

# APPENDIX I

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## Selection of Tissue Samples for PCB Congener and Dioxin and Furan Analysis



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## MEMORANDUM

To: Ravi Sanga  
From: EWG  
Subject: Selection of tissue samples for PCB congener and dioxin and furan analysis  
Date: April 3, 2009

Attached to this memorandum are preliminary, unvalidated data representing concentrations of total PCBs (based on detected Aroclor sums) in crab, fish, clam, mussel, geoduck and shrimp tissue collected from the EW (Table 1). The purpose of releasing these data at this time (i.e., pre-validation) is for EWG and EPA to select which composite samples will be analyzed for PCB congeners and dioxin and furans. These data are not suitable for other purposes at this time. The draft data report with validated fish and crab tissue data will be submitted to EPA in May 2009.

Two approaches are proposed for the analysis of PCB congeners and dioxins and furans. For species that have home ranges that are greater than the EW (i.e. crab [edible meat and hepatopancreas], shiner surfperch, English sole fillets and whole body) the creation of "super composites" is proposed. These composites would contain tissue from all available tissue composite samples. For example, there are 11 composite samples of English sole fillets and the super composite would be made up of an equal amount of tissue from all 11 composite samples, creating one sample with contributions from 55 individual English sole fillets (11 composite samples each containing 5 fillets). The advantages of this approach are:

- u The "super" composite sample would include contributions from all collected organisms/composite samples. This provides an estimate of the population mean TEQ concentration using tissue from all collected organisms.
- u Compositing reduces analytical costs while still providing an estimate of the population mean which is the value required for the risk assessments.

Each super composite would be created from an aliquot of tissue collected from all available tissue composite samples. These composites would be analyzed in triplicate. The triplicates would be created from additional aliquots of tissue collected from each composite sample following additional homogenization (stirring). The variability among the triplicate samples would reflect the variability within the tissue homogenates as well as analytical variability associated with the analytical method.

### **Crab**

Crabs were analyzed as composite edible meat and composite hepatopancreas samples. There were 8 composites of each tissue type for red rock crabs and 1 composite of each tissue type for the Dungeness crab. The range of total PCB concentrations was 310-550  $\mu\text{g}/\text{kg ww}$  for the red rock hepatopancreas samples and 48-214  $\mu\text{g}/\text{kg ww}$  for the edible meat samples. The Dungeness crab hepatopancreas sample had a total PCB concentration of 1,910  $\mu\text{g}/\text{kg ww}$  The Dungeness crab edible meat concentration was consistent with the red rock crab edible meat concentrations (177 $\mu\text{g}/\text{kg ww}$ ).

The creation of a super-composite samples for crab edible meat and hepatopancreas tissue is proposed. These samples would include contributions from the existing red rock crab tissue sample and the Dungeness crab samples. The edible meat and hepatopancreas composite samples each contain tissue from seven individual crabs. Therefore the super composite sample contains contributions from 63 individual crabs.

### **English sole**

English sole were analyzed as fillet and whole body composite samples. The consumption of English sole fillets is an important component of the seafood market basket for the human health risk assessment. The total PCB concentrations in the eleven English sole fillet composite samples ranged from 530-1,960  $\mu\text{g}/\text{kg ww}$ . The total PCB concentrations in the eleven English sole whole body samples ranged from 1,460-5,000  $\mu\text{g}/\text{kg ww}$ . The English sole whole body tissue is a minor component of the seafood market basket for the human health risk assessment. In addition, the whole body TEQ concentration will be evaluated in the ERA for the protection of English sole as a ecological receptor.

The creation of separate super-composite samples for English sole fillets and whole body samples is proposed. These samples would include contributions from all the existing English sole fillet and whole body composite samples. The fillet and whole body composite samples each contain tissue from five individual fish. Therefore the super composite sample contains contributions from 55 individual fish.

### **Shiner surfperch**

Eight shiner surfperch composite samples containing ten fish per composite were analyzed. The range of total PCB concentrations was 380-1,130  $\mu\text{g}/\text{kg ww}$ .

The creation of a super-composite samples for shiner surfperch whole body samples is proposed. These samples would include contributions from all the existing shiner

surfperch whole body composite samples. The whole body composite samples each contain tissue from ten individual fish. Therefore the super composite sample contains contributions from 80 individual fish.

### **Brown Rockfish**

Thirteen brown rockfish were collected from locations throughout EW. The brown rockfish has a small home range and therefore these individual fish reflect conditions proximate to the sampling location. Six brown rockfish are proposed for PCB congener and dioxin and furan analysis. These samples represent a range of total PCB concentrations in brown rockfish (500-4,300  $\mu\text{g}/\text{kg ww}$ ). Samples were also selected to represent the spatial extent of the waterway (Map 1).

Eight of the 13 rockfish samples contained only Aroclor 1260. The remaining five samples contained both Aroclor 1254 and Aroclor 1260. The samples selected for PCB congener and dioxin and furan analysis represent both of these Aroclor patterns.

### **Clams**

There were four different species of clams analyzed for total PCBs. Most clams (and biomass) were found in the southern end of the waterway followed by Beach 6 (Map 1). Seven samples of butter clams were analyzed from four different beaches (Beaches 3,6,8,10). There were two samples of cockles from Beaches 8 and 10. Finally, one sample of softshell clam from Beach 9 was analyzed and one sample of Little Neck clams from Beach 8. Three samples are proposed for analysis of PCB congeners and dioxins and furans.

Two butter clam samples which represent the minimum and maximum butter clam tissue concentrations (38  $\mu\text{g}/\text{kg ww}$  and 78  $\mu\text{g}/\text{kg ww}$ ). In addition, the cockle sample from Beach 8 is proposed to evaluate another species.

Two Aroclors were reported as detected in all the clam samples. Aroclor 1254 and Aroclor 1260 were detected in all samples with the exception of the one Mya sample contained only Aroclor 1260. There was very little variability in the Aroclor composition of the clam tissue samples with the exception of the little neck clam sample that contained predominately Aroclor 1260.

Three samples of clams are proposed for analysis due to the relatively low total PCB concentrations in the clam tissues.

### **Geoducks**

Six geoduck edible meat samples were analyzed for total PCBs. The concentrations ranged from 14-23  $\mu\text{g}/\text{Kg ww}$ . Three geoduck edible meat samples are proposed for PCB congener and dioxin analysis. These sample represent the range of total PCB concentrations (17.1-23  $\mu\text{g}/\text{kg ww}$ ). All the geoduck edible meat samples contained mixtures of Aroclor 1254 and Aroclor 1260 with the exception of EW-S01-GD01 which contained only Aroclor 1260. There was insufficient tissue remaining for this sample for the analysis of PCB congeners and dioxins.

Three geoduck gutball composite samples were analyzed. The total PCB concentrations range from 51-78 µg/kg ww. There was sufficient tissue remaining for two samples to be analyzed for PCB congeners and dioxins and furans.

**Mussels**

The total PCB concentrations in the 11 composite mussel tissues are all less than 50 µg/kg ww. The mussel tissue is a minor component of the seafood consumption for the HHRA and the diet of otters in the ERA. Clam tissue TEQ concentrations could represent a health protective level for the mussel component of the diet for human and ecological receptors for the calculation of TEQ risk. Therefore, no mussel samples are proposed for analysis.

**Shrimp**

One composite sample of shrimp was collected in EW. The total PCB concentration was 440 µg/kg ww. There is insufficient sample mass remaining for additional analysis of this sample.

**Table 1. Preliminary unvalidated Aroclor results**

	AROCLOR 1254 (µg/kg ww)	Q	AROCLOR 1260 (µg/kg ww)	Q	TOTAL PCBs	SAMPLE SELECTED?	AROCLOR 1254 (% OF TOTAL PCBs)	AROCLOR 1260 (% OF TOTAL PCBs)
<b>Red Rock Crab hepatopancreas</b>								
EW-08-RR-HP-COMP1	nd	Ui	380	P	380	composite	0%	100%
EW-08-RR-HP-COMP2	nd	Ui	450	P	450	composite	0%	100%
EW-08-RR-HP-COMP3	nd	Ui	550		550	composite	0%	100%
EW-08-RR-HP-COMP4	nd	Ui	440	P	440	composite	0%	100%
EW-08-RR-HP-COMP5	nd	Ui	330	P	330	composite	0%	100%
EW-08-RR-HP-COMP6	nd	Ui	490		490	composite	0%	100%
EW-08-RR-HP-COMP7	nd	Ui	310	P	310	composite	0%	100%
EW-08-RR-HP-COMP8	130		360		490	composite	27%	73%
<b>Red Rock Crab- Edible meat</b>								
EW-08-RR-EM-COMP1	nd	Ui	70		70	composite	0%	100%
EW-08-RR-EM-COMP2	nd	Ui	110		110	composite	0%	100%
EW-08-RR-EM-COMP3	nd	Ui	48	P	48	composite	0%	100%
EW-08-RR-EM-COMP4	nd	Ui	130	P	130	composite	0%	100%
EW-08-RR-EM-COMP5	54	P	160		214	composite	25%	75%
EW-08-RR-EM-COMP6	nd	Ui	68		68	composite	0%	100%
EW-08-RR-EM-COMP7	nd	Ui	98	P	98	composite	0%	100%
EW-08-RR-EM-COMP8	nd	Ui	77		77	composite	0%	100%

	AROCLOR 1254 (µg/kg ww)	Q	AROCLOR 1260 (µg/kg ww)	Q	TOTAL PCBs	SAMPLE SELECTED?	AROCLOR 1254 (% OF TOTAL PCBs)	AROCLOR 1260 (% OF TOTAL PCBs)
<b>Dungeness Crab</b>								
EW-08-DC-HP-COMP1	910	D	1000	D	1910	composite	48%	52%
EW-08-DC-EM-COMP1	85		92		177	composite	48%	52%
<b>English sole - fillet</b>								
EW-08-ES-FL-COMP01	330		250		580	composite	57%	43%
EW-08-ES-FL-COMP02	410		420		830	composite	49%	51%
EW-08-ES-FL-COMP03	460		380		840	composite	55%	45%
EW-08-ES-FL-COMP05	1000	D	960	D	1960	composite	51%	49%
EW-08-ES-FL-COMP06	620		570		1190	composite	52%	48%
EW-08-ES-FL-COMP07	530		550		1080	composite	49%	51%
EW-08-ES-FL-COMP08	630		570		1200	composite	53%	48%
EW-08-ES-FL-COMP09	920	D	890	D	1810	composite	51%	49%
EW-08-ES-FL-COMP10	610		550		1160	composite	53%	47%
EW-08-ES-FL-COMP11	320		360		680	composite	47%	53%
EW-08-ES-FL-COMP04	240		290		530	composite	45%	55%
<b>Brown Rockfish - Whole body</b>								
EW-08-SB002-BR-01	nd	Ui	710		710	no	0%	100%
EW-08-SB002-BR-02	nd	Ui	740	P	740	yes	0%	100%
EW-08-SB002-BR-03	1100	D	1700	PD	2800	no	39%	61%
EW-08-SB002-BR-04	nd	Ui	600		600	no	0%	100%
EW-08-SB002-BR-05	nd	Ui	610	P	610	no	0%	100%
EW-08-SB002-BR-06	nd	Ui	500	P	500	yes	0%	100%
EW-08-SB002-BR-07	860	D	1300	D	2160	no	40%	60%
EW-08-SB002-BR-08	nd	Ui	4300	D	4300	yes	0%	100%
EW-08-SB002-BR-09	1000	D	1900	D	2900	yes	34%	66%
EW-08-SB002-BR-10	770	D	1200	D	1970	yes	39%	61%
EW-08-SB002-BR-11	920	D	1900	D	2820	yes	33%	67%
EW-08-SB002-BR-12	nd	Ui	570	P	570	no	0%	100%
EW-08-SB002-BR-13	nd	Ui	400	P	400	no	0%	100%
<b>Shiner Surfperch - whole body</b>								
EW-08-SS-WB-COMP1	350		350		700	composite	50%	50%
EW-08-SS-WB-COMP2	590	D	510	D	1100	composite	54%	46%
EW-08-SS-WB-COMP3	570	D	560	D	1130	composite	50%	50%
EW-08-SS-WB-COMP4	540	D	490	D	1030	composite	52%	48%
EW-08-SS-WB-COMP5	450	D	470	D	920	composite	49%	51%

	AROCLOR 1254 (µg/kg ww)	Q	AROCLOR 1260 (µg/kg ww)	Q	TOTAL PCBs	SAMPLE SELECTED?	AROCLOR 1254 (% OF TOTAL PCBs)	AROCLOR 1260 (% OF TOTAL PCBs)
EW-08-SS-WB-COMP6	640	D	600	D	1240	composite	52%	48%
EW-08-SS-WB-COMP7	560	PD	520	D	1080	composite	52%	48%
EW-08-SS-WB-COMP8	140	P	240		380	composite	37%	63%
<b>English sole - whole body</b>								
EW-08-ES-WB-COMP01	880	D	900	D	1780	composite	49%	51%
EW-08-ES-WB-COMP02	1600	D	1600	D	3200	composite	50%	50%
EW-08-ES-WB-COMP03	1100	D	1200	D	2300	composite	48%	52%
EW-08-ES-WB-COMP04	2400	D	2600	D	5000	composite	48%	52%
EW-08-ES-WB-COMP05	700	D	760	D	1460	composite	48%	52%
EW-08-ES-WB-COMP06	1900	D	2200	D	4100	composite	46%	54%
EW-08-ES-WB-COMP07	1500	D	1800	D	3300	composite	45%	55%
EW-08-ES-WB-COMP08	1100	D	1400	D	2500	composite	44%	56%
EW-08-ES-WB-COMP09	1000	D	1000	D	2000	composite	50%	50%
EW-08-ES-WB-COMP10	1200	D	1600	D	2800	composite	43%	57%
EW-08-ES-WB-COMP11	810	D	850	D	1660	composite	49%	51%
<b>Clam Tissue</b>								
<b>Butter clams</b>								
EW-B03-BC-03-COMP01	17		34		51	no	33%	67%
EW-B06-BC-01-COMP01	31		47		78	yes	40%	60%
EW-B06-BC-01-COMP02	27		44	P	71	no	38%	62%
EW-B08-BC-01-COMP01	26		49		75	no	35%	65%
EW-B08-BC-01-COMP02	15		27	P	42	no	36%	64%
EW-B10-BC-01-COMP01	16		22	P	38	yes	42%	58%
EW-B10-BC-01-COMP02	16		24	P	40	no	40%	60%
<b>Little neck clam</b>								
EW-B08-NL-03-COMP01	15	P	68	P	83	no	18%	82%
<b>Cockles</b>								
EW-B08-CN-02-COMP01	35		47		82	yes	43%	57%
EW-B10-CN-05-COMP01	30		36	P	66	no	45%	55%
<b>Softshell clam</b>								
EW-B09-NY-M-COMP01	nd	U	4.7	JP	4.7	no	0%	100%
<b>Shrimp</b>								
EW-SR-WB-COMP01	240		220	P	460	no *	52%	48%

	AROCLOR 1254 (µg/kg ww)	Q	AROCLOR 1260 (µg/kg ww)	Q	TOTAL PCBs	SAMPLE SELECTED?	AROCLOR 1254 (% OF TOTAL PCBs)	AROCLOR 1260 (% OF TOTAL PCBs)
<b>Geoducks</b>								
<b>Geoduck -Edible meat</b>								
EW-S01-GD01	nd	U	14		14	no*	0%	100%
EW-S01-GD02	12	P	11		23	yes	52%	48%
EW-S01-GD03	8.6		9.6		18.2	no	47%	53%
EW-S01-GD04	8		9.1		17.1	yes	47%	53%
EW-S01-GD07	9.9		7.9		17.8	no	56%	44%
EW-S01-GD10	12	P	12		24	yes	50%	50%
<b>Geoduck -Gutball</b>								
EW-S01-GD-GBCOMP1	26	P	25		51	yes	51%	49%
EW-S01-GD-GBCOMP2	42		36		78	yes	54%	46%
EW-S01-GD-GBCOMP3	34		36		70	no*	49%	51%
<b>Whole Body Mussels</b>								
EW-08-MS-WB-COMP1	nd	Ui	22	P	22	no	0%	100%
EW-08-MS-WB-COMP2	nd	Ui	44	P	44	no	0%	100%
EW-08-MS-WB-COMP3	nd	Ui	28	P	28	no	0%	100%
EW-08-MS-WB-COMP4	nd	Ui	31	P	31	no	0%	100%
EW-08-MS-WB-COMP5	nd	Ui	29	P	29	no	0%	100%
EW-08-MS-WB-COMP6	nd	Ui	34	P	34	no	0%	100%
EW-08-MS-WB-COMP7	nd	Ui	35	P	35	no	0%	100%
EW-08-MS-WB-COMP8	nd	Ui	26	P	26	no	0%	100%
EW-08-MS-WB-COMP9	nd	Ui	32	P	32	no	0%	100%
EW-08-MS-WB-COMP10	nd	Ui	26	P	26	no	0%	100%
EW-08-MS-WB-COMP11	nd	Ui	19	P	19	no	0%	100%

\* Insufficient tissue remaining for PCB congener and dioxin analysis

## Summary

The number of samples selected for PCB congener and dioxin and furan analysis for each tissue type ranged from 2-6. A summary of the samples proposed for each matrix is provided in Table 2. The 95th UCL will be calculated using proUCL 4.0 for brown rockfish (n=6). For all the other tissue matrices the maximum PCB congener and dioxin and furan concentrations for the analyzed samples will be proposed for use in the human health and ecological risk assessments.



**Table 2. Summary of proposed samples for each matrix**

MATRIX	SAMPLES	NUMBER OF INDIVIDUALS IN EACH SAMPLE (n)	DATA USE
Crab – edible meat <sup>a</sup>	3 replicate super composites	63	maximum value
Crab – hepatopancreas <sup>a</sup>	3 replicate super composites	63	maximum value
English sole – fillets	3 replicate super composites	55	maximum value
English sole –whole body	3 replicate super composites	55	maximum value
Brown rockfish	6 individual fish samples	1	95th UCL
Shiner surfperch –whole body	3 replicate super composites	80	maximum value
Clams	3 existing composite samples	13-17	maximum value <sup>b</sup>
Geoduck – edible meat	3 individual geoduck samples	1	maximum value
Geoduck – gut ball	2 existing gut ball composite samples	2-3	maximum value

<sup>a</sup> Red rock crab and Dungeness crab homogenates will be combined