

Certificate of Analysis

Contaminated Fish Reference Material

Catalog Number:	EDF-2525
Lot Number:	R543
Expiration Date:	August 2026
Matrix:	Fish
Amount per Vial:	10 g
Storage and Handling:	The product contains trace amounts of dioxins, furans, PCBs, BFRs, PAHs, and pesticides. It should be handled according to OSHA guidelines for hazardous material. Protect from light. Store at room temperature.
Intended Use:	For laboratory use only. This product is a sample of homogeneous fish matrix from Lake Ontario lake trout, a freshwater fish species found in Canada. This sample is intended for use in evaluating the performance of an analytical laboratory for the listed analytes.
Preparation:	The preparation of this fish sample has been detailed in Reference Materials for Environmental Analysis (Clement, Keith, & Siu, 1997). Lake Ontario lake trout were collected as a representative of a contaminated fish species and then frozen. Fish were sent for central processing consisting of gutting, homogenizing, and sterilizing.
Interlaboratory Analysis:	The product was included in the Second Round of International Interlaboratory Study conducted by Cambridge Isotope Laboratories and Cerilliant Corporation. Participating laboratories used a variety of sample preparation and analytical techniques. The results listed below supersede those obtained in the First Round of Interlaboratory Study. This Second Round of Interlaboratory Study adds consensus values for fifteen additional PCB congeners, three new brominated diphenyl ethers, and seven additional pesticides.
Interlaboratory Results:	Results of the international interlaboratory study are attached. Consensus values were independently assigned by Manna Associates in the UK using the Cofino model of statistical analysis. These numbers are certified reference values. All values are presented at three significant figures. Analytes with fewer than five laboratories contributing acceptable data do not have assigned values reported in this study.

Cerilliant certifies that this standard meets or exceeds the specifications stated in this data sheet.

Authorized Signature:



Darron Ellsworth, Quality Assurance Manager

July 15, 2016

Date

Interlaboratory Participants:

- AgriQuality Limited - Wellington Laboratory, New Zealand
- Almacen CAN, Spain
- Alta Analytical Laboratory, USA
- Beijing Center for Disease Control and Prevention, China
- CA Department of Toxic Substances Control, USA
- CARSO, France
- CEAEQ, Canada
- Chinese Center for Disease Control and Prevention, China
- CIEMAT (Energetic, Environmental, & Technological Research Center), Spain
- Dr. Weßling Laboratorien GmbH, Germany
- ECOChem, A.S., Czech Republic
- Environment Canada, Canada
- EPFL-ENAC-ISTE-CECOTOX, Switzerland
- FDA, USA
- Fraunhofer-Institute IVV, Germany
- GfA (Gesellschaft für Arbeitsplatz und Umweltanalytik) mbH, Germany
- Hong Kong Baptist University, Hong Kong
- IDEA Consultants, Inc. (METOCIAN), Japan
- Institute of Chemical Technology, Czech Republic
- Institute of Public Health, Czech Republic
- Japan Food Research Laboratories, Japan
- Maxxam Analytics, Inc., Canada
- Michigan Department of Community Health, USA
- Murata Keisokuki Service, Japan
- Nab Labs Ympäristöanalytiikka Oy, Finland
- National Center for Scientific Research "Demokritos", Greece
- National Central University, Taiwan
- National Institute of Nutrition and Food Safety (Chinese Center for Disease Control and Prevention), China
- Nippon Suisan Kaisha, LTD, Japan
- Norwegian Institute for Air Research (NILU), Norway
- Norwegian Institute of Public Health, Norway
- Oekometric GmbH, Germany
- Otsuka Pharmaceutical Co., LTD, Japan
- Pace Analytical Services, Inc., USA
- Seikan Co., LTD., Japan
- Severn Trent Laboratories, CA USA
- Severn Trent Laboratories, TN USA
- SGS Institut Fresenius GmbH Bayreuth, Germany
- Shimadzu Techno-Research, Inc., Japan
- Sougou Mizu Institute, LTD., Japan
- Unitaka Environmental Technical Center LTD., Japan
- Xiamen University, China

Interlaboratory Results:

<i>Compound</i>	<i>Assigned¹ Value (ng/kg)</i>	<i>Standard Deviation</i>	<i>Reference² Value (ng/kg)</i>	<i>(n)³</i>
<i>Polychlorinated dioxins and furans</i>				
2,3,7,8-Tetrachlorodibenzo-p-dioxin	17.0	1.95	17.0 ± 3.90	36
Total Tetrachlorodibenzo-p-dioxin	16.8	0.77	16.8 ± 1.54	16
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	3.71	0.45	3.71 ± 0.90	36
Total Pentachlorodibenzo-p-dioxin	3.68	0.42	3.68 ± 0.84	16
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.33	0.09	0.33 ± 0.18	32
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	2.03	0.30	2.03 ± 0.60	35
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.30	0.07	0.30 ± 0.14	31
Total Hexachlorodibenzo-p-dioxin	2.52	0.55	252 ± 1.10	14
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.48	0.18	0.48 ± 0.36	33
Total Heptachlorodibenzo-p-dioxin	0.56	0.31	0.56 ± 0.62	16
Octachlorodibenzo-p-dioxin	1.71	0.69	1.71 ± 1.38	35
2,3,7,8-Tetrachlorodibenzofuran	24.3	2.37	24.3 ± 4.74	36
Total Tetrachlorodibenzofuran	27.7	4.70	27.7 ± 9.40	16
1,2,3,7,8-Pentachlorodibenzofuran	4.58	0.71	4.58 ± 1.42	36
2,3,4,7,8-Pentachlorodibenzofuran	14.5	2.02	14.5 ± 4.04	36
Total Pentachlorodibenzofuran	23.4	3.33	23.4 ± 6.66	16
1,2,3,4,7,8-Hexachlorodibenzofuran	5.95	0.76	5.95 ± 1.52	36
1,2,3,6,7,8-Hexachlorodibenzofuran	1.73	0.27	1.73 ± 0.54	31
1,2,3,7,8,9-Hexachlorodibenzofuran	0.10	0.10	0.10 ± 0.20	29
2,3,4,6,7,8-Hexachlorodibenzofuran	1.04	0.15	1.04 ± 0.30	34
Total Hexachlorodibenzofuran	10.7	3.09	10.7 ± 6.18	16
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.59	0.22	0.59 ± 0.44	34
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.16	0.16	0.16 ± 0.32	29
Total Heptachlorodibenzofuran	1.13	0.74	1.13 ± 1.48	13
Octachlorodibenzofuran	0.38	0.25	0.38 ± 0.50	33

Interlaboratory Results (continued):

Compound	Assigned¹ Value (ng/kg)	Standard Deviation	Reference² Value (ng/kg)	(n)³
Polychlorinated biphenyls⁴				
2,2',5-Trichlorobiphenyl (#18)	1,390	485	1,390 ± 970	10
2,4,4'-Trichlorobiphenyl (#28)	7,100	628	7,100 ± 1,260	22
2,4',5-Trichlorobiphenyl (#31)	4,000	35.8	4,000 ± 71.6	5
2,4',6-Trichlorobiphenyl (#32)	220	108	220 ± 216	5
3,4,4'-Trichlorobiphenyl (#37)	165	61.4	165 ± 123	9
2,2',3,5'-Tetrachlorobiphenyl (#44)	14,200	4,830	14,200 ± 9,660	11
2,2',4,4'-Tetrachlorobiphenyl (#47)	16,000	3,280	16,000 ± 6,560	5
2,2',4,5'-Tetrachlorobiphenyl (#49)	13,600	4,550	13,600 ± 9,100	9
2,2',5,5'-Tetrachlorobiphenyl (#52)	27,100	6,050	27,100 ± 12,100	21
2,3',4,4'-Tetrachlorobiphenyl (#66)	56,500	10,400	56,500 ± 20,800	8
2,3',4',5-Tetrachlorobiphenyl (#70)	44,400	1,930	44,400 ± 3,860	5
2,4,4',5-Tetrachlorobiphenyl (#74)	23,100	4,220	23,100 ± 8,440	11
3,3',4,4'-Tetrachlorobiphenyl (#77)	1,850	417	1,850 ± 834	31
3,4,4',5-Tetrachlorobiphenyl (#81)	161	37.0	161 ± 74.0	28
2,2',3,4,5'-Pentachlorobiphenyl (#87)	38,400	12,000	38,400 ± 24,000	8
2,2',3',4,5-Pentachlorobiphenyl (#97)	29,800	7,330	29,800 ± 14,700	6
2,2',4,4',5-Pentachlorobiphenyl (#99)	94,300	12,600	94,300 ± 25,200	12
2,2',4,5,5'-Pentachlorobiphenyl (#101)	82,700	10,700	82,700 ± 21,400	19
2,3,3',4,4'-Pentachlorobiphenyl (#105)	50,100	7,830	50,100 ± 15,700	33
2,3,3',4,6-Pentachlorobiphenyl (#110)	84,900	9,560	84,900 ± 19,100	11
2,3,4,4',5-Pentachlorobiphenyl (#114)	3,410	774	3,410 ± 1,550	31
2,3',4,4',5-Pentachlorobiphenyl (#118)	122,000	19,000	122,000 ± 38,000	31
2',3,4,4',5-Pentachlorobiphenyl (#123)	3,280	1,010	3,280 ± 2,020	28
3,3',4,4',5-Pentachlorobiphenyl (#126)	628	121	628 ± 242	32
2,2',3,3',4,4'-Hexachlorobiphenyl (#128)	28,200	4,730	28,200 ± 9,460	11
2,2',3,4,4',5-Hexachlorobiphenyl (#137)	7,250	1,220	7,250 ± 2,440	8
2,2',3,4,4',5'-Hexachlorobiphenyl (#138)	178,000	13,900	178,000 ± 27,800	21
2,2',3,4,5,5'-Hexachlorobiphenyl (#141)	22,040	1,750	22,040 ± 3,500	9
2,2',3,4',5,5'-Hexachlorobiphenyl (#146)	39,500	8,500	39,500 ± 17,000	7
2,2',3,4',5',6-Hexachlorobiphenyl (#149)	69,800	12,300	69,800 ± 24,600	10
2,2',3,5,5',6-Hexachlorobiphenyl (#151)	24,900	5,550	24,900 ± 11,100	10
2,2',4,4',5,5'-Hexachlorobiphenyl (#153)	226,000	35,600	226,000 ± 71,200	23
2,3,3',4,4',5-Hexachlorobiphenyl (#156)	13,100	1,360	13,100 ± 2,620	32
2,3,3',4,4',5'-Hexachlorobiphenyl (#157)	3,380	506	3,380 ± 1,010	29
2,3,3',4,4',6-Hexachlorobiphenyl (#158)	11,600	937	11,600 ± 1,870	8
2,3',4,4',5,5'-Hexachlorobiphenyl (#167)	7,060	1,510	7,060 ± 3,020	30
3,3',4,4',5,5'-Hexachlorobiphenyl (#169)	52.1	7.01	52.1 ± 14.0	30
2,2',3,3',4,4',5-Heptachlorobiphenyl (#170)	35,100	6,370	35,100 ± 12,700	16
2,2',3,3',4,5,5'-Heptachlorobiphenyl (#172)	8,450	799	8,450 ± 1,600	7
2,2',3,3',4',5,6-Heptachlorobiphenyl (#177)	18,800	2,070	18,800 ± 4,140	9
2,2',3,3',5,5',6-Heptachlorobiphenyl (#178)	12,100	920	12,100 ± 1,840	7

Interlaboratory Results (continued):

<i>Compound</i>	<i>Assigned¹ Value (ng/kg)</i>	<i>Standard Deviation</i>	<i>Reference² Value (ng/kg)</i>	<i>(n)³</i>
<i>Polychlorinated biphenyls (cont.)⁴</i>				
2,2',3,4,4',5,5'-Heptachlorobiphenyl (#180)	108,000	11,800	108,000 ± 23,600	24
2,2',3,4,4',5',6-Heptachlorobiphenyl (#183)	28,300	3,370	28,300 ± 6,740	11
2,2',3,4',5,5',6-Heptachlorobiphenyl (#187)	62,900	10,800	62,900 ± 21,600	9
2,3,3',4,4',5,5'-Heptachlorobiphenyl (#189)	1,440	249	1,440 ± 498	30
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (#194)	12,700	1,600	12,700 ± 3,200	12
2,2',3,3',4,4',5,6-Octachlorobiphenyl (#195)	4,620	724	4,620 ± 1,450	9
2,2',3,3',4,4',5',6-Octachlorobiphenyl (#196)	7,720	1,620	7,720 ± 3,240	6
2,2',3,3',4,5,6,6'-Octachlorobiphenyl (#199) ⁵	16,700	1,200	16,700 ± 2,400	11
2,2',3,4,4',5,5',6-Octachlorobiphenyl (#203)	13,800	1,180	13,800 ± 2,360	5
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (#206)	4,960	384	4,960 ± 768	12
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (#208)	2,370	175	2,370 ± 350	9
Decachlorobiphenyl (#209)	3,510	491	3,510 ± 982	13
<i>Brominated Flame Retardants⁶</i>				
2,4,4'-Tribromodiphenyl ether (#28)	312	101	312 ± 202	15
2,2',4,4'-Tetrabromodiphenyl ether (#47)	9,080	1,310	9,080 ± 2,620	16
2,2',4,5'-Tetrabromodiphenyl ether (#49)	524	137	524 ± 274	6
2,3',4,4'-Tetrabromodiphenyl ether (#66)	262	41	262 ± 81.0	13
2,2',4,4',5-Pentabromodiphenyl ether (#99)	2,280	236	2,280 ± 472	16
2,2',4,4',6-Pentabromodiphenyl ether (#100)	1,720	283	1,720 ± 566	16
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	2,030	253	2,030 ± 506	16
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	2,550	502	2,550 ± 1,000	16
2,2',3,4,4',5',6-Heptabromodiphenyl ether (#183)	137	23.9	137 ± 47.8	15
Decabromodiphenyl ether (#209)	545	1,000	545 ± 1,999	8

Interlaboratory Results (continued):

<i>Compound</i>	<i>Assigned¹ Value (ng/kg)</i>	<i>Standard Deviation</i>	<i>Reference² Value (ng/kg)</i>	<i>(n)³</i>
<i>Pesticides</i>				
Chlordane	33,400	3,150	33,400 ± 6,300	5
4,4'-DDE	587,000	70,000	587,000 ± 140,000	10
4,4'-DDD	97,600	16,600	97,600 ± 33,200	10
4,4'-DDT	9,100	1,350	9,100 ± 2,700	10
Dieldrin	54,500	8,650	54,500 ± 17,300	8
Endosulfan I	1,310	361	1,310 ± 722	6
Endosulfan II	10,100	808	10,100 ± 1,620	6
Endrin	2,420	217	2,420 ± 434	7
α-Hexachlorocyclohexane	1,400	572	1,400 ± 1,140	9
β-Hexachlorocyclohexane	834	818	834 ± 436	11
γ-Hexachlorocyclohexane (Lindane)	492	108	492 ± 216	11
Heptachlor	1,970	556	1,970 ± 1,110	9
Heptachlor epoxide	8,210	780	8,210 ± 1,560	7
Hexachlorobenzene	18,100	7,670	18,100 ± 15,300	11
Mirex	93,700	11,600	93,700 ± 23,200	7
cis-Nonachlor	27,700	3,200	27,700 ± 6,400	6
trans-Nonachlor	57,700	25,500	57,700 ± 51,000	8
Oxychlordane	18,100	5,610	18,100 ± 11,200	8
α-Chlordane	30,100	9,490	30,100 ± 19,000	5
γ-Chlordane	11,500	3,620	11,500 ± 7,240	8

¹ Assigned Value as determined by Manna Associates in the UK using Cofino analysis of raw interlaboratory study data.

² Reference Value is the Assigned Value plus or minus two standard deviations. Negative numbers resulting from two standard deviations being greater than the assigned value have no significance.

³ Number of laboratories providing results for this analyte.

⁴ All numbers in parentheses refer to the IUPAC designation for the compound.

⁵ This is also known as IUPAC PCB # 201.

⁶ All numbers in parentheses refer to the IUPAC designation for the related PCB congener.

COA Revision History

Revision No.	Date	Reason for Revision
03	July 15, 2016	Revised Expiration Date from August 2016 to August 2026.