

## Supporting Information

### **Sensitive iodine speciation in seawater by multi-mode size-exclusion chromatography with sector-field ICP-MS**

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**Table 1S** Analytical results of total iodine and dissolved iodine species in seawater collected at Stn. 1 in the North Pacific off Aomori, Japan

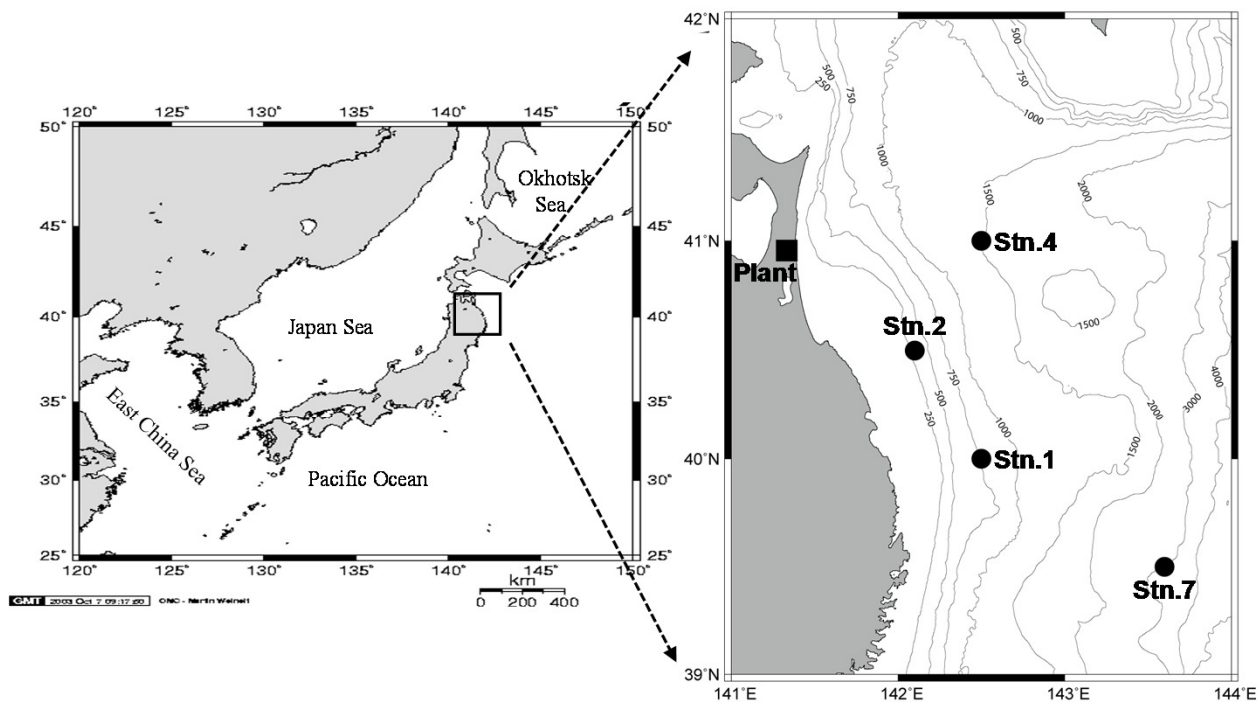
Depth (m)	TI ( $\mu\text{M}$ )	$\text{IO}_3^-$ ( $\mu\text{M}$ )	$\text{I}^-$ ( $\mu\text{M}$ )	TII ( $\mu\text{M}$ )	DOI ( $\mu\text{M}$ )	Iodate (%)	Iodide (%)	DOI (%)
0	0.499 $\pm$ 0.010	0.331	0.094	0.425	0.074	66.3	18.8	14.9
5	0.495 $\pm$ 0.009	0.328	0.100	0.428	0.066	66.4	20.2	13.4
10	0.500 $\pm$ 0.010	0.389	0.096	0.485	0.015	77.7	19.3	3.0
20	0.497 $\pm$ 0.009	0.376	0.065	0.441	0.055	75.8	13.1	11.2
30	0.486 $\pm$ 0.006	0.385	0.064	0.449	0.037	79.2	13.1	7.7
40	0.502 $\pm$ 0.013	0.345	0.066	0.412	0.091	68.8	13.2	18.1
50	0.504 $\pm$ 0.009	0.366	0.065	0.431	0.073	72.8	12.8	14.4
60	0.503 $\pm$ 0.006	0.370	0.062	0.432	0.071	73.6	12.3	14.2
75	0.483 $\pm$ 0.007	0.378	0.059	0.437	0.046	78.3	12.2	9.5
100	0.503 $\pm$ 0.017	0.379	0.058	0.437	0.066	75.4	11.5	13.1
150	0.505 $\pm$ 0.008	0.361	0.057	0.418	0.087	71.5	11.3	17.2
200	0.514 $\pm$ 0.012	0.382	0.044	0.426	0.087	74.4	8.6	17.0
250	0.509 $\pm$ 0.020	0.401	0.044	0.445	0.063	78.9	8.7	12.4
300	0.507 $\pm$ 0.007	0.392	0.042	0.433	0.074	77.3	8.2	14.5
500	0.527 $\pm$ 0.010	0.403	0.041	0.444	0.083	76.5	7.8	15.7
700	0.537 $\pm$ 0.013	0.413	0.009	0.423	0.114	77.0	1.7	21.3

TI: total iodine; TII: total inorganic iodine, which equals to the sum of iodate and iodide concentrations. DOI: dissolved organic iodine. Concentrations of iodate and iodide are the mean of duplicate determinations. DOI was calculated from the difference between TI and TII. TI was obtained with triplicate measurements. Concentrations of  $\text{IO}_3^-$  and  $\text{I}^-$  were obtained with duplicate measurements.

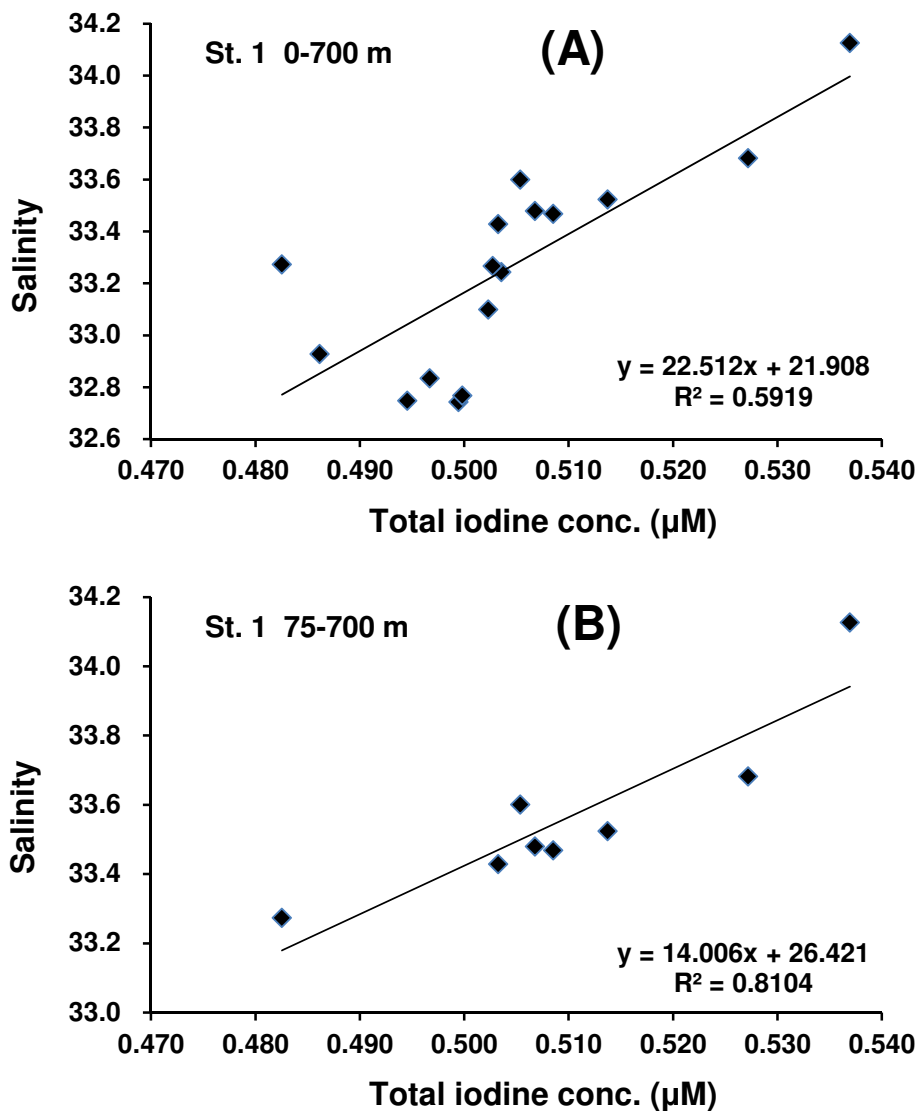
**Table 2S** Comparison of inorganic iodate and iodide separation using different chromatographic columns

Column	Separation mode	Mobile phase	IO <sub>3</sub> <sup>-</sup> RT(s)	I <sup>-</sup> RT(s)
IonPac CG 5A	cation-exchange	30 mM ammonium bicarbonate, 1.1 ml/min	23 ± 1	183 ± 1
ICS-A2H	anion-exchange	30 mM ammonium bicarbonate, 1.1 ml/min	19 ± 1	98 ± 1
IonPac CG 5A+ICS-A2H	cation-exchange +anion-exchange	30 mM ammonium bicarbonate, 1.1 ml/min	36 ± 1	272 ± 2
ExcelPak ICS-A23	anion-exchange	30 mM ammonium bicarbonate, 1.1 ml/min	144 ± 1	867 ± 1
TCC2	cation concentrator	30 mM ammonium bicarbonate, 1.1 ml/min	11 ± 1	12 ± 1
TCC2+ICS-A2H	cation concentrator +anion-exchange	30 mM ammonium bicarbonate, 1.1 ml/min	25 ± 1	105 ± 1
AsahiPak GS-220 7C	multi-mode size-exclusion	50 mM malonic acid-37.5 mM TMAH, pH 6.9; 1.0 ml/min	157 ± 1	312 ± 1

\*RT: retention time, measured with 3 consecutive analyses.



**Fig. 1S** Map showing the location sites for coastal seawater samples and the location of nuclear fuel reprocessing plant. Seawater samples of Stn. 1 were used in this study for iodine speciation, and samples from other stations were used for the analysis of radionuclides, such as  $^{99}\text{Tc}$ ,  $^{137}\text{Cs}$  and Pu isotopes.



**Fig. 2S** Correlation between salinity and total iodine concentrations. (A) In the whole water column (0-700 m); (B) For the depths of 75-700 m. Total iodine concentrations were obtained with triplicate measurements using SF-ICP-MS.