ITM
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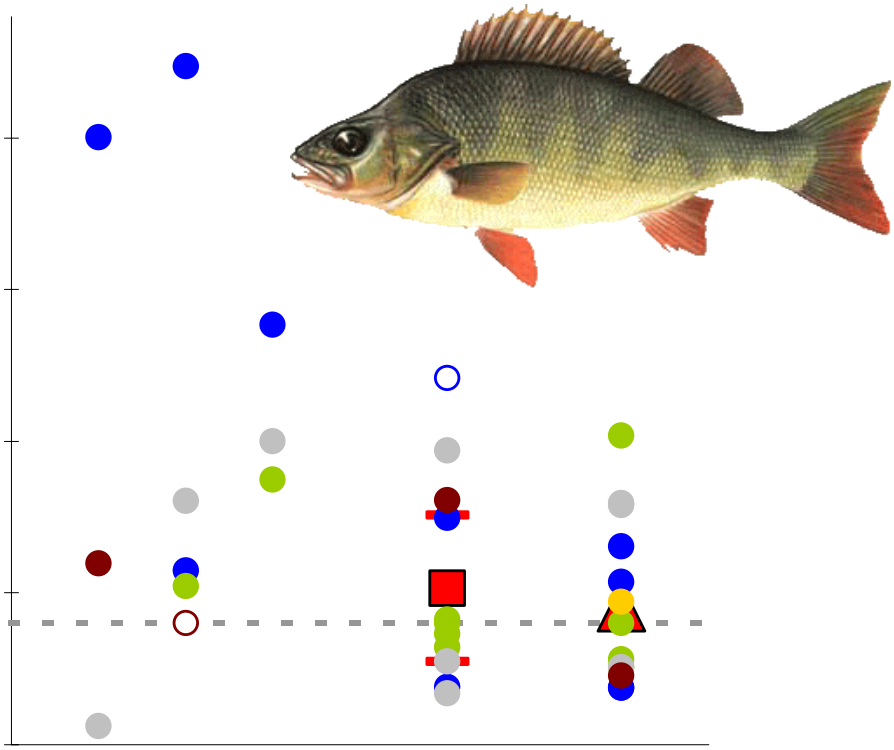
ITM-rapport 126

COMPARATIVE DETERMINATIONS OF METALS IN FISH

An interlaboratory trial

Karin Holm
Hans Borg



Institute of Applied Environmental Research (ITM)
Stockholm university Sweden

ITM report 126

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An interlaboratory trial

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Contents

Page

1. Background and purpose 5

2. Introduction 5

3. Samples 5

4. Statistical evaluation 6

5. Results 7

6. Discussion 9
   6.1 Precision 9
   6.2 Influence of the used methods 12
   6.3 Laboratories 13

7. Participants 16

Appendix 17

1. Background and purpose

The Institute of Applied Environmental Research (ITM) in Sweden was assigned by the Swedish Environmental Protection Agency, Naturvårdsverket (NV), to organize a project with the purpose to compare results of analyses from different laboratories regarding metals in fish liver and mercury in fish muscle. The analyses should be made on samples from perch from one of the national monitoring program lakes in southern Sweden, and the invited laboratories should primarily be laboratories that are potential performers in the program. The Contaminant Research Group at the Swedish Museum of Natural History was at the same time assigned to organize a similar project, regarding organic pollutants in fish muscle.

2. Introduction

The project was performed as an interlaboratory trial, where the participants should be compensated for costs. The invitation to participate was sent out at the beginning of July 2003. Five of the invited laboratories were selected by NV. In order to increase the statistical base, invitation was also sent to some laboratories in other sectors (e.g. food and medicine), and to a few outside Sweden. Thirteen laboratories wished to participate. Eight were from Sweden, three from Norway, one from Denmark and one from Canada. The participants are listed in Chapter 7. The samples were sent out in the beginning of September. The laboratories were asked to analyze Hg in fish muscle samples and Al, As, Cd, Cr, Cu, Ni, Pb and Zn in fish liver samples as first priority. They were also asked to analyze Ag, Bi, In, Sb, Se, Sn Tl, U and W in fish liver samples if possible. Results of the analyses should be sent to ITM at the beginning of November. A preliminary report with results and statistics was presented at the end of December 2003.

3. Samples

The samples were perch muscle and liver from one of the reference lakes in the national monitoring program, situated in southern Sweden, and also some certified reference materials. The perch samples were taken from the environmental specimen bank at the Swedish Museum of Natural History. The livers were freeze dried and homogenized at ITM. The muscle samples, that were also used for the organic pollutants, were homogenized at the museum and thereafter portioned and freeze dried at ITM. The certified reference materials were DOLT-2 and DOLT-3 (dried homogenized dogfish liver) and also DORM-2 (dried homogenized dogfish muscle) from the National Research Council of Canada. DOLT-2 is certified for Al, As, Cd, (Co,) Cr, Cu, (Fe,) Pb, (Mn, Hg,) Ni, Se, Ag, Zn and has an information value for Sn. DOLT-3, that is the successor of DOLT-2, is certified for As, Cd, Cu, (Fe,) Pb, (Hg,) Ni, Se, Ag, Zn and has information values for Al, Cr and Sn. DORM-2 is certified for Hg and a number of other elements (about the same set as for DOLT-2). Each laboratory received three subsamples (a triplicate) from the perch liver homogenate and three

from the perch muscle homogenate and also one sample of DOLT-2, DOLT-3 and DORM-2 respectively. The liver samples consisted of about 200 mg and the muscle samples of about 400 mg dry material.

Because of a limited amount of perch sample and a wish to have many participants in the project, it was not possible to make a homogeneity test before the samples were sent out.

4. Statistical evaluation

The laboratories were asked to report results with one more digit than they usually do, and they were also asked to report the actual result, even if it was below the generally applied detection limit of the method used. There are though, some results reported as "<".

For each element the mean and median values were calculated for all results from the ***perch samples***, and also the standard deviation and coefficient of variation. If a single result was outside three standard deviations from the mean value, it was considered as an outlier and excluded from the calculations. If a result was outside two standard deviations from the mean value, it was marked as a "straggler", but not excluded.

For each laboratory the triplicate mean value was calculated and also the standard deviation and coefficient of variation. If one or two of the triplicate results were outliers, the standard deviation was not calculated, but the mean value was.

Z-score for each laboratory was calculated as

(m – M) / S, where

m = triplicate mean (or duplicate mean or single result in case of excluded results)
M = mean value of all results
S = standard deviation of all results.

s/s mean for each laboratory was calculated, where

s = standard deviation of the triplicate
s mean = the mean value of all laboratory's triplicate s values.

s/s mean was not calculated if there were excluded results in the triplicate.

For the ***certified reference materials*** the mean and median values were calculated, and also the standard deviation and coefficient of variation. If a result was outside three standard deviations from the mean value, it was considered as an outlier and excluded from the

calculations. If a result was outside two standard deviations from the mean value, it was marked as a "straggler", but not excluded.

Z-score was calculated for all elements, and also **Z cert.** if a certified value was established for the element, as

(x – C) / t.l., where

x = a laboratory's result
C = the certified value
t.l. = the 95 % tolerance limit for the certified value.

5. Results

A summary of the statistics for the results is presented in Table 1 for the perch samples, and in Table 2 for the certified reference materials.

*Table 1. Results for the **perch samples**. Mean, median, standard deviation (s) and coefficient of variation (CV) for all results. Number of results included in the statistical evaluation (n), how many of these that are reported under detection limit (n<LOD) and how many results that are outliers and excluded from statistics (E). Mean, median, minimum and maximum values for each laboratory's coefficient of variation for the triplicate.*

	Mean µg/g	Median µg/g	s µg/g	CV %	n	n < LOD	E	Laboratory CV, %			
								Mean	Median	Min	Max
Hg	0.671	0.677	0.066	9.9	33		3	3.2	2.1	0.5	9.0
Al	54.12	53.50	4.32	8.0	28		2	4.9	4.0	0.7	13.9
As	0.505	0.488	0.059	11.6	29		1	4.9	4.2	1.6	8.0
Cd	10.39	10.28	0.77	7.4	38		1	1.7	1.3	0.4	3.7
Cr	0.0632	0.0469	0.0571	90.2	27	3	6	55.2	45.7	16.7	116.2
Cu	44.62	44.97	2.41	5.4	39			3.0	1.5	0.8	12.1
Ni	0.0689	0.0518	0.0494	71.7	34	8	2	34.2	31.8	6.5	63.1
Pb	0.623	0.645	0.154	24.8	39			4.2	3.3	0.2	11.8
Zn	129.2	128.1	9.4	7.3	37		2	2.9	1.2	0.9	12.9
Ag	0.352	0.322	0.082	23.4	24			2.8	2.0	0.5	6.5
Bi	0.0045	0.0042	0.0015	33.4	23	6	1	10.0	6.0	0.1	30.7
In	0.00116	0.00052	0.00149	128.5	18	11		33.7	29.3	8.9	65.1
Sb	0.00596	0.00604	0.00166	27.9	24	12	6	21.0	18.9	7.5	44.0
Se	7.69	7.40	1.69	22.0	33			5.2	3.7	0.4	14.9
Sn	0.0365	0.0264	0.0388	106.3	21	7	3	54.6	33.5	7.7	153.4
Tl	0.1348	0.1360	0.0145	10.8	29	2	1	2.3	1.8	0.3	6.1
U	0.0049	0.0052	0.0012	24.3	27	6		5.9	4.3	0.5	15.9
W	0.0035	0.0029	0.0041	116.6	21	14		45.7	55.6	10.0	83.6

*Table 2. Results for the **certified reference materials**. Mean, median, standard deviation (s) and coefficient of variation (CV) for all results. Number of results included in the statistical evaluation (n), how many of these that are reported under detection limit (n<LOD) and how many results that are outliers and excluded from statistics (E). Established certified values and their 95 % tolerance limits (±) or information values (in parenthesis).*

	DORM-2								
	Mean µg/g	**Median µg/g**	**s µg/g**	**CV %**	**n**	**n < LOD**	**E**	**Cert. v. µg/g**	**± µg/g**
Hg	4.26	4.20	0.39	9.3	11		1	4.64	0.26
	DOLT-2								
	Mean µg/g	**Median µg/g**	**s µg/g**	**CV %**	**n**	**n < LOD**	**E**	**Cert. v. µg/g**	**± µg/g**
Al	22.07	21.05	4.46	20.2	10			25.2	2.4
As	14.98	14.10	3.06	20.4	11			16.6	1.1
Cd	20.30	20.20	1.56	7.7	13			20.8	0.5
Cr	0.376	0.332	0.114	30.4	11	1	1	0.37	0.08
Cu	26.63	26.62	1.86	7.0	13			25.8	1.1
Ni	0.206	0.196	0.043	20.7	12			0.20	0.02
Pb	0.261	0.237	0.135	51.5	12		1	0.22	0.02
Zn	88.86	87.90	7.96	9.0	13			85.8	2.5
Ag	0.607	0.582	0.070	11.5	8			0.608	0.032
Bi	0.0111	0.0093	0.0058	52.3	8	2		-	-
In	0.00133	0.00102	0.00115	86.6	6	3		-	-
Sb	0.0104	0.0067	0.0191	184.4	10	6		-	-
Se	6.20	5.75	1.43	23.1	11			6.06	0.49
Sn	0.350	0.194	0.509	145.3	9			(0.13)	-
Tl	0.00882	0.00860	0.00088	9.9	9	3		-	-
U	0.0447	0.0474	0.0085	19.0	10			-	-
W	0.00503	0.00500	0.00616	122.6	8	2		-	-
	DOLT-3								
	Mean µg/g	**Median µg/g**	**s µg/g**	**CV %**	**n**	**n < LOD**	**E**	**Cert. v. µg/g**	**± µg/g**
Al	22.08	21.97	3.32	15.0	10			(25)	-
As	9.40	9.49	1.49	15.9	11			10.2	0.5
Cd	18.97	18.70	2.10	11.1	13			19.4	0.6
Cr	3.544	3.325	0.911	25.7	13			(3.5)	-
Cu	31.67	31.80	2.05	6.5	13			31.2	1.0
Ni	2.97	2.84	0.67	22.6	13			2.72	0.35
Pb	0.331	0.300	0.187	56.5	13			0.32	0.05
Zn	92.96	89.71	10.76	11.6	13			86.6	2.4
Ag	1.179	1.195	0.090	7.7	8			1.20	0.07
Bi	0.0407	0.0399	0.0042	10.4	8			-	-
In	0.00109	0.00080	0.00111	102.0	7	3		-	-
Sb	0.0133	0.0144	0.0094	70.7	10	3		-	-
Se	7.32	6.73	1.82	24.9	11			7.06	0.48
Sn	0.550	0.447	0.412	74.8	9			(0.4)	-
Tl	0.01097	0.01110	0.00116	10.6	9	3		-	-
U	0.0440	0.0465	0.0084	19.0	10			-	-
W	0.276	0.101	0.496	180.1	8	1		-	-

Tables with all results and the statistics are presented in the Appendix together with diagrams for all elements. In the tables it is shown, beside the results, what methods for digestion and determination the laboratories have used, and whether they are accredited or not. It is also shown if reported results are below the detection limit. Established certified values for the reference materials are also presented, both in the tables and in the diagrams.

Some laboratories have determined more elements than was required. If more than one laboratory have determined a specific element, these results are also presented in tables, after the other elements.

Some laboratories have made comments together with the results that might explain some outliers.
Lab no. 2: “The digestion of sample L6 might be contaminated. “
Lab no. 7: “The results for Hg are not reliable.”
Lab no. 11: “The blank digestion sample was high for Al, Cu, Ni, Pb, Zn and Sn.”
Lab no. 1 made some mistake at the digestion of the muscle samples, and one of their perch samples and the DORM-2 sample were replaced. They had to dry the perch muscle themselves, why the dry substance could differ from the ones that were freeze dried at ITM.

6. Discussion

6.1 Precision

The concentration range for the elements (and samples) in this project varies from 0,0005 to over 100 µg/g. The coefficient of variation (CV %) between laboratories is consequently also varying, from 10 % or lower for the highest concentrations (Cu, Al och Zn) to about 130 % for the lowest concentration (In), and is nearly 200 % in some other cases. There seems to be other factors than the concentration that affects the precision. Fig. 1 shows the CV % between laboratories for both the perch samples and the certified materials. Some elements (e.g. Sn and in some cases W, Sb, Cr and Ni) seem to have unexpected high CV % values with respect to their concentrations and compared to other elements. Others (e.g. Bi, U, Tl and Sb in perch liver) have relatively low CV % values.

Besides the CV % between laboratories for the perch samples, Fig. 2 also show the within-laboratory precision. As expected, the mean and median CV % values within the laboratories are in all cases lower than the CV % values between laboratories, even if for some elements there are individual within-laboratory values that are higher than the between-laboratory values (Sn, Cr, Cu, Al, Zn). The typical ratio between within-laboratory CV % and between-laboratory CV % is 1:4. The greatest difference is shown for Ag and Pb, which means that there are large systematical errors in the determinations, but smaller random errors. A smaller difference is shown for e.g. Sb, Cr, Ni and Al, where the random errors are larger (or the systematic errors smaller).

Figure 1. Coefficient of variation (CV %) between laboratories, as a function of the concentration (logarithmic scale). Triangles are for perch samples and circles are for certified reference materials. The different colors are just to separate the elements from each other.

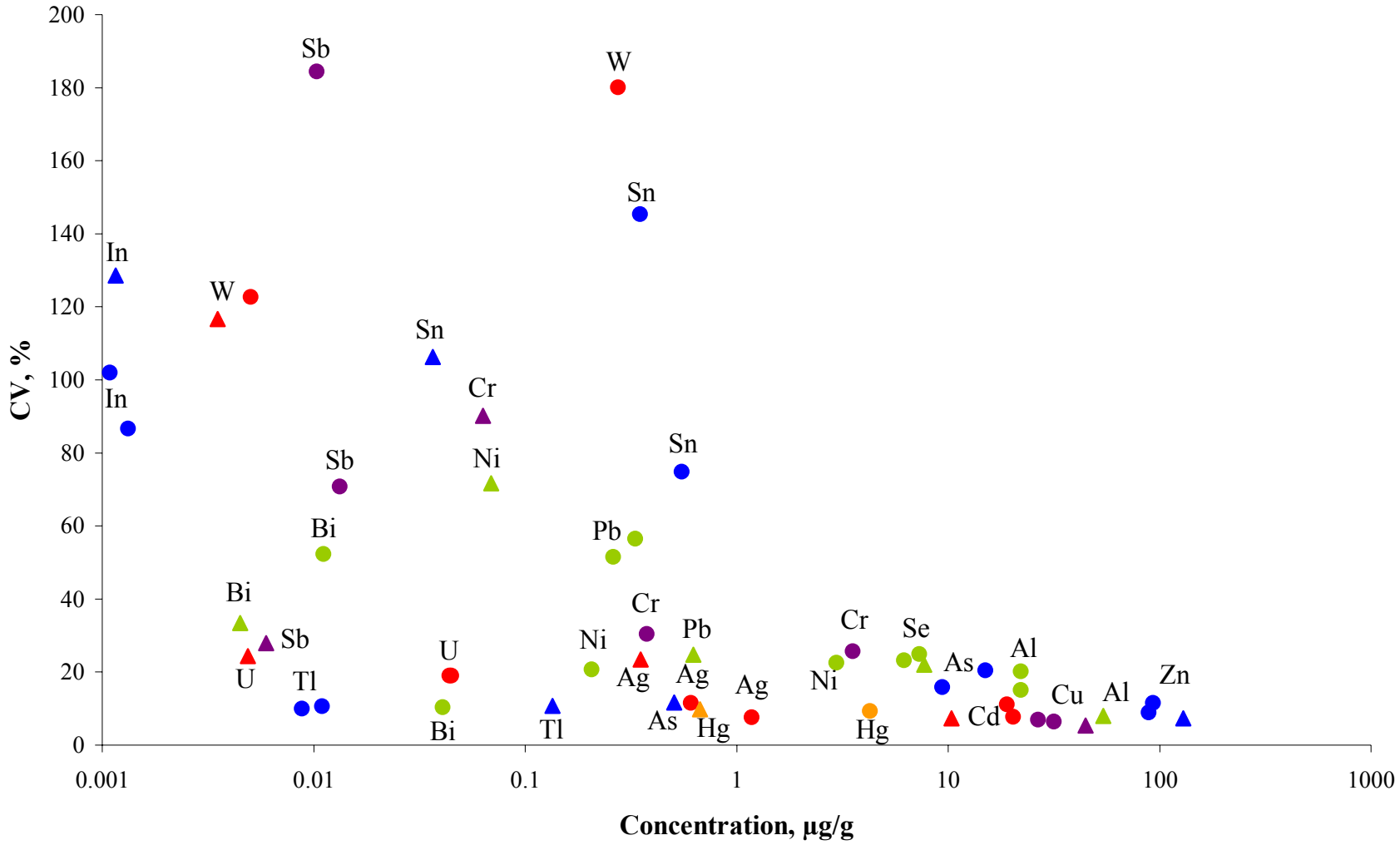
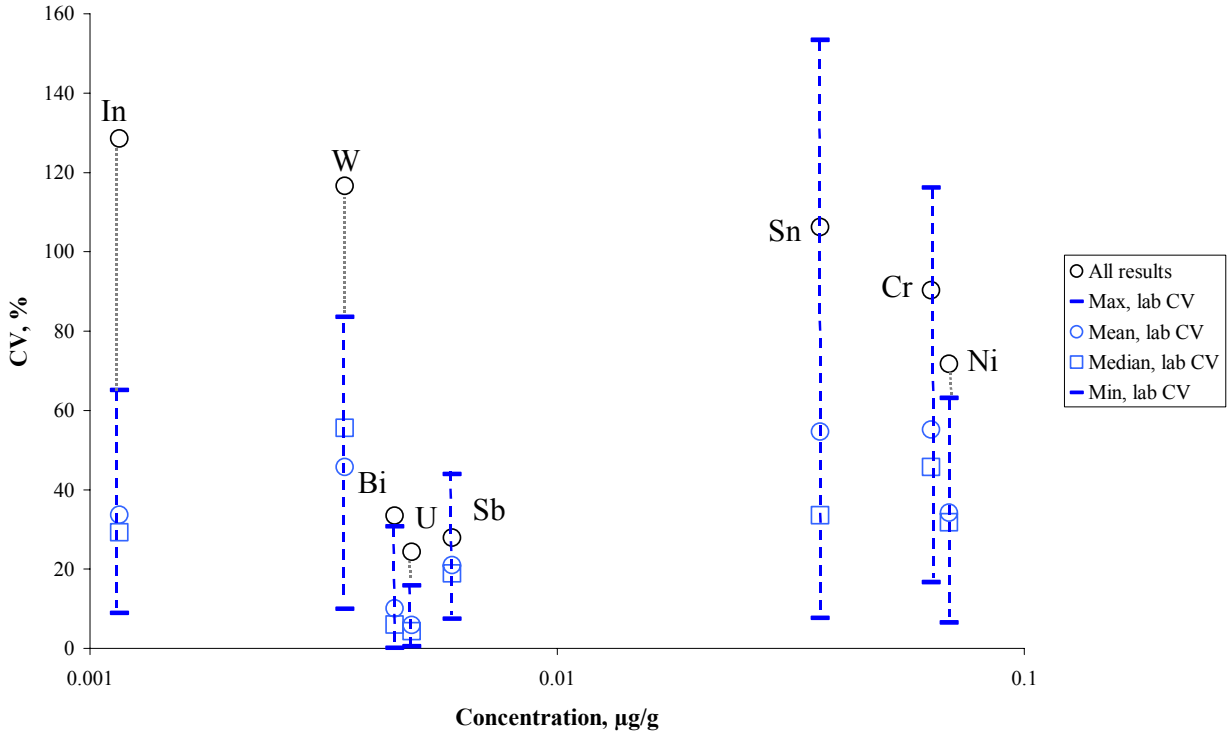
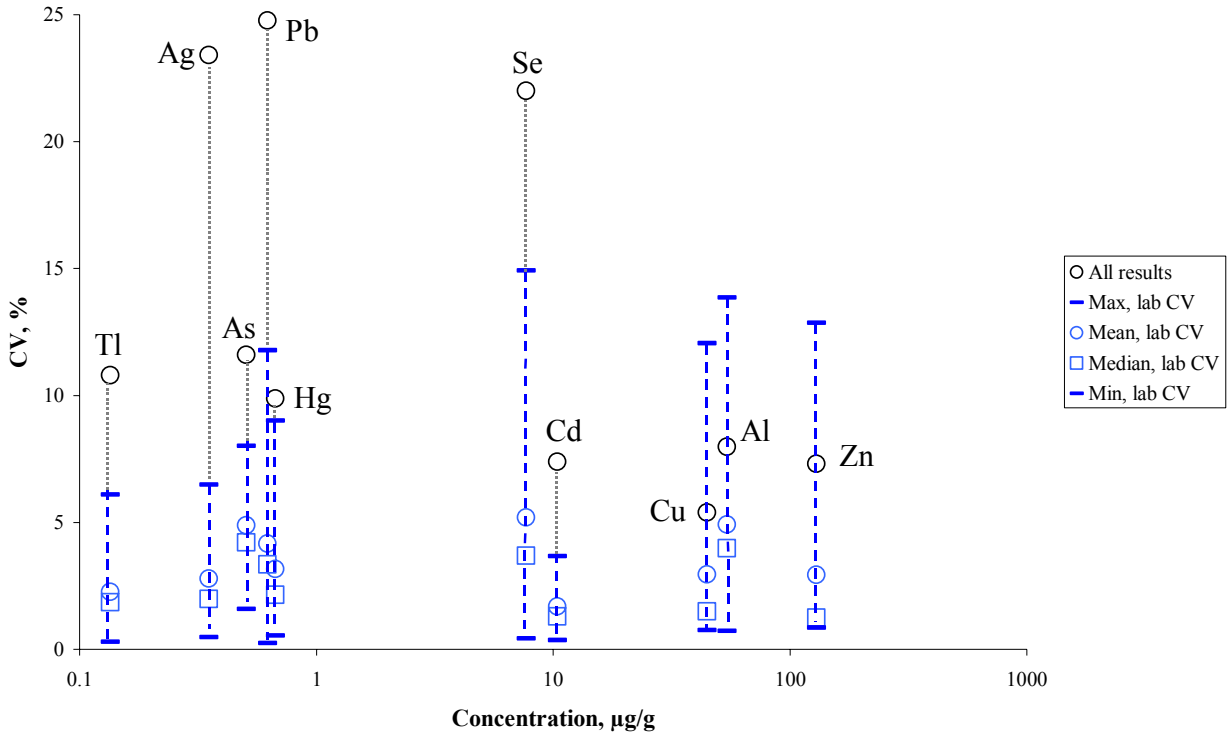


Figure 2. Coefficient of variation (CV %) between laboratories (all results) and within laboratories (lab CV) for the perch samples, as a function of the concentration (logarithmic scale).





The values for precision that are discussed in this chapter are calculated when outliers are excluded from the statistical evaluation. For some elements, the variation would otherwise be significantly higher.

6.2 Influence of the used methods

For determination of metals in liver samples five different methods have been used; graphite furnace AAS, ICP-MS with quadrupole, high resolution ICP-MS, ICP-MS with reaction cell and ICP-AES in a few cases. Four methods have been used for mercury determination; ICP-MS with quadrupole, high resolution ICP-MS, cold vapor AAS and cold vapor AFS. (For the abbreviations, see Appendix.)

For all elements, the diagrams in the Appendix show the determination methods with different symbols. In most cases it is not possible to see significant differences between methods. Cr is an element that could be difficult to analyze in low concentrations with a quadrupole ICP-MS because of interferences of ArC and/or ClO that have to be corrected for. This is probably the reason for the far too high quadrupole results from one laboratory for Cr in perch liver. They may have been reported without any consideration to interferences. The other quadrupole results for Cr in perch liver also seem high, compared to the high resolution ICP-MS results, which is a technique not suffering from this kind of interferences. For the higher concentrations of Cr in the reference samples, the problem is obviously of less importance.

All results For Hg in muscle from lab no. 7 are outliers (too low). The laboratory has commented that the results are not reliable. Hg is known to be difficult to analyze with some ICP-MS instruments because of severe memory effects in the sample introduction system. Still, there are some reliable results with both high resolution and quadrupole ICP-MS instruments. The graphite furnace and ICP-AES determinations does not seem to be connected with any special problems. Some high results with graphite furnace (and ICP-MS) from lab no. 2 are rather caused by contamination, as the laboratory concluded.

For the digestion of liver samples three rather similar methods have been used; digestion with HNO_3 in closed vessels (with pressure), digestion with HNO_3 in an open system and digestion with HNO_3 and H_2O_2 in closed vessels (with pressure). The latter method has also been modified by one lab, in the way that HCl has been added to the digestion before analysis of Ag, and HF before analysis of W, in order to stabilize the solutions. For the digestion of muscle samples five methods have been used; beside the above mentioned, also digestion with HNO_3 and H_2SO_4 in both closed vessels and in an open system. For some elements, there are diagrams in the Appendix that show the digestion methods with different symbols (Hg, Al, Ag, Tl and W). As for the different determination methods, it is difficult to see any significant differences on the results depending on digestion method. One observation is that the digestion methods using both HNO_3 and H_2SO_4 seem to work well together with the cold vapor AFS technique for Hg.

6.3 Laboratories

Thirteen laboratories participated in this test (see Chapter 7) with a varying number of elements, from 1 to 18. Lab no. 2 participated with two different methods for determination of metals in the liver samples, and has therefore been given the lab numbers 2a and 2b. In Table 3 the laboratories are listed (anonymously) with their lab numbers, what elements they have determined and which elements they are accredited for. As described in Chapter 4 some statistical parameters, s/s mean, Z-score and Z cert., have been calculated for each laboratory and element. **s/s mean** covers the perch samples, **Z-score** both perch and reference samples and **Z cert.** only reference samples. Values close to zero for these parameters indicate good results for precision (s/s mean) and for accuracy (the Z values). The mean value for all elements and these three parameters are presented in Table 3 for each laboratory. Beside those, also the absolute values of Z-score and Z cert. are listed. A mean Z-score value close to zero means that there are no systematic high or low results, but the individual Z-score values could be high (both positive and negative) and give a mean value close to zero. Therefore the mean value of all Z-scores does not give enough information without looking at the absolute values of them. The same is relevant for Z cert. that is a similar parameter.

The values in Table 3 are calculated after exclusion of outliers. To judge an individual laboratory's skill, the outliers (and stragglers) are also of interest. In Fig. 3 each laboratory is presented with the number of elements they have determined and with the number of outliers and stragglers, both for accredited and not accredited elements.

Since it was not possible to make any homogeneity test on the small amount of perch samples available, it is not out of the question that a single "bad" result can depend on homogeneity variations in the material, but hardly in the case where a laboratory has biased results for an element on all three samples in the triplicate.

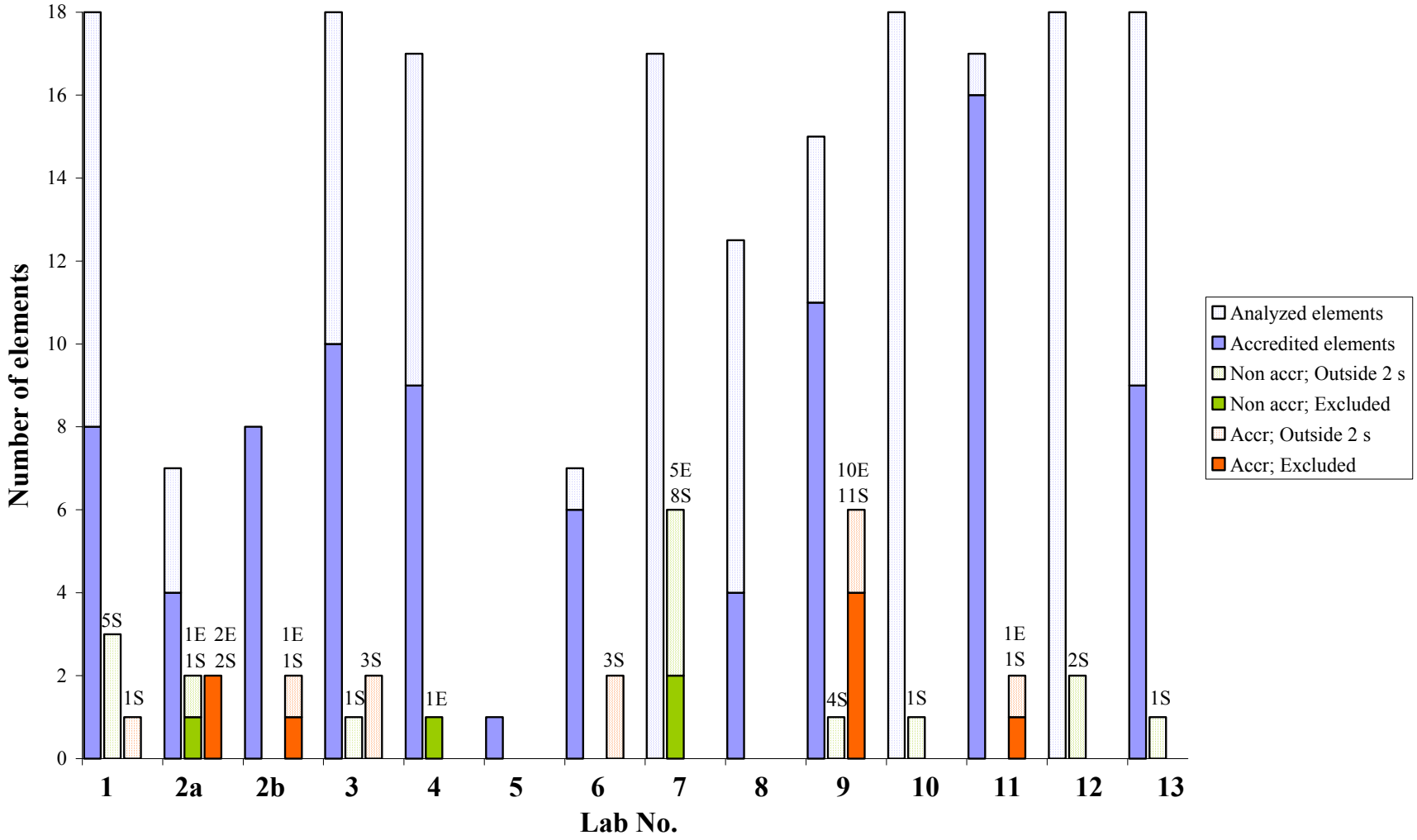
Some diagrams in the Appendix show the results with respect to the accreditation status of the laboratories (Cr, Pb, Sn and U). From these diagrams, as well as from the tables where all results are presented, and from Fig. 3, it could be concluded that there is no large difference in the performance of the laboratories that have participated in this project, that could be related to the laboratory being accredited or not.

It should also be reminded that this is a one occasion interlaboratory trial. If it would be repeated, it is likely that the outcome for the individual laboratories would be different. Anyway, this work gives an idea of what the precision for different elements and concentration levels are, and a general picture of the outcome of an interlaboratory trial like this. However, it implies that there is a need for repeated interlaboratory trials on a regularly basis for biological materials. In addition to the lack of trials, established certified metal values for biological reference materials covers only a limited number of elements, why it can be problematic for laboratories, and their clients, to estimate the quality of some of the analyses.

Table 3. List over which elements each laboratory has determined, which they are accredited for, and also each laboratory's mean values of s/s mean, Z-score and Z cert. together with their absolute values.

	Participation, a = accredited for																		**Mean all elements**				
Lab No.	Hg	Al	As	Cd	Cr	Cu	Ni	Pb	Zn	Ag	Bi	In	Sb	Se	Sn	Tl	U	W	**s/s mean**	**Z-score**	**|Z-score|**	**Z cert.**	**|Z cert.|**
1	**a**	x	**a**	**a**	**a**	**a**	**a**	**a**	**a**	x	x	x	x	x	x	x	x	x	0.91	0.24	0.61	-0.23	1.05
2a	x			**a**	x	**a**	x	**a**	**a**										2.07	0.51	1.04	2.32	3.77
2b			**a**	**a**	**a**	**a**	**a**	**a**	**a**					**a**					1.61	-0.06	0.78	0.83	2.62
3	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	x	x	x	x	**a**	x	x	x	x	1.52	-0.93	1.00	-3.41	3.54
4	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	x		x	x	x	**a**	x	x	x	x	0.74	-0.03	0.53	0.11	1.87
5	**a**																		0.34	0.59	0.59	0.04	0.04
6	x			**a**	**a**	**a**	**a**	**a**	**a**										0.77	0.53	0.80	1.65	2.11
7	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	1.50	0.76	0.87	3.66	3.76
8		x	**a**	**a**	(x)	x	(x)	**a**	x	x			x	**a**		x	x		0.98	-0.34	0.51	-0.05	1.63
9	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	x			x	x	**a**	x	**a**		0.89	-0.06	1.39	-1.62	2.80
10	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0.61	-0.26	0.48	-0.40	2.07
11	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**		**a**	**a**	**a**	**a**	**a**	x	0.72	-0.18	0.66	-0.16	2.15
12	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0.92	0.11	0.52	-0.30	1.51
13	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	**a**	x	x	x	x	x	x	x	x	x	0.75	0.29	0.63	1.18	1.69

Figure 3. The number of elements each laboratory has determined, how many they are accredited for, how many elements that contain outliers excluded from statistical evaluation and how many that contain "stragglers" (outside 2 standard deviations from the mean value). The numbers on top of the bars means how many samples that are excluded (E) or stragglers (S).



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Appendix

Explanation to abbreviations etc. in the result tables and diagrams:

Code describes the digestion procedure and analytical technique.

1=digestion with HNO_3 in closed vessels (with pressure)
2=digestion with HNO_3 in an open system
3=digestion with HNO_3/H_2O_2 in closed vessels (with pressure)
5=digestion with HNO_3/H_2SO_4 in closed vessels (with pressure)
6=digestion with HNO_3/H_2SO_4 in an open system

A=Graphite Furnace Atomic Absorption Spectrometry (GF-AAS)
B=Quadrupole Inductively Coupled Plasma Mass Spectrometry (ICP-MS quadr.)
C=High Resolution Inductively Coupled Plasma Mass Spectrometry (HR-ICP-MS)
D= Inductively Coupled Plasma Mass Spectrometry with reaction cell (ICP-MS react. c.)
E= Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)
F=Cold Vapor Atomic Absorption Spectrometry (CV-AAS)
G=Cold Vapouur Atomic Fluorescence Spectrometry (CV-AFS)

Accred. "Yes" if the laboratory is accredited for the element and sample type.

Det.limit is presented in those cases where the laboratories have reported results below their detection limit for the method. Those values are also written in *italics*.

E after a reported value means that it is outside three standard deviations from the mean value and therefore excluded from statistic evaluation (outlier). The value is also underlined.

An underlined value is outside two standard deviations from the mean value and considered as a "straggler", but is not excluded from the statistical evaluation.

The **certified values** are given for DOLT-2, DOLT-3 and DORM-2, where they are established. ± is the 95 % tolerance limit for the certified value. Information values are given within parenthesis.

For the statistical evaluation, see Chapter 4.

All individual results, normalized with the median value, are plotted in the diagrams. Each method (determination or digestion) has its own color. Accepted values are circles, outliers are triangles and results reported below the detection limit are unfilled circles or triangles.

Mercury, Perch Muscle

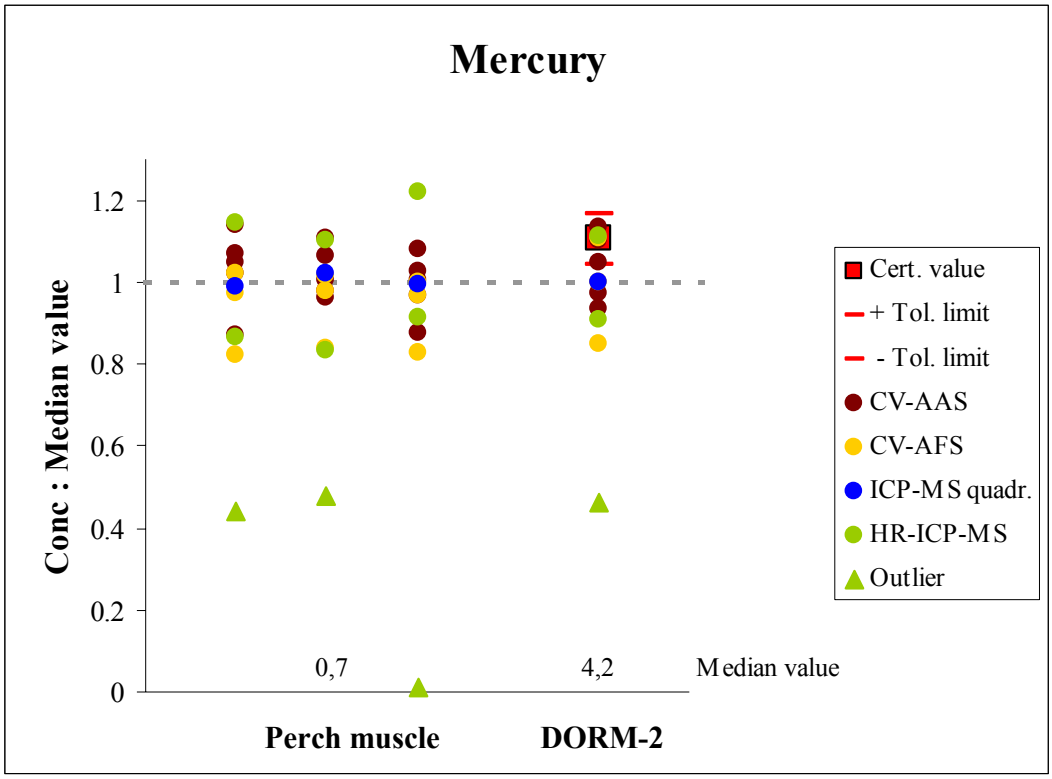
Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
7	1C			M1	0,298 E	M17	0,322 E	M34	0,008 E		-	-	-	E	E (3)
3	2G	Yes		M2	0.555	M22	0.568	M32	0.561		0.561	0.007	1.2	-1.66	0.31
4	1C	Yes		M3	0.585	M14	0.564	M28	0.618		0.589	0.027	4.6	-1.24	1.28
2	1F			M4	0.590	M19	0.651	M35	0.656		0.632	0.037	5.8	-0.59	1.73
9	1F	Yes		M8	0.709	M16	0.663	M27	0.592		0.655	0.059	9.0	-0.25	2.78
6	5G			M9	0.658	M20	0.661	M29	0.654		0.658	0.004	0.5	-0.21	0.17
10	2B			M6	0.669	M23	0.691	M33	0.671		0.677	0.012	1.8	0.08	0.57
11	1F	Yes		M11	0.69	M15	0.68	M25	0.68		0.68	0.006	0.8	0.18	0.27
5	6G	Yes		M5	0.691	M24	0.687	M36	0.677		0.685	0.007	1.1	0.20	0.34
13	2F	Yes		M7	0.722	M18	0.721	M31	0.695		0.713	0.015	2.1	0.62	0.72
12	3F			M10	0.77	M21	0.75	M30	0.73		0.75	0.020	2.7	1.18	0.94
1	3C	Yes		M12	0.776	M13	0.747	M37	0.826		0.783	0.040	5.1	1.68	1.88
			Mean all values		0.671					**Mean**	0.671	0.021	3.2		
			Median all values		0.677					**Median**	0.677	0.015	2.1		
			Standard deviation		0.066										
			Coefficient of variation, %		9.9							**Min**	0.5		
												Max	9.0		

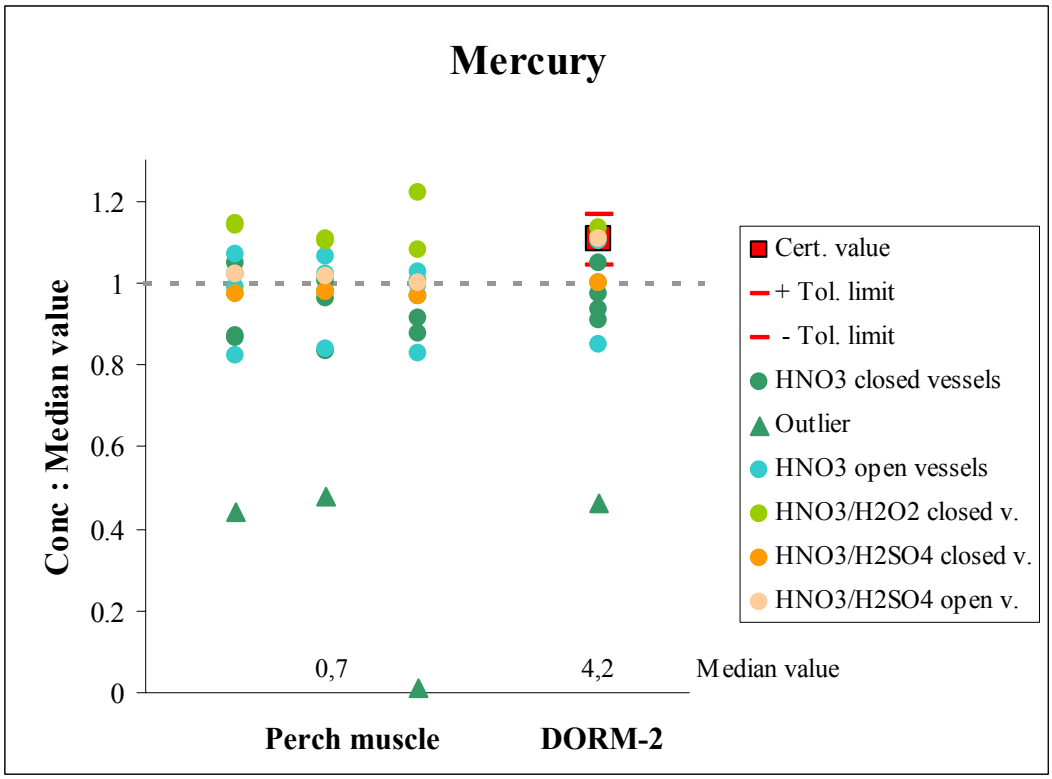
Mercury, DORM-2

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g		Z-score	Z cert.
7	1C			A6	1,932 E		E	E
3	2G	Yes		A9	3.56		-1.78	-4.15
4	1C	Yes		A2	3.821		-1.12	-3.15
2	1F			A1	3.935		-0.83	-2.71
9	1F	Yes		A7	4.08		-0.46	-2.15
6	5G			A4	4.19		-0.19	-1.73
10	2B			A8	4.20		-0.16	-1.69
11	1F	Yes		A12	4.40		0.35	-0.92
13	2F	Yes		A11	4.631		0.93	-0.03
5	6G	Yes		A3	4.65		0.98	0.04
1	3C	Yes		A13	4.67		1.03	0.12
12	3F			A10	4.76		1.26	0.46
				Mean	4.26	**Certified value**		4.64
				Median	4.20		±	0.26
			Standard deviation		0.39			
			Coefficient of variation, %		9.3			

Lab no. 7:
The results for Hg are not reliable.

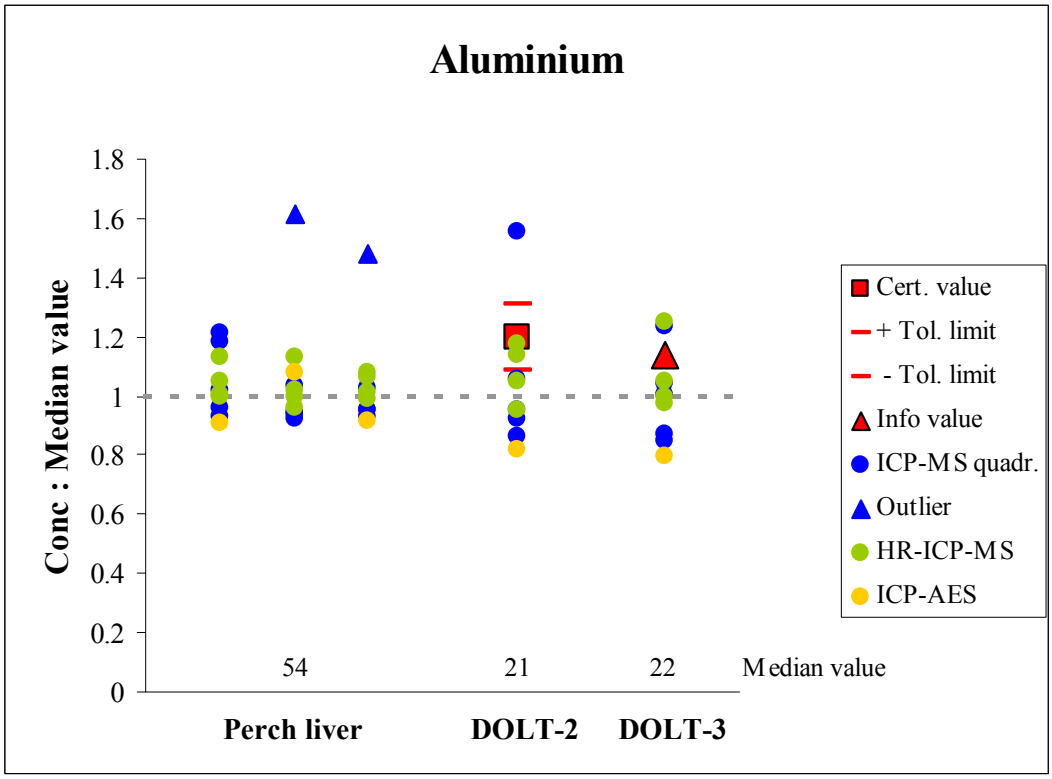
Lab no. 1:
Sample M37 may have another dry substance than the others.

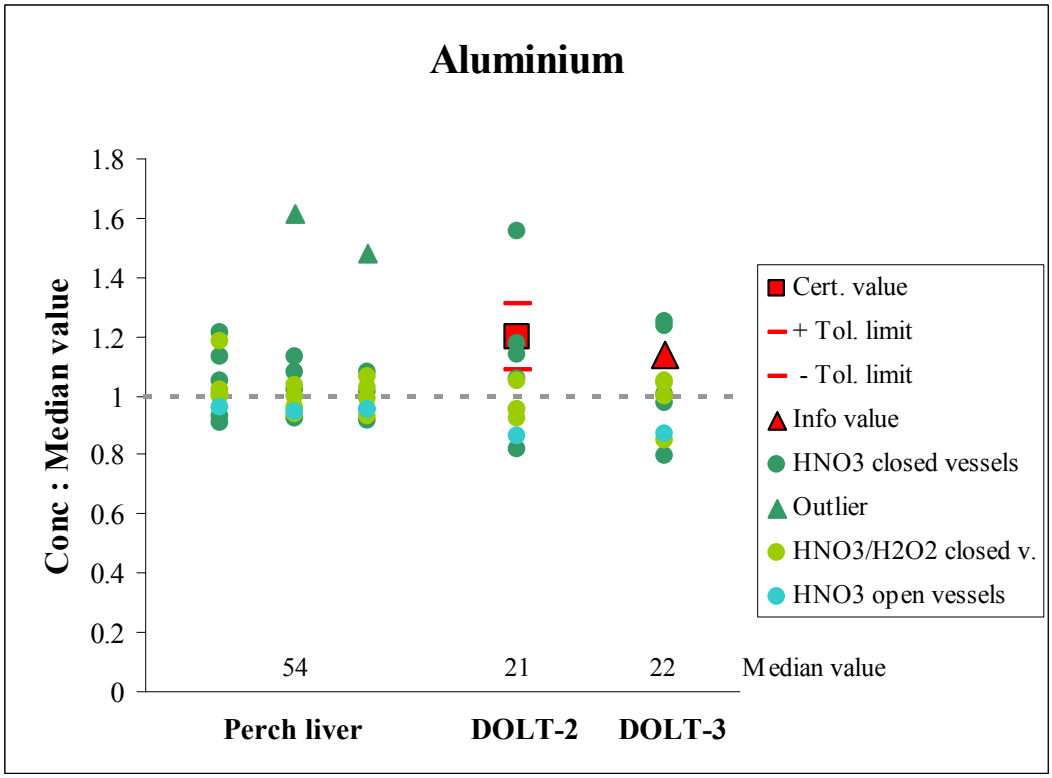

Mercury
Conc : Median value
1.2
1
0.8
0.6
0.4
0.2
0
0,7
4,2
Median value
Perch muscle
DORM-2
Cert. value
+ Tol. limit
- Tol. limit
CV-AAS
CV-AFS
ICP-MS quadr.
HR-ICP-MS
Outlier


Mercury
Conc : Median value
1.2
1
0.8
0.6
0.4
0.2
0
0,7
4,2
Median value
Perch muscle
DORM-2
Cert. value
+ Tol. limit
- Tol. limit
HNO3 closed vessels
Outlier
HNO3 open vessels
HNO3/H2O2 closed v.
HNO3/H2SO4 closed v.
HNO3/H2SO4 open v.

Aluminium, Perch Liver															
Lab No.	**Code**	**Accred.**	***Det. limit***	**Sample**	**µg/g**	**Sample**	**µg/g**	**Sample**	**µg/g**		**Lab mean**	**s**	**CV, %**	**Z-score**	**s/s mean**
11	1B	Yes		L11	49.60	L24	49.54	L28	50.78		49.97	0.70	1.4	-0.96	0.26
10	2B			L2	51.39	L20	50.72	L27	50.79		50.97	0.37	0.7	-0.73	0.14
8	1E			L9	48.6	L13	57.8	L26	48.8		51.7	5.25	10.2	-0.55	1.97
12	3C			L10	53.7	L22	51.2	L29	52.9		52.6	1.28	2.4	-0.35	0.48
3	3B	Yes		L3	63.1	L17	50.3	L33	49.8		54.4	7.54	13.9	0.07	2.83
1	3C			L4	53.3	L21	53.2	L36	57.0		54.5	2.17	4.0	0.09	0.81
13	3B	Yes		L12	54.39	L16	55.43	L30	54.87		54.90	0.52	0.9	0.18	0.20
4	1C	Yes		L5	56.06	L15	60.35	L31	54.23		56.88	3.14	5.5	0.64	1.18
7	1C			L8	60.43	L23	54.40	L32	57.61		57.48	3.02	5.2	0.78	1.13
9	1B	Yes		L1	65.0	L19	86,3 E	L25	79,2 E		65.0	-	-	2.52	E (2)
			Mean all values		54.12					**Mean**	54.84	2.66	4.9		
			Median all values		53.50					**Median**	54.45	2.17	4.0		
			Standard deviation		4.32										
		Coefficient of variation, %			8.0							**Min**	0.7		
												Max	13.9		

Aluminium, DOLT-2 (B) and DOLT-3 (C)															
Lab No.	**Code**	**Accred.**	***Det. limit***	**Sample**	**µg/g**	**Sample**	**µg/g**	**B:**	**Z-score**	**Z cert.**	**C:**	**Z-score**	**Z cert.**		
8	1E			B7	17.3	C11	17.4		-1.07	-3.29		-1.41	-		
10	2B			B9	18.21	C8	19.10		-0.86	-2.91		-0.90	-		
3	3B	Yes		B5	19.4	C2	18.6		-0.60	-2.42		-1.05	-		
1	3C			B4	20.0	C10	21.9		-0.46	-2.17		-0.05	-		
13	3B	Yes		B11	19.98	C7	22.82		-0.47	-2.18		0.22	-		
11	1B	Yes		B10	22.22	C5	22.03		0.03	-1.24		-0.01	-		
4	1C	Yes		B2	23.92	C3	21.36		0.41	-0.53		-0.22	-		
12	3C			B12	22.1	C6	23.0		0.01	-1.29		0.28	-		
7	1C			B6	24.76	C12	27.38		0.60	-0.18		1.60	-		
9	1B	Yes		B8	32.8	C9	27.2		2.40	3.17		1.54	-		
				Mean	22.07		22.08			**DOLT-2**	**DOLT-3**				
				Median	21.05		21.97	**Certified value**		25.2	(25)				
			Standard deviation		4.46		3.32		±	2.4	-				
		Coefficient of variation, %			20.2		15.0								


Aluminium
Conc : Median value
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
54
21
22
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
Info value
ICP-MS quadr.
Outlier
HR-ICP-MS
ICP-AES

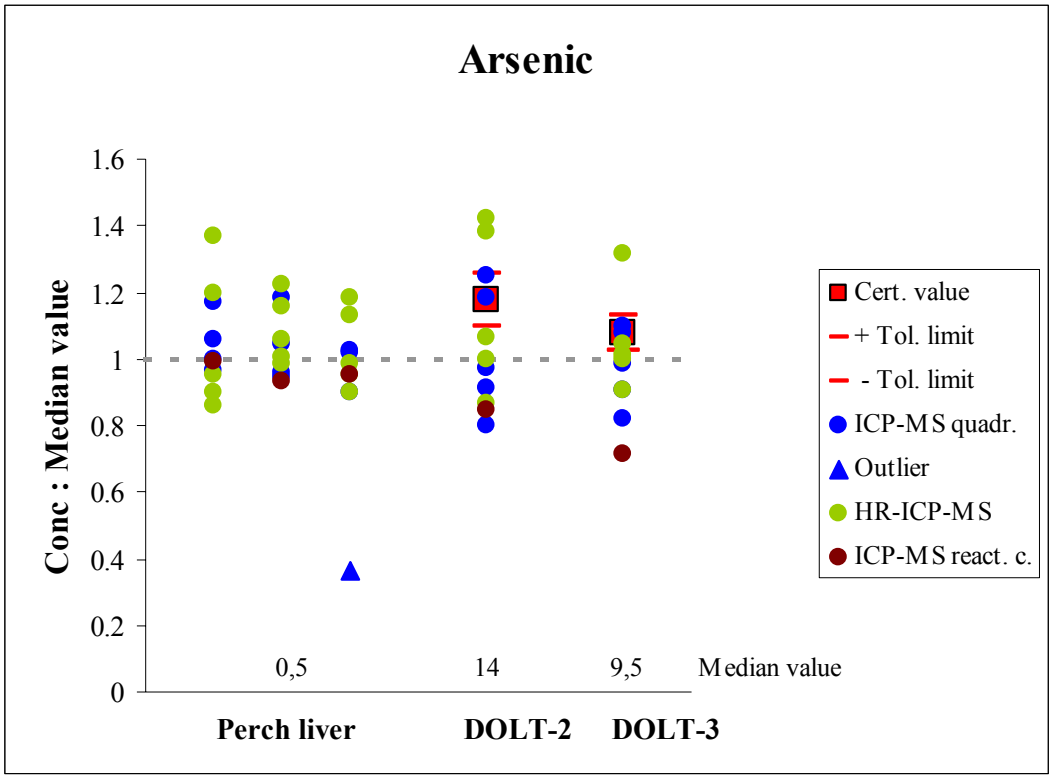

Aluminium
Conc : Median value
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
54
21
22
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
Info value
HNO3 closed vessels
Outlier
HNO3/H2O2 closed v.
HNO3 open vessels

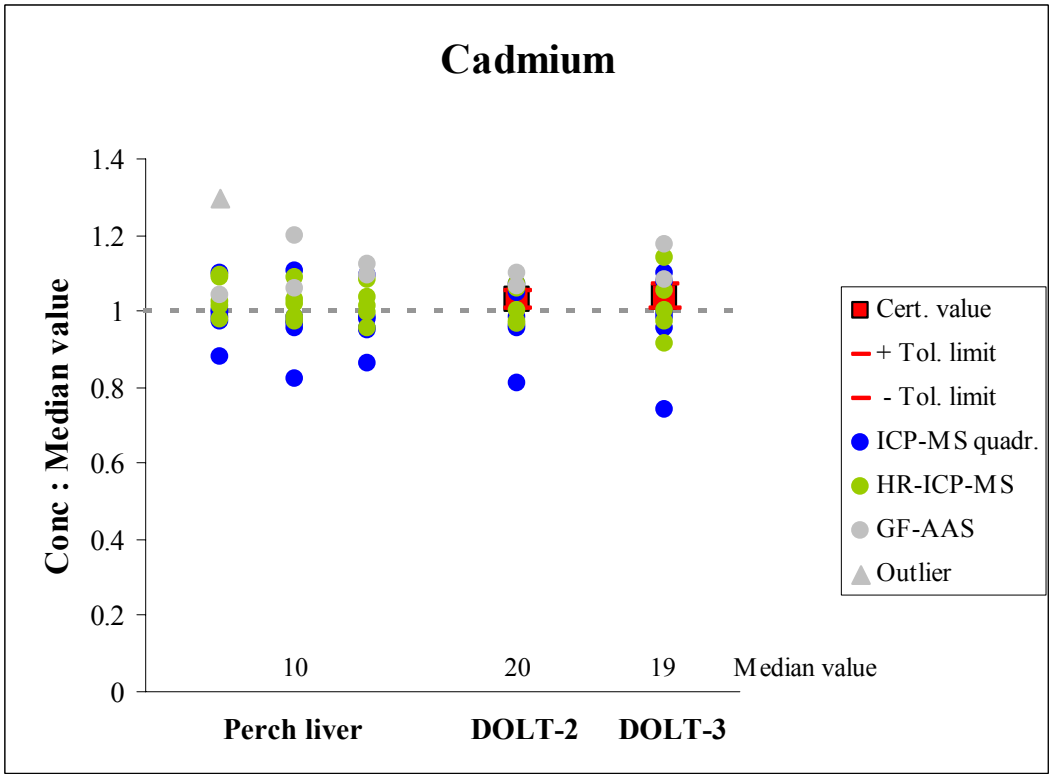
Arsenic, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
12	3C			L10	0.42	L22	0.49	L29	0.44		0.45	0.036	8.0	-0.94	1.38
2b	1B	Yes		L6	0.471	L18	0.462	L35	0.440		0.458	0.016	3.5	-0.81	0.61
8	1C	Yes		L9	0.44	L13	0.48	L26	0.48		0.47	0.023	4.9	-0.66	0.88
3	3D	Yes		L3	0.485	L17	0.455	L33	0.463		0.468	0.016	3.3	-0.64	0.59
11	1B	Yes		L11	0.488	L24	0.468	L28	0,177 E		0.478	-	-	-0.46	E (1)
1	3C	Yes		L4	0.466	L21	0.516	L36	0.465		0.482	0.029	6.0	-0.39	1.12
10	2B			L2	0.517	L20	0.511	L27	0.501		0.510	0.008	1.6	0.08	0.31
13	3B	Yes		L12	0.571	L16	0.576	L30	0.498		0.548	0.044	8.0	0.74	1.67
4	1C	Yes		L5	0.584	L15	0.566	L31	0.552		0.567	0.016	2.8	1.06	0.61
7	1C			L8	0.6684	L23	0.5964	L32	0.5787		0.615	0.048	7.7	1.87	1.82
9	1B	Yes		L1	<0.12	L19	<0.12	L25	<0.12		<0.12	-	-	<	<
			Mean all values		0.505					**Mean**	0.504	0.026	5.1		
			Median all values		0.488					**Median**	0.480	0.023	4.9		
			Standard deviation		0.059										
			Coefficient of variation, %		11.6							**Min**	1.6		
												Max	8.0		

Arsenic, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
3	3D	Yes		B5	11.9	C2	6.78		-1.01	-4.27		-1.76	-6.84		
9	1B	Yes		B8	12.9	C9	7.80		-0.68	-3.36		-1.07	-4.80		
10	2B			B9	11.25	C8	8.62		-1.22	-4.86		-0.52	-3.16		
12	3C			B12	14.1	C6	8.60		-0.29	-2.27		-0.53	-3.20		
1	3C	Yes		B4	12.2	C10	9.60		-0.91	-4.00		0.14	-1.20		
2b	1B	Yes		B1	13.69	C4	9.38		-0.42	-2.65		-0.01	-1.64		
8	1C	Yes		B7	15.0	C11	9.49		0.01	-1.45		0.06	-1.42		
13	3B	Yes		B11	16.65	C7	10.44		0.54	0.05		0.70	0.48		
11	1B	Yes		B10	17.59	C5	10.24		0.85	0.90		0.57	0.08		
4	1C	Yes		B2	20.059	C3	9.940		1.66	3.14		0.36	-0.52		
7	1C			B6	19.48	C12	12.47		1.47	2.62		2.06	4.54		
				Mean	14.98		9.40			**DOLT-2**	**DOLT-3**				
				Median	14.10		9.49	**Certified value**		16.6	10.2				
			Standard deviation		3.06		1.49		±	1.1	0.5				
			Coefficient of variation, %		20.4		15.9								


Arsenic
Conc : Median value
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0,5
14
9,5
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
Outlier
HR-ICP-MS
ICP-MS react. c.


Cadmium
Conc : Median value
1.4
1.2
1
0.8
0.6
0.4
0.2
0
10
20
19
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
HR-ICP-MS
GF-AAS
Outlier

Cadmium, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
3	3B	Yes		L3	9.01	L17	8.45	L33	8.87		8.78	0.291	3.3	-2.10	1.71
10	2B			L2	9.97	L20	10.01	L27	9.80		9.93	0.112	1.1	-0.61	0.65
2b	1B	Yes		L6	10.25	L18	9.83	L35	9.75		9.94	0.269	2.7	-0.59	1.58
4	1C	Yes		L5	10.051	L15	10.015	L31	9.783		9.950	0.145	1.5	-0.58	0.85
11	1B	Yes		L11	10.13	L24	9.93	L28	10.02		10.03	0.100	1.0	-0.48	0.59
9	1B	Yes		L1	10.3	L19	10.1	L25	10.1		10.2	0.115	1.1	-0.29	0.68
12	3C			L10	10.4	L22	10.1	L29	10.2		10.2	0.153	1.5	-0.21	0.90
8	1C	Yes		L9	10.5	L13	10.6	L26	10.4		10.5	0.100	1.0	0.14	0.59
7	1C			L8	11.21	L23	10.45	L32	10.64		10.77	0.396	3.7	0.49	2.32
6	1A	Yes		L7	10.71	L14	10.88	L34	11.23		10.94	0.265	2.4	0.71	1.56
1	3C	Yes		L4	11.2	L21	11.2	L36	11.1		11.2	0.058	0.5	1.01	0.34
13	3B	Yes		L12	11.32	L16	11.34	L30	11.26		11.31	0.042	0.4	1.19	0.24
2a	1A	Yes		L6	13.338 E	L18	12.294	L35	11.520		11.907	-	-	1.97	E (1)
			Mean all values		10.393					**Mean**	10.432	0.170	1.7		
			Median all values		10.275					**Median**	10.233	0.130	1.3		
			Standard deviation		0.768										
			Coefficient of variation, %		7.4							**Min**	0.4		
												Max	3.7		

Cadmium, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.
3	3B	Yes		B5	16.4	C2	13.8		-2.50	-8.80		-2.46	-9.33
4	1C	Yes		B2	19.671	C3	17.120		-0.40	-2.26		-0.88	-3.80
10	2B			B9	19.23	C8	17.87		-0.68	-3.14		-0.52	-2.55
12	3C			B12	19.5	C6	18.2		-0.51	-2.60		-0.37	-2.00
9	1B	Yes		B8	19.9	C9	18.4		-0.25	-1.80		-0.27	-1.67
8	1C	Yes		B7	20.2	C11	18.7		-0.06	-1.20		-0.13	-1.17
2b	1B	Yes		B1	19.38	C4	20.09		-0.59	-2.84		0.53	1.15
11	1B	Yes		B10	21.10	C5	18.61		0.52	0.60		-0.17	-1.32
1	3C	Yes		B4	21.4	C10	19.7		0.71	1.20		0.35	0.50
6	1A	Yes		B3	21.55	C1	20.22		0.81	1.50		0.59	1.37
13	3B	Yes		B11	21.67	C7	20.60		0.88	1.74		0.78	2.00
7	1C			B6	21.65	C12	21.31		0.87	1.70		1.11	3.18
2a	1A	Yes		B1	22.196	C4	21.986		1.22	2.79		1.43	4.31
				Mean	20.30		18.97			**DOLT-2**	**DOLT-3**		
				Median	20.20		18.70	**Certified value**		20.8	19.4		
			Standard deviation		1.56		2.10		±	0.5	0.6		
			Coefficient of variation, %		7.7		11.1						

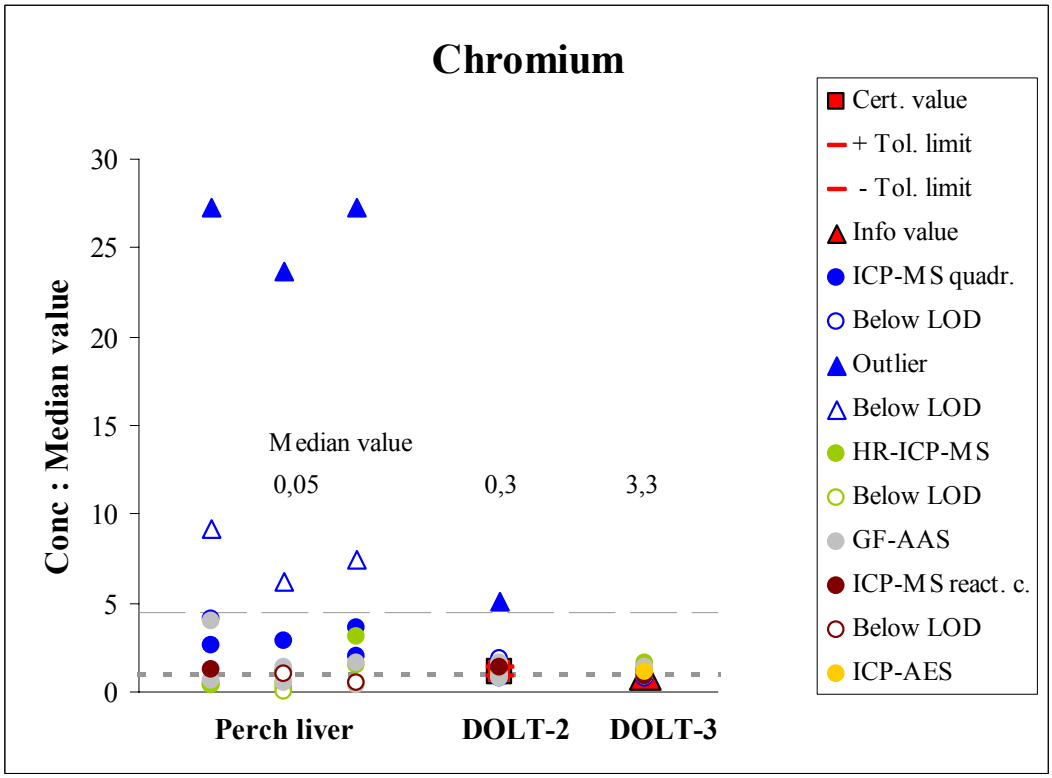
Chromium, Perch Liver

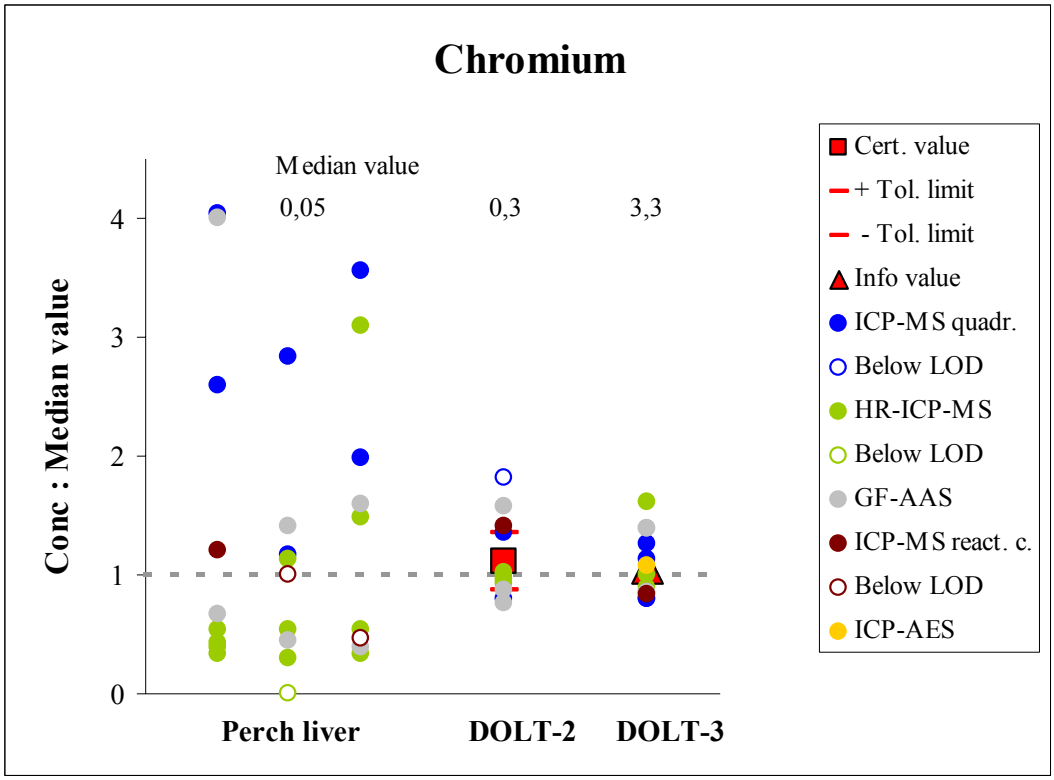
Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
4	1C	Yes	*<0.002*	L5	0.018	L15	*-0.001*	L31	0.016		*0.011*	*0.010*	*94.9*	*-0.92*	*0.32*
1	3C	Yes		L4	0.0202	L21	0.0142	L36	0.0249		0.0198	0.005	27.1	-0.76	0.16
6	1A	Yes		L7	0.031	L14	0.021	L34	0.018		0.023	0.007	29.2	-0.70	0.21
3	3D	Yes	*<0.05*	L3	0.0561	L17	*0.0469*	L33	*0.0215*		*0.0415*	*0.018*	*43.2*	*-0.38*	*0.55*
7	1C			L8	0.0249	L23	0.0526	L32	0.0691		0.0489	0.022	45.7	-0.25	0.68
12	3C			L10	0.016	L22	0.025	L29	0.145		0.062	0.072	116.2	-0.02	2.19
2a	1A			L6	0.188	L18	0.0658	L35	0.0750		0.1096	0.068	62.1	0.81	2.07
2b	1B	Yes		L6	0.189	L18	0.055	L35	0.093		0.112	0.069	61.5	0.86	2.10
13	3B	Yes		L12	0.122	L16	0.133	L30	0.167		0.141	0.023	16.7	1.36	0.71
10	2B		*<1*	L2	*0,43 E*	L20	*0,29 E*	L27	*0,35 E*		-	-	-	*E*	*E (3)*
9	1B	Yes		L1	1,28 E	L19	1,11 E	L25	1,28 E		-	-	-	E	E (3)
11	1A	Yes		L11	<0.05	L24	<0.05	L28	<0.05		-	-	-	<	<
			Mean all values		0.0632					**Mean**	0.063	0.033	55.2		
			Median all values		0.0469					**Median**	0.049	0.022	45.7		
			Standard deviation		0.0571										
			Coefficient of variation, %		90.2							**Min**	16.7		
												Max	116.2		

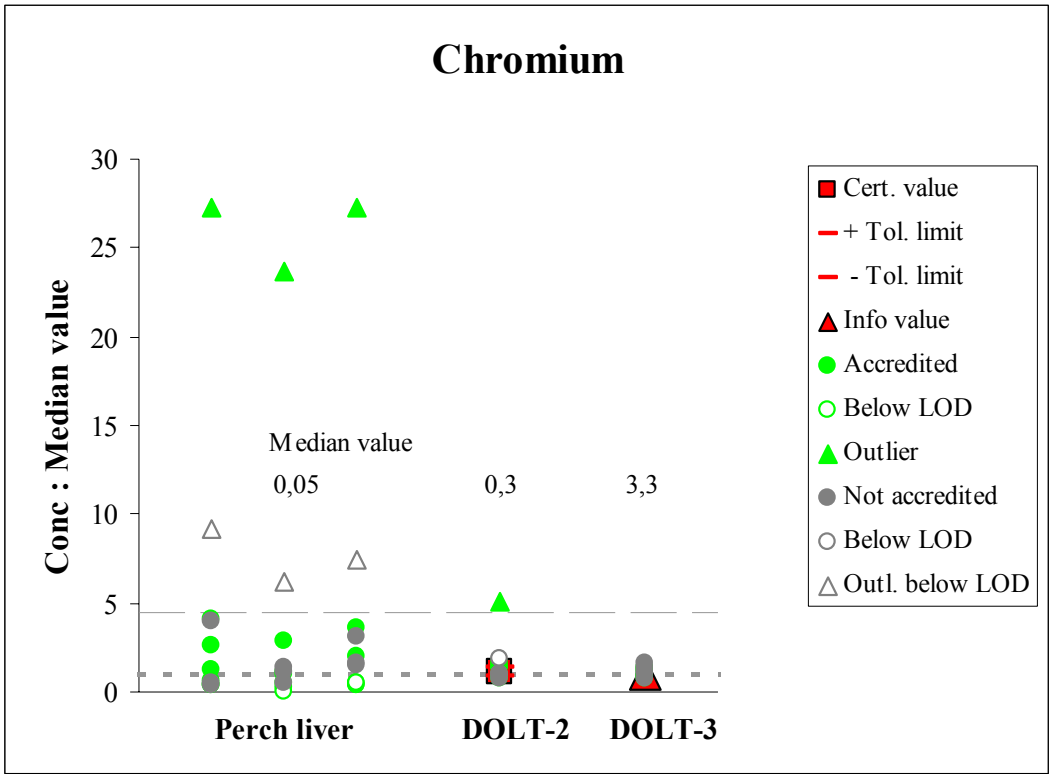
Lab no. 2: The digestion of sample L6 might be contaminated.

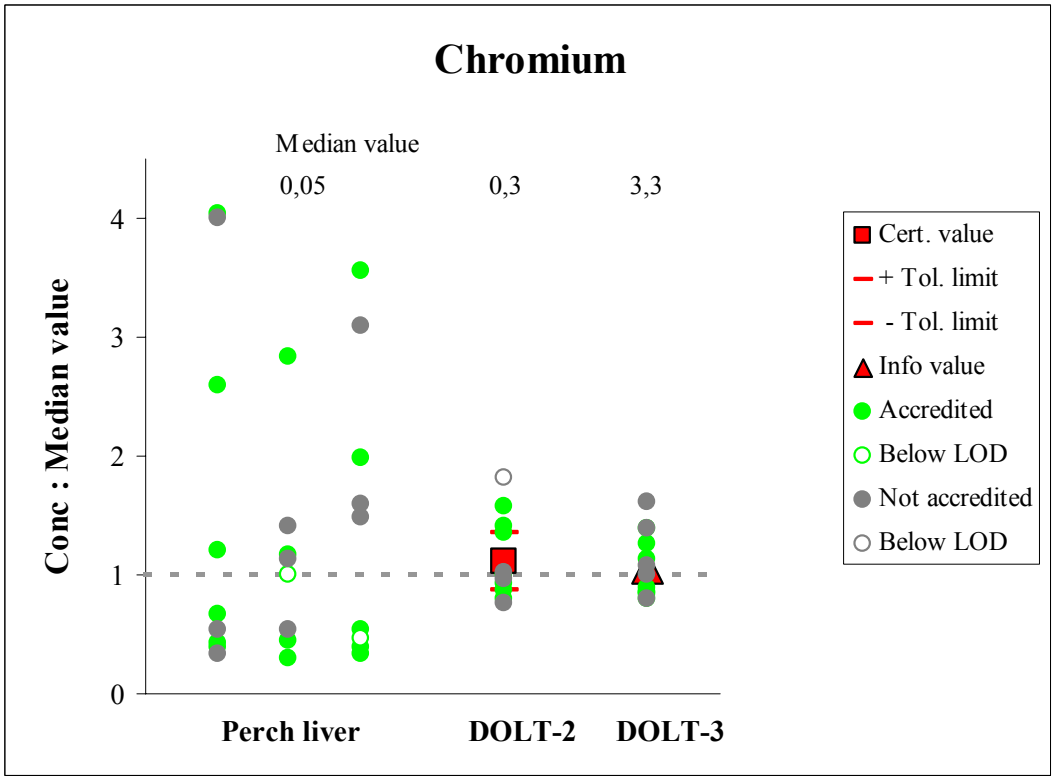
Chromium, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
11	1A	Yes		B10	0.29	C5	2.84		-0.75	-1.00		-0.77	-		
1	3C	Yes		B4	0.306	C10	2.84		-0.61	-0.80		-0.77	-		
13	3B	Yes		B11	0.447	C7	2.62		0.62	0.96		-1.02	-		
4	1C	Yes		B2	0.332	C3	2.926		-0.39	-0.48		-0.68	-		
3	3D	Yes		B5	0.467	C2	2.75		0.79	1.21		-0.87	-		
10	2B		*<1*	B9	*0.60*	C8	2.62		*1.96*	*2.88*		-1.02	-		
7	1C			B6	0.3208	C12	3.325		-0.48	-0.62		-0.24	-		
8	1E			-	-	C11	3.56		-	-		0.02	-		
2b	1B	Yes		B1	0.262	C4	4.17		-1.00	-1.35		0.69	-		
2a	1A			B1	0.255	C4	4.644		-1.06	-1.44		1.21	-		
6	1A	Yes		B3	0.521	C1	4.62		1.27	1.89		1.18	-		
12	3C			B12	0.336	C6	5.381		-0.35	-0.43		2.02	-		
9	1B	Yes		B8	1,68 E	C9	3.78		E	E		0.26	-		
				Mean	0.376		3.544			**DOLT-2**	**DOLT-3**				
				Median	0.332		3.325		**Certified value**	0.37	(3.5)				
			Standard deviation		0.114		0.911		±	0.08	-				
			Coefficient of variation, %		30.4		25.7								


Chromium
Conc : Median value
30
25
20
15
10
5
0
Median value
0,05
0,3
3,3
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
Info value
ICP-MS quadr.
Below LOD
Outlier
Below LOD
HR-ICP-MS
Below LOD
GF-AAS
ICP-MS react. c.
Below LOD
ICP-AES


Chromium
Conc : Median value
4
3
2
1
0
Median value
0,05
0,3
3,3
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
Info value
ICP-MS quadr.
Below LOD
HR-ICP-MS
Below LOD
GF-AAS
ICP-MS react. c.
Below LOD
ICP-AES


Chromium
Conc : Median value
30
25
20
15
10
5
0
Median value
0,05
0,3
3,3
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
Info value
Accredited
Below LOD
Outlier
Not accredited
Below LOD
Outl. below LOD

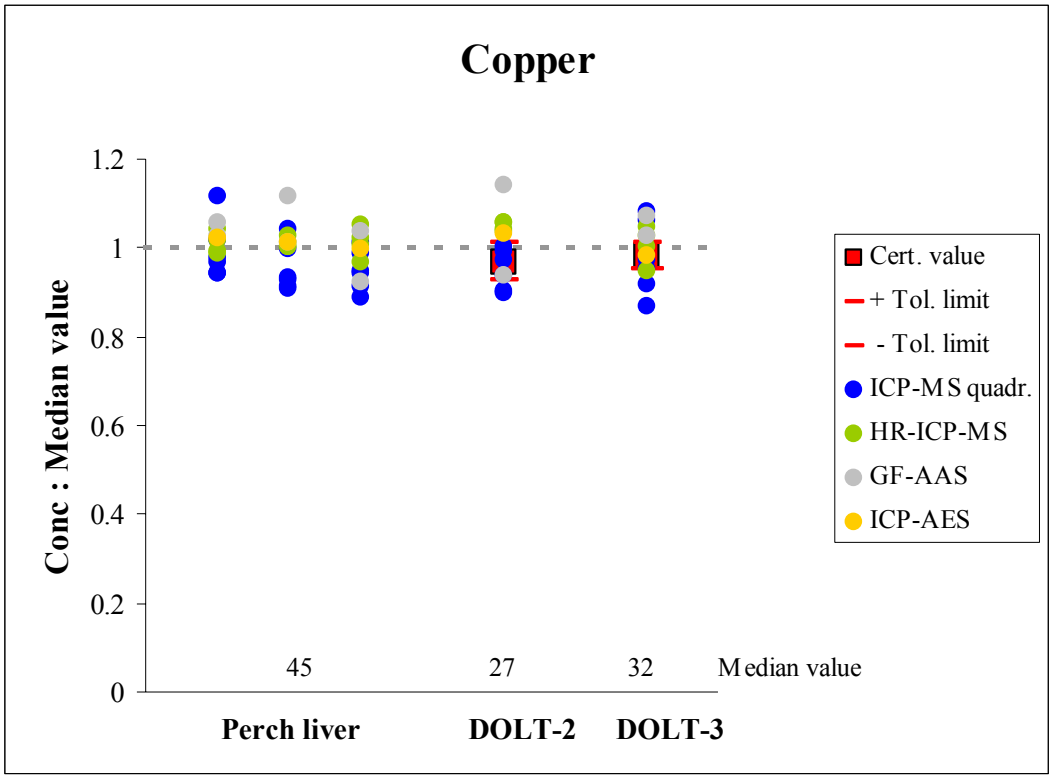

Chromium
Conc : Median value
4
3
2
1
0
Median value
0,05
0,3
3,3
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
Info value
Accredited
Below LOD
Not accredited
Below LOD

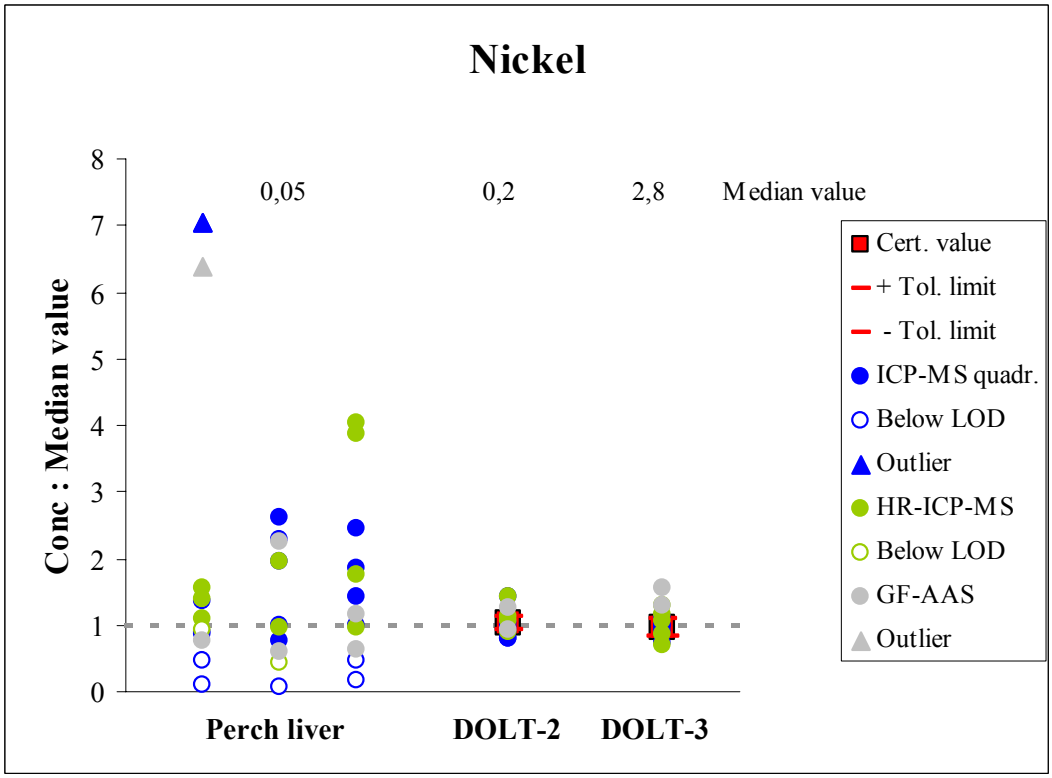
Copper, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
2b	1B	Yes		L6	43.42	L18	40.71	L35	39.87		41.33	1.86	4.5	-1.36	1.41
9	1B	Yes		L1	42.4	L19	41.7	L25	42.4		42.2	0.40	1.0	-1.02	0.31
11	1B	Yes		L11	42.33	L24	41.96	L28	42.60		42.30	0.32	0.8	-0.96	0.24
3	3B	Yes		L3	50.2	L17	41.0	L33	41.0		44.07	5.31	12.1	-0.23	4.04
10	2B			L2	43.92	L20	44.85	L27	44.40		44.39	0.47	1.0	-0.10	0.35
2a	1A	Yes		L6	46.200	L18	45.566	L35	41.538		44.435	2.53	5.7	-0.08	1.92
4	1C	Yes		L5	45.82	L15	44.97	L31	43.47		44.75	1.19	2.7	0.06	0.91
7	1C			L8	44.29	L23	44.97	L32	45.29		44.85	0.51	1.1	0.10	0.39
1	3C	Yes		L4	44.5	L21	45.6	L36	45.9		45.3	0.74	1.6	0.30	0.56
8	1E			L9	46.0	L13	45.6	L26	44.8		45.5	0.61	1.3	0.35	0.46
13	3B	Yes		L12	45.66	L16	46.80	L30	45.56		46.01	0.69	1.5	0.58	0.52
12	3C			L10	46.9	L22	46.1	L29	47.3		46.8	0.61	1.3	0.89	0.46
6	1A	Yes		L7	47.59	L14	50.26	L34	46.71		48.19	1.85	3.8	1.48	1.41
			Mean all values		44.62					**Mean**	44.62	1.31	3.0		
			Median all values		44.97					**Median**	44.75	0.69	1.5		
			Standard deviation		2.41										
			Coefficient of variation, %		5.4							**Min**	0.8		
												Max	12.1		

Copper, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
3	3B	Yes		B5	24.0	C2	27.6		-1.41	-1.64		-1.98	-3.60		
9	1B	Yes		B8	25.0	C9	29.1		-0.87	-0.73		-1.25	-2.10		
11	1B	Yes		B10	25.89	C5	30.26		-0.40	0.08		-0.69	-0.94		
10	2B			B9	26.38	C8	30.85		-0.13	0.53		-0.40	-0.35		
2b	1B	Yes		B1	23.95	C4	33.68		-1.44	-1.68		0.98	2.48		
2a	1A	Yes		B1	24.941	C4	32.607		-0.91	-0.78		0.46	1.41		
4	1C	Yes		B2	28.14	C3	30.07		0.81	2.13		-0.78	-1.13		
8	1E			B7	27.4	C11	31.2		0.42	1.45		-0.23	0.00		
12	3C			B12	27.7	C6	31.8		0.58	1.73		0.06	0.60		
1	3C	Yes		B4	27.6	C10	32.7		0.52	1.64		0.50	1.50		
13	3B	Yes		B11	26.62	C7	34.37		0.00	0.75		1.32	3.17		
7	1C			B6	28.13	C12	33.31		0.81	2.12		0.80	2.11		
6	1A	Yes		B3	30.38	C1	34.12		2.02	4.16		1.19	2.92		
				Mean	26.63		31.67			**DOLT-2**	**DOLT-3**				
				Median	26.62		31.80	**Certified value**		25.8	31.2				
			Standard deviation		1.86		2.05		±	1.1	1.0				
			Coefficient of variation, %		7.0		6.5								


Copper
Conc : Median value
1.2
1
0.8
0.6
0.4
0.2
0
45
27
32
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
HR-ICP-MS
GF-AAS
ICP-AES


Nickel
Conc : Median value
8
7
6
5
4
3
2
1
0
0,05
0,2
2,8
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
Below LOD
Outlier
HR-ICP-MS
Below LOD
GF-AAS
Outlier

Nickel, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
3	3B	Yes	*<0.05*	L3	*0.00547*	L17	*0.00296*	L33	*0.00854*		0.00566	0.003	49.4	*-1.28*	*0.12*
13	3B	Yes	*<0.025*	L12	*0.0240*	L16	0.0400	L30	*0.0238*		0.0293	0.009	31.8	*-0.80*	*0.41*
6	1A	Yes		L7	0.040	L14	0.030	L34	0.032		0.034	0.005	15.6	-0.71	0.23
10	2B			L2	0.0461	L20	0.0518	L27	0.0517		0.0499	0.003	6.5	-0.39	0.14
1	3C	Yes		L4	0.056	L21	0.050	L36	0.050		0.052	0.003	6.7	-0.34	0.15
4	1C	Yes	*<0.051*	L5	*0.048*	L15	*0.023*	L31	0.090		0.054	0.034	63.1	*-0.31*	*1.50*
2a	1A			L6	0.330 E	L18	0.1167	L35	0.0595		0.0881	-	-	0.39	E (1)
11	1B	Yes		L11	0.045	L24	0.136	L28	0.096		0.092	0.046	49.4	0.47	2.02
2b	1B	Yes		L6	0.364 E	L18	0.118	L35	0.073		0.096	-	-	0.54	E (1)
9	1B	Yes	*<0.10*	L1	*0.07*	L19	0.101	L25	0.126		0.099	0.028	28.3	*0.61*	*1.24*
7	1C			L8	0.0716	L23	0.1007	L32	0.2082		0.1268	0.072	56.7	1.17	3.18
12	3C			L10	0.08	L22	<0.05	L29	0.20		-	-	-	<	<
			Mean all values		0.0689					**Mean**	0.0660	0.023	34.2		
			Median all values		0.0518					**Median**	0.0537	0.009	31.8		
			Standard deviation		0.0494										
			Coefficient of variation, %		71.7							**Min**	6.5		
												Max	63.1		

Lab no. 2: The digestion of sample L6 might be contaminated.

Nickel, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
8	1C			-	-	C11	2.0		-	-		-1.45	-2.06		
3	3B	Yes		B5	0.177	C2	2.10		-0.68	-1.15		-1.30	-1.77		
13	3B	Yes		B11	0.158	C7	2.51		-1.13	-2.10		-0.69	-0.60		
4	1C	Yes		B2	0.172	C3	2.456		-0.80	-1.40		-0.77	-0.75		
9	1B	Yes		B8	0.158	C9	2.84		-1.13	-2.10		-0.20	0.34		
10	2B			B9	0.188	C8	2.78		-0.42	-0.60		-0.29	0.17		
2b	1B	Yes		B1	0.203	C4	3.17		-0.07	0.15		0.29	1.29		
2a	1A			B1	0.183	C4	3.634		-0.54	-0.85		0.99	2.61		
1	3C	Yes		B4	0.221	C10	3.05		0.35	1.05		0.12	0.94		
12	3C			B12	0.209	C6	3.707		0.07	0.45		1.10	2.82		
11	1B	Yes		B10	0.281	C5	2.75		1.75	4.05		-0.33	0.09		
7	1C			B6	0.2778	C12	3.253		1.68	3.89		0.42	1.52		
6	1A	Yes		B3	0.246	C1	4.39		0.93	2.30		2.11	4.77		
				Mean	0.206		2.97			**DOLT-2**	**DOLT-3**				
				Median	0.196		2.84		**Certified value**	0.20	2.72				
			Standard deviation		0.043		0.67		±	0.02	0.35				
			Coefficient of variation, %		20.7		22.6								

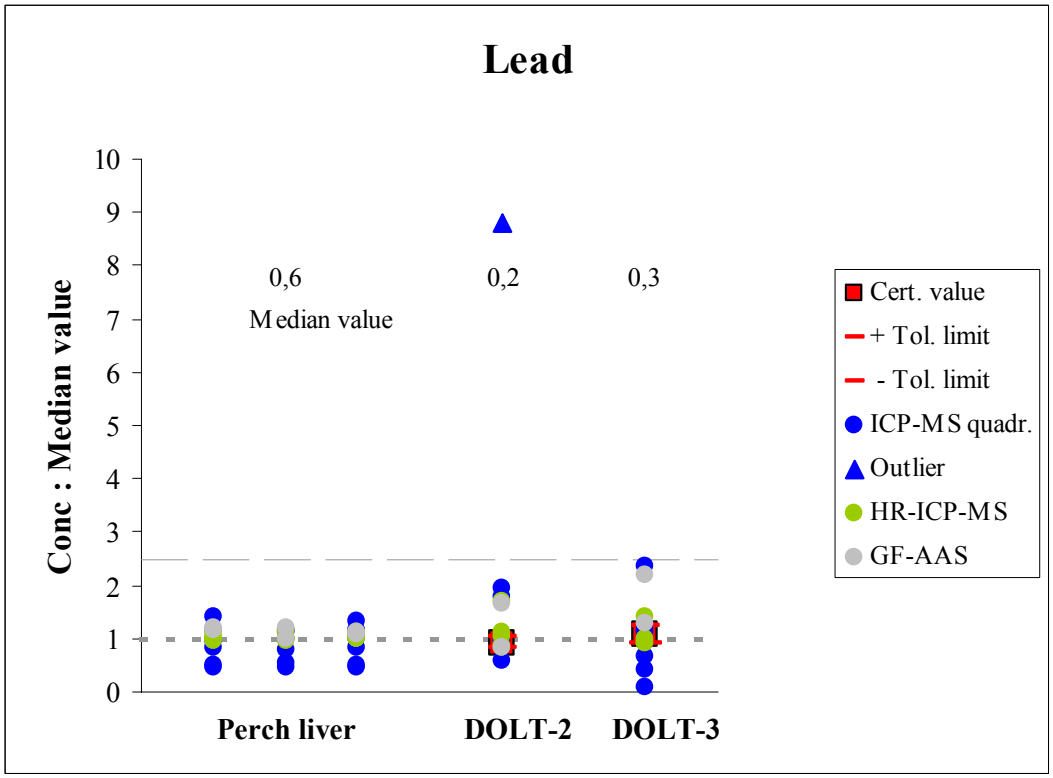
Lead, Perch Liver

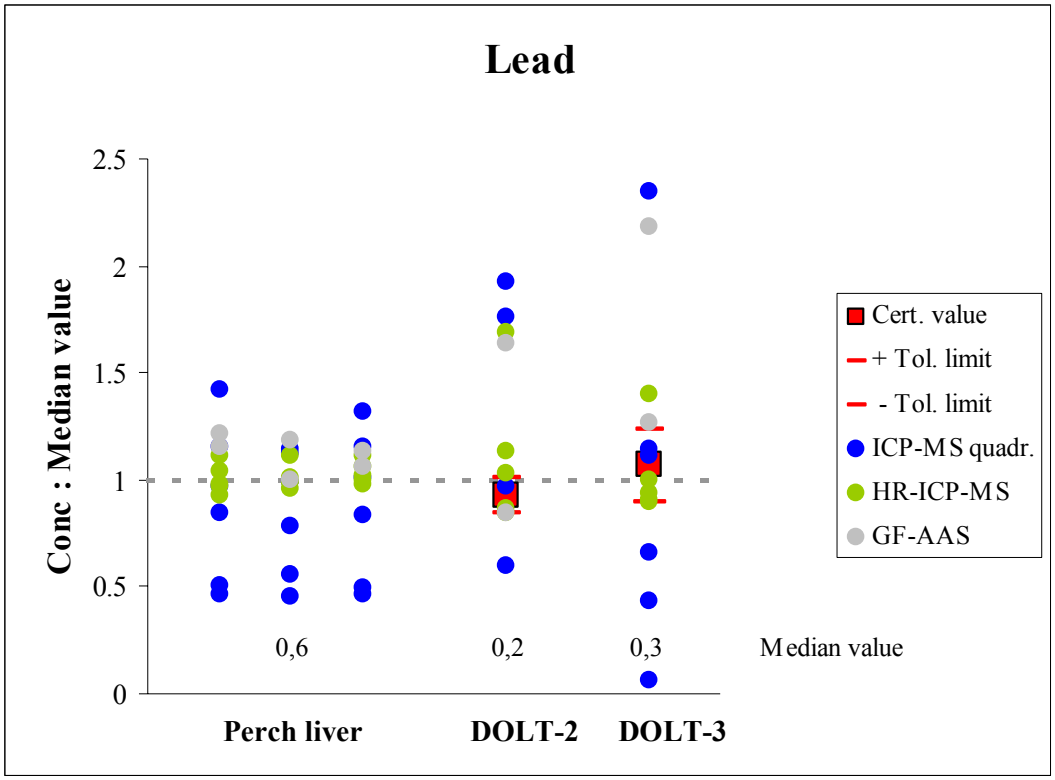
Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
9	1B	Yes		L1	0.30	L19	0.29	L25	0.30		0.30	0.006	1.9	-2.11	0.21
11	1B	Yes		L11	0.322	L24	0.356	L28	0.320		0.333	0.020	6.1	-1.88	0.75
3	3B	Yes		L3	0.541	L17	0.502	L33	0.539		0.527	0.022	4.2	-0.62	0.81
8	1C	Yes		L9	0.60	L13	0.64	L26	0.63		0.62	0.021	3.3	0.01	0.77
4	1C	Yes		L5	0.627	L15	0.618	L31	0.645		0.630	0.014	2.2	0.05	0.51
10	2B			L2	0.621	L20	0.637	L27	0.649		0.636	0.014	2.2	0.08	0.52
7	1C			L8	0.629	L23	0.649	L32	0.684		0.654	0.028	4.3	0.20	1.03
12	3C			L10	0.67	L22	0.64	L29	0.66		0.66	0.015	2.3	0.22	0.56
2a	1A	Yes		L6	0.780	L18	0.6421	L35	0.727		0.716	0.070	9.7	0.61	2.57
1	3C	Yes		L4	0.719	L21	0.716	L36	0.719		0.718	0.002	0.2	0.62	0.06
6	1A	Yes		L7	0.745	L14	0.762	L34	0.685		0.731	0.040	5.5	0.70	1.49
13	3B	Yes		L12	0.7429	L16	0.7373	L30	0.7426		0.7409	0.003	0.4	0.77	0.12
2b	1B	Yes		L6	0.918	L18	0.725	L35	0.850		0.831	0.098	11.8	1.35	3.61
			Mean all values		0.623					**Mean**	0.6226	0.027	4.2		
			Median all values		0.645					**Median**	0.6540	0.020	3.3		
			Standard deviation		0.154										
			Coefficient of variation, %		24.8							**Min**	0.2		
												Max	11.8		

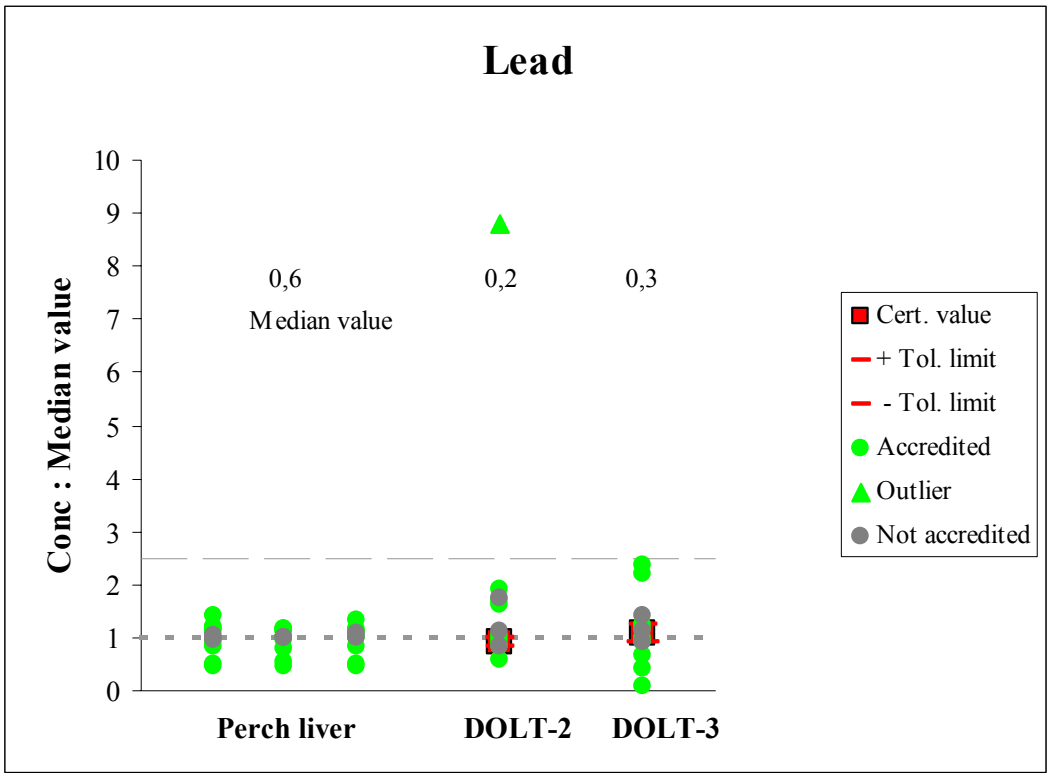
Lab no. 11: Digestion blank was high.

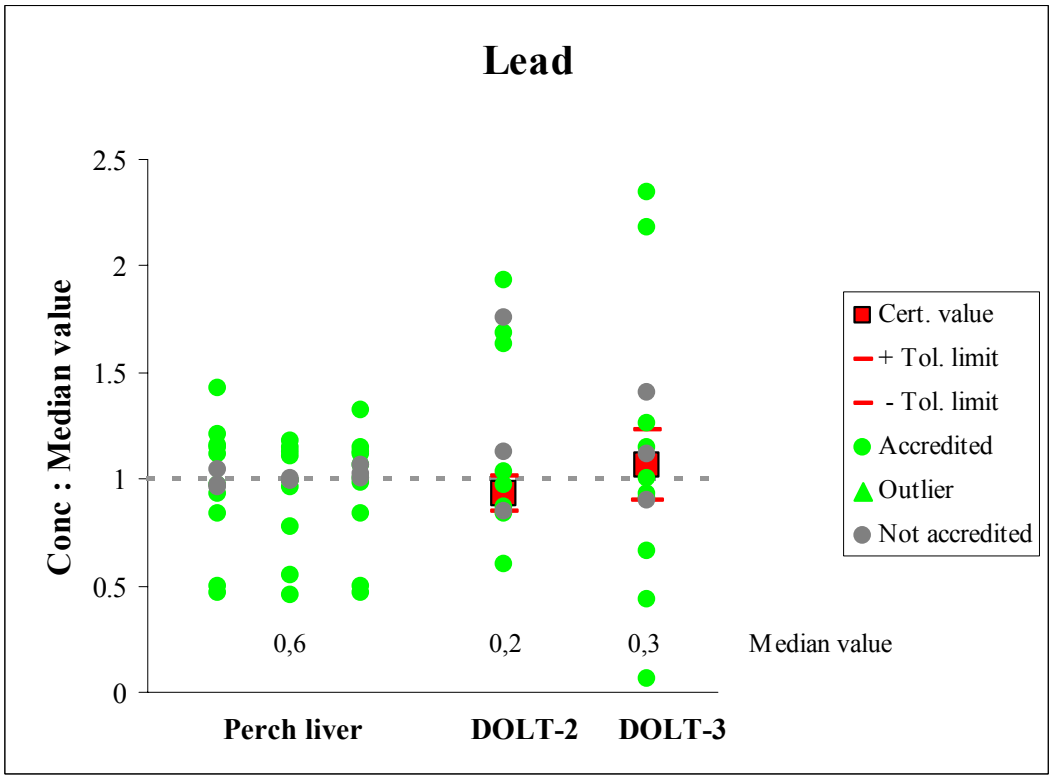
Lead, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
9	1B	Yes		B8	2.09 E	C9	0.02		E	E		-1.66	-6.00		
11	1B	Yes		B10	-0.013	C5	0.129		-2.04	-11.65		-1.08	-3.82		
3	3B	Yes		B5	0.142	C2	0.199		-0.89	-3.90		-0.71	-2.42		
12	3C			B12	0.20	C6	0.27		-0.46	-1.00		-0.33	-1.00		
1	3C	Yes		B4	0.206	C10	0.300		-0.41	-0.70		-0.17	-0.40		
4	1C	Yes		B2	0.244	C3	0.272		-0.13	1.20		-0.32	-0.96		
6	1A	Yes		B3	0.199	C1	0.379		-0.46	-1.05		0.25	1.18		
13	3B	Yes		B11	0.2301	C7	0.3425		-0.23	0.51		0.06	0.45		
7	1C			B6	0.268	C12	0.421		0.05	2.40		0.48	2.02		
8	1C	Yes		B7	0.40	C11	0.28		1.03	9.00		-0.27	-0.80		
10	2B			B9	0.417	C8	0.334		1.16	9.85		0.01	0.28		
2a	1A	Yes		B1	0.387	C4	0.655		0.93	8.35		1.73	6.70		
2b	1B	Yes		B1	0.457	C4	0.705		1.45	11.85		2.00	7.70		
				Mean	0.261		0.331			**DOLT-2**	**DOLT-3**				
				Median	0.237		0.300		**Certified value**	0.22	0.32				
			Standard deviation		0.135		0.187		±	0.02	0.05				
			Coefficient of variation, %		51.5		56.5								


Lead
Conc : Median value
10
9
8
7
6
5
4
3
2
1
0
0,6
0,2
0,3
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
Outlier
HR-ICP-MS
GF-AAS


Lead
Conc : Median value
2.5
2
1.5
1
0.5
0
0,6
0,2
0,3
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
HR-ICP-MS
GF-AAS


Lead
Conc : Median value
10
9
8
7
6
5
4
3
2
1
0
0,6
0,2
0,3
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
Accredited
Outlier
Not accredited

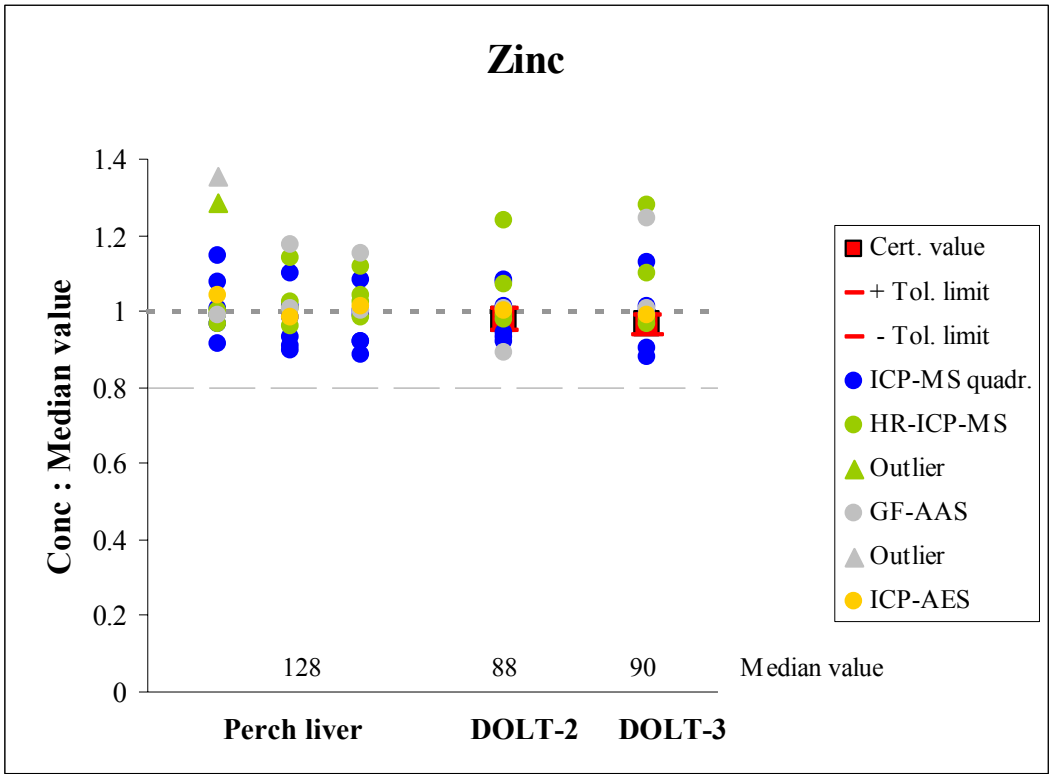

Lead
Conc : Median value
2.5
2
1.5
1
0.5
0
0,6
0,2
0,3
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
Accredited
Outlier
Not accredited

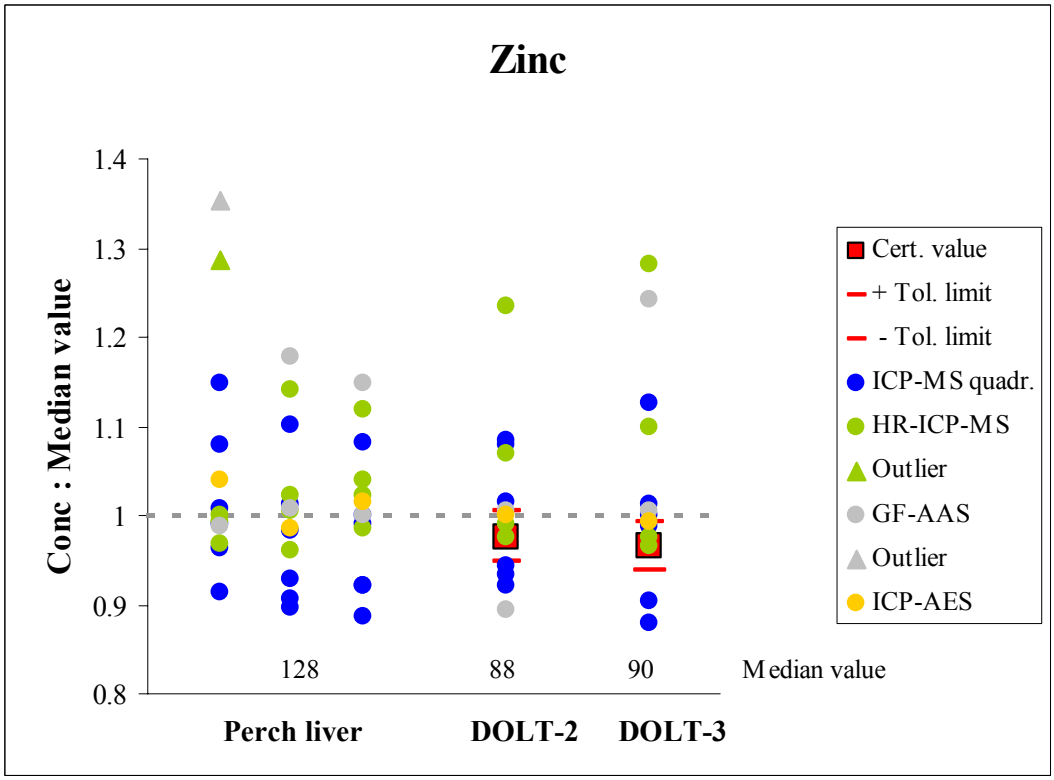
Zinc, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
9	1B	Yes		L1	117	L19	116	L25	118		117	1.0	0.9	-1.30	0.27
2b	1B	Yes		L6	123.4	L18	114.9	L35	113.4		117.2	5.4	4.6	-1.27	1.45
1	3C	Yes		L4	124	L21	123	L36	131		126	4.4	3.5	-0.34	1.17
11	1B	Yes		L11	128.9	L24	125.8	L28	126.8		127.2	1.6	1.2	-0.22	0.43
4	1C			L5	128.05	L15	128.75	L31	126.2		127.7	1.3	1.0	-0.17	0.35
6	1A	Yes		L7	126.6	L14	128.9	L34	128.0		127.8	1.2	0.9	-0.15	0.31
3	3B	Yes		L3	147	L17	119	L33	118		128	16.5	12.9	-0.13	4.43
10	2B			L2	126.7	L20	129.6	L27	128.1		128.1	1.5	1.1	-0.12	0.39
8	1E			L9	133	L13	126	L26	130		130	3.5	2.7	0.05	0.95
12	3C			L10	127	L22	131	L29	133		130	3.1	2.3	0.12	0.82
13	3B	Yes		L12	138.1	L16	141.0	L30	138.6		139.2	1.6	1.1	1.06	0.42
7	1C			L8	164.6 E	L23	146.0	L32	143.3		144.7	-	-	1.63	E (1)
2a	1A	Yes		L6	173.25 E	L18	150.708	L35	147.115		148.912	-	-	2.08	E (1)
			Mean all values		129.2					**Mean**	130.1	3.7	2.9		
			Median all values		128.1					**Median**	128.0	1.6	1.2		
			Standard deviation		9.4										
			Coefficient of variation, %		7.3							**Min**	0.9		
												Max	12.9		

Zinc, DOLT-2 (B) and DOLT-3 (C)

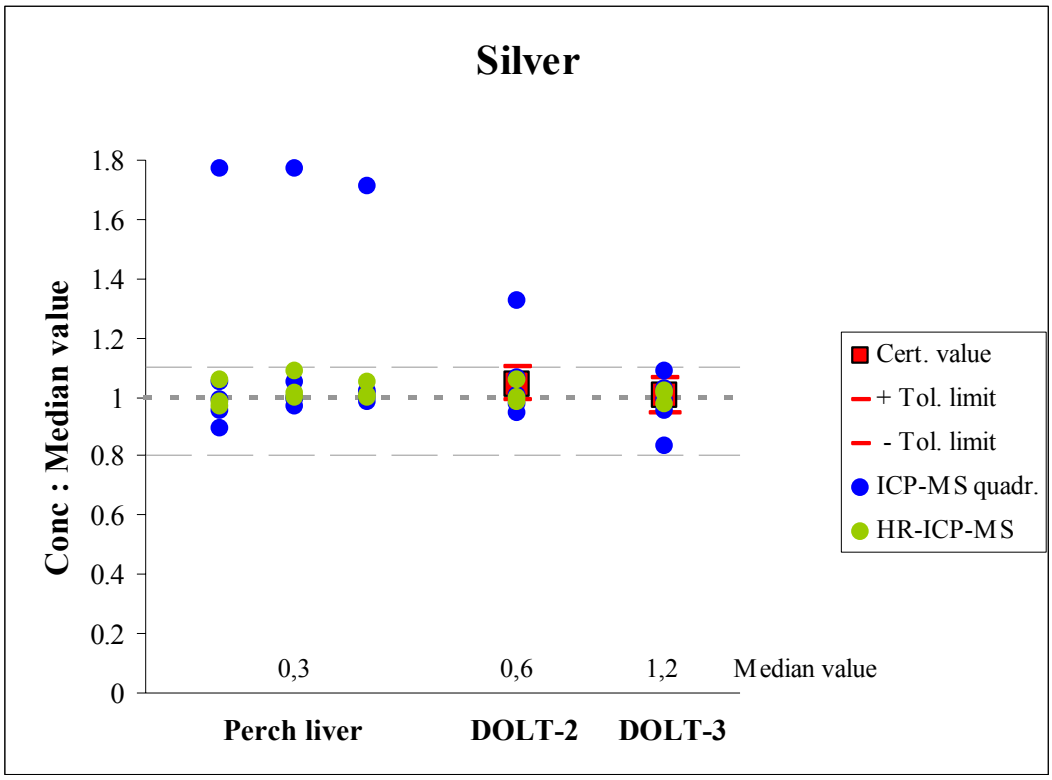
Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
3	3B	Yes		B5	81.0	C2	78.9		-0.99	-1.92		-1.31	-3.21		
9	1B	Yes		B8	82.8	C9	81.1		-0.76	-1.20		-1.10	-2.29		
2b	1B	Yes		B1	81.96	C4	89.71		-0.87	-1.54		-0.30	1.30		
1	3C	Yes		B4	87.0	C10	87.6		-0.23	0.48		-0.50	0.42		
8	1E			B7	87.9	C11	89.0		-0.12	0.84		-0.37	1.00		
10	2B			B9	89.13	C8	88.51		0.03	1.33		-0.41	0.80		
6	1A	Yes		B3	88.4	C1	90.1		-0.06	1.04		-0.27	1.46		
4	1C			B2	94.05	C3	86.7		0.65	3.30		-0.58	0.04		
12	3C			B12	85.7	C6	98.6		-0.40	-0.04		0.52	5.00		
2a	1A	Yes		B1	78.538	C4	111.497		-1.30	-2.90		1.72	10.37		
11	1B	Yes		B10	95.31	C5	90.80		0.81	3.80		-0.20	1.75		
13	3B	Yes		B11	94.8	C7	101.1		0.75	3.60		0.76	6.04		
7	1C			B6	108.6	C12	114.9		2.48	9.12		2.04	11.79		
				Mean	88.86		92.96			**DOLT-2**	**DOLT-3**				
				Median	87.90		89.71		**Certified value**	85.8	86.6				
			Standard deviation		7.96		10.76		±	2.5	2.4				
			Coefficient of variation, %		9.0		11.6								

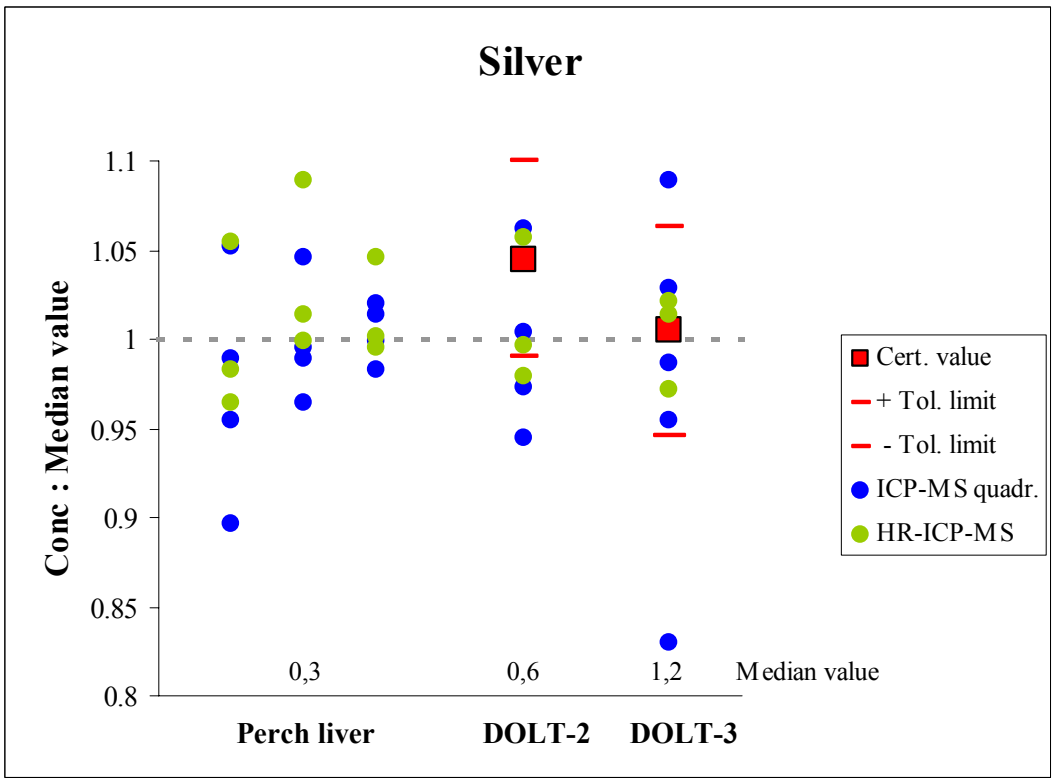

Zinc
Conc : Median value
1.4
1.2
1
0.8
0.6
0.4
0.2
0
128
88
90
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
HR-ICP-MS
Outlier
GF-AAS
Outlier
ICP-AES

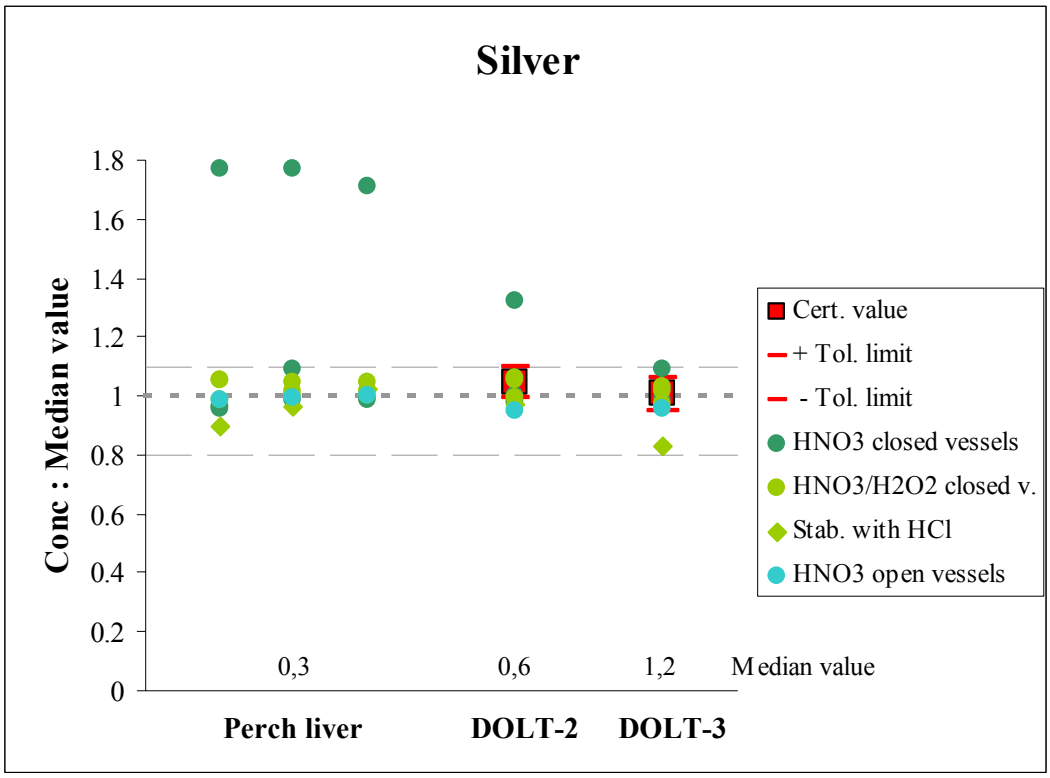

Zinc
Conc : Median value
1.4
1.3
1.2
1.1
1
0.9
0.8
128
88
90
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
HR-ICP-MS
Outlier
GF-AAS
Outlier
ICP-AES

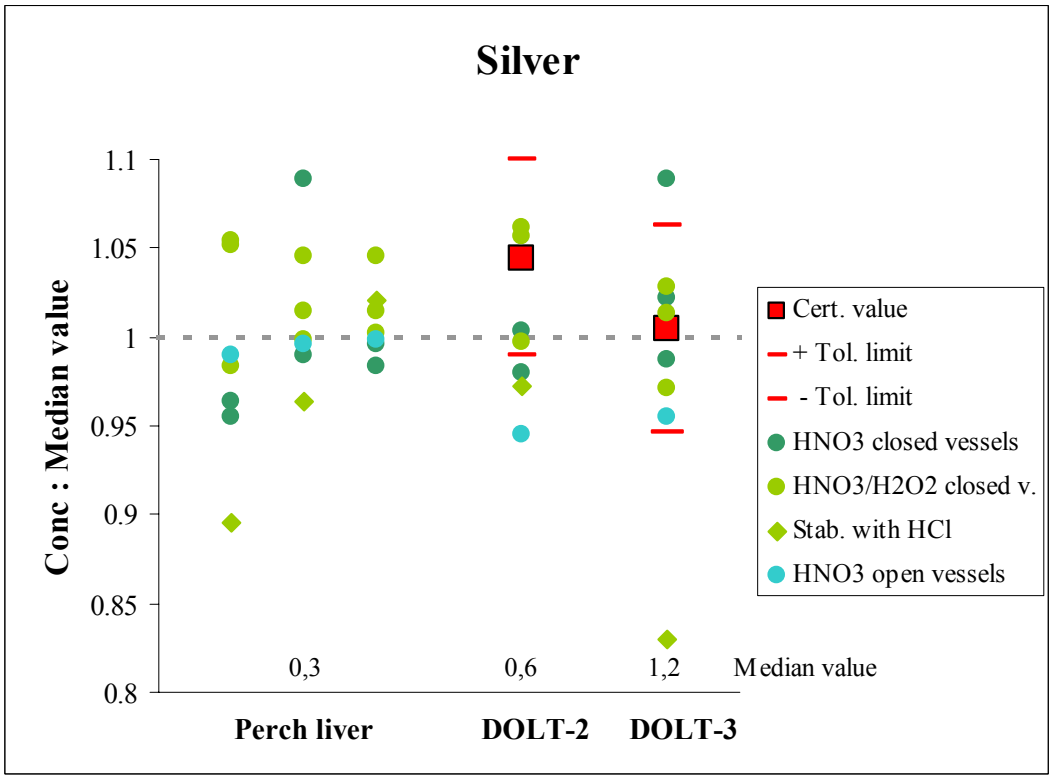
Silver, Perch Liver															
Lab No.	**Code**	**Accred.**	***Det. limit***	**Sample**	**µg/g**	**Sample**	**µg/g**	**Sample**	**µg/g**		**Lab mean**	**s**	**CV, %**	**Z-score**	**s/s mean**
3	3_{HCl}B			L3	0.288	L17	0.310	L33	0.328		0.309	0.020	6.5	-0.53	2.10
11	1B	Yes		L11	0.307	L24	0.318	L28	0.316		0.314	0.006	1.9	-0.47	0.61
1	3C			L4	0.316	L21	0.321	L36	0.322		0.320	0.003	1.0	-0.40	0.34
10	2B			L2	0.318	L20	0.320	L27	0.321		0.320	0.002	0.5	-0.40	0.16
8	1C			L9	0.31	L13	0.35	L26	0.32		0.33	0.021	6.4	-0.31	2.18
13	3B			L12	0.338	L16	0.336	L30	0.326		0.333	0.006	1.9	-0.23	0.67
12	3C			L10	0.339	L22	0.326	L29	0.336		0.334	0.007	2.0	-0.23	0.71
9	1B			L1	0.57	L19	0.57	L25	0.55		0.56	0.012	2.0	2.56	1.21
			Mean all values		0.352					**Mean**	0.352	0.010	2.8		
			Median all values		0.322					**Median**	0.323	0.007	2.0		
			Standard deviation		0.082										
		Coefficient of variation, %			23.4							**Min**	0.5		
												Max	6.5		

Silver, DOLT-2 (B) and DOLT-3 (C)															
Lab No.	**Code**	**Accred.**	***Det. limit***	**Sample**	**µg/g**	**Sample**	**µg/g**	**B:**	**Z-score**	**Z cert.**	**C:**	**Z-score**	**Z cert.**		
3	3_{HCl}B			B5	0.566	C2	0.991		-0.58	-1.31		-2.08	-2.99		
10	2B			B9	0.550	C8	1.14		-0.81	-1.81		-0.43	-0.86		
1	3C			B4	0.580	C10	1.16		-0.38	-0.88		-0.21	-0.57		
11	1B	Yes		B10	0.584	C5	1.179		-0.32	-0.75		0.01	-0.30		
8	1C			B7	0.57	C11	1.22		-0.52	-1.19		0.46	0.29		
12	3C			B12	0.615	C6	1.21		0.12	0.22		0.35	0.14		
13	3B			B11	0.618	C7	1.228		0.16	0.31		0.55	0.40		
9	1B			B8	0.77	C9	1.30		2.33	5.06		1.35	1.43		
				Mean	0.607		1.179			**DOLT-2**	**DOLT-3**				
				Median	0.582		1.195	**Certified value**		0.608	1.20				
			Standard deviation		0.070		0.090		±	0.032	0.07				
		Coefficient of variation, %			11.5		7.7								


Silver
Conc : Median value
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0,3
0,6
1,2
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
HR-ICP-MS


Silver
Conc : Median value
1.1
1.05
1
0.95
0.9
0.85
0.8
0,3
0,6
1,2
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
HR-ICP-MS


Silver
Conc : Median value
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0,3
0,6
1,2
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
HNO3 closed vessels
HNO3/H2O2 closed v.
Stab. with HCl
HNO3 open vessels

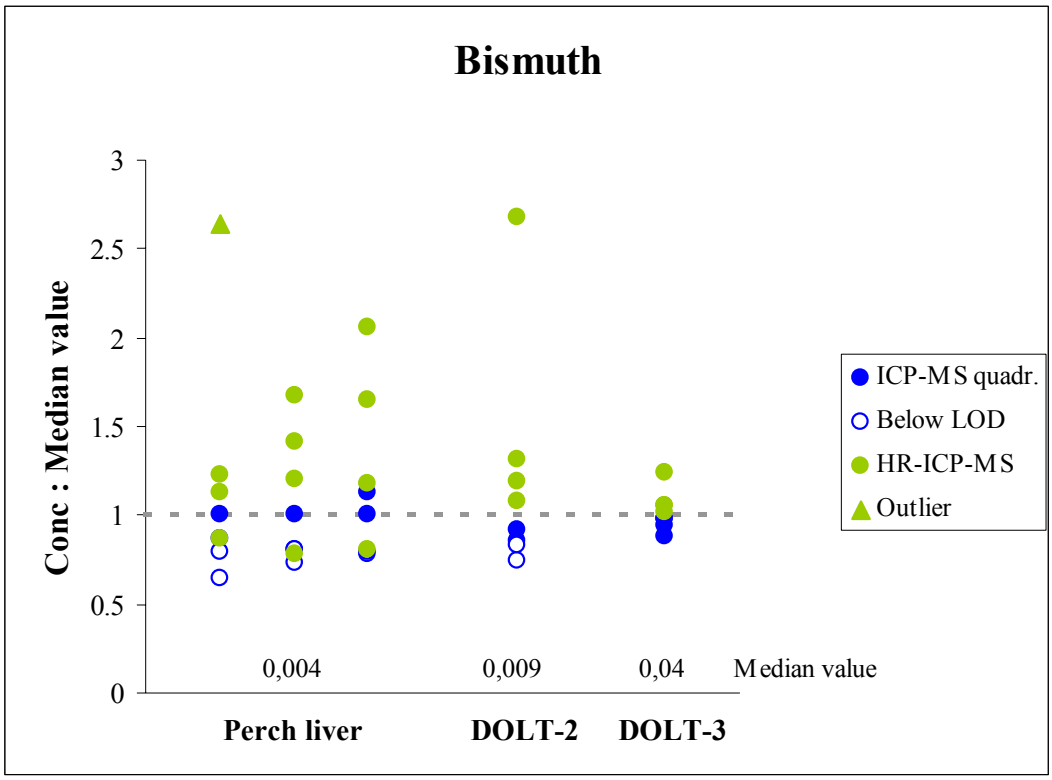

Silver
Conc : Median value
1.1
1.05
1
0.95
0.9
0.85
0.8
0,3
0,6
1,2
Median value
Perch liver
DOLT-2
DOLT-3
Cert. value
+ Tol. limit
- Tol. limit
HNO3 closed vessels
HNO3/H2O2 closed v.
Stab. with HCl
HNO3 open vessels

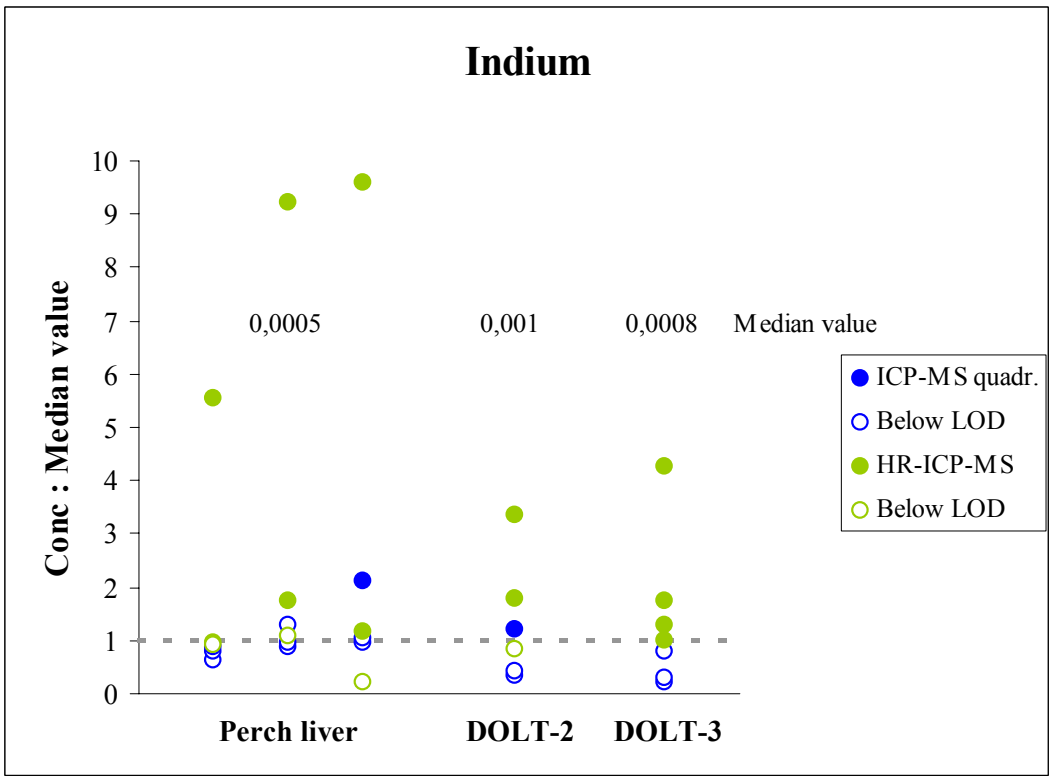
Bismuth, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
3	3B		*<0.01*	L3	*0.00273*	L17	*0.00312*	L33	*0.00339*		0.00308	0.00033	10.8	*-0.94*	*0.67*
11	1B	Yes	*<0.024*	L11	*0.00339*	L24	*0.00344*	L28	*0.00330*		0.00338	0.00007	2.1	*-0.74*	*0.14*
12	3C			L10	0.0037	L22	0.0033	L29	0.0034		0.0035	0.00021	6.0	-0.68	0.42
10	2B			L2	0.0037	L20	0.0034	L27	0.0048		0.0040	0.00074	18.6	-0.35	1.50
13	3B			L12	0.00425	L16	0.00424	L30	0.00425		0.00425	0.00001	0.1	-0.16	0.01
1	3C			L4	0.0052	L21	0.0051	L36	0.0050		0.0051	0.00010	2.0	0.41	0.20
7	1C			L8	0.0048	L23	0.0060	L32	0.0087		0.0065	0.00200	30.7	1.34	4.05
4	1C			L5	0.0112 E	L15	0.0071	L31	0.0070		0.0071	-	-	1.70	E (1)
			Mean all values		0.0045					**Mean**	0.0046	0.00049	10.0		
			Median all values		0.0042					**Median**	0.0041	0.00021	6.0		
			Standard deviation		0.0015										
		Coefficient of variation, %			33.4							**Min**	0.1		
												Max	30.7		

Bismuth, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
10	2B			B9	0.0079	C8	0.0352		-0.55	-		-1.29	-		
3	3B		*<0.01*	B5	*0.00686*	C2	0.0376		*-0.73*	-		-0.73	-		
11	1B	Yes	*<0.024*	B10	*0.0077*	C5	0.0392		*-0.59*	-		-0.35	-		
13	3B			B11	0.00850	C7	0.0393		-0.45	-		-0.33	-		
12	3C			B12	0.010	C6	0.042		-0.19	-		0.31	-		
4	1C			B2	0.0121	C3	0.0405		0.17	-		-0.04	-		
1	3C			B4	0.0110	C10	0.0495		-0.02	-		2.09	-		
7	1C			B6	0.0248	C12	0.0421		2.36	-		0.34	-		
				Mean	0.0111		0.0407			**DOLT-2**	**DOLT-3**				
				Median	0.0093		0.0399	**Certified value**		-	-				
			Standard deviation		0.0058		0.0042		±	-	-				
		Coefficient of variation, %			52.3		10.4								


Bismuth
Conc : Median value
3
2.5
2
1.5
1
0.5
0
0,004
0,009
0,04
Median value
Perch liver
DOLT-2
DOLT-3
ICP-MS quadr.
Below LOD
HR-ICP-MS
Outlier


Indium
Conc : Median value
10
9
8
7
6
5
4
3
2
1
0
0,0005
0,001
0,0008
Median value
Perch liver
DOLT-2
DOLT-3
ICP-MS quadr.
Below LOD
HR-ICP-MS
Below LOD

Indium, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
4	1C		*<0.001*	L5	*0.00048*	L15	*0.00057*	L31	*0.00010*		0.00038	0.00025	65.1	*-0.52*	*0.71*
13	3B		*<0.0005*	L12	*0.00041*	L16	*0.00046*	L30	*0.00049*		0.00045	0.00004	8.9	*-0.47*	*0.12*
3	3B		*<0.01*	L3	*0.00032*	L17	*0.0005*	L33	*0.00054*		0.000456	0.00012	25.5	*-0.47*	*0.33*
7	1C			L8	0.0005	L23	0.0009	L32	0.0006		0.0007	0.00021	31.2	-0.33	0.59
10	2B		*<0.001*	L2	*0.00046*	L20	*0.00067*	L27	0.0011		0.00074	0.00033	43.9	*-0.28*	*0.93*
1	3C			L4	0.0029	L21	0.0048	L36	0.0050		0.0042	0.00116	27.4	2.07	3.31
12	3C			L10	<0.001	L22	<0.001	L29	<0.001		-	-	-	<	<
			Mean all values		0.00116					**Mean**	0.00116	0.00035	33.7		
			Median all values		0.00052					**Median**	0.00056	0.00023	29.3		
			Standard deviation		0.00149										
		Coefficient of variation, %			128.5							**Min**	8.9		
												Max	65.1		

Indium, DOLT-2 (B) and DOLT-3 (C)

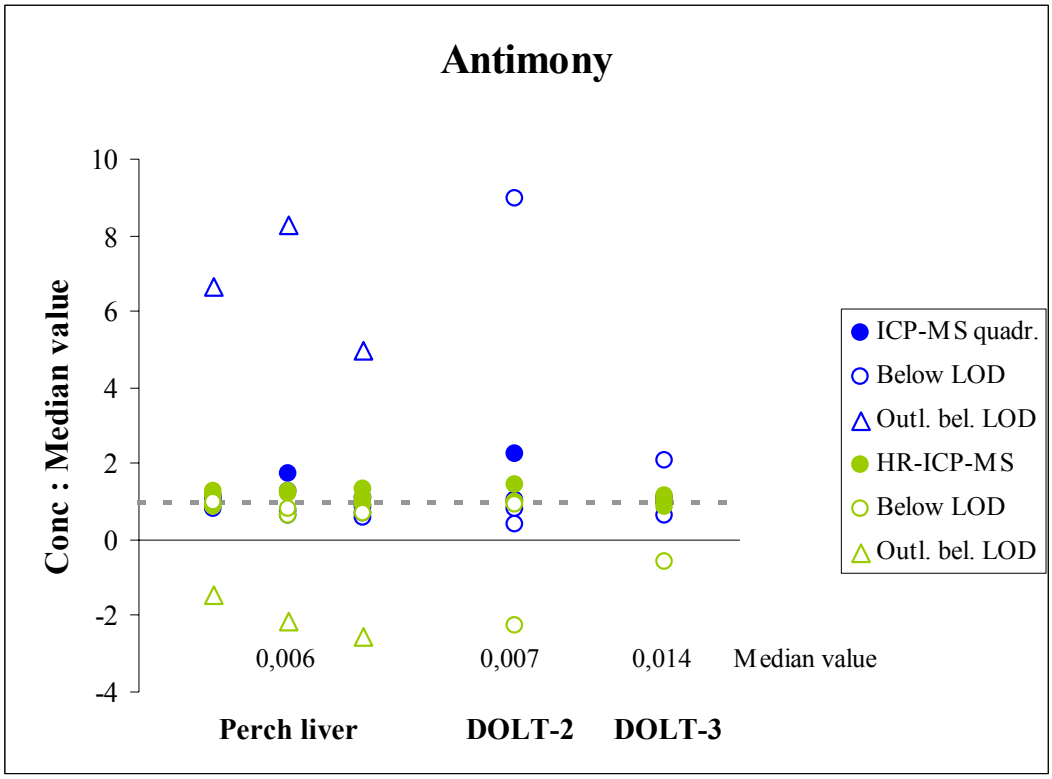
Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
13	3B		*<0.0005*	B11	*0.00033*	C7	*0.00015*		*-0.87*	-		*-0.85*	-		
3	3B		*<0.01*	B5	*0.00041*	C2	*0.00022*		*-0.80*	-		*-0.79*	-		
10	2B		*<0.001*	B9	0.0012	C8	*0.00063*		-0.11	-		*-0.41*	-		
4	1C		*<0.001*	B2	*0.00083*	C3	0.00102		*-0.43*	-		-0.06	-		
7	1C			B6	0.0018	C12	0.0008		0.41	-		-0.26	-		
12	3C			B12	<0.001	C6	0.0014		<	-		0.28	-		
1	3C			B4	0.0034	C10	0.0034		1.80	-		2.08	-		
				Mean	0.00133		0.00109			**DOLT-2**	**DOLT-3**				
				Median	0.00102		0.00080	**Certified value**		-	-				
			Standard deviation		0.00115		0.00111		±	-	-				
		Coefficient of variation, %			86.6		102.0								

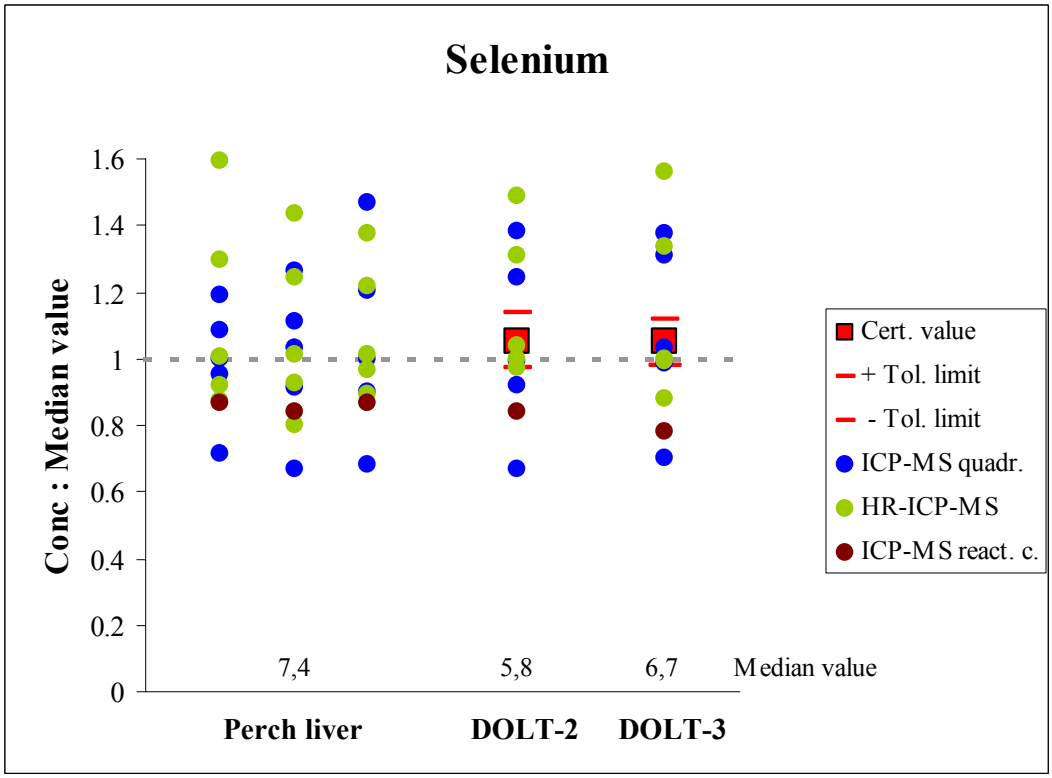
Antimony, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
3	3B		*<0.2*	L3	*0.00607*	L17	*0.00373*	L33	*0.00340*		0.00440	0.0015	33.1	*-0.94*	*1.22*
4	1C		*<0.004*	L5	0.0051	L15	*0.0038*	L31	0.0054		0.0048	0.0009	17.8	*-0.72*	*0.71*
12	3C		*<0.01*	L10	*0.006*	L22	*0.005*	L29	*0.004*		0.005	0.0010	20.0	*-0.58*	*0.84*
11	1B	Yes	*<0.012*	L11	*0.0069*	L24	*0.0045*	L28	*0.0043*		0.0052	0.0014	27.6	*-0.44*	*1.21*
10	2B		*<0.01*	L2	*0.0050*	L20	0.0103	L27	*0.0052*		0.0068	0.0030	44.0	*0.52*	*2.51*
13	3B			L12	0.0065	L16	0.0076	L30	0.0065		0.0069	0.0006	9.2	0.54	0.53
1	3C			L4	0.0076	L21	0.0076	L36	0.0065		0.0072	0.0006	8.8	0.76	0.53
7	1C			L8	0.0068	L23	0.0074	L32	0.0079		0.0074	0.0006	7.5	0.84	0.46
8	1C		*<0.1*	L9	*0.00888 E*	L13	*-0.0129 E*	L26	*-0.0155 E*		-	-	-	*E*	*E (3)*
9	1B		*<0.24*	L1	*0.04 E*	L19	*0.05 E*	L25	*0.03 E*		-	-	-	*E*	*E (3)*
			Mean all values		0.00596					**Mean**	0.00596	0.00120	21.0		
			Median all values		0.00604					**Median**	0.00603	0.00093	18.9		
			Standard deviation		0.00166										
			Coefficient of variation, %		27.9							**Min**	7.5		
												Max	44.0		

Antimony, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
8	1C		*<0.1*	B7	*-0.0152*	C11	*-0.0085*		*-1.34*	-		*-2.31*	-		
3	3B		*<0.2*	B5	*0.00248*	C2	*0.00871*		*-0.41*	-		*-0.49*	-		
1	3C			B4	0.0067	C10	0.0127		-0.19	-		-0.06	-		
11	1B	Yes	*<0.012*	B10	*0.0069*	C5	0.0140		*-0.18*	-		0.07	-		
4	1C			B2	0.0067	C3	0.0144		-0.19	-		0.12	-		
12	3C		*<0.01*	B12	*0.006*	C6	0.015		*-0.23*	-		0.18	-		
10	2B		*<0.01*	B9	*0.0054*	C8	0.0157		*-0.26*	-		0.25	-		
7	1C			B6	0.0097	C12	0.0167		-0.03	-		0.36	-		
13	3B			B11	0.0149	C7	0.0143		0.24	-		0.11	-		
9	1B		*<0.24*	B8	*0.06*	C9	*0.03*		*2.60*	-		*1.77*	-		
				Mean	0.0104		0.0133			**DOLT-2**	**DOLT-3**				
				Median	0.0067		0.0144	**Certified value**		-	-				
			Standard deviation		0.0191		0.0094		±	-	-				
			Coefficient of variation, %		184.4		70.7								


Antimony
Conc : Median value
10
8
6
4
2
0
-2
-4
ICP-MS quadr.
Below LOD
Outl. bel. LOD
HR-ICP-MS
Below LOD
Outl. bel. LOD
0,006
0,007
0,014
Median value
Perch liver
DOLT-2
DOLT-3


Selenium
Conc : Median value
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Cert. value
+ Tol. limit
- Tol. limit
ICP-MS quadr.
HR-ICP-MS
ICP-MS react. c.
7,4
5,8
6,7
Median value
Perch liver
DOLT-2
DOLT-3

Selenium, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
9	1B			L1	5.29	L19	4.93	L25	5.02		5.08	0.19	3.7	-1.54	0.44
3	3D	Yes		L3	6.43	L17	6.20	L33	6.42		6.35	0.13	2.0	-0.79	0.30
12	3C			L10	6.8	L22	5.9	L29	6.6		6.4	0.47	7.3	-0.74	1.10
1	3C			L4	6.45	L21	6.84	L36	7.12		6.80	0.34	4.9	-0.52	0.78
2b	1B	Yes		L6	7.06	L18	6.74	L35	6.64		6.81	0.22	3.2	-0.52	0.51
8	1C	Yes		L9	7.42	L13	7.47	L26	7.48		7.46	0.03	0.4	-0.14	0.07
10	2B			L2	7.40	L20	7.62	L27	7.39		7.47	0.13	1.7	-0.13	0.30
13	3B			L12	8.01	L16	9.34	L30	8.89		8.75	0.68	7.7	0.63	1.57
4	1C	Yes		L5	9.61	L15	9.18	L31	9.00		9.26	0.31	3.4	0.93	0.73
11	1B	Yes		L11	8.83	L24	8.23	L28	10.88		9.31	1.39	14.9	0.96	3.23
7	1C			L8	11.79	L23	10.60	L32	10.17		10.85	0.84	7.7	1.87	1.95
			Mean all values		7.69					**Mean**	7.69	0.43	5.2		
			Median all values		7.40					**Median**	7.46	0.31	3.7		
			Standard deviation		1.69										
			Coefficient of variation, %		22.0							**Min**	0.4		
												Max	14.9		

Selenium, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
9	1B			B8	3.83	C9	4.73		-1.65	-4.55		-1.42	-4.85		
3	3D	Yes		B5	4.81	C2	5.27		-0.97	-2.55		-1.12	-3.73		
12	3C			B12	5.6	C6	5.9		-0.42	-0.94		-0.78	-2.42		
2b	1B	Yes		B1	5.30	C4	6.96		-0.63	-1.55		-0.20	-0.21		
10	2B			B9	5.71	C8	6.65		-0.34	-0.71		-0.37	-0.85		
1	3C			B4	5.75	C10	6.67		-0.31	-0.63		-0.36	-0.81		
8	1C	Yes		B7	5.97	C11	6.73		-0.16	-0.18		-0.32	-0.69		
13	3B			B11	7.15	C7	9.25		0.67	2.22		1.06	4.56		
4	1C	Yes		B2	7.51	C3	9.01		0.92	2.96		0.93	4.06		
11	1B	Yes		B10	7.96	C5	8.83		1.23	3.88		0.83	3.69		
7	1C			B6	8.57	C12	10.49		1.66	5.12		1.74	7.15		
				Mean	6.20		7.32			**DOLT-2**	**DOLT-3**				
				Median	5.75		6.73	**Certified value**		6.06	7.06				
			Standard deviation		1.43		1.82		±	0.49	0.48				
			Coefficient of variation, %		23.1		24.9								

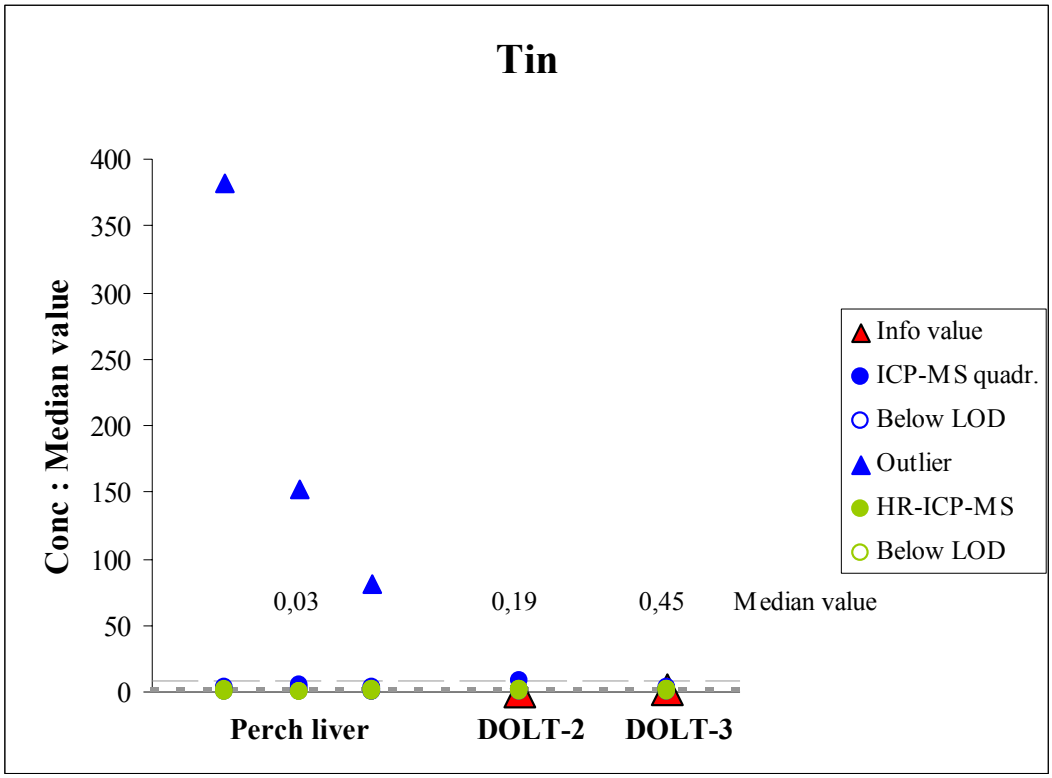
Tin, Perch Liver

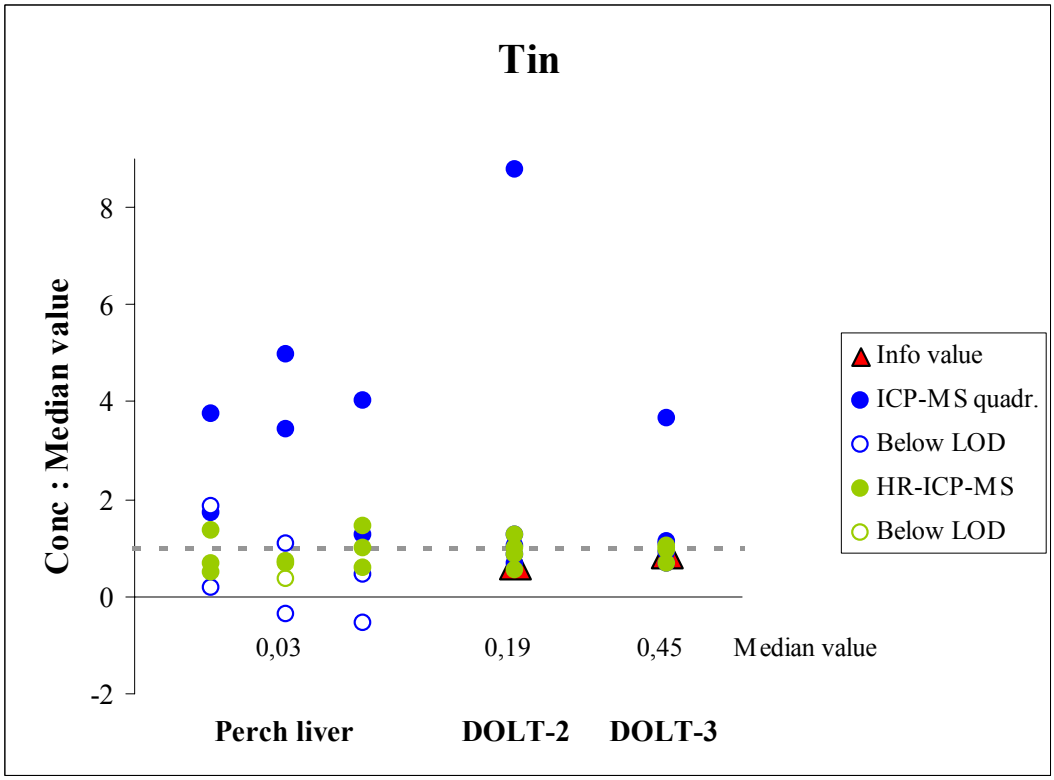
Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
11	1B	Yes	*<0.03*	L11	*0.0048*	L24	*-0.0099*	L28	*-0.0150*		-0.0067	0.0103	153.4	*-1.11*	*0.66*
4	1C		*<0.010*	L5	0.0134	L15	*0.0093*	L31	0.0156		0.0128	0.0032	25.0	*-0.61*	*0.21*
1	3C			L4	0.0182	L21	0.0178	L36	0.0264		0.0208	0.0049	23.3	-0.41	0.31
3	3B		*<0.05*	L3	*0.0490*	L17	*0.0282*	L33	*0.0119*		0.0297	0.0186	62.6	*-0.18*	*1.20*
7	1C			L8	0.0358	L23	0.0190	L32	0.0379		0.0309	0.0104	33.5	-0.14	0.67
13	3B			L12	0.045	L16	0.131	L30	0.033		0.070	0.0535	76.7	0.85	3.46
10	2B			L2	0.0987	L20	0.0909	L27	0.106		0.0985	0.0076	7.7	1.60	0.49
9	1B	Yes		L1	10.1 E	L19	4.03 E	L25	2.12 E		-	-	-	E	E (3)
12	3C			L10	<0.1	L22	<0.1	L29	<0.1		-	-	-	<	<
			Mean all values		0.0365					**Mean**	0.0365	0.0155	54.6		
			Median all values		0.0264					**Median**	0.0297	0.0103	33.5		
			Standard deviation		0.0388										
			Coefficient of variation, %		106.3							**Min**	7.7		
												Max	153.4		

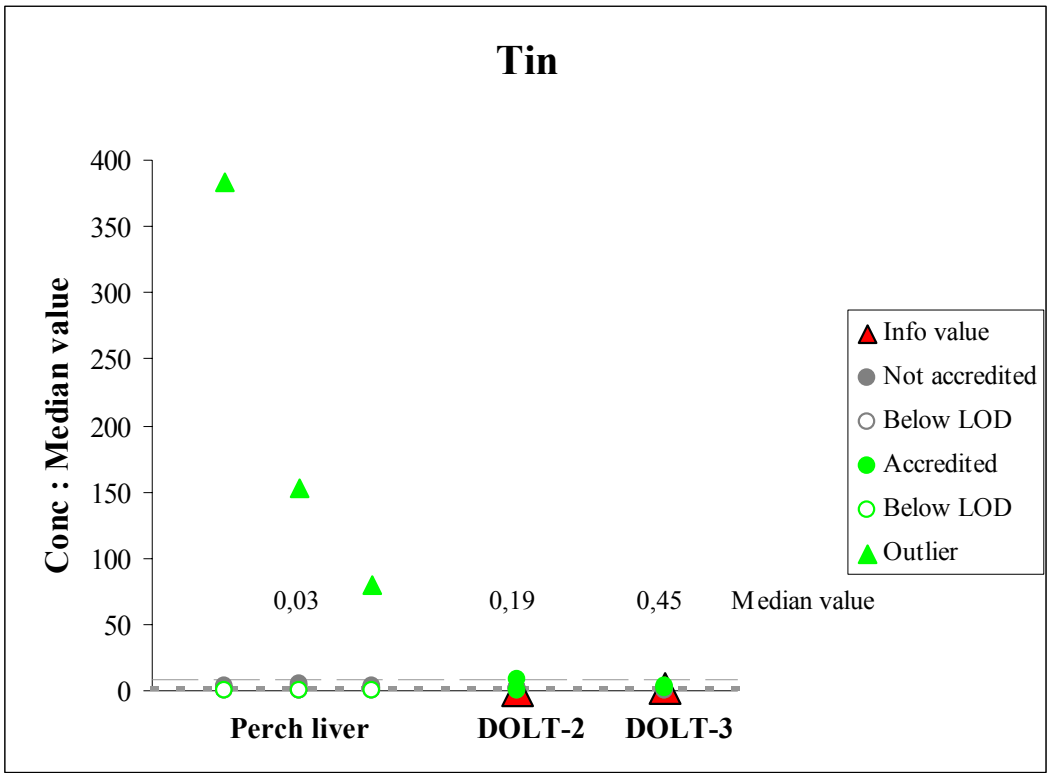
Lab no. 11: Digestion blank was high.

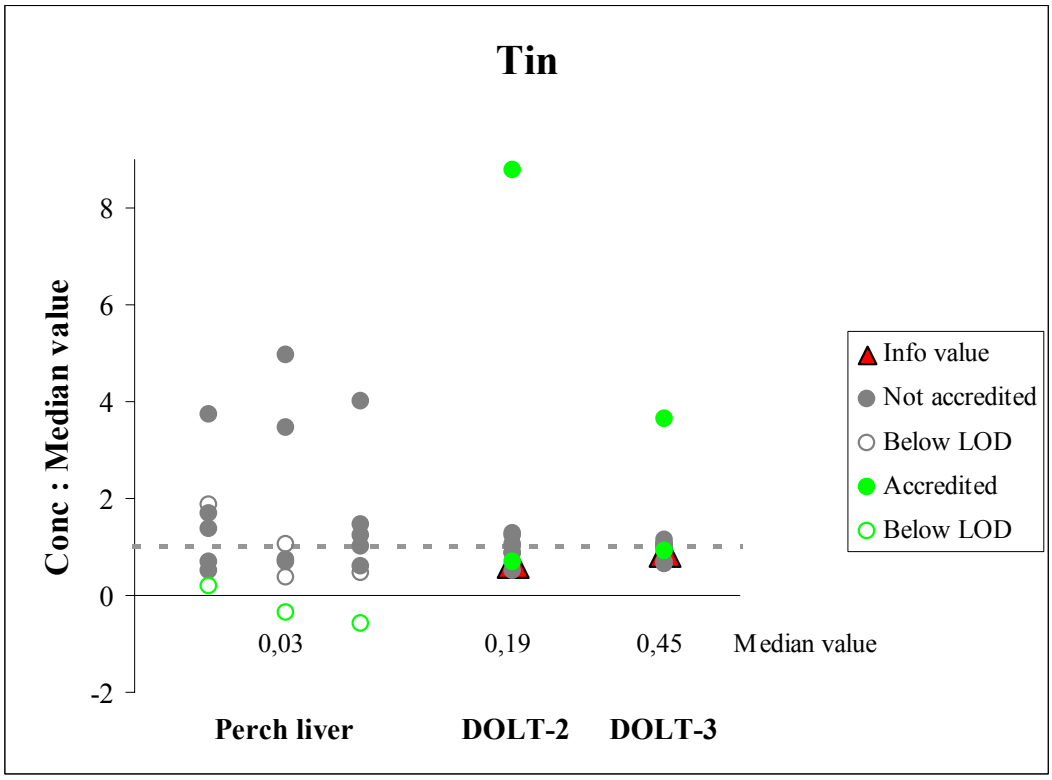
Tin, DOLT-2 (B) and DOLT-3 (C)

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
12	3C			B12	0.100	C6	0.290		-0.49	-		-0.63	-		
3	3B			B5	0.168	C2	0.303		-0.36	-		-0.60	-		
11	1B	Yes		B10	0.129	C5	0.404		-0.43	-		-0.36	-		
1	3C			B4	0.168	C10	0.420		-0.36	-		-0.32	-		
4	1C			B2	0.1941	C3	0.4468		-0.31	-		-0.25	-		
13	3B			B11	0.201	C7	0.476		-0.29	-		-0.18	-		
7	1C			B6	0.2413	C12	0.4715		-0.21	-		-0.19	-		
10	2B			B9	0.248	C8	0.512		-0.20	-		-0.09	-		
9	1B	Yes		B8	1.70	C9	1.63		2.65	-		2.62	-		
				Mean	0.350		0.550			**DOLT-2**	**DOLT-3**				
				Median	0.194		0.447		**Certified value**	(0.13)	(0.4)				
			Standard deviation		0.509		0.412		±	-	-				
			Coefficient of variation, %		145.3		74.8								


Tin
Conc : Median value
400
350
300
250
200
150
100
50
0
0,03
0,19
0,45
Median value
Perch liver
DOLT-2
DOLT-3
Info value
ICP-MS quadr.
Below LOD
Outlier
HR-ICP-MS
Below LOD

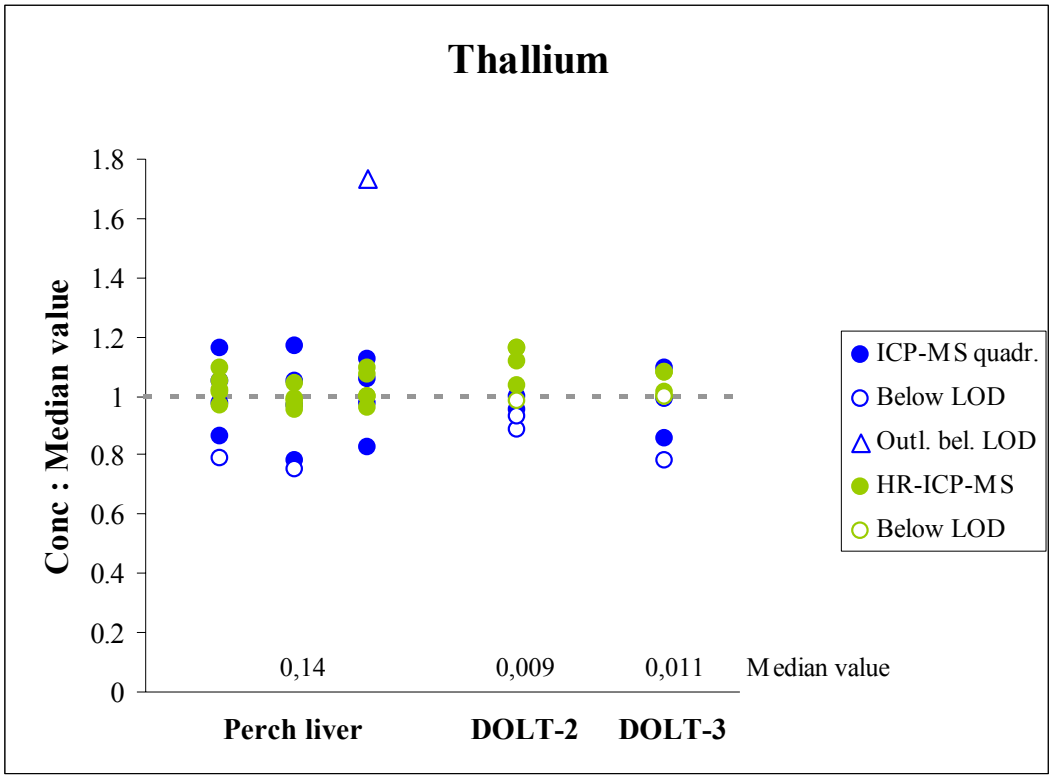

Tin
Conc : Median value
8
6
4
2
0
-2
0,03
0,19
0,45
Median value
Perch liver
DOLT-2
DOLT-3
Info value
ICP-MS quadr.
Below LOD
HR-ICP-MS
Below LOD

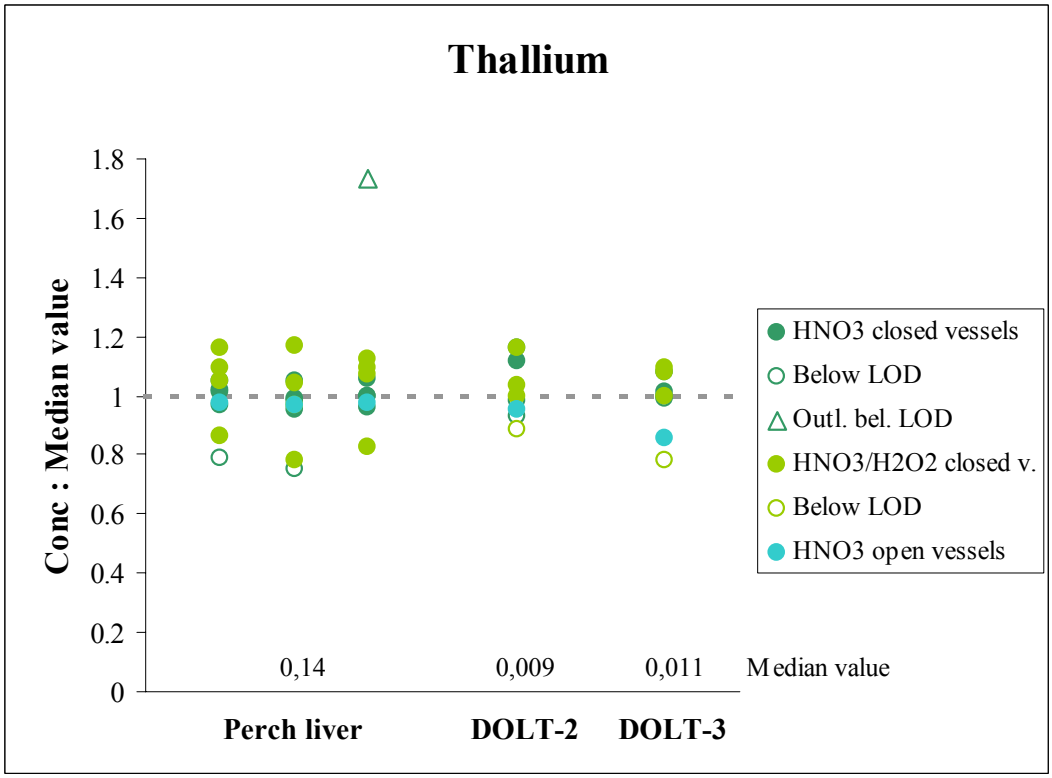

Tin
Conc : Median value
400
350
300
250
200
150
100
50
0
0,03
0,19
0,45
Median value
Perch liver
DOLT-2
DOLT-3
Info value
Not accredited
Below LOD
Accredited
Below LOD
Outlier


Tin
Conc : Median value
8
6
4
2
0
-2
0,03
0,19
0,45
Median value
Perch liver
DOLT-2
DOLT-3
Info value
Not accredited
Below LOD
Accredited
Below LOD

Thallium, Perch Liver															
Lab No.	**Code**	**Accred.**	***Det. limit***	**Sample**	**µg/g**	**Sample**	**µg/g**	**Sample**	**µg/g**		**Lab mean**	**s**	**CV, %**	**Z-score**	**s/s mean**
9	1B		*<0.24*	L1	*0.107*	L19	*0.102*	L25	*0.236 E*		0.105	-	-	*-2.08*	*E (1)*
3	3B			L3	0.117	L17	0.106	L33	0.112		0.112	0.0055	4.9	-1.59	1.81
7	1C			L8	0.131	L23	0.129	L32	0.130		0.130	0.0010	0.8	-0.33	0.33
10	2B			L2	0.133	L20	0.131	L27	0.133		0.132	0.0012	0.9	-0.17	0.38
4	1C			L5	0.139	L15	0.134	L31	0.136		0.136	0.0025	1.8	0.11	0.83
8	1C			L9	0.138	L13	0.135	L26	0.136		0.136	0.0015	1.1	0.11	0.50
1	3C			L4	0.143	L21	0.132	L36	0.149		0.141	0.0086	6.1	0.45	2.84
11	1B	Yes		L11	0.1428	L24	0.1430	L28	0.1436		0.1431	0.0004	0.3	0.57	0.14
12	3C			L10	0.149	L22	0.142	L29	0.146		0.146	0.0035	2.4	0.75	1.16
13	3B			L12	0.1578	L16	0.1586	L30	0.1529		0.1564	0.0031	2.0	1.49	1.02
			Mean all values		0.1348					**Mean**	0.1338	0.0030	2.3		
			Median all values		0.1360					**Median**	0.1363	0.0025	1.8		
			Standard deviation		0.0145										
		Coefficient of variation, %			10.8							**Min**	0.3		
												Max	6.1		

Thallium, DOLT-2 (B) and DOLT-3 (C)															
Lab No.	**Code**	**Accred.**	***Det. limit***	**Sample**	**µg/g**	**Sample**	**µg/g**	**B:**	**Z-score**	**Z cert.**	**C:**	**Z-score**	**Z cert.**		
3	3B		*<0.02*	B5	*0.00759*	C2	*0.00871*		*-1.40*	-		*-1.95*	-		
10	2B			B9	0.0082	C8	0.0095		-0.71	-		-1.27	-		
11	1B	Yes	*<0.012*	B10	*0.0080*	C5	*0.0110*		*-0.93*	-		*0.03*	-		
8	1C		*<0.05*	B7	*0.00847*	C11	*0.0111*		*-0.40*	-		*0.11*	-		
1	3C			B4	0.0089	C10	0.0111		0.09	-		0.11	-		
13	3B			B11	0.0086	C7	0.0121		-0.25	-		0.98	-		
4	1C			B2	0.0096	C3	0.0112		0.89	-		0.20	-		
7	1C			B6	0.010	C12	0.012		1.35	-		0.89	-		
12	3C			B12	0.010	C6	0.012		1.35	-		0.89	-		
9	1B			B8	<0.24	C9	<0.24		<	-		<	-		
				Mean	0.00882		0.01097			**DOLT-2**	**DOLT-3**				
				Median	0.00860		0.01110		**Certified value**	-	-				
			Standard deviation		0.00088		0.00116		±	-	-				
		Coefficient of variation, %			9.9		10.6								


Thallium
Conc : Median value
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0,14
0,009
0,011
Median value
Perch liver
DOLT-2
DOLT-3
ICP-MS quadr.
Below LOD
Outl. bel. LOD
HR-ICP-MS
Below LOD

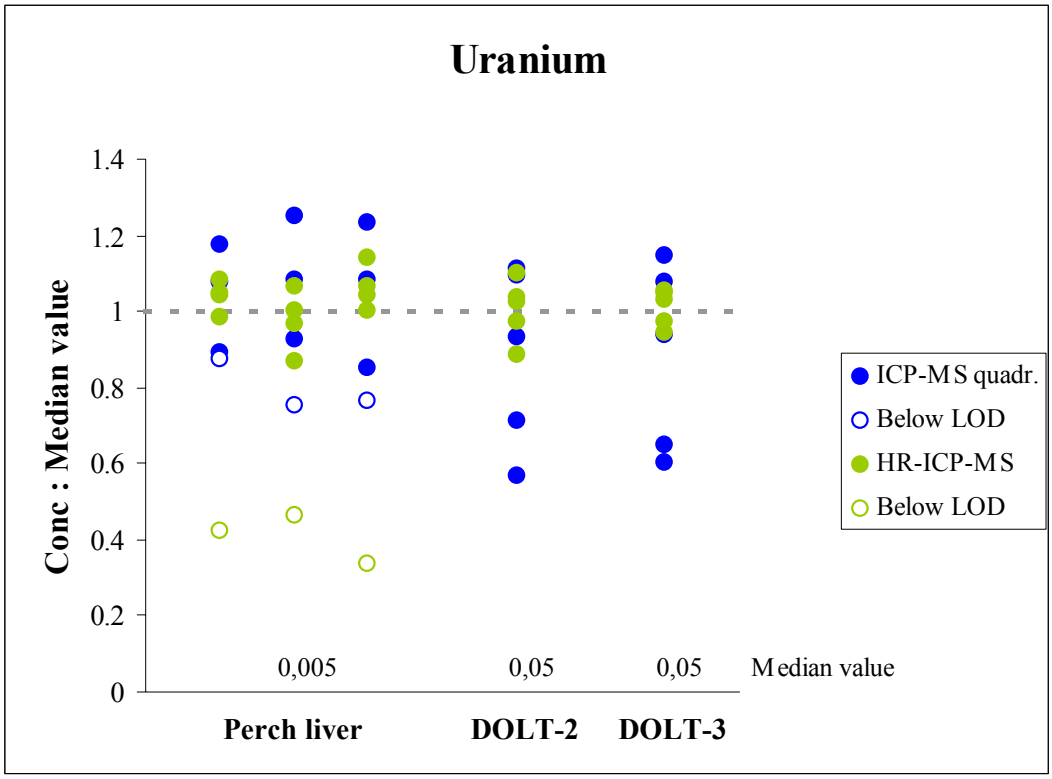

Thallium
Conc : Median value
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0,14
0,009
0,011
Median value
Perch liver
DOLT-2
DOLT-3
HNO3 closed vessels
Below LOD
Outl. bel. LOD
HNO3/H2O2 closed v.
Below LOD
HNO3 open vessels

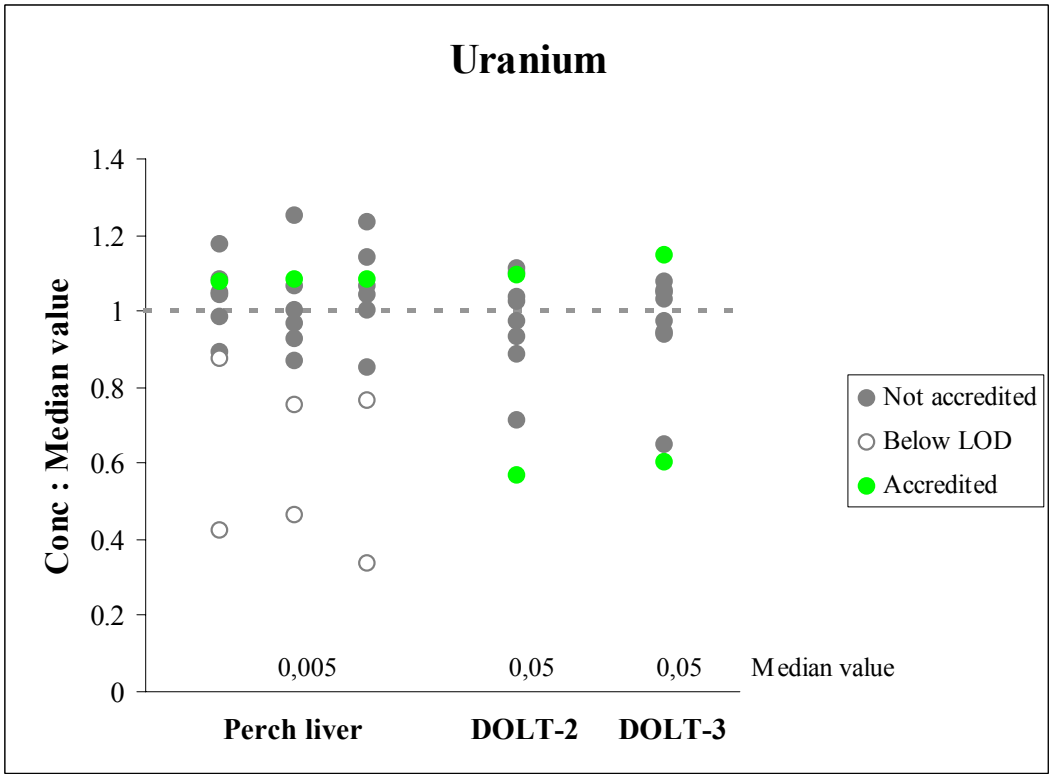
Uranium, Perch Liver

Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	Sample	µg/g		Lab mean	s	CV, %	Z-score	s/s mean
8	1C		*<0.02*	L9	*0.00218*	L13	*0.00241*	L26	*0.00175*		0.00211	0.00034	15.9	*-2.33*	*1.39*
3	3B		*<0.01*	L3	*0.00452*	L17	*0.00391*	L33	*0.00395*		0.00413	0.00034	8.3	*-0.64*	*1.41*
10	2B			L2	0.0046	L20	0.0048	L27	0.0044		0.0046	0.00020	4.3	-0.24	0.83
7	1C			L8	0.0051	L23	0.0045	L32	0.0055		0.0050	0.00050	10.0	0.13	2.08
4	1C			L5	0.00541	L15	0.00517	L31	0.00518		0.00525	0.00014	2.6	0.31	0.56
12	3C			L10	0.0054	L22	0.0050	L29	0.0054		0.0053	0.00023	4.4	0.32	0.96
11	1B	Yes		L11	0.00556	L24	0.00560	L28	0.00561		0.00559	0.00003	0.5	0.59	0.11
1	3C			L4	0.0056	L21	0.0055	L36	0.0059		0.0057	0.00021	3.7	0.66	0.86
13	3B			L12	0.00609	L16	0.00646	L30	0.00638		0.00631	0.00019	3.1	1.20	0.81
9	1B	Yes		L1	<0.012	L19	<0.012	L25	<0.012		-	-	-	<	<
			Mean all values		0.0049					**Mean**	0.00488	0.00024	5.9		
			Median all values		0.0052					**Median**	0.00525	0.00021	4.3		
			Standard deviation		0.0012										
			Coefficient of variation, %		24.3							**Min**	0.5		
												Max	15.9		

Uranium, DOLT-2 (B) and DOLT-3 (C)

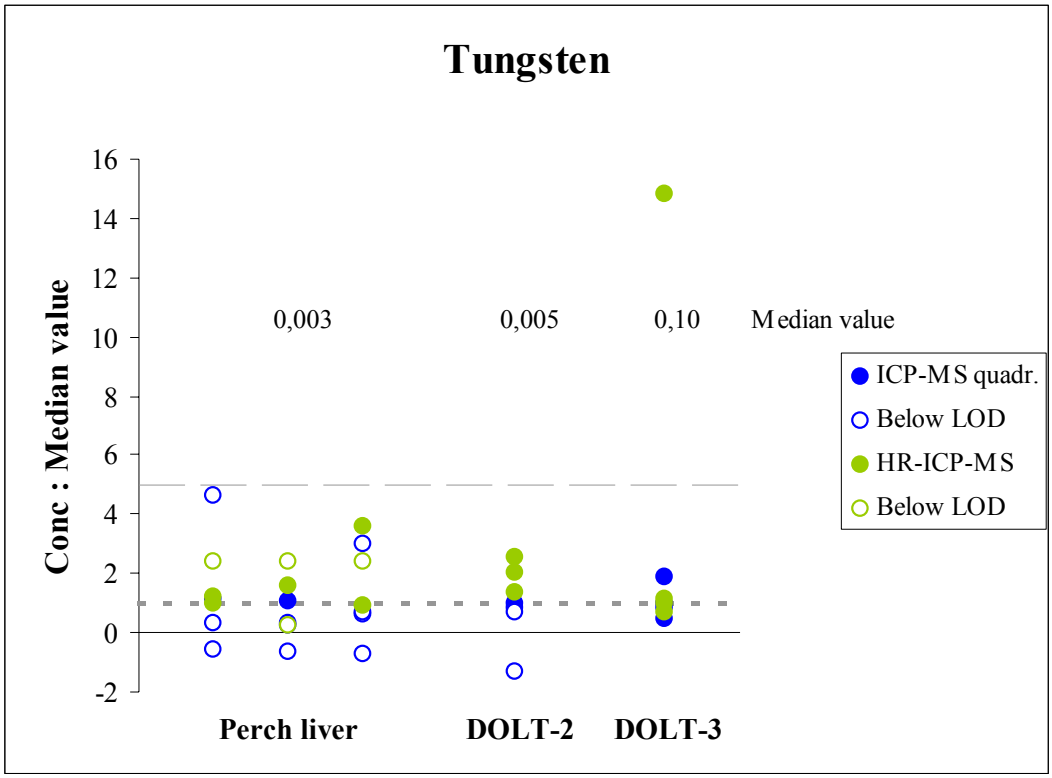
Lab No.	Code	Accred.	*Det. limit*	Sample	µg/g	Sample	µg/g	B:	Z-score	Z cert.	C:	Z-score	Z cert.		
9	1B	Yes		B8	0.027	C9	0.028		-2.08	-		-1.91	-		
3	3B			B5	0.0336	C2	0.0302		-1.31	-		-1.64	-		
8	1C			B7	0.0420	C11	0.0452		-0.32	-		0.15	-		
10	2B			B9	0.0441	C8	0.0435		-0.07	-		-0.05	-		
4	1C			B2	0.0462	C3	0.0439		0.17	-		-0.01	-		
12	3C			B12	0.0486	C6	0.0486		0.45	-		0.56	-		
1	3C			B4	0.0491	C10	0.0490		0.51	-		0.60	-		
7	1C			B6	0.0522	C12	0.0478		0.88	-		0.46	-		
13	3B			B11	0.0526	C7	0.0501		0.93	-		0.73	-		
11	1B	Yes		B10	0.0519	C5	0.0532		0.84	-		1.11	-		
				Mean	0.0447		0.0440			**DOLT-2**	**DOLT-3**				
				Median	0.0474		0.0465	**Certified value**		-	-				
			Standard deviation		0.0085		0.0084		±	-	-				
			Coefficient of variation, %		19.0		19.0								

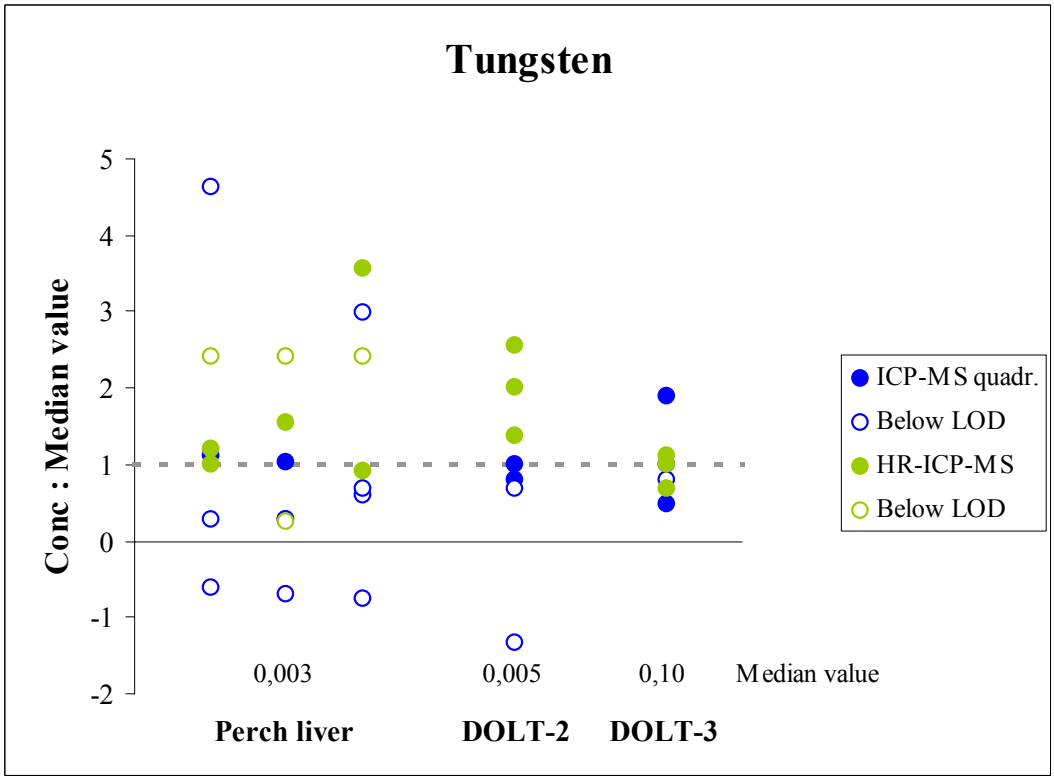

Uranium
Conc : Median value
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0,005
0,05
0,05
Median value
Perch liver
DOLT-2
DOLT-3
ICP-MS quadr.
Below LOD
HR-ICP-MS
Below LOD

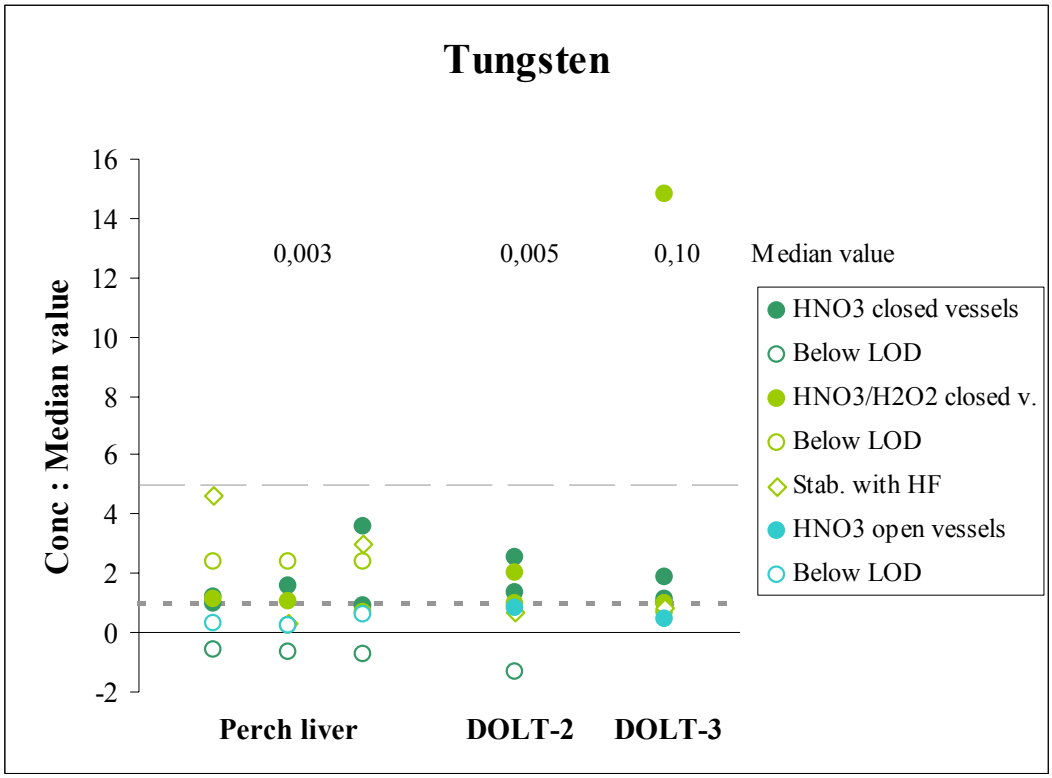

Uranium
Conc : Median value
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0,005
0,05
0,05
Median value
Perch liver
DOLT-2
DOLT-3
Not accredited
Below LOD
Accredited

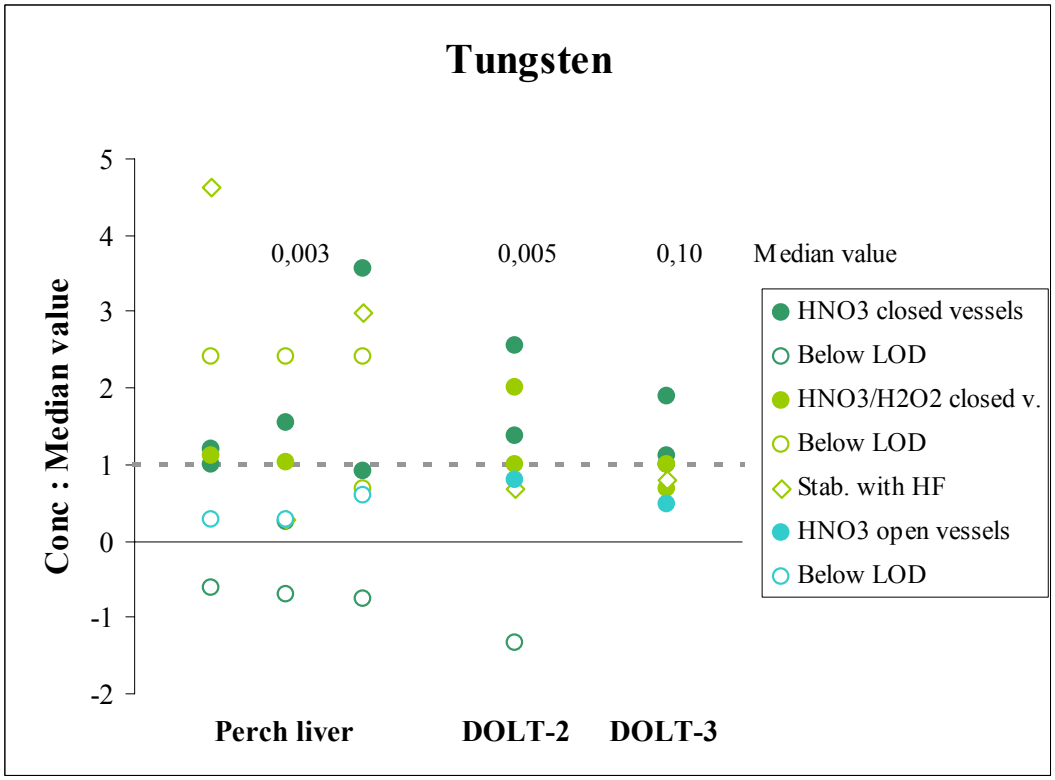
Tungsten, Perch Liver															
Lab No.	**Code**	**Accred.**	***Det. limit***	**Sample**	**µg/g**	**Sample**	**µg/g**	**Sample**	**µg/g**		**Lab mean**	**s**	**CV, %**	**Z-score**	**s/s mean**
11	1B		*<0.12*	L11	*-0.0018*	L24	*-0.0020*	L28	*-0.0022*		-0.0020	0.00020	-10.0	*-1.35*	*0.09*
10	2B		*<0.002*	L2	*0.00082*	L20	*0.00076*	L27	*0.0017*		0.00109	0.00053	48.1	*-0.59*	*0.24*
4	1C		*<0.001*	L5	0.0035	L15	*0.0007*	L31	0.0026		0.0023	0.00143	63.1	*-0.30*	*0.66*
13	3B		*<0.003*	L12	0.0032	L16	0.0030	L30	*0.0020*		0.0027	0.00064	23.5	*-0.19*	*0.30*
7	1C			L8	0.0029	L23	0.0045	L32	0.0103		0.0059	0.00389	66.0	0.58	1.79
12	3C		*<0.01*	L10	*0.007*	L22	*0.007*	L29	*0.007*		0.007	-	-	*0.85*	-
3	3_{HF}B		*<0.1*	L3	*0.0134*	L17	*0.00080*	L33	*0.00863*		0.00761	0.00636	83.6	*1.00*	*2.92*
1	3C			L4	<0.005	L21	<0.005	L36	<0.005		-	-	-	<	<
			Mean all values		0.0035					**Mean**	0.00351	0.00218	45.7		
			Median all values		0.0029					**Median**	0.00273	0.00104	55.6		
			Standard deviation		0.0041										
		Coefficient of variation, %			116.6							**Min**	10.0		
												Max	83.6		

Tungsten, DOLT-2 (B) and DOLT-3 (C)														
Lab No.	**Code**	**Accred.**	***Det. limit***	**Sample**	**µg/g**	**Sample**	**µg/g**	**B:**	**Z-score**	**Z cert.**	**C:**	**Z-score**	**Z cert.**	
11	1B		*<0.12*	B10	*-0.0067*	C5	0.190		*-1.90*	-		-0.17	-	
3	3_{HF}B		*<0.1*	B5	*0.00339*	C2	*0.0816*		*-0.27*	-		*-0.39*	-	
10	2B			B9	0.0040	C8	0.0491		-0.17	-		-0.46	-	
13	3B			B11	0.0050	C7	0.1009		0.00	-		-0.35	-	
4	1C			B2	0.0068	C3	0.1016		0.29	-		-0.35	-	
12	3C			B12	0.01	C6	0.07		0.81	-		-0.41	-	
7	1C			B6	0.0127	C12	0.1121		1.24	-		-0.33	-	
1	3C			B4	<0.005	C10	1.50		<	-		2.47	-	
				Mean	0.00503		0.276			**DOLT-2**	**DOLT-3**			
				Median	0.00500		0.101	**Certified value**		-	-			
			Standard deviation		0.00616		0.496		±	-	-			
		Coefficient of variation, %			122.6		180.1							


Tungsten
Conc : Median value
16
14
12
10
8
6
4
2
0
-2
0,003
0,005
0,10
Median value
ICP-MS quadr.
Below LOD
HR-ICP-MS
Below LOD
Perch liver
DOLT-2
DOLT-3


Tungsten
Conc : Median value
5
4
3
2
1
0
-1
-2
0,003
0,005
0,10
Median value
ICP-MS quadr.
Below LOD
HR-ICP-MS
Below LOD
Perch liver
DOLT-2
DOLT-3


Tungsten
Conc : Median value
16
14
12
10
8
6
4
2
0
-2
0,003
0,005
0,10
Median value
HNO3 closed vessels
Below LOD
HNO3/H2O2 closed v.
Below LOD
Stab. with HF
HNO3 open vessels
Below LOD
Perch liver
DOLT-2
DOLT-3


Tungsten
Conc : Median value
5
4
3
2
1
0
-1
-2
0,003
0,005
0,10
Median value
HNO3 closed vessels
Below LOD
HNO3/H2O2 closed v.
Below LOD
Stab. with HF
HNO3 open vessels
Below LOD
Perch liver
DOLT-2
DOLT-3

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g
Ba	4	1C		L5	0.370	L15	0.340	L31	0.362
Ba	12	3C		L10	0.37	L22	0.42	L29	0.37
			Mean all values		0.372				

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g
Ba	4	1C		B2	0.496	C3	0.136
Ba	12	3C		B12	0.54	C6	0.21
		DOLT-2	**DOLT-3**	**Mean**	0.518		0.173
Certified value		-	-				
	±	-	-				

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g
Co	1	3C	Yes	L4	1.27	L21	1.26	L36	1.25
Co	4	1C	Yes	L5	1.475	L15	1.256	L31	1.302
Co	12	3C		L10	1.33	L22	1.28	L29	1.35
			Mean all values		1.31				

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Z cert. B	Z cert. C
Co	1	3C	Yes	B4	0.042	C10	0.280	-3.96	
Co	4	1C	Yes	B2	0.205	C3	0.270	-0.70	
Co	12	3C		B12	0.188	C6	0.292	-1.04	
		DOLT-2	**DOLT-3**	**Mean**	0.145		0.281		
Certified value		0.24	-						
	±	0.05	-						

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g
Cs	4	1C		L5	0.145	L15	0.137	L31	0.135
Cs	12	3C		L10	0.145	L22	0.139	L29	0.140
			Mean all values		0.140				

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g
Cs	4	1C		B2	0.089	C3	0.101
Cs	12	3C		B12	0.087	C6	0.108
		DOLT-2	**DOLT-3**	**Mean**	0.088		0.105
Certified value		-	-				
	±	-	-				

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g	
Fe	4	1C	Yes	L5	1008.2	L15	1021.2	L31	1007.1	
Fe	12	3C		L10	1090	L22	1060	L29	1090	
Fe	13	3B		L12	1230	L16	1223	L30	1224	
				Mean all values	1106					
	Lab No.	**Code**	**Accred.**	**Sample**	**µg/g**	**Sample**	**µg/g**		**Z cert. B**	**Z cert. C**
Fe	4	1C	Yes	B2	978.1	C3	1239.4		-2.66	-4.29
Fe	12	3C		B12	1000	C6	1380		-2.19	-1.82
Fe	13	3B		B11	1107	C7	1541		0.09	1.00
		DOLT-2	**DOLT-3**	**Mean**	1028		1387			
Certified value		1103	1484							
	±	47	57							

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g	
K	4	1C	Yes	L5	14989	L15	12434	L31	12110	
K	12	3C		L10	10300	L22	12200	L29	12400	
				Mean all values	12406					
	Lab No.	**Code**	**Accred.**	**Sample**	**µg/g**	**Sample**	**µg/g**			
K	4	1C	Yes	B2	8971	C3	9927			
K	12	3C		B12	8690	C6	10300			
		DOLT-2	**DOLT-3**	**Mean**	8831		10114			
Certified value		-	-							
	±	-	-							

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g	
La	4	1C		L5	4.737	L15	4.578	L31	4.699	
La	12	3C		L10	4.97	L22	4.83	L29	4.88	
				Mean all values	4.78					
	Lab No.	**Code**	**Accred.**	**Sample**	**µg/g**	**Sample**	**µg/g**			
La	4	1C		B2	0.021	C3	0.054			
La	12	3C		B12	0.021	C6	0.026			
		DOLT-2	**DOLT-3**	**Mean**	0.021		0.040			
Certified value		-	-							
	±	-	-							

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g	
Mn	1	3C	Yes	L4	7.43	L21	7.43	L36	7.68	
Mn	4	1C	Yes	L5	8.409	L15	7.560	L31	7.470	
Mn	12	3C		L10	7.93	L22	8.03	L29	7.66	
				Mean all values	7.73					
	Lab No.	**Code**	**Accred.**	**Sample**	**µg/g**	**Sample**	**µg/g**		**Z cert. B**	**Z cert. C**
Mn	1	3C	Yes	B4	5.65	C10	9.53		-2.20	
Mn	4	1C	Yes	B2	6.322	C3	8.951		-1.00	
Mn	12	3C		B12	5.99	C6	9.34		-1.59	
		DOLT-2	**DOLT-3**	**Mean**	5.99		9.27			
Certified value		6.88	-							
	±	0.56	-							

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g
Mo	4	1C		L5	0.864	L15	0.748	L31	0.766
Mo	12	3C		L10	0.71	L22	0.68	L29	0.70
				Mean all values	0.745				
	Lab No.	**Code**	**Accred.**	**Sample**	**µg/g**	**Sample**	**µg/g**		
Mo	4	1C		B2	0.968	C3	3.175		
Mo	12	3C		B12	0.90	C6	3.51		
		DOLT-2	**DOLT-3**	**Mean**	0.934		3.34		
Certified value		-	-						
	±	-	-						

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g
Rb	4	1C		L5	43.3	L15	41.7	L31	43.0
Rb	12	3C		L10	42.8	L22	41.6	L29	42.1
				Mean all values	42.4				
	Lab No.	**Code**	**Accred.**	**Sample**	**µg/g**	**Sample**	**µg/g**		
Rb	4	1C		B2	2.82	C3	3.12		
Rb	12	3C		B12	2.81	C6	3.18		
		DOLT-2	**DOLT-3**	**Mean**	2.82		3.15		
Certified value		-	-						
	±	-	-						

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g
Sr	4	1C		L5	2.87	L15	2.72	L31	2.83
Sr	12	3C		L10	2.72	L22	2.83	L29	2.69
			Mean all values		2.78				

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g
Sr	4	1C		B2	4.46	C3	3.40
Sr	12	3C		B12	4.46	C6	3.41
		DOLT-2	**DOLT-3**	**Mean**	4.46		3.41
Certified value		-	-				
	±	-	-				

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g	Sample	µg/g
V	4	1C		L5	0.131	L15	0.127	L31	0.126
V	12	3C		L10	0.12	L22	0.11	L29	0.13
			Mean all values		0.124				

	Lab No.	Code	Accred.	Sample	µg/g	Sample	µg/g
V	4	1C		B2	0.303	C3	0.307
V	12	3C		B12	0.27	C6	0.31
		DOLT-2	**DOLT-3**	**Mean**	0.287		0.309
Certified value		-	-				
	±	-	-				