

Certificate of Analysis

Clean Fish Reference Material

Catalog Number:	EDF-2524
Lot Number:	R542
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. Store at room temperature, protect from light.
Intended Use:	For laboratory use only. This product is a sample of homogeneous fish matrix from Pacific herring, a marine fish sample 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). In short, Pacific herring was collected as a representative of a clean fish 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 seventeen additional PCB congeners and eight additional pesticides. Seven BDE congeners and eleven Polyaromatic hydrocarbon compounds were added, both classes of compounds for which no consensus values were determined in the First Round of Interlaboratory Study.
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
 CARSO, France
 CenPro Technology CO., LTD, Taiwan
 Chinese Center for Disease Control and Prevention, China
 Columbia Analytical Services, Inc., USA
 Dr. Weßling Laboratorien GmbH, Germany
 Environment Canada, Canada
 Frahofer-Institute IVV, Germany
 GfA (Gesellschaft für Arbeitsplatz und Umweltanalytik) mbH, Germany
 Institute of Chemical Technology, Czech Republic
 Maxxam Analytics, Inc., Canada

Michigan Department of Community Health, USA
 Nab Labs Ympäristöanalytiikka Oy, Finland
 National Center for Scientific Research "Demokritos", Greece
 National Institute of Nutrition and Food Safety (Chinese Center for Disease Control and Prevention), China
 Norwegian Institute of Public Health, Norway
 Oekometric GmbH, Germany
 Pace Analytical Services, Inc., USA
 Severn Trent Laboratories, CA USA
 Severn Trent Laboratories, TN USA
 SGS Institut Fresenius GmbH Bayreuth, Germany
 Shengyang Center for Disease Control and Prevention, China
 Xiamen University, China

Interlaboratory Results:

Compound	Assigned¹ Value (ng/kg)	Standard Deviation	Reference² Value (ng/kg)	(n)³
Polychlorinated dioxins and furans				
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.07	0.03	0.07 ± 0.06	18
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.15	0.02	0.15 ± 0.03	18
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.06	0.02	0.06 ± 0.03	18
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.24	0.07	0.24 ± 0.14	19
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.07	0.03	0.07 ± 0.05	19
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.29	0.07	0.29 ± 0.54	19
Total Heptachlorodibenzo-p-dioxin	0.23	0.15	0.23 ± 0.30	7
Octachlorodibenzo-p-dioxin	0.59	0.41	0.59 ± 0.82	19
2,3,7,8-Tetrachlorodibenzofuran	2.42	0.37	2.42 ± 0.74	20
Total Tetrachlorodibenzofuran	2.49	0.46	2.49 ± 0.92	8
1,2,3,7,8-Pentachlorodibenzofuran	0.09	0.03	0.09 ± 0.06	19
2,3,4,7,8-Pentachlorodibenzofuran	0.21	0.07	0.21 ± 0.14	18
Total Pentachlorodibenzofuran	1.22	1.13	1.22 ± 1.13	7
1,2,3,4,7,8-Hexachlorodibenzofuran	0.09	0.07	0.09 ± 0.14	19
1,2,3,6,7,8-Hexachlorodibenzofuran	0.08	0.06	0.08 ± 0.12	18
2,3,4,6,7,8-Hexachlorodibenzofuran	0.08	0.03	0.08 ± 0.05	18
Total Hexachlorodibenzofuran ⁴	0.55	0.66	0.55 ± 1.31	9
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.17	0.14	0.17 ± 0.28	18
Octachlorodibenzofuran	0.24	0.29	0.24 ± 0.58	17

Interlaboratory Results (continued):

Compound	Assigned¹ Value (ng/kg)	Standard Deviation	Reference² Value (ng/kg)	(n)³
Polychlorinated biphenyls⁵				
2,2',5-Trichlorobiphenyl (#18)	86.0	30.2	86.0 ± 60.4	6
2,4,4'-Trichlorobiphenyl (#28)	253	122	253 ± 244	15
3,4,4'-Trichlorobiphenyl (#37)	12.6	2.26	12.6 ± 4.52	7
2,2',3,5'-Tetrachlorobiphenyl (#44)	274	96.0	274 ± 192	8
2,2',4,5'-Tetrachlorobiphenyl (#49)	176	20.8	176 ± 41.6	5
2,2',5,5'-Tetrachlorobiphenyl (#52)	653	100	653 ± 200	14
2,3',4,4'-Tetrachlorobiphenyl (#66)	218	106	218 ± 212	5
2,4,4',5-Tetrachlorobiphenyl (#74)	348	199	348 ± 398	6
3,3',4,4'-Tetrachlorobiphenyl (#77)	8.82	2.08	8.82 ± 4.16	15
3,4,4',5-Tetrachlorobiphenyl (#81)	1.27	1.26	1.27 ± 2.52	13
2,2',4,4',5-Pentachlorobiphenyl (#99)	588	59.8	588 ± 120	8
2,2',4,5,5'-Pentachlorobiphenyl (#101)	1,130	137	1,130 ± 274	12
2,3,3',4,4'-Pentachlorobiphenyl (#105)	280	40.2	280 ± 80.4	16
2,3,3',4',6-Pentachlorobiphenyl (#110)	789	84.9	789 ± 170	7
2,3,4,4',5-Pentachlorobiphenyl (#114)	18.6	2.99	18.6 ± 5.98	14
2,3',4,4',5-Pentachlorobiphenyl (#118)	692	51.9	692 ± 104	14
2',3,4,4',5-Pentachlorobiphenyl (#123)	11.4	4.62	11.4 ± 9.24	13
3,3',4,4',5-Pentachlorobiphenyl (#126)	2.14	0.62	2.14 ± 1.24	15
2,2',3,3',4,4'-Hexachlorobiphenyl (#128)	127	31.1	127 ± 62.2	6
2,2',3,4,4',5-Hexachlorobiphenyl (#137)	31.8	13.4	31.8 ± 26.8	5
2,2',3,4,4',5'-Hexachlorobiphenyl (#138)	1,110	200	1,110 ± 400	13
2,2',3,4,5,5'-Hexachlorobiphenyl (#141)	152	59.4	152 ± 119	7
2,2',3,4',5,5'-Hexachlorobiphenyl (#146)	261	34.6	261 ± 69.2	6
2,2',3,4',5',6-Hexachlorobiphenyl (#149)	608	394	608 ± 788	5
2,2',3,5,5',6-Hexachlorobiphenyl (#151)	279	106	279 ± 212	7
2,2',4,4',5,5'-Hexachlorobiphenyl (#153)	1,360	258	1,360 ± 516	15
2,3,3',4,4',5-Hexachlorobiphenyl (#156)	64.7	9.20	64.7 ± 18.4	14
2,3,3',4,4',5'-Hexachlorobiphenyl (#157)	19.2	4.34	19.2 ± 8.68	12
2,3,3',4,4',6-Hexachlorobiphenyl (#158)	73.2	26.3	73.2 ± 52.6	5
2,3',4,4',5,5'-Hexachlorobiphenyl (#167)	24.7	8.55	24.7 ± 17.1	14
3,3',4,4',5,5'-Hexachlorobiphenyl (#169)	0.65	0.23	0.65 ± 0.46	15
2,2',3,3',4,4',5-Heptachlorobiphenyl (#170)	119	21.0	119 ± 42.0	8
2,2',3,3',4,5,5'-Heptachlorobiphenyl (#172)	38.6	6.02	38.6 ± 12.0	5
2,2',3,3',4',5,6-Heptachlorobiphenyl (#177)	126	23.9	126 ± 47.8	6
2,2',3,3',5,5',6-Heptachlorobiphenyl (#178)	68.2	2.90	68.2 ± 5.80	5
2,2',3,4,4',5,5'-Heptachlorobiphenyl (#180)	412	91.2	412 ± 182	15
2,2',3,4,4',5',6-Heptachlorobiphenyl (#183)	125	29.7	125 ± 59.4	7
2,2',3,4',5,5',6-Heptachlorobiphenyl (#187)	357	111	357 ± 222	5
2,3,3',4,4',5,5'-Heptachlorobiphenyl (#189)	6.16	1.36	6.16 ± 2.72	13
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (#194)	48.1	12.8	48.1 ± 25.6	7
2,2',3,3',4,4',5',6-Octachlorobiphenyl (#196)	44.8	28.3	44.8 ± 56.6	5
2,2',3,3',4,5,5',6'-Octachlorobiphenyl (#199) ⁶	81.7	33.7	81.7 ± 67.4	7
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (#206)	10.4	1.03	10.4 ± 2.06	6
Decachlorobiphenyl (#209)	14.4	0.54	14.4 ± 1.08	7

Interlaboratory Results (continued):

Compound	Assigned¹ Value (ng/kg)	Standard Deviation	Reference² Value (ng/kg)	(n)³
Polybrominated Diphenyl Ethers⁷				
2,4,4'-Tribromodiphenyl ether (#28)	26.6	22.9	26.6 ± 45.8	6
2,2',4,4'-Tetrabromodiphenyl ether (#47)	712	409	712 ± 818	7
2,3',4,4'-Tetrabromodiphenyl ether (#66)	23.4	10.8	23.4 ± 21.6	6
2,2',4,4',5-Pentabromodiphenyl ether (#99)	184	43.1	184 ± 86.2	7
2,2',4,4',6-Pentabromodiphenyl ether (#100)	113	46.8	113 ± 93.6	7
2,2',4,4',5,5'-Hexabromodiphenyl ether (#153)	21.6	7.37	21.6 ± 14.7	7
2,2',4,4',5,6'-Hexabromodiphenyl ether (#154)	30.9	19.9	30.9 ± 39.8	7
Polyaromatic Hydrocarbons				
Acenaphthene	967	302	967 ± 604	6
Acenaphthylene	516	145	516 ± 290	6
Anthracene	592	142	592 ± 284	6
Benzo[<i>b</i>]fluoranthene	794	78.4	794 ± 157	6
Benzo[<i>k</i>]fluoranthene	222	3.80	222 ± 7.60	6
Chrysene	720	157	720 ± 314	6
Fluoranthene	4930	657	4,930 ± 1,310	6
Fluorene	4,400	1,760	4,400 ± 3,530	6
Naphthalene	15,600	7,880	15,600 ± 15,800	6
Phenanthrene	12,000	6,990	12,000 ± 14,000	6
Pyrene	6,300	816	6,300 ± 1,630	6
Pesticides				
4,4'-DDE	10,100	1,220	10,100 ± 2,440	7
4,4'-DDD	1,640	378	1,640 ± 756	7
4,4'-DDT	976	69.7	976 ± 1,390	7
Dieldrin	488	37.3	488 ± 74.6	7
Endosulfan-I	534	189	534 ± 378	6
α-Hexachlorocyclohexane	267	113	267 ± 226	7
Lindane (γ-HCCH)	390	68.0	390 ± 136	8
Hexachlorobenzene	783	180	783 ± 360	8
cis-Nonachlor	211	62.8	211 ± 126	5
trans-Nonachlor	1,130	271	1,130 ± 542	6

¹ Assigned Value was 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 Assigned values from the First Round of International Interlaboratory Study.

⁵ All numbers in parentheses refer to the IUPAC designation for the compound.

⁶ This is also known as IUPAC PCB # 201.

⁷ 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.

