

Supporting Information

Perfluoroalkyl Acids in the Atlantic and Canadian Arctic Oceans

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MATERIALS AND METHODS

Analytical standards and reagents

Oasis WAX solid phase extraction (SPE) cartridges (6 cm³, 150 mg, 30 µm) were obtained from Waters (Waters Corporation, Milford, Mass). Centrifuge tubes (15 mL polypropylene (PP)), PP sample bottles, Methanol (MeOH; Omnisolv), HPLC grade water (OmniSolv) and 25% ammonia solution were obtained from VWR (Mississauga, ON). Ammonium acetate was supplied by Fisher Scientific (Toronto, ON). All HPLC grade water utilized in this work was passed through an Oasis WAX SPE cartridge prior to use. Further details on standards and solvents are provided in Scott et al.¹ SPE-cleaned water along with eluents used for SPE were analyzed for possible PFAA contamination prior to use (see following section).

Perfluorohexanoic acid (PFHxA) was obtained from Oakwood Products Inc. (West Columbia, SC). Perfluoroheptanoic acid (PFHpA), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluoroundecanoic acid (PFUnDA), perfluorododecanoic acid (PFDoDA), and perfluorotetradecanoic acid (PFTDA) were supplied by Aldrich Chemicals, (Milwaukee, WI). Perfluorobutanesulfonate (PFBS), perfluorohexane sulfonate (PFHxS), perfluorooctane sulfonate (PFOS), perfluoroheptane sulfonate (PFHpS), perfluorodecane sulfonate (PFDS), perfluorooctane sulfonamide (FOSA), the internal standards (spiked prior to extraction) ¹³C₂-PFHxA, ¹³C₄-PFOA, ¹³C₅-PFNA, ¹³C₂-PFDA, ¹³C₂-PFUnDA, ¹³C₂-PFDoDA, ¹³C₄-PFOS, ¹⁸O₂-PFHxS, and instrument performance standards (spiked after extraction and immediately prior to analysis) ¹³C₂-PFOA, ¹³C₈-PFOS, ¹³C₉-PFNA, and ¹³C₇-PFUnDA were purchased from Wellington Laboratories (Guelph, ON).

PFAA analysis in solvents and reagents

PFAA concentrations in SPE-extracted HPLC water was determined by subtracting the average quantity of PFAA in stay lab blanks (prepared with only 4mL of SPE-cleaned water; Table S10) from the average quantity of PFAAs observed in “stay” blanks (prepared with 1L of SPE-cleaned water; Table S10), divided by the difference in volume between the blanks (996mL). Concentrations of PFAAs in SPE-cleaned water were: 29 pg/L PFHxA, 18 pg/L PFHpA, 5.8 pg/L PFOA, 2.1 pg/L PFNA, and 1.2 pg/L of FOSA. The SPE-cleaned water used to prepare each sample (4mL for priming the cartridges+4mL for rinsing+0.25mL used to bring the final volume of extract to 0.5mL = 4.25mL SPE-cleaned water used per/sample) is therefore expected to contribute <1pg of each of the aforementioned PFAAs per sample.

Eluents were also examined routinely for signs of PFAA contamination. 6 mL of MeOH or 8 mL of 0.1% ammonia in MeOH was added to a polypropylene centrifuge tube and reduced to 0.5 mL under nitrogen, then analyzed by HPLC-MS/MS. PFAAs were not typically detected in the 100% MeOH eluent, however the 0.1% ammonia in MeOH eluent occasionally contained measurable levels of PFAAs (<2pg PFHxA, <13pg PFHpA, <20pg PFOA, <1pg PFDA, <3pg PFUnDA, <1pg of PFTrDA, <1pg of PFHxS, <15pg PFOS, and <1 pg FOSA), likely attributable specifically to the ammonia solution used to prepare it. Any minor contamination of eluents is expected to have been accounted for by lab blanks, which were subtracted from samples in all instances.

Extraction of samples and instrumental analysis

Water samples were spiked with internal standards (50 pg of each isotope-labeled standard listed in Table S3) prior to extraction, except for a subset of samples used in the interlaboratory comparison (half of the 2008 Gjoa Haven and Resolute Bay samples and all of the 2009 Resolute Bay samples), which were not spiked. Samples were extracted using Oasis WAX cartridges (150 mg, 6 cm³) as follows: after pre-conditioning with 4 mL of 0.1% ammonia in MeOH, 4 mL MeOH, and 4mL of WAX SPE-extracted water, samples were loaded onto SPE cartridges at a rate of 1 drop/second. After loading, cartridges were rinsed with 4mL of 25 mM acetate buffer and then centrifuged at 3000 rpm to remove any remaining water. Target analytes were eluted with 6 mL of MeOH, followed by 8 mL of 0.1% ammonia in MeOH. The eluents were combined and reduced to just under 250 µL and then spiked with 50 pg of instrument performance standards (Table S3; except for the aforementioned interlaboratory samples which were not spiked). The extract was brought to 250 µL (confirmed by weight), and then 250 µL of WAX SPE-extracted HPLC grade water was added. The final extract (500 µL final volume; 50% MeOH/water) was vortexed and then transferred to a polypropylene microvial for analysis by HPLC-MS/MS.

PFAAs were analyzed by liquid chromatography tandem mass spectrometry (HPLC-MS/MS) using an Agilent 1100 HPLC coupled to an API 4000 triple quadrupole mass spectrometer (AB Sciex, Concord ON, Canada) operated in negative ionization mode with multiple reaction monitoring. Extracts were injected (10-100 µL) onto a SecurityGuardTM C18 guard cartridge (5 µm, 2 mm i.d. × 4 mm) coupled to a Luna C18 HPLC column (3 µm, 2 mm i.d. x 50 mm,) using 0.01 M aqueous ammonium acetate solution prepared with Milli-Q water (solvent A) and MeOH (solvent B) as the mobile phase. Column temperature was 35 °C. Eight-point calibration curves were produced for each set of samples analyzed using varying concentrations of the standards from just above the instrumental quantification limit up to two-fold this value. All

PFAAs were quantified as the sum of all isomers. Further instrumental details are provided in Scott et al.¹

For the 2007 *Oden* samples, concentrations reported are the mean of $n=2$ samples/location while for the 2005 *Oden* samples a second subset consisting of the combined remaining sample from each site (500 mL) was analyzed later to confirm the results for the first batch of samples because of lab blank contamination. For all remaining sampling cruises, the PFAA concentrations reported are based on $n=1$ sample/location.

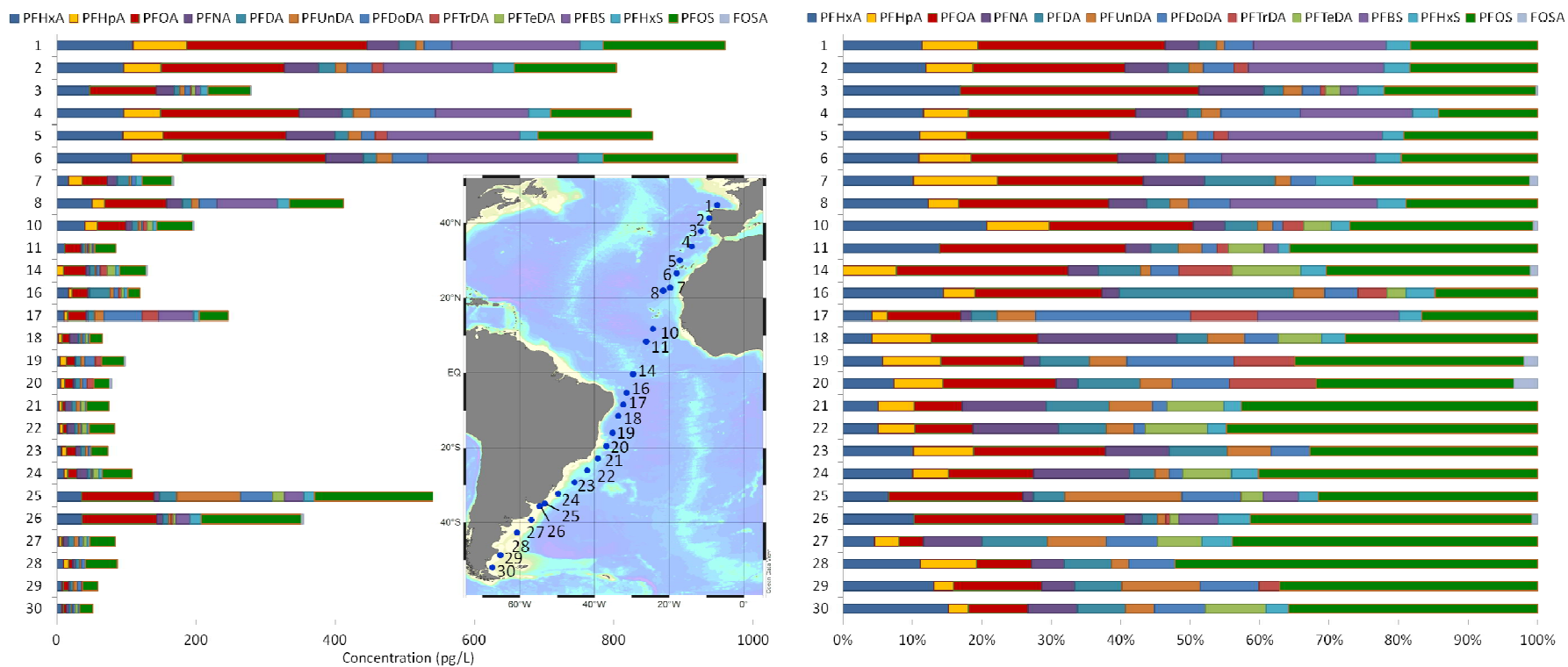


Figure S1. Σ PFAA concentrations (pg/L) and relative profile for 2007 *Oden* Cruise (Bay of Biscay to Argentina).

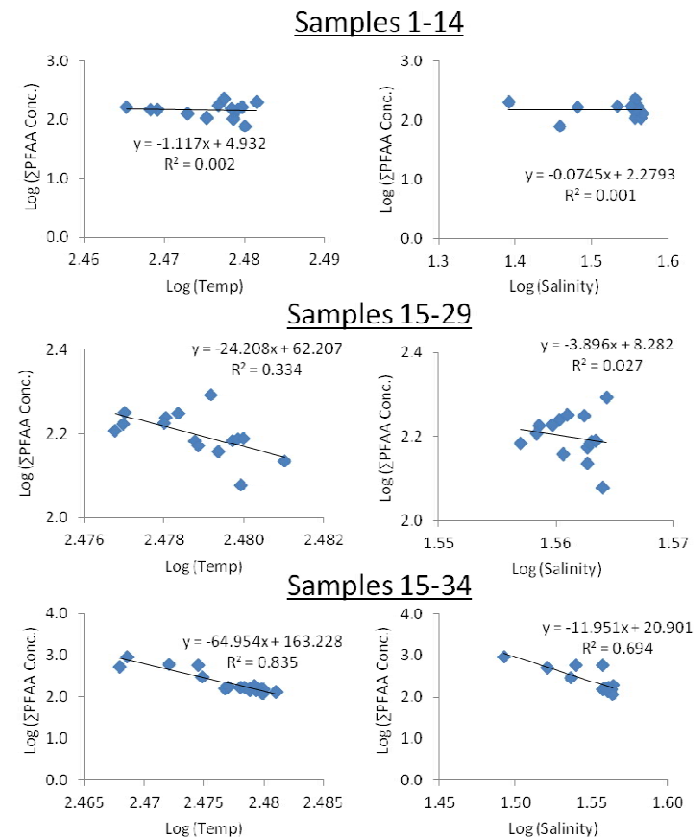
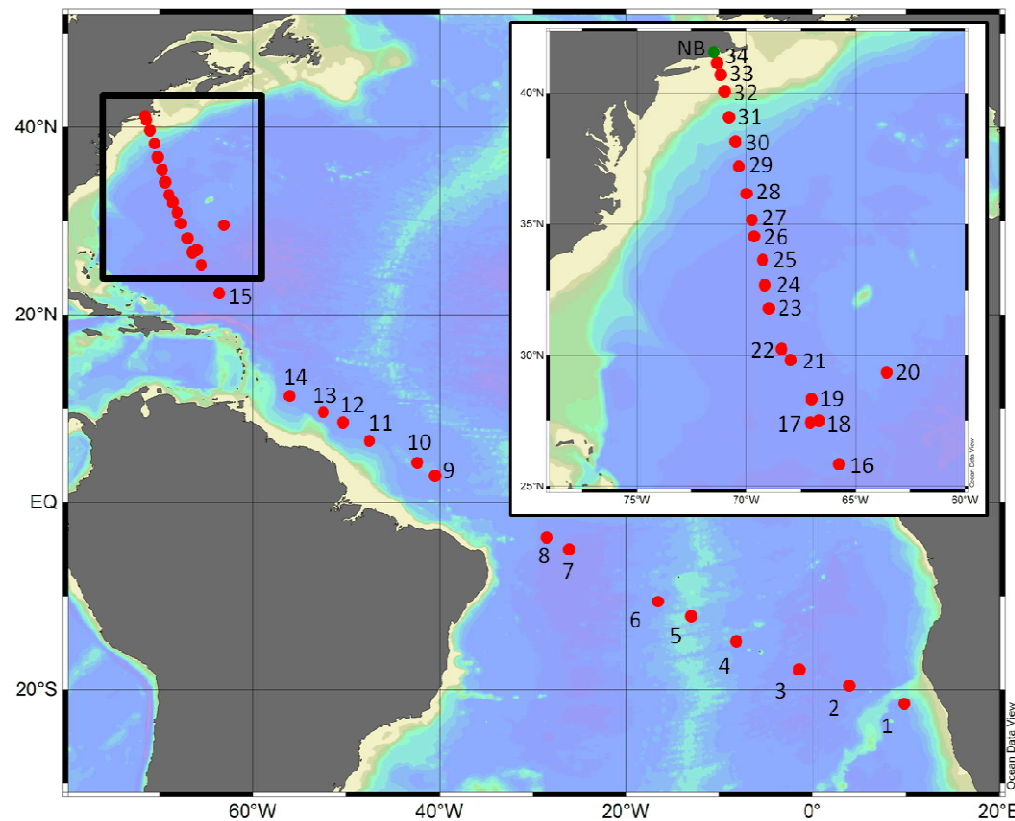


Figure S2. Regressions of Log(Σ PFAA concentration) versus Temperature and Salinity for 2009 Endeavour cruise from Namibia to Rhode Island. Regressions were performed on samples 1-14 (Bengula Current, South Equatorial Current and North Brazil Current), samples 15-29 (Antilles Current/Gulf Stream), and samples 15-34 (Antilles Current/Gulf Stream/Coastal Water). A dramatic increase in Σ PFAA concentrations was observed upon crossing from the Gulf Stream into the cold waters of the Eastern Seaboard United States as shown by the correlation with decreasing water temperature and salinity.

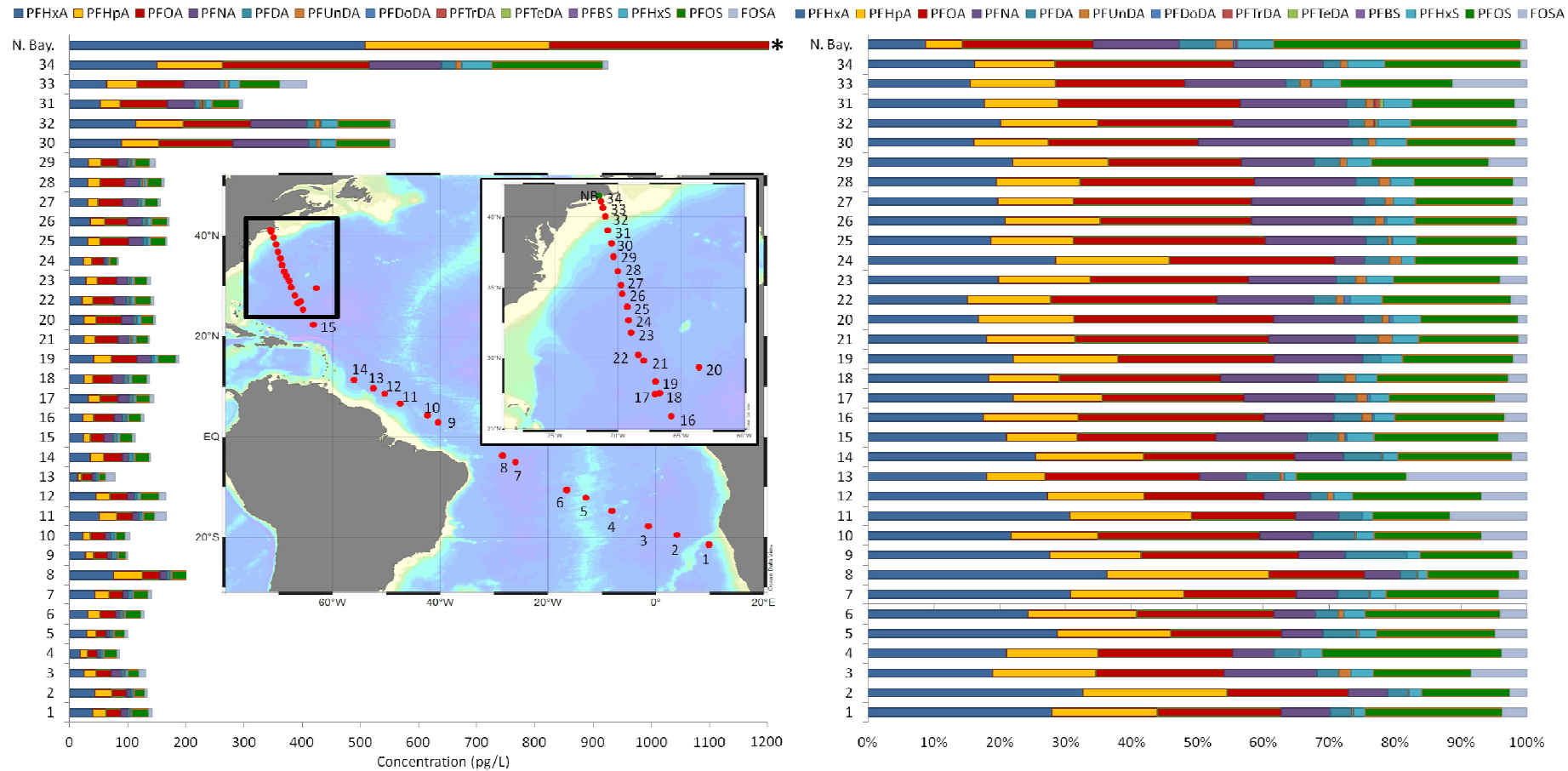


Figure S3. Σ PFAA concentrations (pg/L) and relative profile for 2009 *Endeavor* Cruise (Namibia to Narragansett, RI). * Σ PFAA concentration in Narragansett Bay is off-scale (5800 pg/L).

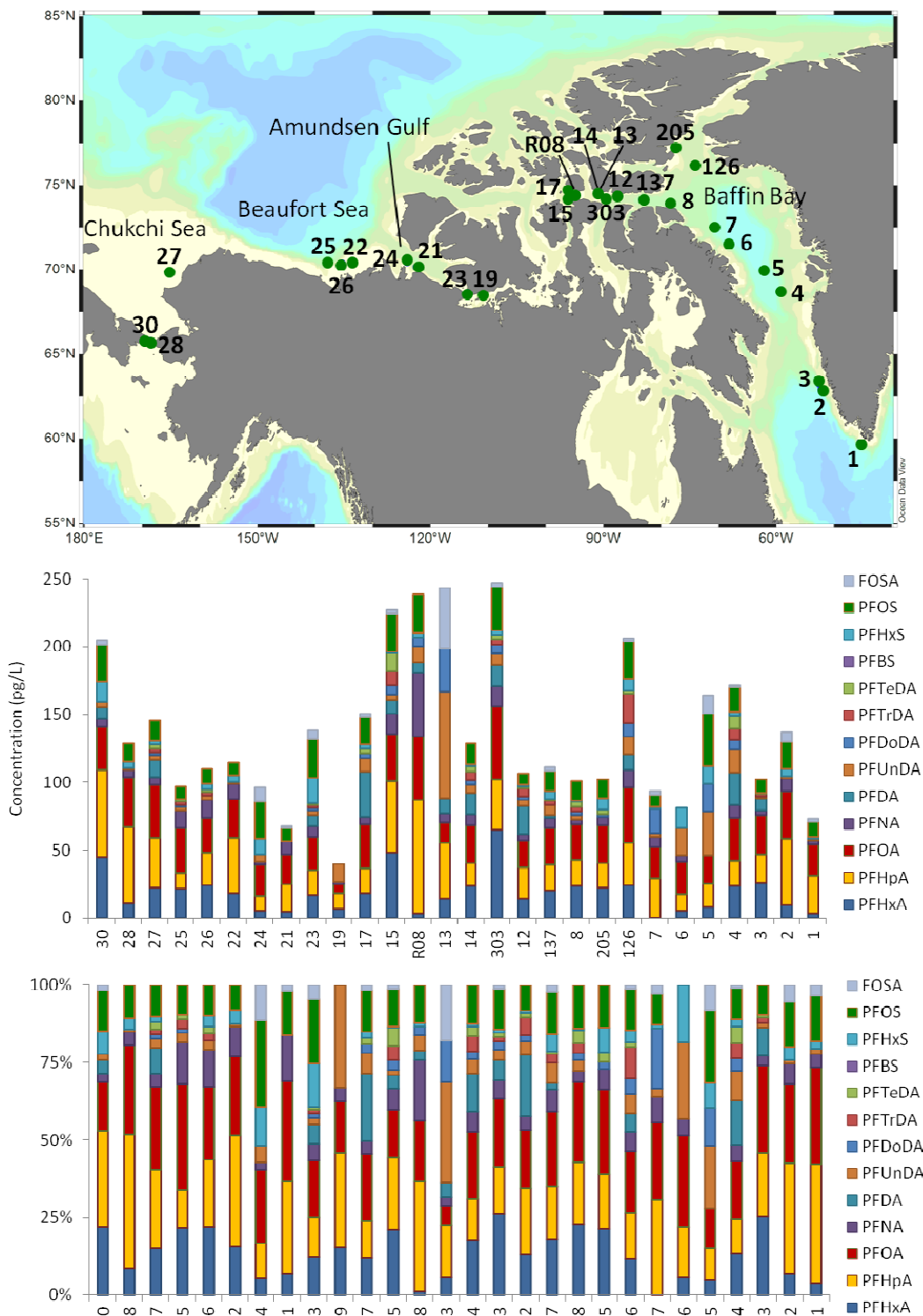


Figure S4. Σ PFAA concentrations (pg/L) and profiles for the 2005 *Oden* cruise (Greenland to Chukchi Sea; samples 1-30), and 2008 *Amundsen* cruise (North Baffin Bay; samples 126-303). R08 represents the average of 2 sites in Resolute Bay (n=2 samples/ site) sampled in 2008 and analyzed at CCIW as part of the CCIW/AIST interlaboratory study.

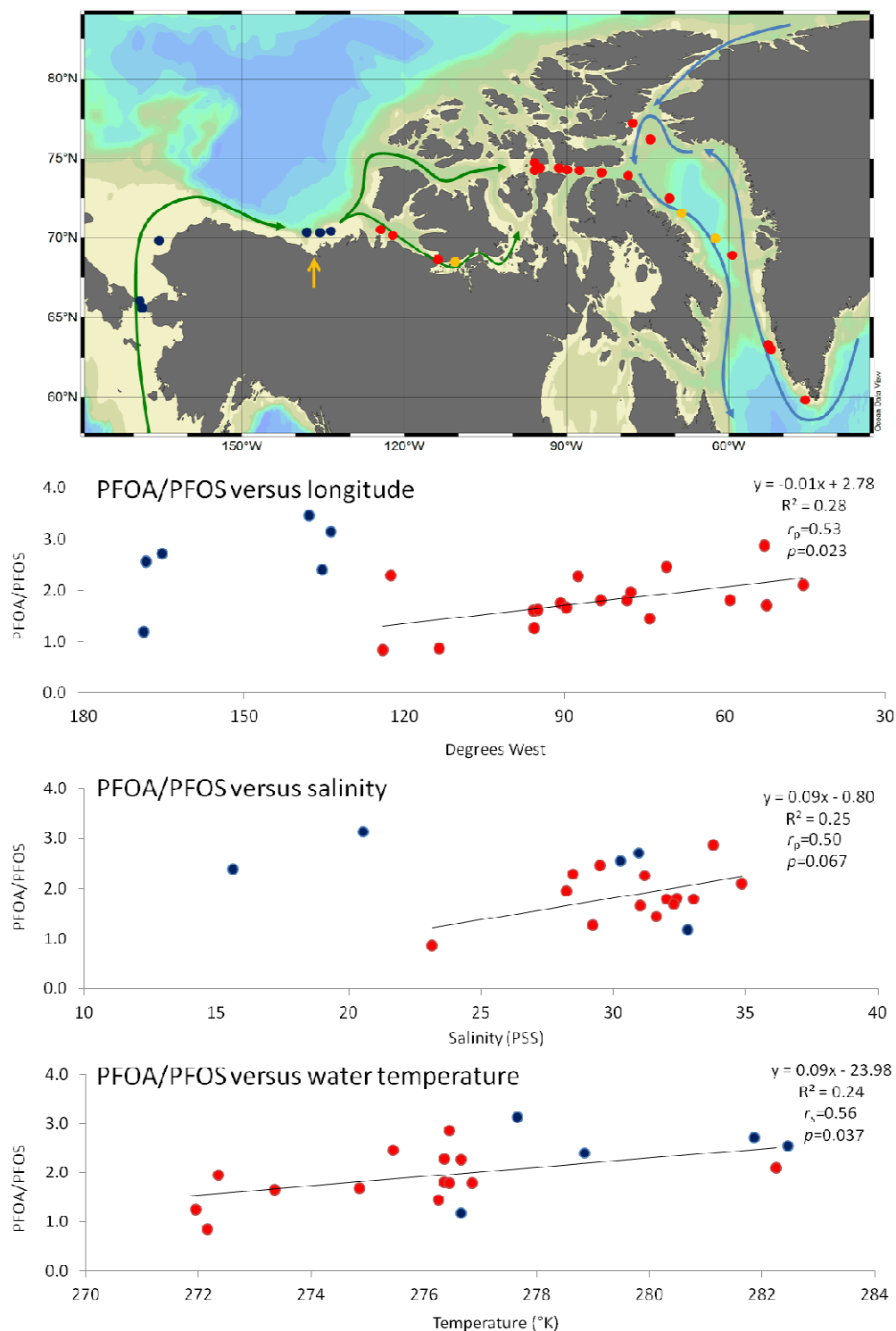


Figure S5. Linear regressions of PFOA/PFOS ratios versus longitude, salinity, and temperature. Blue circles, representing locations west of the Canadian Arctic Archipalego, were not included in regression or statistical analysis. Yellow circles indicate locations where PFOA/PFOS ratios could not be calculated due to non-detection of PFOS. Blue arrows represent water originating from the Atlantic while green arrows represent water originating from the Pacific. The Yellow arrow represents the location of the Mackenzie River, a major freshwater input into the Arctic Ocean.

1 **Table S1.** Abbreviations and chemical formulae for PFAAs examined in the present study.

Abbreviation	Perfluorinated Compound	Chemical Formula
PFBS	Perfluorobutane sulfonate	$C_4F_9SO_3^-$
PFHxS	Perfluorohexane sulfonate	$C_6F_{13}SO_3^-$
PFOS	Perfluorooctane sulfonate	$C_8F_{17}SO_3^-$
FOSA	Perfluorooctane sulfonamide	$C_8F_{17}SO_2NH_2$
PFHxA	Perfluorohexanoate	$C_5F_{11}CO_2^-$
PFHpA	Perfluoroheptanoate	$C_6F_{13}CO_2^-$
PFOA	Perfluorooctanoate	$C_7F_{15}CO_2^-$
PFNA	Perfluorononanoate	$C_8F_{17}CO_2^-$
PFDA	Perfluorodecanoate	$C_9F_{19}CO_2^-$
PFUnDA	Perfluoroundecanoate	$C_{10}F_{21}CO_2^-$
PFDoDA	Perfluorododecanoate	$C_{11}F_{23}CO_2^-$
PFTriDA	Perfluorotridecanoate	$C_{12}F_{25}CO_2^-$
PFTeDA	Perfluorotetradecanoate	$C_{13}F_{27}CO_2^-$

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1 **Table S2.** Comparison of PFAA concentrations (pg/L) in global surface waters with values from the present study

		PFOS	PFHxS	PFHxA	PFOA	PFNA	Reference
Atlantic	North Atlantic Ocean (>40°N)	8.6–36	4.1–6.1	n.a.	160–338	15–36	Yamashita et al. ²
	Northeastern Atlantic Ocean	<10-291	n.d.	<5.7-127	<4-229	<5.1-107	Ahrens et al. ³
	Northeastern Atlantic Ocean (40-49 °N)	45-110	8-27	38-57	77-154	5.4-38	Ahrens et al. ⁴
	North to South Atlantic Ocean	<14-170	n.a.	n.a.	<17-90	n.a.	Theobald et al. ⁵
	Mid eastern Atlantic Ocean (40S-40 °N)	47-116	7-17	<3-42	<5.2-117	<3-39	Ahrens et al. ⁴
	Eastern Atlantic (27-46 °N)	61-192	11-36	47-110	96-259	26-70	This Study
	East Coast U.S. (38-41 °N) ¹ (not including Narragansett Bay)	46-191	13-51	53-150	80-252	48-131	This Study
	Western Atlantic (3-37 °N)	13-32	1-7	14-75	17-49	4-27	This Study
	Mid Atlantic Ocean	<10-60	n.d.	<5.7	<4-87	<5.1-35	Ahrens et al. ³
	Mid Atlantic Ocean	37–73	2.6–12	n.a.	100–439	n.a.	Yamashita et al. ²
	Mid to Eastern Atlantic (0-24 °N)	30-78	1-17	n.d.-51	23-89	3-22	This Study
	South Atlantic Ocean	<10	n.d.	<5.7	<4	<5.1	Ahrens et al., 2009a
	Southeastern Atlantic (50-70 °S)	<11-51	<4.1	<3	<5.2	<3	Ahrens et al. ⁴
	Mid to southeastern Atlantic (3-21 °S)	18-30	2-5	18-75	17-30	5-19	This Study
	Southwest Atlantic (5-52 °S) (not including Rio de la Plata)	18-45	n.d.-8	3-17	3-26	2-15	This Study
Northern Seas	Open North Sea	120 ²	20 ²	40 ²		40 ²	Theobald et al. ⁶
	North Sea (at 60°N,7°E)	~25	n.a.	<5.7	~300	n.a.	Caliebe et al. ⁷
	Greenland Sea (75-80°N)	12-32	<2-20	n.d.	25-80	n.a.	Caliebe et al. ⁷
	Norwegian Sea (72-75°N)	25-80	5-16	n.d.	45-60	n.a.	Caliebe et al. ⁷
Labrador and Greenland	East Greenland (AO-2 surface water)	20-40	n.a.	n.a.	50-55	n.a.	Yamashita et al. ²
	NW Atlantic (east of Newfoundland)	<10	n.a.	<5.7	40-81	<5.1	Ahrens et al. ³
	Labrador Sea (coastal)	24-73	2.3-10	n.a.	8-182	<MDL	Rosenberg et al. ⁸
Arctic	Labrador Sea/ Davis Strait/ North Baffin Bay (59-77 °N)	n.d.-39	n.d.-15	0.4-26	21-41	n.d.-13	This Study
	Canadian Arctic Archipelago (87-124 °W)	n.d.-32	n.d.-19	3-65	6-54	2-47	This Study
	Chukchi Sea/Arctic Ocean	<21-53	<66	<27-28	<20-67	<22-51	Cai et al. ⁹
	Beaufort Sea/Chukchi Sea/Bering Strait (137-169 °W)	9-27	n.d.-15	11-45	26-39	5-13	This Study
Pacific	Northwest Pacific Ocean and Bering Sea	<21-60	<66	<27	<20-100	<22-70	Cai et al. ⁹
	Western Pacific Ocean	54–78	2.2–2.8	n.a.	136–142	n.a.	Yamashita et al. ²
	Central to Eastern Pacific Ocean	1.1–20	0.1–1.6	n.a.	15–62	1.0–16	Yamashita et al. ²
	Central and South Pacific Ocean	<5-21	<5	<5	<5-7.0	<5	Wei et al. ¹⁰
Antarctic	South Pacific Ocean	<5-11	n.a.	n.a.	<5-11	n.a.	Yamashita et al. ²
	Antarctic Region	<5-22.6	<1	<5	<5	<5	Wei et al. ¹⁰

2 ¹ Narragansett Bay not included

3 ² Median shown

1 **Table S3.** Mean internal standard % recoveries \pm standard error about the mean for individual sampling cruises

	$^{13}\text{C}_2\text{-PFHxA}$	$^{13}\text{C}_4\text{-PFOA}$	$^{13}\text{C}_5\text{-PFNA}$	$^{13}\text{C}_2\text{-PFDA}$	$^{13}\text{C}_2\text{-PFUnDA}$	$^{13}\text{C}_2\text{-PFDODA}$	$^{13}\text{C}_4\text{-PFOS}$	$^{18}\text{O}_2\text{-PFHxS}$
2009 Endeavor Cruise¹ (Namibia to Narragansett, RI, $n=35$ samples)	85 \pm 2.0	94 \pm 2.0	80 \pm 1.4	60 \pm 1.3	51 \pm 1.0	42 \pm 2.2	75 \pm 1.4	90 \pm 1.5
2007 Oden Cruise² (Bay of Biscay to Argentina, $n=60$ samples; 2 samples/site)	120 \pm 2.5	100 \pm 2.1	n.a.	46 \pm 2.1	28 \pm 1.4	21 \pm 0.9	74 \pm 3.0	130 \pm 3.4
2005 Oden Cruise² (Greenland to Chukchi Sea, $n=23$ samples)	120 \pm 7.6	130 \pm 7.3	n.a.	62 \pm 5.5	31 \pm 4.1	21 \pm 2.8	70 \pm 4.6	104 \pm 7.6
2008 Amundsen Cruise² (North Baffin Bay/ Lancaster Sound, $n=4$ samples)	110 \pm 24	130 \pm 20	n.a.	28 \pm 6.0	26 \pm 5.5	34 \pm 7.4	79 \pm 16	200 \pm 27
2008 Gjoa Haven³ (Interlab study, analyzed by AIST, $n=2$ spiked samples)	92 \pm 2.8	102 \pm 2.3	n.a.	72 \pm 3.0	n.a.	8.0 \pm 0.4	95 \pm 2.7	120 \pm 2.9
2008 Gjoa Haven² (Interlab study, analyzed by CCIW, $n=2$ spiked samples)	100 \pm 2.8	95 \pm 2.6	n.a.	44 \pm 2.6	26 \pm 4.3	18 \pm 2.9	67 \pm 3.6	150 \pm 4.3
2008 Resolute Bay³ (Interlab study, analyzed by AIST, $n=2$ spiked samples)	98 \pm 3.0	98 \pm 3.9	n.a.	76 \pm 6.2	n.a.	16 \pm 14	96 \pm 1.3	110 \pm 0.02
2008 Resolute Bay² (Interlab study, analyzed by CCIW, $n=2$ spiked samples)	120 \pm 7.2	88 \pm 9.2	n.a.	41 \pm 9.4	21 \pm 4.7	12 \pm 1.6	64 \pm 7.8	140 \pm 16

n.a.-not available at the time of analysis.

1. $^{13}\text{C}_2\text{-PFOA}$, $^{13}\text{C}_8\text{-PFOS}$, $^{13}\text{C}_9\text{-PFNA}$, and $^{13}\text{C}_7\text{-PFUnDA}$ used as instrument performance standard.

2. $^{13}\text{C}_2\text{-PFOA}$ used as instrument performance standard.

3. $^{13}\text{C}_5\text{-PFNA}$ -used as instrument performance standard.

1 **Table S4.** Interlab comparison of 2008 Gjoa Haven (68°37'N, 95°52'W) and 2008 Resolute Bay (74°43'N, 94°58'W) water samples.

Lab	Year	Sample (depth)	rep	Congener (MRM transition)									
				PFHxA (313/269)	PFHpA (363/319)	PFOA (413/369)	PFNA (463/419)	PFDA (513/469)	PFUnDA (563/519)	PFDaDA (613/569)	PFHxS (399/99)	PFOS ⁴ (499/99)	FOSA (498/78)
CCIW	2008	Gjoa Haven (6 m) ³	1	58	112 ⁷	217	59	57	1.0	5.6	4.1	14	<1.0 ⁵
CCIW	2008	Gjoa Haven (6 m) ³	2	40	108	211	51	43	1.0	6.4	3.9	20	2.3
		Average		49	110	214	55	50	1.0	6.0	4.0	17	1.7
CCIW	2008	Gjoa Haven (6 m)	1	74	21	304	302	11	0.3	0.5	9.2	180	<1.0
CCIW	2008	Gjoa Haven (6 m)	2	80	23	348	352	17	7.7	3.5	0.8	<2.0 ⁶	<1.0
		Average		77	22	326	327	14	4.0	2.0	5.0	180	<1.0
AIST	2008	Gjoa Haven (6 m)	1	78	162	499	103	48	4.5	1.1	8.2	24	
AIST	2008	Gjoa Haven (6 m)	2	69	151	472	100	43	3.3	1.0	3.1	23	
		Average		73	156	485	101	45	3.9	1.1	5.6	24	
AIST	2008	Gjoa Haven (6 m) ³	1	76	158	468	95	54	3.6	0.2	11	23	
AIST	2008	Gjoa Haven (6 m) ³	2	85	168	527	100	55	5.3	2.0	14	25	
		Average		81	163	497	97	55	4.4	1.1	12	24	
average interlab deviation				18%	59%	45%	-92%	36%	40%	-266%	49%	27%	
CCIW	2008	Resolute Bay (6 m) ³	1	5.2	31	45	35	11	27	13	5.2	19	3.0
CCIW	2008	Resolute Bay (6 m) ³	2	4.8	29	43	49	8.9	13	8.6	4.8	31	<1.0
		Average		5.0	30	44	42	10	20	11	5.0	25	2.0
CCIW	2008	Resolute Bay (6 m)	1	<2.0	137	51	45	1.0	1.6	<2.0	<2.0	<2.0	<1.0
CCIW	2008	Resolute Bay (6 m)	2	<2.0	137	49	57	9.0	6.4	3.7	<2.0	<2.0	<1.0
		Average		2.0	137	50	51	5.0	4.0	2.9	2.0	2.0	1.0
AIST	2008	Resolute Bay (6 m)	1	17	43	78	62	8.6	8.5	0.9	6.6	17	
AIST	2008	Resolute Bay (6 m)	2	17	42	88	66	7.5	9.0	<1.0	6.0	17	
		Average		17	43	83	64	8.1	8.8	0.4	6.3	17	
AIST	2008	Resolute Bay (6 m) ³	1	26	42	92	69	10	12	0.2	6.2	18	
AIST	2008	Resolute Bay (6 m) ³	2	23	46	68	58	14	13	2.8	4.2	14	
		Average		25	44	80	64	12	12.5	1.5	5.2	16	
average interlab deviation				83%	-93%	42%	27%	26%	-13%	-605%	39%	18%	

¹CCIW = Canada Centre for Inland Waters (Environment Canada, Aquatic Ecosystem Protection Research Division Burlington, ON Canada).

²AIST = National Institute of Advanced Industrial Science and Technology, Tsukuba, Ibaraki 305-8569, Japan

³ these samples pre-spiked with ¹³C-PFAAs at CCIW prior to analysis by both labs

⁴ Sum of branched + linear isomers

⁵ Unless otherwise specified, values below the MDL were set to the MDL for calculation of means.

⁶ This value not included in the calculation of average deviation for this sample.

⁷ Where three digits are provided the last digit is non-significant and is included for illustrative purposes only.

1 **Table S5.** Interlab comparison of 2009 Resolute Bay (74°43'N, 94°58'W) water samples (not spiked with isotope-labeled standards)

Lab	Year	Sample (depth)	rep	Congener (MRM transition)											
				PFHxA (313/269)	PFHpA (363/319)	PFOA (413/369)	PFNA (463/419)	PFDA (513/469)	PFUnDA (563/519)	PFDoDA (613/569)	PFHxS (399/99)	PFOS ³ (499/99)	PFHpS ⁴ (449/80)	PFDS ⁵ (599/80)	FOSA (498/78)
CCIW ¹	2009	Resolute Bay (0.5 m)	1	49	3.7	48	33	6.2	6	0.1	18	16			1.4
CCIW	2009	Resolute Bay (0.5 m)	2	38	3.4	35	21	4.2	3.8	0.3	16	13			1.5
CCIW	2009	Resolute Bay (0.5 m)	3	43	3.9	42	30	6.1	5.8	1.6	18	18			0.8
		Average		43	3.7	42	28	5.5	5.2	0.7	17	16			1.2
		(CVr)		13%	7%	15%	22%	21%	24%	119%	5%	15%			32%
AIST ²	2009	Resolute Bay (0.5 m)	1	64	44	60	9.3	9	1.4	1.7	25	24	9.4	8.1	
AIST	2009	Resolute Bay (0.5 m)	2	69	52	84	27	11	1.6	<1.0	33	28	6.3	7.6	
AIST	2009	Resolute Bay (0.5 m)	3	73	49	61	7.1	6.7	1.3	1.3	19	21	11	6.6	
		Average		68	49	68	14	8.9	1.5	1.0 ⁶	25	25	8.8	7.4	
		(CVr)		7%	8%	20%	75%	25%	11%	89%	26%	14%	26%	10%	
average interlab deviation				37%	37%	92%	39%	-94%	39%	-256%	33%	31%	37%		

2 ¹CCIW = Canada Centre for Inland Waters (Environment Canada, Aquatic Ecosystem Protection Research Division Burlington, ON
3 Canada);

4 ²AIST = National Institute of Advanced Industrial Science and Technology, Tsukuba, Ibaraki 305-8569, Japan

5 ³Sum of branched + linear isomers

6 ⁴Perfluoroheptane sulfonate (PFHpS, C₇F₁₅SO₃⁻) was also analyzed by AIST for 2009 samples.

7 ⁵Perfluorodecane sulfonate (PFDS, C₁₀F₂₁SO₃⁻) was also analyzed by AIST for 2009 samples.

8 ⁶A value of zero was used for calculation of the mean.

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Table S6. Region of sample collection, coordinates, date of collection, depth, and sampling technique utilized for 2005 *Oden* Cruise through the Bering Strait to Southern Greenland.

Ocean	Region	Nearby Rivers/sources	Date	Code	Latitude	Longitude	depth (m)	Sampler	Water Temp (°K)	Salinity (psu)
Northwest Atlantic	Labrador Sea	-	11-Jul-05	1	59°46.00'N	45°25.20'W	8	in line	282	35
Arctic	Davis Strait	-	12-Jul-05	2	62°53.41'N	52°14.42'W	8	in line	275	32
Arctic	Davis Strait	-	13-Jul-05	3	63°12.48'N	52°35.84'W	8	in line	276	34
Arctic	Baffin Bay	-	15-Jul-05	4	68°47.23'N	59°7.79'W	8	in line	276	33
Arctic	Baffin Bay	-	15-Jul-05	5	69°56.13'N	62°05.01'W	8	in line	272	30
Arctic	Baffin Bay	-	16-Jul-05	6	71°35.27'N	68°17.22'W	8	in line	275	29
Arctic	Baffin Bay	-	16-Jul-05	7	72°27.05'N	70°55.56'W	8	in line	275	29
Arctic	Baffin Bay	-	17-Jul-05	8	73°50.29'N	78°17.35'W	8	in line	276	32
Arctic	Lancaster Sound	-	17-Jul-05	12	74°16.04'N	87°29.60'W	8	in line	277	31
Arctic	Lancaster Sound	-	17-Jul-05	13	74°25.67'N	90°0.81'W	8	in line	272	29
Arctic	Lancaster Sound	-	17-Jul-05	14	74°25.67'N	90°0.81'W	8	in line	n.a.	n.a.
Arctic	Barrow Strait	-	18-Jul-05	15	74°10.77'N	95°40.15'W	8	in line	272	29
Arctic	Barrow Strait	-	18-Jul-05	17	74°42.19'N	95°47.64'W	20	Rosette	n.a.	n.a.
Arctic	Victoria Strait	-	25-Jul-05	19	68°25.80'N	110°38.88'W	8	in line	274	28
Arctic	Amundsen Gulf	-	26-Jul-05	21	70°9.18'N	122°28.98'W	8	in line	276	28
Arctic	Mackenzie Bay	Near Mackenzie R.	27-Jul-05	22	70°28.43'N	133°43.38'W	8	in line	278	21
Arctic	Coronation Gulf	-	25-Jul-05	23	68°38.20'N	113°31.98'W	8	in line	272	23
Arctic	Amundsen Gulf	-	26-Jul-05	24	70°24.12'N	124°4.86'W	32	Rosette	n.a.	n.a.
Arctic	Mackenzie Bay	Near Mackenzie R.	27-Jul-05	25	70°27.00'N	137°51.66'W	2	Rosette	n.a.	n.a.
Arctic	Mackenzie Bay	Near Mackenzie R.	27-Jul-05	26	70°22.46'N	135°18.66'W	8	in line	279	16
Arctic	Chukchi Sea	-	31-Jul-05	27	69°53.61'N	165°15.66'W	8	in line	282	31
Arctic	Bering Strait	-	1-Aug-05	28	65°41.58'N	168°22.50'W	8	in line	282	30
Arctic	Bering Strait	-	5-Aug-05	30	65°46.35'N	168°40.56'W	8	in line	277	33

n.a.-not available

Table S7. Region of sample collection, coordinates, date of collection, depth, and sampling technique utilized for 2008 *Amundsen* Cruise in North Baffin Bay/Lancaster Sound.

Ocean	Region	Nearby Rivers/sources	Date	Code	Latitude	Longitude	depth (m)	Sampler	Water Temp (°K)	Salinity (psu)
Arctic	Lancaster Sound	-	07-Sep-08	303	74°14.23'N	89°40.20'W	surface	pail	273	31
Arctic	Lancaster Sound	-	10-Sep-08	137	74° 56.20'N	69°04.20'W	surface	pail	277	32
Arctic	Baffin Bay	-	16-Sep-08	205	77°9.95'N	77°42.60'W	surface	pail	272	28
Arctic	Baffin Bay	-	18-Sep-08	126	77°20.69'N	73°25.68'W	surface	pail	276	32

Table S8. Region of sample collection, coordinates, date of collection, depth, and sampling technique utilized for 2007 *Oden* Cruise from the Bay of Biscay to Argentina.

Ocean	Region	Nearby Rivers/sources	Date	Code	Latitude	Longitude	depth (m)	Sampler	Water Temp (°K)	Salinity (psu)
North Atlantic	Northeast Atlantic	Bay of Biscay	26-Oct-07	1	45°49.31'N	08°14.48'W	8	in line	290	35
North Atlantic	East Atlantic	-	27-Oct-07	2	42°10.70'N	10°35.25'W	8	in line	291	35
North Atlantic	East Atlantic	-	27-Oct-07	3	38°48.52'N	12°38.22'W	8	in line	293	36
North Atlantic	East Atlantic	-	28-Oct-07	4	34°39.98'N	15°03.90'W	8	in line	294	36
North Atlantic	East Atlantic	Near Madeiras	29-Oct-07	5	31°02.58'N	17°53.77'W	8	in line	293	37
North Atlantic	East Atlantic	Near Canary Is	30-Oct-07	6	27°18.35'N	19°00.30'W	8	in line	294	37
North Atlantic	East Atlantic	-	31-Oct-07	7	23°36.61'N	20°33.85'W	8	in line	296	37
North Atlantic	East Atlantic	-	1-Nov-07	8	22°38.90'N	22°17.13'W	8	in line	297	37
North Atlantic	East Atlantic	Near Cape Verde	2-Nov-07	10	12°17.22'N	25°12.85'W	8	in line	301	36
North Atlantic	Mid Atlantic	-	4-Nov-07	11	08°27.06'N	26°48.55'W	8	in line	301	36
South Atlantic	Mid Atlantic	-	6-Nov-07	14	00°03.78'S	30°18.29'W	8	in line	300	36
South Atlantic	South western Atlantic	-	8-Nov-07	16	05°11.34'S	32°02.88'W	8	in line	300	37
South Atlantic	South western Atlantic	Near Recife	9-Nov-07	17	08°09.58'S	32°56.63'W	8	in line	299	37
South Atlantic	South western Atlantic	-	10-Nov-07	18	11°21.66'S	34°28.60'W	8	in line	300	37
South Atlantic	South western Atlantic	-	11-Nov-07	19	15°03.94'S	36°02.96'W	8	in line	300	38
South Atlantic	South western Atlantic	-	12-Nov-07	20	19°05.91'S	37°32.86'W	8	in line	299	37
South Atlantic	South western Atlantic	-	13-Nov-07	21	22°40.12'S	39°42.58'W	8	in line	298	36
South Atlantic	South western Atlantic	Near Rio de Janeiro	14-Nov-07	22	25°28.11'S	42°40.17'W	8	in line	297	36
South Atlantic	South western Atlantic	-	16-Nov-07	23	28°55.05'S	46°33.50'W	8	in line	295	36
South Atlantic	South western Atlantic	-	17-Nov-07	24	58°09.00'S	50° 07. 60'W	8	in line	294	36
South Atlantic	South western Atlantic	East of Rio de la Plata	18-Nov-07	25	34°48.59'S	53°50.95'W	8	in line	290	34
South Atlantic	South western Atlantic	East of Rio de la Plata	20-Nov-07	26	35°25.08'S	55°04.02'W	8	in line	291	34
South Atlantic	South western Atlantic	-	21-Nov-07	27	39°08.50'S	57°15.05'W	8	in line	285	35
South Atlantic	South western Atlantic	-	22-Nov-07	28	42°38.80'S	60° 59.90'W	8	in line	285	35
South Atlantic	South western Atlantic	-	24-Jan-07	29	48°41.02'S	65°42.07'W	8	in line	283	34
South Atlantic	South western Atlantic	Near Rio Gallegos	25-Nov-07	30	51°56.02'S	67°34.06'W	8	in line	283	34

Table S9. Region of sample collection, coordinates, date of collection, depth, and sampling technique utilized for 2009 *Endeavor* Cruise from Namibia to Rhode Island.

Ocean	Region	Nearby Rivers/sources	Date	Code	Latitude	Longitude	depth (m)	Sampler	Water Temp (°K)	Salinity (psu)
North Atlantic	Narragansett Bay	Narragansett	3-Aug-09	NB	41°29.53'N	71°25.12'W	8	in line	n.a.	n.a.
North Atlantic	Western Atlantic	Rhode Is Sound	29-Jul-09	34	41°14.61'N	71°20.81'W	8	in line	294	31
North Atlantic	Western Atlantic	-	28-Jul-09	33	40°51.39'N	71°17.42'W	8	in line	294	33
North Atlantic	Western Atlantic	-	28-Jul-09	32	39°57.21'N	71°00.64'W	8	in line	298	34
North Atlantic	Western Atlantic	-	28-Jul-09	31	39°02.17'N	70°45.28'W	8	in line	297	36
North Atlantic	Western Atlantic	-	28-Jul-09	30	38°09.84'N	70°31.74'W	8	in line	298	35
North Atlantic	Western Atlantic	-	27-Jul-09	29	37°17.93'N	70°15.93'W	8	in line	301	36
North Atlantic	Western Atlantic	-	27-Jul-09	28	36°14.66'N	70°00.74'W	8	in line	300	36
North Atlantic	Western Atlantic	-	27-Jul-09	27	35°20.38'N	69°47.37'W	8	in line	300	36
North Atlantic	Sargasso Sea	-	27-Jul-09	26	34°33.61'N	69°33.45'W	8	in line	300	36
North Atlantic	Sargasso Sea	-	26-Jul-09	25	33°38.29'N	69°17.74'W	8	in line	301	36
North Atlantic	Sargasso Sea	-	26-Jul-09	24	32°48.67'N	69°7.71'W	8	in line	301	36
North Atlantic	Sargasso Sea	-	26-Jul-09	23	31°53.78'N	68°51.07'W	8	in line	301	37
North Atlantic	Sargasso Sea	-	26-Jul-09	22	30°54.13'N	68°28.29'W	8	in line	301	37
North Atlantic	Sargasso Sea	-	25-Jul-09	21	29°59.90'N	67°59.61'W	8	in line	302	37
North Atlantic	Sargasso Sea	-	25-Jul-09	20	29°26.12'N	63°37.05'W	8	in line	302	36
North Atlantic	Sargasso Sea	-	25-Jul-09	19	28°20.60'N	67°01.61'W	8	in line	301	37
North Atlantic	Sargasso Sea	-	25-Jul-09	18	27°32.92'N	66°33.30'W	8	in line	302	37
North Atlantic	Sargasso Sea	-	25-Jul-09	17	26°44.39'N	66°52.25'W	8	in line	302	37
North Atlantic	Sargasso Sea	-	24-Jul-09	16	25°50.26'N	65°36.38'W	8	in line	303	37
North Atlantic	South western Atlantic	-	23-Jul-09	15	22°26.30'N	63°49.22'W	8	in line	302	37
North Atlantic	South western Atlantic	North of Amazon R.	18-Jul-09	14	11°24.70'N	56°27.60'W	8	in line	302	30
North Atlantic	South western Atlantic	North of Amazon R.	17-Jul-09	13	09°32.16'N	52°49.48'W	8	in line	302	29
North Atlantic	South western Atlantic	North of Amazon R.	16-Jul-09	12	08°28.00'N	50°53.64'W	8	in line	303	25
North Atlantic	South western Atlantic	North of Amazon R.	15-Jul-09	11	06°31.76'N	47°21.85'W	8	in line	302	34
North Atlantic	South western Atlantic	-	14-Jul-09	10	04°04.46'N	42°59.36'W	8	in line	301	36
North Atlantic	South western Atlantic	-	13-Jul-09	9	03°05.09'N	41°14.86'W	8	in line	301	36
South Atlantic	Mid Atlantic	-	11-Jul-09	8	03°52.77'S	29°04.02'W	8	in line	300	36
South Atlantic	Mid Atlantic	-	10-Jul-09	7	04°51.36'S	27°20.67'W	8	in line	301	36
South Atlantic	Central South Atlantic	-	8-Jul-09	6	10°21.18'S	17°20.76'W	8	in line	300	36
South Atlantic	Central South Atlantic	-	7-Jul-09	5	12°00.57'S	13°45.80'W	8	in line	299	37
South Atlantic	Central South Atlantic	-	6-Jul-09	4	14°05.87'S	09°39.17'W	8	in line	297	37
South Atlantic	Central South Atlantic	-	4-Jul-09	3	17°34.40'S	00°58.20'W	8	in line	294	36
South Atlantic	South East Atlantic	-	3-Jul-09	2	19°06.10'S	03°27.30'E	8	in line	294	36
South Atlantic	South East Atlantic	-	2-Jul-09	1	21°11.00'S	09°16.00'E	8	in line	292	35

n.a.-not available

Table S10. Results for analysis of lab water blanks, field blanks and MDL estimates for seawater sampling (pg/L). PFBS, PFTrDA, and PFTeDA were not detected in blanks, therefore MDLs are concentrations producing a signal to noise ratio of greater than 3.

Cruise	Sample name	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDODA	ΣPFOS	PFHxS	FOSA
<i>Endeavor</i> – Atlantic (2009)	average stay blank ¹	35	22	12	4.3	2.4	1.0	0.5	7.0	1.1	2.2
	average travel blank ¹	43	27	19	6.3	2.7	1.1	0.2	2.7	1.3	3.2
	deviation	21%	25%	65%	46%	11%	12%	-54%	-62%	19%	46%
	Blank	2.8	0.87	3.1	0.62	0.39	1.3	0.06	0.74	0.48	0.92
	MDL	5.4	1.9	7.1	1.5	1.1	3.1	0.10	2.5	1.3	2.1
<i>Oden</i> – Atlantic (2007)	Blank	2.6	1.6	3.7	2.1	5.6	1.3	1.7	6.1	1.6	0.7
	MDL	4.6	3.1	5.7	3.6	25	3.3	3.9	19	4.1	1.6
<i>Oden</i> – Arctic (2005)	Blank	1.0	1.0	1.5	0.3	1.8	0.5	0.6	1.5	0.7	0.7
	MDL	2.4	5.3	2.6	0.5	8.2	0.7	1.1	4.1	2.1	1.3
<i>Amundsen</i> – North Baffin (2008)	Blank	23	11	18	5.7	10.4	4.4	5.9	32	2.9	0.6
	MDL	11	4.0	6.0	5.0	6.8	4.3	1.6	5.5	1.1	1.1
Resolute from under ice (2008)	Blank	2.4	4.5	5.0	2.3	2.7	0.98	2.7	8.0	1.2	2.2
	MDL	0.26	2.4	3.5	2.9	7.3	4.2	3.9	1.6	2.4	6.8

¹Stay blank refers to the same stock of water that was used as the travel blank, however it remained in the lab until analysis. Travel blank refers to water that was transported to the field.

Table S11. Individual and Σ PFAA concentrations (pg/L) for the 2009 *Endeavor* Cruise from Namibia to Rhode Island.

Sample	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFHxS	Σ PFOS	FOSA	Σ PFAAs
N. Bay.	510	320	1200	754	319	150	23	15	4	n.a.	310	2200	46	5800
34	150	110	250	130	25	10	n.d.	n.d.	n.d.	n.a.	51	190	7.9	920
33	63	53	80	63	8.6	6.3	n.d.	0.9	n.d.	n.a.	18	69	46	410
31	53	33	82	48	9.0	3.5	0.4	2.2	1.8	n.a.	13	46	5.3	300
32	110	82	120	98	14	7.7	0.2	1.3	1.6	n.a.	28	91	7.7	560
30	90	63	130	130	14	6.9	n.d.	n.d.	n.d.	n.a.	26	93	9.2	560
29	32	21	30	16	5.7	1.6	n.d.	n.d.	n.d.	n.a.	5.4	26	8.3	150
28	32	21	43	25	5.7	2.8	n.d.	n.d.	n.d.	n.a.	5.8	25	3.1	160
27	31	18	42	27	4.8	1.9	n.d.	n.d.	n.d.	n.a.	5.3	23	3.1	160
26	36	25	39	26	5.9	2.2	0.8	n.d.	n.d.	n.a.	7.3	27	2.4	170
25	31	21	49	26	5.5	1.0	0.3	n.d.	n.d.	n.a.	5.9	26	2.3	170
24	24	14	21	3.8	3.1	1.5	n.d.	n.d.	n.d.	n.a.	1.6	13	1.1	83
23	28	19	34	19	4.1	2.3	n.d.	n.d.	n.d.	n.a.	5.8	23	5.5	140
22	22	18	37	21	4.9	1.6	1.4	n.d.	n.d.	n.a.	7.1	28	3.4	140
20	25	21	44	20	4.2	1.6	0.9	n.d.	n.d.	n.a.	6.0	22	1.9	150
21	25	19	40	18	4.8	2.9	n.d.	n.d.	n.d.	n.a.	5.4	21	1.7	140
19	42	30	45	25	5.3	0.0	n.d.	n.d.	n.d.	n.a.	6.0	32	3.6	190
18	25	15	34	20	5.6	2.3	n.d.	n.d.	n.d.	n.a.	4.5	27	3.7	140
17	32	20	31	20	4.7	2.3	0.7	n.d.	n.d.	n.a.	4.1	23	6.9	150
16	22	18	36	13	5.4	2.0	0.3	n.d.	n.d.	n.a.	4.0	21	4.3	130
15	24	12	24	16	5.2	1.2	0.2	n.d.	n.d.	n.a.	4.7	21	4.8	110
14	36	23	32	10	8.0	0.3	n.d.	n.d.	n.d.	n.a.	3.1	24	3.0	140
13	14	7	18	5.5	4.0	0.4	n.d.	n.d.	n.d.	n.a.	1.4	13	14	77
12	45	24	30	12	4.3	1.5	n.d.	n.d.	n.d.	n.a.	4.9	32	11	170
11	51	31	26	11	5.8	0.0	n.d.	n.d.	n.d.	n.a.	2.7	20	19	170
10	23	14	26	8.4	6.5	0.3	n.d.	n.d.	n.d.	n.a.	2.8	17	7.0	110
9	28	14	24	7.0	9.3	0.0	n.d.	n.d.	n.d.	n.a.	2.0	14	2.0	100
8	75	51	30	11	5.2	0.5	n.d.	n.d.	n.d.	n.a.	3.0	29	2.3	210
7	43	24	24	9.0	6.7	0.3	n.d.	n.d.	n.d.	n.a.	3.3	24	5.9	140
6	31	21	27	8.0	4.5	1.0	n.d.	n.d.	n.d.	n.a.	4.2	26	5.1	130
5	29	17	17	6.2	5.2	0.3	n.d.	n.d.	n.d.	n.a.	2.7	18	4.7	100
4	18	12	18	5.4	3.3	0.1	n.d.	n.d.	n.d.	n.a.	2.8	23	3.2	90
3	25	21	25	19	4.3	2.4	n.d.	n.d.	n.d.	n.a.	4.5	20	11	130
2	43	29	24	8.0	4.1	0.1	n.d.	n.d.	n.d.	n.a.	2.5	18	3.3	130
1	40	23	27	11	4.6	0.5	n.d.	n.d.	n.d.	n.a.	2.5	30	5.3	140

n.a.-not included in analysis.

n.d.-not detected

Table S12. Individual and Σ PFAA concentrations (pg/L) for the 2007 *Oden* Cruise from the Bay of Biscay to Argentina. Values shown represent the average of n=2 samples/location.

Sample	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDODA	PFTrDA	PFTeDA	PFBS	PFHxS	Σ PFOS	FOSA	Σ PFAAs
1	110	78	260	46	24	12	39	n.d.	n.d.	180	33	180	n.d.	960
2	96	54	180	50	24	16	36	17	n.d.	160	30	150	n.d.	800
3	47	n.d.	96	26	7.7	7.6	7.3	2.0	5.9	7.0	11	61	0.5	280
4	96	54	200	62	16	24	94	n.d.	n.d.	130	31	120	n.d.	830
5	95	58	180	70	19	19	20	17	n.d.	190	26	160	n.d.	860
6	110	73	210	54	19	23	51	n.d.	n.d.	220	36	190	n.d.	980
7	17	20	35	15	17	3.7	6.0	n.d.	n.d.	n.d.	9.0	43	1.8	170
8	51	18	89	22	14	11	25	n.d.	n.d.	88	17	78	n.d.	410
10	41	18	41	9.1	9.2	4.3	2.8	6.0	7.8	n.d.	5.2	52	1.0	200
11	12	n.d.	23	3.1	3.4	2.9	1.8	1.4	4.4	1.7	1.4	30	n.d.	85
14	n.d.	10	32	5.8	7.9	1.9	5.3	10	13	n.d.	4.8	38	1.3	130
16	17	5.4	22	3.1	30	5.4	5.7	5.0	3.3	n.d.	5.0	18	n.d.	120
17	10	5.4	26	3.7	9.1	14	55	24	n.d.	50	8.0	41	n.d.	250
18	2.8	5.5	10	13	2.9	3.5	3.2	n.d.	4.1	n.d.	2.2	18	n.d.	66
19	5.7	8.3	12	2.4	7.1	5.4	15	8.7	n.d.	n.d.	n.d.	33	1.9	99
20	5.9	5.6	13	2.5	7.0	3.7	6.6	9.9	n.d.	n.d.	n.d.	23	2.7	79
21	3.9	3.9	5.2	9.2	7.0	4.7	1.6	n.d.	6.2	n.d.	1.9	32	n.d.	80
22	4.3	4.4	7.0	10	5.8	3.3	1.3	n.d.	7.5	n.d.	2.3	38	n.d.	84
23	7.6	6.4	14	6.8	6.1	4.7	4.1	n.d.	n.d.	n.d.	n.d.	24	n.d.	74
24	11	5.5	13	15	4.0	2.3	2.1	n.d.	7.6	n.d.	4.3	44	n.d.	110
25	36	n.d.	100	8.3	24	92	46	0.2	17	28	16	170	n.d.	540
26	37	n.d.	110	9.0	7.5	4.2	n.d.	2.2	4.6	20	16	140	2.8	350
27	3.9	3.0	3.0	7.2	7.9	7.2	6.3	n.d.	5.5	n.d.	3.7	37	n.d.	85
28	9.7	7.1	6.9	4.1	5.8	2.3	5.8	n.d.	n.d.	n.d.	n.d.	45	n.d.	87
29	7.8	1.7	7.6	2.8	4.1	6.7	5.0	1.8	n.d.	n.d.	n.d.	22	n.d.	60
30	8.0	1.5	4.5	3.7	3.6	2.2	3.8	n.d.	4.6	n.d.	1.7	19	n.d.	52

n.d.-not detected

Table S13. Individual and Σ PFAA concentrations (pg/L) for all Arctic sampling locations

Sample	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFHxS	Σ PFOS	FOSA	Σ PFAA
30	45	64	32	6.0	8.4	4.3	n.d.	n.d.	n.d.	n.a.	15	27	3.5	210
28	11	56	37	5.5	n.d.	0.9	n.d.	n.d.	n.d.	n.a.	4.5	14	n.d.	130
27	22	37	39	6.2	12	4.1	1.9	2.5	3.3	n.a.	2.6	15	n.d.	150
26	24	24	26	13	n.d.	3.2	n.d.	2.5	2.5	n.a.	3.6	11	n.d.	110
25	21	12	33	13	n.d.	3.2	1.2	2.7	1.4	n.a.	n.d.	9.5	n.d.	97
24	5.2	11	23	2.0	n.d.	5.3	n.d.	n.d.	n.d.	n.a.	12	27	11	97
23	17	18	25	7.7	8.4	3.1	2.1	1.7	1.3	n.a.	19	29	6.3	140
22	18	41	29	11	n.d.	1.0	n.d.	n.d.	n.d.	n.a.	5.1	9.1	n.d.	114
21	4.6	20	22	10	n.d.	n.d.	n.d.	n.d.	n.d.	n.a.	n.d.	9.5	1.4	68
19	6.1	12	6.5	1.9	n.d.	13	n.d.	n.d.	n.d.	n.a.	n.d.	n.d.	n.d.	40
17	18	18	33	6.0	33	9.7	4.2	n.d.	3.1	n.a.	3.3	20	2.6	150
15	48	53	35	15	9.7	4.0	7.2	11	14	n.a.	0.7	28	2.3	230
R08	3.0	84	47	47	7.5	12	6.5	n.d.	n.d.	n.a.	3.0	29	n.d.	240
14	23	17	28	8.4	16	5.9	3.2	6.4	4.0	n.a.	1.2	16	n.d.	130
13	14	41	15	7.4	11	79	32	n.d.	n.d.	n.a.	n.d.	n.d.	44	240
303	65	37	54	15	16	8.4	6.6	3.9	3.3	n.a.	2.8	32	3.1	250
12	14	23	20	4.8	21	4.6	2.0	6.1	1.5	n.a.	1.0	8.8	n.d.	110
137	20	19	27	7.9	2.3	7.2	n.d.	3.2	0.9	n.a.	6.2	15	2.6	110
8	23	20	26	3.7	n.d.	3.6	2.2	3.1	4.3	n.a.	0.7	14	n.d.	100
205	22	18	28	6.6	n.d.	n.d.	2.3	n.d.	3.3	n.a.	8.1	14	n.d.	100
126	24	31	41	13	12	13	10	21	3.1	n.a.	8.0	28	2.2	210
7	n.d.	29	23	7.8	n.d.	2.8	18	n.d.	n.d.	n.a.	1.0	9.4	2.7	94
6	4.7	13	24	4.3	n.d.	20	n.d.	n.d.	n.d.	n.a.	15	n.d.	n.d.	81
5	7.9	17	21	n.d.	n.d.	33	20	n.d.	n.d.	n.a.	13	39	13	160
4	23	19	32	9.5	24	17	6.8	8.3	9.1	n.a.	3.8	18	1.3	170
3	26	21	29	3.0	9.5	1.5	n.d.	1.6	0.8	n.a.	n.d.	10	n.d.	100
2	9.5	49	35	9.1	n.d.	1.8	n.d.	n.d.	n.d.	n.a.	5.6	20	7.5	140
1	2.9	28	23	3.1	n.d.	1.2	n.d.	n.d.	n.d.	n.a.	1.6	11	2.4	73

n.a.-not included in analysis.

n.d.-not detected

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