	na	na
Smallmouth bass	carcass	3/3	100	55 J	110 J	74	31	na
	fillet (with skin)	1/3	33	2.4 J	2.4 J	na	na	29 – 41
Total LPAHs (ND = 0.5 RL) (µg/kg ww)[i]								
Brown bullhead	whole body	6/6	100	180 J	300 J	250	44	na
Carp	fillet (with skin)	12/12	100	77 J	340 J	170	82	na
	whole body	12/12	100	93 J	260 J	170	51	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total LPAHs (ND = 0.5 RL) (µg/kg ww) (cont.)[i]								
Channel catfish	carcass	11/11	100	71 J	170 J	110	35	na
	fillet (skinless)	11/11	100	21 J	86 J	38	17	na
White catfish	carcass	19/19	100	45 J	510 J	160	130	na
	fillet (skinless)	19/19	100	12 J	370 J	73	90	na
White sucker	carcass	5/5	100	36 J	89 J	64	21	na
	fillet (with skin)	5/5	100	10 J	24 J	18	5.7	na
Blue crab	carcass	23/24	96	19 J	500 J	90	100	11
	hepatopancreas only	7/7	100	17 J	620 J	150	210	na
	muscle only	18/21	86	9.5 J	30 J	18	7.1	5.9 – 10
	muscle/hepatopancreas	40/41	98	4.4 J	350 J	31	55	4.1
White perch	carcass	1/1	100	380 J	380 J	na	na	na
	fillet (with skin)	19/19	100	16 J	190 J	75	50	na
	whole body	19/19	100	40 J	330 J	190	85	na
American eel	carcass	2/2	100	98 J	210 J	150	79	na
	fillet (skinless)	32/32	100	13 J	300 J	74	62	na
	whole body	19/19	100	24 J	200 J	86	57	na
Largemouth bass	carcass	3/3	100	60 J	69 J	64	4.6	na
	fillet (with skin)	1/3	33	100 J	100 J	na	na	37
Northern pike	carcass	1/1	100	470 J	470 J	na	na	na
	fillet (with skin)	1/1	100	56 J	56 J	na	na	na
Smallmouth bass	carcass	3/3	100	63 J	140 J	97	39	na
	fillet (with skin)	1/3	33	27 J	27 J	na	na	29 – 41
Total LPAHs (ND = RL) (µg/kg ww)[i]								
Brown bullhead	whole body	6/6	100	190 J	340 J	290	55	na
Carp	fillet (with skin)	12/12	100	100 J	370 J	190	83	na
	whole body	12/12	100	93 J	300 J	200	66	na
Channel catfish	carcass	11/11	100	80 J	200 J	120	39	na
	fillet (skinless)	11/11	100	26 J	90 J	40	18	na
White catfish	carcass	19/19	100	49 J	510 J	180	120	na
	fillet (skinless)	19/19	100	19 J	370 J	92	93	na
White sucker	carcass	5/5	100	48 J	100 J	73	20	na
	fillet (with skin)	5/5	100	16 J	34 J	25	7.1	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total LPAHs (ND = RL) (µg/kg ww) (cont.)[j]								
Blue crab	carcass	23/24	96	25 J	500 J	98	98	11
	hepatopancreas only	7/7	100	26 J	620 J	160	210	na
	muscle only	18/21	86	16 J	40 J	27	7.7	5.9 – 10
	muscle/hepatopancreas	40/41	98	6.9 J	360 J	35	56	4.1
White perch	carcass	1/1	100	450 J	450 J	na	na	na
	fillet (with skin)	19/19	100	25 J	200 J	87	54	na
	whole body	19/19	100	44 J	380 J	210	90	na
American eel	carcass	2/2	100	130 J	260 J	200	92	na
	fillet (skinless)	32/32	100	17 J	340 J	110	68	na
	whole body	19/19	100	28 J	230 J	110	69	na
Largemouth bass	carcass	3/3	100	83 J	96 J	87	7.5	na
	fillet (with skin)	1/3	33	110 J	110 J	na	na	37
Northern pike	carcass	1/1	100	490 J	490 J	na	na	na
	fillet (with skin)	1/1	100	84 J	84 J	na	na	na
Smallmouth bass	carcass	3/3	100	67 J	170 J	120	52	na
	fillet (with skin)	1/3	33	52 J	52 J	na	na	29 – 41
Total PAHs (ND = 0) (µg/kg ww)[k]								
Brown bullhead	whole body	6/6	100	210 J	330 J	300	44	na
Carp	fillet (with skin)	12/12	100	78 J	410 J	190	110	na
	whole body	12/12	100	120 J	350 J	210	68	na
Channel catfish	carcass	11/11	100	70 J	240 J	140	56	na
	fillet (skinless)	11/11	100	19 J	140 J	50	32	na
White catfish	carcass	19/19	100	69 J	670 J	220	200	na
	fillet (skinless)	19/19	100	9.0 J	440 J	68	100	na
White sucker	carcass	5/5	100	55 J	160 J	100	40	na
	fillet (with skin)	5/5	100	12 J	22 J	17	4.4	na
Blue crab	carcass	24/24	100	19 J	810 J	200	210	na
	hepatopancreas only	7/7	100	23 J	1,300 J	380	440	na
	muscle only	20/21	95	2.1 J	53 J	16	12	9.9
	muscle/hepatopancreas	41/41	100	5.2 J	500 J	58	84	na
White perch	carcass	1/1	100	540 J	540 J	na	na	na
	fillet (with skin)	19/19	100	11 J	200 J	88	57	na
	whole body	19/19	100	63 J	570 J	280	130	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total PAHs (ND = 0) (µg/kg ww) (cont.)[k]								
American eel	carcass	2/2	100	84 J	170 J	130	61	na
	fillet (skinless)	32/32	100	7.0 J	280 J	54	59	na
	whole body	19/19	100	27 J	170 J	78	48	na
Largemouth bass	carcass	3/3	100	50 J	53 J	52	1.5	na
	fillet (with skin)	3/3	100	1.3 J	95 J	33	54	na
Northern pike	carcass	1/1	100	530 J	530 J	530	na	na
	fillet (with skin)	1/1	100	35 J	35 J	na	na	na
Smallmouth bass	carcass	3/3	100	68 J	770 J	300	400	na
	fillet (with skin)	2/3	67	1.6 J	4.8 J	3.2	2.3	41
Total PAHs (ND = 0.5 RL) (µg/kg ww)[l]								
Brown bullhead	whole body	6/6	100	250 J	380 J	330	48	na
Carp	fillet (with skin)	12/12	100	110 J	470 J	230	110	na
	whole body	12/12	100	130 J	360 J	230	71	na
Channel catfish	carcass	11/11	100	110 J	280 J	160	60	na
	fillet (skinless)	11/11	100	35 J	150 J	58	32	na
White catfish	carcass	19/19	100	84 J	680 J	240	190	na
	fillet (skinless)	19/19	100	27 J	440 J	93	100	na
White sucker	carcass	5/5	100	67 J	170 J	110	39	na
	fillet (with skin)	5/5	100	21 J	36 J	30	6.3	na
Blue crab	carcass	24/24	100	55 J	820 J	230	200	na
	hepatopancreas only	7/7	100	64 J	1,300 J	400	420	na
	muscle only	20/21	95	20 J	69 J	36	14	9.9
	muscle/hepatopancreas	41/41	100	13 J	510 J	67	83	na
White perch	carcass	1/1	100	610 J	610 J	na	na	na
	fillet (with skin)	19/19	100	26 J	220 J	110	60	na
	whole body	19/19	100	72 J	570 J	300	130	na
American eel	carcass	2/2	100	120 J	240 J	180	85	na
	fillet (skinless)	32/32	100	18 J	320 J	88	63	na
	whole body	19/19	100	38 J	210 J	110	57	na
Largemouth bass	carcass	3/3	100	93 J	97 J	95	2.1	na
	fillet (with skin)	3/3	100	46 J	110 J	68	36	na
Northern pike	carcass	1/1	100	560 J	560 J	na	na	na
	fillet (with skin)	1/1	100	76 J	76 J	76	na	na

Table 4-4. Summary of detected PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RL[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total PAHs (ND = 0.5 RL) (µg/kg ww) (cont.)[l]								
Smallmouth bass	carcass	3/3	100	85 J	810 J	350	400	na
	fillet (with skin)	2/3	67	38 J	39 J	39	0.71	41
Total PAHs (ND = RL) (µg/kg ww)[m]								
Brown bullhead	whole body	6/6	100	290 J	430 J	370	55	na
Carp	fillet (with skin)	12/12	100	140 J	520 J	270	120	na
	whole body	12/12	100	140 J	380 J	260	81	na
Channel catfish	carcass	11/11	100	120 J	310 J	180	62	na
	fillet (skinless)	11/11	100	46 J	150 J	66	29	na
White catfish	carcass	19/19	100	94 J	690 J	270	180	na
	fillet (skinless)	19/19	100	44 J	440 J	120	100	na
White sucker	carcass	5/5	100	80 J	190 J	130	41	na
	fillet (with skin)	5/5	100	30 J	53 J	42	8.9	na
Blue crab	carcass	24/24	100	75 J	820 J	260	200	na
	hepatopancreas only	7/7	100	110 J	1,300 J	430	410	na
	muscle only	20/21	95	34 J	110 J	56	19	9.9
	muscle/hepatopancreas	41/41	100	20 J	520 J	77	82	na
White perch	carcass	1/1	100	680 J	680 J	na	na	na
	fillet (with skin)	19/19	100	42 J	240 J	120	64	na
	whole body	19/19	100	81 J	580 J	320	130	na
American eel	carcass	2/2	100	160 J	300 J	230	99	na
	fillet (skinless)	32/32	100	27 J	370 J	120	71	na
	whole body	19/19	100	49 J	240 J	140	69	na
Largemouth bass	carcass	3/3	100	130 J	140 J	140	5.8	na
	fillet (with skin)	3/3	100	92 J	120 J	100	15	na
Northern pike	carcass	1/1	100	600 J	600 J	na	na	na
	fillet (with skin)	1/1	100	120 J	120 J	na	na	na
Smallmouth bass	carcass	3/3	100	100 J	840 J	380	400	na
	fillet (with skin)	2/3	67	71 J	77 J	74	4.2	41

[a] Only chemicals with detected results are presented. If the chemical was not detected in any samples for a given species and tissue type, the analyte is not presented in the table. Data tables that contain results for each sample, including non-detected sample results, are presented in Appendix F.

[b] A calculated sum was considered detected if one or more of the components of the sum were detected. If all components of the sum were not detected, the sum was considered not detected.

[c] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviation) include data only for detected results. Non-detected data are not included in summary statistics.

[d] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

[e] Total HPAHs were calculated as the sum of benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, and pyrene. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for more details).

[f] Total HPAHs were calculated as the sum of benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, and pyrene. Non-detected results were set equal to one-half the RL when the total concentration was calculated (see Appendix E for more details).

[g] Total HPAHs were calculated as the sum of benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, and pyrene. Non-detected results were set equal to the RL when the total concentration was calculated. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for more details).

[h] Total LPAHs were calculated as the sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for more details).

[i] Total LPAHs were calculated as the sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. Non-detected results were set equal to one-half the RL when the total concentration was calculated (see Appendix E for more details).

[j] Total LPAHs were calculated as the sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for more details).

[k] Total PAHs were calculated as the sum of acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for more details).

[l] Total PAHs were calculated as the sum of acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene. Non-detected results were set equal to one half the RL when the total concentration was calculated (see Appendix E for more details).

[m] Total PAHs were calculated as the sum of acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for more details).

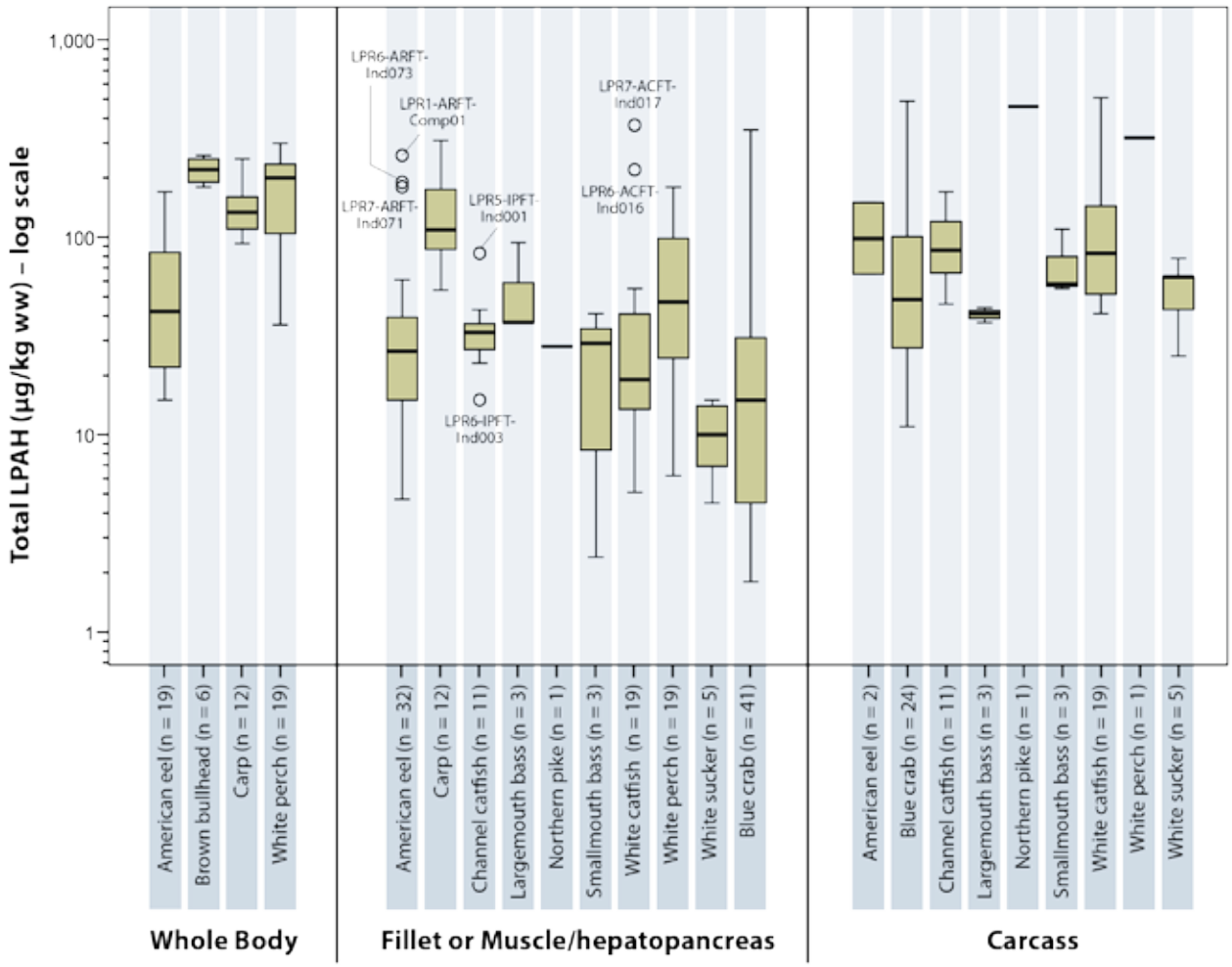
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
J – estimated concentration
LPRSA – Lower Passaic River Study Area
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
Max – maximum
Min – minimum
na – not applicable
ND – non-detected concentration
PAH – polycyclic aromatic hydrocarbon
RL – reporting limit
St Dev – standard deviation
ww – wet weight

4.3.1 LPAHs

The detection frequency for individual LPAH compounds (i.e., acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene) ranged from 0 to 100% in each species group of tissue samples (Table 4-4). Total LPAH concentrations ranged from 1.8 to 620 µg/kg ww across all fish and blue crab samples. The highest LPAH concentration (620 µg/kg ww) was measured in a blue crab hepatopancreas-only sample (LPR3-CSHT-Comp64) from Reach 3. The distributions of total LPAH concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-27.[12] The following summarize total LPAH concentrations for fish and blue crab by tissue type, as shown in Figure 4-27:

- **Fish whole body** – Total LPAHs were detected in all fish whole-body samples. Fish whole-body total LPAH concentrations ranged from 15 to 300 µg/kg ww. The highest whole-body total LPAH concentration (300 µg/kg ww) was measured in two white perch composite samples (LPR3-MAWB-Comp10 and LPR3-MAWB-Comp11) from Reach 3.
- **Fish fillet and blue crab/muscle hepatopancreas** – Total LPAHs were detected in 101 of 105 fish fillet samples and in 40 of the 41 blue crab muscle hepatopancreas samples. Fish fillet detected total LPAH concentrations ranged from 2.4 to 370 µg/kg ww, and the highest fish fillet total LPAH concentration (370 µg/kg ww) was measured in an individual white catfish fillet sample (LPR7-ACFT-Ind017) from Reach 7. Detected LPAH concentrations in blue crab muscle/hepatopancreas samples ranged from 1.8 to 350 µg/kg ww, and the highest blue crab muscle/hepatopancreas total LPAH concentration (350 µg/kg ww) was detected in a composite sample (LPR3-CSMH-Comp26) from Reach 3.
- **Fish and blue crab carcass** – Total LPAHs were detected in all fish carcass samples and in 23 of 24 blue crab carcass samples. Fish carcass total LPAH concentrations ranged from 25 to 510 µg/kg ww, and the highest fish carcass total LPAH concentration (510 µg/kg ww) was measured in an individual white catfish sample (LPR7-ACCT-Ind017) from Reach 7. Detected total LPAH concentrations in blue crab carcass samples ranged from 12 to 490 µg/kg ww, and the highest blue crab carcass total LPAH concentration (490 µg/kg ww) was measured in a composite sample (LPR4-CSCT-Comp32) from Reach 4.

[12] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.



Note: Total LPAHs were calculated as the sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. Non-detected results were set equal to zero when the total concentrations were calculated for this figure.

Figure 4-27. LPAH concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopcreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue total LPAH concentrations are shown by percentile range and reach in Figures 4-28 through 4-30, respectively. The highest American eel total LPAH concentration (260 µg/kg ww) was measured in a fillet composite sample (LPR1-ARFT-Comp01) from Reach 1 (Figure 4-28). The highest white perch total LPAH concentration (320 µg/kg ww) was measured in an individual carcass sample (LPR1-MACT-Ind145) from Reach 1 (Figure 4-29). The two highest blue crab total LPAH concentrations (620 and 490 µg/kg ww) were measured in a

hepatopancreas-only composite sample (LPR3-CSHT-Comp64) from Reach 3 and a carcass sample (LPR4-CSCT-Comp32) from Reach 4, respectively (Figure 4-30).

Dundee Dam
Comp19
Comp18
RM 17
Comp16
RM 16
Saddle River
Comp15
Reach 8
Reach 7
RM 14
Comp13
RM 15
RM 13
Ind070
Third River
Reach 7
Reach 6
RM 12
Ind069
RM 11
Ind074
Reach 6
Reach 5
RM 10
Ind039
Ind062
RM 9
Second River
Reach 5
Reach 4
RM 8
Comp11
Ind043
Ind025
RM 7
Ind024
Ind060
Reach 4
Reach 3
RM 6
Ind009
Ind012
RM 5
Ind001
RM 4
Reach 3
RM 3
Reach 2
Reach 1
RM 2
Comp03
RM 1
RM 0

Whole body tissue

Dundee Dam
Comp22
Comp21
Comp17
Comp14
RM 17
RM 16
Saddle River
Reach 8
Reach 7
RM 14
RM 15
Ind071
RM 13
Third River
Reach 7
Reach 6
RM 12
Ind073
RM 11
Ind065
Reach 6
Reach 5
RM 10
Ind040
Ind030
Comp12
Comp10
RM 9
Ind086
Second River
Ind048
Ind021
Ind049
Comp09
Reach 5
Reach 4
RM 8
Ind026
Ind044
Ind022
RM 7
Ind034
Comp07
Comp07
Comp08
Reach 4
Reach 3
RM 6
Ind010
Comp05
Ind005
Comp06
RM 5
RM 3
Comp04
Reach 2
Reach 1
RM 2
Ind014
Comp20
RM 4
Reach 3
Reach 2
Ind085
Comp02
Comp01
RM 1
RM 0

Fillet (skinless) tissue

River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

LPAH (µg/kg)	(Percentile)
> 140	(> 90th)
> 48 and ≤ 140	(> 75th and ≤ 90th)
> 29 and ≤ 48	(> 50th and ≤ 75th)
> 19 and ≤ 29	(> 25th and ≤ 50th)
≤ 19	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-28. LPAH concentrations in American eel 2009 tissue samples from the LPRSA

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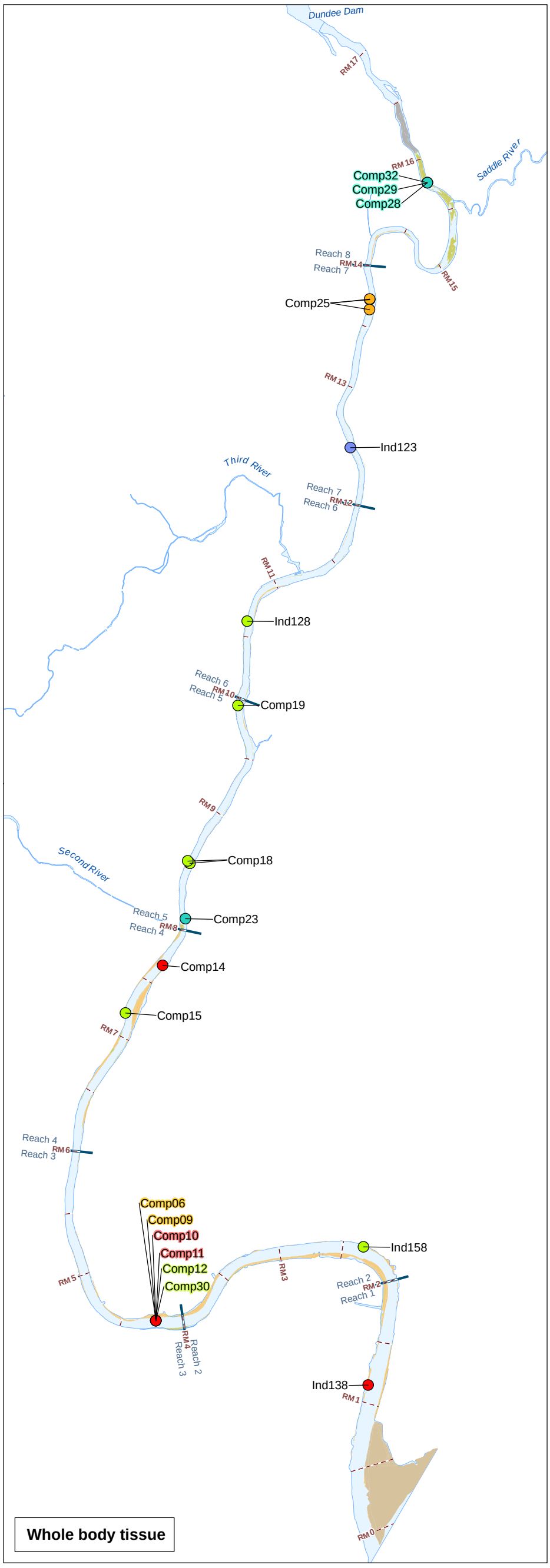

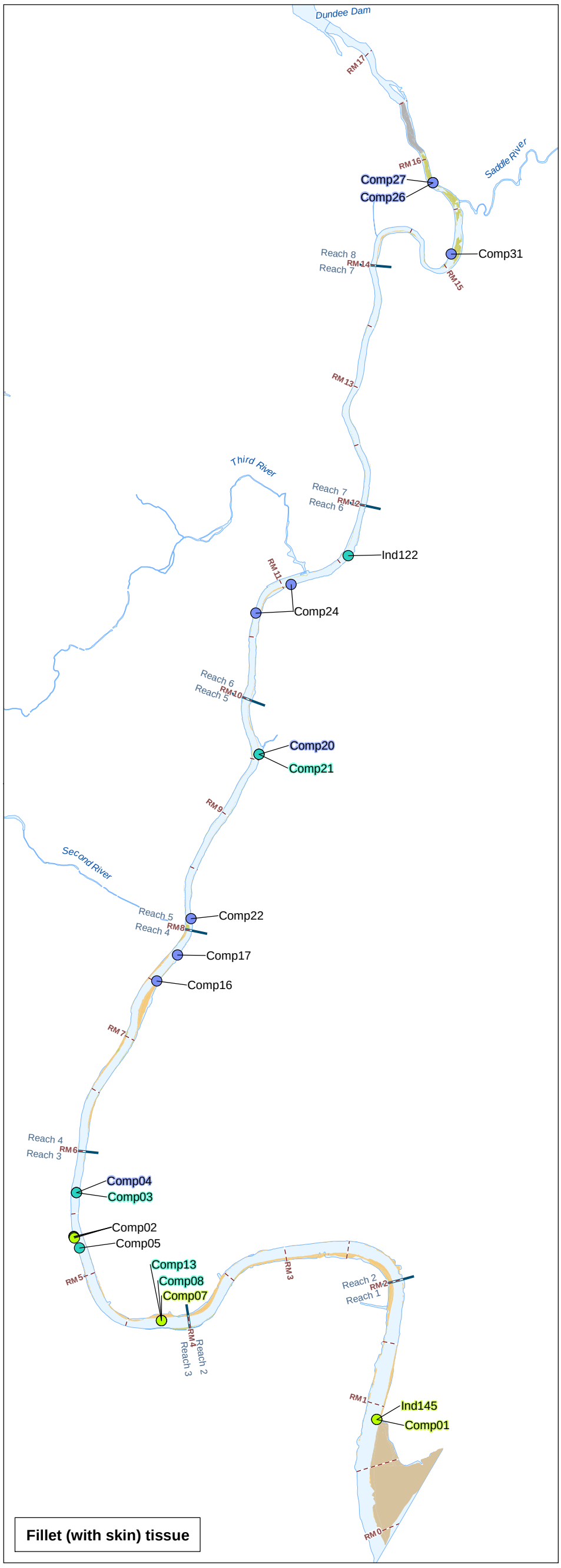

River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

LPAH (µg/kg)	(Percentile)
> 240	(> 90th)
> 200 and ≤ 240	(> 75th and ≤ 90th)
> 100 and ≤ 200	(> 50th and ≤ 75th)
> 44 and ≤ 100	(> 25th and ≤ 50th)
≤ 44	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-29. LPAH concentrations in white perch 2009 tissue samples from the LPRSA

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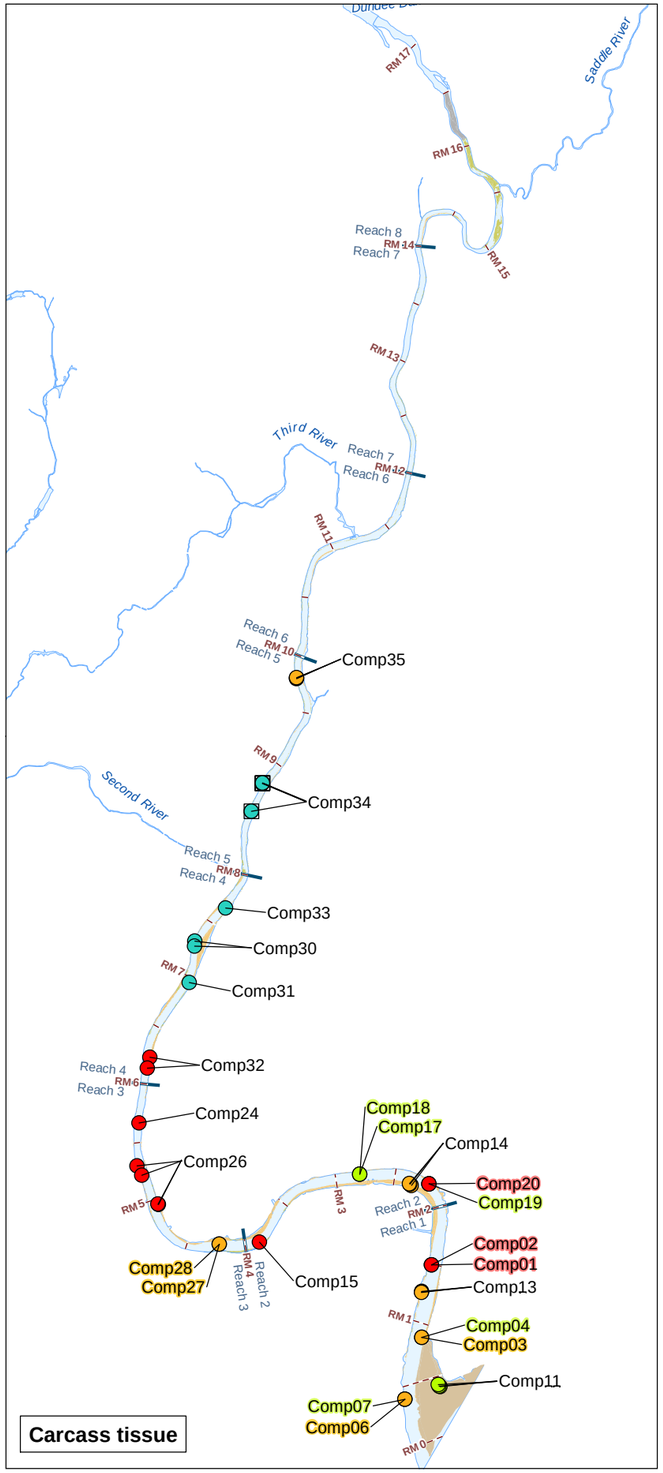

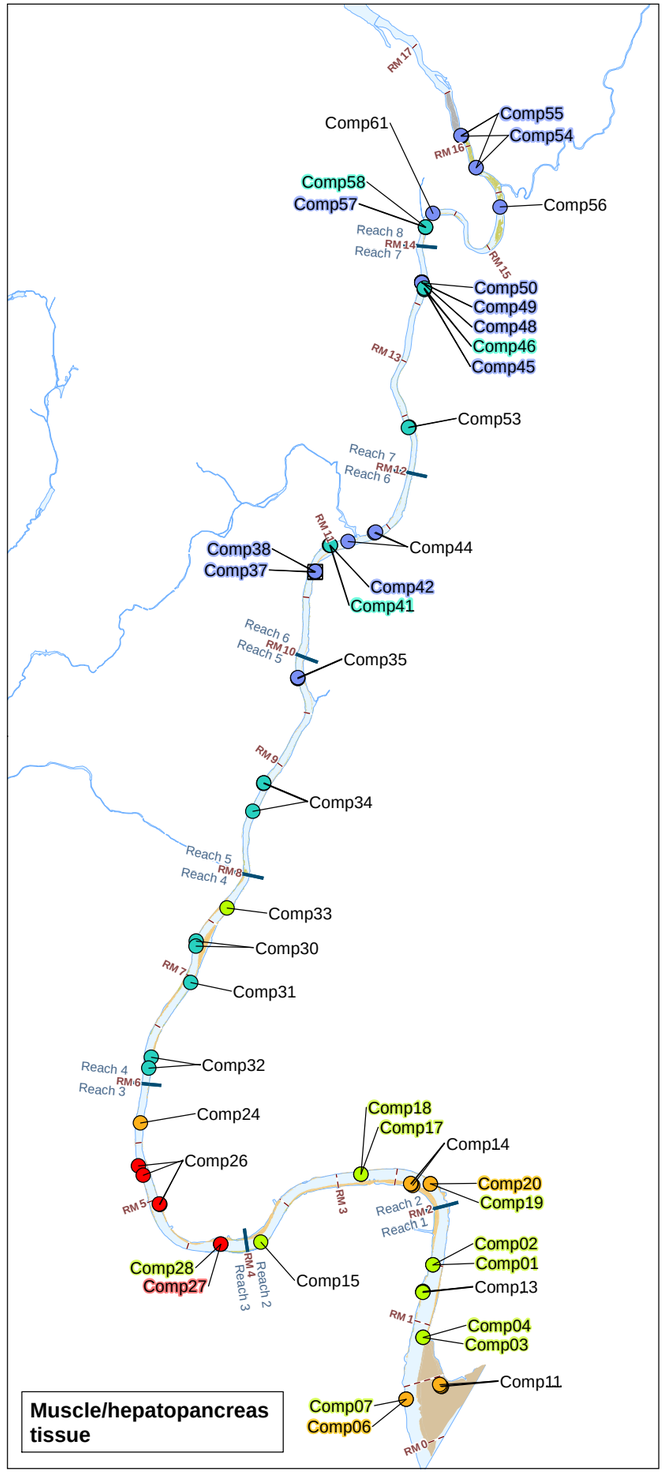

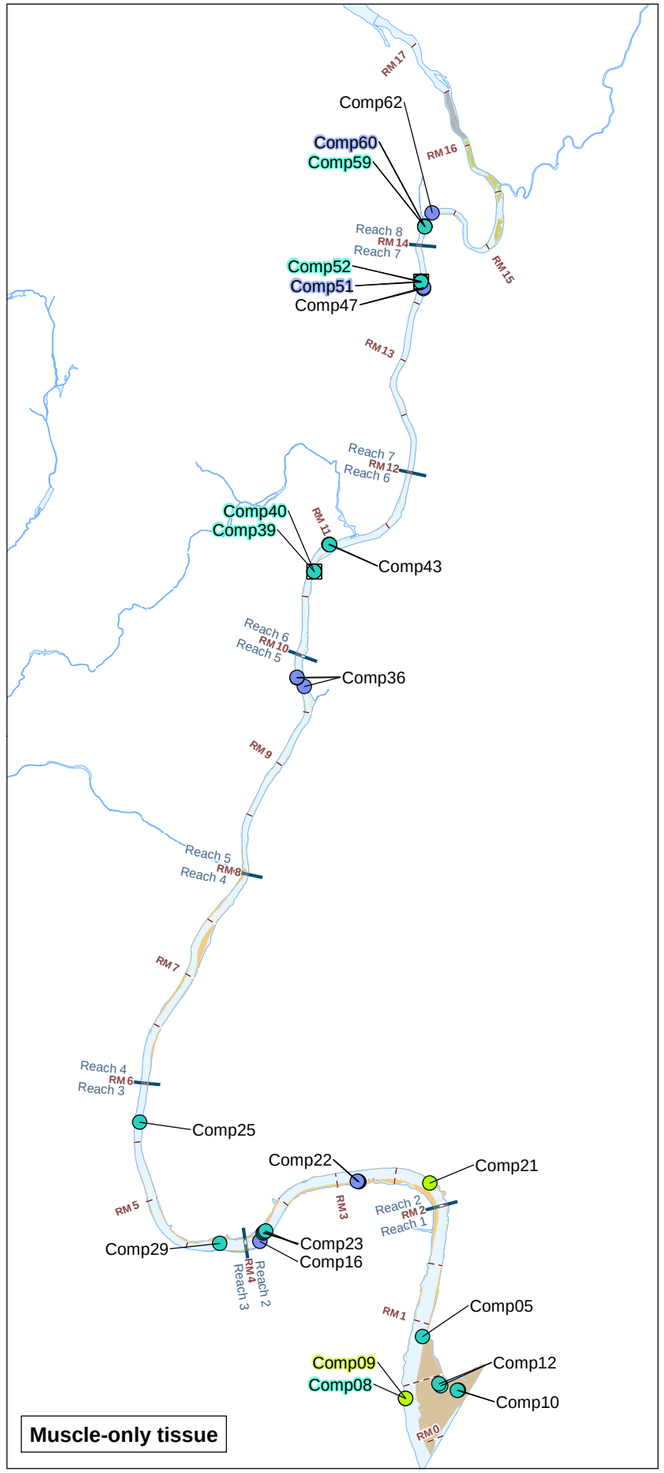

LPAH (µg/kg) | (Percentile)

- > 82 | (> 90th)
- > 33 and ≤ 82 | (> 75th and ≤ 90th)
- > 18 and ≤ 33 | (> 50th and ≤ 75th)
- > 4.7 and ≤ 18 | (> 25th and ≤ 50th)
- ≤ 4.7 | (≤ 25th)
- Non-detected

The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

N

0 1 2 Miles

- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-30. LPAH concentrations in blue crab 2009 tissue samples from the LPRSA

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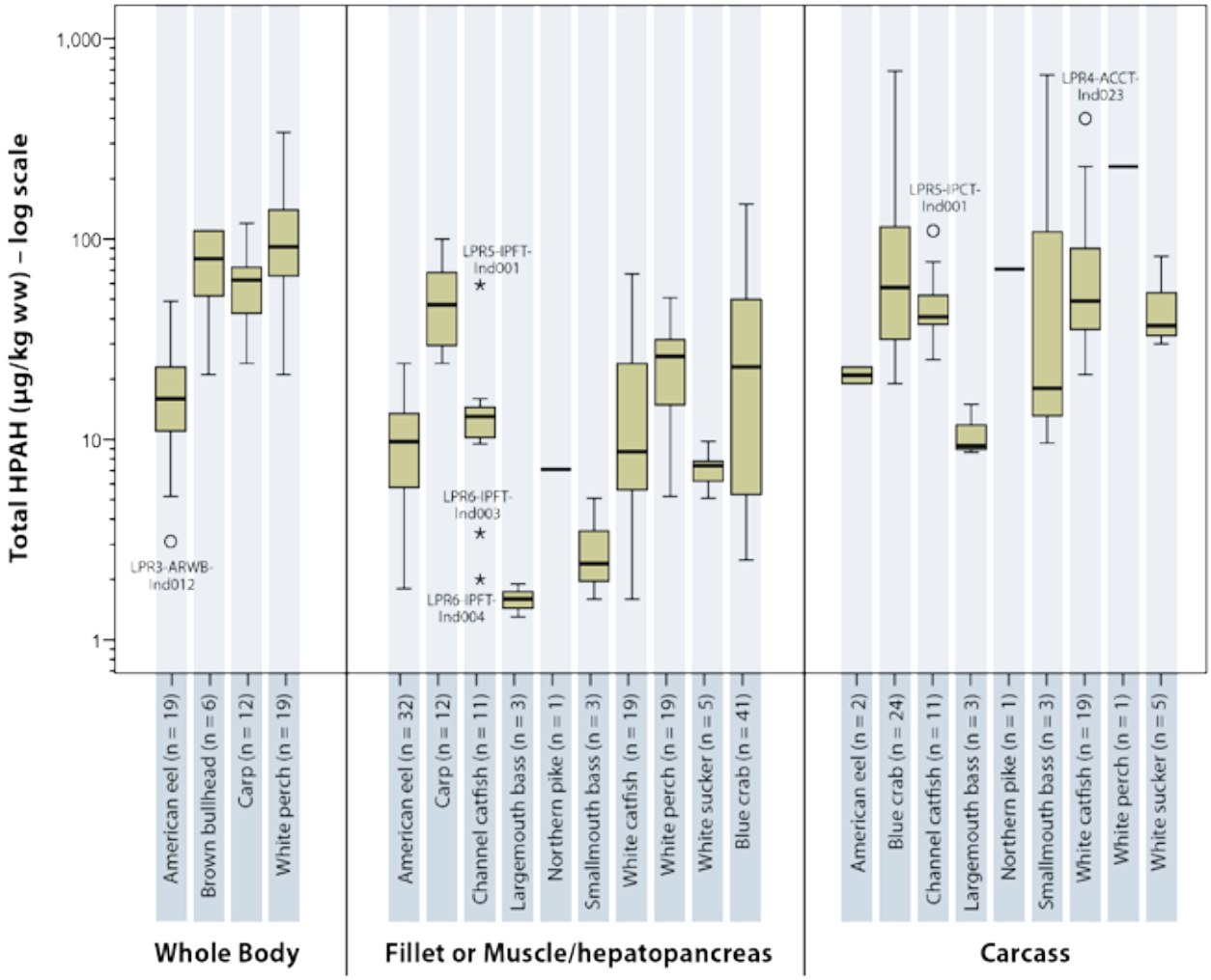
4.3.2 HPAHs

Individual HPAH compounds (i.e., benzo(a)anthrecene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene) had a detection frequency that ranged from 0 to 100% in each species group of tissue samples (Table 4-4). Total HPAH concentrations ranged from 0.91 to 690 µg/kg ww across all fish and blue crab samples. The highest total HPAH concentration (690 µg/kg ww) was measured in a blue crab carcass composite sample (LPR1-CSCT-Comp01) from Reach 1 and a blue crab hepatopancreas-only sample (LPR3-CSHT-Comp64) from Reach 3. The distributions of total HPAH concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-31.[13] The following summarize total HPAH concentrations for fish and blue crab by tissue type, as shown in Figure 4-31:

- **Fish whole body** – Total HPAHs were detected in all fish whole-body samples. Fish whole-body total HPAH concentrations ranged from 3.1 to 340 µg/kg ww. The highest whole-body total HPAH concentration (340 µg/kg ww) was measured in a white perch composite sample (LPR3-MAWB-Comp09) from Reach 3.
- **Fish fillet and blue crab muscle/hepatopancreas** – Total HPAHs were detected in 101 of 105 fish fillet samples and in all 41 of the blue crab muscle/hepatopancreas samples. Detected total HPAH concentrations ranged from 1.3 to 100 µg/kg ww in fish fillet samples, and the highest fish fillet concentration (100 µg/kg ww) was measured in two individual carp fillet samples (LPR5-CCFT-Ind181 and LPR5-CCFT-Ind184) from Reach 5. Detected total HPAH concentrations ranged from 2.5 to 150 µg/kg ww in blue crab muscle/hepatopancreas samples, and the highest total HPAH concentration (150 µg/kg ww) was measured in a composite sample (LPR3-CSMH-Comp26) from Reach 3.
- **Fish and blue crab carcass** – Total HPAHs were detected in all fish and blue crab carcass samples. Fish carcass total HPAH concentrations ranged from 8.6 to 660 µg/kg ww, and the highest fish carcass total HPAH concentration (660 µg/kg ww) was measured in a smallmouth bass composite sample (LPR8-MDCT-Comp03) from Reach 8. Blue crab carcass total HPAH concentrations ranged from 19 to 690 µg/kg ww, and the highest blue crab

[13] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

carcass total HPAH concentration (690 µg/kg ww) was measured in a composite sample (LPR1-CSCT-Comp01) from Reach 1.

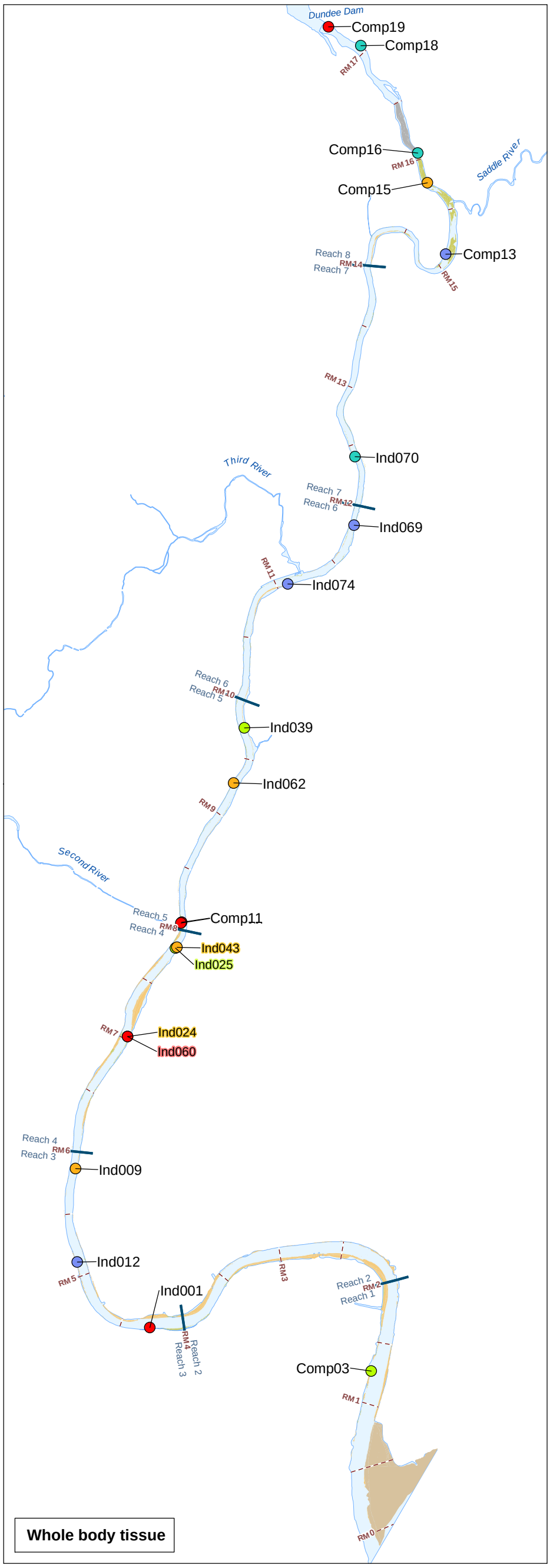


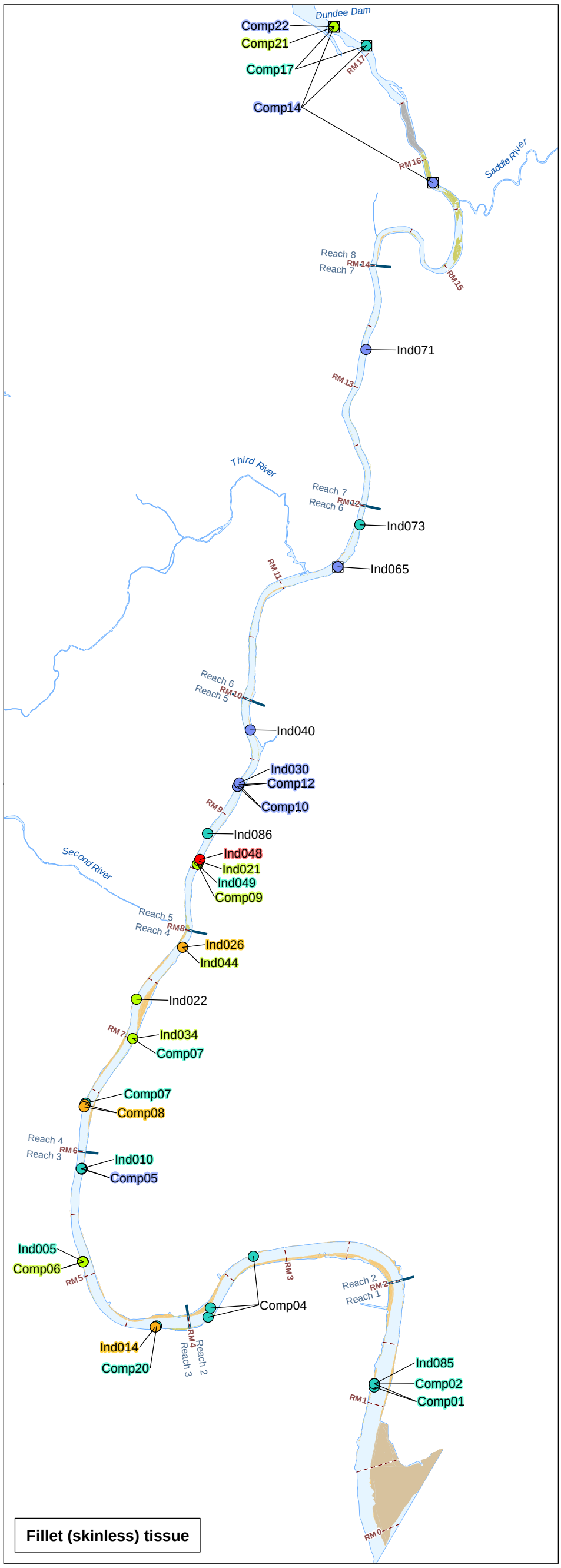
Note: Total HPAHs were calculated as the sum of benzo(a)anthracene, benzo(a)pyrene, benzo(b/j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, and pyrene. Non-detected results were set equal to zero when total concentrations were calculated for this figure.

Figure 4-31. HPAH concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue total HPAH concentrations are shown by percentile range and reach in Figures 4-32 through 4-34, respectively. The highest American eel HPAH concentration (49 µg/kg ww) was measured in a whole-body composite sample (LPR5-ARWB-Comp11) from Reach 5 (Figure 4-32). The highest white perch total HPAH concentration (340 µg/kg ww) was measured in a whole-

body composite sample (LPR3-MAWB-Comp09) from Reach 3 (Figure 4-33).The highest blue crab total HPAH concentration (690 µg/kg ww) was measured in a hepatopancreas-only composite sample (LPR3-CSHT-Comp64) from Reach 3 and a carcass composite sample (LPR1-CSCT-Comp01) from Reach 1 (Figure 4-34).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

HPAH (µg/kg)	(Percentile)
> 23	(> 90th)
> 18 and ≤ 23	(> 75th and ≤ 90th)
> 12 and ≤ 18	(> 50th and ≤ 75th)
> 6.4 and ≤ 12	(> 25th and ≤ 50th)
≤ 6.4	(≤ 25th)
Non-detected	

The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-32. HPAH concentrations in American eel 2009 tissue samples from the LPRSA

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Dundee Dam
RM17
RM16
Saddle River
Comp32
Comp29
Comp28
Reach 8
Reach 7
RM14
RM15
Comp25
RM13
Ind123
Third River
Reach 7
Reach 6
RM12
RM11
Ind128
Reach 6
Reach 5
RM10
Comp19
RM9
Second River
Comp18
Reach 5
Reach 4
RM8
Comp23
Comp14
Comp15
RM7
Reach 4
Reach 3
RM6
Comp06
Comp09
Comp10
Comp11
Comp12
Comp30
RM5
RM4
RM3
Reach 3
Reach 2
Ind158
Reach 2
Reach 1
RM2
Ind138
RM1
RM0

Whole body tissue

Dundee Dam
RM17
RM16
Saddle River
Comp27
Comp26
Reach 8
Reach 7
RM14
RM15
Comp31
RM13
Third River
Reach 7
Reach 6
RM12
RM11
Ind122
Comp24
Reach 6
Reach 5
RM10
Comp20
Comp21
RM9
Second River
Reach 5
Reach 4
RM8
Comp22
Comp17
Comp16
RM7
Reach 4
Reach 3
RM6
Comp04
Comp03
Comp02
Comp05
Comp13
Comp08
Comp07
RM5
RM4
RM3
Reach 3
Reach 2
Reach 2
Reach 1
RM2
Ind145
Comp01
RM1
RM0

Fillet (with skin) tissue

- River mile
- Sampling reach boundary
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data
- LPRSA

N

0 0.5 1 Miles

HPAH (µg/kg)	(Percentile)
> 140	(> 90th)
> 84 and ≤ 140	(> 75th and ≤ 90th)
> 45 and ≤ 84	(> 50th and ≤ 75th)
> 25 and ≤ 45	(> 25th and ≤ 50th)
≤ 25	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-33. HPAH concentrations in white perch 2009 tissue samples from the LPRSA

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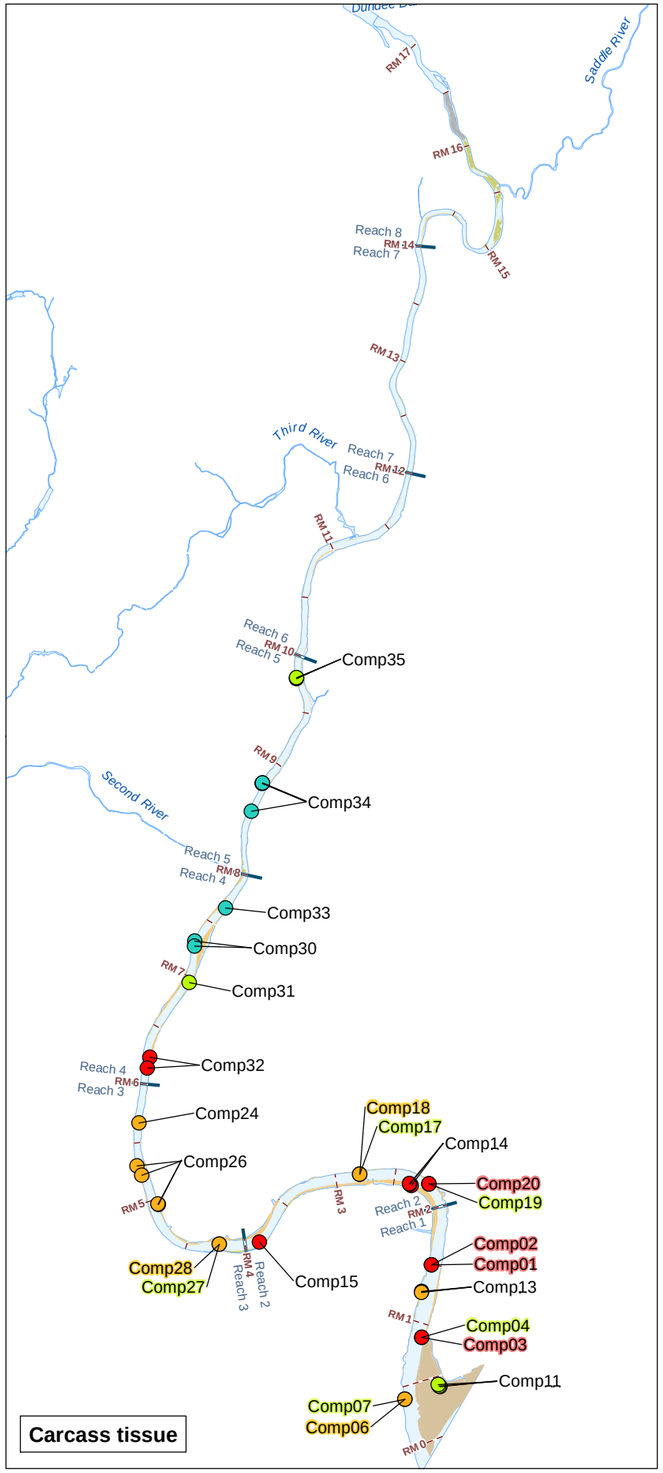
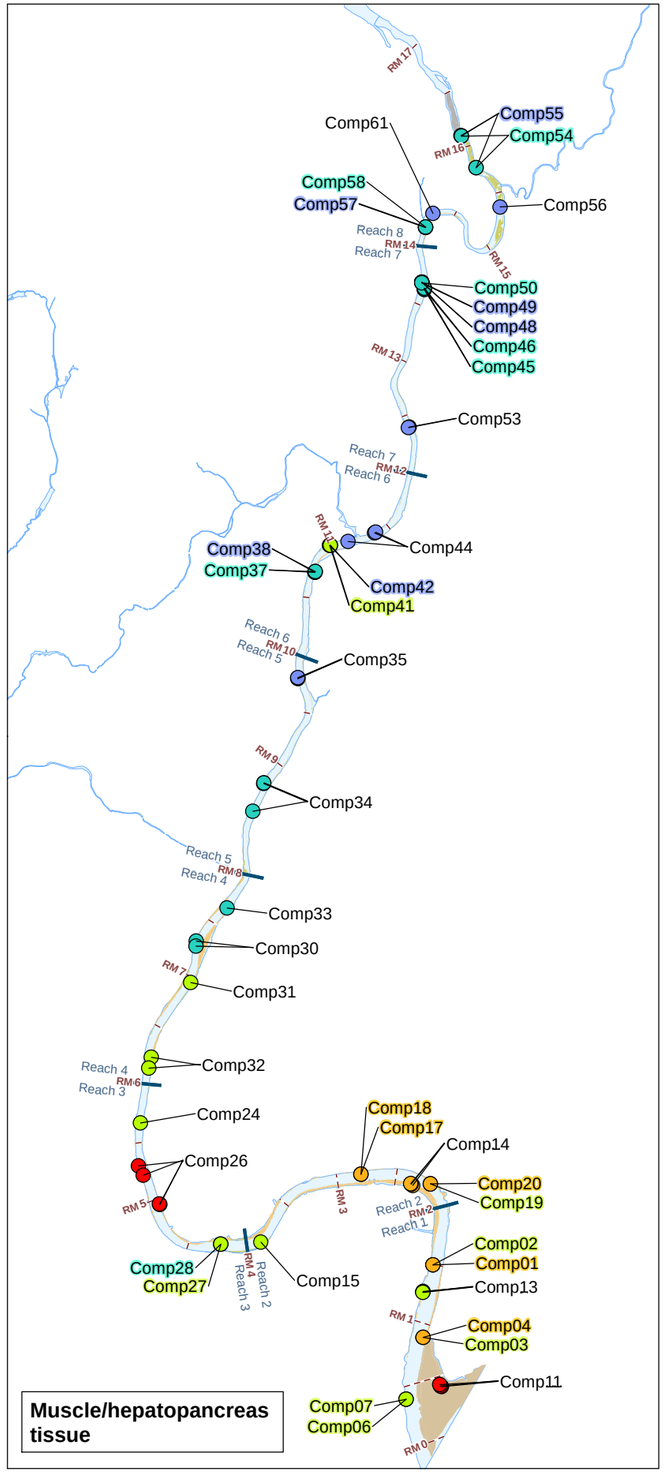
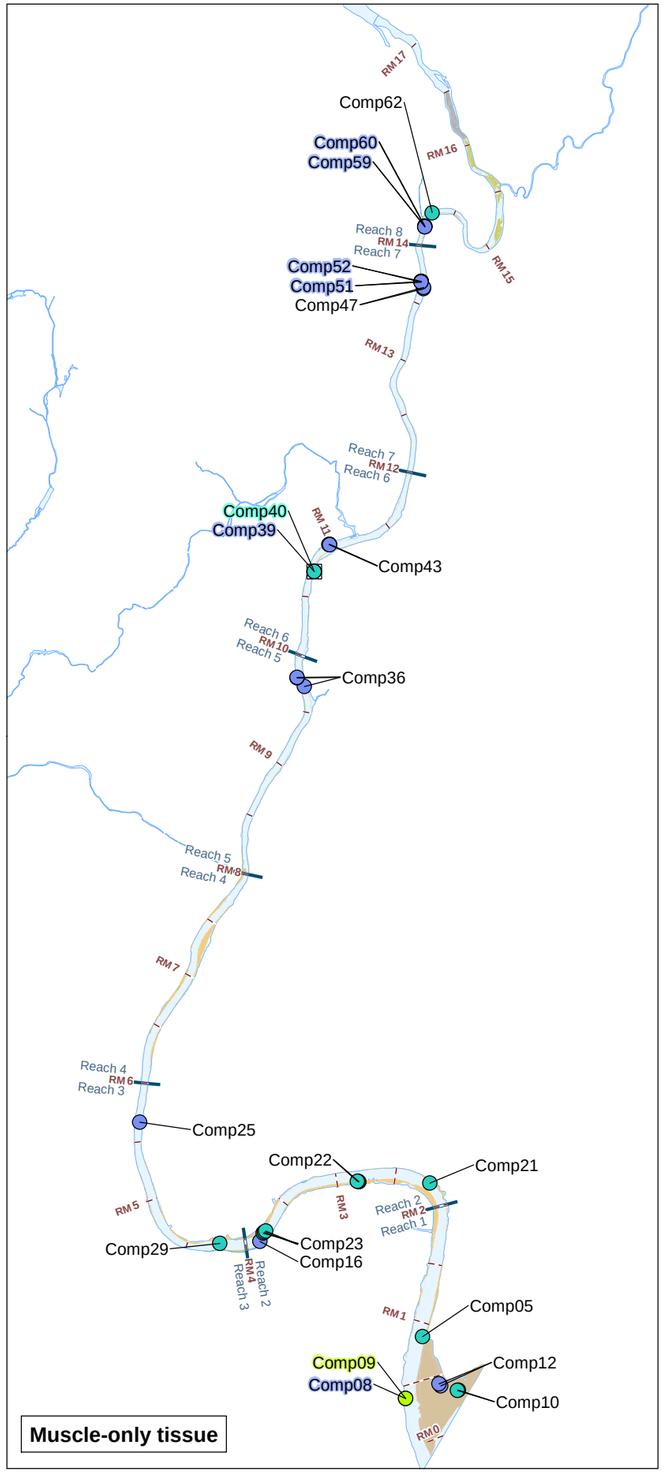
Prepared by LSM 4/28/2011, map 4654; W:\Projects\06-58-01 Passaic RI\Data\GIS\Maps_and_Analysis\FishData







HPAH (µg/kg) (Percentile)

- > 100 (> 90th)
- > 56 and ≤ 100 (> 75th and ≤ 90th)
- > 23 and ≤ 56 (> 50th and ≤ 75th)
- > 5.3 and ≤ 23 (> 25th and ≤ 50th)
- ≤ 5.3 (≤ 25th)
- Non-detected

The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

N

0 1 2 Miles

- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-34. HPAH concentrations in blue crab 2009 tissue samples from the LPRSA

FINAL

Wind Ward environmental LLC

Prepared by LSM 5/10/2011, map 4653: W:\Projects\06-58-01 Passaic R\Data\GIS\deliverInternal\FishTissue

4.3.3 Alkylated PAHs

Table 4-5 presents a summary of the alkylated PAHs detected in each tissue type, including the number of detections, the range of detected concentrations, and the RL or range of RLs for samples reported as non-detects. Data tables that contain alkylated PAH concentrations for each sample, including non-detected sample results, are presented in Appendix F.

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C1-Benzanthracene/Chrysenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	0.46 J	1.7	1.1	0.55	na
Carp	fillet (with skin)	1/12	8	2.8	2.8	na	na	0.84 – 0.97
	whole body	11/12	92	0.53 J	1.9	0.84	0.42	0.81
Channel catfish	carcass	10/11	91	0.49 J	2.5 J	1.1	0.64	0.94
White catfish	carcass	10/19	53	0.48 J	6.2	1.9	2.1	0.85 – 0.96
White sucker	carcass	5/5	100	0.59 J	7.4 J	2.6	2.9	na
Blue crab	carcass	24/24	100	1 J	25 J	5.6	5.1	na
	hepatopancreas only	7/7	100	1 J	16 J	7.7	5.8	na
	muscle only	6/21	29	0.6 J	1 J	0.77	0.15	0.9 – 1
	muscle/hepatopancreas	37/41	91	0.4 J	6 J	1.3	1.2	0.9 – 1
White perch	carcass	1/1	100	0.92	0.92	na	na	na
	whole body	15/19	79	0.62 J	10	1.9	2.3	0.85 – 0.9
American eel	whole body	6/19	32	0.5 J	1.6	0.98	0.45	0.85 – 0.99
Smallmouth bass	carcass	2/3	67	0.51 J	15	7.8	10	0.99
C1-Dibenzothiophenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	1.6 J	11 J	6.8	4.0	na
Carp	fillet (with skin)	12/12	100	1.0 J	8.6 J	2.8	2.1	na
	whole body	12/12	100	4.1 J	12 J	7.3	2.2	na
Channel catfish	carcass	11/11	100	1.8 J	5.8 J	3.5	1.2	na
	fillet (skinless)	10/11	91	0.64 J	3.8 J	1.5	0.88	1
White catfish	carcass	19/19	100	1.1 J	15 J	3.4	3.2	na
	fillet (skinless)	16/19	84	0.55 J	4.7 J	1.3	1.0	0.91 – 0.95
White sucker	carcass	5/5	100	1.1 J	2.7 J	2.0	0.68	na
	fillet (with skin)	3/5	60	0.47 J	0.52 J	0.49	0.029	0.89 – 0.91
Blue crab	carcass	14/24	58	0.5 J	2 J	0.81	0.39	0.9 – 1
	hepatopancreas only	7/7	100	0.5 J	9 J	3.1	2.9	na
	muscle/hepatopancreas	13/41	32	0.5 J	1 J	0.69	0.17	0.9 – 1

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C1-Dibenzothiophenes (µg/kg ww) (cont.)								
White perch	carcass	1/1	100	12 J	12 J	na	na	na
	fillet (with skin)	18/19	95	0.70 J	3.8 J	1.6	0.91	0.9
	whole body	19/19	100	1.0 J	13 J	5.3	3.8	na
American eel	carcass	2/2	100	0.97 J	1.1 J	1.0	0.092	na
	fillet (skinless)	31/32	97	0.44 J	1.3 J	0.71	0.21	0.97
	whole body	18/19	95	0.50 J	1.8 J	1.0	0.43	0.97
Largemouth bass	carcass	3/3	100	0.82 J	10 J	3.9	5.3	na
	fillet (with skin)	1/3	33	0.49 J	0.49 J	na	na	0.93 – 0.96
Northern pike	carcass	1/1	100	13 J	13 J	na	na	na
	fillet (with skin)	1/1	100	0.57 J	0.57 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.90 J	1.2 J	1.1	0.15	na
C1-Fluorenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	2.6	9.9	6.5	2.6	na
Carp	fillet (with skin)	12/12	100	1.9	8.4	4.5	1.9	na
	whole body	12/12	100	2.9	10	5.5	2.3	na
Channel catfish	carcass	11/11	100	2.3 J	10 J	5.6	2.4	na
	fillet (skinless)	11/11	100	0.61 J	5.2	1.8	1.2	na
White catfish	carcass	19/19	100	1.6	21	5.8	4.7	na
	fillet (skinless)	19/19	100	0.57 J	7.8	1.8	1.6	na
White sucker	carcass	5/5	100	1.2 J	5.4 J	3.1	1.7	na
	fillet (with skin)	3/5	60	0.62 J	0.70 J	0.66	0.040	0.91 – 0.92
Blue crab	carcass	21/24	88	0.5 J	3 J	1.2	0.74	1
	hepatopancreas only	7/7	100	0.7 J	13 J	4.7	4.2	na
	muscle only	2/21	9	0.5 J	0.5 J	na	na	0.9 – 1
	muscle/hepatopancreas	19/41	46	0.5 J	3 J	0.97	0.60	0.9 – 1
White perch	carcass	1/1	100	24	24	na	na	na
	fillet (with skin)	19/19	100	0.79 J	9.8 J	3.5	2.4	na
	whole body	19/19	100	3.0 J	18	10	4.7	na
American eel	carcass	2/2	100	2.6	2.7	2.7	0.071	na
	fillet (skinless)	32/32	100	0.49 J	2.7	1.3	0.58	na
	whole body	19/19	100	0.64 J	3.8	1.8	0.88	na
Largemouth bass	carcass	3/3	100	1.8	2.3	2.0	0.29	na
Northern pike	carcass	1/1	100	9.8	9.8	na	na	na
	fillet (with skin)	1/1	100	1.1	1.1	na	na	na

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C1-Fluorenes (µg/kg ww) (cont.)								
Smallmouth bass	carcass	3/3	100	1.5	2.6	2.2	0.59	na
C1-Phenanthrene/anthracenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	5.0	18	11	4.3	na
Carp	fillet (with skin)	12/12	100	3.8	30	8.9	7.1	na
	whole body	12/12	100	4.7	18	8.6	3.9	na
Channel catfish	carcass	11/11	100	4.1 J	13 J	8.5	2.7	na
	fillet (skinless)	11/11	100	0.92 J	8.5	2.8	2.0	na
White catfish	carcass	19/19	100	3.7	29	8.9	7.0	na
	fillet (skinless)	19/19	100	0.65 J	11	2.5	2.3	na
White sucker	carcass	5/5	100	2.5 J	7.8 J	4.5	2.2	na
	fillet (with skin)	4/5	80	0.55 J	0.80 J	0.65	0.11	0.91
Blue crab	carcass	24/24	100	1 J	24 J	5.3	5.3	na
	hepatopancreas only	7/7	100	2 J	35 J	9.0	12	na
	muscle only	10/21	48	0.5 J	1 J	0.64	0.14	0.9 – 1
	muscle/hepatopancreas	40/41	98	0.5 J	6 J	1.5	1.3	0.9
White perch	carcass	1/1	100	21	21	na	na	na
	fillet (with skin)	19/19	100	1.1	11 J	3.8	2.5	na
	whole body	19/19	100	3.6 J	24 J	13	6.9	na
American eel	carcass	2/2	100	2.6	3.3	3.0	0.49	na
	fillet (skinless)	32/32	100	0.63 J	3.2	1.6	0.61	na
	whole body	19/19	100	0.83 J	5.7	2.4	1.4	na
Largemouth bass	carcass	3/3	100	1.6	2.5	1.9	0.49	na
Northern pike	carcass	1/1	100	11	11	na	na	na
	fillet (with skin)	1/1	100	1.6	1.6	na	na	na
Smallmouth bass	carcass	3/3	100	1.7	8.7	4.3	3.9	na
C1-Pyrene/fluoranthenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	4.3	11	7.7	3.1	na
Carp	fillet (with skin)	12/12	100	2.0	18	6.2	4.3	na
	whole body	12/12	100	3.6	11	6.5	2.4	na
Channel catfish	carcass	11/11	100	2.7 J	5.6 J	4.2	0.90	na
	fillet (skinless)	11/11	100	0.59 J	2.7	1.2	0.61	na
White catfish	carcass	19/19	100	2.0	27	6.3	5.7	na
	fillet (skinless)	19/19	100	0.55 J	3.9	1.5	0.99	na

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C1-Pyrene/fluoranthenes (µg/kg ww) (cont.)								
White sucker	carcass	5/5	100	2.5 J	11 J	5.2	3.5	na
	fillet (with skin)	3/5	60	0.42 J	0.68 J	0.59	0.14	0.89 – 0.91
Blue crab	carcass	24/24	100	4 J	90 J	18	18	na
	hepatopancreas only	7/7	100	7 J	87 J	42	30	na
	muscle only	21/21	100	0.7 J	6 J	2.1	1.5	na
	muscle/hepatopancreas	41/41	100	1 J	18 J	4.8	4.1	na
White perch	carcass	1/1	100	24	24	na	na	na
	fillet (with skin)	19/19	100	0.68 J	6.3 J	2.8	1.7	na
	whole body	19/19	100	1.8 J	38	11	8.0	na
American eel	carcass	2/2	100	2.1	2.4	2.3	0.21	na
	fillet (skinless)	32/32	100	0.61 J	2.4	1.3	0.45	na
	whole body	19/19	100	0.89	4.5	2.2	1.1	na
Largemouth bass	carcass	3/3	100	1.6	3.5	2.3	1.1	na
	fillet (with skin)	1/3	33	0.51 J	0.51 J	na	na	0.96 – 0.97
Northern pike	carcass	1/1	100	4.4	4.4	na	na	na
	fillet (with skin)	1/1	100	0.59 J	0.59 J	na	na	na
Smallmouth bass	carcass	3/3	100	1.9	36	14	19	na
C2-Benzanthracene/chrysenes (µg/kg ww)								
Brown bullhead	whole body	5/6	83	1.0	1.4	1.2	0.15	0.91
Carp	fillet (with skin)	1/12	8	6.7	6.7	na	na	0.84 – 0.97
	whole body	12/12	100	0.54 J	2.5	1.2	0.62	na
Channel catfish	carcass	10/11	91	0.85 J	3.6 J	1.7	0.99	0.92
White catfish	carcass	7/19	37	0.98	4.0	2.1	1.3	0.85 – 0.96
White sucker	carcass	5/5	100	0.66 J	4.2 J	2.1	1.5	na
Blue crab	carcass	24/24	100	0.8 J	9 J	2.9	1.9	na
	hepatopancreas only	7/7	100	0.9 J	13 J	6.4	4.8	na
	muscle only	5/21	24	0.6 J	0.9 J	0.68	0.13	0.9 – 1
	muscle/hepatopancreas	16/41	39	0.5 J	3 J	1.4	0.72	0.9 – 1
White perch	carcass	1/1	100	0.46 J	0.46 J	na	na	na
	whole body	14/19	74	0.76 J	4.5	1.3	0.96	0.85 – 0.96
Smallmouth bass	carcass	2/3	67	0.82 J	5.0	2.9	3.0	0.99

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C2-Dibenzothiophenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	2.4 J	12 J	6.0	3.5	na
Carp	fillet (with skin)	12/12	100	2.2 J	16 J	5.2	4.0	na
	whole body	12/12	100	1.9 J	13 J	5.8	2.9	na
Channel catfish	carcass	11/11	100	3.1 J	7.5 J	4.6	1.3	na
	fillet (skinless)	10/11	91	0.61 J	3.1 J	1.2	0.74	1
White catfish	carcass	19/19	100	1.7 J	11 J	4.2	2.3	na
	fillet (skinless)	19/19	100	0.48 J	4.0 J	1.3	0.94	na
White sucker	carcass	5/5	100	1.8 J	4.4 J	3.0	1.0	na
	fillet (with skin)	3/5	60	0.47 J	0.60 J	0.52	0.068	0.89 – 0.91
Blue crab	carcass	23/24	96	0.6 J	4 J	1.5	0.89	1
	hepatopancreas only	7/7	100	1 J	11 J	5.1	3.9	na
	muscle only	2/21	10	0.6 J	1 J	0.80	0.28	0.9 – 1
	muscle/hepatopancreas	35/41	85	0.5 J	3 J	1.0	0.62	0.9 – 1
White perch	carcass	1/1	100	8.5 J	8.5 J	na	na	na
	fillet (with skin)	19/19	100	0.51 J	4.7 J	1.8	1.1	na
	whole body	19/19	100	1.1 J	8.9 J	5.6	2.7	na
American eel	carcass	2/2	100	1.1 J	1.3 J	1.2	0.14	na
	fillet (skinless)	30/32	94	0.45 J	1.3 J	0.74	0.21	0.91 – 0.97
	whole body	19/19	100	0.47 J	2.2 J	1.0	0.46	na
Largemouth bass	carcass	3/3	100	0.73 J	1.4 J	1.2	0.39	na
	fillet (with skin)	1/3	33	0.95 J	0.95 J	na	na	0.93 – 0.96
Northern pike	carcass	1/1	100	4.8 J	4.8 J	na	na	na
	fillet (with skin)	1/1	100	1.1 J	1.1 J	na	na	na
Smallmouth bass	carcass	3/3	100	2.1 J	2.4 J	2.2	0.15	na
	fillet (with skin)	2/3	67	0.61 J	0.90 J	0.76	0.21	0.93
C2-Fluorenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	2.9	13	7.6	3.8	na
Carp	fillet (with skin)	12/12	100	2.5	25	6.6	6.2	na
	whole body	12/12	100	2.8	17	7.5	4.5	na
Channel catfish	carcass	11/11	100	2.5 J	9.0 J	4.7	1.8	na
	fillet (skinless)	9/11	82	0.72 J	4.8	1.7	1.2	0.89 – 1
White catfish	carcass	19/19	100	1.7	15	5.0	3.3	na
	fillet (skinless)	17/19	90	0.62 J	6.4	1.8	1.4	0.92 – 0.95
White sucker	carcass	5/5	100	2.0 J	4.1 J	3.1	0.77	na

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C2-Fluorenes (µg/kg ww) (cont.)								
Blue crab	carcass	21/24	88	0.6 J	4 J	1.6	0.90	1
	hepatopancreas only	7/7	100	2 J	16 J	8.6	5.3	na
	muscle only	3/21	14	0.5 J	0.7 J	0.60	0.10	0.9 – 1
	muscle/hepatopancreas	16/41	39	0.7 J	3 J	1.6	0.76	0.9 – 1
White perch	carcass	1/1	100	21	21	na	na	na
	fillet (with skin)	19/19	100	0.75 J	9.4 J	3.1	2.1	na
	whole body	19/19	100	2.2 J	16	8.9	4.3	na
American eel	carcass	2/2	100	2.4	2.7	2.6	0.21	na
	fillet (skinless)	32/32	100	0.62 J	2.8	1.4	0.54	na
	whole body	17/19	90	0.78 J	3.9	2.1	0.87	0.89 – 0.97
Largemouth bass	carcass	3/3	100	1.6	2.2	1.9	0.31	na
Northern pike	carcass	1/1	100	10	10	na	na	na
	fillet (with skin)	1/1	100	1.3	1.3	na	na	na
Smallmouth bass	carcass	3/3	100	2.3	3.2	2.7	0.47	na
C2-Naphthalenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	15 J	47 J	29	14	na
Carp	fillet (with skin)	12/12	100	7.8 J	64 J	22	14	na
	whole body	12/12	100	12 J	46 J	23	10	na
Channel catfish	carcass	11/11	100	11 J	46 J	29	10	na
	fillet (skinless)	11/11	100	2.8	17	9.0	4.0	na
White catfish	carcass	19/19	100	5.3	84	28	20	na
	fillet (skinless)	19/19	100	2.2	31	8.1	6.9	na
White sucker	carcass	5/5	100	5.1 J	30 J	15	10	na
	fillet (with skin)	5/5	100	1.1	3.8	2.4	1.2	na
Blue crab	carcass	24/24	100	2 J	11 J	5.0	2.3	na
	hepatopancreas only	7/7	100	4 J	60 J	16	20	na
	muscle only	21/21	100	0.6 J	3 J	1.6	1.0	na
	muscle/hepatopancreas	41/41	100	0.7 J	19 J	2.7	3.0	na
White perch	carcass	1/1	100	42 J	42 J	na	na	na
	fillet (with skin)	19/19	100	1.6	25 J	7.4	6.2	na
	whole body	19/19	100	4.7 J	45 J	23	13	na
American eel	carcass	2/2	100	5.9	14	10	5.7	na
	fillet (skinless)	32/32	100	1.0	15	4.1	2.8	na
	whole body	19/19	100	2.0	16	5.4	3.4	na

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C2-Naphthalenes (µg/kg ww) (cont.)								
Largemouth bass	carcass	3/3	100	7.8	17	11	5.1	na
	fillet (with skin)	3/3	100	1.2	2.2	1.5	0.58	na
Northern pike	carcass	1/1	100	55	55	na	na	na
	fillet (with skin)	1/1	100	7.7	7.7	na	na	na
Smallmouth bass	carcass	3/3	100	5.4	15	10	4.8	na
	fillet (with skin)	3/3	100	0.93 J	2.1	1.5	0.59	na
C2-Phenanthrene/anthracenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	5.7	15	9.4	3.4	na
Carp	fillet (with skin)	12/12	100	3.6	35	9.8	8.8	na
	whole body	12/12	100	5.9	16	9.8	3.6	na
Channel catfish	carcass	11/11	100	4.1 J	8.3 J	6.0	1.4	na
	fillet (skinless)	11/11	100	0.61 J	3.8	1.5	0.99	na
White catfish	carcass	19/19	100	2.5	12	5.6	2.6	na
	fillet (skinless)	19/19	100	0.59 J	4.8	1.7	1.2	na
White sucker	carcass	5/5	100	2.8 J	7.0 J	5.0	1.6	na
	fillet (with skin)	3/5	60	0.42 J	0.52 J	0.48	0.055	0.89 – 0.91
Blue crab	carcass	24/24	100	1 J	16 J	4.9	3.2	na
	hepatopancreas only	7/7	100	6 J	34 J	15	10	na
	muscle only	11/21	52	0.6 J	2 J	0.89	0.38	0.9 – 1
	muscle/hepatopancreas	41/41	100	0.9 J	7 J	2.5	1.6	na
White perch	carcass	1/1	100	14	14	na	na	na
	fillet (with skin)	19/19	100	0.92	6.7 J	2.7	1.5	na
	whole body	19/19	100	1.9 J	14	8.3	3.9	na
American eel	carcass	2/2	100	2.4	2.9	2.7	0.35	na
	fillet (skinless)	32/32	100	0.61 J	3.0	1.6	0.54	na
	whole body	19/19	100	1.2	4.3	2.5	1.0	na
Largemouth bass	carcass	3/3	100	2.1	3.9	3.0	0.90	na
	fillet (with skin)	1/3	33	0.98	0.98	0.98	na	0.93 – 0.96
Northern pike	carcass	1/1	100	7.4	7.4	na	na	na
	fillet (with skin)	1/1	100	1.2	1.2	na	na	na
Smallmouth bass	carcass	3/3	100	2.8	8.8	5.0	3.3	na
	fillet (with skin)	1/3	33	0.75 J	0.75 J	na	na	0.93 – 0.95

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C3-Benzanthracene/chrysenes (µg/kg ww)								
Carp	whole body	1/12	8	1.1	1.1	na	na	0.74 – 0.99
Channel catfish	carcass	7/11	64	1.4 J	4.6 J	2.7	1.4	0.92 – 0.95
White catfish	carcass	4/19	21	2.4 J	3.6	3.2	0.56	0.85 – 0.97
White sucker	carcass	4/5	80	1.8 J	4.4 J	3.0	1.4	0.88
Blue crab	carcass	17/24	71	1 J	6 J	2.8	1.1	0.9 – 1
	hepatopancreas only	7/7	100	2 J	14 J	6.9	4.8	na
	muscle/hepatopancreas	5/41	12	1 J	3 J	1.8	0.84	0.8 – 1
White perch	whole body	1/19	5	3.0	3.0	na	na	0.85 – 0.98
Smallmouth bass	carcass	1/3	33	5.4	5.4	na	na	0.92 – 0.99
C3-Dibenzothiophenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	3.1 J	13 J	6.6	3.9	na
Carp	fillet (with skin)	12/12	100	2.3 J	25 J	7.1	6.5	na
	whole body	12/12	100	2.5 J	15 J	7.3	3.8	na
Channel catfish	carcass	11/11	100	3.6 J	11 J	6.2	2.1	na
	fillet (skinless)	2/11	18	1.1 J	2.5 J	1.8	0.99	0.86 – 1
White catfish	carcass	19/19	100	1.8 J	8.1 J	4.5	2.0	na
	fillet (skinless)	10/19	53	1.0 J	3.6 J	2.2	0.95	0.86 – 0.97
White sucker	carcass	5/5	100	3.5 J	6.5 J	4.6	1.3	na
Blue crab	carcass	24/24	100	0.9 J	4 J	2.2	1.1	na
	hepatopancreas only	7/7	100	2 J	19 J	8.6	6.1	na
	muscle only	11/21	53	0.5 J	2 J	0.78	0.44	0.9 – 1
	muscle/hepatopancreas	33/41	81	0.7 J	6 J	2.0	1.2	0.9 – 1
White perch	carcass	1/1	100	9.7 J	9.7 J	na	na	na
	fillet (with skin)	18/19	95	1.0 J	5.8 J	2.3	1.3	0.9
	whole body	19/19	100	1.1 J	10 J	6.4	2.9	na
American eel	carcass	2/2	100	1.6 J	2.0 J	1.8	0.28	na
	fillet (skinless)	31/32	97	0.66 J	1.9 J	1.1	0.30	0.97
	whole body	19/19	100	0.75 J	2.7 J	1.5	0.53	na
Largemouth bass	carcass	2/3	67	1.3 J	3.1 J	2.2	1.3	0.92
	fillet (with skin)	1/3	33	1.7 J	1.7 J	na	na	0.93 – 0.96
Northern pike	carcass	1/1	100	6.2 J	6.2 J	na	na	na
	fillet (with skin)	1/1	100	1.5 J	1.5 J	na	na	na
Smallmouth bass	carcass	3/3	100	1.8 J	4.2 J	3.2	1.3	na
	fillet (with skin)	2/3	67	1.2 J	1.3 J	1.3	0.071	0.93

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C3-Fluorenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	6.8	20	12	4.9	na
Carp	fillet (with skin)	12/12	100	4.2	52	13	13	na
	whole body	12/12	100	6.1	22	12	5.2	na
Channel catfish	carcass	11/11	100	5.9 J	13 J	8.9	2.6	na
	fillet (skinless)	3/11	27	2.4	4.7	3.3	1.2	0.84 – 1
White catfish	carcass	19/19	100	3.9	19	8.6	3.9	na
	fillet (skinless)	11/19	58	1.7	7.4	4.0	1.8	0.86 – 0.97
White sucker	carcass	5/5	100	4.7 J	9.9 J	7.5	2.1	na
Blue crab	carcass	17/24	71	3 J	6 J	3.9	0.90	0.9 – 1
	hepatopancreas only	7/7	100	8 J	29 J	16	8.1	na
	muscle only	2/21	10	2 J	2 J	na	na	0.9 – 1
	muscle/hepatopancreas	13/41	32	3 J	8 J	5.1	1.6	0.9 – 1
White perch	carcass	1/1	100	25	25	na	na	na
	fillet (with skin)	19/19	100	1.1	8.8 J	3.5	2.0	na
	whole body	19/19	100	3.5 J	19	12	4.6	na
Largemouth bass	carcass	2/3	67	4.5	4.5	na	na	0.92
Northern pike	carcass	1/1	100	18	18	na	na	na
Smallmouth bass	carcass	3/3	100	4.1	5.9	5.1	0.91	na
C3-Naphthalenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	9.3 J	58 J	29	17	na
Carp	fillet (with skin)	12/12	100	5.4 J	41 J	15	9.2	na
	whole body	12/12	100	9.0 J	29 J	17	6.4	na
Channel catfish	carcass	11/11	100	9.5 J	40 J	23	10	na
	fillet (skinless)	11/11	100	2.1	20	6.9	4.8	na
White catfish	carcass	19/19	100	6.2	120	31	27	na
	fillet (skinless)	19/19	100	2.3	42	8.8	9.1	na
White sucker	carcass	5/5	100	4.3 J	20 J	11	6.1	na
	fillet (with skin)	5/5	100	1.0	2.4	1.8	0.61	na
Blue crab	carcass	24/24	100	1 J	8 J	4.2	1.9	na
	hepatopancreas only	7/7	100	5 J	52 J	17	17	na
	muscle only	21/21	100	0.7 J	3 J	1.4	0.63	na
	muscle/hepatopancreas	41/41	100	1 J	12 J	2.7	2.5	na

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C3-Naphthalenes (µg/kg ww) (cont.)								
White perch	carcass	1/1	100	62 J	62 J	na	na	na
	fillet (with skin)	19/19	100	1.9	26 J	8.9	6.4	na
	whole body	19/19	100	6.4 J	50 J	28	14	na
American eel	carcass	2/2	100	6.3	8.9	7.6	1.8	na
	fillet (skinless)	32/32	100	1.5	7.5	3.5	1.7	na
	whole body	19/19	100	2.1	12	4.8	2.5	na
Largemouth bass	carcass	3/3	100	8.0	12	9.5	2.2	na
	fillet (with skin)	3/3	100	0.97	1.5	1.2	0.28	na
Northern pike	carcass	1/1	100	45	45	na	na	na
	fillet (with skin)	1/1	100	6.0	6.0	na	na	na
Smallmouth bass	carcass	3/3	100	6.1	11	9.4	2.8	na
	fillet (with skin)	3/3	100	0.88 J	1.5	1.3	0.36	na
C3-Phenanthrene/Anthracenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	4.8	36	13	11	na
Carp	fillet (with skin)	12/12	100	4.8	94	25	23	na
	whole body	11/12	92	8.2	44	22	11	0.96
Channel catfish	carcass	11/11	100	4.0 J	22 J	12	6.3	na
	fillet (skinless)	11/11	100	1.5	9.4	3.5	2.3	na
White catfish	carcass	19/19	100	4.0	39	18	8.6	na
	fillet (skinless)	19/19	100	0.99	21	5.7	4.8	na
White sucker	carcass	5/5	100	9.1 J	25 J	14	6.3	na
	fillet (with skin)	5/5	100	1.1	4.2	2.4	1.2	na
Blue crab	carcass	24/24	100	2 J	10 J	5.3	2.2	na
	hepatopancreas only	7/7	100	5 J	46 J	20	14	na
	muscle only	14/21	67	0.5 J	3 J	1.1	0.64	0.9 – 1
	muscle/hepatopancreas	41/41	100	1 J	10 J	4.0	2.3	na
White perch	carcass	1/1	100	13	13	na	na	na
	fillet (with skin)	19/19	100	1.2	9.9 J	3.9	2.4	na
	whole body	19/19	100	2.6 J	33	15	7.8	na
American eel	carcass	2/2	100	6.9	7.8	7.4	0.64	na
	fillet (skinless)	32/32	100	1.2	10	4.3	2.2	na
	whole body	19/19	100	2.3	17	6.4	3.4	na
Largemouth bass	carcass	3/3	100	7.0	84	33	44	na
	fillet (with skin)	3/3	100	1.0	9.2	3.8	4.7	na

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C3-Phenanthrene/Anthracenes (µg/kg ww) (cont.)								
Northern pike	carcass	1/1	100	20	20	na	na	na
	fillet (with skin)	1/1	100	2.8	2.8	na	na	na
Smallmouth bass	carcass	3/3	100	11	18	14	3.8	na
	fillet (with skin)	3/3	100	0.77 J	2.0	1.4	0.62	na
C4-Benzanthracene/Chrysenes (µg/kg ww)								
Blue crab	hepatopancreas only	5/7	71	3 J	7 J	4.6	1.8	1
C4-Dibenzothiophenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	4.8 J	21 J	11	6.0	na
Carp	fillet (with skin)	12/12	100	5.1 J	44 J	13	11	na
	whole body	12/12	100	5.3 J	23 J	14	5.8	na
Channel catfish	carcass	11/11	100	4.2 J	16 J	9.5	3.5	na
White catfish	carcass	18/19	95	2.8 J	20 J	9.8	4.4	0.92
	fillet (skinless)	1/19	5	6.1 J	6.1 J	na	na	0.84 – 0.99
White sucker	carcass	5/5	100	5.4 J	9.6 J	7.2	1.7	na
Blue crab	carcass	24/24	100	1 J	5 J	2.8	1.0	na
	hepatopancreas only	7/7	100	5 J	33 J	15	9.4	na
	muscle only	11/21	52	0.5 J	2 J	0.95	0.39	0.9 – 1
	muscle/hepatopancreas	41/41	100	1 J	6 J	2.7	1.5	na
White perch	fillet (with skin)	3/19	16	4.5 J	8.0 J	5.8	1.9	0.84 – 0.98
American eel	carcass	2/2	100	4.5 J	5.4 J	5.0	0.64	na
	fillet (skinless)	31/32	97	1.4 J	5.9 J	3.0	1.2	0.97
	whole body	19/19	100	1.7 J	11 J	4.5	2.2	na
Largemouth bass	fillet (with skin)	1/3	33	1.8 J	1.8 J	na	na	0.93 – 0.96
Smallmouth bass	carcass	1/3	33	8.1 J	8.1 J	na	na	0.67 – 0.99
C4-Naphthalenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	5.8 J	39 J	22	13	na
Carp	fillet (with skin)	12/12	100	5.0 J	52 J	15	14	na
	whole body	12/12	100	4.8 J	32 J	16	8.1	na
Channel catfish	carcass	11/11	100	7.2 J	27 J	15	6.0	na
	fillet (skinless)	11/11	100	1.6	13	4.4	3.1	na
White catfish	carcass	19/19	100	4.7	63	20	14	na
	fillet (skinless)	19/19	100	1.7	23	5.9	5.2	na
White sucker	carcass	5/5	100	5.6 J	13 J	9.6	3.0	na
	fillet (with skin)	5/5	100	0.88 J	2.5	1.5	0.60	na

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C4-Naphthalenes (µg/kg ww) (cont.)								
Blue crab	carcass	24/24	100	2 J	9 J	4.5	2.1	na
	hepatopancreas only	7/7	100	6 J	49 J	24	18	na
	muscle only	14/21	67	0.7 J	3 J	1.6	0.67	0.9 – 1
	muscle/hepatopancreas	40/41	98	0.5 J	17 J	2.9	3.4	0.9
White perch	carcass	1/1	100	67 J	67 J	na	na	na
	fillet (with skin)	19/19	100	1.6	33 J	10	7.6	na
	whole body	19/19	100	6.3 J	52 J	31	15	na
American eel	carcass	2/2	100	5.4	5.8	5.6	0.28	na
	fillet (skinless)	32/32	100	1.3	5.5	2.7	1.0	na
	whole body	19/19	100	1.6	8.5	3.9	2.0	na
Largemouth bass	carcass	3/3	100	5.8	9.6	8.2	2.1	na
	fillet (with skin)	3/3	100	0.91 J	1.3	1.1	0.20	na
Northern pike	carcass	1/1	100	35	35	na	na	na
	fillet (with skin)	1/1	100	4.9	4.9	na	na	na
Smallmouth bass	carcass	3/3	100	9.2	17	13	3.9	na
	fillet (with skin)	3/3	100	0.98	1.3	1.2	0.16	na
C4-Phenanthrene/Anthracenes (µg/kg ww)								
Brown bullhead	whole body	6/6	100	1.3	8.9	3.9	2.6	na
Carp	fillet (with skin)	12/12	100	1.1	15	3.1	3.9	na
	whole body	12/12	100	1.7	6.9	4.3	1.5	na
Channel catfish	carcass	11/11	100	1.2 J	5.3 J	2.8	1.3	na
White catfish	carcass	19/19	100	0.74 J	3.1	1.8	0.73	na
	fillet (skinless)	2/19	11	0.45 J	0.96	0.71	0.36	0.84 – 0.99
White sucker	carcass	4/5	80	1.4 J	3.7 J	2.5	0.94	0.88
Blue crab	carcass	24/24	100	1 J	8 J	4.4	2.1	na
	hepatopancreas only	7/7	100	5 J	51 J	22	16	na
	muscle only	13/21	62	0.7 J	3 J	1.6	0.71	0.9 – 1
	muscle/hepatopancreas	39/41	95	0.5 J	9 J	2.7	2.3	0.9
White perch	carcass	1/1	100	4.6	4.6	na	na	na
	fillet (with skin)	5/19	26	0.66 J	0.94	0.81	0.13	0.84 – 0.98
	whole body	19/19	100	0.58 J	3.7 J	2.2	0.94	na
American eel	whole body	1/19	5	0.75 J	0.75 J	na	na	0.85 – 0.99
Largemouth bass	carcass	3/3	100	1.0	1.6	1.2	0.32	na
	fillet (with skin)	1/3	33	0.81 J	0.81 J	na	na	0.93 – 0.96

Table 4-5. Summary of detected alkylated PAH results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
C4-Phenanthrene/Anthracenes (µg/kg ww) (cont.)								
Northern pike	carcass	1/1	100	2.6	2.6	na	na	na
	fillet (with skin)	1/1	100	0.53 J	0.53 J	na	na	na
Smallmouth bass	carcass	3/3	100	1.5	2.1	1.8	0.30	na
	fillet (with skin)	1/3	33	0.67 J	0.67 J	na	na	0.93 – 0.95

[a] Only chemicals with detected results are presented. If the chemical was not detected in any samples for a given species and tissue type, the chemical is not presented in the table. Data tables that contain results for each sample, including non-detected sample results, are presented in Appendix F.

[b] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviation) include data only for detected results. Non-detected data are not included in summary statistics.

[b] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

J – estimated concentration
Max – maximum
Min – minimum
na – not applicable
RL – reporting limit
St Dev – standard deviation
ww – wet weight

4.4 SVOCs

A total of 47 SVOCs were analyzed in tissue. The analytical laboratory (Alpha Analtyical) experciened chromatographic interferences when gel permeation chromatography (GPC)-cleaned extracts were analyzed for SVOCs using gas chromatography / mass spectrometry (GC / MS). Over time, the organic acids in the tissue samples stripped the phase on the column of the instrument. Several columns were destroyed during the SVOC analysis, and sample extracts had to be diluted to prevent the GC / MS instrument from shutting down during analysis. This analytical issue affected all tissue types and was a significant analytical challenge. USEPA Region 2 was notified and provided with the required dilution ranges for each tissue type. The required dilutions elevated detection limits, and only one SVOC (benzaldehyde) was detected in blue crab, and two SVOCs (benzaldehyde and bis(2-ethylhexyl) phthalate) were detected in fish. Table 4-6 presents a summary of the SVOCs detected in each tissue type, including the number of detections, range of detected concentrations, and RL or range of RLs for samples reported as non-detects. Data tables that contain SVOC concentrations for each sample, including non-detected sample results, are presented in Appendix F.

Table 4-6. Summary of detected SVOC results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
Benzaldehyde (µg/kg ww)								
Blue crab	hepatopancreas only	2/2[d]	100[d]	7,000 J	13,000 J	10,000	4,200	na
Largemouth bass	carcass	3/3	100	2,700 J	7,600 J	5,800	2,700	na
Smallmouth bass	carcass	3/3	100	5,400 J	5,900 J	5,700	250	na
Bis(2-ethylhexyl) phthalate (µg/kg ww)								
American eel	fillet (skinless)	2/32	6	900 J	1,400 J	1,200	350	1,700 – 2,000

[a] Only chemicals with detected results are presented. If the chemical was not detected in any samples for a given species and tissue type, the chemical is not presented in the table. Data tables that contain results for each sample, including non-detected sample results, are presented in Appendix F.

[b] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviation) include data only for detected results. Non-detected data are not included in summary statistics.

[c] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

[d] Detection frequency does not include five hepatopancreas-only samples analyzed for benzaldehyde that were rejected during data validation (see Section 5 for more details).

J – estimated concentration
Max – maximum
Min – minimum
na – not applicable
RL – reporting limit
St Dev – standard deviation
SVOC – semivolatile organic compound
ww – wet weight

4.5 PCBs

Table 4-7 presents a summary of PCB Aroclors and total PCBs (as Aroclors and as congeners) detected in each tissue type, including the number of detections, range of detected concentrations, and RL or range of RLs for samples reported as non-detects. Data tables that contain PCB results for each sample, including individual PCB congener results and non-detected sample results, are presented in Appendix F.

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Aroclor 1242 (µg/kg ww)								
Brown bullhead	whole body	6/6	100	42	300	150	120	na
Carp	fillet (with skin)	12/12	100	100 J	1,500 J	540	470	na
	whole body	12/12	100	100 J	1,100	580	350	na
Channel catfish	carcass	11/11	100	53	170	110	43	na
	fillet (skinless)	10/11	91	22 J	87	46	21	7.6

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
White catfish	carcass	19/19	100	23 NJ	280 J	110	60	na
	fillet (skinless)	8/19	42	36 J	130 J	83	39	6.7 – 8
White sucker	carcass	5/5	100	84	280	190	86	na
	fillet (with skin)	5/5	100	19	74	42	23	na
White perch	carcass	1/1	100	330	330	na	na	na
	fillet (with skin)	19/19	100	17	150	74	36	na
	whole body	19/19	100	34	500	250	120	na
Aroclor 1254 (µg/kg ww)								
Brown bullhead	whole body	6/6	100	290 J	1200	730	340	na
Carp	fillet (with skin)	12/12	100	760 J	4,800 J	2,500	1,100	na
	whole body	12/12	100	1,100	6,800	2,900	1,700	na
Channel catfish	carcass	11/11	100	460 J	2,100	1,200	530	na
	fillet (skinless)	11/11	100	220 J	1,200	470	290	na
White catfish	carcass	19/19	100	590	5,600	2,200	1,500	na
	fillet (skinless)	19/19	100	90 J	2,500 J	710	630	na

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Aroclor 1254 (µg/kg ww) (cont.)								
White sucker	carcass	5/5	100	520	2,300	1,200	660	na
	fillet (with skin)	5/5	100	100	400	230	120	na
Blue crab	carcass	24/24	100	91 J	350	230	65	na
	hepatopancreas only	7/7	100	880	3,500	2,400	900	na
	muscle only	19/21	91	10	67	29	17	7
	muscle/hepatopancreas	41/41	100	87	830	330	170	na
White perch	carcass	1/1	100	940	940	na	na	na
	fillet (with skin)	19/19	100	99	710	310	170	na
	whole body	19/19	100	220	2,400	1,300	600	na
American eel	carcass	2/2	100	1,000 J	1,200	1,100	140	na
	fillet (skinless)	32/32	100	110 J	1,300 J	580	320	na
	whole body	19/19	100	230	2,200	880	520	na
Largemouth bass	carcass	3/3	100	1,400	14,000	5,600	7,300	na
	fillet (with skin)	3/3	100	83 J	730	320	360	na
Northern pike	carcass	1/1	100	2,400	2,400	na	na	na
	fillet (with skin)	1/1	100	220	220	na	na	na
Smallmouth bass	carcass	3/3	100	1,100	2,300	1,600	620	na
	fillet (with skin)	3/3	100	61	170	120	55	na
Aroclor 1260 (µg/kg ww)								
Brown bullhead	whole body	6/6	100	110	780	400	230	na
Carp	fillet (with skin)	12/12	100	230 J	2,200 J	1,300	650	na
	whole body	12/12	100	460	3,000	1,300	850	na
Channel catfish	carcass	11/11	100	95	1,100	580	350	na
	fillet (skinless)	11/11	100	55	590	220	160	na
White catfish	carcass	19/19	100	240	4,500	1,700	1,300	na
	fillet (skinless)	19/19	100	65 J	2,100 J	500	510	na
White sucker	carcass	5/5	100	210	1,600	720	530	na
	fillet (with skin)	5/5	100	41	280	140	97	na
Blue crab	carcass	24/24	100	20	210	93	52	na
	hepatopancreas only	7/7	100	310	1,600	920	380	na
	muscle only	4/21	19	11	36	24	12	7 – 8
	muscle/hepatopancreas	41/41	100	24	530	140	110	na

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Aroclor 1260 (µg/kg ww) (cont.)								
White perch	carcass	1/1	100	530	530	na	na	na
	fillet (with skin)	19/19	100	41	490	170	110	na
	whole body	19/19	100	140	2,000	770	460	na
American eel	carcass	2/2	100	1,200	1,300	1,300	71	na
	fillet (skinless)	32/32	100	150	3,600	600	620	na
	whole body	19/19	100	190	5,300	970	1,300	na
Largemouth bass	carcass	3/3	100	450	2,400	1,200	1,000	na
	fillet (with skin)	3/3	100	24	95	65	37	na
Northern pike	carcass	1/1	100	1,300	1,300	na	na	na
	fillet (with skin)	1/1	100	100	100	na	na	na
Smallmouth bass	carcass	3/3	100	910	1,300	1,100	210	na
	fillet (with skin)	3/3	100	39	89	65	25	na
Total PCB Aroclors (ND = 0) (µg/kg ww)[e]								
Brown bullhead	whole body	6/6	100	450 J	2,300 J	1,300	660	na
Carp	fillet (with skin)	12/12	100	1,100 J	8,500 J	4,300	2,200	na
	whole body	12/12	100	1,700 J	11,000	4,800	2,800	na
Channel catfish	carcass	11/11	100	730 J	3,300 J	1,900	870	na
	fillet (skinless)	11/11	100	340 J	1,900	740	460	na
White catfish	carcass	19/19	100	1,100 J	10,000	4,000	2,700	na
	fillet (skinless)	19/19	100	160 J	4,700 J	1,300	1,200	na
White sucker	carcass	5/5	100	810	4,200	2,100	1,300	na
	fillet (with skin)	5/5	100	160	740	410	230	na
Blue crab	carcass	24/24	100	110 J	520	320	110	na
	hepatopancreas only	7/7	100	1,200	5,100	3,300	1,200	na
	muscle only	19/21	91	10	100	34	27	7
	muscle/hepatopancreas	41/41	100	110	1,300	470	280	na
White perch	carcass	1/1	100	1,800	1,800	na	na	na
	fillet (with skin)	19/19	100	190	1,300	550	300	na
	whole body	19/19	100	470	4,200	2,300	1,100	na
American eel	carcass	2/2	100	2,300 J	2,400	2,400	71	na
	fillet (skinless)	32/32	100	310 J	4,900 J	1,200	880	na
	whole body	19/19	100	670	7,500	1,800	1,700	na
Largemouth bass	carcass	3/3	100	1,900 J	16,000	6,700	8,100	na
	fillet (with skin)	3/3	100	110 J	830	390	390	na

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total PCB Aroclors (ND = 0) (µg/kg ww) (cont.)[e]								
Northern pike	carcass	1/1	100	3,700	3,700	na	na	na
	fillet (with skin)	1/1	100	320	320	na	na	na
Smallmouth bass	carcass	3/3	100	2,000	3,600	2,700	830	na
	fillet (with skin)	3/3	100	100	260	180	80	na
Total PCB Aroclors (ND = 0.5 RL) (µg/kg ww)[f]								
Brown bullhead	whole body	6/6	100	510 J	2,300 J	1,300	660	na
Carp	fillet (with skin)	12/12	100	1,100 J	8,500 J	4,300	2,100	na
	whole body	12/12	100	1,700 J	11,000	4,900	2,800	na
Channel catfish	carcass	11/11	100	750 J	3,400 J	1,900	880	na
	fillet (skinless)	11/11	100	360 J	1,900	770	460	na
White catfish	carcass	19/19	100	1,100 J	10,000	4,000	2,700	na
	fillet (skinless)	19/19	100	180 J	4,800 J	1,300	1,200	na
White sucker	carcass	5/5	100	840	4,200	2,200	1,200	na
	fillet (with skin)	5/5	100	180	760	430	230	na
Blue crab	carcass	24/24	100	140 J	550	350	110	na
	hepatopancreas only	7/7	100	1,200	5,100	3,300	1,200	na
	muscle only	19/21	91	38	130	64	26	7
	muscle/hepatopancreas	41/41	100	140	1,300	500	280	na
White perch	carcass	1/1	100	1,800	1,800	na	na	na
	fillet (with skin)	19/19	100	210	1,300	570	300	na
	whole body	19/19	100	490	4,200	2,300	1,100	na
American eel	carcass	2/2	100	2,300 J	2,400	2,400	71	na
	fillet (skinless)	32/32	100	340 J	4,900 J	1,200	880	na
	whole body	19/19	100	700	7,500	1,900	1,700	na
Largemouth bass	carcass	3/3	100	1,900 J	16,000	6,700	8,100	na
	fillet (with skin)	3/3	100	120 J	840	400	390	na
Northern pike	carcass	1/1	100	3,700	3,700	na	na	na
	fillet (with skin)	1/1	100	330	330	na	na	na
Smallmouth bass	carcass	3/3	100	2,000	3,600	2,700	830	na
	fillet (with skin)	3/3	100	110	270	190	80	na
Total PCB Aroclors (ND = RL) (µg/kg ww)[g]								
Brown bullhead	whole body	6/6	100	560 J	2,400 J	1,400	660	na
Carp	fillet (with skin)	12/12	100	1,100 J	8,500 J	4,300	2,100	na
	whole body	12/12	100	1,800 J	11,000	4,900	2,800	na

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total PCB Aroclors (ND = RL) (µg/kg ww) (cont.)[g]								
Channel catfish	carcass	11/11	100	770 J	3,400 J	1,900	870	na
	fillet (skinless)	11/11	100	380 J	1,900	790	450	na
White catfish	carcass	19/19	100	1,200 J	10,000	4,000	2,700	na
	fillet (skinless)	19/19	100	210 J	4,800 J	1,300	1,200	na
White sucker	carcass	5/5	100	860	4,200	2,200	1,200	na
	fillet (with skin)	5/5	100	210	780	450	230	na
Blue crab	carcass	24/24	100	160 J	580	380	110	na
	hepatopancreas only	7/7	100	1,200	5,200	3,400	1,300	na
	muscle only	19/21	91	66	160	95	26	7
	muscle/hepatopancreas	41/41	100	160	1,400	540	280	na
White perch	carcass	1/1	100	1,800	1,800	na	na	na
	fillet (with skin)	19/19	100	230	1,400	600	310	na
	whole body	19/19	100	520	4,200	2,400	1,100	na
American eel	carcass	2/2	100	2,400 J	2,500	2,500	71	na
	fillet (skinless)	32/32	100	360 J	4,900 J	1,200	880	na
	whole body	19/19	100	720	7,500	1,900	1,700	na
Largemouth bass	carcass	3/3	100	1,900 J	16,000	6,700	8,100	na
	fillet (with skin)	3/3	100	130 J	850	410	390	na
Northern pike	carcass	1/1	100	3,700	3,700	na	na	na
	fillet (with skin)	1/1	100	350	350	350	na	na
Smallmouth bass	carcass	3/3	100	2,000	3,600	2,700	830	na
	fillet (with skin)	3/3	100	130	280	210	75	na
Total PCB Congeners (ND = 0) (µg/kg ww)[h]								
Brown bullhead	whole body	6/6	100	260 J	1,700 J	870	610	na
Carp	fillet (with skin)	12/12	100	850 J	15,000 J	4,800	3,700	na
	whole body	12/12	100	1,500 J	7,900 J	4,100	2,000	na
Channel catfish	carcass	11/11	100	400 J	3,100 J	1,600	910	na
	fillet (skinless)	11/11	100	190 J	1,300 J	500	340	na
White catfish	carcass	19/19	100	780 J	8,600 J	3,200	1,900	na
	fillet (skinless)	19/19	100	130 J	3,900 J	980	950	na
White sucker	carcass	5/5	100	800 J	4,700 J	2,200	1,500	na
	fillet (with skin)	5/5	100	160 J	580 J	330	200	na

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total PCB Congeners (ND = 0) (µg/kg ww) (cont.)[h]								
Blue crab	carcass	24/24	100	140 J	360 J	240	69	na
	hepatopancreas only	7/7	100	510 J	1,400 J	980	310	na
	muscle only	21/21	100	11 J	110 J	42	29	na
	muscle/hepatopancreas	41/41	100	76 J	790 J	330	140	na
White perch	carcass	1/1	100	1,800 J	1,800 J	na	na	na
	fillet (with skin)	19/19	100	150 J	1,500 J	580	340	na
	whole body	19/19	100	290 J	5,100 J	2,200	1,200	na
American eel	carcass	2/2	100	1,600 J	2,200 J	1,900	420	na
	fillet (skinless)	32/32	100	270 J	4,300 J	1,100	760	na
	whole body	19/19	100	420 J	5,700 J	1,500	1,200	na
Largemouth bass	carcass	3/3	100	1,900 J	12,000 J	5,800	5,400	na
	fillet (with skin)	3/3	100	48 J	480 J	210	240	na
Northern pike	carcass	1/1	100	3,500 J	3,500 J	na	na	na
	fillet (with skin)	1/1	100	330 J	330 J	na	na	na
Smallmouth bass	carcass	3/3	100	980 J	2,100 J	1,600	560	na
	fillet (with skin)	3/3	100	57 J	140 J	92	43	na
Total PCB Congeners (ND = 0.5 RL) (ng/kg ww)[i]								
Brown bullhead	whole body	6/6	100	260 J	1,700 J	870	610	na
Carp	fillet (with skin)	12/12	100	850 J	15,000 J	4,800	3,700	na
	whole body	12/12	100	1,500 J	7,900 J	4,100	2,000	na
Channel catfish	carcass	11/11	100	400 J	3,100 J	1,600	910	na
	fillet (skinless)	11/11	100	190 J	1,300 J	500	340	na
White catfish	carcass	19/19	100	780 J	8,600 J	3,200	1,900	na
	fillet (skinless)	19/19	100	130 J	3,900 J	980	950	na
White sucker	carcass	5/5	100	800 J	4,700 J	2,200	1,500	na
	fillet (with skin)	5/5	100	160 J	580 J	330	200	na
Blue crab	carcass	24/24	100	140 J	360 J	240	69	na
	hepatopancreas only	7/7	100	510 J	1,400 J	980	310	na
	muscle only	21/21	100	11 J	110 J	42	29	na
	muscle/hepatopancreas	41/41	100	76 J	790 J	330	140	na
White perch	carcass	1/1	100	1,800 J	1,800 J	na	na	na
	fillet (with skin)	19/19	100	150 J	1,500 J	580	340	na
	whole body	19/19	100	290 J	5,100 J	2,200	1,200	na

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total PCB Congeners (ND = 0.5 RL) (ng/kg ww) (cont.)[i]								
American eel	carcass	2/2	100	1,600 J	2,200 J	1,900	420	na
	fillet (skinless)	32/32	100	270 J	4,300 J	1,100	760	na
	whole body	19/19	100	420 J	5,700 J	1,500	1,200	na
Largemouth bass	carcass	3/3	100	1,900 J	12,000 J	5,800	5,400	na
	fillet (with skin)	3/3	100	48 J	480 J	210	240	na
Northern pike	carcass	1/1	100	3,500 J	3,500 J	na	na	na
	fillet (with skin)	1/1	100	330 J	330 J	na	na	na
Smallmouth bass	carcass	3/3	100	980 J	2,100 J	1,600	560	na
	fillet (with skin)	3/3	100	57 J	140 J	92	43	na
Total PCB Congeners (ND = RL) (ng/kg ww)[i]								
Brown bullhead	whole body	6/6	100	260 J	1,700 J	870	610	na
Carp	fillet (with skin)	12/12	100	850 J	15,000 J	4,800	3,700	na
	whole body	12/12	100	1,500 J	7,900 J	4,100	2,000	na
Channel catfish	carcass	11/11	100	400 J	3,100 J	1,600	910	na
	fillet (skinless)	11/11	100	190 J	1,300 J	500	340	na
White catfish	carcass	19/19	100	780 J	8,600 J	3,200	1,900	na
	fillet (skinless)	19/19	100	130 J	3,900 J	980	950	na
White sucker	carcass	5/5	100	800 J	4,700 J	2,200	1,500	na
	fillet (with skin)	5/5	100	160 J	580 J	330	200	na
Blue crab	carcass	24/24	100	140 J	360 J	240	69	na
	hepatopancreas only	7/7	100	510 J	1,400 J	980	310	na
	muscle only	21/21	100	12 J	110 J	42	29	na
	muscle/hepatopancreas	41/41	100	77 J	790 J	330	140	na
White perch	carcass	1/1	100	1,800 J	1,800 J	na	na	na
	fillet (with skin)	19/19	100	150 J	1,500 J	580	340	na
	whole body	19/19	100	290 J	5,100 J	2,200	1,200	na
American eel	carcass	2/2	100	1,600 J	2,200 J	1,900	420	na
	fillet (skinless)	32/32	100	270 J	4,300 J	1,100	760	na
	whole body	19/19	100	420 J	5,700 J	1,500	1,200	na
Largemouth bass	carcass	3/3	100	1,900 J	12,000 J	5,800	5,400	na
	fillet (with skin)	3/3	100	48 J	480 J	210	240	na
Northern pike	carcass	1/1	100	3,500 J	3,500 J	na	na	na
	fillet (with skin)	1/1	100	330 J	330 J	na	na	na

Table 4-7. Summary of detected PCB results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total PCB Congeners (ND = RL) (ng/kg ww) (cont.)[i]								
Smallmouth bass	carcass	3/3	100	980 J	2,100 J	1,600	560	na
	fillet (with skin)	3/3	100	57 J	140 J	92	43	na

[a] Only chemicals with detected results are presented. If the chemicals was not detected in any samples for a given species and tissue type, the analyte is not presented in the table. Data tables that contain results for each sample, including non-detected sample results, are presented in Appendix F.

[b] A calculated total concentration was considered detected if one or more of the components of the sum were detected. If all components of the sum were not detected, the calculated total concentration was considered not detected.

[c] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviation) include data only for detected results. Non-detected data are not included in summary statistics.

[d] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

[e] Total PCB Aroclors were calculated as the sum of Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262, and Aroclor 1268. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for further details).

[f] Total PCB Aroclors were calculated as the sum of Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262, and Aroclor 1268. Non-detected results were set equal to one-half the RL when the total concentration was calculated (see Appendix E for further details).

[g] Total PCB Aroclors were calculated as the sum of Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262, and Aroclor 1268. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for further details).

[h] Total PCB congeners were calculated as the sum of 209 PCB congeners. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for further details).

[i] Total PCB congeners were calculated as the sum of 209 PCB congeners. Non-detected results were set to equal to one-half the RL when the total concentration was calculated (see Appendix E for further details).

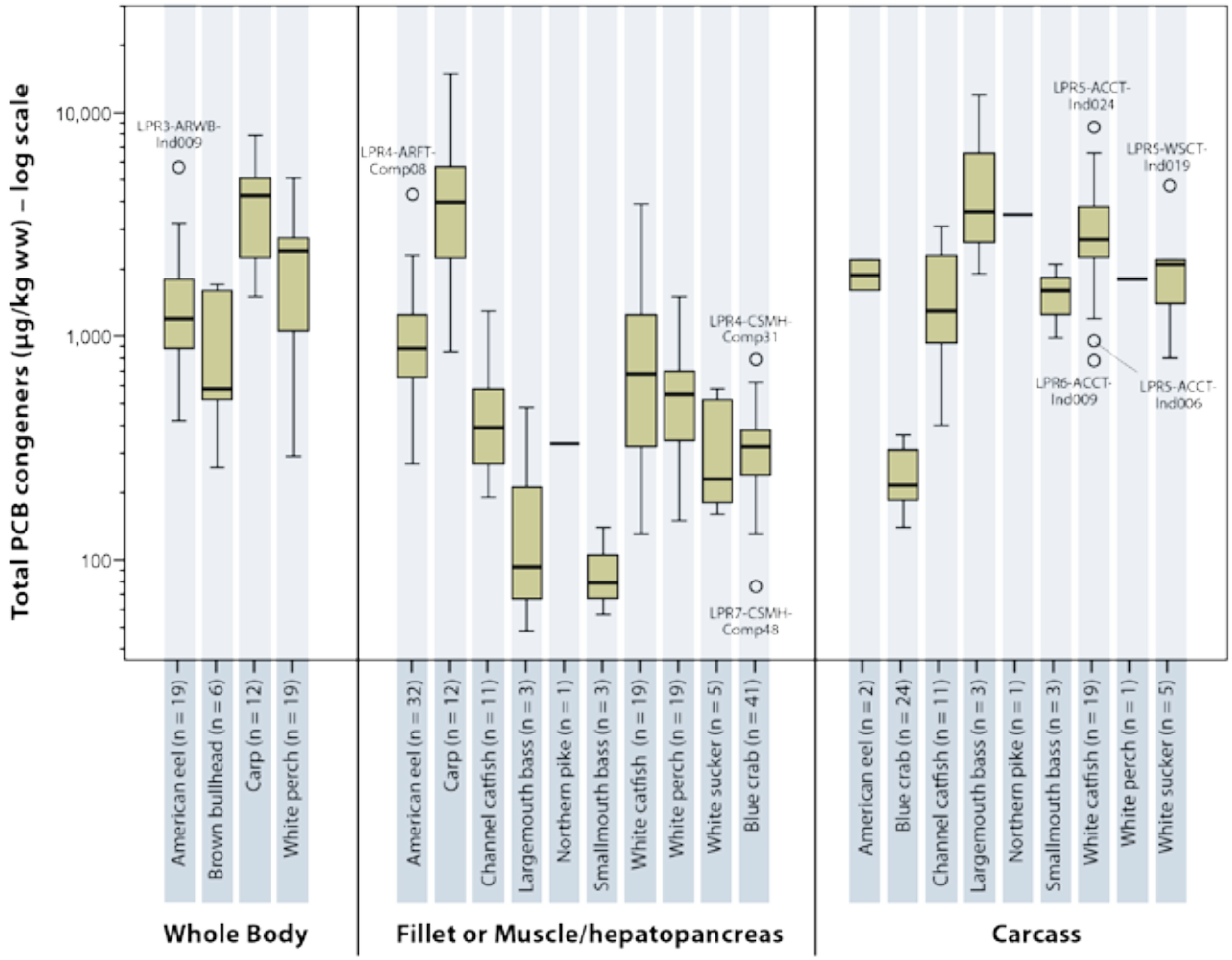
[j] Total PCB congeners were calculated as the sum of 209 PCB congeners. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for further details).

J – estimated concentration
Max – maximum
Min – minimum
N – tentative identification
na – not applicable
PCB – polychlorinated biphenyl
RL – reporting limit
St Dev – standard deviation
ww – wet weight

Total PCB congener concentrations ranged from 11 to 15,000 µg/kg ww across all fish and blue crab samples analyzed. The highest total PCB concentration (15,000 µg/kg ww) was measured in an individual carp fillet sample (LPR5-CCFT-Ind184) from Reach 5. The distributions of total PCB congener concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-35.[14] The following summarize total PCB congener concentrations for fish and blue crab by tissue type, as shown in Figure 4-35:

- **Fish whole body** – Fish whole-body total PCB congener concentrations ranged from 260 to 7,900 µg/kg ww. The highest whole-body total PCB congener concentration was measured in an individual carp whole-body sample (LPR4-CCWB-Ind175) from Reach 4 (7,900 µg/kg ww).
- **Fish fillet and crab muscle/hepatopancreas** – Fish fillet total PCB congener concentrations ranged from 48 to 15,000 µg/kg ww, and the highest fillet concentration (15,000 µg/kg ww) was measured in an individual carp fillet sample (LPR5-CCFT-Ind184) from Reach 5. Blue crab muscle/hepatopancreas total PCB congener concentrations ranged from 76 to 790 µg/kg ww, and the highest blue crab total PCB congener concentration (790 µg/kg ww) was measured in a composite sample (LPR4-CSMH-Comp31) from Reach 4.
- **Fish and blue crab carcass** – Fish carcass total PCB congener concentrations ranged from 400 to 12,000 µg/kg ww, and the highest carcass total PCB congener concentration (12,000 g/kg ww) was measured in an individual largemouth bass carcass sample (LPR8-MSCT-Ind002) from Reach 8. Blue crab carcass total PCB congener concentrations ranged from 140 to 360 µg/kg ww, and the highest blue crab carcass total PCB congener concentration (360 µg/kg ww) was measured in a composite sample (LPR3-CSCT-Comp24) from Reach 3.

[14] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

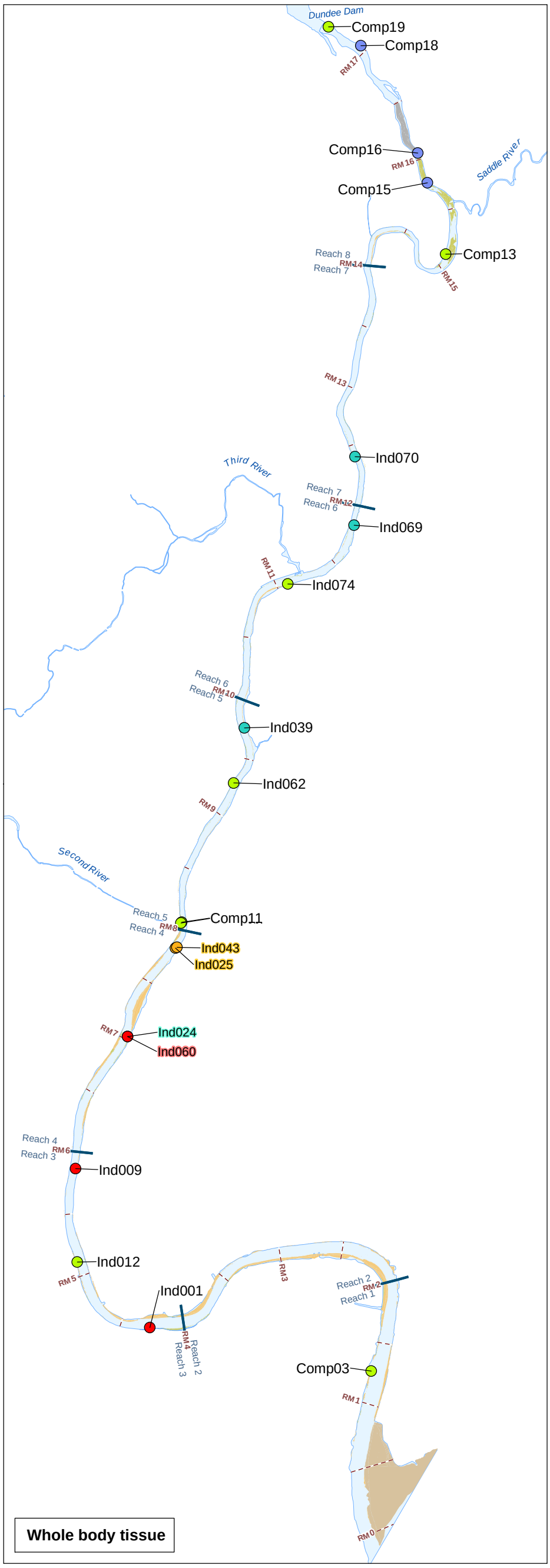


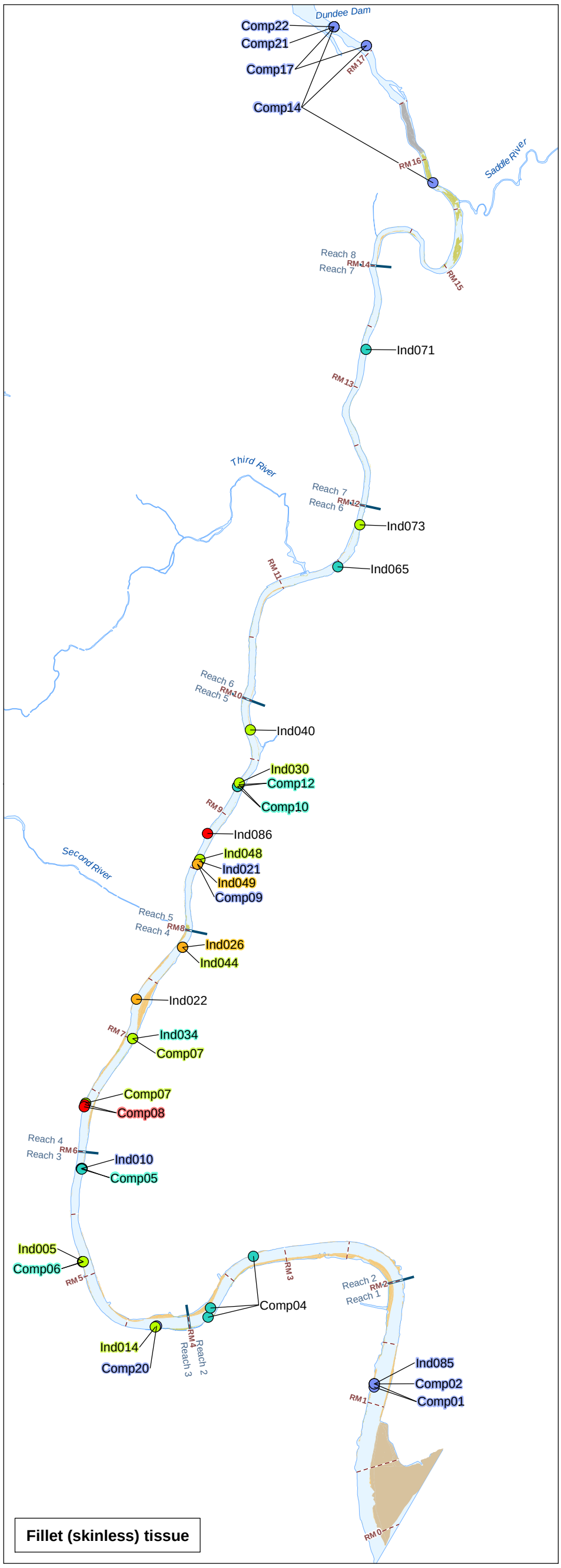
Note: Total PCB congeners were calculated as the sum of 209 PCB congeners. Non-detected results were set equal to zero when total concentrations were calculated for this figure.

Figure 4-35. Total PCB congener concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue total PCB congener concentrations are shown by percentile range and reach in Figures 4-36 through 4-38, respectively. The highest American eel total PCB congener concentration (5,700 µg/kg ww) was measured in an individual whole-body sample (LPR3-ARWB-Ind009) from Reach 3 (Figure 4-36). The highest white perch total PCB congener concentration (5,100 µg/kg ww) was measured in a whole-body composite sample (LPR5-MAWB-Comp19) from Reach 5 (Figure 4-37). The highest blue crab total PCB congener concentration (1,400 µg/kg ww) was measured in a hepatopancreas-only composite sample (LPR3-CSHT-Comp64) from Reach 3. Of the 93 blue crab samples, 5 hepatopancreas-only samples had elevated total PCB congener concentrations

(ranging from 1,400 to 940 µg/kg ww). The highest blue crab total PCB congener concentration, excluding hepatopancreas-only sampes (790 µg/kg ww), was measured in a composite sample (LPR4-CSMH-Comp31) from Reach 4 (Figure 4-38).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Total PCBs (µg/kg)	(Percentile)
> 2,000	(> 90th)
> 1,500 and ≤ 2,000	(> 75th and ≤ 90th)
> 950 and ≤ 1,500	(> 50th and ≤ 75th)
> 670 and ≤ 950	(> 25th and ≤ 50th)
≤ 670	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-36. Total PCB congener concentrations in American eel 2009 tissue samples from the LPRSA

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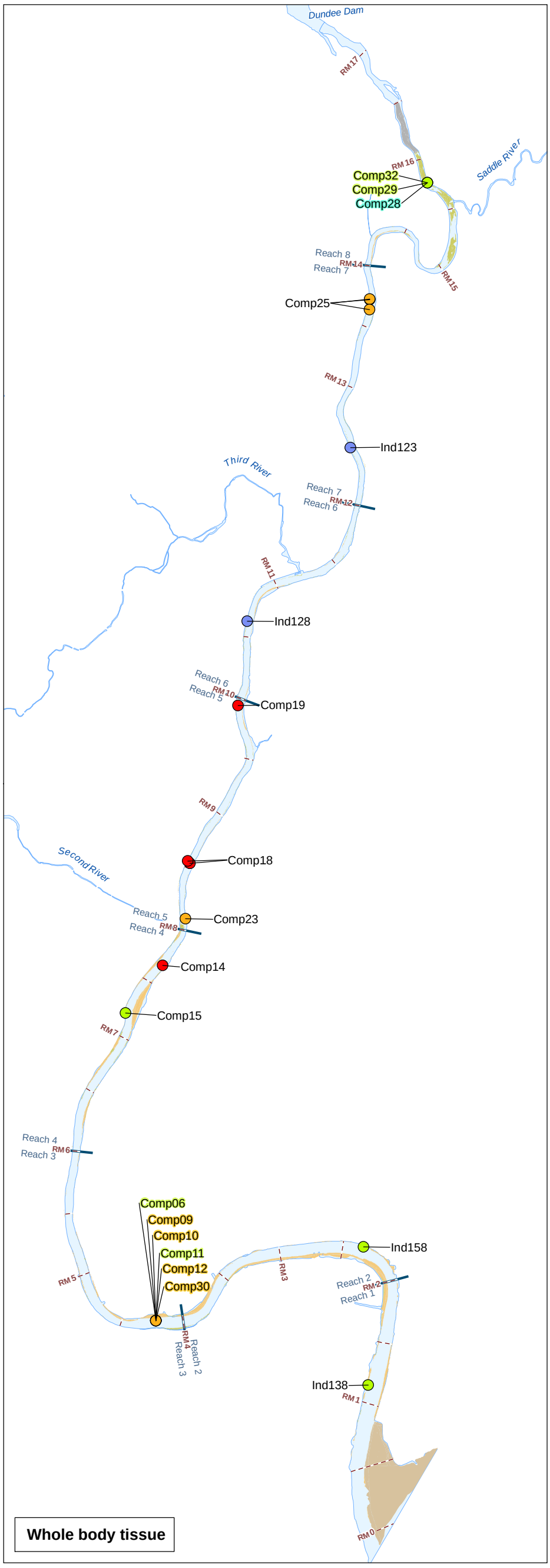

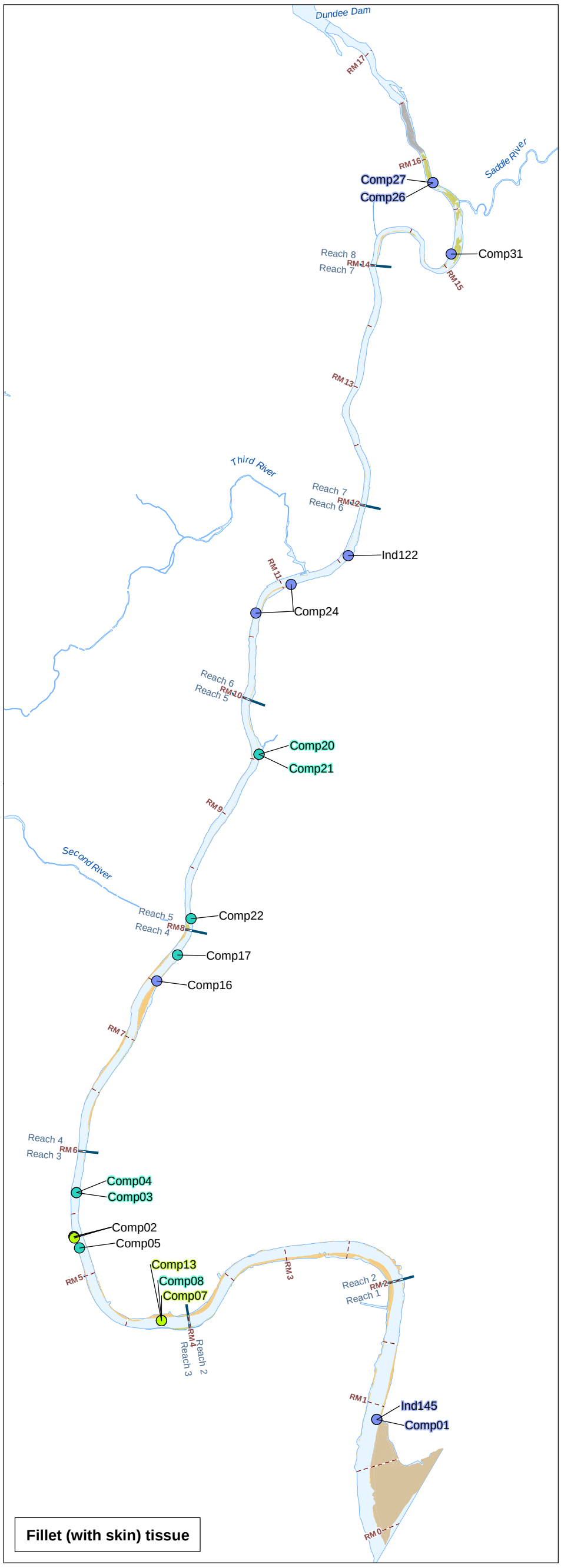

River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Total PCBs (µg/kg)	(Percentile)
> 2,800	(> 90th)
> 2,500 and ≤ 2,800	(> 75th and ≤ 90th)
> 850 and ≤ 2,500	(> 50th and ≤ 75th)
> 520 and ≤ 850	(> 25th and ≤ 50th)
≤ 520	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-37. Total PCB congener concentrations in white perch 2009 tissue samples from the LPRSA

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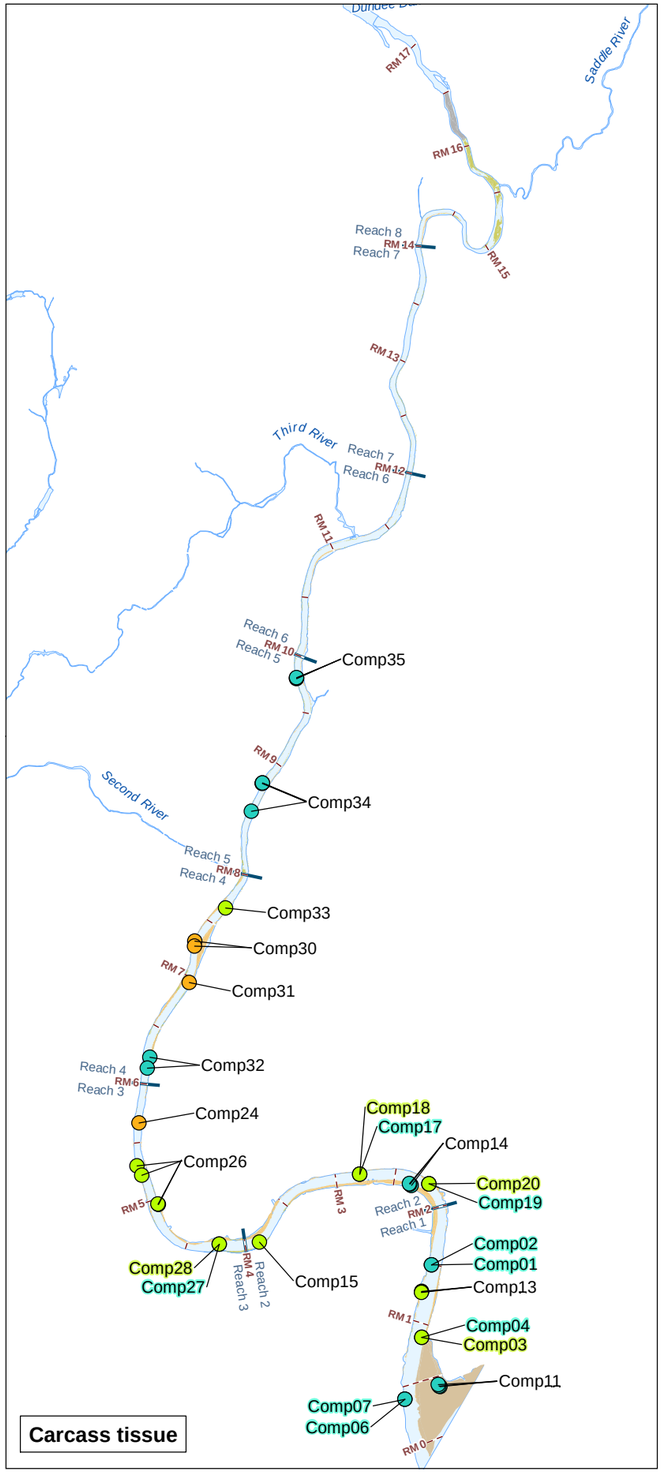
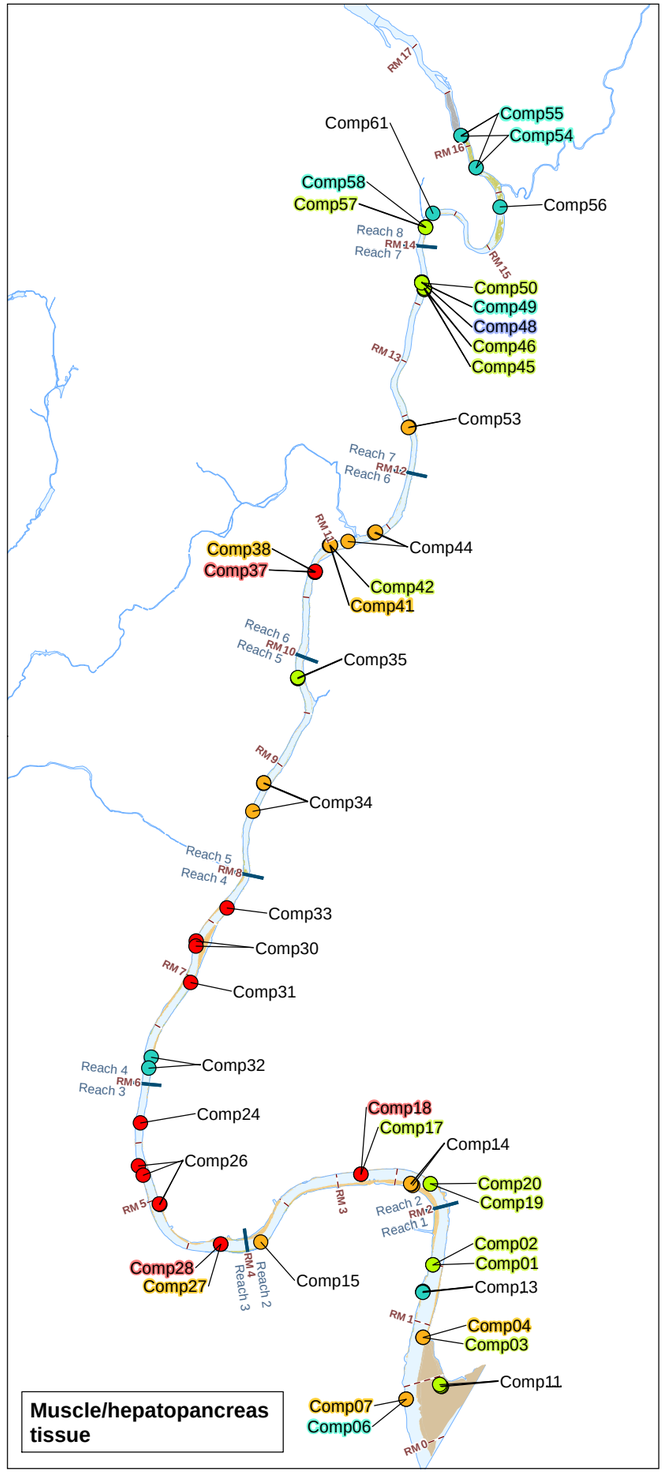
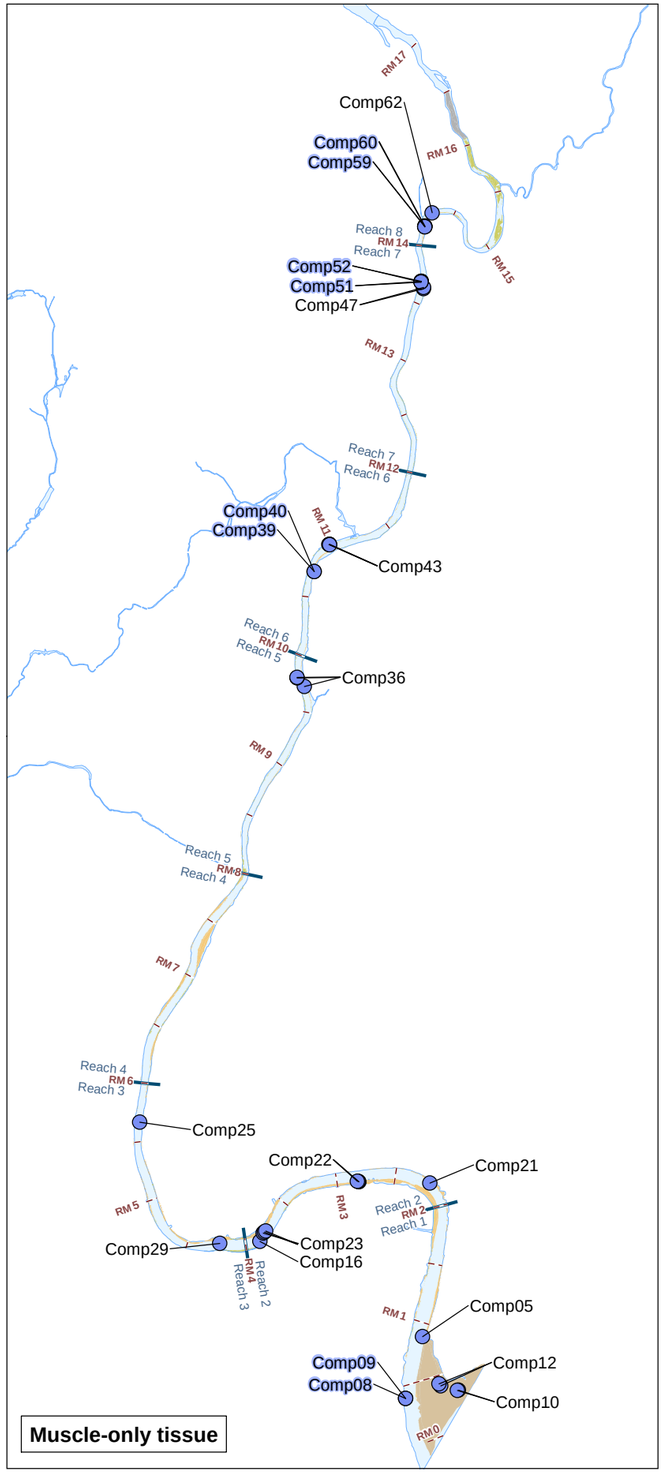
Prepared by LSM 4/28/2011, map 4657; W:\Projects\06-58-01 Passaic RI\Data\GIS\Maps_and_Analysis\FishData

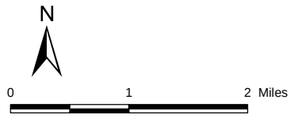






Total PCBs (µg/kg)	(Percentile)
> 390	(> 90th)
> 330 and ≤ 390	(> 75th and ≤ 90th)
> 220 and ≤ 330	(> 50th and ≤ 75th)
> 120 and ≤ 220	(> 25th and ≤ 50th)
≤ 120	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.



- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-38. Total PCB congener concentrations in blue crab 2009 tissue samples from the LPRSA

FINAL

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Prepared by LSM 5/10/2011, map 4656: W:\Projects\06-58-01 Passaic R\Data\GIS\deliverInternal\FishTissue

4.6 PCDDs/PCDFs

Table 4-8 presents a summary of the detected polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), including the number of detections, range of detected concentrations, and RL or range of RLs for samples reported as non-detects. Of the 17 individual PCDDs / PCDFs, 15 were detected in fish and / or blue crab tissue; only 1,2,3,7,8,9-hexachlorodibenzofuran and 1,2,3,4,7,8,9-heptachlorodibenzofuran were not detected in fish or blue crab tissue. Data tables that contain PCDD / PCDF concentrations for each sample, including non-detected sample results, are presented in Appendix F. The subsection that follows Table 4-8 discusses 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD).

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
1,2,3,4,6,7,8-HpCDD (ng/kg ww)								
Brown bullhead	whole body	6/6	100	2.4 J	6.5	4.2	1.8	na
Carp	fillet (with skin)	9/12	75	6.5	29	16	8.5	3.7 – 6.3
	whole body	12/12	100	7.2	42	22	9.5	na
Channel catfish	carcass	11/11	100	1.3 J	5.2	2.5	1.2	na
	fillet (skinless)	10/11	91	0.54 J	1.8 J	0.99	0.43	0.53
White catfish	carcass	19/19	100	1.7 J	6.8	4.0	1.5	na
	fillet (skinless)	15/19	79	0.23 J	2.6 J	1.2	0.69	0.33 – 0.41
White sucker	carcass	5/5	100	1.4 EMPC J	2.2 J	1.7	0.33	na
Blue crab	carcass	24/24	100	1.1 J	5.1	2.0	0.85	na
	hepatopancreas only	7/7	100	1.8 J	6.9	3.7	1.6	na
	muscle only	10/21	48	0.21 EMPC J	0.77 EMPC J	0.42	0.18	0.15 – 0.36
	muscle/ hepatopancreas	40/41	98	0.67 EMPC J	4.1 J	1.5	0.65	1.1
White perch	carcass	1/1	100	1.7 J	1.7 J	na	na	na
	fillet (with skin)	11/19	58	0.56 J	2.2 J	1.0	0.48	0.37 – 0.75
	whole body	17/19	90	0.51 J	2.7 J	1.7	0.58	0.55 – 0.72
American eel	carcass	2/2	100	1.7 J	2.2 J	2.0	0.35	na
	fillet (skinless)	22/32	69	0.42 EMPC J	2.7 J	1.2	0.56	0.41 – 1.3
	whole body	19/19	100	0.57 J	4.1 J	2.0	0.93	na
Smallmouth bass	fillet (with skin)	2/3	67	0.75 J	1.5 J	1.1	0.53	0.6

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
1,2,3,4,7,8-HxCDD (ng/kg ww)								
Brown bullhead	whole body	5/6	83	0.38 EMPC J	1.3 J	0.88	0.38	0.45
Carp	fillet (with skin)	12/12	100	0.47 EMPC J	4.0 J	1.8	1.1	na
	whole body	12/12	100	1.1 J	3.7 J	2.4	0.82	na
Channel catfish	carcass	10/11	91	0.34 EMPC J	2.3 J	1.2	0.63	0.2
	fillet (skinless)	3/11	27	0.28 J	0.40 J	0.32	0.069	0.31 – 0.44
White catfish	carcass	18/19	95	0.55 J	2.1 J	1.0	0.47	0.33
	fillet (skinless)	4/19	21	0.31 EMPC J	0.93 J	0.55	0.27	0.14 – 0.43
White sucker	carcass	3/5	60	0.77 EMPC J	1.4 J	1.0	0.34	0.45 – 0.46
Blue crab	carcass	3/24	13	0.24 J	0.37 J	0.32	0.072	0.2 – 0.54
	hepatopancreas only	4/7	57	0.60 J	1.1 EMPC J	0.76	0.23	0.71 – 1.2
	muscle/ hepatopancreas	10/41	24	0.30 EMPC J	0.57 J	0.45	0.11	0.23 – 1.2
White perch	carcass	1/1	100	0.63 J	0.63 J	na	na	na
	whole body	15/19	79	0.51 EMPC J	1.6 J	0.84	0.25	0.23 – 0.55
American eel	carcass	2/2	100	0.46 J	0.47 J	0.47	0.0071	na
	fillet (skinless)	10/32	31	0.23 EMPC J	0.64 J	0.40	0.14	0.2 – 1.1
	whole body	16/19	84	0.35 EMPC J	1.3 J	0.72	0.33	0.19 – 0.39
Northern pike	carcass	1/1	100	0.71 EMPC J	0.71 EMPC J	na	na	na
1,2,3,6,7,8-HxCDD (ng/kg ww)								
Brown bullhead	whole body	6/6	100	1.1 J	5.1	2.7	1.5	na
Carp	fillet (with skin)	12/12	100	1.8 J	15	6.0	3.9	na
	whole body	12/12	100	2.6 J	15	7.8	3.4	na
Channel catfish	carcass	11/11	100	0.66 J	5.3	2.4	1.4	na
	fillet (skinless)	8/11	73	0.46 J	1.5 J	0.87	0.38	0.37 – 0.45
White catfish	carcass	19/19	100	0.90 J	7.0	3.6	1.6	na
	fillet (skinless)	12/19	63	0.47 J	3.0 EMPC J	1.3	0.80	0.14 – 0.28
White sucker	carcass	5/5	100	0.52 J	1.3 J	1.0	0.29	na
Blue crab	carcass	23/24	96	0.34 EMPC J	1.1 J	0.65	0.21	0.36
	hepatopancreas only	7/7	100	1.2 J	3.3	2.3	0.75	na
	muscle only	1/21	5	0.26 EMPC J	0.26 EMPC J	na	na	0.13 – 0.37
	muscle/ hepatopancreas	29/41	71	0.54 J	1.7 J	0.96	0.29	0.35 – 1.3

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
1,2,3,6,7,8-HxCDD (ng/kg ww) (cont.)								
White perch	carcass	1/1	100	1.9 J	1.9 J	na	na	na
	fillet (with skin)	8/19	42	0.27 EMPC J	1.1 EMPC J	0.54	0.26	0.27 – 0.56
	whole body	17/19	90	0.31 J	2.7 J	1.3	0.60	0.53
American eel	carcass	2/2	100	1.7 J	3.0 J	2.4	0.92	na
	fillet (skinless)	26/32	81	0.67 J	2.4 J	1.4	0.51	0.3 – 0.65
	whole body	19/19	100	0.60 J	5.4	2.3	1.4	na
Largemouth bass	carcass	2/3	67	0.68 EMPC J	0.93 J	0.81	0.18	0.42
Northern pike	carcass	1/1	100	2.5 J	2.5 J	na	na	na
Smallmouth bass	carcass	2/3	67	1.4 J	1.5 J	1.5	0.071	0.32
1,2,3,7,8,9-HxCDD (ng/kg ww)								
Brown bullhead	whole body	6/6	100	0.58 J	1.4 J	0.98	0.32	na
Carp	fillet (with skin)	11/12	92	0.60 EMPC J	4.1 J	1.6	1.1	0.41
	whole body	12/12	100	0.83 J	4.0 J	2.1	0.87	na
Channel catfish	carcass	11/11	100	0.33 EMPC J	2.0 J	0.87	0.49	na
	fillet (skinless)	7/11	64	0.39 J	0.72 J	0.48	0.11	0.42 – 0.45
White catfish	carcass	18/19	95	0.49 EMPC J	1.9 EMPC J	1.1	0.36	0.39
	fillet (skinless)	10/19	53	0.19 EMPC J	0.71 EMPC J	0.50	0.17	0.17 – 0.43
White sucker	carcass	1/5	20	0.68 J	0.68 J	na	na	0.43 – 0.7
Blue crab	carcass	12/24	50	0.33 J	0.69 J	0.47	0.12	0.26 – 0.68
	hepatopancreas only	3/7	43	0.54 J	1.0 J	0.84	0.26	0.83 – 1.6
	muscle only	1/21	5	0.19 EMPC J	0.19 EMPC J	na	na	0.13 – 0.39
	muscle/ hepatopancreas	12/41	29	0.39 EMPC J	0.97 J	0.57	0.17	0.27 – 1.4
White perch	carcass	1/1	100	0.57 J	0.57 J	na	na	na
	fillet (with skin)	5/19	26	0.23 EMPC J	0.67 J	0.41	0.18	0.31 – 0.56
	whole body	15/19	79	0.27 EMPC J	0.83 J	0.52	0.15	0.28 – 0.66
American eel	carcass	2/2	100	0.49 EMPC J	0.57 J	0.53	0.057	na
	fillet (skinless)	12/32	38	0.32 J	0.75 EMPC J	0.47	0.14	0.28 – 1.1
	whole body	10/19	53	0.32 EMPC J	1.1 J	0.67	0.26	0.24 – 0.67
Northern pike	carcass	1/1	100	0.82 J	0.82 J	na	na	na

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
1,2,3,7,8-PeCDD (ng/kg ww)								
Brown bullhead	whole body	5/6	83	0.76 J	2.7 J	1.9	0.82	0.4
Carp	fillet (with skin)	12/12	100	1.4 J	10	3.8	2.4	na
	whole body	12/12	100	1.6 J	9.5	4.7	2.2	na
Channel catfish	carcass	11/11	100	0.54 EMPC J	3.9 EMPC J	1.8	1.1	na
	fillet (skinless)	8/11	73	0.46 J	1.4 J	0.77	0.33	0.26 – 0.36
White catfish	carcass	18/19	95	0.61 EMPC J	6.1 EMPC J	3.1	1.4	0.37
	fillet (skinless)	13/19	68	0.48 EMPC J	2.6 J	1.2	0.64	0.14 – 0.3
White sucker	carcass	5/5	100	0.66 EMPC J	2.5 J	1.5	0.70	na
	fillet (with skin)	1/5	20	0.71 EMPC J	0.71 EMPC J	na	na	0.28 – 0.56
Blue crab	carcass	22/24	92	0.47 J	1.0 J	0.73	0.15	0.32 – 0.42
	hepatopancreas only	7/7	100	1.5 EMPC J	3.4	2.7	0.72	na
	muscle only	4/21	19	0.16 J	0.37 J	0.26	0.088	0.12 – 0.42
	muscle/ hepatopancreas	35/41	85	0.60 EMPC J	1.8 J	0.97	0.27	0.37 – 0.9
White perch	carcass	1/1	100	2.6 J	2.6 J	na	na	na
	fillet (with skin)	14/19	74	0.38 EMPC J	1.3 J	0.71	0.25	0.23 – 0.62
	whole body	18/19	95	0.45 J	3.5 EMPC J	1.8	0.85	0.21
American eel	carcass	2/2	100	1.1 EMPC J	1.2 J	1.2	0.071	na
	fillet (skinless)	11/32	34	0.41 EMPC J	1.1 J	0.59	0.20	0.16 – 0.86
	whole body	6/19	31	0.26 EMPC J	1.0 EMPC J	0.64	0.29	0.17 – 0.43
Largemouth bass	carcass	2/3	67	0.93 EMPC J	1.3 EMPC J	1.1	0.26	0.4
Northern pike	carcass	1/1	100	3.6 J	3.6 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.63 EMPC J	1.2 J	0.98	0.30	na
2,3,7,8-TCDD (ng/kg ww)								
Brown bullhead	whole body	6/6	100	7.8	190	91	71	na
Carp	fillet (with skin)	12/12	100	10	730	270	240	na
	whole body	12/12	100	5.2	1400	410	380	na
Channel catfish	carcass	11/11	100	25	190	86	57	na
	fillet (skinless)	11/11	100	9.6	77	28	21	na
White catfish	carcass	19/19	100	29	470	210	120	na
	fillet (skinless)	19/19	100	3.5	170	56	51	na

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
2,3,7,8-TCDD (ng/kg ww) (cont.)								
White sucker	carcass	5/5	100	4.5	200	88	80	na
	fillet (with skin)	5/5	100	1.0 EMPC J	29	14	13	na
Blue crab	carcass	24/24	100	22	55 J	39	11	na
	hepatopancreas only	7/7	100	41	210	140	64	na
	muscle only	21/21	100	0.82 EMPC J	20	7.5	5.6	na
	muscle/ hepatopancreas	41/41	100	4.0 EMPC J	110	49	25	na
White perch	carcass	1/1	100	150	150	na	na	na
	fillet (with skin)	19/19	100	3.6	99	41	24	na
	whole body	19/19	100	18	250	130	71	na
American eel	carcass	2/2	100	31	31	31	na	na
	fillet (skinless)	32/32	100	0.31 EMPC J	41	14	9.8	na
	whole body	18/19	95	0.32 J	47	18	15	0.21
Largemouth bass	carcass	3/3	100	0.57 J	310	140	160	na
	fillet (with skin)	2/3	67	3.1	5.7	4.4	1.8	0.34
Northern pike	carcass	1/1	100	170	170	na	na	na
	fillet (with skin)	1/1	100	7.6	7.6	na	na	na
Smallmouth bass	carcass	3/3	100	13	110	56	50	na
	fillet (with skin)	3/3	100	0.61 EMPC J	14	6.6	6.8	na
OCDD (ng/kg ww)								
Brown bullhead	whole body	2/6	33	22	28	25	4.2	8.9 – 15
Carp	whole body	11/12	92	21 J	61 J	34	11	17
Channel catfish	carcass	11/11	100	2.4 J	5.7 J	3.8	1.0	na
	fillet (skinless)	11/11	100	1.7 J	9.3 J	4.0	2.2	na
White catfish	carcass	13/19	68	3.0 J	22	9.6	4.6	3.8 – 8.6
	fillet (skinless)	6/19	32	1.5 J	5.7 J	2.5	1.6	0.56 – 8.1
White sucker	carcass	5/5	100	1.8 J	15	6.7	5.1	na
Blue crab	carcass	24/24	100	7.7 J	32	12	5.5	na
	hepatopancreas only	7/7	100	5.3	14	7.7	3.0	na
	muscle only	18/21	86	0.72 J	2.3 J	1.4	0.43	0.48 – 0.89
	muscle/ hepatopancreas	30/41	73	2.5 EMPC J	8.2 J	4.1	1.4	1.2 – 5.4
White perch	carcass	1/1	100	6.6 J	6.6 J	na	na	na
	whole body	18/19	95	1.4 J	12	6.4	3.1	1.4

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
OCDD (ng/kg ww) (cont.)								
American eel	carcass	2/2	100	2.7 J	4.0 J	3.4	0.92	na
	fillet (skinless)	15/32	47	0.75 EMPC J	3.0 J	1.8	0.73	1.2 – 7.7
	whole body	9/19	47	2.6 J	8.9 J	5.8	2.0	1.6 – 4.1
Largemouth bass	fillet (with skin)	3/3	100	5.6 J	6.5 J	5.9	0.49	na
Northern pike	fillet (with skin)	1/1	100	3.6 EMPC J	3.6 EMPC J	na	na	na
Smallmouth bass	fillet (with skin)	3/3	100	5.4 J	17	9.9	6.2	na
1,2,3,4,6,7,8-HpCDF (ng/kg ww)								
Brown bullhead	whole body	6/6	100	1.0 J	5.7	2.3	1.8	na
Carp	fillet (with skin)	8/12	67	3.4 J	12	6.5	3.1	0.27 – 1.2
	whole body	10/12	83	4.7	18	9.2	3.9	1.5 – 1.7
Channel catfish	carcass	11/11	100	0.41 J	1.1 J	0.71	0.21	na
	fillet (skinless)	7/11	64	0.28 J	2.0 J	0.80	0.76	0.24 – 0.28
White catfish	carcass	19/19	100	0.53 J	26	3.0	5.6	na
	fillet (skinless)	17/19	90	0.19 J	1.1 J	0.49	0.28	0.14 – 0.18
White sucker	carcass	5/5	100	0.47 J	1.2 EMPC J	0.73	0.29	na
Blue crab	carcass	24/24	100	1.4 J	7.2	3.9	1.5	na
	hepatopancreas only	7/7	100	1.4 J	15	10	5.6	na
	muscle only	16/21	76	0.18 EMPC J	1.6 J	0.71	0.48	0.12 – 0.26
	muscle/ hepatopancreas	41/41	100	0.35 J	12	3.0	2.3	na
White perch	carcass	1/1	100	2.2 J	2.2 J	na	na	na
	fillet (with skin)	12/19	63	0.30 J	0.82 EMPC J	0.48	0.15	0.16 – 0.35
	whole body	19/19	100	0.21 J	1.8 J	1.1	0.52	na
American eel	carcass	2/2	100	2.1 J	2.8 J	2.5	0.49	na
	fillet (skinless)	31/32	97	0.26 J	1.9 J	0.84	0.38	0.35
	whole body	19/19	100	0.36 J	2.7 J	1.3	0.75	na
Largemouth bass	fillet (with skin)	1/3	33	0.69 J	0.69 J	na	na	0.3 – 0.36
1,2,3,4,7,8-HxCDF (ng/kg ww)								
Brown bullhead	whole body	5/6	83	0.79 J	8.2 J	3.8	3.4	0.33
Carp	fillet (with skin)	12/12	100	0.63 J	27	9.1	8.5	na
	whole body	12/12	100	0.60 J	33 J	12	9.2	na

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
1,2,3,4,7,8-HxCDF (ng/kg ww) (cont.)								
Channel catfish	carcass	11/11	100	0.59 EMPC J	2.6 J	1.2	0.76	na
	fillet (skinless)	6/11	55	0.25 J	0.88 J	0.50	0.25	0.21 – 0.3
White catfish	carcass	18/19	95	0.68 EMPC J	11	4.3	2.9	0.27
	fillet (skinless)	14/19	74	0.25 EMPC J	3.1 J	1.3	0.92	0.09 – 0.17
White sucker	carcass	3/5	60	1.2 EMPC J	1.9 J	1.6	0.35	0.32 – 0.34
	fillet (with skin)	1/5	20	0.48 EMPC J	0.48 EMPC J	na	na	0.19 – 0.25
Blue crab	carcass	24/24	100	0.75 EMPC J	8.0	5.0	1.9	na
	hepatopancreas only	7/7	100	1.8 J	31	20	12	na
	muscle only	13/21	62	0.14 EMPC J	3.1 J	1.4	0.86	0.11 – 0.29
	muscle/ hepatopancreas	41/41	100	0.34 EMPC J	12	5.0	3.8	na
White perch	carcass	1/1	100	11	11	11	na	na
	fillet (with skin)	16/19	84	0.24 J	2.4 J	1.2	0.58	0.19 – 0.23
	whole body	19/19	100	0.28 EMPC J	8.6	3.3	2.1	na
American eel	carcass	2/2	100	4.8 J	5.7	5.3	0.64	na
	fillet (skinless)	30/32	94	0.26 J	2.9 J	1.2	0.77	0.11 – 0.15
	whole body	18/19	95	0.25 J	4.8	1.6	1.6	0.2
Largemouth bass	carcass	2/3	67	0.87 EMPC J	0.87 EMPC J	na	na	0.28
Northern pike	carcass	1/1	100	3.9 J	3.9 J	na	na	na
Smallmouth bass	carcass	2/3	67	0.98 J	2.3 J	1.6	0.93	0.22
1,2,3,6,7,8-HxCDF (ng/kg ww)								
Brown bullhead	whole body	5/6	83	0.31 J	2.9 J	1.5	1.1	0.31
Carp	fillet (with skin)	12/12	100	0.49 J	8.3	3.2	2.5	na
	whole body	12/12	100	0.64 EMPC J	11	4.5	2.8	na
Channel catfish	carcass	11/11	100	0.22 J	1.1 J	0.58	0.30	na
	fillet (skinless)	7/11	64	0.21 EMPC J	0.42 J	0.32	0.074	0.19 – 0.28
White catfish	carcass	18/19	95	0.40 J	9.6	2.0	2.0	0.25
	fillet (skinless)	13/19	68	0.18 EMPC J	0.94 EMPC J	0.49	0.27	0.082 – 0.17
White sucker	carcass	3/5	60	0.50 EMPC J	0.64 J	0.59	0.081	0.31 – 0.32

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
1,2,3,6,7,8-HxCDF (ng/kg ww) (cont.)								
Blue crab	carcass	23/24	96	0.66 J	1.8 J	1.2	0.30	0.2
	hepatopancreas only	7/7	100	0.76 EMPC J	6.0	4.0	2.1	na
	muscle only	10/21	48	0.13 J	0.66 J	0.34	0.14	0.098 – 0.25
	muscle/ hepatopancreas	38/41	93	0.29 EMPC J	3.0 J	1.2	0.68	0.2 – 0.26
White perch	carcass	1/1	100	2.7 J	2.7 J	2.7	na	na
	fillet (with skin)	15/19	79	0.21 J	0.80 J	0.35	0.15	0.16 – 0.21
	whole body	16/19	84	0.40 J	2.0 J	1.1	0.40	0.15 – 0.18
American eel	carcass	2/2	100	1.1 J	1.2 J	1.2	0.071	na
	fillet (skinless)	18/32	56	0.15 J	0.89 J	0.43	0.19	0.11 – 0.56
	whole body	17/19	90	0.16 J	1.7 J	0.59	0.45	0.12 – 0.17
Northern pike	carcass	1/1	100	1.1 J	1.1 J	na	na	na
1,2,3,7,8-PeCDF (ng/kg ww)								
Brown bullhead	whole body	5/6	83	0.42 J	2.0 J	1.0	0.66	0.21
Carp	fillet (with skin)	12/12	100	0.53 J	4.3 J	1.8	1.2	na
	whole body	12/12	100	0.55 J	3.3 J	2.0	0.92	na
Channel catfish	carcass	5/11	46	0.22 EMPC J	0.51 J	0.31	0.12	0.13 – 0.36
	fillet (skinless)	1/11	9	0.20 EMPC J	0.20 EMPC J	na	na	0.17 – 0.27
White catfish	carcass	11/19	58	0.46 J	2.6 J	1.3	0.72	0.17 – 0.53
	fillet (skinless)	3/19	16	0.21 EMPC J	1.1 J	0.69	0.45	0.082 – 0.31
White sucker	carcass	5/5	100	0.31 EMPC J	1.5 J	0.85	0.45	na
	fillet (with skin)	1/5	20	0.34 EMPC J	0.34 EMPC J	na	na	0.22 – 0.32
Blue crab	carcass	24/24	100	0.43 EMPC J	1.4 J	0.99	0.29	na
	hepatopancreas only	7/7	100	1.1 EMPC J	6.3 J	4.2	2.0	na
	muscle only	11/21	53	0.11 EMPC J	0.63 J	0.35	0.16	0.088 – 0.27
	muscle/ hepatopancreas	38/41	93	0.29 EMPC J	2.2 EMPC J	1.2	0.53	0.24 – 0.26
White perch	carcass	1/1	100	3.8 J	3.8 J	na	na	na
	fillet (with skin)	14/19	74	0.31 J	1.3 J	0.65	0.27	0.2 – 0.4
	whole body	17/19	90	0.54 J	3.6 J	1.8	0.78	0.2
Largemouth bass	carcass	3/3	100	0.39 EMPC J	3.6 J	1.6	1.8	na
Northern pike	carcass	1/1	100	2.7 J	2.7 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.41 J	0.75 J	0.56	0.17	na

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
2,3,4,6,7,8-HxCDF (ng/kg ww)								
Brown bullhead	whole body	4/6	67	0.30 J	1.5 EMPC J	0.89	0.52	0.32 – 0.35
Carp	fillet (with skin)	10/12	83	0.33 J	3.5 J	1.5	1.0	0.18 – 0.26
	whole body	12/12	100	0.33 J	4.7 J	1.9	1.1	na
Channel catfish	carcass	10/11	91	0.15 EMPC J	1.1 J	0.50	0.29	0.12
	fillet (skinless)	3/11	27	0.16 EMPC J	0.45 J	0.35	0.17	0.18 – 0.31
White catfish	carcass	18/19	95	0.39 J	1.7 J	0.90	0.42	0.26
	fillet (skinless)	3/19	16	0.17 J	0.59 J	0.44	0.23	0.088 – 0.33
Blue crab	carcass	17/24	71	0.21 EMPC J	0.59 J	0.40	0.091	0.1 – 0.28
	hepatopancreas only	6/7	86	0.43 J	2.1 J	1.4	0.71	0.51
	muscle/ hepatopancreas	19/41	46	0.28 J	0.83 J	0.55	0.16	0.15 – 0.58
White perch	carcass	1/1	100	0.86 J	0.86 J	na	na	na
	fillet (with skin)	5/19	26	0.15 EMPC J	0.27 J	0.21	0.044	0.16 – 0.3
	whole body	15/19	79	0.20 EMPC J	0.79 EMPC J	0.51	0.16	0.15 – 0.19
American eel	carcass	2/2	100	0.51 J	0.68 J	0.60	0.12	na
	fillet (skinless)	3/32	9	0.24 EMPC J	0.39 J	0.31	0.075	0.11 – 0.6
	whole body	13/19	68	0.18 J	0.80 J	0.37	0.23	0.15 – 0.23
2,3,4,7,8-PeCDF (ng/kg ww)								
Brown bullhead	whole body	6/6	100	0.94 J	8.8	4.0	3.2	na
Carp	fillet (with skin)	12/12	100	1.7 J	29	10	7.9	na
	whole body	12/12	100	1.7 J	29	12	7.6	na
Channel catfish	carcass	11/11	100	0.86 J	7.5	3.8	2.2	na
	fillet (skinless)	11/11	100	0.42 EMPC J	2.8 J	1.2	0.77	na
White catfish	carcass	18/19	95	1.2 J	21	8.7	5.0	0.49
	fillet (skinless)	19/19	100	0.16 J	7.2	2.3	2.1	na
White sucker	carcass	5/5	100	1.2 J	4.6 J	2.7	1.3	na
	fillet (with skin)	3/5	60	0.39 J	0.83 J	0.55	0.25	0.22 – 0.32
Blue crab	carcass	24/24	100	1.4 EMPC J	7.1	3.7	1.4	na
	hepatopancreas only	7/7	100	3.8	26	17	9.2	na
	muscle only	15/21	71	0.22 EMPC J	2.1 EMPC J	0.98	0.62	0.084 – 0.27
	muscle/ hepatopancreas	38/41	93	0.71 J	10	4.6	2.5	0.18 – 0.24

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
2,3,4,7,8-PeCDF (ng/kg ww) (cont.)								
White perch	carcass	1/1	100	15	15	na	na	na
	fillet (with skin)	19/19	100	0.35 EMPC J	3.8 J	2.0	1.1	na
	whole body	19/19	100	0.47 EMPC J	12	5.8	3.2	na
American eel	carcass	2/2	100	1.2 J	2.3 J	1.8	0.78	na
	fillet (skinless)	19/32	59	0.27 J	0.91 J	0.58	0.18	0.12 – 0.44
	whole body	17/19	90	0.17 EMPC J	1.7 J	0.56	0.41	0.16 – 0.19
Largemouth bass	carcass	3/3	100	1.6 EMPC J	4.1 J	2.8	1.3	na
Northern pike	carcass	1/1	100	12	12	na	na	na
	fillet (with skin)	1/1	100	0.44 EMPC J	0.44 EMPC J	na	na	na
Smallmouth bass	carcass	3/3	100	1.1 J	3.8 J	2.1	1.5	na
2,3,7,8-TCDF (ng/kg ww)								
Brown bullhead	whole body	6/6	100	0.42 J	2.9	1.3	0.93	na
Carp	fillet (with skin)	12/12	100	1.1	6.5	3.0	1.6	na
	whole body	12/12	100	1.7	5.0	2.9	1.0	na
Channel catfish	carcass	10/11	91	0.29 EMPC J	0.97 J	0.60	0.27	0.16
	fillet (skinless)	3/11	27	0.24 EMPC J	0.48 J	0.35	0.12	0.16 – 0.28
White catfish	carcass	18/19	95	0.23 EMPC J	3.0	0.84	0.67	0.14
	fillet (skinless)	7/19	37	0.097 J	1.3	0.45	0.42	0.088 – 0.26
White sucker	carcass	5/5	100	5.7	10	8.4	2.0	na
	fillet (with skin)	5/5	100	0.75 J	2.1	1.3	0.49	na
Blue crab	carcass	24/24	100	2.4	8	5.3	1.8	na
	hepatopancreas only	7/7	100	9.9	34	24	10	na
	muscle only	21/21	100	0.33 J	3.4 J	1.2	0.90	na
	muscle/ hepatopancreas	41/41	100	2.3	14	6.9	2.8	na
White perch	carcass	1/1	100	20	20	na	na	na
	fillet (with skin)	19/19	100	0.75 J	5.7	2.6	1.3	na
	whole body	19/19	100	1.4	17	9.0	4.3	na
American eel	carcass	1/2	50	0.23 J	0.23 J	na	na	0.12
	whole body	1/19	5	0.21 J	0.21 J	na	na	0.1 – 0.24
Largemouth bass	carcass	3/3	100	1.4 J	14	5.7	7.2	na
	fillet (with skin)	1/3	33	0.71 J	0.71 J	na	na	0.19 – 0.25

Table 4-8. Summary of detected PCDD/PCDF results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency		Detected Concentration[b]				RL or Range of RLs[c]
		Ratio	%	Min	Max	Mean	St Dev	
2,3,7,8-TCDF (ng/kg ww) (cont.)								
Northern pike	carcass	1/1	100	20	20	na	na	na
	fillet (with skin)	1/1	100	1.1	1.1	na	na	na
Smallmouth bass	carcass	3/3	100	0.86 J	1.7	1.3	0.42	na
OCDF (ng/kg ww)								
Brown bullhead	whole body	6/6	100	1.4 J	2.9 J	2.0	0.53	na
Carp	whole body	10/12	83	1.4 J	3.6 J	2.4	0.67	0.64 – 3
Channel catfish	carcass	6/11	55	0.33 J	1.0 J	0.61	0.30	0.2 – 0.35
	fillet (skinless)	5/11	45	0.53 J	1.9 J	1.1	0.57	0.49 – 0.75
White catfish	carcass	7/19	37	0.68 EMPC J	2.9 J	1.5	0.87	0.3 – 1.4
	fillet (skinless)	9/19	47	0.30 EMPC J	1.6 J	0.85	0.45	0.35 – 0.76
White sucker	carcass	1/5	20	1.1 EMPC J	1.1 EMPC J	na	na	0.62 – 0.75
Blue crab	carcass	23/24	96	1.1 J	6.2 J	2.3	1.3	0.75
	muscle/ hepatopancreas	1/41	2	0.51 J	0.51 J	na	na	0.37 – 1.9
White perch	carcass	1/1	100	1.3 J	1.3 J	na	na	na
	fillet (with skin)	4/19	21	0.95 J	2.4 J	1.7	0.63	0.4 – 1.3
	whole body	11/19	58	0.53 EMPC J	3.9 J	1.5	0.96	0.25 – 0.83
American eel	carcass	2/2	100	0.47 J	0.70 J	0.59	0.16	na
	fillet (skinless)	4/32	13	0.56 J	1.5 J	1.2	0.44	0.29 – 1.7
	whole body	6/19	32	0.49 J	1.0 J	0.66	0.19	0.33 – 0.6
Largemouth bass	fillet (with skin)	1/3	33	0.97 J	0.97 J	na	na	1.1 – 1.2
Smallmouth bass	fillet (with skin)	3/3	100	1.6 J	2.8 J	2.1	0.61	na

[a] Only analytes with detected results are presented. If the analyte was not detected in any samples for a given species and tissue type, the analyte is not presented in the table. Data tables that contain results for each sample, including non-detected sample results, are presented in Appendix F.

[b] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviation) include data for detected results only. Non-detected data are not included in summary statistics.

[c] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

EMPC – estimated maximum potential concentration
HpCDD – heptachlorodibenzo-*p*-dioxin
HpCDF – heptachlorodibenzofuran
HxCDD – hexachlorodibenzo-*p*-dioxin
HxCDF – hexachlorodibenzofuran
J – estimated concentration
Max – maximum
Min – minimum
OCDF – octachlorodibenzofuran
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
PeCDD – pentachlorodibenzo-*p*-dioxin
PeCDF – pentachlorodibenzofuran
RL – reporting limit
St Dev – standard deviation
TCDD – tetrachlorodibenzo-*p*-dioxin

na – not applicable
ND – non-detected concentration
OCDD – octachlorodibenzo-*p*-dioxin
TCDF – tetrachlorodibenzofuran
ww – wet weight

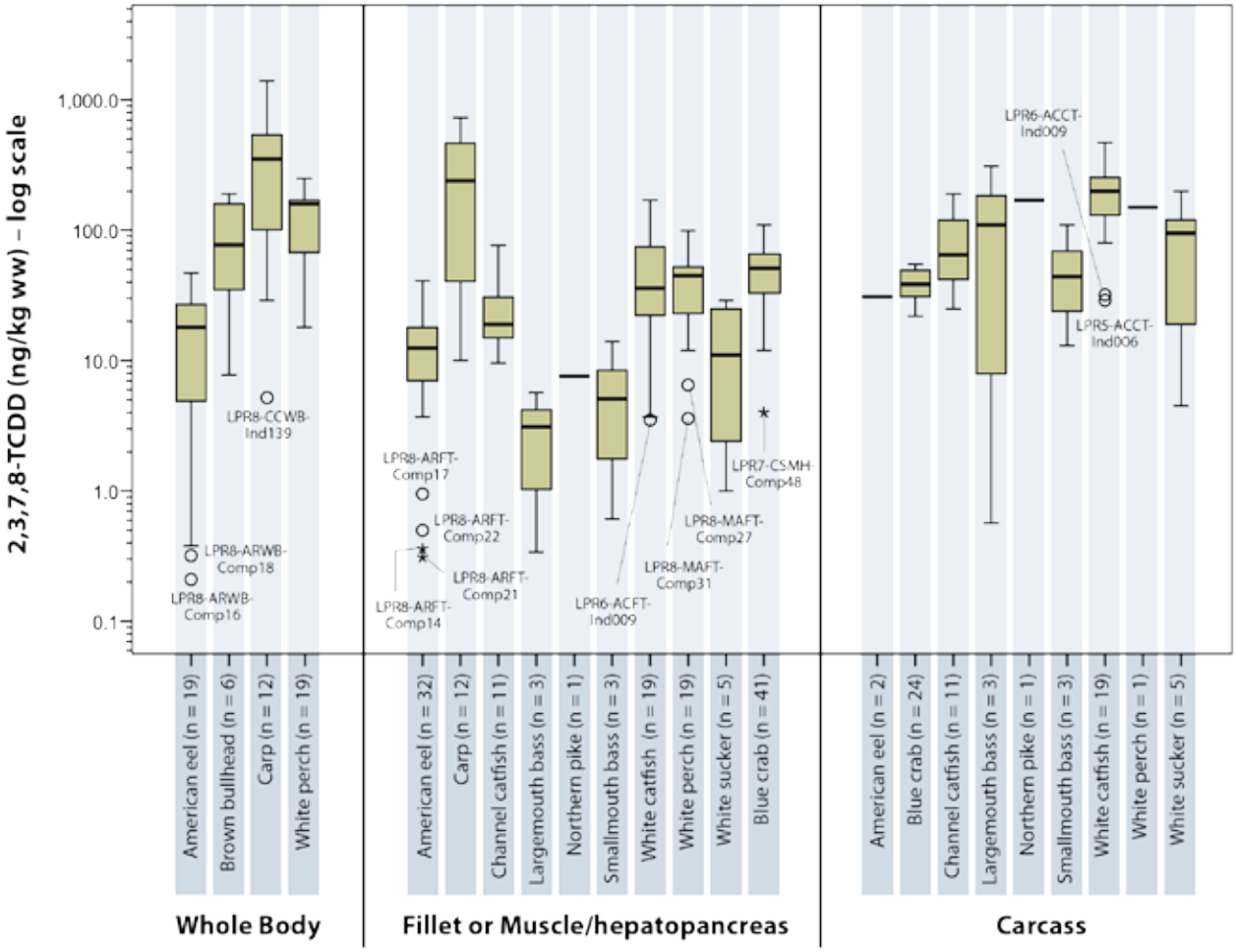
4.6.1 2,3,7,8-TCDD

2,3,7,8-TCDD was detected in 297 of 299 fish and blue crab samples analyzed (Table 4-8). Detected 2,3,7,8-TCDD concentrations ranged from 0.31 to 1,400 ng/kg ww across all fish and blue crab samples. The highest 2,3,7,8-TCDD concentration (1,400 ng/kg ww) was measured in an individual carp whole-body sample (LPR4-CCWB-Ind175) from Reach 4. The distributions of 2,3,7,8-TCDD concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-39.[15] The following summarize 2,3,7,8-TCDD concentrations for fish and blue crab by tissue type, as shown in Figure 4-39:

- **Fish whole body** – 2,3,7,8-TCDD was detected in all fish whole-body samples, except for one American eel whole-body composite sample. Fish whole-body detected 2,3,7,8-TCDD concentrations ranged from 0.32 to 1,400 ng/kg ww. The highest whole-body 2,3,7,8-TCDD concentration (1,400 ng/kg ww) was measured in an individual carp whole-body sample (LPR4-CCWB-Ind175) from Reach 4.
- **Fish fillet and blue crab muscle/hepatopancreas** – 2,3,7,8-TCDD was detected in all fish fillet samples, except for one individual largemouth bass fillet sample. 2,3,7,8-TCDD was detected in blue crab muscle/hepatopancreas samples. Fish fillet 2,3,7,8-TCDD concentrations ranged from 0.31 to 730 ng/kg ww, and the highest fish fillet 2,3,7,8-TCDD concentration (730 ng/kg ww) was measured in an individual carp fillet sample (LPR5-CCFT-Ind184) from Reach 5. Blue crab muscle/hepatopancreas 2,3,7,8-TCDD concentrations ranged from 4.0 to 110 ng/kg ww, and the highest blue crab muscle/hepatopancreas 2,3,7,8-TCDD concentration (110 ng/kg ww) was measured in a composite sample (LPR4-CSMH-Comp33) from Reach 4.
- **Fish and blue crab carcass** – 2,3,7,8-TCDD was detected in all fish and blue crab carcass samples. Fish carcass 2,3,7,8-TCDD concentrations ranged from 0.57 to 470 ng/kg ww, and the highest fish carcass 2,3,7,8-TCDD concentration (470 ng/kg ww) was measured in an individual white catfish carcass sample (LPR3-ACCT-Ind005) from Reach 3. Blue crab carcass 2,3,7,8-TCDD concentrations ranged from 22 to 55 ng/kg ww, and the highest blue crab

[15] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

carcass 2,3,7,8-TCDD concentration (55 ng/kg ww) was measured in a composite sample (LPR2-CSCT-Comp15) from Reach 2.

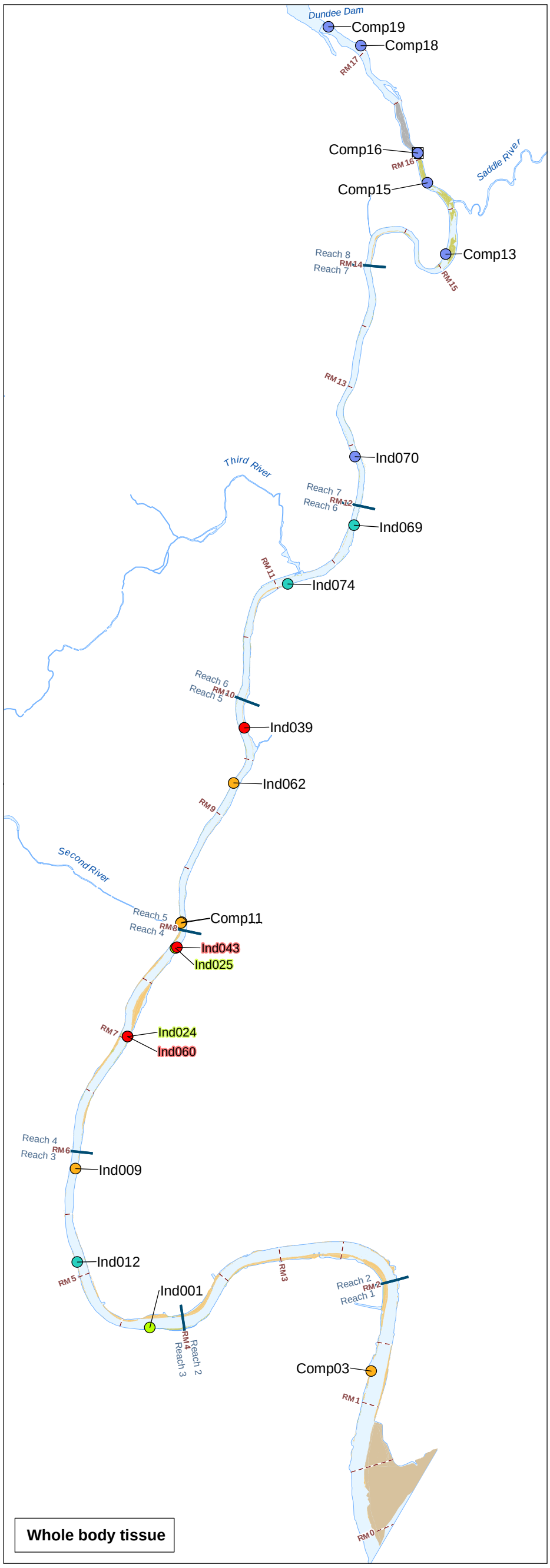


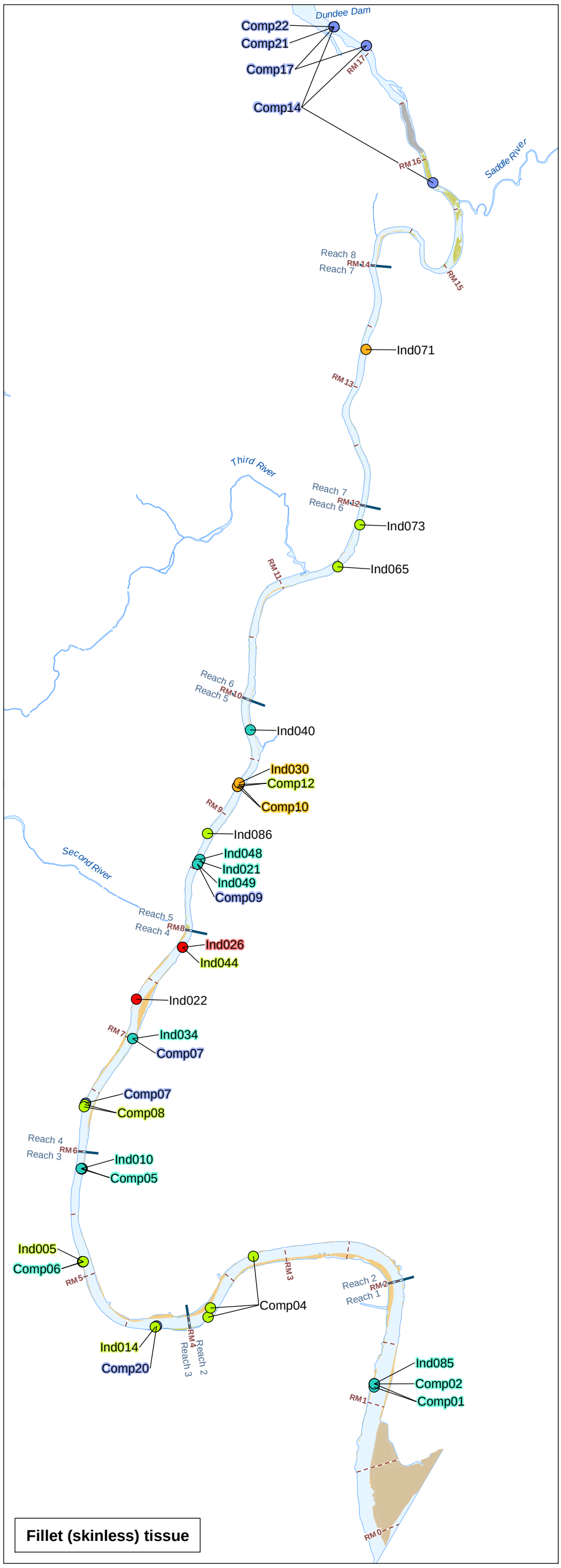
Note: The RL is displayed for non-detected concentrations.

Figure 4-39. 2,3,7,8-TCDD concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue 2,3,7,8-TCDD concentrations are shown by percentile range and reach in Figures 4-40 through 4-42, respectively. The highest American eel 2,3,7,8-TCDD concentration (47 ng/kg ww) was measured in an individual fish whole-body sample (LPR4-ARWB-Ind060) from Reach 4 (Figure 4-40). The highest white perch 2,3,7,8-TCDD concentration (250 ng/kg ww) was measured in a whole-body composite sample (LPR4-MAWB-Comp14) from Reach 4 (Figure 4-41). The highest blue crab 2,3,7,8-TCDD concentration (210 ng/kg ww) was measured in one blue crab hepatopancreas-only composite sample (LPR2-CSHT-Comp63) from Reach 2 and one hepatopancreas-only composite sample (LPR3-CSHT-Comp64) from

Reach 3. Of the 93 blue crab samples, 5 hepatopancreas-only samples had the highest 2,3,7,8-TCDD concentrations (ranging from 210 to 130 ng/kg ww). The highest blue crab 2,3,7,8-TCDD concentration, excluding hepatopancreas-only samples (110 ng/kg ww), was measured in a muscle/hepatopancreas composite sample (LPR4-CSMH-Comp33) from Reach 4 (Figure 4-42).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

2,3,7,8-TCDD (ng/kg)	(Percentile)
> 33	(> 90th)
> 23 and ≤ 33	(> 75th and ≤ 90th)
> 13 and ≤ 23	(> 50th and ≤ 75th)
> 5.4 and ≤ 13	(> 25th and ≤ 50th)
≤ 5.4	(≤ 25th)
Non-detected	

The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-40. 2,3,7,8-TCDD concentrations in American eel 2009 tissue samples from the LPRSA

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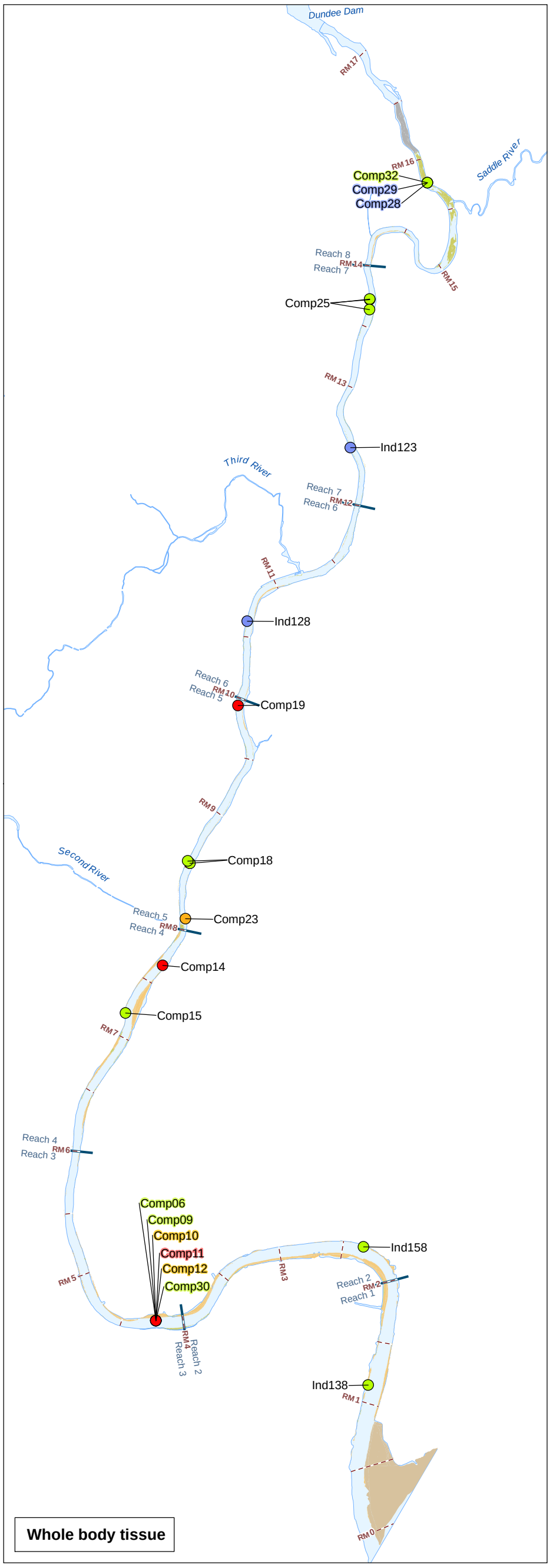
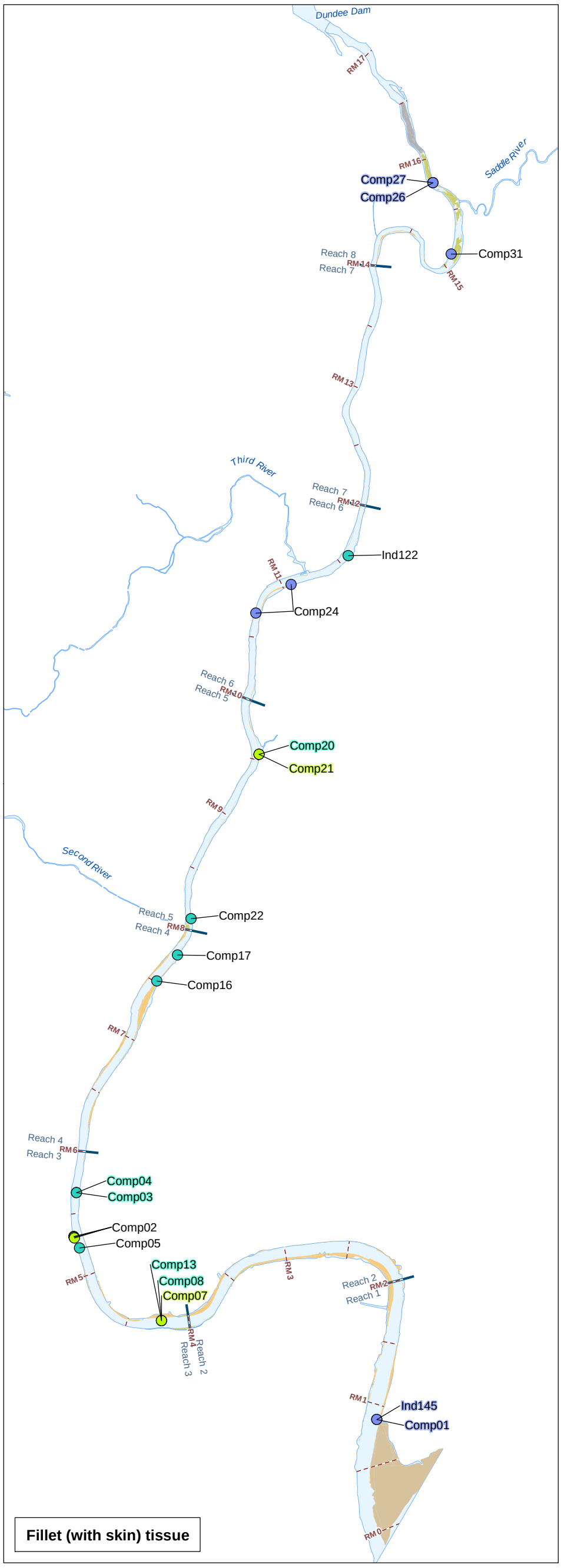
Prepared by LSM 4/28/2011, map 4661; W:\Projects\06-58-01 Passaic RI\Data\GIS\Maps_and_Analysis\FishData





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

2,3,7,8-TCDD (ng/kg)	(Percentile)
> 170	(> 90th)
> 160 and ≤ 170	(> 75th and ≤ 90th)
> 53 and ≤ 160	(> 50th and ≤ 75th)
> 28 and ≤ 53	(> 25th and ≤ 50th)
≤ 28	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-41. 2,3,7,8-TCDD concentrations in white perch 2009 tissue samples from the LPRSA

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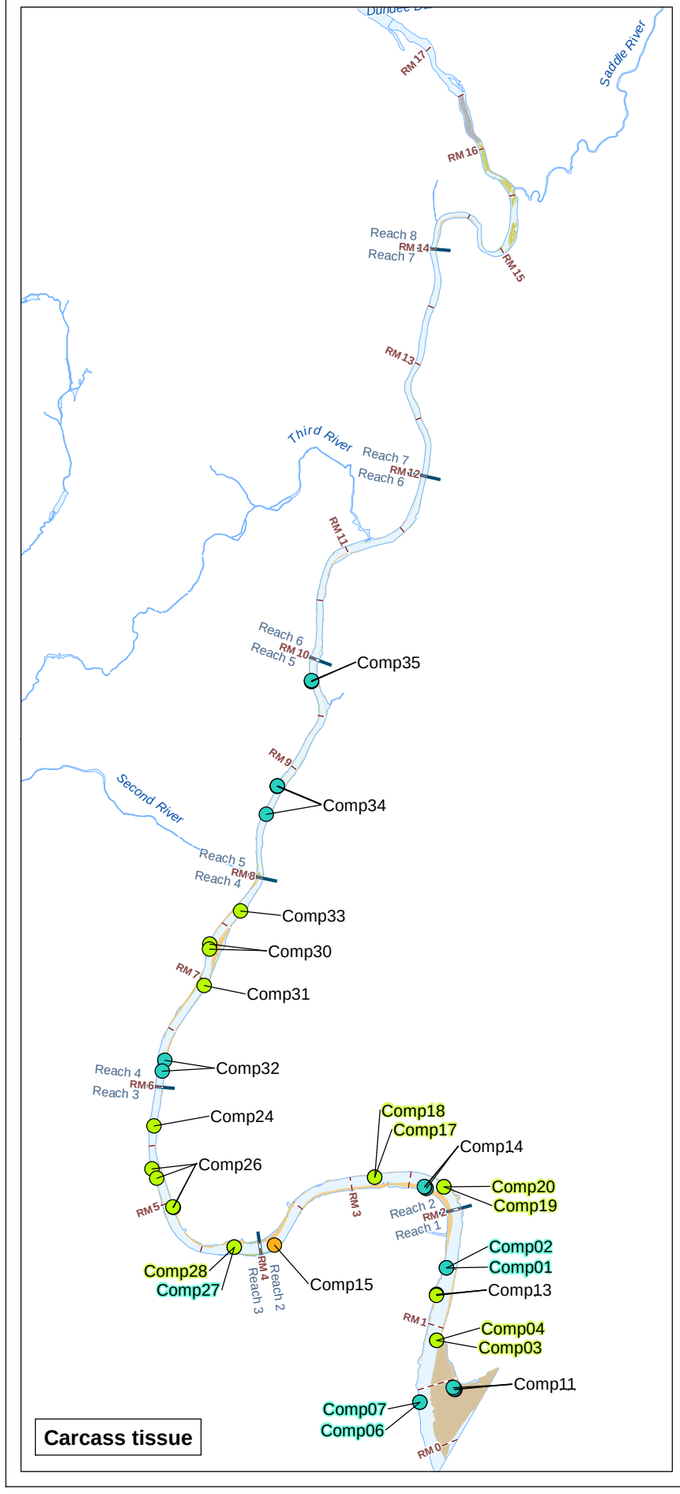
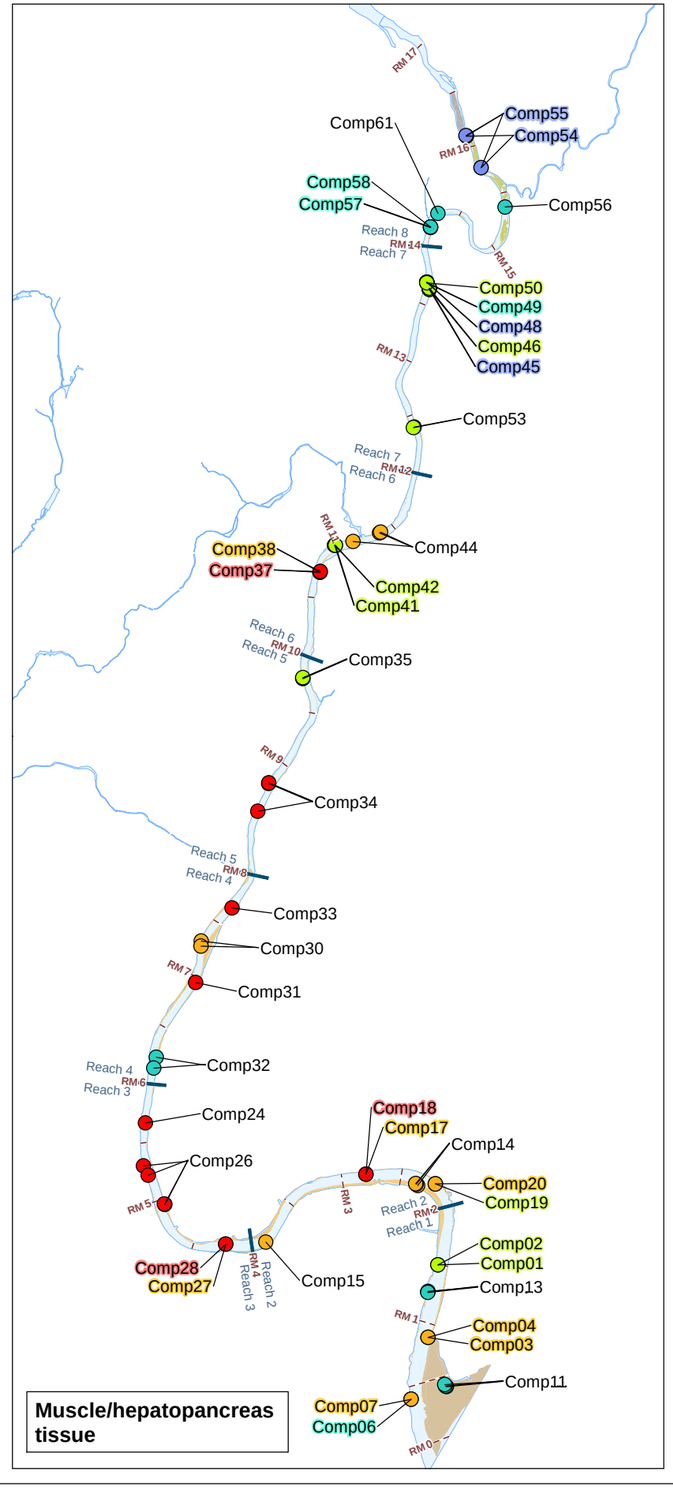
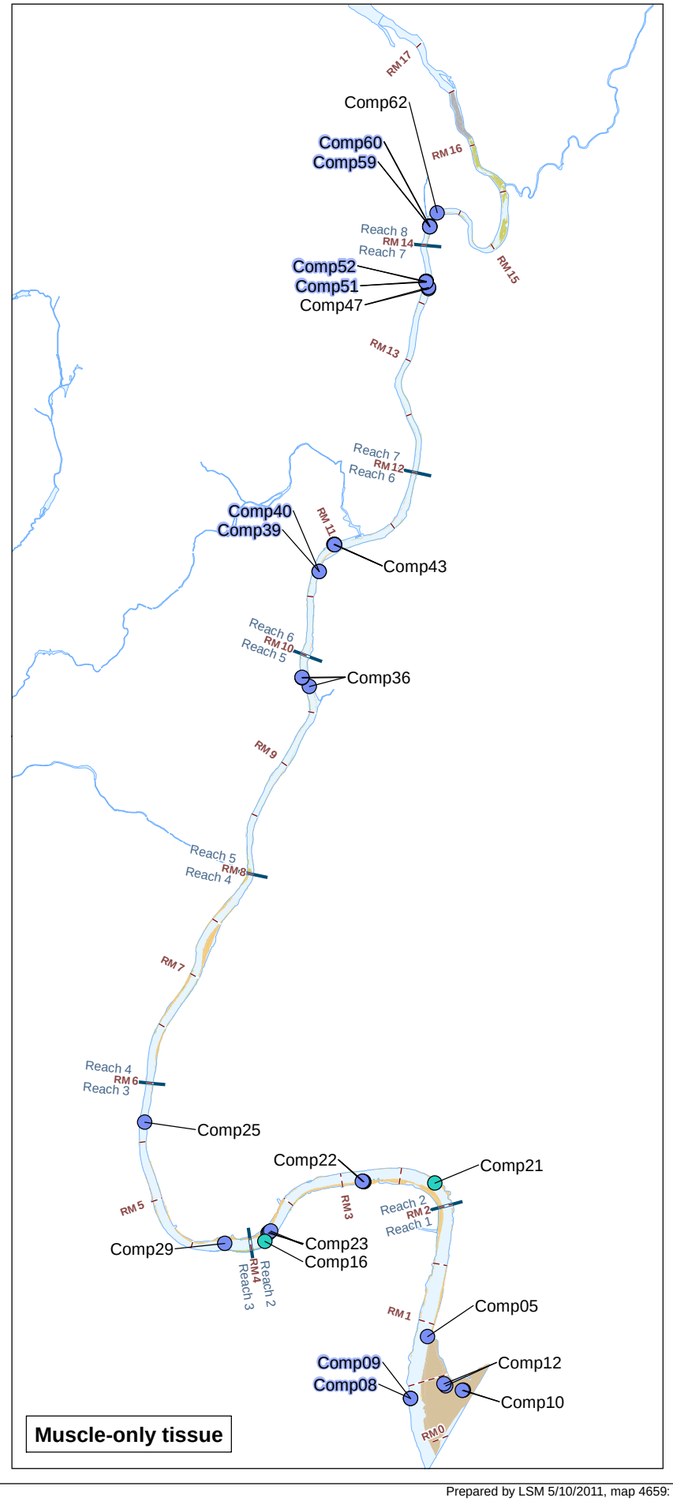
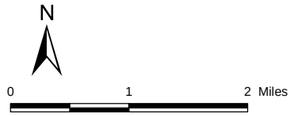






2,3,7,8-TCDD (ng/kg)	(Percentile)
> 67	(> 90th)
> 53 and ≤ 67	(> 75th and ≤ 90th)
> 36 and ≤ 53	(> 50th and ≤ 75th)
> 15 and ≤ 36	(> 25th and ≤ 50th)
≤ 15	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.



- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-42. 2,3,7,8-TCDD concentrations in blue crab 2009 tissue samples from the LPRSA

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Prepared by LSM 5/10/2011, map 4659: W:\Projects\06-58-01 Passaic RI\Data\GIS\deliverInternal\FishTissue

4.7 Organochlorine Pesticides

Fish and blue crab samples were analyzed for 27 organochlorine pesticides, and all were detected. Table 4-9 presents a summary of the pesticides detected in each tissue type, including the number of detections, the range of detected concentrations, and the RL or range of RLs for samples reported as non-detects. Data tables that contain organochlorine pesticide concentrations for each sample, including non-detected sample results, are presented in Appendix F. Total DDx (sum of all six dichlorodiphenyltrichloroethane [DDT] isomers [2,4′-dichlorodiphenyldichloroethane (DDD), 4,4′-DDD, 2,4′-dichlorodiphenyl-dichloroethylene (DDE), 4,4′-DDE, 2,4′-DDT and 4,4′-DDT]), total chlordane (sum of alpha-chlordane, gamma-chlordane, and oxychlordane, cis-nonachlor, and trans-nonachlor), and dieldrin are discussed further in subsections that follow Table 4-9.

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
2,4'-DDD (µg/kg ww)								
Brown bullhead	whole body	6/6	100	1.7 J	17 J	6.7	6.6	na
Carp	fillet (with skin)	9/12	75	11 J	180	62	56	15 – 62
	whole body	12/12	100	7.6	110	62	35	na
Channel catfish	carcass	11/11	100	4.6	26 J	13	6.5	na
	fillet (skinless)	8/11	73	1.3 J	12 J	4.8	3.6	2.1 – 4.9
White catfish	carcass	18/19	95	5.5 J	35	14	7.7	3.6
	fillet (skinless)	16/19	84	1.4 J	13	4.4	3.5	2 – 2.6
White sucker	carcass	5/5	100	7.0	28	16	8.5	na
	fillet (with skin)	3/5	60	3.0	5.1	4.1	1.1	1.3 – 1.4
Blue crab	carcass	1/24	4	1.3 J	1.3 J	na	na	0.48 – 4.7
	muscle/hepatopancreas	8/41	20	0.097 J	0.78	0.31	0.23	0.13 – 5.9
White perch	carcass	1/1	100	24 J	24 J	na	na	na
	fillet (with skin)	17/19	90	3.3	15	8.3	3.7	1.5 – 2
	whole body	19/19	100	3.8 J	76 J	32	19	na
American eel	carcass	2/2	100	6.3 J	6.8 J	6.6	0.35	na
	fillet (skinless)	20/32	63	0.60 J	6.3 J	3.2	1.6	1.2 – 7.7
	whole body	15/19	79	0.44 J	9.1	3.6	2.3	2.6 – 13
Largemouth bass	carcass	3/3	100	2.5 J	12 J	8.8	5.5	na
Northern pike	carcass	1/1	100	55 J	55 J	na	na	na
	fillet (with skin)	1/1	100	5.0 J	5.0 J	na	na	na
Smallmouth bass	carcass	3/3	100	6.9 J	17 J	12	5.1	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
2,4'-DDE (µg/kg ww)								
Brown bullhead	whole body	4/6	67	2.0 J	9.5 J	5.5	3.9	0.53 – 0.55
Carp	fillet (with skin)	7/12	58	1.3 J	69 J	27	24	12 – 43
	whole body	10/12	83	1.5 J	80 J	30	21	1.1 – 4.8
Channel catfish	carcass	9/11	82	1.8 J	11 J	5.3	3.0	2.9 – 3.4
	fillet (skinless)	2/11	18	1.3 J	3.4 J	2.4	1.5	1.4 – 3.6
White catfish	carcass	17/19	90	3.2 J	21 J	8.4	5.1	4.8 – 9.5
	fillet (skinless)	12/19	63	0.78 J	11 J	3.4	3.0	1 – 2.8
White sucker	carcass	4/5	80	2.5 J	12 J	6.0	4.1	1.2
Blue crab	hepatopancreas only	1/7	14	1.7 J	1.7 J	na	na	1.2 – 5.1
	muscle/hepatopancreas	10/41	24	0.16 J	0.84 J	0.40	0.25	0.093 – 4
White perch	carcass	1/1	100	8.3 J	8.3 J	na	na	na
	fillet (with skin)	13/19	68	1.8 J	5.9 J	3.3	1.0	0.044 – 3.2
	whole body	17/19	90	1.6 J	16 J	10	4.4	2.4 – 14
American eel	carcass	1/2	50	2.4 J	2.4 J	na	na	0.87
	fillet (skinless)	7/32	22	0.53 J	1.1 J	0.84	0.18	0.24 – 9.1
	whole body	2/19	11	0.39 J	3.0 J	1.7	1.8	0.27 – 12
Largemouth bass	carcass	1/3	33	5.4 J	5.4 J	na	na	3.7 – 5
Northern pike	carcass	1/1	100	17 J	17 J	na	na	na
	fillet (with skin)	1/1	100	1.6 J	1.6 J	na	na	na
Smallmouth bass	carcass	2/3	67	7.4 J	12 J	9.7	3.3	5.2
2,4'-DDT (µg/kg ww)								
Brown bullhead	whole body	1/6	17	0.96 J	0.96 J	na	na	0.6 – 1.9
Carp	fillet (with skin)	5/12	42	1.7 J	27 J	8.6	10	1.6 – 46
	whole body	5/12	42	2.5 J	19 J	8.3	6.4	0.67 – 4.9
Channel catfish	carcass	1/11	9	4.4 J	4.4 J	na	na	1.8 – 6.6
	fillet (skinless)	1/11	9	0.59 J	0.59 J	na	na	0.72 – 8.7
White catfish	carcass	4/19	21	2.0 J	3.2 J	2.6	0.53	0.63 – 7.1
	fillet (skinless)	3/19	16	0.63 J	1.5 J	1.1	0.46	0.29 – 2.7
White sucker	carcass	1/5	20	3.3 J	3.3 J	na	na	2.2 – 2.8
Blue crab	carcass	1/24	4	0.50 J	0.50 J	0.50	na	0.37 – 5.3
	hepatopancreas only	1/7	14	7.4 J	7.4 J	na	na	1.7 – 5.6
	muscle/hepatopancreas	5/41	12	0.15 J	2 J	0.59	0.79	0.13 – 5.5
White perch	fillet (with skin)	1/19	5	0.60 J	0.60 J	na	na	0.41 – 4
	whole body	9/19	47	0.47 J	9.0 J	4.1	2.8	0.55 – 7.3

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
2,4'-DDT (µg/kg ww) (cont.)								
American eel	fillet (skinless)	4/32	13	1.1 J	1.6 J	1.3	0.24	0.37 – 120
	whole body	2/19	11	0.67 J	1.6 J	1.1	0.66	0.39 – 200
Largemouth bass	carcass	1/3	33	2.6 J	2.6 J	na	na	2.7 – 4
Northern pike	carcass	1/1	100	8.4 J	8.4 J	na	na	na
Smallmouth bass	carcass	1/3	33	1.4 J	1.4 J	na	na	3.9 – 8
4,4'-DDD (µg/kg ww)								
Brown bullhead	whole body	2/6	33	76	87 J	82	7.8	9.5 – 30
Carp	fillet (with skin)	11/12	92	38 J	500	180	130	120
	whole body	9/12	75	78	350	200	73	36 – 240
Channel catfish	carcass	11/11	100	24 J	180 J	79	42	na
	fillet (skinless)	10/11	91	4.0 J	77 J	27	20	13
White catfish	carcass	14/19	74	23	280	98	68	81 – 220
	fillet (skinless)	16/19	84	4.8 J	140	37	36	14 – 16
White sucker	carcass	3/5	60	30	62	51	18	36 – 100
	fillet (with skin)	2/5	40	10	16	13	4.2	5.3 – 14
Blue crab	carcass	23/24	96	8.5	26	15	5.4	17
	hepatopancreas only	7/7	100	42	140	87	38	na
	muscle only	19/21	91	3.0	8.8	5.4	1.6	2.6 – 18
	muscle/hepatopancreas	39/41	95	8	36	20	6.2	11 – 15
White perch	carcass	1/1	100	61 J	61 J	na	na	na
	fillet (with skin)	14/19	74	7.6	36	19	7.0	2.2 – 40
	whole body	16/19	84	8.1 J	210 J	74	49	20 – 70
American eel	carcass	2/2	100	84 J	110 J	97	18	na
	fillet (skinless)	28/32	88	13 J	110 J	50	26	19 – 87
	whole body	18/19	95	7.7 J	130 J	63	37	140
Largemouth bass	carcass	3/3	100	11 J	69 J	46	31	na
	fillet (with skin)	2/3	67	2.2 J	3.1 J	2.7	0.64	1.8
Northern pike	carcass	1/1	100	150 J	150 J	na	na	na
	fillet (with skin)	1/1	100	12 J	12 J	na	na	na
Smallmouth bass	carcass	2/3	67	28 J	100 J	64	51	50
	fillet (with skin)	2/3	67	2.8 J	5.0 J	3.9	1.6	1.2

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
4,4'-DDE (µg/kg ww)								
Brown bullhead	whole body	6/6	100	18	88	54	28	na
Carp	fillet (with skin)	12/12	100	51 J	760	280	190	na
	whole body	12/12	100	100	570	270	130	na
Channel catfish	carcass	11/11	100	22 J	330 J	150	97	na
	fillet (skinless)	11/11	100	7.0 J	130 J	51	37	na
White catfish	carcass	17/19	90	69	670	220	140	230 – 340
	fillet (skinless)	19/19	100	14 J	350	76	80	na
White sucker	carcass	5/5	100	54	200	110	56	na
	fillet (with skin)	5/5	100	12	30	20	7.1	na
Blue crab	carcass	24/24	100	18	69	35	11	na
	hepatopancreas only	7/7	100	110	360 J	220	86	na
	muscle only	20/21	95	5.7	21	13	5.2	23
	muscle/hepatopancreas	41/41	100	16	77	46	15	na
White perch	carcass	1/1	100	140 J	140 J	na	na	na
	fillet (with skin)	19/19	100	10	55	30	13	na
	whole body	19/19	100	23 J	190 J	99	43	na
American eel	carcass	2/2	100	180 J	210 J	200	21	na
	fillet (skinless)	32/32	100	35 J	230 J	110	52	na
	whole body	19/19	100	20 J	340	140	78	na
Largemouth bass	carcass	3/3	100	89 J	160 J	130	37	na
	fillet (with skin)	3/3	100	2.7 J	10 J	6.0	3.7	na
Northern pike	carcass	1/1	100	220 J	220 J	na	na	na
	fillet (with skin)	1/1	100	27 J	27 J	na	na	na
Smallmouth bass	carcass	3/3	100	120 J	240 J	170	61	na
	fillet (with skin)	3/3	100	5.3 J	12 J	8.7	3.4	na
4,4'-DDT (µg/kg ww)								
Brown bullhead	whole body	2/6	33	2.8 J	4.5 J	3.7	1.2	2.2 – 9.8
Carp	fillet (with skin)	6/12	50	1.4 J	16 J	5.3	5.3	7.6 – 41
	whole body	8/12	67	1.5 J	24 J	6.3	7.6	2.3 – 6.7
Channel catfish	carcass	11/11	100	2.8 J	22 J	12	6.1	na
	fillet (skinless)	8/11	73	0.86 J	8.2 J	4.3	2.1	2.8 – 7.5
White catfish	carcass	17/19	90	3.3 J	37 J	11	8.1	5 – 10
	fillet (skinless)	12/19	63	1.4 J	20 J	5.6	5.9	0.5 – 4.1

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
4,4'-DDT (µg/kg ww) (cont.)								
White sucker	carcass	4/5	80	8.3 J	14 J	11	2.4	16
	fillet (with skin)	4/5	80	1.6 J	2.2 J	2.0	0.26	2
Blue crab	carcass	9/24	38	0.51 J	11 J	2.0	3.4	0.33 – 3.2
	hepatopancreas only	7/7	100	3.4	11	8.0	2.8	na
	muscle/hepatopancreas	35/41	86	0.25 J	12	2.8	2.1	1.1 – 5.6
White perch	carcass	1/1	100	4.0 J	4.0 J	na	na	na
	fillet (with skin)	12/19	63	0.62 J	5.1 J	3.3	1.5	1.6 – 3.8
	whole body	15/19	79	1.6 J	22 J	9.1	5.2	6.7 – 8.6
American eel	carcass	2/2	100	5.0 J	7.8 J	6.4	2.0	na
	fillet (skinless)	25/32	78	2.3 J	17 J	7.2	3.7	3.8 – 19
	whole body	18/19	95	3.4 J	37 J	13	8.3	17
Largemouth bass	carcass	3/3	100	5.5 J	54 J	26	25	na
	fillet (with skin)	1/3	33	2.0 J	2.0 J	na	na	1.7 – 1.8
Northern pike	carcass	1/1	100	23 J	23 J	na	na	na
	fillet (with skin)	1/1	100	2.3 J	2.3 J	na	na	na
Smallmouth bass	carcass	3/3	100	11 J	13 J	12	1.2	na
Aldrin (µg/kg ww)								
Brown bullhead	whole body	5/6	83	0.076 J	0.43 J	0.23	0.14	0.086
Carp	fillet (with skin)	5/12	42	0.040 J	0.75 J	0.33	0.29	0.077 – 1.3
	whole body	11/12	92	0.12 J	0.49 J	0.27	0.12	0.46
Channel catfish	carcass	11/11	100	0.18 J	0.41 J	0.31	0.073	na
	fillet (skinless)	6/11	55	0.037 J	0.21 J	0.11	0.062	0.021 – 0.32
White catfish	carcass	12/19	63	0.099 J	0.52 J	0.20	0.12	0.055 – 0.19
	fillet (skinless)	8/19	42	0.027 J	0.19 J	0.070	0.056	0.0054 – 0.13
White sucker	carcass	3/5	60	0.22 J	0.37 J	0.29	0.075	0.042 – 0.12
	fillet (with skin)	1/5	20	0.052 J	0.052 J	0.052	na	0.003 – 0.049
Blue crab	carcass	2/24	8	0.014 J	0.025 J	0.020	0.0078	0.0097 – 0.049
	hepatopancreas only	1/7	14	0.059 J	0.059 J	0.059	na	0.045 – 0.17
	muscle only	1/21	5	0.0052 J	0.0052 J	0.0052	na	0.0092 – 0.28
	muscle/hepatopancreas	3/41	7	0.0037 J	0.034 J	0.017	0.015	0.02 – 0.53
White perch	fillet (with skin)	6/19	32	0.060 J	0.15 J	0.088	0.035	0.0018 – 0.22
	whole body	11/19	58	0.055 J	0.29 J	0.16	0.098	0.052 – 0.31
American eel	fillet (skinless)	2/32	6	0.030 J	0.034 J	0.032	0.0028	0.0089 – 0.14
	whole body	3/19	16	0.033 J	0.14 J	0.10	0.059	0.016 – 0.11

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Aldrin (µg/kg ww) (cont.)								
Largemouth bass	carcass	2/3	67	0.083 J	0.15 J	0.12	0.047	0.15
alpha-BHC (µg/kg ww)								
Brown bullhead	whole body	1/6	17	0.085 J	0.085 J	na	na	0.025 – 0.089
Carp	fillet (with skin)	5/12	42	0.050 J	0.28 J	0.13	0.092	0.063 – 4.2
	whole body	4/12	33	0.066 J	0.15 J	0.11	0.036	0.036 – 0.55
Channel catfish	carcass	1/11	9	0.12 J	0.12 J	na	na	0.18 – 0.5
White catfish	carcass	2/19	11	0.072 J	0.075 J	0.074	0.0021	0.026 – 0.68
	fillet (skinless)	1/19	5	0.046 J	0.046 J	na	na	0.018 – 0.36
White sucker	carcass	2/5	40	0.069 J	0.12 J	0.095	0.036	0.03 – 0.1
Blue crab	carcass	3/24	13	0.022 J	0.033 J	0.026	0.0059	0.021 – 0.25
	hepatopancreas only	3/7	43	0.27 J	0.34 J	0.31	0.035	0.13 – 0.39
	muscle/hepatopancreas	9/41	22	0.012 J	0.045 J	0.026	0.010	0.011 – 0.7
White perch	carcass	1/1	100	0.22 J	0.22 J	na	na	na
	whole body	4/19	21	0.051 J	0.14 J	0.10	0.039	0.023 – 0.28
American eel	carcass	2/2	100	0.19 J	0.26 J	0.23	0.049	na
	fillet (skinless)	6/32	19	0.062 J	0.13 J	0.096	0.025	0.019 – 0.27
	whole body	2/19	11	0.11 J	0.26 J	0.19	0.11	0.018 – 0.59
alpha-Chlordane (µg/kg ww)								
Brown bullhead	whole body	6/6	100	27 J	83 J	56	20	na
Carp	fillet (with skin)	11/12	92	49 J	270	130	60	39
	whole body	12/12	100	85	220 J	140	47	na
Channel catfish	carcass	11/11	100	39 J	140 J	95	34	na
	fillet (skinless)	11/11	100	8.0 J	77 J	30	19	na
White catfish	carcass	19/19	100	25	220	93	46	na
	fillet (skinless)	19/19	100	4.4 J	100	30	27	na
White sucker	carcass	5/5	100	55	83	69	11	na
	fillet (with skin)	5/5	100	10	17	13	2.9	na
Blue crab	carcass	23/24	96	1.2	6.2 J	2.7	1.3	2.3
	hepatopancreas only	7/7	100	18	50	29	11	na
	muscle only	19/21	91	0.17 J	1.1 J	0.58	0.21	0.29 – 0.58
	muscle/hepatopancreas	40/41	98	1.5	10	4.9	1.9	4.1
White perch	carcass	1/1	100	39 J	39 J	na	na	na
	fillet (with skin)	19/19	100	8.1 J	770	72	180	na
	whole body	19/19	100	15 J	320	76	65	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
alpha-Chlordane (µg/kg ww) (cont.)								
American eel	carcass	2/2	100	31 J	45 J	38	9.9	na
	fillet (skinless)	32/32	100	11	260 J	40	44	na
	whole body	19/19	100	16	87 J	50	20	na
Largemouth bass	carcass	3/3	100	19 J	150 J	78	66	na
	fillet (with skin)	2/3	67	3.8 J	6.7 J	5.3	2.1	0.56
Northern pike	carcass	1/1	100	120 J	120 J	na	na	na
	fillet (with skin)	1/1	100	16 J	16 J	na	na	na
Smallmouth bass	carcass	3/3	100	36 J	68 J	55	17	na
	fillet (with skin)	3/3	100	1.5 J	3.7 J	2.7	1.1	na
beta-BHC (µg/kg ww)								
Carp	fillet (with skin)	4/12	33	0.25 J	0.79 J	0.50	0.22	0.15 – 6
	whole body	5/12	42	0.26 J	0.38 J	0.34	0.048	0.097 – 0.77
Channel catfish	carcass	1/11	9	0.22 J	0.22 J	na	na	0.22 – 0.72
White catfish	carcass	3/19	16	0.078 J	0.14 J	0.11	0.032	0.076 – 0.97
	fillet (skinless)	4/19	21	0.039 J	0.083 J	0.061	0.018	0.042 – 0.52
White sucker	carcass	1/5	20	0.16 J	0.16 J	na	na	0.047 – 0.17
Blue crab	carcass	6/24	25	0.044 J	0.099 J	0.072	0.023	0.052 – 0.4
	hepatopancreas only	4/7	57	0.38 J	0.55 J	0.48	0.074	0.21 – 0.62
	muscle/hepatopancreas	12/41	29	0.036 J	0.2 J	0.079	0.046	0.019 – 0.88
White perch	carcass	1/1	100	0.46 J	0.46 J	na	na	na
	fillet (with skin)	2/19	11	0.066 J	0.070 J	0.068	0.0028	0.045 – 0.51
	whole body	6/19	32	0.12 J	0.28 J	0.17	0.060	0.025 – 0.39
American eel	carcass	2/2	100	0.31 J	0.31 J	na	na	na
	fillet (skinless)	10/32	31	0.14 J	0.32 J	0.21	0.052	0.061 – 0.37
	whole body	6/19	32	0.050 J	0.82 J	0.36	0.27	0.037 – 0.99
cis-Nonachlor (µg/kg ww)								
Brown bullhead	whole body	6/6	100	6.0 J	22 J	14	6.7	na
Carp	fillet (with skin)	12/12	100	14 J	81 J	40	17	na
	whole body	12/12	100	24 J	69 J	41	14	na
Channel catfish	carcass	11/11	100	6.8 J	57 J	30	15	na
	fillet (skinless)	9/11	82	1.3 J	27 J	12	8.7	2.3 – 9.9
White catfish	carcass	19/19	100	12	110 J	38	22	na
	fillet (skinless)	18/19	95	1.8 J	55 J	13	13	6.4

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
cis-Nonachlor (µg/kg ww) (cont.)								
White sucker	carcass	5/5	100	15 J	28 J	21	6.4	na
	fillet (with skin)	3/5	60	2.9 J	5.4 J	3.9	1.3	2.5 – 3.6
Blue crab	carcass	23/24	96	1.4 J	7.6 J	3.7	1.3	3.5
	hepatopancreas only	7/7	100	27	42	33	5.5	na
	muscle only	19/21	91	0.44 J	1.7 J	0.97	0.33	0.58 – 8.4
	muscle/hepatopancreas	40/41	98	2.6	16	7.3	2.6	2.7
White perch	carcass	1/1	100	20 J	20 J	na	na	na
	fillet (with skin)	17/19	90	3.6 J	14 J	6.3	2.8	2.9 – 4.2
	whole body	19/19	100	5.5 J	30	18	7.4	na
American eel	carcass	2/2	100	18 J	30 J	24	8.5	na
	fillet (skinless)	32/32	100	5.1 J	31 J	16	6.8	na
	whole body	19/19	100	6.8 J	87 J	27	18	na
Largemouth bass	carcass	3/3	100	9.6 J	70 J	40	30	na
	fillet (with skin)	2/3	67	2.4 J	3.3 J	2.9	0.64	0.33
Northern pike	carcass	1/1	100	46 J	46 J	na	na	na
	fillet (with skin)	1/1	100	5.2 J	5.2 J	na	na	na
Smallmouth bass	carcass	3/3	100	29 J	35 J	31	3.5	na
	fillet (with skin)	3/3	100	0.83 J	1.8 J	1.3	0.49	na
delta-BHC (µg/kg ww)								
White catfish	fillet (skinless)	3/19	16	0.050 J	0.086 J	0.062	0.021	0.021 – 0.48
Blue crab	muscle only	1/21	5	0.097 J	0.097 J	na	na	0.036 – 1.3
	muscle/hepatopancreas	9/41	22	0.0097 J	0.1 J	0.023	0.029	0.0043 – 0.93
White perch	carcass	1/1	100	0.11 J	0.11 J	na	na	na
	fillet (with skin)	2/19	11	0.032 J	0.051 J	0.042	0.013	0.027 – 0.47
	whole body	3/19	16	0.092 J	0.31 J	0.18	0.11	0.035 – 0.36
American eel	fillet (skinless)	2/32	6	0.098 J	0.16 J	0.13	0.044	0.026 – 0.36
Dieldrin (mg/kg ww)								
Brown bullhead	whole body	6/6	100	9.7 J	34 J	22	9.4	na
Carp	fillet (with skin)	12/12	100	12 J	97	40	22	na
	whole body	12/12	100	29	72	48	13	na
Channel catfish	carcass	11/11	100	22	91 J	48	20	na
	fillet (skinless)	11/11	100	4.9 J	35 J	15	8.5	na
White catfish	carcass	19/19	100	8.5 J	57 J	26	14	na
	fillet (skinless)	19/19	100	1.7 J	32 J	8.8	8.3	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Dieldrin (ng/kg ww) (cont.)								
White sucker	carcass	5/5	100	23	38	30	6.0	na
	fillet (with skin)	5/5	100	4.5	6.7	5.4	1.0	na
Blue crab	carcass	24/24	100	2.2 J	6.5	4.1	1.2	na
	hepatopancreas only	7/7	100	29	50	36	6.9	na
	muscle only	20/21	95	0.70 J	3.6	1.9	0.65	4.1
	muscle/hepatopancreas	40/41	98	2.0	17	8.6	2.9	20
White perch	carcass	1/1	100	33 J	33 J	na	na	na
	fillet (with skin)	17/19	90	4.0 J	17	9.5	3.5	3.2 – 5.6
	whole body	19/19	100	7.8 J	47	28	12	na
American eel	carcass	2/2	100	38 J	42 J	40	2.8	na
	fillet (skinless)	32/32	100	9.4 J	100 J	30	18	na
	whole body	19/19	100	7.6	110 J	46	26	na
Largemouth bass	carcass	3/3	100	25 J	67 J	40	23	na
	fillet (with skin)	3/3	100	0.91 J	3.9 J	2.3	1.5	na
Northern pike	carcass	1/1	100	73 J	73 J	na	na	na
	fillet (with skin)	1/1	100	6.9 J	6.9 J	6.9	na	na
Smallmouth bass	carcass	3/3	100	26 J	32 J	29	3.1	na
	fillet (with skin)	3/3	100	1.3 J	2.1 J	1.7	0.40	na
Endosulfan I (µg/kg ww)								
Brown bullhead	whole body	3/6	50	0.97 J	1.1 J	1.0	0.068	0.45 – 0.56
Carp	fillet (with skin)	3/8[e]	38[e]	0.38 J	1.4 J	0.91	0.51	1.3 – 25
	whole body	2/12	17	1.2 J	4.0	2.6	2.0	0.58 – 5.8
Channel catfish	carcass	2/11	18	0.79 J	2.2 J	1.5	1.0	0.98 – 8.6
	fillet (skinless)	1/11	9	0.23 J	0.23 J	na	na	0.22 – 2.6
White sucker	carcass	1/5	20	0.67 J	0.67 J	na	na	0.79 – 1.5
White perch	whole body	1/19	5	0.22 J	0.22 J	na	na	0.36 – 3.2
American eel	whole body	2/19	11	0.20 J	0.59 J	0.40	0.28	0.24 – 5.9
Endosulfan II (µg/kg ww)								
Carp	fillet (with skin)	2/12	17	0.59 J	0.68 J	0.64	0.064	0.85 – 21
	whole body	2/12	17	0.71 J	2.7	1.7	1.4	0.6 – 2.9
Channel catfish	fillet (skinless)	1/11	9	0.44 J	0.44 J	na	na	0.75 – 5
White catfish	carcass	1/19	5	3.1 J	3.1 J	na	na	0.68 – 12
	fillet (skinless)	1/19	5	0.85 J	0.85 J	na	na	0.33 – 4.2
American eel	whole body	2/19	11	0.37 J	0.56 J	0.47	0.13	0.31 – 8.4

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Endosulfan sulfate (µg/kg ww)								
Brown bullhead	whole body	3/6	50	0.55 J	0.76 J	0.67	0.11	0.18 – 0.5
Carp	fillet (with skin)	8/12	67	0.28 J	1.4 J	0.87	0.36	0.12 – 1.3
	whole body	9/12	75	0.46 J	1.5	0.96	0.33	0.31 – 0.66
Channel catfish	carcass	2/11	18	0.41 J	1.1 J	0.76	0.49	0.18 – 0.86
	fillet (skinless)	1/11	9	0.53 J	0.53 J	na	na	0.016 – 0.37
White catfish	carcass	9/19	47	0.31 J	0.83 J	0.50	0.17	0.12 – 0.67
	fillet (skinless)	2/19	11	0.24 J	0.29 J	0.27	0.035	0.016 – 0.28
Blue crab	carcass	10/24	42	0.033 J	0.36 J	0.094	0.097	0.032 – 0.98
	hepatopancreas only	6/7	86	0.30 J	0.81 J	0.49	0.18	0.54
	muscle only	1/21	5	0.036 J	0.036 J	0.036	na	0.034 – 6.4
	muscle/hepatopancreas	20/41	49	0.024 J	1.1	0.14	0.23	0.0062 – 2
White perch	carcass	1/1	100	1.0 J	1.0 J	na	na	na
	fillet (with skin)	7/19	37	0.20 J	0.92 J	0.52	0.24	0.051 – 0.45
	whole body	8/19	42	0.54 J	1.5	1.0	0.39	0.23 – 1
American eel	fillet (skinless)	15/32	47	0.11 J	1.5	0.56	0.33	0.057 – 0.66
	whole body	13/19	68	0.35 J	1.1 J	0.75	0.20	0.16 – 0.38
Largemouth bass	carcass	3/3	100	0.14 J	0.36 J	0.27	0.12	na
	fillet (with skin)	1/3	33	0.046 J	0.046 J	na	na	0.017 – 0.06
Northern pike	carcass	1/1	100	2.5 J	2.5 J	na	na	na
	fillet (with skin)	1/1	100	0.42 J	0.42 J	na	na	na
Smallmouth bass	carcass	2/3	67	0.42 J	0.51 J	0.47	0.064	0.34
	fillet (with skin)	1/3	33	0.067 J	0.067 J	na	na	0.031 – 0.14
Endrin (µg/kg ww)								
Carp	fillet (with skin)	2/12	17	0.27 J	0.29 J	0.28	0.014	0.38 – 14
	whole body	1/12	8	0.23 J	0.23 J	na	na	0.3 – 4
Channel catfish	carcass	1/11	9	0.84 J	0.84 J	na	na	0.49 – 2.1
White catfish	fillet (skinless)	1/19	5	0.12 J	0.12 J	na	na	0.064 – 0.89
Blue crab	muscle only	2/21	10	0.072 J	0.18 J	0.13	0.076	0.14 – 8.5
	muscle/hepatopancreas	1/41	2	0.89	0.89	na	na	0.072 – 7.7
White perch	fillet (with skin)	1/19	5	0.17 J	0.17 J	na	na	0.07 – 0.6
	whole body	1/19	5	0.23 J	0.23 J	na	na	0.097 – 1.1
American eel	fillet (skinless)	1/32	3	0.24 J	0.24 J	na	na	0.055 – 3.9
	whole body	1/19	5	0.63 J	0.63 J	na	na	0.052 – 3

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Endrin aldehyde (µg/kg ww)								
Brown bullhead	whole body	1/6	17	0.17 J	0.17 J	na	na	0.064 – 0.44
Carp	whole body	1/12	8	0.69 J	0.69 J	na	na	0.2 – 4.3
White catfish	carcass	1/19	5	3.3 J	3.3 J	na	na	0.037 – 3
	fillet (skinless)	2/19	11	0.11 J	0.21 J	0.16	0.071	0.034 – 1.3
White sucker	fillet (with skin)	1/5	20	0.11 J	0.11 J	na	na	0.068 – 0.4
Blue crab	carcass	2/24	8	0.13 J	0.79 J	0.46	0.47	0.22 – 16
	muscle only	3/21	14	0.052 J	0.49 J	0.20	0.25	0.11 – 9.9
	muscle/hepatopancreas	2/41	5	0.07 J	1.9	0.99	1.3	0.069 – 21
White perch	carcass	1/1	100	0.20 J	0.20 J	na	na	na
	fillet (with skin)	2/19	11	0.043 J	0.063 J	0.053	0.014	0.023 – 0.37
	whole body	1/19	5	0.77 J	0.77 J	na	na	0.045 – 0.96
American eel	fillet (skinless)	3/32	9	0.13 J	0.49 J	0.26	0.20	0.027 – 3.1
	whole body	2/19	11	0.21 J	0.36 J	0.29	0.11	0.021 – 3.9
Endrin ketone (µg/kg ww)								
Carp	whole body	1/9[f]	11[f]	0.27 J	0.27 J	na	na	0.16 – 2.2
White catfish	fillet (skinless)	1/19	5	0.052 J	0.052 J	na	na	0.06 – 1.7
White perch	carcass	1/1	100	0.30 J	0.30 J	na	na	na
	whole body	1/19	5	1.2 J	1.2 J	na	na	0.085 – 2
American eel	fillet (skinless)	2/32	6	0.14 J	0.16 J	0.15	0.014	0.11 – 3.9
	whole body	2/19	11	0.36 J	0.43 J	0.40	0.049	0.11 – 2.5
gamma-BHC (Lindane) (µg/kg ww)								
Brown bullhead	whole body	3/6	50	0.12 J	0.28 J	0.18	0.085	0.065 – 0.16
Carp	fillet (with skin)	6/12	50	0.16 J	0.70 J	0.39	0.18	2.5 – 12
	whole body	8/12	67	0.20 J	0.76 J	0.44	0.20	0.22 – 1.4
Channel catfish	carcass	3/11	27	0.28 J	1.0 J	0.56	0.39	0.2 – 1.2
	fillet (skinless)	1/11	9	0.44 J	0.44 J	na	na	0.13 – 0.29
White catfish	carcass	11/19	58	0.062 J	0.30 J	0.20	0.074	0.11 – 1.6
	fillet (skinless)	9/19	47	0.033 J	0.14 J	0.079	0.035	0.044 – 0.88
White sucker	carcass	3/5	60	0.097 J	0.21 J	0.17	0.063	0.062 – 0.091
Blue crab	muscle/hepatopancreas	5/41	12	0.017 J	0.044 J	0.033	0.011	0.009 – 1.7
White perch	carcass	1/1	100	0.26 J	0.26 J	na	na	na
	fillet (with skin)	9/19	47	0.049 J	0.13 J	0.082	0.033	0.033 – 0.87
	whole body	13/19	68	0.024 J	0.24 J	0.13	0.056	0.088 – 0.67

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
gamma-BHC (Lindane) (µg/kg ww) (cont.)								
American eel	carcass	1/2	50	0.25 J	0.25 J	na	na	0.16
	fillet (skinless)	22/32	69	0.093 J	0.57 J	0.25	0.13	0.044 – 0.66
	whole body	16/19	84	0.041 J	0.74 J	0.30	0.21	0.33 – 1.9
gamma-Chlordane (µg/kg ww)								
Brown bullhead	whole body	6/6	100	10	49 J	31	14	na
Carp	fillet (with skin)	12/12	100	25 J	150	67	35	na
	whole body	12/12	100	41	130	80	31	na
Channel catfish	carcass	11/11	100	20 J	72 J	45	17	na
	fillet (skinless)	11/11	100	4.7 J	41 J	14	9.6	na
White catfish	carcass	19/19	100	12	82	42	18	na
	fillet (skinless)	17/19	90	2.4 J	42 J	13	12	7.3 – 14
White sucker	carcass	5/5	100	20	50	35	11	na
	fillet (with skin)	4/5	80	4.9	9.0	6.3	1.9	6.3
Blue crab	carcass	24/24	100	0.14 J	1.6 J	0.45	0.30	na
	hepatopancreas only	7/7	100	1.9	4.7	3.3	0.97	na
	muscle only	13/21	62	0.031 J	0.13 J	0.076	0.027	0.03 – 0.3
	muscle/hepatopancreas	34/41	83	0.18 J	1.4	0.59	0.30	0.15 – 1.3
White perch	carcass	1/1	100	13 J	13 J	na	na	na
	fillet (with skin)	16/19	84	2.7 J	14 J	6.9	3.2	2.9 – 13
	whole body	19/19	100	4.2 J	69	24	15	na
American eel	carcass	2/2	100	13 J	18 J	16	3.5	na
	fillet (skinless)	28/32	88	3.4 J	20 J	9.6	4.7	5.6 – 18
	whole body	19/19	100	6.0 J	26	16	6.0	na
Largemouth bass	carcass	3/3	100	6.4 J	34 J	19	14	na
	fillet (with skin)	3/3	100	0.22 J	1.5 J	0.90	0.64	na
Northern pike	carcass	1/1	100	53 J	53 J	na	na	na
	fillet (with skin)	1/1	100	5.9 J	5.9 J	na	na	na
Smallmouth bass	carcass	3/3	100	12 J	22 J	18	5.1	na
	fillet (with skin)	3/3	100	0.45 J	1.1 J	0.83	0.34	na
Heptachlor (µg/kg ww)								
Brown bullhead	whole body	2/6	33	0.034 J	0.066 J	0.050	0.023	0.023 – 0.087
Carp	fillet (with skin)	5/12	42	0.085 J	0.66 J	0.28	0.23	0.096 – 1.4
	whole body	9/12	75	0.16 J	0.33 J	0.24	0.048	0.11 – 0.28

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Heptachlor (mg/kg ww) (cont.)								
Channel catfish	carcass	7/11	64	0.21 J	0.37 J	0.26	0.052	0.12 – 0.19
	fillet (skinless)	6/11	55	0.061 J	0.099 J	0.083	0.014	0.015 – 0.11
White catfish	carcass	12/19	63	0.030 J	0.18 J	0.084	0.050	0.0032 – 0.16
	fillet (skinless)	4/19	21	0.013 J	0.073 J	0.035	0.027	0.01 – 0.12
White sucker	carcass	1/5	20	0.40 J	0.40 J	na	na	0.058 – 0.29
Blue crab	carcass	2/24	8	0.019 J	0.027 J	0.023	0.0057	0.015 – 0.063
	hepatopancreas only	1/7	14	0.025 J	0.025 J	na	na	0.07 – 0.18
	muscle only	3/21	14	0.0047 J	0.0085 J	0.0068	0.0019	0.01 – 0.3
	muscle/hepatopancreas	4/41	10	0.0052 J	0.037 J	0.021	0.015	0.013 – 0.4
White perch	fillet (with skin)	4/19	21	0.019 J	0.091 J	0.050	0.030	0.0013 – 0.07
	whole body	7/19	37	0.019 J	0.17 J	0.13	0.052	0.021 – 0.15
American eel	fillet (skinless)	12/32	38	0.016 J	0.085 J	0.041	0.021	0.00081 – 0.14
	whole body	10/19	53	0.013 J	0.13 J	0.061	0.034	0.0064 – 0.082
Largemouth bass	carcass	3/3	100	0.084 J	0.69 J	0.32	0.32	na
Northern pike	carcass	1/1	100	0.24 J	0.24 J	na	na	na
Smallmouth bass	carcass	3/3	100	0.12 J	0.18 J	0.14	0.032	na
Heptachlor Epoxide (µg/kg ww)								
Brown bullhead	whole body	6/6	100	4.5	13	9.1	3.5	na
Carp	fillet (with skin)	11/12	92	5.3 J	38	17	9.4	17
	whole body	12/12	100	13	27	19	4.5	na
Channel catfish	carcass	11/11	100	9.5	40 J	21	8.0	na
	fillet (skinless)	11/11	100	2.7 J	15 J	6.9	3.7	na
White catfish	carcass	19/19	100	3.2	22	11	5.5	na
	fillet (skinless)	18/19	95	0.60 J	12 J	3.6	3.2	3.5
White sucker	carcass	5/5	100	8.4	16	11	3.1	na
	fillet (with skin)	4/5	80	1.8 J	2.4	2.0	0.29	1.1
Blue crab	carcass	24/24	100	1.1 J	7.3	3.8	1.7	na
	hepatopancreas only	7/7	100	24	59	40	13	na
	muscle only	21/21	100	0.27 J	1.4	0.87	0.30	na
	muscle/hepatopancreas	41/41	100	1.7	20	8.9	4.4	na
White perch	carcass	1/1	100	13 J	13 J	na	na	na
	fillet (with skin)	17/19	90	1.2 J	5.9	3.6	1.3	1.1 – 3.2
	whole body	19/19	100	3.5 J	18 J	11	4.4	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Heptachlor Epoxide (µg/kg ww) (cont.)								
American eel	carcass	2/2	100	13 J	14 J	14	0.71	na
	fillet (skinless)	32/32	100	4.3 J	27 J	11	5.5	na
	whole body	19/19	100	3.1	31 J	18	8.3	na
Largemouth bass	carcass	3/3	100	12 J	27 J	18	8.1	na
	fillet (with skin)	3/3	100	0.50 J	1.1 J	0.77	0.30	na
Northern pike	carcass	1/1	100	23 J	23 J	na	na	na
	fillet (with skin)	1/1	100	2.7 J	2.7 J	na	na	na
Smallmouth bass	carcass	3/3	100	8.2 J	12 J	10	2.0	na
	fillet (with skin)	3/3	100	0.40 J	0.66 J	0.57	0.14	na
Hexachlorobenzene (µg/kg ww)								
Brown bullhead	whole body	5/6	83	0.98 J	7.2 J	2.9	2.5	5.7
Carp	fillet (with skin)	11/12	92	2.1 J	28	10	8.2	7.5
	whole body	11/12	92	2.6	20 J	12	5.8	2.9
Channel catfish	carcass	9/11	82	4.1 J	35 J	8.2	10	3.1 – 4.1
	fillet (skinless)	11/11	100	0.50 J	12 J	2.4	3.2	na
White catfish	carcass	18/19	95	1.8	18	6.6	4.2	6.3
	fillet (skinless)	17/19	90	0.37 J	6.5	2.2	2.0	0.38 – 0.71
White sucker	carcass	3/5	60	2.5	6.3	4.4	1.9	1.5 – 5.4
	fillet (with skin)	4/5	80	0.39 J	1.4 J	0.79	0.49	0.66
Blue crab	carcass	22/24	92	0.75 J	2.9	1.7	0.47	0.73 – 1.3
	hepatopancreas only	7/7	100	3.7	20	14	6.7	na
	muscle only	17/21	81	0.11 J	1.2	0.61	0.37	0.13 – 0.15
	muscle/hepatopancreas	41/41	100	0.4 J	4	2.2	1.2	na
White perch	carcass	1/1	100	17 J	17 J	na	na	na
	fillet (with skin)	18/19	95	0.18 J	3.3	1.8	0.93	0.6
	whole body	18/19	95	0.90 J	9.9	5.7	2.7	0.48
American eel	carcass	2/2	100	14 J	17 J	16	2.1	na
	fillet (skinless)	30/32	94	0.95 J	11 J	4.7	2.6	3.3 – 11
	whole body	19/19	100	1.4 J	16	5.9	4.5	na
Largemouth bass	carcass	3/3	100	1.1 J	3.7 J	2.3	1.3	na
	fillet (with skin)	2/3	67	0.15 J	0.38 J	0.27	0.16	0.063
Northern pike	carcass	1/1	100	5.2 J	5.2 J	na	na	na
	fillet (with skin)	1/1	100	0.66 J	0.66 J	na	na	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Hexachlorobenzene (µg/kg ww) (cont.)								
Smallmouth bass	carcass	3/3	100	1.1 J	4.1 J	2.6	1.5	na
	fillet (with skin)	2/3	67	0.24 J	0.36 J	0.30	0.085	0.072
Methoxychlor (µg/kg ww)								
Blue crab	muscle/hepatopancreas	4/41	10	9	14	13	2.5	0.088 – 6.3
White perch	whole body	1/19	5	0.55 J	0.55 J	na	na	0.086 – 1.3
Oxychlordane (µg/kg ww)								
Brown bullhead	whole body	6/6	100	4.6 J	11 J	8.0	2.2	na
Carp	fillet (with skin)	12/12	100	3.3 J	45 J	17	11	na
	whole body	12/12	100	10 J	28 J	17	5.0	na
Channel catfish	carcass	11/11	100	5.1 J	55 J	29	14	na
	fillet (skinless)	11/11	100	1.8 J	29 J	9.9	8.4	na
White catfish	carcass	19/19	100	6.7 J	64 J	21	15	na
	fillet (skinless)	18/19	95	0.72 J	38 J	7.8	9.5	2.2
White sucker	carcass	5/5	100	9.2 J	16 J	12	3.0	na
	fillet (with skin)	4/5	80	2.1 J	2.6 J	2.4	0.21	0.87
Blue crab	carcass	24/24	100	6.8 J	27 J	16	5.9	na
	hepatopancreas only	7/7	100	110 J	250 J	170	54	na
	muscle only	21/21	100	1.6 J	7.6 J	4.5	1.6	na
	muscle/hepatopancreas	41/41	100	11 J	61 J	33	12	na
White perch	carcass	1/1	100	53 J	53 J	na	na	na
	fillet (with skin)	16/19	84	2.5 J	16 J	4.7	3.5	1.6 – 6
	whole body	19/19	100	3.6 J	17 J	11	3.7	na
American eel	carcass	2/2	100	32 J	59 J	46	19	na
	fillet (skinless)	32/32	100	8.2 J	88 J	31	20	na
	whole body	19/19	100	5.7 J	130 J	46	36	na
Largemouth bass	carcass	3/3	100	11 J	76 J	38	34	na
	fillet (with skin)	3/3	100	0.38 J	3.1 J	1.7	1.4	na
Northern pike	carcass	1/1	100	33 J	33 J	na	na	na
	fillet (with skin)	1/1	100	3.4 J	3.4 J	na	na	na
Smallmouth bass	carcass	3/3	100	25 J	35 J	30	5.0	na
	fillet (with skin)	3/3	100	1.1 J	1.8 J	1.6	0.40	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 2,4'- and 4,4'-DDD (ND = 0) (µg/kg ww)								
Brown bullhead	whole body	6/6	100	1.7 J	100 J	33	48	na
Carp	fillet (with skin)	12/12	100	29 J	680	210	190	na
	whole body	12/12	100	7.6	460	210	130	na
Channel catfish	carcass	11/11	100	34 J	210 J	93	48	na
	fillet (skinless)	10/11	91	5.3 J	89 J	31	23	13
White catfish	carcass	19/19	100	11 J	310	85	78	na
	fillet (skinless)	19/19	100	1.7 J	150	34	38	na
White sucker	carcass	5/5	100	9.2	82	47	32	na
	fillet (with skin)	3/5	60	4.1	21	13	8.5	5.3 – 5.5
Blue crab	carcass	23/24	96	8.5	27 J	15	5.5	17
	hepatopancreas only	7/7	100	42	140	87	38	na
	muscle only	19/21	91	3.0	8.8	5.4	1.6	2.6 – 21
	muscle/hepatopancreas	39/41	95	8.0	36	20	6.2	11 – 15
White perch	carcass	1/1	100	85 J	85 J	na	na	na
	fillet (with skin)	17/19	90	3.5 J	51	24	11	2.2 – 4.5
	whole body	19/19	100	9.1	290 J	95	71	na
American eel	carcass	2/2	100	90 J	120 J	110	21	na
	fillet (skinless)	30/32	94	3.0 J	110 J	49	27	19 – 22
	whole body	19/19	100	3.7	130	62	40	na
Largemouth bass	carcass	3/3	100	14 J	81 J	55	36	na
	fillet (with skin)	2/3	67	2.2 J	3.1 J	2.7	0.64	1.8
Northern pike	carcass	1/1	100	210 J	210 J	na	na	na
	fillet (with skin)	1/1	100	17 J	17 J	na	na	na
Smallmouth bass	carcass	3/3	100	13 J	120 J	56	57	na
	fillet (with skin)	2/3	67	2.8 J	5.0 J	3.9	1.6	1.4
Total 2,4'- and 4,4'-DDD (ND = 0.5 RL) (µg/kg ww)								
Brown bullhead	whole body	6/6	100	6.5 J	100 J	40	43	na
Carp	fillet (with skin)	12/12	100	46 J	680	220	180	na
	whole body	12/12	100	26	460	230	120	na
Channel catfish	carcass	11/11	100	34 J	210 J	93	48	na
	fillet (skinless)	10/11	91	5.3 J	89 J	32	23	13
White catfish	carcass	19/19	100	25	310	100	67	na
	fillet (skinless)	19/19	100	5.9 J	150	36	37	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 2,4'- and 4,4'-DDD (ND = 0.5 RL) (µg/kg ww) (cont.)								
White sucker	carcass	5/5	100	27	82	61	27	na
	fillet (with skin)	3/5	60	11	21	15	5.3	5.3 – 5.5
Blue crab	carcass	23/24	96	8.8	27 J	16	5.5	17
	hepatopancreas only	7/7	100	43	140	89	37	na
	muscle only	19/21	91	3.6	9.5	6.0	1.7	2.6 – 21
	muscle/hepatopancreas	39/41	95	9.0	37	20	6.3	11 – 15
White perch	carcass	1/1	100	85 J	85 J	na	na	na
	fillet (with skin)	17/19	90	9.0 J	51	26	10	2.2 – 4.5
	whole body	19/19	100	12 J	290 J	99	67	na
American eel	carcass	2/2	100	90 J	120 J	110	21	na
	fillet (skinless)	30/32	94	13 J	110 J	51	26	19 – 22
	whole body	19/19	100	8.1 J	140 J	67	39	na
Largemouth bass	carcass	3/3	100	14 J	81 J	55	36	na
	fillet (with skin)	2/3	67	3.4 J	3.9 J	3.7	0.35	1.8
Northern pike	carcass	1/1	100	210 J	210 J	210	na	na
	fillet (with skin)	1/1	100	17 J	17 J	na	na	na
Smallmouth bass	carcass	3/3	100	35 J	120 J	64	48	na
	fillet (with skin)	2/3	67	3.3 J	5.7 J	4.5	1.7	1.4
Total 2,4'- and 4,4'-DDD (ND = RL) (µg/kg ww)								
Brown bullhead	whole body	6/6	100	11 J	100 J	47	38	na
Carp	fillet (with skin)	12/12	100	53 J	680	230	180	na
	whole body	12/12	100	44	460	240	120	na
Channel catfish	carcass	11/11	100	34 J	210 J	93	48	na
	fillet (skinless)	10/11	91	5.3 J	89 J	32	23	13
White catfish	carcass	19/19	100	27	310	120	72	na
	fillet (skinless)	19/19	100	6.9 J	150	37	36	na
White sucker	carcass	5/5	100	37	130	75	37	na
	fillet (with skin)	3/5	60	13	21	17	4.0	5.3 – 5.5
Blue crab	carcass	23/24	96	9.0	27	16	5.5	17
	hepatopancreas only	7/7	100	44	150	91	39	na
	muscle only	19/21	91	4.1	10	6.5	1.7	2.6 – 21
	muscle/hepatopancreas	39/41	95	10	38	21	6.3	11 – 15

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 2,4'- and 4,4'-DDD (ND = RL) (µg/kg ww) (cont.)								
White perch	carcass	1/1	100	85 J	85 J	na	na	na
	fillet (with skin)	17/19	90	11	55 J	28	12	2.2 – 4.5
	whole body	19/19	100	12 J	290 J	100	66	na
American eel	carcass	2/2	100	90 J	120 J	110	21	na
	fillet (skinless)	30/32	94	14 J	110 J	54	27	19 – 22
	whole body	19/19	100	8.1 J	140	71	43	na
Largemouth bass	carcass	3/3	100	14 J	81 J	55	36	na
	fillet (with skin)	2/3	67	4.5 J	4.6 J	4.6	0.071	1.8
Northern pike	carcass	1/1	100	210 J	210 J	na	na	na
	fillet (with skin)	1/1	100	17 J	17 J	na	na	na
Smallmouth bass	carcass	3/3	100	35 J	120 J	73	43	na
	fillet (with skin)	2/3	67	3.8 J	6.3 J	5.1	1.8	1.4
Total 2,4'- and 4,4'-DDE (ND = 0) (µg/kg ww)								
Brown bullhead	whole body	6/6	100	18 J	98 J	58	32	na
Carp	fillet (with skin)	12/12	100	51 J	830 J	290	210	na
	whole body	12/12	100	100 J	650 J	290	150	na
Channel catfish	carcass	11/11	100	24 J	340 J	160	100	na
	fillet (skinless)	11/11	100	7.0 J	130 J	52	37	na
White catfish	carcass	19/19	100	9.4 J	690 J	210	150	na
	fillet (skinless)	19/19	100	14 J	360 J	78	82	na
White sucker	carcass	5/5	100	54 J	210 J	110	59	na
	fillet (with skin)	5/5	100	12 J	30 J	20	7.1	na
Blue crab	carcass	24/24	100	18 J	69 J	35	11	na
	hepatopancreas only	7/7	100	110 J	360 J	220	86	na
	muscle only	20/21	95	5.7 J	21 J	13	5.2	23
	muscle/hepatopancreas	41/41	100	16 J	77 J	46	15	na
White perch	carcass	1/1	100	150 J	150 J	na	na	na
	fillet (with skin)	19/19	100	10 J	60 J	32	14	na
	whole body	19/19	100	23 J	200 J	110	47	na
American eel	carcass	2/2	100	180 J	210 J	200	21	na
	fillet (skinless)	32/32	100	35 J	230 J	110	52	na
	whole body	19/19	100	20 J	340 J	140	78	na
Largemouth bass	carcass	3/3	100	89 J	170 J	130	41	na
	fillet (with skin)	3/3	100	2.7 J	10 J	6.0	3.7	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 2,4'- and 4,4'-DDE (ND = 0) (µg/kg ww) (cont.)								
Northern pike	carcass	1/1	100	240 J	240 J	na	na	na
	fillet (with skin)	1/1	100	29 J	29 J	na	na	na
Smallmouth bass	carcass	3/3	100	120 J	250 J	180	66	na
	fillet (with skin)	3/3	100	5.3 J	12 J	8.7	3.4	na
Total 2,4'- and 4,4'-DDE (ND = 0.5 RL) (µg/kg ww)								
Brown bullhead	whole body	6/6	100	18 J	98 J	58	32	na
Carp	fillet (with skin)	12/12	100	64 J	830 J	300	200	na
	whole body	12/12	100	100 J	650 J	290	150	na
Channel catfish	carcass	11/11	100	24 J	340 J	160	100	na
	fillet (skinless)	11/11	100	7.7 J	130 J	52	37	na
White catfish	carcass	19/19	100	71 J	690 J	220	140	na
	fillet (skinless)	19/19	100	15 J	360 J	78	82	na
White sucker	carcass	5/5	100	55 J	210 J	110	59	na
	fillet (with skin)	5/5	100	13 J	31 J	21	7.1	na
Blue crab	carcass	24/24	100	19 J	69 J	35	11	na
	hepatopancreas only	7/7	100	110 J	360 J	220	86	na
	muscle only	20/21	95	6.4 J	21 J	14	5.1	23
	muscle/hepatopancreas	41/41	100	17 J	78 J	46	15	na
White perch	carcass	1/1	100	150 J	150 J	na	na	na
	fillet (with skin)	19/19	100	10 J	60 J	32	14	na
	whole body	19/19	100	24 J	200 J	110	47	na
American eel	carcass	2/2	100	180 J	210 J	200	21	na
	fillet (skinless)	32/32	100	35 J	230 J	110	52	na
	whole body	19/19	100	20 J	350 J	140	80	na
Largemouth bass	carcass	3/3	100	91 J	170 J	130	40	na
	fillet (with skin)	3/3	100	3.9 J	11 J	7.2	3.6	na
Northern pike	carcass	1/1	100	240 J	240 J	na	na	na
	fillet (with skin)	1/1	100	29 J	29 J	na	na	na
Smallmouth bass	carcass	3/3	100	120 J	250 J	180	66	na
	fillet (with skin)	3/3	100	6.8 J	13 J	9.8	3.1	na
Total 2,4'- and 4,4'-DDE (ND = RL) (µg/kg ww)								
Brown bullhead	whole body	6/6	100	19 J	98 J	58	32	na
Carp	fillet (with skin)	12/12	100	77 J	830 J	310	200	na
	whole body	12/12	100	100 J	650 J	290	150	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 2,4'- and 4,4'-DDE (ND = RL) (µg/kg ww) (cont.)								
Channel catfish	carcass	11/11	100	24 J	340 J	160	100	na
	fillet (skinless)	11/11	100	8.4 J	130 J	53	37	na
White catfish	carcass	19/19	100	74 J	690 J	240	140	na
	fillet (skinless)	19/19	100	17 J	360 J	79	82	na
White sucker	carcass	5/5	100	55 J	210 J	110	59	na
	fillet (with skin)	5/5	100	13 J	32 J	21	7.6	na
Blue crab	carcass	24/24	100	19 J	70 J	36	11	na
	hepatopancreas only	7/7	100	110 J	370 J	220	89	na
	muscle only	20/21	95	7.0 J	22 J	14	5.3	23
	muscle/hepatopancreas	41/41	100	18 J	78 J	47	14	na
White perch	carcass	1/1	100	150 J	150 J	na	na	na
	fillet (with skin)	19/19	100	10 J	60 J	33	14	na
	whole body	19/19	100	25 J	200 J	110	47	na
American eel	carcass	2/2	100	180 J	210 J	200	21	na
	fillet (skinless)	32/32	100	36 J	230 J	110	52	na
	whole body	19/19	100	20 J	350 J	140	80	na
Largemouth bass	carcass	3/3	100	93 J	170 J	140	40	na
	fillet (with skin)	3/3	100	5.0 J	12 J	8.3	3.5	na
Northern pike	carcass	1/1	100	240 J	240 J	na	na	na
	fillet (with skin)	1/1	100	29 J	29 J	na	na	na
Smallmouth bass	carcass	3/3	100	130 J	250 J	180	61	na
	fillet (with skin)	3/3	100	8.3 J	14 J	11	2.9	na
Total 2,4'- and 4,4'-DDT (ND = 0) (µg/kg ww)								
Brown bullhead	whole body	2/6	33	2.8 J	5.5 J	4.2	1.9	2.2 – 9.8
Carp	fillet (with skin)	6/12	50	3.1 J	43 J	13	15	8.6 – 46
	whole body	9/12	75	1.5 J	43 J	10	13	2.3 – 5.2
Channel catfish	carcass	11/11	100	2.8 J	22 J	12	6.2	na
	fillet (skinless)	8/11	73	0.86 J	8.2 J	4.4	2.1	3.1 – 8.7
White catfish	carcass	17/19	90	3.3 J	40 J	12	8.7	5 – 10
	fillet (skinless)	13/19	68	1.4 J	20 J	5.4	5.7	0.53 – 4.1
White sucker	carcass	5/5	100	3.3 J	14 J	9.2	3.9	na
	fillet (with skin)	4/5	80	1.6 J	2.2 J	2.0	0.26	2.2

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 2,4'- and 4,4'-DDT (ND = 0) (µg/kg ww) (cont.)								
Blue crab	carcass	9/24	38	0.51 J	11 J	2.1	3.4	0.37 – 5.3
	hepatopancreas only	7/7	100	3.4 J	17 J	9.1	4.4	na
	muscle/hepatopancreas	35/41	85	0.25 J	12 J	2.9	2.1	1.1 – 5.6
White perch	carcass	1/1	100	4.0 J	4.0 J	na	na	na
	fillet (with skin)	13/19	68	0.60 J	5.1 J	3.1	1.6	2.2 – 4
	whole body	16/19	84	1.8 J	31 J	11	7.8	7.3 – 8.6
American eel	carcass	2/2	100	5.0 J	7.8 J	6.4	2.0	na
	fillet (skinless)	25/32	78	2.3 J	17 J	7.4	3.9	4.2 – 120
	whole body	18/19	95	3.4 J	37 J	13	8.3	200
Largemouth bass	carcass	3/3	100	5.5 J	54 J	27	25	na
	fillet (with skin)	1/3	33	2.0 J	2.0 J	na	na	1.9 – 2
Northern pike	carcass	1/1	100	31 J	31 J	na	na	na
	fillet (with skin)	1/1	100	2.3 J	2.3 J	na	na	na
Smallmouth bass	carcass	3/3	100	11 J	14 J	13	1.5	na
Total 2,4'- and 4,4'-DDT (ND = 0.5 RL) (µg/kg ww)								
Brown bullhead	whole body	2/6	33	3.1 J	5.5 J	4.3	1.7	2.2 – 9.8
Carp	fillet (with skin)	6/12	50	3.1 J	43 J	13	15	8.6 – 46
	whole body	9/12	75	1.8 J	43 J	11	13	2.3 – 5.2
Channel catfish	carcass	11/11	100	3.7 J	25 J	14	6.8	na
	fillet (skinless)	8/11	73	1.2 J	10 J	5.7	2.6	3.1 – 8.7
White catfish	carcass	17/19	90	3.6 J	40 J	13	8.6	5 – 10
	fillet (skinless)	13/19	69	1.7 J	20 J	5.9	5.7	0.53 – 4.1
White sucker	carcass	5/5	100	9.5 J	15 J	12	2.0	na
	fillet (with skin)	4/5	80	2.8 J	3.2 J	3.1	0.19	2.2
Blue crab	carcass	9/24	38	0.76 J	12 J	2.4	3.6	0.37 – 5.3
	hepatopancreas only	7/7	100	4.3 J	17 J	11	4.3	na
	muscle/hepatopancreas	35/41	85	0.32 J	12 J	3.6	2.3	1.1 – 5.6
White perch	carcass	1/1	100	4.4 J	4.4 J	na	na	na
	fillet (with skin)	13/19	68	0.86 J	6.9 J	4.0	2.0	2.2 – 4
	whole body	16/19	84	2.1 J	31 J	12	7.4	7.3 – 8.6
American eel	carcass	2/2	100	5.6 J	8.5 J	7.1	2.1	na
	fillet (skinless)	25/32	78	2.6 J	18 J	8.3	3.9	4.2 – 120
	whole body	18/19	95	3.6 J	39 J	15	8.6	200

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 2,4'- and 4,4'-DDT (ND = 0.5 RL) (µg/kg ww) (cont.)								
Largemouth bass	carcass	3/3	100	6.9 J	56 J	28	25	na
	fillet (with skin)	1/3	33	3.1 J	3.1 J	na	na	1.9 – 2
Northern pike	carcass	1/1	100	31 J	31 J	na	na	na
	fillet (with skin)	1/1	100	3.0 J	3.0 J	na	na	na
Smallmouth bass	carcass	3/3	100	13 J	17 J	15	2.1	na
Total 2,4'- and 4,4'-DDT (ND = RL) (µg/kg ww)								
Brown bullhead	whole body	2/6	33	3.4 J	5.5 J	4.5	1.5	2.2 – 9.8
Carp	fillet (with skin)	6/12	50	3.1 J	43 J	13	15	8.6 – 46
	whole body	9/12	75	2.2 J	43 J	12	13	2.3 – 5.2
Channel catfish	carcass	11/11	100	4.6 J	29 J	15	7.6	na
	fillet (skinless)	8/11	73	1.6 J	12 J	7.1	3.2	3.1 – 8.7
White catfish	carcass	17/19	90	3.9 J	40 J	14	8.4	5 – 10
	fillet (skinless)	13/19	68	1.9 J	21 J	6.5	6.1	0.53 – 4.1
White sucker	carcass	5/5	100	11 J	19 J	14	3.4	na
	fillet (with skin)	4/5	80	3.9 J	4.4 J	4.2	0.24	2.2
Blue crab	carcass	9/24	38	1.0 J	13 J	2.8	3.8	0.37 – 5.3
	hepatopancreas only	7/7	100	5.1 J	17 J	12	4.5	na
	muscle/hepatopancreas	35/41	85	0.38 J	12 J	4.3	2.5	1.1 – 5.6
White perch	carcass	1/1	100	4.9 J	4.9 J	na	na	na
	fillet (with skin)	13/19	68	1.1 J	8.6 J	4.9	2.4	2.2 – 4
	whole body	16/19	84	2.1 J	31 J	13	7.1	7.3 – 8.6
American eel	carcass	2/2	100	6.2 J	9.2 J	7.7	2.1	na
	fillet (skinless)	25/32	78	3.0 J	20 J	9.2	4.2	4.2 – 120
	whole body	18/19	95	3.8 J	41 J	16	9.0	200
Largemouth bass	carcass	3/3	100	8.2 J	58 J	29	26	na
	fillet (with skin)	1/3	33	4.1 J	4.1 J	na	na	1.9 – 2
Northern pike	carcass	1/1	100	31 J	31 J	na	na	na
	fillet (with skin)	1/1	100	3.6 J	3.6 J	na	na	na
Smallmouth bass	carcass	3/3	100	14 J	21 J	17	3.8	na
Total 4,4'-DDT (ND = 0) (µg/kg ww)[g]								
Brown bullhead	whole body	6/6	100	18 J	180 J	83	69	na
Carp	fillet (with skin)	12/12	100	89 J	1300 J	450	330	na
	whole body	12/12	100	100 J	920 J	420	220	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 4,4'-DDT (ND = 0) (µg/kg ww) (cont.)[g]								
Channel catfish	carcass	11/11	100	49 J	530 J	240	140	na
	fillet (skinless)	11/11	100	12 J	210 J	80	59	na
White catfish	carcass	18/19	95	7.2 J	970 J	300	210	340
	fillet (skinless)	19/19	100	19 J	510 J	110	120	na
White sucker	carcass	5/5	100	92 J	200 J	150	48	na
	fillet (with skin)	5/5	100	12 J	38 J	26	12	na
Blue crab	carcass	24/24	100	27 J	110 J	51	17	na
	hepatopancreas only	7/7	100	160	510 J	310	120	na
	muscle only	20/21	95	5.7	29	18	7.0	23
	muscle/hepatopancreas	41/41	100	26	120	67	21	na
White perch	carcass	1/1	100	210 J	210 J	na	na	na
	fillet (with skin)	19/19	100	10 J	95 J	46	21	na
	whole body	19/19	100	34 J	400 J	170	93	na
American eel	carcass	2/2	100	270 J	330 J	300	42	na
	fillet (skinless)	32/32	100	45 J	350 J	160	79	na
	whole body	19/19	100	31 J	470 J	210	110	na
Largemouth bass	carcass	3/3	100	110 J	250 J	200	81	na
	fillet (with skin)	3/3	100	2.7 J	13 J	8.4	5.2	na
Northern pike	carcass	1/1	100	390 J	390 J	na	na	na
	fillet (with skin)	1/1	100	41 J	41 J	na	na	na
Smallmouth bass	carcass	3/3	100	160 J	350 J	230	110	na
	fillet (with skin)	3/3	100	5.3 J	17 J	11	5.9	na
Total 4,4'-DDT (ND = 0.5 RL) (µg/kg ww)[h]								
Brown bullhead	whole body	6/6	100	24 J	180 J	92	66	na
Carp	fillet (with skin)	12/12	100	99 J	1,300 J	460	320	na
	whole body	12/12	100	120 J	920 J	430	220	na
Channel catfish	carcass	11/11	100	49 J	530 J	240	140	na
	fillet (skinless)	11/11	100	12 J	210 J	81	58	na
White catfish	carcass	18/19	95	97 J	970 J	320	200	340
	fillet (skinless)	19/19	100	20 J	510 J	110	120	na
White sucker	carcass	5/5	100	92 J	260 J	160	66	na
	fillet (with skin)	5/5	100	16 J	39 J	29	11	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 4,4'-DDT (ND = 0.5 RL) (µg/kg ww) (cont.)[h]								
Blue crab	carcass	24/24	100	27 J	110 J	51	17	na
	hepatopancreas only	7/7	100	160	510 J	310	120	na
	muscle only	20/21	95	7.6	29	19	7.0	23
	muscle/hepatopancreas	41/41	100	26	120	67	20	na
White perch	carcass	1/1	100	210 J	210 J	na	na	na
	fillet (with skin)	19/19	100	13 J	95 J	48	21	na
	whole body	19/19	100	34 J	400 J	170	90	na
American eel	carcass	2/2	100	270 J	330 J	300	42	na
	fillet (skinless)	32/32	100	55 J	350 J	160	79	na
	whole body	19/19	100	31 J	480 J	220	110	na
Largemouth bass	carcass	3/3	100	110 J	250 J	200	81	na
	fillet (with skin)	3/3	100	4.5 J	14 J	9.4	4.8	na
Northern pike	carcass	1/1	100	390 J	390 J	na	na	na
	fillet (with skin)	1/1	100	41 J	41 J	na	na	na
Smallmouth bass	carcass	3/3	100	160 J	350 J	240	100	na
	fillet (with skin)	3/3	100	6.5 J	18 J	12	5.8	na
Total 4,4'-DDT (ND = RL) (µg/kg ww)[i]								
Brown bullhead	whole body	6/6	100	30 J	180 J	100	62	na
Carp	fillet (with skin)	12/12	100	110 J	1,300 J	470	320	na
	whole body	12/12	100	140 J	920 J	450	220	na
Channel catfish	carcass	11/11	100	49 J	530 J	240	140	na
	fillet (skinless)	11/11	100	12 J	210 J	82	57	na
White catfish	carcass	18/19	95	97 J	970 J	340	200	340
	fillet (skinless)	19/19	100	20 J	510 J	110	120	na
White sucker	carcass	5/5	100	92 J	320 J	180	87	na
	fillet (with skin)	5/5	100	19 J	46 J	32	11	na
Blue crab	carcass	24/24	100	27 J	110 J	52	18	na
	hepatopancreas only	7/7	100	160	510 J	310	120	na
	muscle only	20/21	95	9.4	30	19	6.9	23
	muscle/hepatopancreas	41/41	100	26	120	68	20	na
White perch	carcass	1/1	100	210 J	210 J	na	na	na
	fillet (with skin)	19/19	100	16 J	96 J	51	22	na
	whole body	19/19	100	34 J	400 J	180	89	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total 4,4'-DDT (ND = RL) (µg/kg ww) (cont.)[i]								
American eel	carcass	2/2	100	270 J	330 J	300	42	na
	fillet (skinless)	32/32	100	55 J	350 J	170	80	na
	whole body	19/19	100	31 J	490 J	220	110	na
Largemouth bass	carcass	3/3	100	110 J	250 J	200	81	na
	fillet (with skin)	3/3	100	6.3 J	15 J	10	4.4	na
Northern pike	carcass	1/1	100	390 J	390 J	na	na	na
	fillet (with skin)	1/1	100	41 J	41 J	na	na	na
Smallmouth bass	carcass	3/3	100	160 J	350 J	240	97	na
	fillet (with skin)	3/3	100	7.7 J	18 J	13	5.2	na
Total Chlordane (ND = 0) (µg/kg ww)[j]								
Brown bullhead	whole body	6/6	100	65 J	220 J	140	56	na
Carp	fillet (with skin)	12/12	100	81 J	630 J	300	140	na
	whole body	12/12	100	200 J	560 J	360	120	na
Channel catfish	carcass	11/11	100	100 J	400 J	240	90	na
	fillet (skinless)	11/11	100	20 J	200 J	76	51	na
White catfish	carcass	19/19	100	58 J	550 J	230	110	na
	fillet (skinless)	19/19	100	12 J	270 J	75	73	na
White sucker	carcass	5/5	100	100 J	200 J	170	41	na
	fillet (with skin)	5/5	100	18 J	43 J	27	9.5	na
Blue crab	carcass	24/24	100	10 J	40 J	23	8.3	na
	hepatopancreas only	7/7	100	170 J	320 J	240	60	na
	muscle only	21/21	100	1.9 J	10 J	5.9	2.1	na
	muscle/hepatopancreas	41/41	100	15 J	83 J	46	16	na
White perch	carcass	1/1	100	140 J	140 J	na	na	na
	fillet (with skin)	19/19	100	24 J	780 J	95	170	na
	whole body	19/19	100	36 J	480 J	150	97	na
American eel	carcass	2/2	100	110 J	170 J	140	42	na
	fillet (skinless)	32/32	100	33 J	300 J	110	55	na
	whole body	19/19	100	43 J	290 J	150	70	na
Largemouth bass	carcass	3/3	100	53 J	370 J	200	160	na
	fillet (with skin)	3/3	100	0.60 J	16 J	8.9	7.8	na
Northern pike	carcass	1/1	100	310 J	310 J	na	na	na
	fillet (with skin)	1/1	100	36 J	36 J	na	na	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total Chlordane (ND = 0) (µg/kg ww) (cont.)[j]								
Smallmouth bass	carcass	3/3	100	110 J	170 J	150	35	na
	fillet (with skin)	3/3	100	4.3 J	8.9 J	7.3	2.6	na
Total Chlordane (ND = 0.5 RL) (µg/kg ww)[k]								
Brown bullhead	whole body	6/6	100	65 J	220 J	140	56	na
Carp	fillet (with skin)	12/12	100	100 J	630 J	300	140	na
	whole body	12/12	100	200 J	560 J	360	120	na
Channel catfish	carcass	11/11	100	100 J	400 J	240	90	na
	fillet (skinless)	11/11	100	20 J	200 J	77	50	na
White catfish	carcass	19/19	100	68 J	550 J	240	110	na
	fillet (skinless)	19/19	100	12 J	270 J	76	72	na
White sucker	carcass	5/5	100	110 J	200 J	170	37	na
	fillet (with skin)	5/5	100	21 J	43 J	29	8.4	na
Blue crab	carcass	24/24	100	10 J	40 J	23	8.3	na
	hepatopancreas only	7/7	100	170 J	320 J	240	60	na
	muscle only	21/21	100	2.5 J	10 J	6.3	2.1	na
	muscle/hepatopancreas	41/41	100	15 J	83 J	46	16	na
White perch	carcass	1/1	100	140 J	140 J	na	na	na
	fillet (with skin)	19/19	100	24 J	790 J	96	170	na
	whole body	19/19	100	36 J	480 J	150	96	na
American eel	carcass	2/2	100	110 J	170 J	140	42	na
	fillet (skinless)	32/32	100	33 J	310 J	110	57	na
	whole body	19/19	100	43 J	290 J	150	70	na
Largemouth bass	carcass	3/3	100	53 J	370 J	200	160	na
	fillet (with skin)	3/3	100	1.2 J	16 J	9.1	7.4	na
Northern pike	carcass	1/1	100	310 J	310 J	na	na	na
	fillet (with skin)	1/1	100	36 J	36 J	na	na	na
Smallmouth bass	carcass	3/3	100	110 J	170 J	150	35	na
	fillet (with skin)	3/3	100	4.3 J	8.9 J	7.3	2.6	na
Total Chlordane (ND = RL) (µg/kg ww)[l]								
Brown bullhead	whole body	6/6	100	65 J	220 J	140	56	na
Carp	fillet (with skin)	12/12	100	120 J	630 J	300	140	na
	whole body	12/12	100	200 J	560 J	360	120	na
Channel catfish	carcass	11/11	100	100 J	400 J	240	90	na
	fillet (skinless)	11/11	100	20 J	200 J	78	49	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total Chlordane (ND = RL) (µg/kg ww) (cont.)[l]								
White catfish	carcass	19/19	100	77 J	550 J	240	110	na
	fillet (skinless)	19/19	100	12 J	270 J	77	72	na
White sucker	carcass	5/5	100	120 J	200 J	170	33	na
	fillet (with skin)	5/5	100	25 J	43 J	31	7.5	na
Blue crab	carcass	24/24	100	10 J	40 J	23	8.4	na
	hepatopancreas only	7/7	100	170 J	320 J	240	61	na
	muscle only	21/21	100	3.2 J	14 J	6.6	2.5	na
	muscle/hepatopancreas	41/41	100	15 J	83 J	47	16	na
White perch	carcass	1/1	100	140 J	140 J	na	na	na
	fillet (with skin)	19/19	100	24 J	810 J	99	180	na
	whole body	19/19	100	36 J	480 J	150	96	na
American eel	carcass	2/2	100	110 J	170 J	140	42	na
	fillet (skinless)	32/32	100	33 J	320 J	110	58	na
	whole body	19/19	100	43 J	290 J	150	70	na
Largemouth bass	carcass	3/3	100	53 J	370 J	200	160	na
	fillet (with skin)	3/3	100	1.7 J	16 J	9.2	7.2	na
Northern pike	carcass	1/1	100	310 J	310 J	na	na	na
	fillet (with skin)	1/1	100	36 J	36 J	na	na	na
Smallmouth bass	carcass	3/3	100	110 J	170 J	150	35	na
	fillet (with skin)	3/3	100	4.3 J	8.9 J	7.3	2.6	na
Total DDx (ND = 0) (µg/kg ww)[m]								
Brown bullhead	whole body	6/6	100	20 J	200 J	93	80	na
Carp	fillet (with skin)	12/12	100	89 J	1,600 J	520	420	na
	whole body	12/12	100	110 J	1,100 J	510	270	na
Channel catfish	carcass	11/11	100	61 J	570 J	260	150	na
	fillet (skinless)	11/11	100	13 J	220 J	84	61	na
White catfish	carcass	19/19	100	28 J	1,000 J	300	220	na
	fillet (skinless)	19/19	100	20 J	530 J	120	120	na
White sucker	carcass	5/5	100	99 J	240 J	170	61	na
	fillet (with skin)	5/5	100	12 J	43 J	29	14	na
Blue crab	carcass	24/24	100	27 J	110 J	51	17	na
	hepatopancreas only	7/7	100	160 J	510 J	310	120	na
	muscle only	20/21	95	5.7 J	29 J	18	7.0	23
	muscle/hepatopancreas	41/41	100	26 J	120 J	67	21	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total DDx (ND = 0) (µg/kg ww) (cont.)[m]								
White perch	carcass	1/1	100	240 J	240 J	na	na	na
	fillet (with skin)	19/19	100	10 J	110 J	55	25	na
	whole body	19/19	100	38 J	490 J	210	120	na
American eel	carcass	2/2	100	280 J	330 J	310	35	na
	fillet (skinless)	32/32	100	45 J	360 J	160	81	na
	whole body	19/19	100	32 J	470 J	220	110	na
Largemouth bass	carcass	3/3	100	110 J	270 J	210	90	na
	fillet (with skin)	3/3	100	2.7 J	13 J	8.4	5.2	na
Northern pike	carcass	1/1	100	470 J	470 J	na	na	na
	fillet (with skin)	1/1	100	48 J	48 J	na	na	na
Smallmouth bass	carcass	3/3	100	170 J	380 J	250	120	na
	fillet (with skin)	3/3	100	5.3 J	17 J	11	5.9	na
Total DDx (ND = 0.5 RL) (µg/kg ww)[n]								
Brown bullhead	whole body	6/6	100	26 J	200 J	100	75	na
Carp	fillet (with skin)	12/12	100	130 J	1,600 J	540	400	na
	whole body	12/12	100	130 J	1,100 J	530	270	na
Channel catfish	carcass	11/11	100	62 J	570 J	260	150	na
	fillet (skinless)	11/11	100	14 J	230 J	87	61	na
White catfish	carcass	19/19	100	100 J	1,000 J	340	200	na
	fillet (skinless)	19/19	100	23 J	530 J	120	120	na
White sucker	carcass	5/5	100	100 J	300 J	190	77	na
	fillet (with skin)	5/5	100	18 J	45 J	34	13	na
Blue crab	carcass	24/24	100	28 J	110 J	53	17	na
	hepatopancreas only	7/7	100	160 J	520 J	320	130	na
	muscle only	20/21	95	9.6 J	31 J	20	7.1	23
	muscle/hepatopancreas	41/41	100	29 J	120 J	70	20	na
White perch	carcass	1/1	100	240 J	240 J	na	na	na
	fillet (with skin)	19/19	100	16 J	120 J	60	26	na
	whole body	19/19	100	41 J	490 J	220	110	na
American eel	carcass	2/2	100	280 J	340 J	310	42	na
	fillet (skinless)	32/32	100	56 J	360 J	170	82	na
	whole body	19/19	100	32 J	590 J	230	130	na
Largemouth bass	carcass	3/3	100	110 J	270 J	220	92	na
	fillet (with skin)	3/3	100	7.4 J	17 J	12	4.8	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total DDx (ND = 0.5 RL) (µg/kg ww) (cont.)[n]								
Northern pike	carcass	1/1	100	470 J	470 J	na	na	na
	fillet (with skin)	1/1	100	49 J	49 J	na	na	na
Smallmouth bass	carcass	3/3	100	170 J	390 J	260	120	na
	fillet (with skin)	3/3	100	9.4 J	20 J	14	5.3	na
Total DDx (ND = RL) (µg/kg ww)[o]								
Brown bullhead	whole body	6/6	100	33 J	200 J	110	70	na
Carp	fillet (with skin)	12/12	100	170 J	1,600 J	570	390	na
	whole body	12/12	100	150 J	1,100 J	540	270	na
Channel catfish	carcass	11/11	100	62 J	570 J	270	150	na
	fillet (skinless)	11/11	100	15 J	240 J	92	62	na
White catfish	carcass	19/19	100	110 J	1,000 J	370	200	na
	fillet (skinless)	19/19	100	27 J	530 J	120	120	na
White sucker	carcass	5/5	100	100 J	360 J	200	97	na
	fillet (with skin)	5/5	100	24 J	54 J	39	13	na
Blue crab	carcass	24/24	100	30 J	110 J	55	17	na
	hepatopancreas only	7/7	100	170 J	530 J	320	120	na
	muscle only	20/21	95	13 J	33 J	22	7.0	23
	muscle/hepatopancreas	41/41	100	32 J	120 J	72	20	na
White perch	carcass	1/1	100	240 J	240 J	na	na	na
	fillet (with skin)	19/19	100	21 J	120 J	64	27	na
	whole body	19/19	100	43 J	490 J	220	110	na
American eel	carcass	2/2	100	280 J	340 J	310	42	na
	fillet (skinless)	32/32	100	57 J	360 J	180	87	na
	whole body	19/19	100	32 J	710 J	240	150	na
Largemouth bass	carcass	3/3	100	110 J	270 J	220	92	na
	fillet (with skin)	3/3	100	12 J	20 J	16	4.0	na
Northern pike	carcass	1/1	100	470 J	470 J	na	na	na
	fillet (with skin)	1/1	100	49 J	49 J	na	na	na
Smallmouth bass	carcass	3/3	100	180 J	390 J	270	110	na
	fillet (with skin)	3/3	100	13 J	22 J	17	4.6	na
Total Endosulfan (ND = 0) (µg/kg ww)[p]								
Brown bullhead	whole body	4/6	67	0.55 J	1.7 J	1.3	0.55	0.91 – 1
Carp	fillet (with skin)	9/12	75	0.28 J	2.4 J	1.2	0.79	5.9 – 25
	whole body	9/12	75	0.46 J	8.2	1.9	2.4	1.5 – 2.5

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total Endosulfan (ND = 0) (µg/kg ww) (cont.)[p]								
Channel catfish	carcass	4/11	36	0.41 J	2.2 J	1.1	0.77	2 – 8.6
	fillet (skinless)	2/11	18	0.53 J	0.67 J	0.60	0.099	0.76 – 5
White catfish	carcass	9/19	47	0.31 J	3.7 J	0.85	1.1	0.9 – 8.7
	fillet (skinless)	3/19	16	0.24 J	0.85 J	0.46	0.34	0.39 – 4.2
White sucker	carcass	1/5	20	0.67 J	0.67 J	na	na	0.79 – 2.8
Blue crab	carcass	10/24	42	0.033 J	0.36 J	0.094	0.097	0.43 – 3
	hepatopancreas only	6/7	86	0.30 J	0.81 J	0.49	0.18	2.7
	muscle only	1/21	5	0.036 J	0.036 J	na	na	1 – 33
	muscle/hepatopancreas	20/41	49	0.024 J	1.1	0.14	0.23	1.1 – 44
White perch	carcass	1/1	100	1.0 J	1.0 J	na	na	na
	fillet (with skin)	7/19	37	0.20 J	0.92 J	0.52	0.24	0.42 – 3.1
	whole body	8/19	42	0.56 J	1.5	1.0	0.36	0.71 – 3.2
American eel	fillet (skinless)	15/32	47	0.11 J	1.5	0.56	0.33	0.4 – 3.8
	whole body	13/19	68	0.35 J	1.5 J	0.88	0.31	0.31 – 2.9
Largemouth bass	carcass	3/3	100	0.14 J	0.36 J	0.27	0.12	na
	fillet (with skin)	1/3	33	0.046 J	0.046 J	na	na	3.6 – 4.3
Northern pike	carcass	1/1	100	2.5 J	2.5 J	na	na	na
	fillet (with skin)	1/1	100	0.42 J	0.42 J	na	na	na
Smallmouth bass	carcass	2/3	67	0.42 J	0.51 J	0.47	0.064	7.2
	fillet (with skin)	1/3	33	0.067 J, T(1)	0.067 J, T(1)	na	na	2.4 – 3.3
Total Endosulfan (ND = 0.5 RL) (µg/kg ww)[q]								
Brown bullhead	whole body	4/6	67	1.2 J	2.5 J	1.9	0.56	0.91 – 1
Carp	fillet (with skin)	9/12	75	1.4 J	14 J	5.8	5.0	5.9 – 25
	whole body	9/12	75	1.3 J	8.2	3.5	2.1	1.5 – 2.5
Channel catfish	carcass	4/11	36	1.7 J	3.6 J	2.3	0.90	2 – 8.6
	fillet (skinless)	2/11	18	0.81 J	3.0 J	1.9	1.5	0.76 – 5
White catfish	carcass	9/19	47	1.3 J	8.4 J	3.0	2.4	0.9 – 8.7
	fillet (skinless)	3/19	16	0.64 J	1.4 J	0.94	0.40	0.39 – 4.2
White sucker	carcass	1/5	20	0.96 J	0.96 J	na	na	0.79 – 2.8
Blue crab	carcass	10/24	42	0.54 J	3.7 J	1.3	0.99	0.43 – 3
	hepatopancreas only	6/7	86	2.9 J	9.5 J	5.7	2.4	2.7
	muscle only	1/21	5	1.4 J	1.4 J	na	na	1 – 33
	muscle/hepatopancreas	20/41	49	1.4 J	23	4.9	4.9	1.1 – 44

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total Endosulfan (ND = 0.5 RL) (µg/kg ww) (cont.)[q]								
White perch	carcass	1/1	100	1.6 J	1.6 J	na	na	na
	fillet (with skin)	7/19	37	0.47 J	1.9 J	1.2	0.51	0.42 – 3.1
	whole body	8/19	42	0.91 J	4.2	2.3	1.3	0.71 – 3.2
American eel	fillet (skinless)	15/32	47	0.56 J	4.5 J	2.1	1.1	0.4 – 3.8
	whole body	13/19	68	1.1 J	8.0 J	2.8	1.7	0.31 – 2.9
Largemouth bass	carcass	3/3	100	5.8 J	19 J	11	7.0	na
	fillet (with skin)	1/3	33	3.0 J	3.0 J	na	na	3.6 – 4.3
Northern pike	carcass	1/1	100	14 J	14 J	na	na	na
	fillet (with skin)	1/1	100	1.8 J	1.8 J	na	na	na
Smallmouth bass	carcass	2/3	67	3.1 J	12 J	7.6	6.3	7.2
	fillet (with skin)	1/3	33	0.87 J, T(1)	0.87 J, T(1)	na	na	2.4 – 3.3
Total Endosulfan (ND = RL) (µg/kg ww)[r]								
Brown bullhead	whole body	4/6	67	1.8 J	3.3 J	2.5	0.62	0.91 – 1
Carp	fillet (with skin)	9/12	75	2.3 J	28 J	10	10	5.9 – 25
	whole body	9/12	75	2.0 J	9.5 J	5.1	2.7	1.5 – 2.5
Channel catfish	carcass	4/11	36	2.7 J	5.0 J	3.3	1.1	2 – 8.6
	fillet (skinless)	2/11	18	0.94 J	5.5 J	3.2	3.2	0.76 – 5
White catfish	carcass	9/19	47	2.0 J	17 J	5.3	4.7	0.9 – 8.7
	fillet (skinless)	3/19	16	0.99 J	2.0 J	1.4	0.52	0.39 – 4.2
White sucker	carcass	1/5	20	1.3 J	1.3 J	na	na	0.79 – 2.8
Blue crab	carcass	10/24	42	1.0 J	7.0 J	2.5	1.9	0.43 – 3
	hepatopancreas only	6/7	86	5.4 J	18 J	11	4.5	2.7
	muscle only	1/21	5	2.9 J	2.9 J	na	na	1 – 33
	muscle/hepatopancreas	20/41	49	2.7 J	45	9.6	9.6	1.1 – 44
White perch	carcass	1/1	100	2.2 J	2.2 J	na	na	na
	fillet (with skin)	7/19	37	0.73 J	3.2 J	1.9	0.83	0.42 – 3.1
	whole body	8/19	42	1.1 J	6.8	3.5	2.2	0.71 – 3.2
American eel	fillet (skinless)	15/32	47	0.81 J	8.6 J	3.6	2.1	0.4 – 3.8
	whole body	13/19	68	1.2 J	15 J	4.7	3.5	0.31 – 2.9
Largemouth bass	carcass	3/3	100	11 J	37 J	21	14	na
	fillet (with skin)	1/3	33	6.0 J	6.0 J	na	na	3.6 – 4.3
Northern pike	carcass	1/1	100	26 J	26 J	na	na	na
	fillet (with skin)	1/1	100	3.2 J	3.2 J	na	na	na

Table 4-9. Summary of detected organochlorine pesticide results for fish and blue crab tissue samples

Chemical[a]	Tissue Type	Detection Frequency[b]		Detected Concentration[c]				RL or Range of RLs[d]
		Ratio	%	Min	Max	Mean	St Dev	
Total Endosulfan (ND = RL) (µg/kg ww) (cont.)[r]								
Smallmouth bass	carcass	2/3	67	5.8 J	24 J	15	13	7.2
	fillet (with skin)	1/3	33	1.7 J, T(1)	1.7 J, T(1)	na	na	2.4 – 3.3
trans-Nonachlor (µg/kg ww)								
Brown bullhead	whole body	6/6	100	11	58 J	32	16	na
Carp	fillet (with skin)	12/12	100	25 J	82 J	54	18	na
	whole body	12/12	100	36 J	130 J	73	33	na
Channel catfish	carcass	11/11	100	30 J	76 J	44	15	na
	fillet (skinless)	10/11	91	4.5 J	35 J	14	8.6	11
White catfish	carcass	17/19	90	23 J	76 J	44	17	19 – 36
	fillet (skinless)	19/19	100	2.6 J	47 J	14	13	na
White sucker	carcass	4/5	80	25 J	46	35	8.8	17
	fillet (with skin)	3/5	60	5.5	8.8	7.1	1.7	4.8 – 4.9
Blue crab	carcass	21/24	88	0.15 J	1.6 J	0.51	0.32	0.21 – 0.29
	hepatopancreas only	6/7	86	1.8	15	5.4	4.9	3.8
	muscle only	7/21	33	0.063 J	0.28 J	0.11	0.076	0.058 – 0.77
	muscle/hepatopancreas	29/41	71	0.17 J	1.6	0.61	0.33	0.3 – 19
White perch	carcass	1/1	100	13 J	13 J	na	na	na
	fillet (with skin)	17/19	90	2.9 J	16 J	7.6	3.6	20 – 26
	whole body	18/19	95	5.3 J	45 J	22	11	23
American eel	carcass	2/2	100	13 J	17 J	15	2.8	na
	fillet (skinless)	30/32	94	3.3 J	23 J	10	4.9	4.8 – 7
	whole body	18/19	95	5.9 J	31 J	16	6.8	6.5
Largemouth bass	carcass	3/3	100	7.4 J	43 J	22	18	na
	fillet (with skin)	2/3	67	1.2 J	1.7 J	1.5	0.35	0.23
Northern pike	carcass	1/1	100	54 J	54 J	na	na	na
	fillet (with skin)	1/1	100	5.8 J	5.8 J	na	na	na
Smallmouth bass	carcass	3/3	100	12 J	20 J	17	4.4	na
	fillet (with skin)	3/3	100	0.46 J	1.1 J	0.89	0.37	na

[a] Only analytes with detected results are presented. If the analyte was not detected in any samples for a given species and tissue type, the analyte is not presented in the table. Data tables that contain results for each sample, including non-detected sample results, are presented in Appendix F.

[b] A calculated total concentration was considered detected if one or more of the components of the sum were detected. If all components of the sum were not detected, the calculated total concentration was considered not detected.

[c] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviations) include data only for detected results. Non-detected data are not included in summary statistics.

[d] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

[e] Detection frequency does not include four carp fillet samples analyzed for endosulfan II that were rejected during data validation (see Section 5 for more details).

[f] Detection frequency does not include three carp fillet samples analyzed for endrin ketone that were rejected during data validation (see Section 5 for more details).

[g] Total 4,4'-DDT was calculated as the sum of 4,4′-DDD; 4,4′-DDE; 4,4′-DDT. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for more details).

[h] Total 4,4'-DDT was calculated as the sum of 4,4′-DDD; 4,4′-DDE; 4,4′-DDT. Non-detected results were set equal to one-half the RL when the total concentration was calculated (see Appendix E for more details).

[i] Total 4,4'-DDT was calculated as the sum of 4,4′-DDD; 4,4′-DDE; 4,4′-DDT. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for more details).

[j] Total chlordane was calculated as the sum of alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for more details).

[k] Total chlordane was calculated as the sum of alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor. Non-detected results were set equal to one-half the RL when the total concentration was calculated (see Appendix E for more details).

[l] Total chlordane was calculated as the sum of alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for more details).

[m] Total DDx was calculated as the sum of 2,4′-DDD; 2,4′-DDE; 2,4′-DDT; 4,4′-DDD; 4,4′-DDE; and 4,4′-DDT. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for more details).

[n] Total DDx was calculated as the sum of 2,4′-DDD; 2,4′-DDE; 2,4′-DDT; 4,4′-DDD; 4,4′-DDE; and 4,4′-DDT. Non-detected results were set equal to one-half the RL when the total concentration was calculated (see Appendix E for more details).

[o] Total DDx was calculated as the sum of 2,4′-DDD; 2,4′-DDE; 2,4′-DDT; 4,4′-DDD; 4,4′-DDE; and 4,4′-DDT. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for more details).

[p] Total endosulfan was calculated as the sum of endosulfan I, endosulfan II, and endosulfan sulfate. Non-detected results were set equal to zero when the total concentration was calculated (see Appendix E for more details). Partial sums were calculated in instances when a constituent parameter was missing (e.g., a compound rejected by validation); a T(1) data qualifier indicates that one constituent parameter was missing from the sum value.

[q] Total endosulfan was calculated as the sum of endosulfan I, endosulfan II, and endosulfan sulfate. Non-detected results were set equal to one-half the RL when the total concentration was calculated (see Appendix E for more details). Partial sums were calculated in instances when a constituent parameter was missing (e.g., a compound rejected by validation); a T(1) data qualifier indicates that one constituent parameter was missing from the sum value.

[r] Total endosulfan was calculated as the sum of endosulfan I, endosulfan II, and endosulfan sulfate. Non-detected results were set equal to the RL when the total concentration was calculated (see Appendix E for more details). Partial sums were calculated in instances when a constituent parameter was missing (e.g., a compound rejected by validation); a T(1) data qualifier indicates that one constituent parameter was missing from the sum value.

BHC – benzene hexachloride
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethylene
DDT – dichlorodiphenyltrichloroethane
J – estimated concentration
Max – maximum
Min – minimum
na – not applicable
ND – non-detected concentration
RL – reporting limit
St Dev – standard deviation
total DDx – sum of all six DDT isomers (2,4′-DDD, 4,4′-DDD, 2,4′-DDE, 4,4′-DDE, 2,4′-DDT and 4,4′-DDT)
ww – wet weight

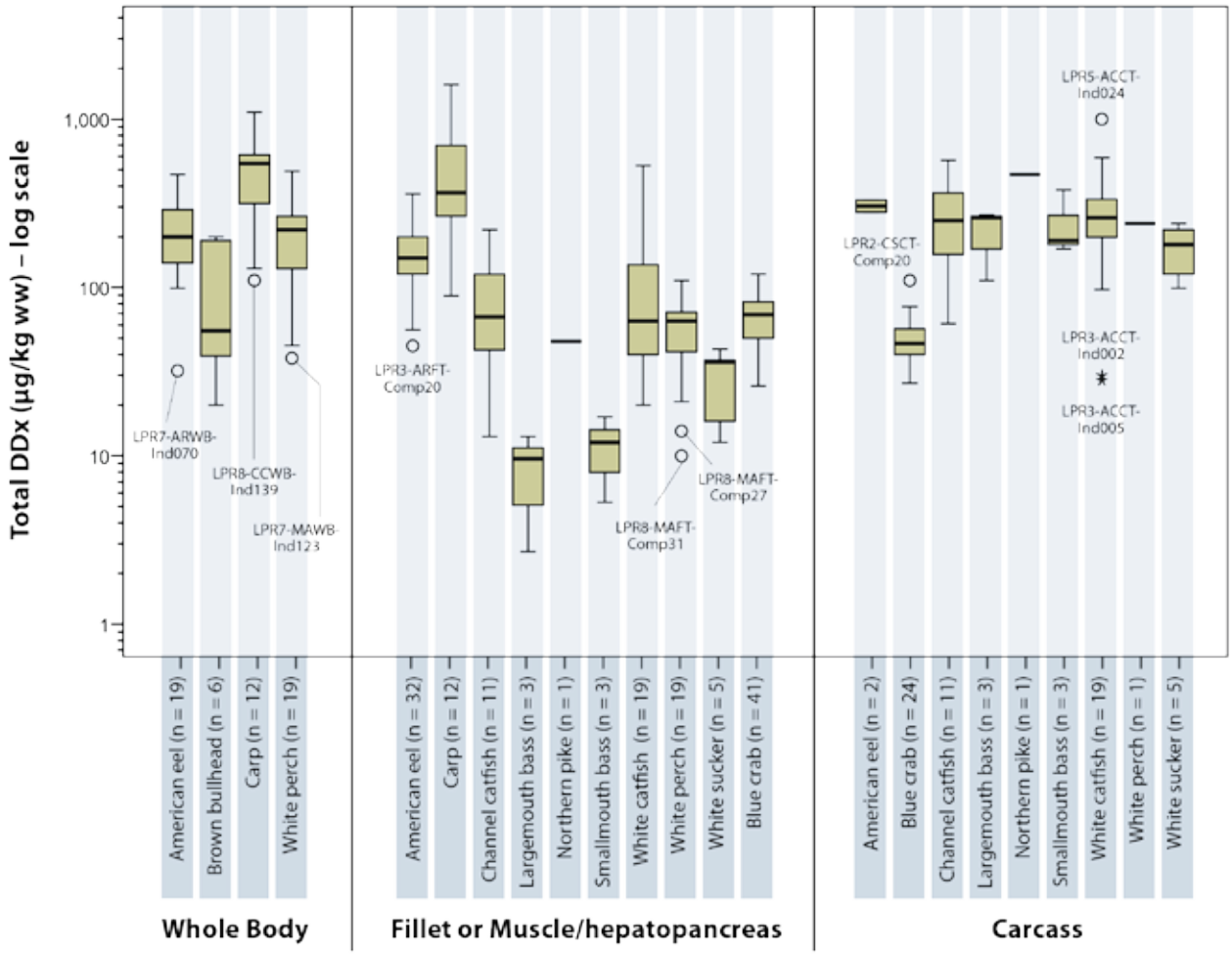
4.7.1 Total DDx

The six DDT isomers (2,4′-DDD, 4,4′-DDD, 2,4′-DDE, 4,4′-DDE, 2,4′-DDT, and 4,4′-DDT) that comprise total DDx had a detection frequency that ranged from 4 to 100% in each species group of tissue samples (Table 4-9). Total DDx was detected in all fish and blue crab samples, except for one blue crab muscle-only sample. Detected total DDx concentrations ranged from 2.7 to 1,600 µg/kg ww across all fish and blue crab samples. The highest total DDx concentration (1,600 µg/kg ww) was measured in a carp fillet sample (LPR5-CCFT-Ind184) from Reach 5. The distribution of total DDx concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and

for blue crab (i.e., muscle / hepatopancreas and carcass) samples are shown in Figure 4-43.[16] The following summarize total DDx concentrations for fish and blue crab by tissue type, as shown in Figure 4-43:

- **Fish whole body** – Fish whole-body total DDx concentrations ranged from 20 to 1,100 µg / kg ww. The highest total DDx concentration (1,100 µg / kg ww) was measured in an individual carp whole-body sample (LPR4-CCWB-Ind175) from Reach 4.
- **Fish fillet and blue crab muscle/hepatopancreas** – Fish fillet total DDx concentrations ranged from 2.7 to 1,600 µg / kg ww, and the highest total DDx concentration (1,600 µg / kg ww) was measured in an individual carp fillet sample (LPR5-CCFT-Ind184) from Reach 5. Blue crab muscle / hepatopancreas total DDx concentrations ranged from 26 to 120 µg / kg ww, and the highest blue crab muscle / hepatopancreas total DDx concentration (120 µg / kg ww) was measured in a composite sample (LPR4-CSMH-Comp31) from Reach 4.
- **Fish and blue crab carcass** – Fish carcass total DDx concentrations ranged from 28 to 1,000 µg / kg ww, and the highest fish carcass total DDx concentration (1,000 µg / kg ww) was measured in an individual white catfish sample (LPR5-ACCT-Ind024) from Reach 5. Blue crab carcass total DDx concentrations ranged from 27 to 110 µg / kg ww, and the highest total DDx concentration (110 µg / kg ww) was measured in a composite sample (LPR2-CSCT-Comp20) from Reach 2.

[16] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

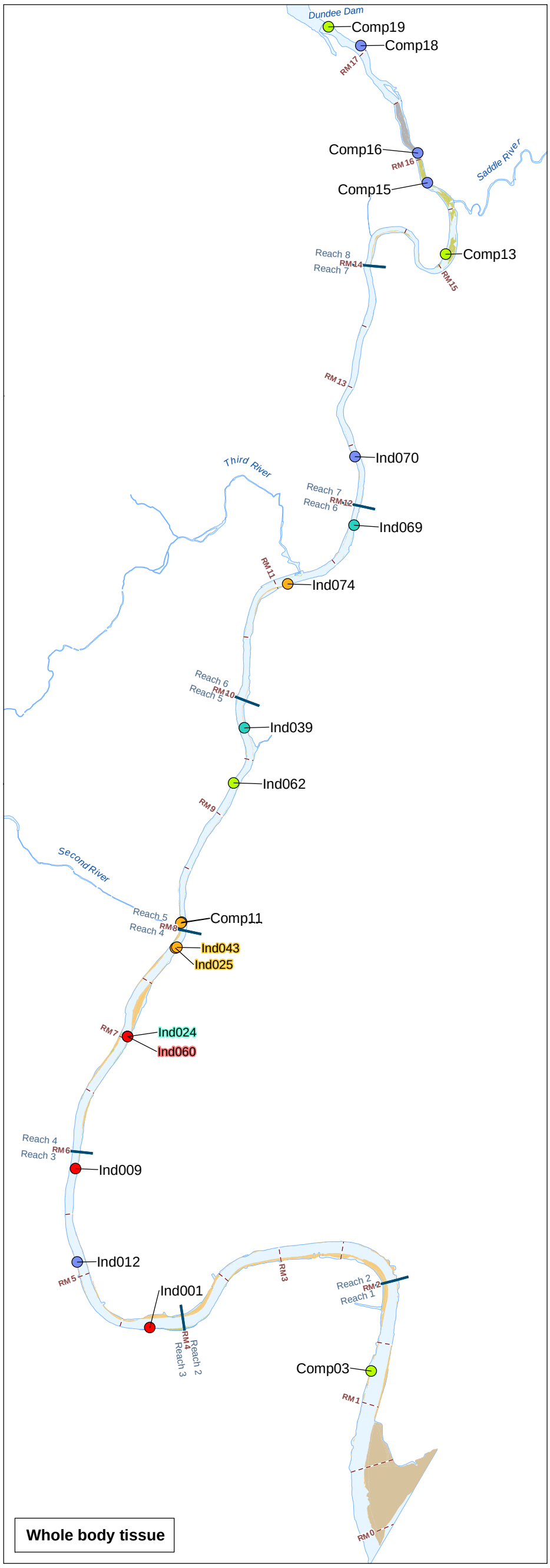


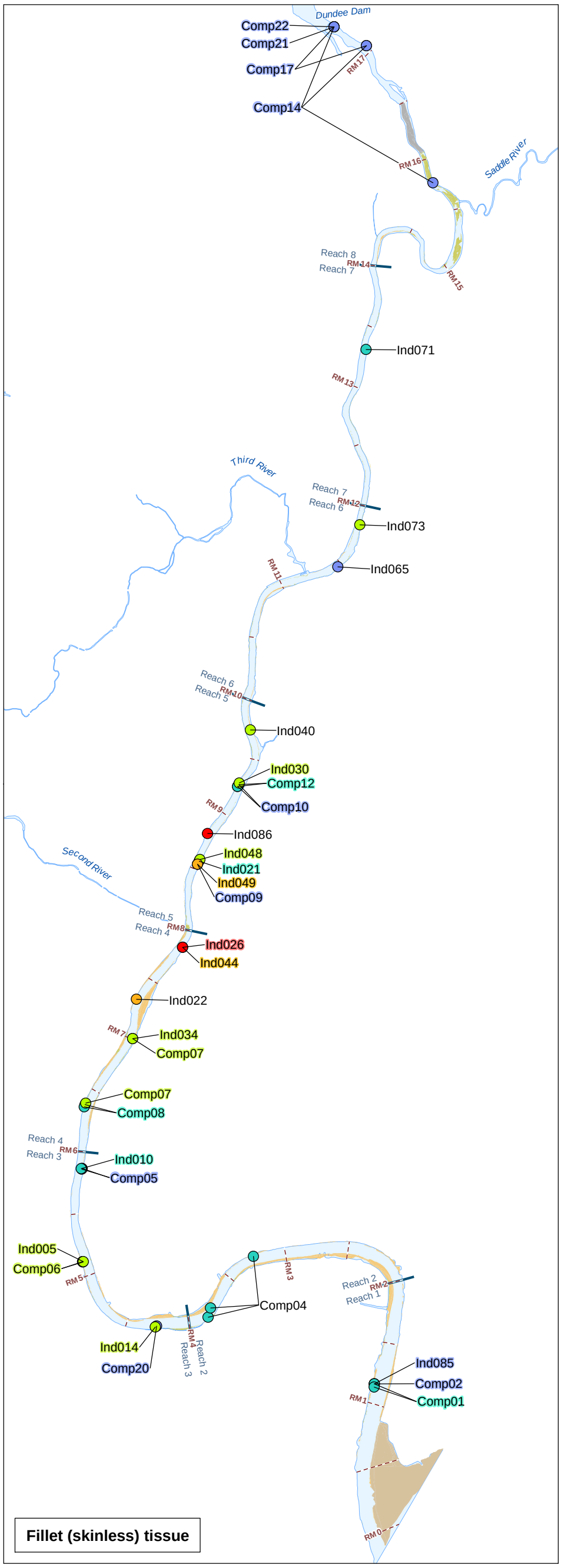
Note: Total DDx was calculated as the sum of 2,4′-DDD; 2,4′-DDE; 2,4′-DDT; 4,4′-DDD; 4,4′-DDE; and 4,4′-DDT. Non-detected results were set equal to zero when total concentrations were calculated for this figure.

Figure 4-43. Total DDx concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue total DDx concentrations are shown by percentile range and reach in Figures 4-44 through 4-46, respectively. The highest American eel total DDx concentration (470 µg/kg ww) was measured in an individual whole-body sample (LPR3-ARWB-Ind009) from Reach 3 (Figure 4-44). The highest white perch total DDx concentration (490 µg/kg ww) was measured in an individual whole-body sample (LPR1-MAWB-Ind138) from Reach 1 (Figure 4-45). The highest blue crab total DDx concentration (510 µg/kg ww) was measured in a hepatopancreas-only composite sample (LPR3-CSHT-Comp64) from Reach 3. Of the 93 blue crab samples, the 7 hepatopancres-only samples had the highest total DDx concentrations (ranging from 510 to 160 µg/kg ww). The highest blue crab total DDx concentration,

excluding hepatopancreas-only samples (120 µg / kg ww), was measured in a muscle / hepatopancreas composite sample (LPR4-CSMH-Comp31) from Reach 4 (Figure 4-46).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Total DDx (µg/kg)	(Percentile)
> 310	(> 90th)
> 240 and ≤ 310	(> 75th and ≤ 90th)
> 160 and ≤ 240	(> 50th and ≤ 75th)
> 120 and ≤ 160	(> 25th and ≤ 50th)
≤ 120	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-44. Total DDx concentrations in American eel 2009 tissue samples from the LPRSA

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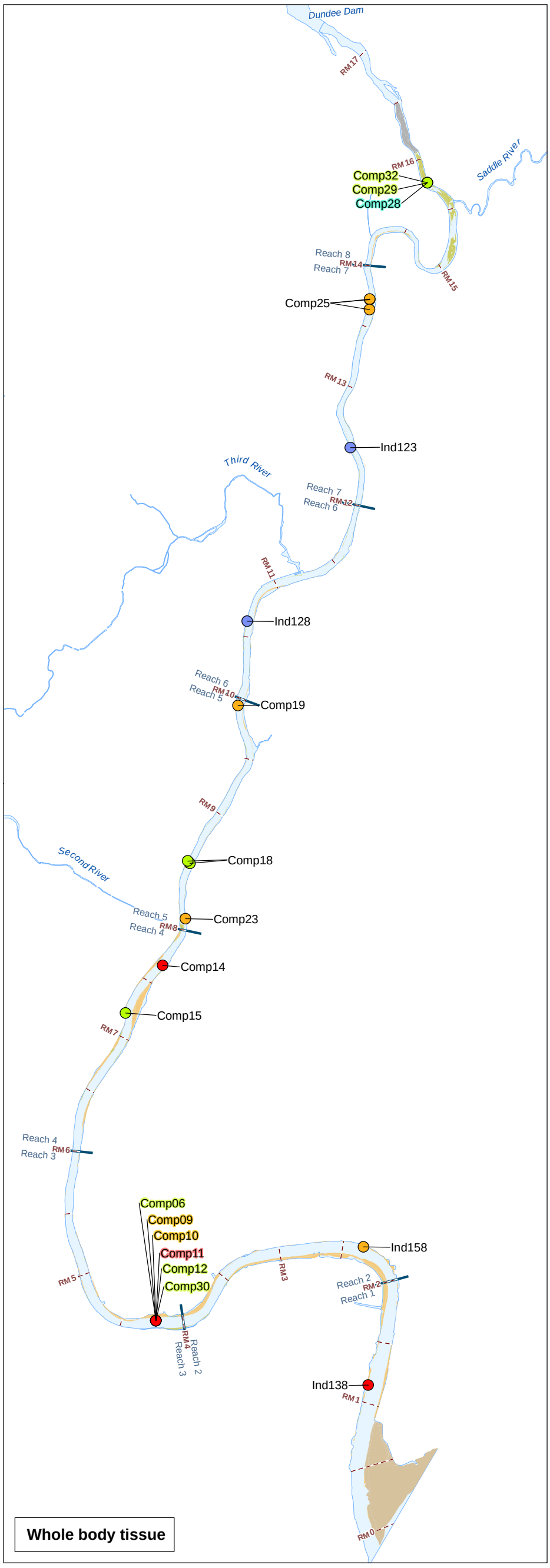

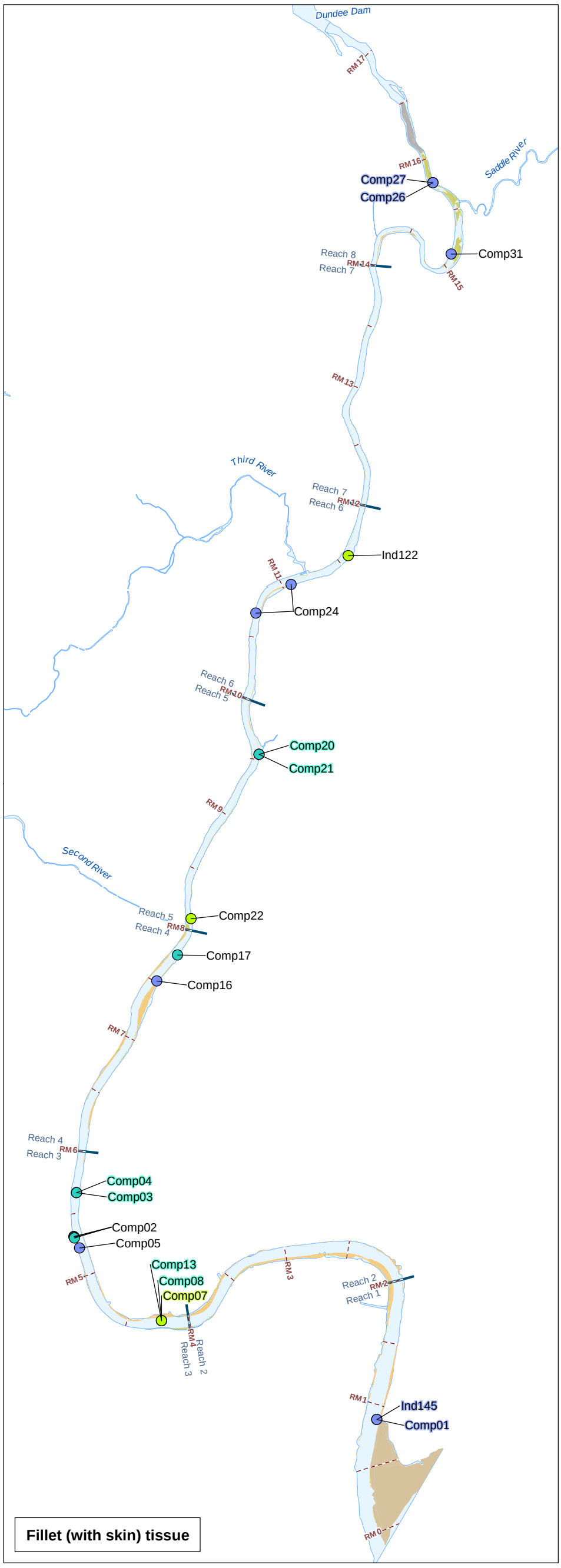

- River mile
- Sampling reach boundary
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data
- LPRSA

N

0 0.5 1 Miles

Total DDx (µg/kg)	(Percentile)
> 280	(> 90th)
> 220 and ≤ 280	(> 75th and ≤ 90th)
> 78 and ≤ 220	(> 50th and ≤ 75th)
> 49 and ≤ 78	(> 25th and ≤ 50th)
≤ 49	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-45. Total DDx concentrations in white perch 2009 tissue samples from the LPRSA

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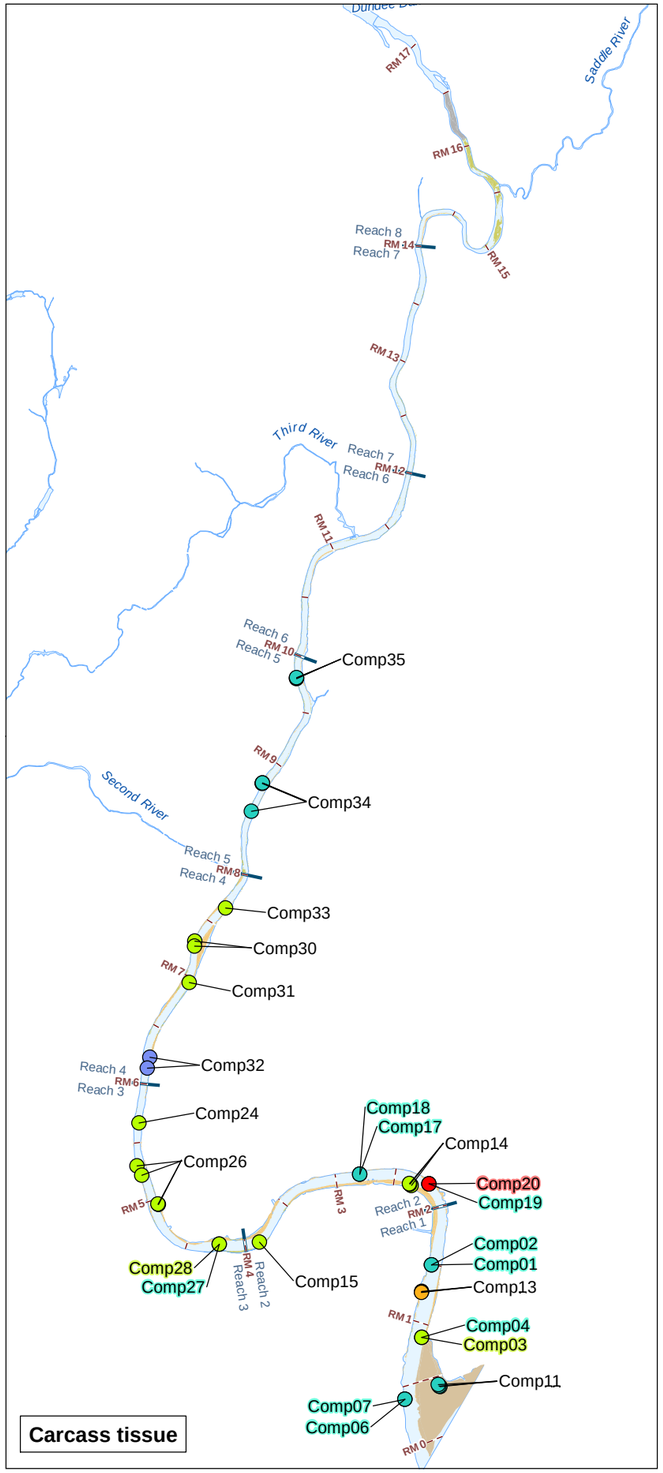

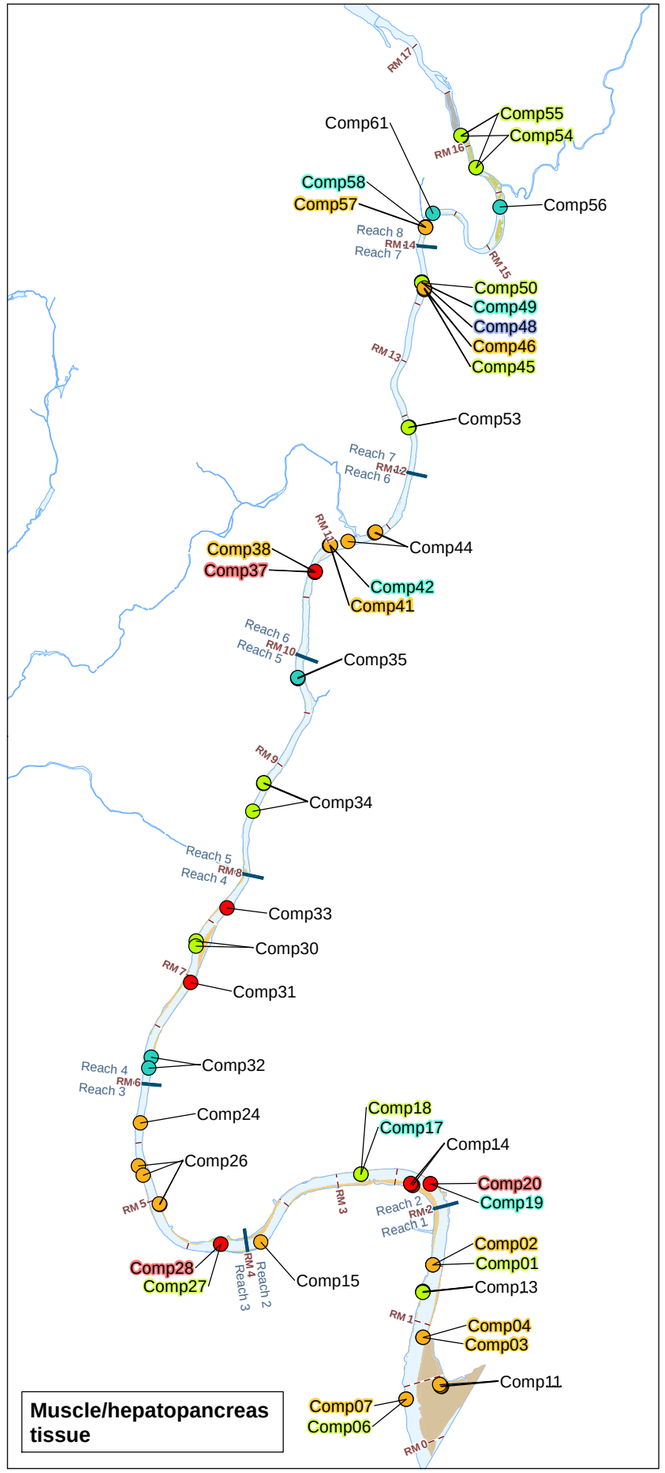

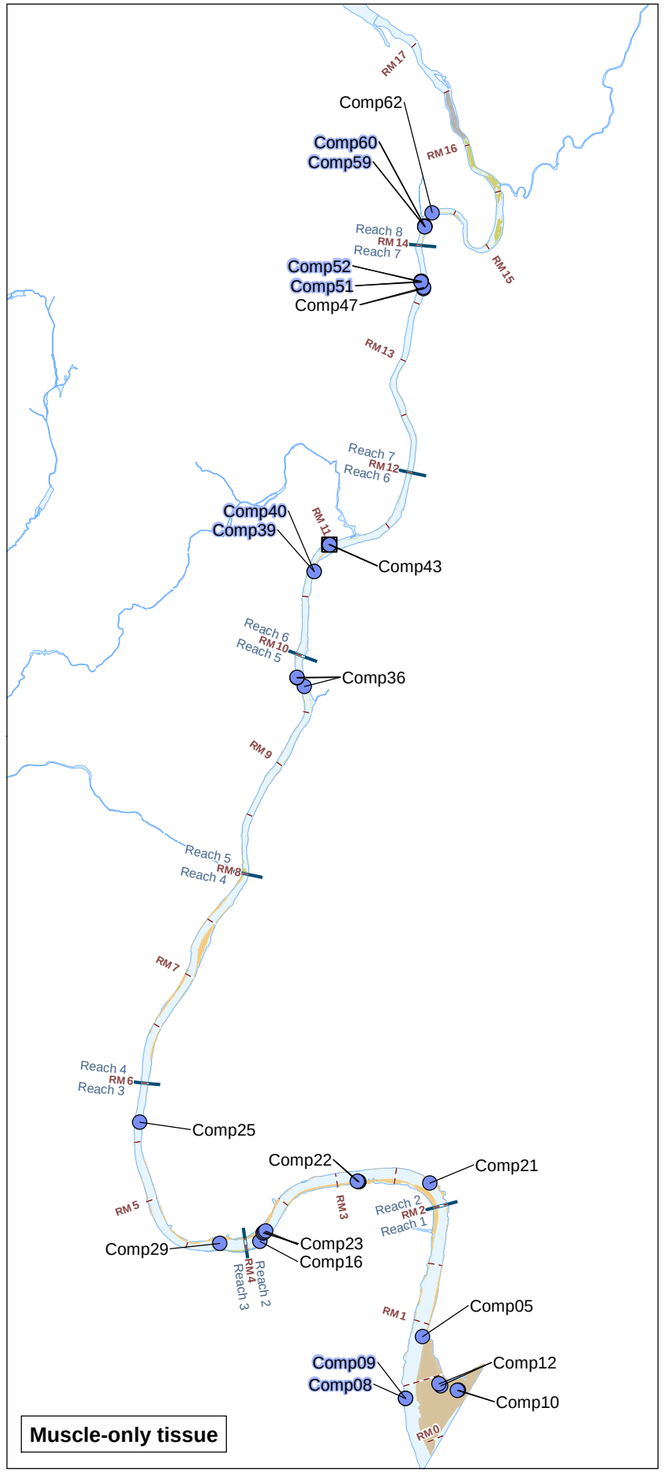

Total DDx (µg/kg) (Percentile)

- > 87 (> 90th)
- > 69 and ≤ 87 (> 75th and ≤ 90th)
- > 48 and ≤ 69 (> 50th and ≤ 75th)
- > 29 and ≤ 48 (> 25th and ≤ 50th)
- ≤ 29 (≤ 25th)
- Non-detected

The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

N

0 1 2 Miles

- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-46. Total DDx concentrations in blue crab 2009 tissue samples from the LPRSA

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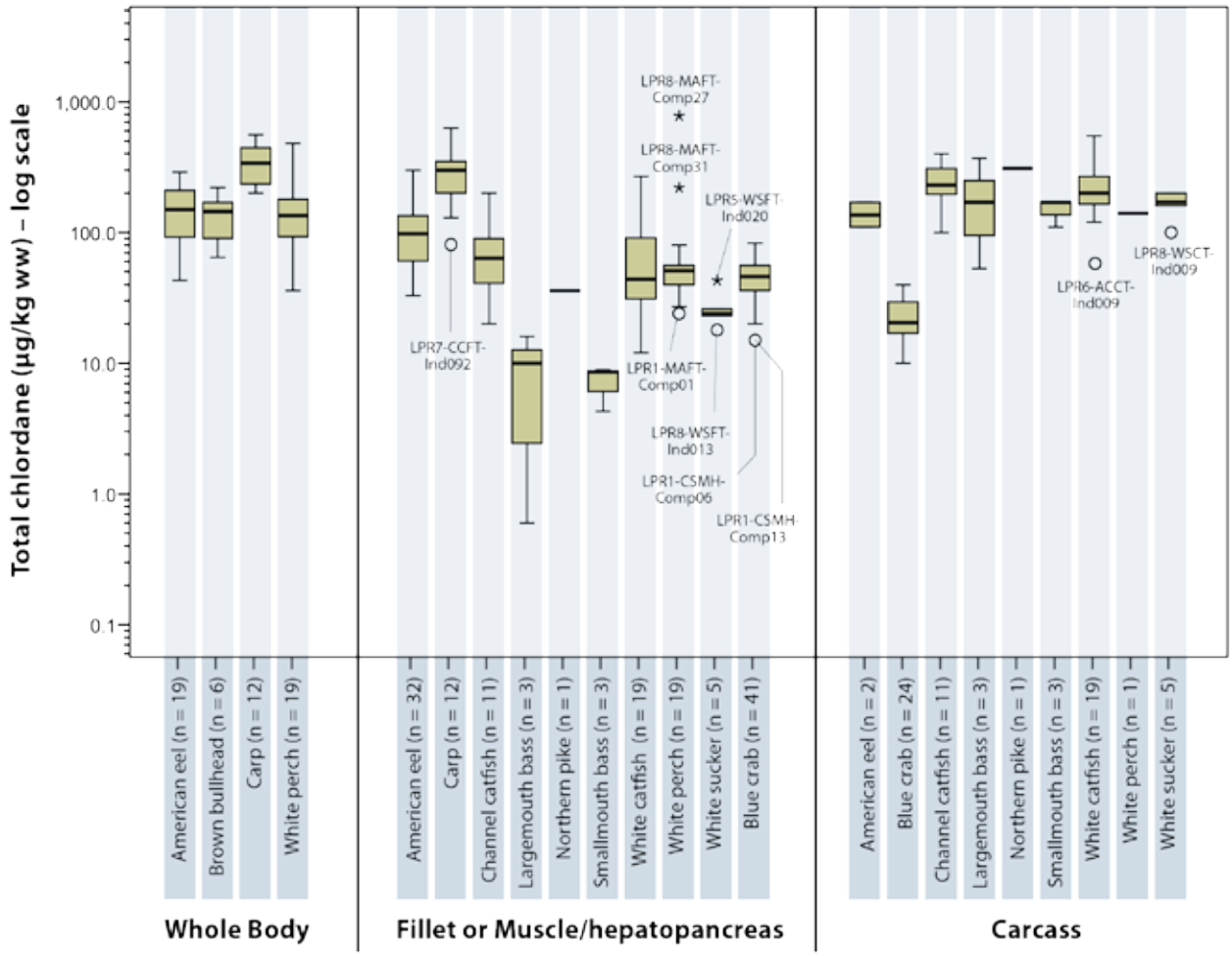
4.7.2 Total chlordane

The detection frequency for the individual total chlordane compounds (i.e., alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor) that comprise total chlordane ranged from 33 to 100% in each species group of tissue samples (Table 4-9). Total chlordane concentrations ranged from 0.6 to 780 µg/kg ww across all fish and blue crab samples. The highest total chlordane concentration (780 µg/kg ww) was measured in a white perch fillet composite sample (LPR8-MAFT-Comp27) from Reach 8. The distributions of total chlordane concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-47.[17] The following summarize total chlordane concentrations for fish and blue crab by tissue type, as shown in Figure 4-47:

- **Fish whole body** – Fish whole-body total chlordane concentrations ranged from 36 to 560 µg/kg ww. The highest whole-body total chlordane concentration (560 µg/kg ww) was measured in an individual carp whole-body sample (LPR7-CCWB-Ind069) from Reach 7.
- **Fish fillet and crab muscle/hepatopancreas** – Fish fillet total chlordane concentrations ranged from 0.6 to 780 µg/kg ww, and the highest fish fillet total chlordane concentration (780 µg/kg ww) was measured in a white perch composite sample (LPR8-MAFT-Comp27) from Reach 8. Blue crab muscle/hepatopancreas total chlordane concentrations ranged from 15 to 83 µg/kg ww, and the highest blue crab muscle/hepatopancreas total chlordane concentration (83 µg/kg ww) was measured in a composite sample (LPR6-CSMH-Comp41) from Reach 6.
- **Fish and blue crab carcass** – Fish carcass total chlordane concentrations ranged from 53 to 550 µg/kg ww, and the highest fish carcass total chlordane concentration (550 µg/kg ww) was measured in an individual white catfish carcass sample (LPR5-ACCT-Ind024) from Reach 5. Blue crab total chlordane concentrations ranged from 10 to 40 µg/kg ww, and the highest blue crab carcass total chlordane concentration (40 µg/kg ww) was measured in a composite sample (LPR4-CSCT-Comp33) from Reach 4.

[17] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

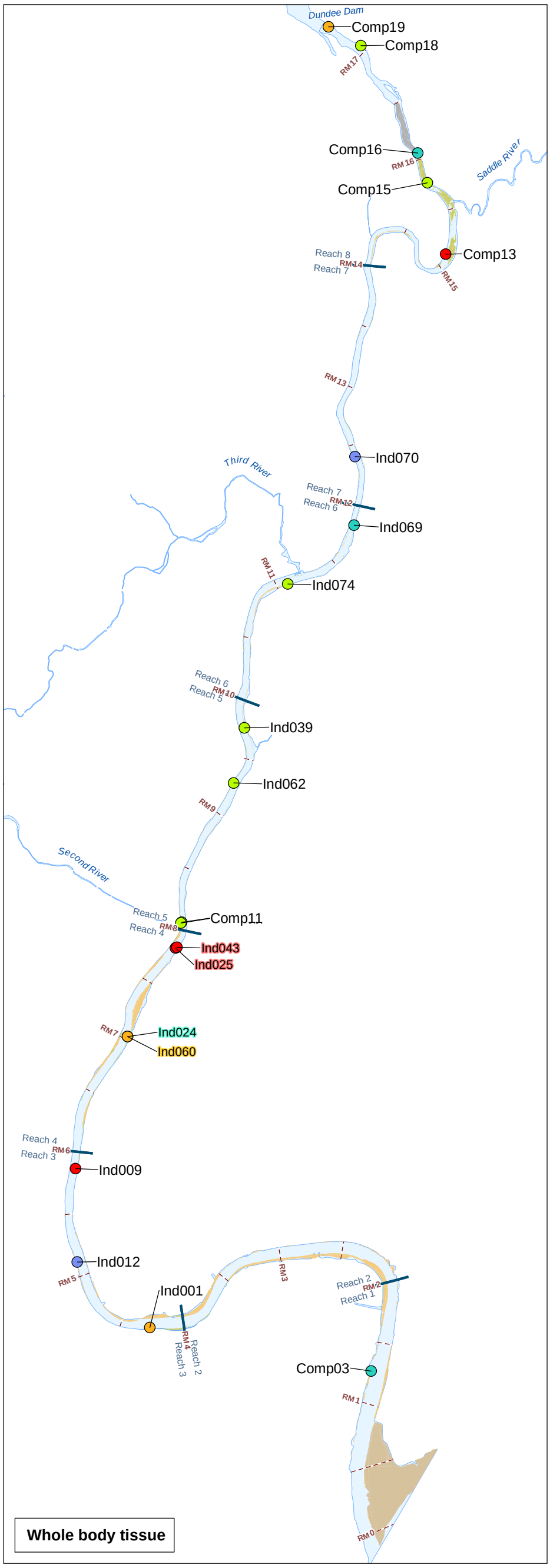


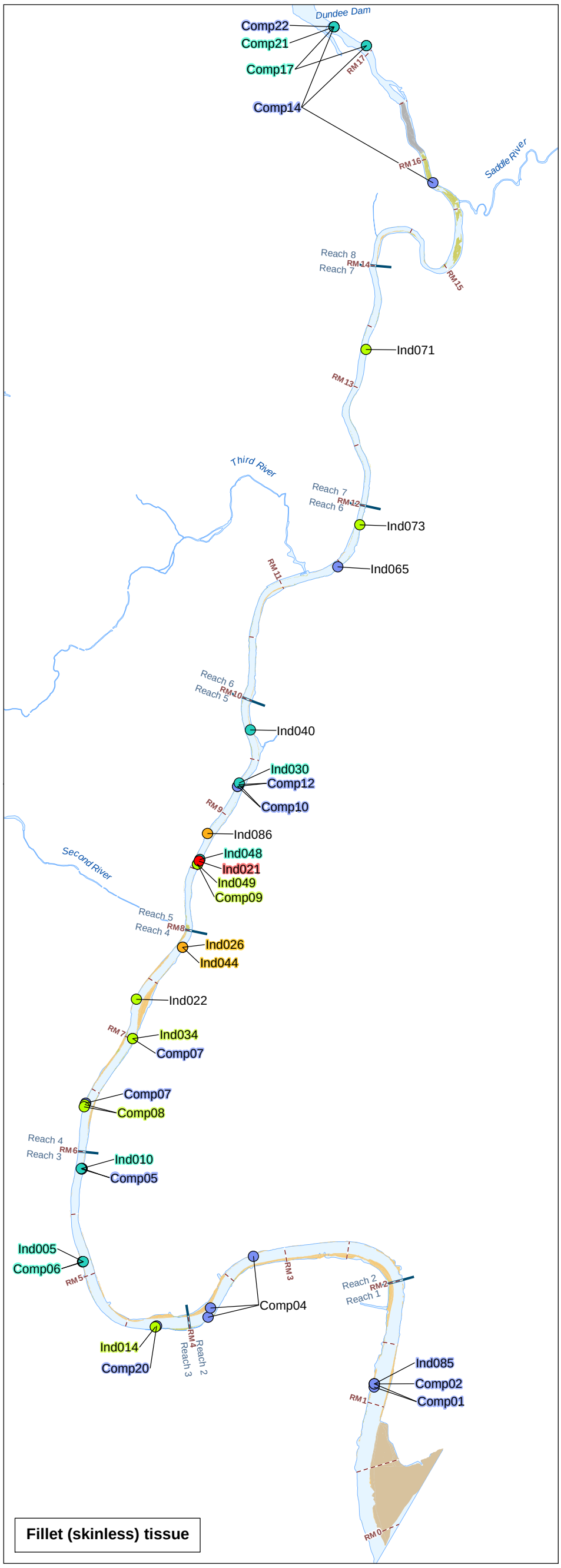
Note: Total chlordane was calculated as the sum of alpha-chlordane, gamma-chlordane, oxychlordane, cis-nonachlor, and trans-nonachlor. Non-detected results were set equal to zero when total concentration were calculated for this figure.

Figure 4-47. Total chlordane concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue total chlordane concentrations are shown by percentile range and reach in Figures 4-48 through 4-50, respectively. The highest American eel total chlordane concentration (300 µg/kg ww) was measured in an individual fillet sample (LPR5-ARFT-Ind021) from Reach 5 (Figure 4-48). The highest white perch fillet total chlordane concentration (780 µg/kg ww) was measured in a composite sample (LPR8-MAFT-Comp27) from Reach 8 (Figure 4-49). The highest blue crab total chlordane congener concentration (320 µg/kg ww) was measured in a hepatopancreas-only composite sample (LPR8-CSHT-Comp66) from Reach 8. Of the

93 blue crab samples, the 7 hepatopancres-only samples had the highest total chlordane concentrations (ranging from 170 to 320 µg/kg ww). The highest blue crab total chlordane concentration, excluding hepatopancreas-only samples (83 µg/kg ww), was measured in a muscle/hepatopancreas composite sample (LPR6-CSMH-Comp41) from Reach 6 (Figure 4-50).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Total chlordane (µg/kg)	(Percentile)
> 210	(> 90th)
> 160 and ≤ 210	(> 75th and ≤ 90th)
> 110 and ≤ 160	(> 50th and ≤ 75th)
> 72 and ≤ 110	(> 25th and ≤ 50th)
≤ 72	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-48. Total chlordane concentrations in American eel 2009 tissue samples from the LPRSA

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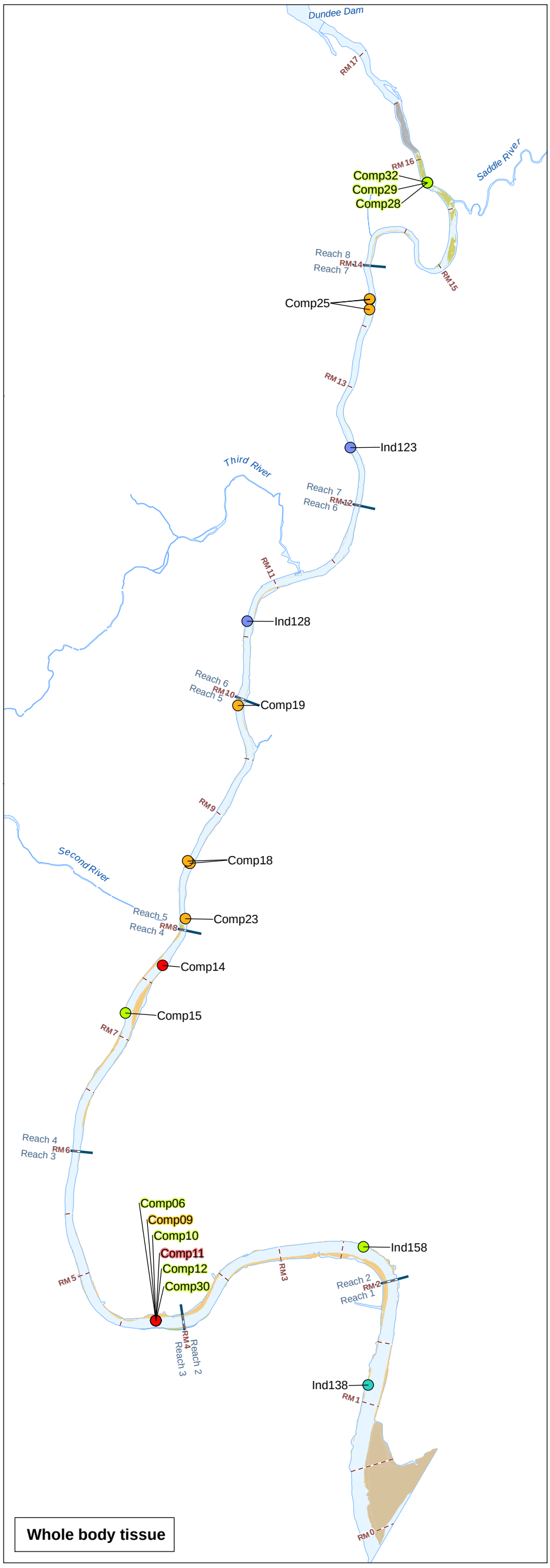

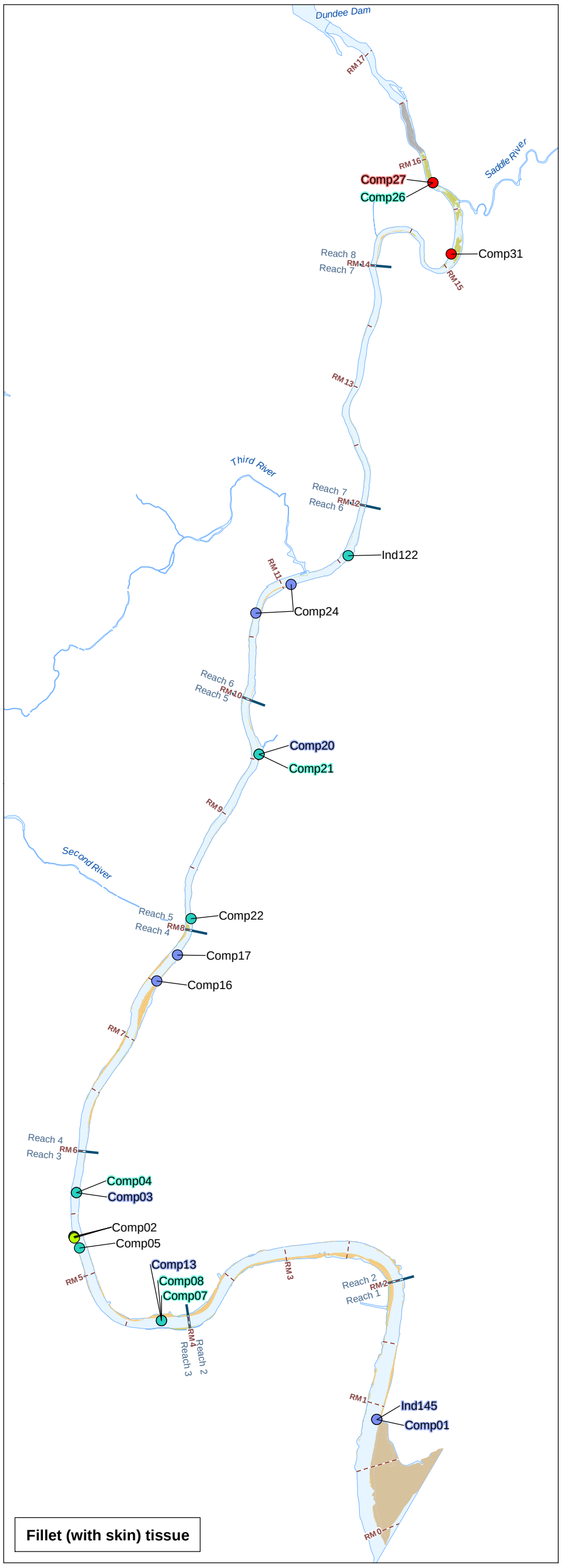

- River mile
- Sampling reach boundary
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data
- LPRSA

N

0 0.5 1 Miles

Total chlordane (µg/kg)	(Percentile)
> 200	(> 90th)
> 160 and ≤ 200	(> 75th and ≤ 90th)
> 76 and ≤ 160	(> 50th and ≤ 75th)
> 44 and ≤ 76	(> 25th and ≤ 50th)
≤ 44	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-49. Total chlordane concentrations in white perch 2009 tissue samples from the LPRSA

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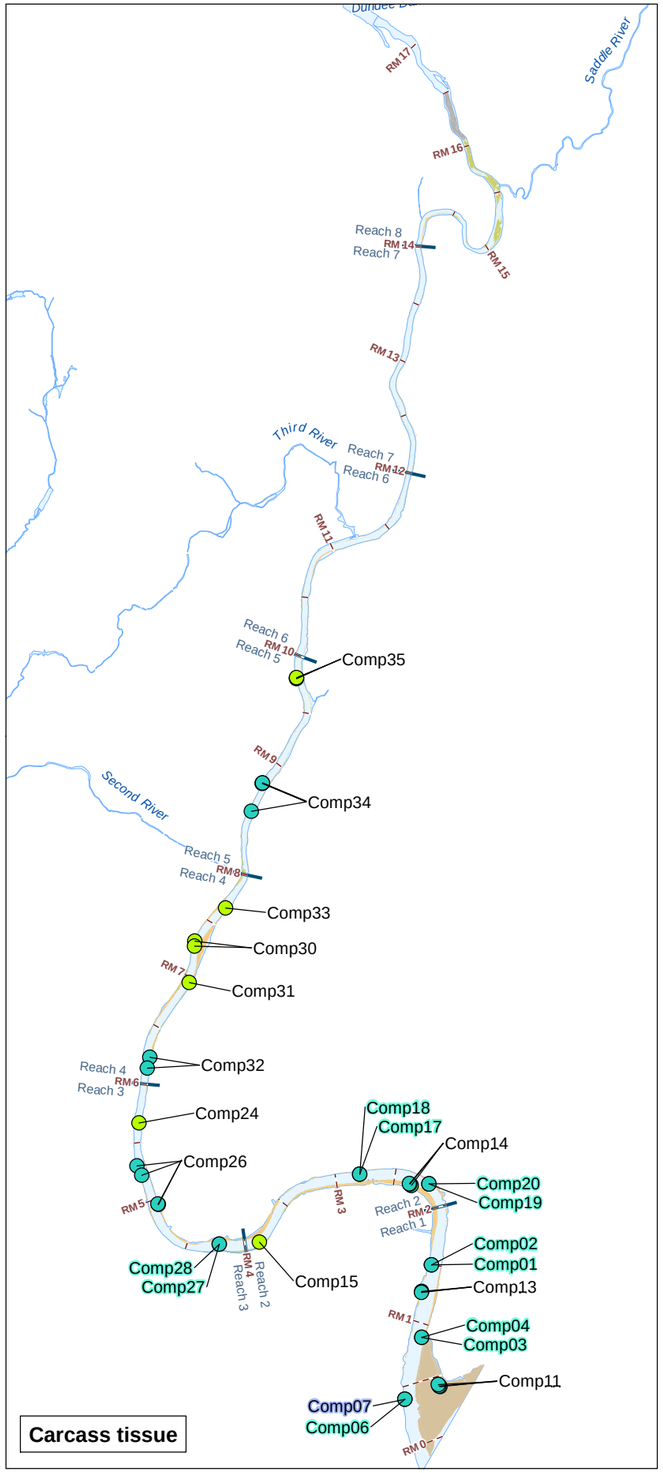

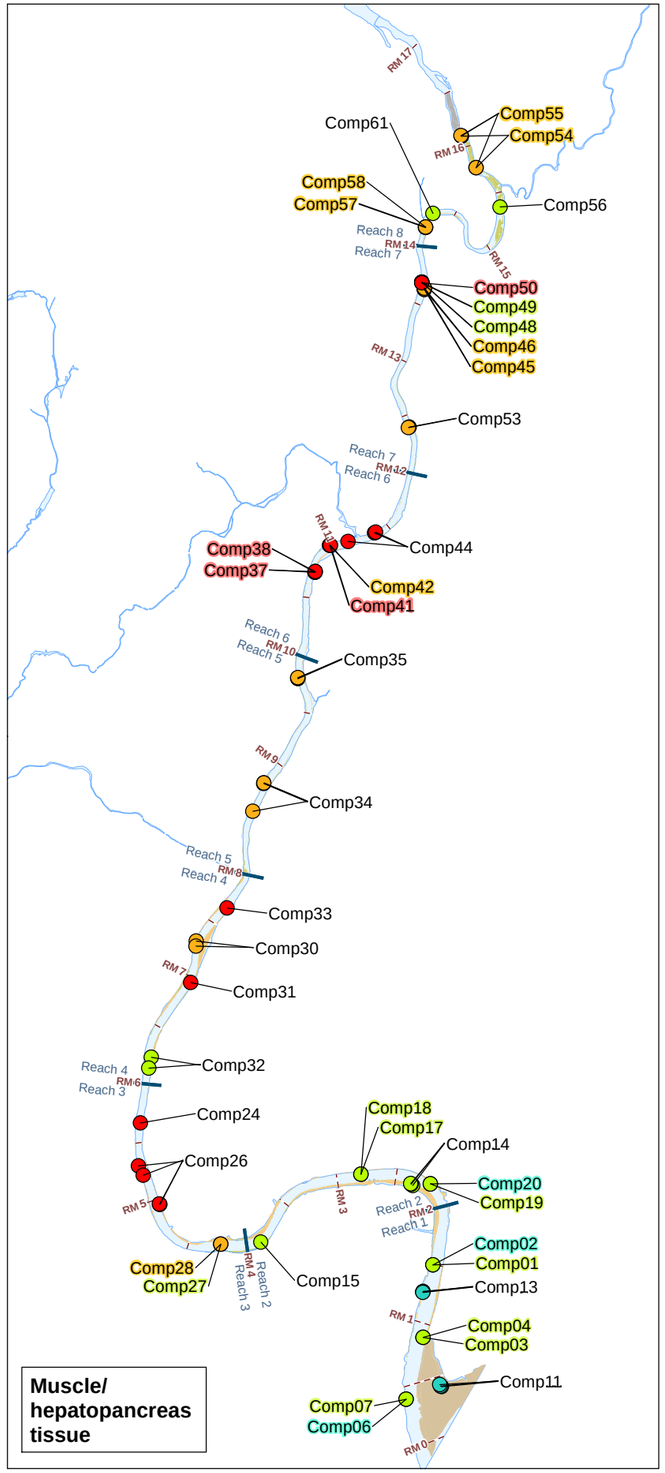

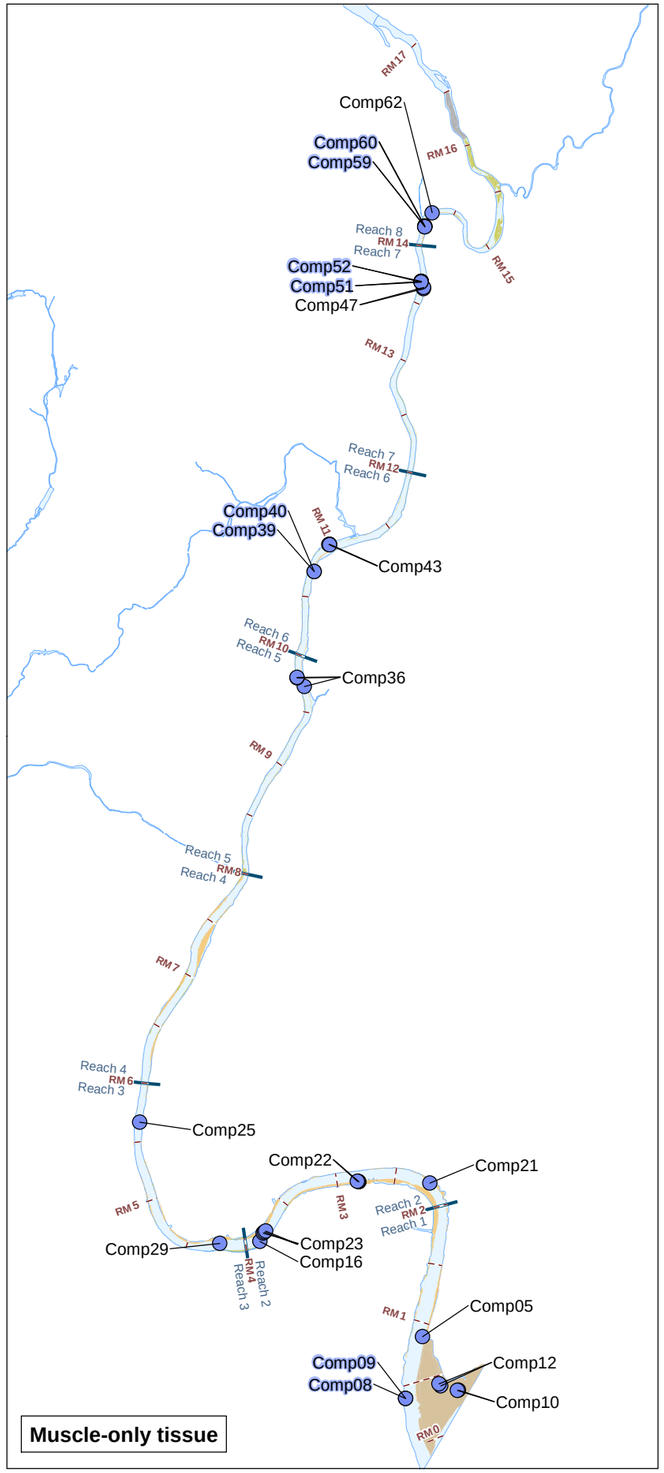

Total chlordane (µg/kg)	(Percentile)
> 57	(> 90th)
> 45 and ≤ 57	(> 75th and ≤ 90th)
> 29 and ≤ 45	(> 50th and ≤ 75th)
> 10 and ≤ 29	(> 25th and ≤ 50th)
≤ 10	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

N

0 1 2 Miles

- River mile
- LPRSA
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data

Figure 4-50. Total chlordane concentrations in blue crab 2009 tissue samples from the LPRSA

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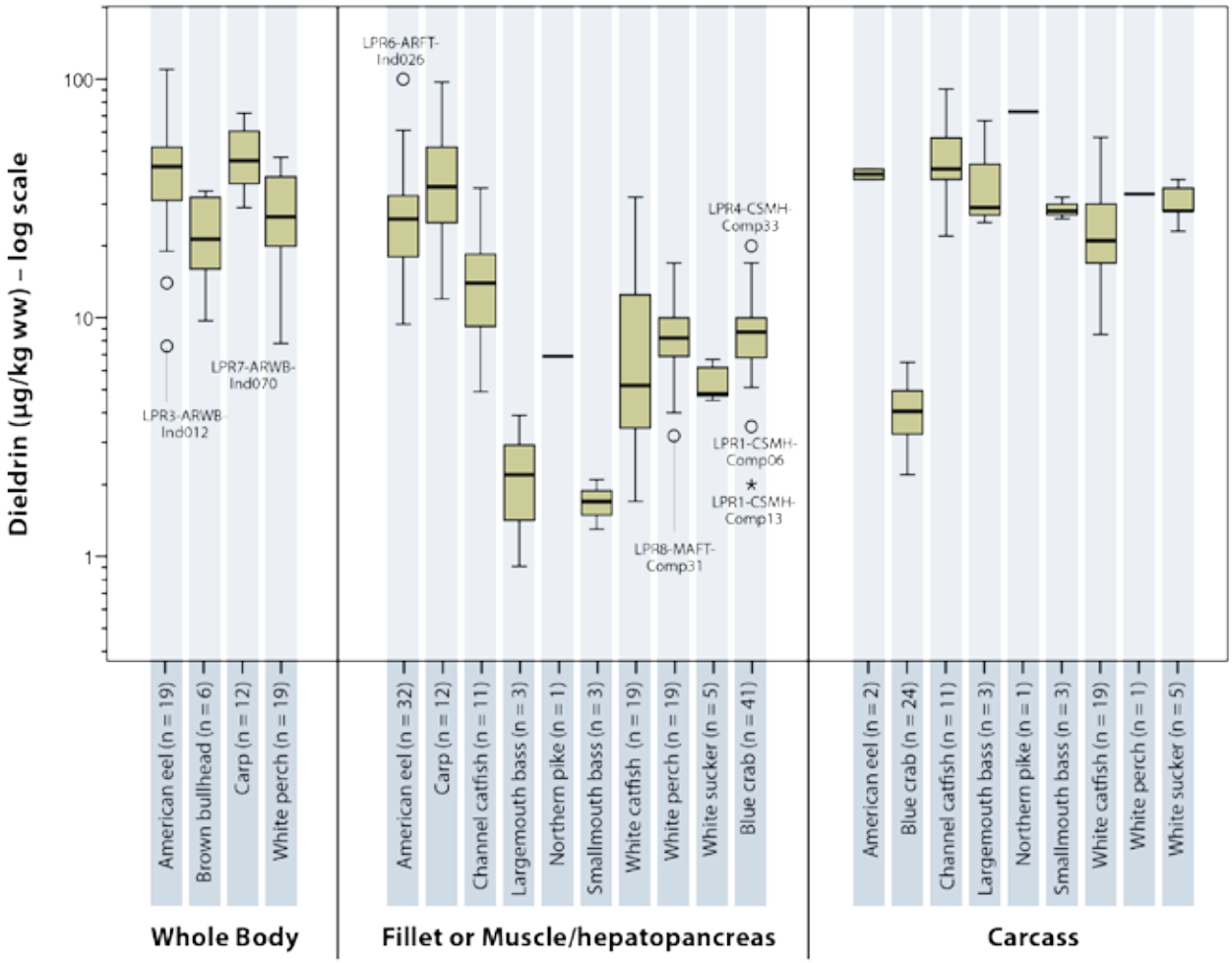
4.7.3 Dieldrin

Dieldrin was detected in 295 of 299 fish and blue crab samples analyzed (Table 4-9). Dieldrin concentrations ranged from 0.7 to 110 µg/kg ww across all fish and blue crab samples. The highest dieldrin concentration (110 µg/kg ww) was measured in an American eel whole-body composite sample (LPR8-ARWB-Comp15) from Reach 8. The distributions of dieldrin concentrations by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle/hepatopancreas and carcass) samples are shown in Figure 4-51.[18] The following summarize dieldrin concentrations for fish and blue crab by tissue type, as shown in Figure 4-51:

- **Fish whole body** – Dieldrin was detected in all fish whole-body samples. Fish whole-body dieldrin concentrations ranged from 7.6 to 110 µg/kg ww. The highest fish whole-body dieldrin concentration (110 µg/kg ww) was measured in an American eel composite sample (LPR8-ARWB-Comp15) from Reach 8.
- **Fish fillet and blue crab muscle/hepatopancreas** – Dieldrin was detected in 103 of 105 fish fillet samples and in 40 of 41 blue crab muscle/hepatopancreas samples. Fish fillet detected dieldrin concentrations ranged from 0.91 to 100 µg/kg ww, and the highest fillet concentration (100 µg/kg ww) was measured in an individual American eel fillet sample (LPR4-ARFT-Ind026) from Reach 4. Blue crab muscle/hepatopancreas detected dieldrin concentrations ranged from 2 to 17 µg/kg ww, and the highest blue crab muscle/hepatopancreas dieldrin concentration (17 µg/kg ww) was measured in a composite sample (LPR6-CSMH-Comp41) from Reach 6.
- **Fish and blue crab carcass** – Dieldrin was detected in all fish and blue crab carcass samples. Fish carcass dieldrin concentrations ranged from 8.5 to 91 µg/kg ww, and the highest fish carcass dieldrin concentration (91 µg/kg ww) was measured in an individual channel catfish carcass sample (LPR8-IPCT-Ind013) from Reach 8. Blue crab carcass dieldrin concentrations ranged from 2.2 to 6.5 µg/kg ww, and the highest blue crab carcass dieldrin concentration (6.5 µg/kg ww) was measured in a composite sample (LPR4-CSCT-Comp33) from Reach 4.

[18] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

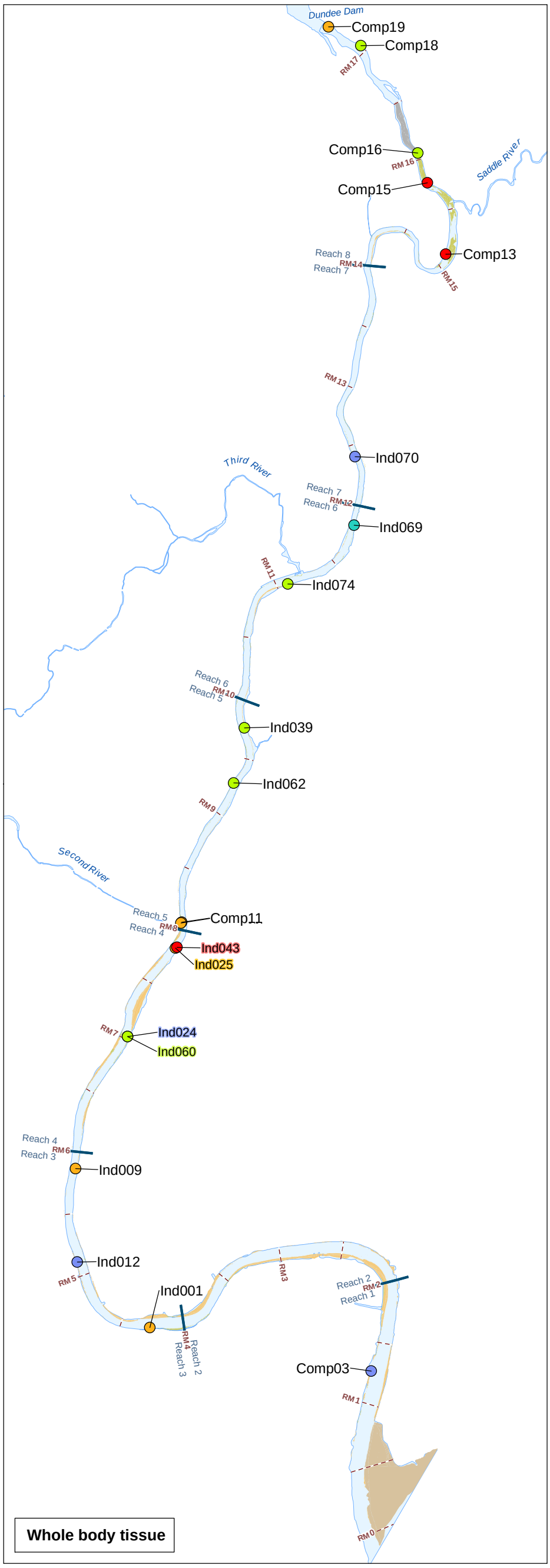


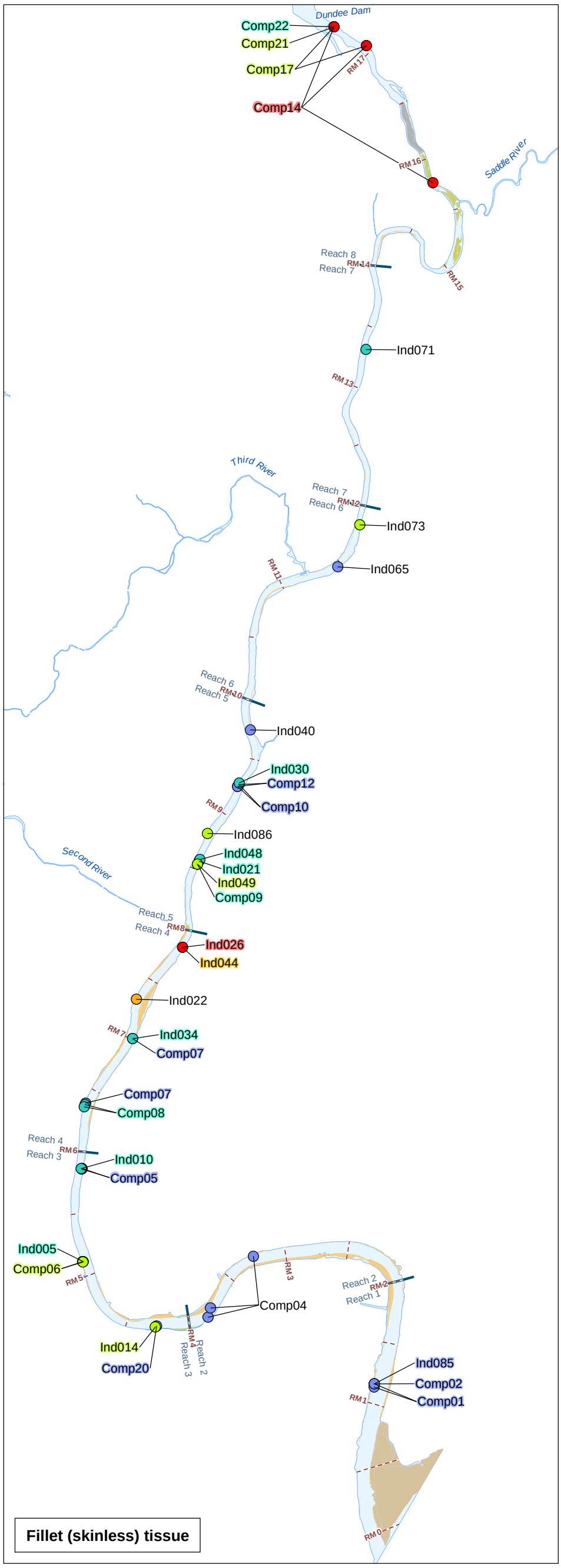
Note: The RL is displayed for non-detected concentrations.

Figure 4-51. Dieldrin concentrations in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

For those species for which data were available from all eight reaches (i.e., American eel, white perch, and blue crab), tissue concentrations are shown by percentile range and reach in Figures 4-52 through 4-54, respectively. The highest American eel dieldrin concentration (110 µg/kg ww) was measured in a whole-body composite sample (LPR8-ARWB-Comp15) from Reach 8 (Figure 4-52). The highest white perch dieldrin concentration (47 µg/kg ww) was measured in a whole-body composite sample (LPR5-MAWB-Comp19) from Reach 5 (Figure 4-53). The highest blue crab dieldrin concentration (50 µg/kg ww) was measured in a hepatopancreas-only composite sample (LPR3-CSHT-Comp64) from Reach 3. Of the 93 blue crab samples, the 7 hepatopancres-only samples had the highest dieldrin concentrations (ranging from 50 to 29 µg/kg ww). The highest blue crab dieldrin concentration, excluding

hepatopancreas-only samples (17µg/kg ww), was measured in a muscle/hepatopancreas composite sample (LPR6-CSMH-Comp41) from Reach 6 (Figure 4-54).





River mile
Sampling reach boundary
Mudflat
Kearney Point mudflat
Gravel flat
No grain size data
LPRSA

N

0 0.5 1 Miles

Dieldrin (µg/kg)	(Percentile)
> 60	(> 90th)
> 46 and ≤ 60	(> 75th and ≤ 90th)
> 31 and ≤ 46	(> 50th and ≤ 75th)
> 20 and ≤ 31	(> 25th and ≤ 50th)
≤ 20	(≤ 25th)

All samples were detected.
The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-52. Dieldrin concentrations in American eel 2009 tissue samples from the LPRSA

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Dundee Dam
RM17
RM16
Saddle River
Comp32
Comp29
Comp28
Reach 8
Reach 7
RM14
RM15
Comp25
RM13
Ind123
Third River
Reach 7
Reach 6
RM12
RM11
Ind128
Reach 6
Reach 5
RM10
Comp19
RM9
Second River
Comp18
Reach 5
Reach 4
RM8
Comp23
Comp14
Comp15
RM7
Reach 4
Reach 3
RM6
Comp06
Comp09
Comp10
Comp11
Comp12
Comp30
RM5
RM4
RM3
Reach 3
Reach 2
Reach 2
Reach 1
RM2
Ind158
Ind138
RM1
RM0

Whole body tissue

Dundee Dam
RM17
RM16
Saddle River
Comp27
Comp26
Reach 8
Reach 7
RM14
RM15
Comp31
RM13
Third River
Reach 7
Reach 6
RM12
RM11
Ind122
Comp24
Reach 6
Reach 5
RM10
Comp20
Comp21
RM9
Second River
Reach 5
Reach 4
RM8
Comp22
Comp17
Comp16
RM7
Reach 4
Reach 3
RM6
Comp04
Comp03
Comp02
Comp05
Comp13
Comp08
Comp07
RM5
RM4
RM3
Reach 3
Reach 2
Reach 2
Reach 1
RM2
Ind145
Comp01
RM1
RM0

Fillet (with skin) tissue

- River mile
- Sampling reach boundary
- Mudflat
- Kearney Point mudflat
- Gravel flat
- No grain size data
- LPRSA

N

0 0.5 1 Miles

Dieldrin (µg/kg)	(Percentile)
> 39	(> 90th)
> 27 and ≤ 39	(> 75th and ≤ 90th)
> 13 and ≤ 27	(> 50th and ≤ 75th)
> 8.1 and ≤ 13	(> 25th and ≤ 50th)
≤ 8.1	(≤ 25th)
Non-detected	

The percentile is based on the combined data from both tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

Figure 4-53. Dieldrin concentrations in white perch 2009 tissue samples from the LPRSA

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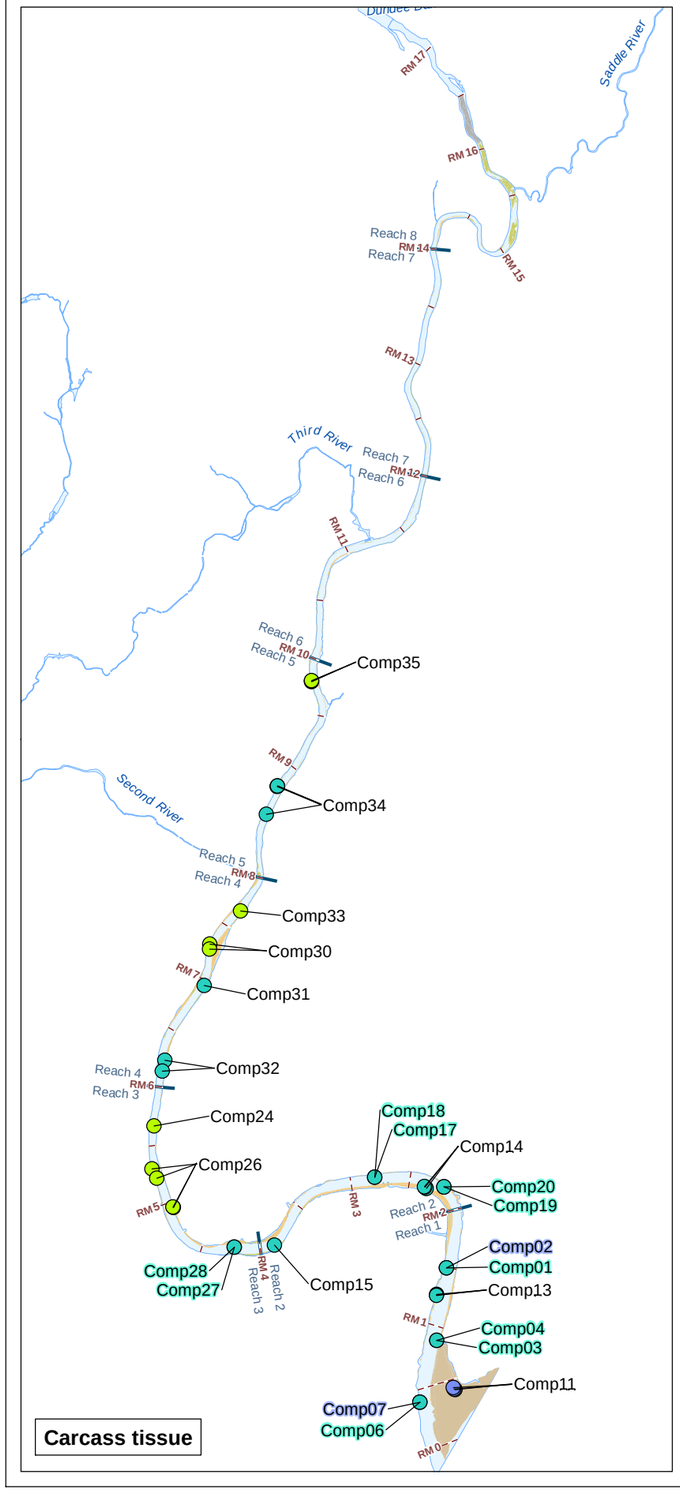

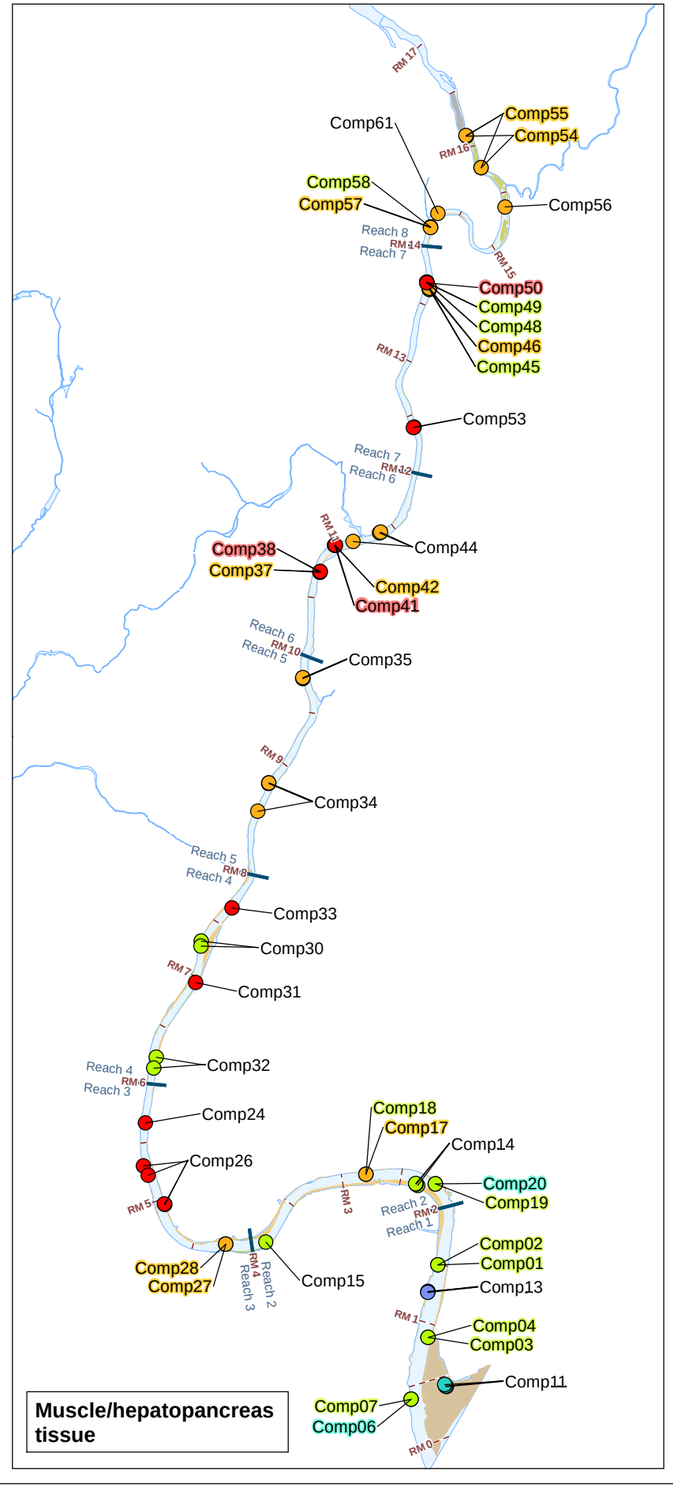

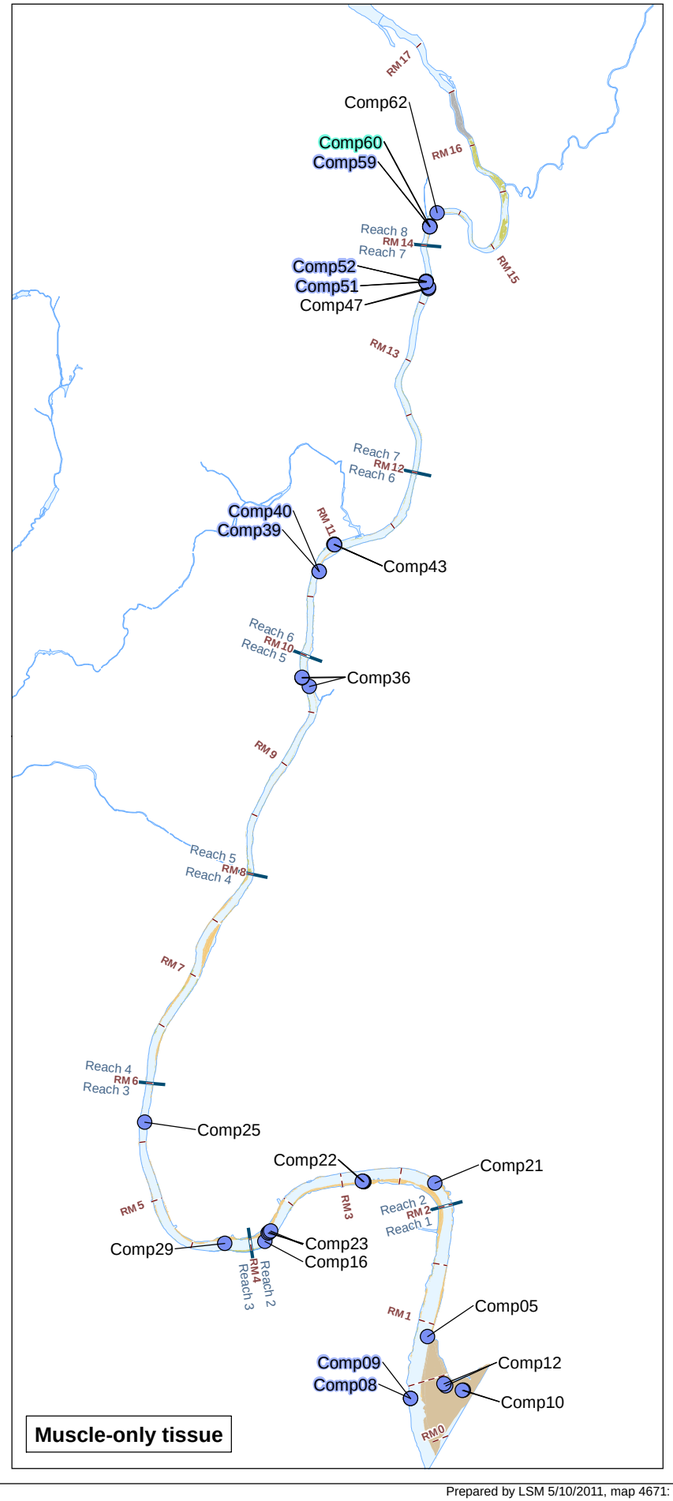

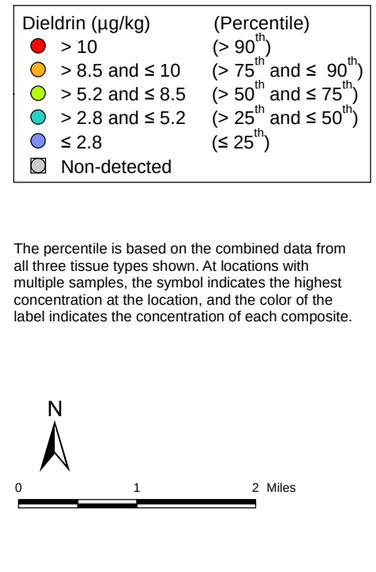

The percentile is based on the combined data from all three tissue types shown. At locations with multiple samples, the symbol indicates the highest concentration at the location, and the color of the label indicates the concentration of each composite.

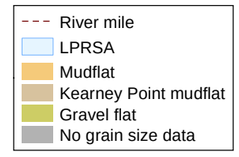

Figure 4-54. Dieldrin concentrations in blue crab 2009 tissue samples from the LPRSA

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Prepared by LSM 5/10/2011, map 4671: W:\Projects\06-58-01 Passaic RI\Data\GIS\deliverInternal\FishTissue

4.8 LIPIDS AND PERCENT MOISTURE

This section presents the percentages of lipids and moisture in all fish and blue crab samples analyzed. Table 4-10 presents a summary of the lipids and percent moisture for each tissue type. Mummichog egg lipid data are also presented in Table 4-10. Data tables that contain lipid and percent moisture results for each sample are presented in Appendix F. Appendix K presents the results of fish and blue crab length and weight relationships.

Table 4-10. Summary of lipid and percent moisture results for fish and blue crab tissue samples

Analyte	Tissue Type	Detection Frequency		Detected Results[a]				RL or Range of RLs[b]
		Ratio	%	Min	Max	Mean	St Dev	
Lipids (%)								
Brown bullhead	whole body	6/6	100	2.2	18	6.2	6.0	na
Carp	fillet (with skin)	12/12	100	2.7	7.1	4.0	1.3	na
	whole body	12/12	100	2.8	8.1	5.4	1.6	na
Channel catfish	carcass	11/11	100	5.7 J	13 J	9.7	2.2	na
	fillet (skinless)	11/11	100	0.73	5.2	2.5	1.6	na
White catfish	carcass	19/19	100	2.0	9.1	5.5	2.2	na
	fillet (skinless)	19/19	100	0.53	3.4	1.8	0.90	na
White sucker	carcass	5/5	100	4.3 J	7.2 J	5.7	1.2	na
	fillet (with skin)	5/5	100	0.96	1.6	1.4	0.25	na
Blue crab	carcass	24/24	100	0.44	1.2	0.77	0.19	na
	hepatopancreas only	7/7	100	5.5	10	7.1	1.5	na
	muscle only	21/21	100	0.25	0.78	0.50	0.12	na
	muscle/hepatopancreas	41/41	100	0.78	3.7	1.7	0.57	na
White perch	carcass	1/1	100	9.4	9.4	na	na	na
	fillet (with skin)	19/19	100	1.0	3.4	2.0	0.69	na
	whole body	19/19	100	1.3	9	4.4	1.7	na
American eel	carcass	2/2	100	5.2	11	8.1	4.1	na
	fillet (skinless)	32/32	100	1.5	7.8	3.9	1.3	na
	whole body	19/19	100	2.5	12	6.5	2.6	na
Largemouth bass	carcass	3/3	100	3.1	4.1	3.7	0.51	na
	fillet (with skin)	3/3	100	0.60	0.83	0.74	0.13	na
Northern pike	carcass	1/1	100	6.9	6.9	na	na	na
	fillet (with skin)	1/1	100	1.2	1.2	na	na	na
Smallmouth bass	carcass	3/3	100	3.0	3.6	3.3	0.31	na
	fillet (with skin)	3/3	100	0.75	0.85	0.79	0.051	na
Mummichog[c]	egg tissue	10/10	100	2.7	3.7	3.1	0.29	na

Table 4-10. Summary of lipid and percent moisture results for fish and blue crab tissue samples

Analyte	Tissue Type	Detection Frequency		Detected Results[a]				RL or Range of RLs[b]
		Ratio	%	Min	Max	Mean	St Dev	
Percent moisture (%)								
Brown bullhead	whole body	6/6	100	69.6	76.0	73.2	2.71	na
Carp	fillet (with skin)	12/12	100	54.1	78.2	70.1	6.31	na
	whole body	12/12	100	58.4	71.0	65.9	3.93	na
Channel catfish	carcass	11/11	100	64.2	73.4	68.9	3.41	na
	fillet (skinless)	11/11	100	75.9	81.6	79.7	1.73	na
White catfish	carcass	19/19	100	64.1	80.6	72.5	3.95	na
	fillet (skinless)	19/19	100	78.0	85.2	81.2	1.84	na
White sucker	carcass	5/5	100	70.5	74.2	72.8	1.50	na
	fillet (with skin)	5/5	100	78.6	83.5	80.2	1.92	na
Blue crab	carcass	24/24	100	72.3	81.2	77.1	2.47	na
	hepatopancreas only	7/7	100	76.2	84.1	78.5	3.17	na
	muscle only	21/21	100	78.8	86.4	82.2	2.12	na
	muscle/hepatopancreas	41/41	100	75.2	85.8	81.2	2.34	na
White perch	carcass	1/1	100	59.9	59.9	na	na	na
	fillet (with skin)	19/19	100	73.0	79.8	76.8	1.62	na
	whole body	19/19	100	67.7	73.7	70.8	1.69	na
American eel	carcass	2/2	100	64.9	68.8	66.9	2.76	na
	fillet (skinless)	32/32	100	70.2	78.7	74.3	2.45	na
	whole body	19/19	100	64.9	76.8	69.5	3.35	na
Largemouth bass	carcass	3/3	100	69.6	73.3	71.7	1.90	na
	fillet (with skin)	3/3	100	78.7	79.2	79.0	0.252	na
Northern pike	carcass	1/1	100	68.6	68.6	na	na	na
	fillet (with skin)	1/1	100	76.8	76.8	na	na	na
Smallmouth bass	carcass	3/3	100	71.4	72.4	71.8	0.529	na
	fillet (with skin)	3/3	100	77.5	79.2	78.5	0.874	na

[a] Summary statistics (i.e., minimum, maximum, and mean concentrations and the standard deviations) include data only for detected results. Non-detected data are not included in summary statistics.

[b] RL or range of RLs for non-detect samples. When the detection frequency is 100% (i.e., no non-detect samples), the RL is not applicable.

[c] Mummichog egg tissue was analyzed only for lipids (percent moisture data not measured).

J – estimated concentration
Max – maximum
Min – minimum
na – not applicable
St Dev – standard deviation
ww – wet weight

The percent moisture ranged from 54.1 to 86.4% across all fish and crab samples analyzed (Table 4-10). The highest percent moisture was measured in a muscle-only crab composite sample (LPR8-CSMT-Comp6) from Reach 8. The percent lipids ranged from 0.25 to 18% across all fish and blue crab samples analyzed (Table 4-10). The highest percent lipids was measured in an individual whole-body brown bullhead sample (LPR3-ANWB-Ind001) from Reach 3. The distribution of percent lipids by tissue type for fish (i.e., whole-body, fillet, and carcass) samples and for blue crab (i.e., muscle / hepatopancreas and carcass) samples are shown in Figure 4-55.[19] The following summarize percent lipids for fish and blue crab by tissue type, as shown in Figure 4-55:

- **Fish whole body** – Fish whole-body percent lipids ranged from 1.3 to 18%. The highest percent lipids (18%) was measured in an individual brown bullhead whole-body sample (LPR3-ANWB-Ind001) from Reach 3.
- **Fish fillet and blue crab muscle/hepatopancreas** – Fish fillet percent lipids ranged from 0.53 to 7.8%, and the highest percent lipids (7.8%) was measured in an American eel fillet composite sample (LPR3-ARFT-Comp06) from Reach 3. Blue crab muscle / hepatopancreas percent lipids ranged from 0.78 to 3.7%, and the highest blue crab muscle / hepatopancreas percent lipids (3.7%) was measured in a composite sample (LPR6-CSMH-Comp41) from Reach 6.
- **Fish and blue crab carcass** – Fish carcass percent lipids ranged from 2 to 13%, and the highest percent lipids (13%) was measured in an individual channel catfish carcass sample (LPR5-IPCT-Ind001) from Reach 5. Blue crab carcass percent lipids ranged from 0.44 to 1.2%, and the highest blue crab carcass percent lipids (1.2%) was measured in a composite sample (LPR2-CSCT-Comp14) from Reach 2.

[19] Log scale was used on the y-axis of the figure to more clearly show the distribution of the data (data were not log-transformed, and untransformed concentrations are shown on the y-axis). Because there was a wide concentration range, the use of a linear scale in the figure resulted in clustering of the data, making it more difficult to see the distribution of the data.

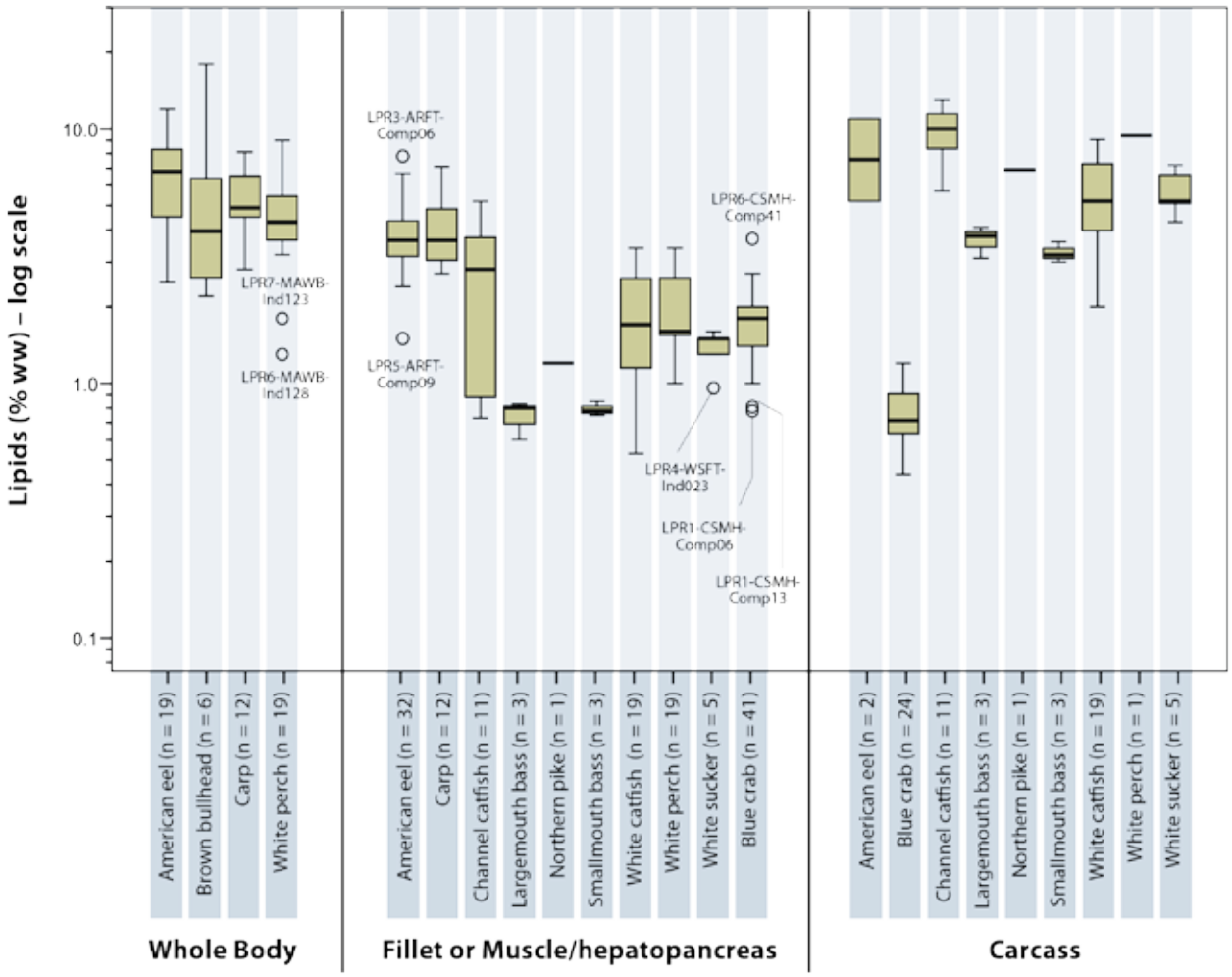

Figure 4-55. Lipid percent in fish whole-body, fillet, and carcass samples and in blue crab muscle/hepatopancreas and carcass samples collected from the LPRSA

5 Data Validation

Independent data validation of all results was conducted by Laboratory Data Consultants and Trillium, Inc., according to the Fish / Decapod QAPP (Windward 2009a), USEPA Region 2 SOPs described in the QAPP, and USEPA national functional guidelines (USEPA 2004, 2005, 2008). The following subsections summarize the results of the validation but do not list every sample affected by a qualification. Detailed information regarding all qualified samples can be found in the data validation reports provided in Appendix I. Table 5-1 provides a summary of the number of samples in each SDG and the level of data validation. All data generated by the PAH (CARB 429 Mod), PCB congener (USEPA 1668B), PCDD / PCDF (USEPA 1613B), and organochlorine pesticide (USEPA 1699 Mod) analyses, which all used high-resolution gas chromatography / high-resolution mass spectrometry instruments, underwent full data validation. For all other chemical groups, at least 20% of the data received full-level validation and up to 80% received summary-level validation. Both summary and full data validation included a review of all quality control summary forms, including initial calibration, continuing calibration verification, internal standard, surrogate, laboratory control sample (LCS), LCS duplicate (LCSD), matrix spike / matrix spike duplicate (MS / MSD), certified reference material (CRM), and interference check sample summary forms. Full validation also included the re-calculation of results.

Table 5-1. Data validation performed for each SDG

SDG	Validation Level	Validator	Sample Type	No. of Samples	Analyses
Alpha Analytical					
L1003087	summary	LDC/Trillium	blue crab tissue	41	PCB Aroclors/alkylated PAHs, percent moisture, SVOCs
		LDC/Trillium	rinsate blank	2	PCB Aroclors/alkylated PAHs, SVOCs
L1003161	full	LDC/Trillium	blue crab tissue	24	PCB Aroclors/alkylated PAHs, percent moisture, SVOCs
L1003164	summary	LDC/Trillium	blue crab tissue	21	PCB Aroclors/alkylated PAHs, percent moisture, SVOCs
L1004936	summary	LDC/Trillium	blue crab tissue	7	PCB Aroclors/alkylated PAHs, percent moisture, SVOCs
L1007319	summary	LDC	fish tissue	35	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
L1007320	summary	LDC	fish tissue	35	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
L1007321	summary	LDC	fish tissue	14	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
			rinsate blank	1	PCB Aroclors, alkylated PAHs, SVOCs

Table 5-1. Data validation performed for each SDG

SDG	Validation Level	Validator	Sample Type	No. of Samples	Analyses
L1007344	full	LDC	fish tissue	18	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
			rinsate blank	1	PCB Aroclors, alkylated PAHs, SVOCs
L1007346	summary	LDC	fish tissue	12	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
			rinsate blank	1	PCB Aroclors, alkylated PAHs, SVOCs
L1009354	full	LDC	fish tissue	20	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
			rinsate blank	1	PCB Aroclors, alkylated PAHs, SVOCs
L1009360	summary	LDC	fish tissue	19	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
L1009361	summary	LDC	fish tissue	32	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
			rinsate blank	1	PCB Aroclors, alkylated PAHs, SVOCs
L1009363	summary	LDC	fish tissue	21	PCB Aroclors, alkylated PAHs, percent moisture, SVOCs
Analytical Perspectives					
P2102	full	LDC	blue crab tissue	11	PCB congeners, PCDDs/PCDFs
P2103	full	LDC	blue crab tissue	10	PCB congeners, PCDDs/PCDFs
P2133	full	LDC	blue crab tissue	10	PCB congeners, PCDDs/PCDFs
P2134	full	LDC	blue crab tissue	14	PCB congeners, PCDDs/PCDFs
P2135	full	LDC	blue crab tissue	10	PCB congeners, PCDDs/PCDFs
P2140	full	LDC	blue crab tissue	10	PCB congeners, PCDDs/PCDFs
P2159	full	LDC	blue crab tissue	7	PCB congeners, PCDDs/PCDFs
P2160	full	LDC	blue crab tissue	10	PCB congeners, PCDDs/PCDFs
P2161	full	LDC	blue crab tissue	11	PCB congeners, PCDDs/PCDFs
P2333	full	LDC	fish tissue	7	PCB congeners, PCDDs/PCDFs
P2351	full	LDC	fish tissue	7	PCB congeners, PCDDs/PCDFs
P2352	full	LDC	fish tissue	12	PCB congeners, PCDDs/PCDFs
P2353	full	LDC	fish tissue	6	PCB congeners, PCDDs/PCDFs
P2354	full	LDC	fish tissue	12	PCB congeners, PCDDs/PCDFs

Table 5-1. Data validation performed for each SDG

SDG	Validation Level	Validator	Sample Type	No. of Samples	Analyses
P2413	full	LDC	fish tissue	10	PCB congeners, PCDDs/PCDFs
P2414	full	LDC	fish tissue	11	PCB congeners, PCDDs/PCDFs
P2415	full	LDC	fish tissue	11	PCB congeners, PCDDs/PCDFs
P2416	full	LDC	fish tissue	12	PCB congeners, PCDDs/PCDFs
P2418	full	LDC	fish tissue	12	PCB congeners, PCDDs/PCDFs
P2419	full	LDC	fish tissue	7	PCB congeners, PCDDs/PCDFs
P2420	full	LDC	fish tissue	7	PCB congeners, PCDDs/PCDFs
P2426	full	LDC	fish tissue	10	PCB congeners, PCDDs/PCDFs
P2427	full	LDC	fish tissue	9	PCB congeners, PCDDs/PCDFs
P2428	full	LDC	fish tissue	10	PCB congeners, PCDDs/PCDFs
P2429	full	LDC	fish tissue	10	PCB congeners, PCDDs/PCDFs
P2447	full	LDC	fish tissue	12	PCB congeners, PCDDs/PCDFs
P2448	full	LDC	fish tissue	11	PCB congeners, PCDDs/PCDFs
P2449	full	LDC	fish tissue	9	PCB congeners, PCDDs/PCDFs
P2450	full	LDC	fish tissue	9	PCB congeners, PCDDs/PCDFs
P2451	full	LDC	fish tissue	12	PCB congeners, PCDDs/PCDFs
P2463	full	LDC	rinsate blank	7	PCB congeners, PCDDs/PCDFs
Brooks Rand Labs					
1013010	summary	Trillium	blue crab tissue	21	inorganic arsenic, methyl mercury, total mercury
			rinsate blank	1	
1015017	summary	Trillium	blue crab tissue	44	inorganic arsenic, methyl mercury, total mercury
1016012	full	Trillium	blue crab tissue	28	inorganic arsenic, methyl mercury, total mercury
			rinsate blank	1	
1024008	summary	LDC	fish tissue	14	inorganic arsenic, methyl mercury, total mercury
			rinsate blank	1	
1025019	summary	LDC	fish tissue	30	inorganic arsenic, methyl mercury, total mercury
			rinsate blank	1	
1027013	full	LDC	rinsate blank	1	inorganic arsenic, methyl mercury, total mercury
1028015	summary	LDC	fish tissue	35	inorganic arsenic, methyl mercury, total mercury
1028033	full	LDC	fish tissue	35	inorganic arsenic, methyl mercury, total mercury

Table 5-1. Data validation performed for each SDG

SDG	Validation Level	Validator	Sample Type	No. of Samples	Analyses
1029028	summary	LDC	fish tissue	19	inorganic arsenic, methyl mercury, total mercury
			rinsate blank	1	
1029029	summary	LDC	fish tissue	20	inorganic arsenic, methyl mercury, total mercury
1030013	summary	LDC	fish tissue	53	inorganic arsenic, methyl mercury, total mercury
			rinsate blank	1	
Columbia Analytical Services, Kelso					
K1002762	summary	Trillium	blue crab tissue	21	butyltins, lipids, metals
K1002794	summary	Trillium/LDC	rinsate blank	2	butyltins /metals
K1003357	full	Trillium	blue crab tissue	24	butyltins, lipids, metals
K1003359	summary	Trillium	blue crab tissue	20	butyltins, lipids, metals
K1003611	summary	Trillium	blue crab tissue	7	butyltins, lipids, metals
K1003612	summary	Trillium	blue crab tissue	21	butyltins, lipids, metals
K1005940	summary	Trillium/LDC	rinsate blank	1	butyltins/metals
K1006037	summary	LDC	fish tissue	14	butyltins, lipids, metals
K1006040	summary	Trillium	egg tissue	10	lipids
K1006240	summary	LDC	fish tissue	18	butyltins, lipids, metals
			rinsate blank	1	butyltins, metals
K1006286	summary	LDC	fish tissue	12	butyltins, lipids, metals
K1006741	full	LDC	rinsate blank	1	butyltins, metals
K1007100	summary	LDC	fish tissue	20	butyltins, lipids, metals
K1007102	summary	LDC	fish tissue	15	butyltins, lipids, metals
K1007103	summary	LDC	fish tissue	20	butyltins, lipids, metals
K1007105	summary	LDC	fish tissue	15	butyltins, lipids, metals
K1007273	summary	LDC	fish tissue	19	butyltins, lipids, metals
			rinsate blank	1	butyltins, metals
K1007274	full	LDC	fish tissue	20	butyltins, lipids, metals
K1007457	summary	LDC	fish tissue	19	butyltins, lipids, metals
			rinsate blank	1	butyltins, metals
K1007620	full	LDC	fish tissue	20	butyltins, lipids, metals
K1007621	summary	LDC	fish tissue	14	butyltins, lipids, metals

Table 5-1. Data validation performed for each SDG

SDG	Validation Level	Validator	Sample Type	No. of Samples	Analyses
Maxxam Analytics					
B036065	full	LDC	blue crab tissue	21	organochlorine pesticides, PAHs
			rinsate blank	1	
B044239	full	LDC	blue crab tissue	7	organochlorine pesticides, PAHs
			rinsate blank	1	
B044251	full	LDC	blue crab tissue	20	organochlorine pesticides, PAHs
B044269	full	LDC	blue crab tissue	21	organochlorine pesticides, PAHs
B044293	full	LDC	blue crab tissue	24	organochlorine pesticides, PAHs
B075209	full	LDC	fish tissue	14	organochlorine pesticides, PAHs
			rinsate blank	1	
B078200	full	LDC	fish tissue	12	organochlorine pesticides, PAHs
B078232	full	LDC	fish tissue	18	organochlorine pesticides, PAHs
			rinsate blank	1	
B085396	full	LDC	rinsate blank	1	organochlorine pesticides, PAHs
B090038	full	LDC	fish tissue	29	organochlorine pesticides, PAHs
B090084	full	LDC	fish tissue	26	organochlorine pesticides, PAHs
B093245	full	LDC	fish tissue	18	organochlorine pesticides, PAHs
B093261	full	LDC	fish tissue	17	organochlorine pesticides, PAHs
			rinsate blank	1	
B096590	full	LDC	fish tissue	31	organochlorine pesticides, PAHs
B096602	full	LDC	fish tissue	21	organochlorine pesticides, PAHs
			rinsate blank	1	
B0F1597	full	LDC	fish tissue	1	organochlorine pesticides, PAHs
B0F1671	full	LDC	fish tissue	15	organochlorine pesticides, PAHs
B0F1717	full	LDC	fish tissue	4	organochlorine pesticides, PAHs

LDC – Laboratory Data Consultants
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
PCDD – polychlorinated dibenzo-*p*-dioxin
PCDF – polychlorinated dibenzofuran
SDG – sample delivery group
SVOC – semivolatile organic compound

5.1 OVERALL DATA QUALITY

The data were considered acceptable for use in the RI/FS process, as qualified. Out of the 299 samples analyzed, 20 tissue samples had rejected lead, barium, and cobalt results; and 129 tissue samples had at least one rejected SVOC result (affected analytes

were 2,4-dinitrophenol, benzaldehyde, hexachlorocyclopentadiene, pentachlorophenol, or 4,6-dinitro-2-methylphenol). Eight samples had endrin ketone results that were rejected, and five samples had endosulfan II and methoxychlor results that were rejected. Issues that resulted in the qualification of data are summarized below by analyte group.

5.2 METALS

5.2.1 Mercury and methyl mercury

All total mercury and methyl mercury data were considered acceptable for use in the RI/FS process, as qualified. The majority of the mercury and methyl mercury data were not qualified. Methyl mercury results for 8% of the samples were qualified as estimated (J- or UJ-qualified) because the associated MS had high recoveries.

5.2.2 Total metals

Lead, barium, and cobalt results for 20 samples were rejected because of a laboratory duplicate pair with poor precision. All other metals data were considered acceptable for use in the RI/FS process, as qualified. The two major issues associated with the qualification of metals results were low MS recoveries and the fact that the inductively coupled plasma interference sample had results that exceeded the control limit (Table 5-2).

Table 5-2. Summary of metals validation results

Chemical	Reason for Qualification	Qualification	Percentage of Samples Qualified
Antimony	low MS recovery	J/UJ	67%
Barium	poor precision with lab duplicate	R	7%
	ICP interference	J/UJ	41%
Cadmium	ICP interference	J/UJ	51%
Cobalt	poor precision with lab duplicate	R	7%
	ICP interference	J/UJ	67%
Copper	ICP interference	J/UJ	74%
Lead	poor precision with lab duplicate	R	7%
	ICP interference	J/UJ	67%
Nickel	ICP interference	J/UJ	74%
Titanium	low MS recovery	J/UJ	85%
Thallium	low MS recovery	J/UJ	40%
Zinc	ICP interference	J/UJ	54%

J – estimated concentration R – rejected concentration

ICP – inductively coupled plasma
MS – matrix spike
U – not detected at given concentration

5.3 BUTYLTINS

All butyltin data were considered acceptable for use in the RI/FS process, as qualified. Forty-five percent of the tissue samples had at least one butyltin result (monobutlytin, dibutltin, and tributyltin) that was qualified as estimated (J- or UJ-qualified) because CRM recoveries did not meet the percent difference control limit of 25%. Approximately 23% of the samples had tributyltin results that were qualified as estimated (J- qualified) because the results of the two columns had RPDs that exceeded the 25% control limit. Fourteen percent of the samples had tributyltin results that were qualified as estimated (J- or UJ-qualified) because associated matrix spike recoveries that were lower than the control limit. Seven percent of the tissue samples had tributyltin results that were qualified as estimated (J- or UJ-qualified) because of a lack of precision between the MS and MSD.

5.4 PAHS

All PAH data were considered acceptable for use in the RI/FS process, as qualified. Approximately 54% of the tissue samples had PAH results that were qualified as estimated (J- or UJ-qualified) because of holding time exceedances, which were mostly caused by the need for re-extractions and/or re-analysis. Ninety-nine percent of the samples had at least one PAH result that was qualified as estimated (J- or UJ-qualified) because an associated CRM recovery was outside of the control limits. The analytes that were most affected by qualifications because of associated CRM recoveries were 1-methylnaphthalene, acenaphthylene, acenaphthene, fluorene, 2,3,5-trimethylnapthalene, and 2,6-dimethylnapthalene. At least 70% of the samples had one PAH result that was qualified as non-detected (U-qualified) or estimated (UJ-qualified) because of method blank contamination, and the analytes that were most affected were naphthalene and fluorene.

5.5 ALKYLATED PAHS

All alkylated PAH data were considered acceptable for use in the RI/FS process, as qualified. All C1-, C2-, C3-, and C4-dibenzothiophenes were qualified as estimated (J- or UJ-qualified) because there were no secondary source standards for dibenzothiophenes, and LCS and MS did not contain this compound. Approximately 22% of the samples had at least one alkylated PAH result that was qualified as estimated (J-qualified) because of an associated LCS, which was attributed to a lack of precision between the between the LCS and LCSD for most qualified results. The analytes that were most affected by qualifications because of a lack of precision between the LCS/LSCD were C2-naphthalenes, C3-naphthalenes, and C4-naphthalenes.

5.6 SVOCs

During the SVOC analysis, Alpha Analytical experienced chromatographic interferences when GPC-cleaned extracts were analyzed using GC/MS. Over time, the organic acids in the tissue samples stripped the phase on the column of the instrument. Several columns were destroyed during the SVOC analysis, and sample extracts had to be diluted to prevent the GC/MS instrument from shutting down during analysis. This analytical issue affected all tissue types and was a significant analytical challenge. USEPA was notified and was provided with the required dilution ranges for each tissue type. The required dilutions resulted in elevated sample detection limits for all samples. Only three SVOCs were detected in the tissue samples (i.e., benzaldehyde in blue crab and benzaldehyde and bis[2-ethylhexyl] phthalate in fish) with the elevated detection limits.

SVOCs were considered acceptable for use in the RI/FS process, as qualified. For SVOCs, 129 of 299 tissue samples had rejected 2,4-dinitrophenol results because of low LCS/LCSD recoveries. In addition, 116 tissue samples had benzaldehyde results that were rejected because of low MS recoveries (n = 91 samples) or because an associated second source calibration standard had a percent difference (93.8%) that exceeded the percent difference control limit of 20% (n = 25 samples). Ninety-three tissue samples had hexachlorocyclopentadiene, pentachlorophenol, and 4,6-dinitro-2-methylphenol results that were rejected because of low MS recoveries, and 73 samples had 4-nitrophenol results that were rejected because of low MS recoveries. Fifty-five percent of the tissue samples had at least one SVOC result qualified as estimated (J- or UJ-qualified) because of a continuing calibration or second source calibration standard exceedance. The analytes most affected by these calibration issues were pentachlorophenol and benzaldehyde. Fifty-three percent of the samples had a least one result qualified as estimated (UJ-qualified) because of LCS/LCSD samples (low recoveries or RPDs greater than the control limit), which primarily affected benzaldehyde, 2,4-dinitrophenol, and pentachlorophenol.

5.7 PCBs

5.7.1 PCB Aroclors

All PCB Aroclor data were considered acceptable for use in the RI/FS process, as qualified. Approximately 11% of the tissue samples had at least one Aroclor (Aroclor 1242, Aroclor 1254, or Aroclor 1260) result that was qualified as estimated (J-qualified) because the results of the two columns had RPDs that exceeded the 25% control limit. Approximately 10% of the samples had at least one Aroclor result that was estimated (J or UJ-qualified) because of LCS/LCSD RPDs that exceeded the control limit.

5.7.2 PCB congeners

All PCB congener data were considered acceptable for use in the RI/FS process, as qualified. Ninety-one percent of the samples had at least one result qualified as estimated (J-qualified) because of target compound identification (primarily secondary ion interference), which primarily affected the dichlorobiphenyl congeners. Approximately 91% of the samples had at least one congener result that was qualified as estimated (J-qualified) because the linear range of the calibration was exceeded. All results with ion abundance ratios that did not meet the theoretical criteria were flagged as estimated maximum potential concentrations (EMPCs) by the laboratory and received an EMPC J-qualification during validation. Seventy-seven percent of the samples had at least one congener result that was qualified as estimated (EMPC J-qualified) because of the EMPC flag. Forty-seven percent of the tissue samples had at least one result qualified as estimated (J-qualified) because an associated batch control spike recovery outside the control limits, and this primarily affected the decachlorobiphenyl congener (PCB 209). Forty-one percent of the samples had at least one congener result that was qualified as estimated (J-qualified) because of the calibration, which primarily affected the dichlorobiphenyl congeners and decachlorobiphenyl.

5.8 PCDDs/PCDFs

All PCDD/PCDF data were considered acceptable for use in the RI/FS process, as qualified. All results that had ion abundance ratios that did not meet the theoretical criteria were flagged as EMPCs by the laboratory and received an EMPC J-qualification during validation. Ninety-two percent of the samples had at least one PCDD/PCDF result qualified as estimated (EMPC J-qualified) because of the EMPC flag. Approximately 71% of the samples had at least one PCDD/PCDF result that was qualified as estimated (J- or UJ-qualified) because an associated CRM recovery was outside of the control limits, which primarily affected total hexachlorodibenzo-*p*-dioxin and pentachlorodibenzofuran.

5.9 Organochlorine Pesticides

A total of 8 of 299 tissue samples had endrin ketone results that were rejected, and 5 samples had endosulfan II and methoxychlor results that were rejected, all because of low internal standard recoveries. All other organochlorine pesticide data were considered acceptable for use in the RI/FS process, as qualified. Approximately 41% of the tissue samples had pesticide results that were qualified as estimated (J- or UJ-qualified) as a result of holding time exceedances, which were mostly because of need for re-extractions and/or re-analysis. All heptachlor, oxychlordane, and 2,4'-DDT results were qualified as estimated (J- or UJ-qualified) because of low CRM recoveries. Ninety-three percent of the samples had 2,4'-DDE results, and 80% of the samples had

gamma-chlordane results that were qualified as estimated (J- or UJ-qualified) due to low CRM recoveries.

5.10 LIPIDS AND PERCENT MOISTURE

All lipid and percent moisture data were considered acceptable for use in the RI/FS process, as qualified. The majority of the lipid data were not qualified, and there were no qualifications of the percent moisture data. Six percent of the samples had lipid results that were qualified as estimated (J-qualified) because an associated CRM recovery was below the control limit.

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