

Supporting information

**Mercury in Molar Excess of Selenium Interfere with Thyroid Hormone
Function in Free-ranging Freshwater Fish**

Paulien J Mulder[†], Elisabeth Lie[‡], Grethe S Eggen[†], Tomasz M Ciesielski[†], Torunn Berg[§],
Janneche U Skaare^{‡,||}, Bjørn M Jenssen[†], and Eugen G Sørmo^{†,*}

[†] Department of Biology, Norwegian University of Science and Technology, Trondheim
Norway

[‡] Norwegian School of Veterinary Science, Oslo, Norway

[§] Department of Chemistry, Norwegian University of Science and Technology,
Trondheim, Norway

^{||} National Veterinary Institute, Oslo Norway

Corresponding author: eugen.sormo@bio.ntnu.no

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Table S1:

Mean \pm standard deviation wet weight tissue concentrations of trace elements in brown trout, *Salmon trutta*, from Lake Mjøsa and Lake Losna, Norway. Asterisks denote statistical differences between the populations (Student's *t*-test), *. $p < 0.05$, ** $p < 0.001$, *** $p < 0.0001$.

	Lake Mjøsa	Lake Losna
Hg muscle (mg/kg) ^A	0.69 \pm 0.29*	0.52 \pm 0.33
Hg liver (mg/kg)	1.74 \pm 0.92**	0.93 \pm 0.72
Cd muscle (μ g/kg) ^A	0.28 \pm 0.15	0.25 \pm 0.08
Cd liver (mg/kg)	0.12 \pm 0.07*	0.09 \pm 0.03
Se muscle (mg/kg) ^A	0.23 \pm 0.27	0.43 \pm 0.12***
Se liver (mg/kg)	5.93 \pm 5.10	13.92 \pm 9.92**
Fe muscle (mg/kg) ^A	3.29 \pm 1.46	2.87 \pm 0.84
Fe liver (mg/kg)	126.7 \pm 62.44	126.7 \pm 94.11
Cu muscle (mg/kg) ^A	0.35 \pm 0.11	0.30 \pm 0.07
Cu liver (mg/kg)	40.76 \pm 34.63	91.91 \pm 57.79***
Zn muscle (mg/kg) ^A	3.76 \pm 0.82	3.77 \pm 0.42
Zn liver (mg/kg)	32.42 \pm 8.22	35.28 \pm 15.71
As muscle (mg/kg) ^A	0.05 \pm 0.03	0.13 \pm 0.04*
As liver (mg/kg)	0.12 \pm 0.04**	0.06 \pm 0.04
Ag liver (mg/kg)	0.47 \pm 0.32	0.65 \pm 0.30*
Al muscle (mg/kg) ^A	0.07 \pm 0.06	0.25 \pm 0.27
Al liver (mg/kg)	0.32 \pm 0.32	0.39 \pm 0.16*

Table S1: Continued

	Lake Mjøsa	Lake Losna
Pb muscle ($\mu\text{g}/\text{kg}$) ^A	0.39 ± 0.25	$1.07 \pm 0.93^{***}$
Pb liver ($\mu\text{g}/\text{kg}$)	0.005 ± 0.003	$0.002 \pm 0.002^{***}$
Cr muscle ($\mu\text{g}/\text{kg}$)	1.61 ± 2.65	$4.12 \pm 3.38^*$
Cr liver (mg/kg)	0.012 ± 0.013	$0.018 \pm 0.013^*$
Co muscle ($\mu\text{g}/\text{kg}$) ^A	2.79 ± 1.10	$4.57 \pm 2.24^*$
Co liver (mg/kg)	0.023 ± 0.005	$0.030 \pm 0.007^{**}$

^ALake Mjøsa data from Sørmo et al.

Table S2:

Mean \pm standard deviation (*minimum-maximum*) wet weight muscle (ng/g) concentrations of polybrominated diphenyl ethers (BDEs), hexabromocyclododecane (HBCD) and polychlorinated biphenyls (PCBs) in brown trout, *Salmo trutta*, from Lake Mjøsa and Lake Losna, Norway. Asterisks denote statistical differences between the populations (Student's *t*-test), *.*p*<0.05, ***p*<0.001, ****p*<0.0001.

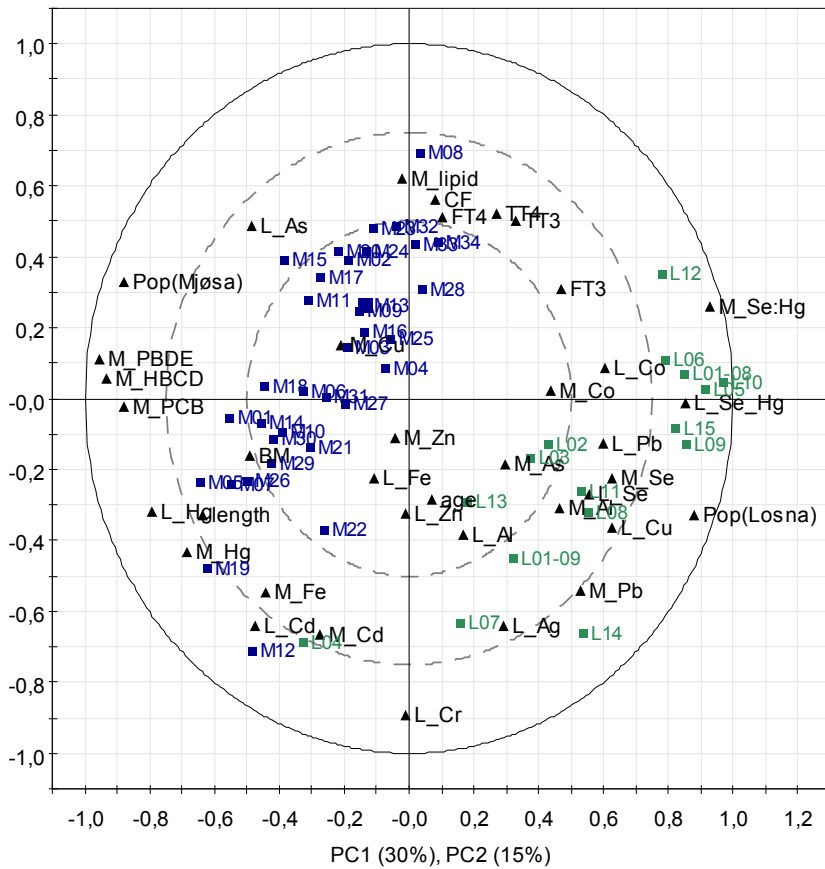
	Lake Mjøsa	Lake Losna
PBDEs		
BDE-28	0.33 \pm 0.19 (0.08-0.80)***	0.02 \pm 0.02 (<i>n.d.</i> -0.04)
BDE-47	122.4 \pm 83.15 (20.33-320.6)***	2.31 \pm 1.83 (0.39-6.08)
BDE-99	16.12 \pm 13.98 (1.51-55.95)***	1.71 \pm 1.86 (0.11-6.02)
BDE-100	28.11 \pm 14.97 (7.01-64.40)***	0.92 \pm 0.83 (0.16-2.74)
BDE-153	4.43 \pm 3.21 (0.62-13.83)***	0.92 \pm 0.83 (0.05-0.85)
BDE-154	7.25 \pm 4.31 (1.44-18.03)***	0.32 \pm 0.30 (0.05-0.99)
PCBs		
PCB-28	0.14 \pm 0.07 (0.05-0.35)	0.11 \pm 0.05 (0.05-0.18)
PCB-31	0.13 \pm 0.07 (<i>n.d.</i> -0.28)	0.14 \pm 0.05 (0.09-0.22)
PCB-47	0.19 \pm 0.10 (0.06-0.45)***	0.08 \pm 0.06 (<i>n.d.</i> -0.18)
PCB-52	1.27 \pm 0.69 (0.25-3.20)***	0.30 \pm 0.25 (<i>n.d.</i> -0.90)
PCB-66	0.80 \pm 0.40 (0.30-1.94)***	0.24 \pm 0.17 (<i>n.d.</i> -0.61)
PCB-74	0.69 \pm 1.56 (0.16-9.58)***	0.15 \pm 0.13 (0.04-0.39)
PCB-87	1.39 \pm 0.64 (0.57-3.21)***	0.33 \pm 0.23 (0.07-0.80)
PCB-99	1.80 \pm 0.96 (0.63-4.66)***	0.49 \pm 0.42 (0.11-1.51)

Table S2: Continued

	Lake Mjøsa	Lake Losna
PCB-101	2.83 ± 1.56 (0.92-8.03)***	1.00 ± 0.86 (0.24-3.04)
PCB-105	1.10 ± 0.55 (0.44-2.67)***	0.24 ± 0.20 (0.06 – 0.78)
PCB-110	5.52 ± 3.05 (n.d.-14.84)***	1.18 ± 0.92 (0.33-3.17)
PCB-114	1.32 ± 0.71 (0.52-3.38)***	0.42 ± 0.36 (0.11-1.40)
PCB-118	3.23 ± 1.64 (1.27-7.90)***	0.93 ± 0.82 (0.21 - 3.06)
PCB-128	1.21 ± 0.60 (0.48 -2.91)***	0.31 ± 0.26 (0.09-0.98)
PCB-136	0.27 ± 0.12 (0.12-0.63)***	0.08 ± 0.05 (0.03-0.18)
PCB-137	0.27 ± 0.15 (0.09-0.68)***	0.10 ± 0.07 (0.03-0.26)
PCB-138	10.78 ± 6.36 (3.52-29.31)***	3.17 ± 3.19 (0.66-11.83)
PCB-141	0.81 ± 0.43 (0.30-1.98)***	0.25 ± 0.24 (0.05-0.90)
PCB-149	2.83 ± 1.43 (n.d.-6.76)***	0.73 ± 0.48 (0.22-1.91)
PCB-151	1.33 ± 0.62 (0.51-3.20)***	0.37±0.31 (0.07-1.16)
PCB-153	12.03 ± 6.74 (4.67-30.63)***	3.97 ± 3.73 (0.79-14.19)
PCB-156	0.91 ± 0.60 (0.25-2.70)***	0.26 ± 0.27 (0.05-0.99)
PCB-157	0.32 ± 0.15 (n.d.-0.67)***	0.12 ± 0.09 (n.d.-0.33)
PCB-180	5.26 ± 3.24 (1.75-15.35)***	2.11 ± 2.24 (0.38-8.44)
PCB-183	1.23 ± 0.73 (0.41-3.53)**	0.54 ± 0.48 (0.10-1.70)
PCB-187	2.09 ± 1.14 (0.79-5.29)***	0.71 ± 0.68 (0.17-2.59)
PCB-189	0.07 ± 0.04 (0.03-0.18)*	0.04 ± 0.04 (n.d.-0.13)

Table S2: Continued

	Lake Mjøsa	Lake Losna
PCB-194	0.63 ± 0.41 (0.20-1.90)**	0.27 ± 0.30 (n.d.-1.14)
PCB-199	0.05 ± 0.02 (0.02-0.13)	0.04 ± 0.02 (0.03-0.08)
PCB-206	0.18 ± 0.10 (0.07-0.50)*	0.11 ± 0.09 (0.03-0.36)
PCB-209	0.06 ± 0.04 (n.d.-0.16)	0.07 ± 0.05 (n.d.-0.17)
HBCD	18.55 ± 12.68 (7.10-64.27)***	0.88 ± 0.82 (n.d.-2.54)



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Figure S1:

Principal component analysis (PCA) bi-plot loading plot of the variability in observations in brown trout, *Salmo trutta*, from Lake Mjøsa and Lake Losna, Norway. Individual Mjøsa and Losna trout are, respectively, labeled M+trout ID number (in blue) and L+trout ID (in green). Variable measurements in muscle and liver tissues are labeled M_variable and L_variable, respectively. Abbreviations, TT4 – total plasma thyroxine; FT4 – free plasma thyroxine; TT3 – total plasma triiodothyronine; and FT3 – free plasma triiodothyronine. Se:Hg – tissue selenium-mercury molar ratio; lipid – lipid content; CF = Fulton's condition factor; length – body length; BM – body mass; Pop – population; PBDE – total concentration of polybrominated diphenylethers; HBCD – total concentration of hexabromocyclododecane; PCB – total concentration of polychlorinated biphenyls.

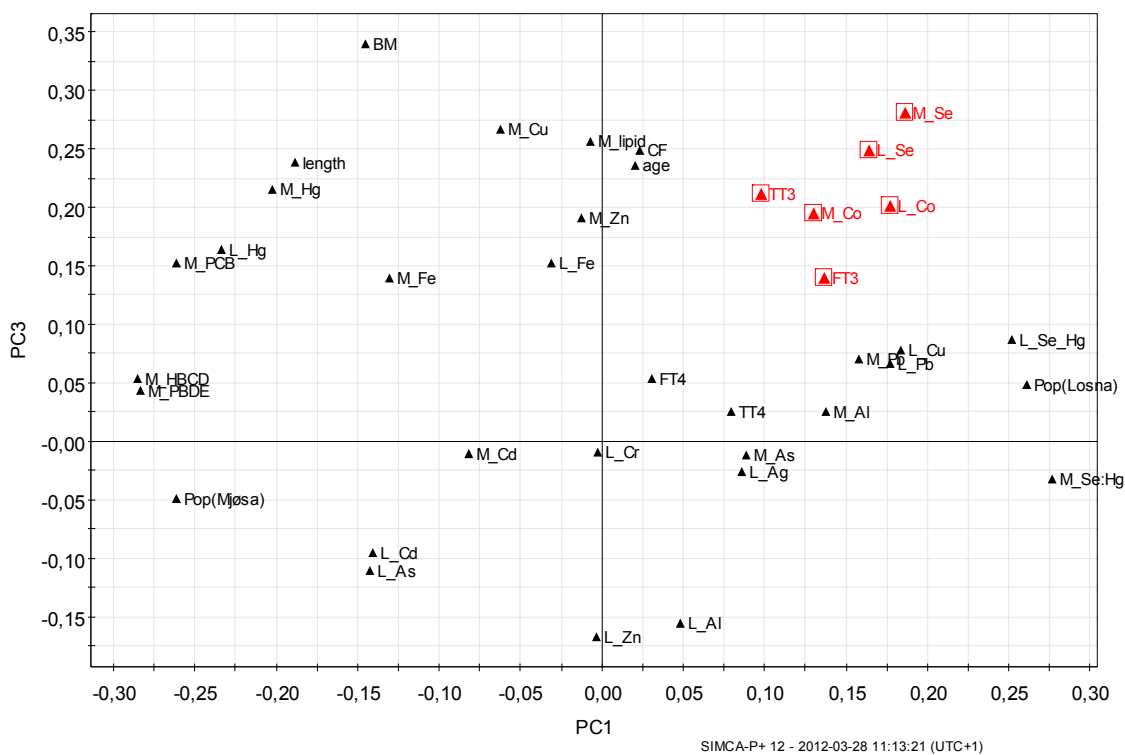


Figure S2:

Loading scatter plot, PC1 versus PC3 of the principal component analysis (PCA) of the variability in observations in brown trout, *Salmo trutta*, from Lake Mjøsa and Lake Losna, Norway, emphasizing (in red) the cluster of plasma concentrations of total and free triiodothyronine (TT3 and FT3, respectively) with tissue concentrations of Se and Co. Variable measurements in muscle and liver tissues are labeled M_variable and L_variable, respectively. See Fig. S1 for definition of acronyms.

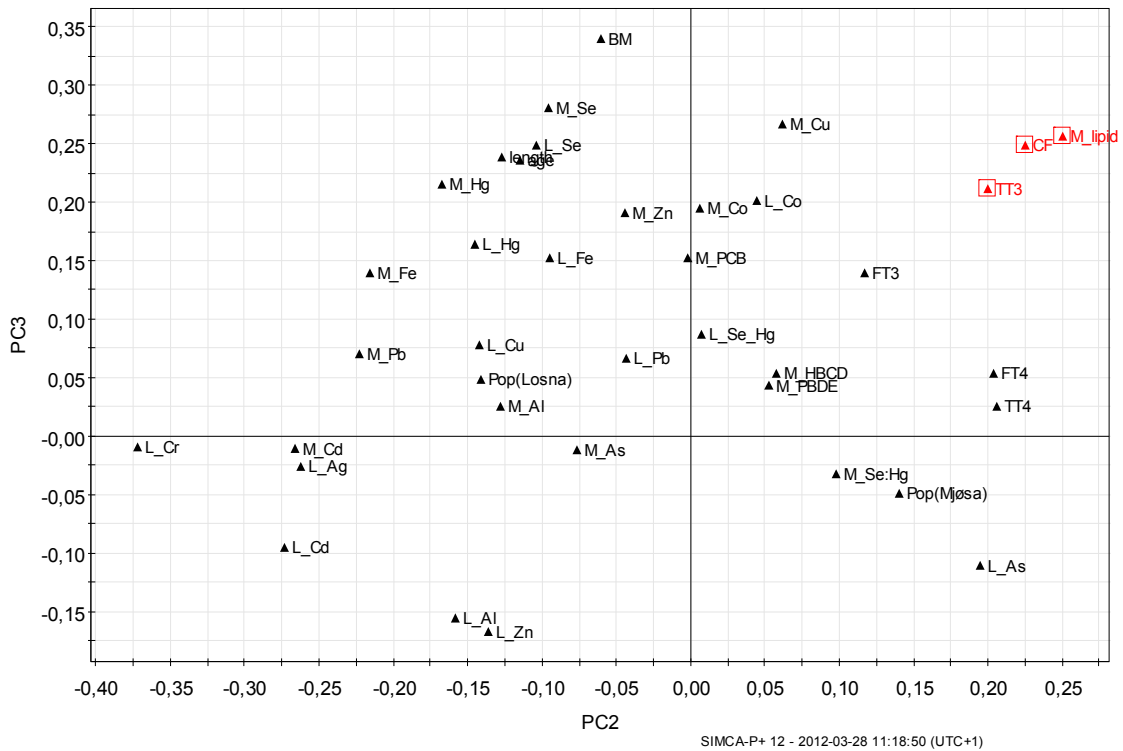


Figure S3:

Loading scatter plot, PC2 versus PC3 of the principal component analysis (PCA) of the variability in observations in brown trout, *Salmo trutta*, from Lake Mjøsa and Lake Losna, Norway, emphasizing the cluster (in red) of plasma concentrations of total triiodothyronine (TT3) with lipid content and condition factor. Variable measurements in muscle and liver tissues are labeled M_variable and L_variable, respectively. See Fig. S1 for definition of acronyms.

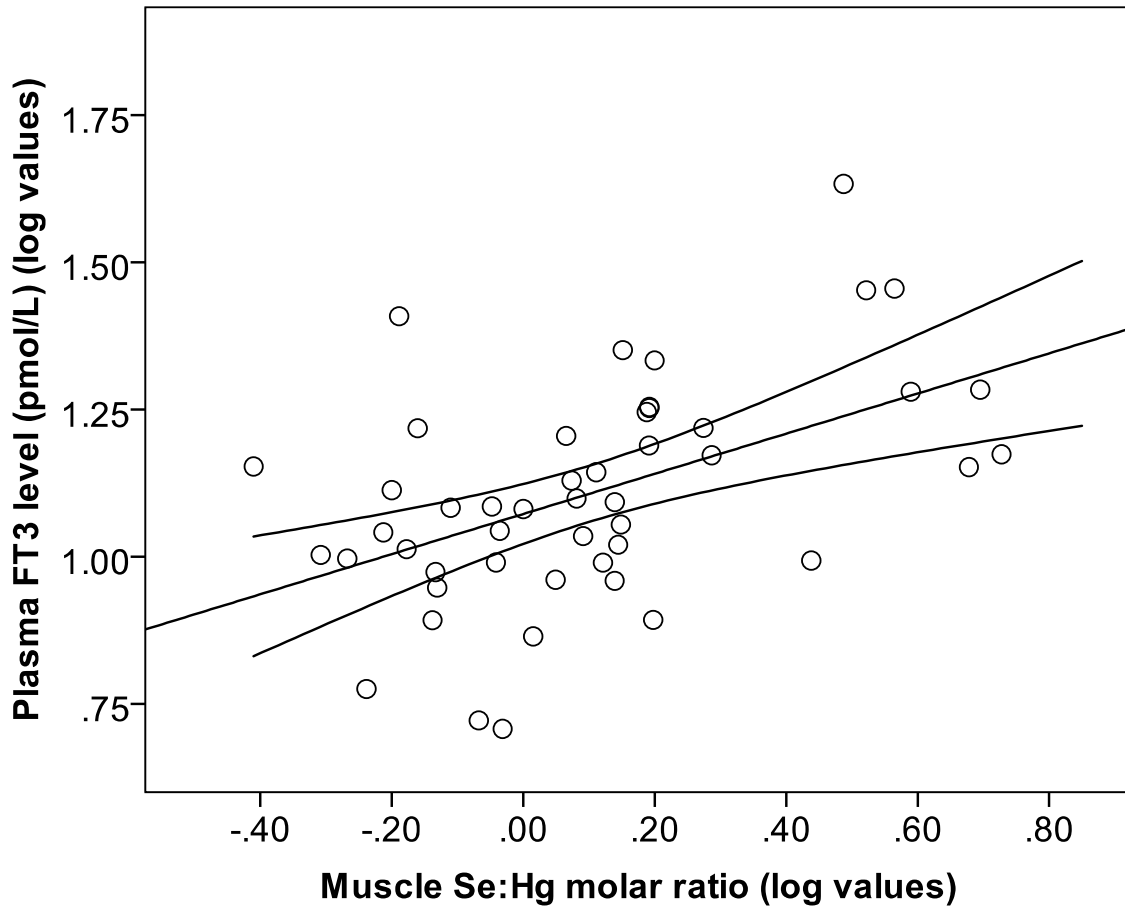


Figure S4.

Positive correlation (\pm 95% confidence intervals) between free plasma triiodothyronine (FT3) and muscle Se:Hg molar ratio in free-ranging brown trout, *Salmo trutta*, from Lake Mjøsa and Lake Losna, Norway.

Reference

Sørmo, E.G., Ciesielski, T.M.; Øverjordet, I.B.; Lienhagen, S.; Eggen, G.S.; Berg, T.;
Jenssen, B.M. Selenium moderates mercury toxicity in free-ranging freshwater fish.
Environ. Sci. Technol. **2011**, *45*, 6561-6566.