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REPORTS ON THE RESULTS OF THE SEVENTH INTERCALIBRATION EXERCISE ON TRACE METALS IN BIOTA (PART 1)

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International Council for the Exploration of the Sea
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ICES SEVENTH ROUND INTERCALIBRATION FOR TRACE METALS IN BIOLOGICAL TISSUES ICES 7/TM/BT (PART 1)

by

S.S. Berman and V.J. Boyko
Marine Analytical Chemistry Standards Program
Division of Chemistry
National Research Council
Ottawa, Ontario, Canada K1A OR9

ABSTRACT

Three marine biological tissue samples (lobster hepatopancreas, scallops and plaice) were distributed to 57 ICES laboratories, 51 of which submitted results.

Values were collated for the six metals, copper, zinc, arsenic, cadmium, mercury and lead. Most laboratories perform well for copper, zinc and cadmium, although there is an indication of a possible matrix problem for copper in plaice. Most of those that analyze for mercury are able to do so even at low (0.06 mg/kg) concentrations. Many laboratories have problems with lead, even at the 5 mg/kg level, and with low level cadmium (0.06 mg/kg).

Only about 40 percent of the respondents analyzed the materials for As, an element which appears to present problems. The distribution of results is poor (21% RSD) at the 25 mg/kg level and deteriorates further (35% RSD) at 5 mg/kg.

Results for chromium, manganese, iron, cobalt, nickel and selenium are also tabulated.

RÉSUMÉ

On a distribué trois échantillons de tissus biologiques marins (hépatopancréas de homard, pétoncles et plie) à 57 laboratoires de CIEM, dont 51 ont soumis des résultats.

Des valeurs ont été compilées pour les 6 métaux, cuivre, zinc, arsenic, cadmium, mercure et plomb. La plupart des laboratoires réussissent bien pour le zinc, le cuivre et le cadmium, bien que l'on décèle une problème de matrice pour le cuivre dans la plie. La plupart de ceux qui analysent pour le mercure peuvent le faire même à de basses concentrations (0.06 mg/kg). Plusiers laboratoires ont des difficultés avec le plomb, même à 5 mg/kg, et avec le cadmium à 0.06 mg/kg.

Seulment 40% des répondants ont déterminé l'arsenic dans les échantillons. Cet élément semble présenter des problèmes. La distribution des résultats est pauvre (21% CV) à 25 mg/kg et se détériore encore plus (35% CV) à 5 mg/kg.

On donne également des résultats pour le chrome, le manganèse, le fer, le cobalt, le nickel et le sélénium.

NOTE

This report differs but little from the preliminary report (Berman, 1984). An arithmetical error by Lab 9 for zinc has been corrected. Lab 13's results for chromium, cobalt and selenium were wrongly interpreted. This has resulted in the recalculation of the means for these metals (pages 20 to 21). Errors were corrected in the calculations of the means for nickel (page 21). Tables II to XIV have been revised to reflect the number of data sets incorporated in the means. A set of charts indicating laboratory precision and bias for each sample for each of the six core metals has been appended. Some typographical and other minor changes have been made.

INTRODUCTION

An ongoing series of ICES intercomparison exercises has been conducted since 1971 in order to examine results of analytical procedures used for the measurement of trace metals in marine biological tissues. The participants in these exercises were laboratories associated with the ICES fish and shellfish baseline and monitoring programs, those nominated by the Joint Monitoring Group of the Oslo/Paris Commissions, as well as others that had expressed an interest in participating in ICES projects. A gradual improvement in the level of agreement between laboratories for the trace metals copper, zinc and mercury was seen over the years, whereas little or no improvement was noted for cadmium and lead (Topping and Holden, 1978; Holden and Topping, 1981) by the end of the fifth exercise in 1979.

The sixth ICES intercomparison study in 1980 was concerned only with cadmium and lead. It was concluded from this study that most laboratories could produce reliable cadmium and lead values at the 1 and 2 mg/kg levels respectively, but only a small minority could analyze for lead at about 0.5 mg/kg (Topping, 1982). As a result, the ICES Marine Chemistry Working Group (MCWG) in 1981 appointed a sub-group whose task was to identify and try to resolve problems concerning the determination of lead in biological tissues. This sub-group confirmed the presence of matrix problems in the analysis using graphite furnace atomic absorption spectrometry and recommended procedures which should enable confident analyses at the greater than 1 mg/kg level (Harms *et al.*, 1982). Harms has recently expanded this work to sub mg/kg levels (Harms, 1985).

In 1982 the MCWG recommended a seventh intercomparison exercise for trace metals in biological tissues in preparation for the 1985 baseline studies of contaminant levels in marine organisms (MCWG, 1982) and in 1983 set up a scheme for a two part study whereby the first phase would be carried out in 1983 prior to the baseline study and the second simultaneously with the baseline study in 1985 (MCWG, 1983). The elements of interest were copper, zinc, arsenic, cadmium, mercury and lead.

PREPARATION OF SAMPLES

Three samples were prepared for the first part of this intercomparison study. The first (Sample A), from the National Research Council of Canada, was prepared from lobster hepatopancreas which had been homogenized, spray dried and acetone extracted to remove the majority of the lipids. The second (Sample B) was freeze dried, ground scallops adductor muscle. The third (Sample C), prepared by U. Harms, Bundesforschungsanstalt für Fischerei, Federal Republic of Germany, was freeze dried plaice. It was hoped that these three materials would provide an ample range of metal concentrations as well as a variety of fish and shellfish matrices.

The materials were thoroughly blended and bottled in 60-ml bottles in quantities of 15, 15 and 20 g respectively. Randomly selected bottles were analyzed at the National Research Council of Canada (Laboratory 49) to assess the interbottle homogeneity. The results of these tests are listed with all the other laboratory data on pages 29 to 52. The difference between the data of Lab 49 and all others is that the individual values in each set of results from this laboratory are from samples taken from different bottles. The materials appear to be homogeneous with respect to copper, zinc, arsenic, cadmium and mercury, but there may be problems with lead in Samples B and C.

SAMPLE DISTRIBUTION AND RECEIPT OF RESULTS

The samples were sent by air post in the latter part of August 1983 to the 57 laboratories that had indicated a desire to participate in this intercomparison exercise (Table XVII, pages 25 to 28). Six replicate analyses of each material for each of the six metals of interest was requested along with data regarding the analytical procedures used in the analyses. Results were requested on a "dry weight" basis. The deadline for the receipt of results was set at December 15, 1983.

Three recipients reported that their samples may have been opened by customs officials prior to delivery. One set had to be replaced. A reminder of the deadline was sent on December 7.

Over 40 sets of results were received by the end of December. It then became apparent that the Christmas mail and other post office problems were delaying the receipt of results. (One set mailed in late December did not arrive until early in March.) A number was assigned to each of the respondents (Table XVII). The final number of respondents was fifty-one, but the results from Labs 50 and 51 arrived too late to be included in the calculated data. These results are listed, however, with all the rest of the data.

RESULTS

It is pleasing to note that a good majority of the respondents supplied most of the data requested of them. These included sample drying techniques, decomposition and dissolution procedures, analytical methodologies, calibration techniques and limits of detection for the analyte elements.

All results, except a few very obvious outliers in some sets, were tabulated (pages 29 to 52). The number of significant figures in submitted data was reduced in many cases to a maximum of three for tabulation and computation.

1. "DRY WEIGHT"

There appear to be almost as many procedures for "drying" a biological tissue sample as laboratories analyzing the materials. Happily, most methods seem to yield similar results. The percent weight loss reported by each laboratory for the three sample and the method used by each are tabulated in Table I on page 4. A t test at the 95 percent confidence level was applied to each set of results and the means for each sample were calculated after the successive rejection of the outliers which are indicated by "*" in Table I. The final means and standard deviations are listed in Table II below. The final columns in each of the tables indicate the number of laboratories contributing to the mean and the number rejected before calculation of the final mean.

It is obvious that for these materials that simply drying the samples for a few hours at tempuratures between 100 and 115 degrees Celsius is apparently sufficient in order to reach comparable sample weights. Lower temperatures, even for prolonged periods, may not be sufficient, and higher temperatures may cause excessive weight losses. The use of dessicants without vacuum appears to lead to lower than average weight losses.

TABLE II

MEAN WEIGHT LOSSES - percent

Sample A	3.96	± 0.86	(22%)	31, 9
Sample B	3.83	± 0.83	(22%)	31, 8
Sample C	8.81	± 0.78	(9%)	36, 5

TABLE I

WEIGHT LOSS - percent

Lab	A	B	C	Procedure
1	4.80	5.80*	2.90*	110 C for 18 hours
2	4.40	4.96	9.01	105 C
3	3.95	4.18	8.17	100-110 C for 4 hours
4	3.48	3.38	7.73	100-105 for 24 hours
5	3.30	3.20	8.60	No data
6	----	----	9.10	105 C for 2 hours
7	3.04	2.97	8.12	105 C for 2 hours
8	4.70	4.29	8.93	105 C for 24 hours
9	4.94	4.40	9.44	100 C for 23 hours
10	3.90	2.77	9.23	Vacuum dessicant for 48 hours
11	4.35	3.78	9.15	110 C for 3 hours
12	3.48	3.70	8.31	95 C for 12 hours
13	3.00	2.50	7.50	80 C for 24 hours
14	2.70	2.70	6.70*	105 C for 5 hours
15	----	----	----	Dessicant for 3 months
16	7.92*	8.92*	9.39	120 C for 3 days
17	4.17	4.00	8.17	105 C overnight
18	4.00	3.90	8.92	105 C overnight
19	5.59	4.56	9.09	105 C for 16 hours
20	2.01	1.10	6.24	65 C for 12 hours
21	----	----	----	Dessicant
22	4.67	2.93	8.96	? C for 2 hours
23	4.45	5.01	7.68	105-110 C for 18 hours
24	----	----	----	No data
25	3.00	1.80*	7.00*	70 C for 6 hours
26	3.04	3.71	7.34	75 C for 15 hours
27	3.92	4.12	9.01	105 C for 4 hours
28	4.56	3.53	9.35	105 C for 16 hours
29	6.39*	6.03*	9.82	105 C for 5 hours
30	----	----	----	Freeze dried
31	4.90	4.77	8.70	103 C for 1 hour
32	7.50*	9.00*	10.0	105 C for 2 hours
33	4.22	4.05	8.69	No method
34	5.60	4.90	8.50	100-105 C for 24 hours
35	----	----	----	60 C for 16 hours
36	10.3*	3.72	9.91	105 C for 2 hours
37	----	----	----	Not dried
38	6.29*	5.32	10.2	150 C for 5 days
39	2.54	----	7.49	105 C
40	4.84	4.51	9.39	100 C for 24 or 48 hours
41	3.18	3.18	8.68	$Mg(ClO_4)_2$ for 72 hours
42	2.73	2.73	6.57*	No method
43	8.80*	4.87	9.53	105 C to constant weight
44	9.07*	7.62*	9.90	130 C for 48 hours
45	7.86*	1.57*	7.50	Lyophilized for 24 hours
46	----	----	----	No data
47	----	----	----	Silica gel for 3 months
48	1.76*	1.00*	6.59*	Silica gel for 48 hours
49	----	----	----	No drying data
50	3.27	2.34	8.87	Silica gel for 48 hours
51	----	----	----	No drying data

---- No data available
* Rejected by t test

The samples were all bottled in an area with reduced humidity and each of the sample sets should have the same original moisture content. However, these materials will pick up moisture from the atmosphere, and if weighings are not made soon after the bottles are opened the weight loss on drying will increase. This may explain some of the high weight loss results noted in Table I on page 4.

For the few laboratories that did not report their results on a dry weight basis, their values were factored by the mean weight losses shown in Table II to make their analytical results comparable to the others.

2. METALS

An evaluation has been made for the results for the six core metals of this study (copper, zinc, arsenic, cadmium, mercury and lead). The data has also been tabulated for those elements where five or more sets of results were received (chromium, manganese, iron, cobalt, nickel and selenium).

An attempt has been made to represent all the data received for the six metals on the individual graphs for each sample:

> The range of results from each laboratory and their mean is plotted. A number of laboratories submitted more than one set of results for various elements in the samples. These have been plotted sequentially and the term "labs" in this section refers to the number of sets of results, not the number of individual participating laboratories.
>
> A range continued by a forward arrow → beyond the right margin of the graph indicates that the range exceeds this boundary.
>
> A forward arrow → beginning at the right margin indicates that all values submitted exceed the boundary.
>
> A backward arrow ← at the right margin indicates results less than a limit of detection beyond the boundary.
>
> A backward arrow ← within the graph indicates results less than the marked limit of detection.
>
> A backward arrow ← from the left margin indicates results less than the boundary value or a limit of detection which is less than this boundary.
>
> Means marked by a "■" are those that have been retained after a rejection test and are incorporated into the overall result. Means marked by a "+" were rejected.

The results of the various calculations are beside each graph. The total range for all values reported is presented. A mean has been calculated for all quantitative results.

A *t* test at the 95 percent confidence level was applied to the means of all the values submitted. Means were successively rejected until a homogeneous set of results was obtained. This, of course, implies a normal distribution of results, which may not be a valid assumption. An overall mean, standard deviation and relative standard deviation (RSD) were calculated for the remaining values. This mean and standard deviation are plotted on each graph. The small discrepancy sometimes apparent in the RSD is the result of rounding off significant figures in reporting the mean and standard deviation.

The final means are the consensus values for the concentrations of the six metals in the three samples for this exercise. And, indeed, they may be good estimates of the real concentrations. There is enough variety of methodologies for the all the metals, except possibly for arsenic, to come to this conclusion. Also, Laboratory 49 attempted to analyze each sample by three independent methods including isotope dilution mass spectrometry (except for arsenic which is a monoisotopic element). The means of the results from this laboratory, which are the top three values plotted on each graph, are never far from the consensus values.

The means of the results for the six metals in Samples B and C have been plotted against each other for those labs that submitted results for both samples. This type of plot, if the concentrations of the metals are not too different, can indicate those laboratories which consistently produce lower or higher values than the overall mean. Also, those that produce inconsistent results are readily obvious.

Copper

Summaries of the results for copper are listed beside the graphs on page 7 and the overall final means and standard deviations are shown in Table III below.

The results for Sample A are quite satisfactory with only four sets of results rejected by the *t* test. However, even at this relatively high concentration of copper there are sets of values with unacceptably high scatter (above 20 percent RSD).

The response for Sample B is good. There are seven rejected sets, most of which are higher than the mean, indicating possible contamination problems.

TABLE III

COPPER CONCENTRATIONS - mg/kg

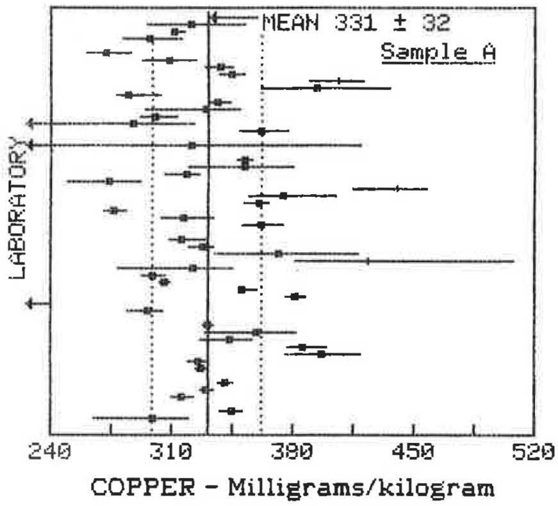
Sample A	331 ± 32	(10%)	45, 4
Sample B	3.7 ± 0.6	(16%)	41, 7
Sample C	3.1 ± 0.8	(27%)	42, 7

The copper results for Sample C are rather puzzling. The concentrations of copper in Samples B and C are almost identical, yet the scatter of results between laboratories is significantly higher for Sample C. There is no evidence of interbottle inhomogeniety suggesting that the problem may be one of the plaice matrix itself. Seven sets of results were rejected, all of which were higher than the mean. The relative standard deviation of 27 percent for this sample is high, indicating a factor of three between the lowest and highest accepted means.

The most common method of sample decomposition is an open beaker digestion with nitric acid or a combination of nitric acid with hydrogen peroxide or perchloric acid. A third of the labs use some form of closed vessel acid decomposition (BOMB) and about 15 percent dry ash the samples.

About half the labs used flame atomic absorption spectrometry (FAAS) and another third, graphite furnace atomic absorption spectrometry (GFAAS), in their measurement procedures. Inductively coupled plasma atomic emission spectrometry (ICP) is not yet employed by many marine laboratories and only a few seem to use electroanalytical, neutron activation or x-ray fluorescence methods.

COPPER DATA

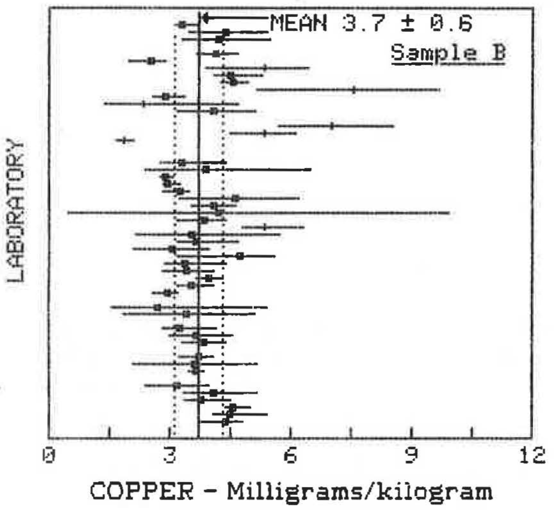


49 labs submitted results ranging from 110 to 508 mg/kg.

All labs submitted quantitative values with a mean of 333 ± 45 mg/kg.

A *t* test rejected the results of 4 of these labs.

The mean of the results of the remaining 45 labs is 331 ± 32 mg/kg. The relative standard deviation is 10 percent.

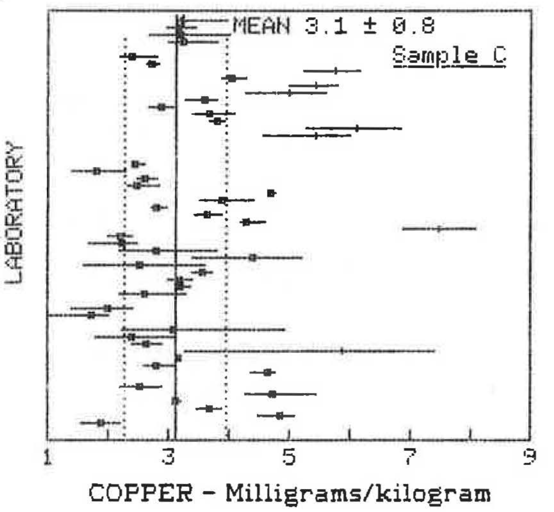


48 labs submitted results ranging from 0.48 to 9.9 mg/kg.

All labs submitted quantitative values with a mean of 3.9 ± 1.0 mg/kg.

A *t* test rejected the results of 7 of these labs.

The mean of the results of the remaining 41 labs is 3.7 ± 0.6 mg/kg. The relative standard deviation is 16 percent.



49 labs submitted results ranging from 1.0 to 8.1 mg/kg.

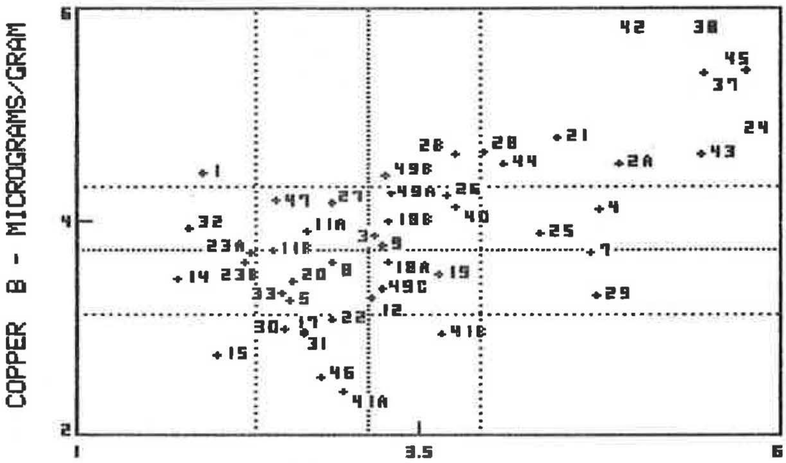
All labs submitted quantitative values with a mean of 3.5 ± 1.3 mg/kg.

A *t* test rejected the results of 7 of these labs.

The mean of the results of the remaining 42 labs is 3.1 ± 0.8 mg/kg. The relative standard deviation is 27 percent.

There is no apparent correlation between performance and methodology. Three out of four of the rejected sets for Sample A used GFAAS, an overly sensitive technique for such a high copper concentration, potentially more prone to matrix and contamination problems than FAAS. Five of the seven sets rejected for both Samples B and C were from the same laboratories.

COPPER B vs COPPER C



The plot of Sample B against Sample C shows no erratic results, but a bias towards high values on the part of some labs. Lab numbers which do not have a "+" next to them have values beyond the boundaries of the graph in the same quadrant in which the numbers are found.

The submitted copper data are listed on pages 29 to 33 along with abbreviated methodologies.

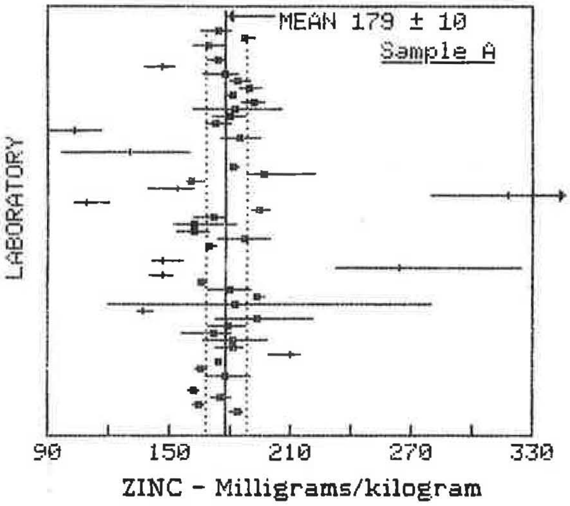
Zinc

The data for zinc are the best of all the metals. Summaries of the results are listed beside the graphs on page 9 and the overall final means and standard deviations are shown in Table IV on page 10.

Sample preparation for zinc analysis is generally identical to that for copper. Seventy percent of the labs used FAAS methods and only ten percent GFAAS. This is because of the inherently high sensitivity of zinc by atomic absorption where flame techniques are quite adequate for the zinc concentrations in these samples.

As in the case of copper, there is no apparent correlation between laboratory performance and methodology. There are eleven, eight and six sets of rejected results for the three samples respectively, but these relatively high numbers are probably due to the quite tight concurrence of the majority of the labs about the concensus values.

ZINC DATA

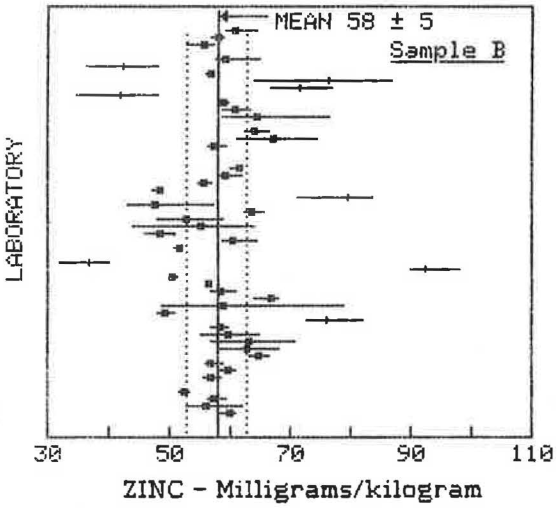


49 labs submitted results ranging from 90.9 to 335 mg/kg.

All labs submitted quantitative values with a mean of 177 ± 32 mg/kg.

A *t* test rejected the results of 11 of these labs.

The mean of the results of the remaining 38 labs is 179 ± 10 mg/kg. The relative standard deviation is 6 percent.

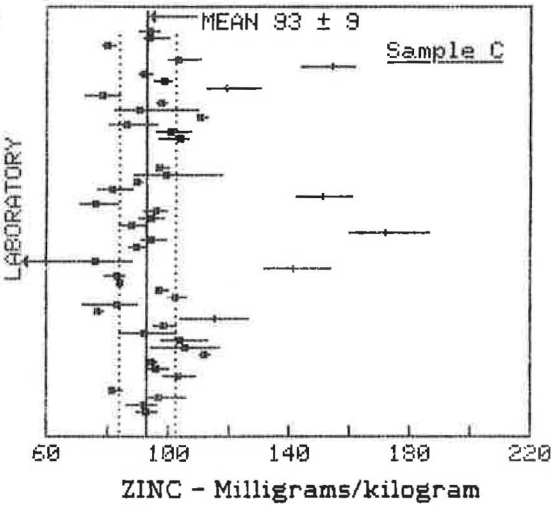


48 labs submitted results ranging from 32 to 98 mg/kg.

All labs submitted quantitative values with a mean of 58 ± 12 mg/kg.

A *t* test rejected the results of 8 of these labs.

The mean of the results of the remaining 40 labs is 58 ± 5 mg/kg. The relative standard deviation is 9 percent.



48 labs submitted results ranging from 59 to 187 mg/kg.

All labs submitted quantitative values with a mean of 98 ± 23 mg/kg.

A *t* test rejected the results of 6 of these labs.

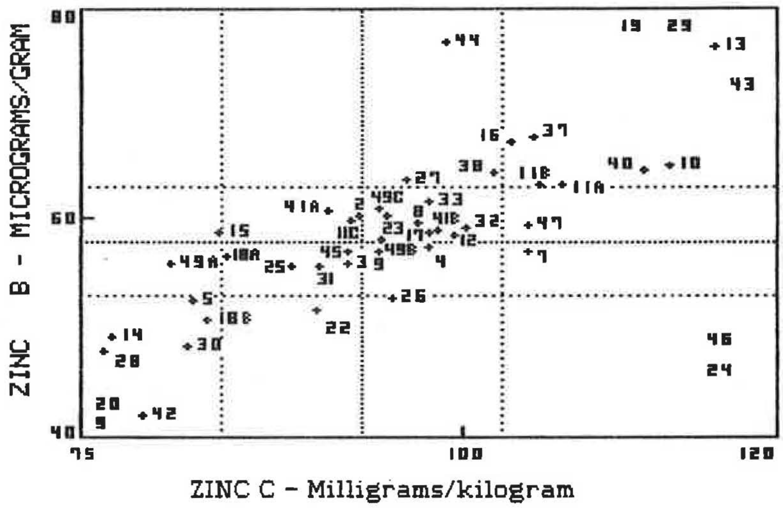
The mean of the results of the remaining 42 labs is 93 ± 9 mg/kg. The relative standard deviation is 10 percent.

TABLE IV

ZINC CONCENTRATIONS - mg/kg

Sample A	179	± 10	(6%)	38,11
Sample B	58	± 5	(9%)	40, 8
Sample C	93	± 9	(10%)	42, 6

ZINC B vs ZINC C



The plot of Sample B against Sample C shown above indicates only two sets of erratic results, two sets biased low and six or seven biased high. Five of the eight sets of results rejected for Sample B and of the six sets rejected for Sample C were from the same labs. However, only one of these five labs was common to the five whose copper results were rejected.

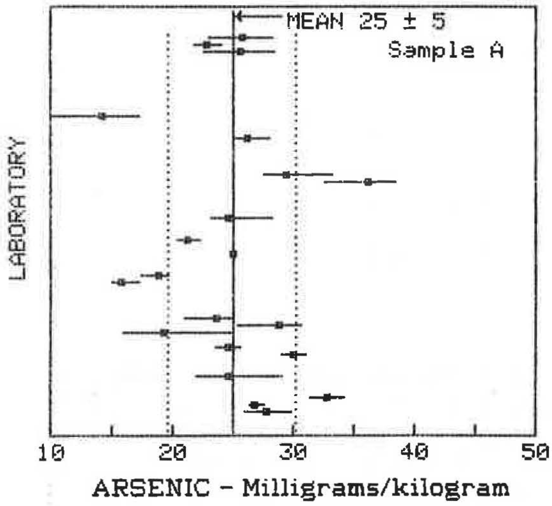
The submitted data for zinc are listed on pages 33 to 37.

Arsenic

Only forty percent of the responding laboratories submitted results for arsenic. It appears that the analysis of biological materials for arsenic is in a questionable state, second only to lead for poor interlaboratory comparisons.

Summaries of the results are listed beside the graphs on page 11 and the overall final means and standard deviations are shown in Table V on page 12.

ARSENIC DATA

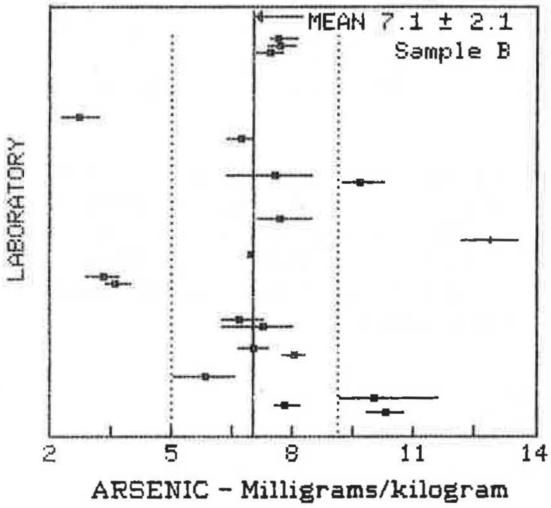


21 labs submitted results ranging from 10.2 to 38.5 mg/kg.

All labs submitted quantitative values with a mean of 25 ± 5 mg/kg.

A *t* test rejected the results of none of these labs.

The relative standard deviation is 21 percent.

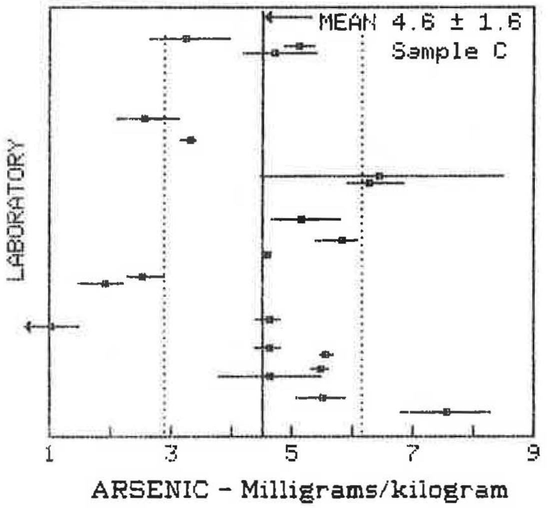


20 labs submitted results ranging from 2.32 to 13.6 mg/kg.

All labs submitted quantitative values with a mean of 7.4 ± 2.4 mg/kg.

A *t* test rejected the results of 1 of these labs.

The mean of the results of the remaining 19 labs is 7.1 ± 2.1 mg/kg. The relative standard deviation is 29 percent.



20 labs submitted results ranging from 0.85 to 8.5 mg/kg.

All labs submitted quantitative values with a mean of 4.6 ± 1.6 mg/kg.

A *t* test rejected the results of none of these labs.

The relative standard deviation is 35 percent.

TABLE V

ARSENIC CONCENTRATIONS - mg/kg

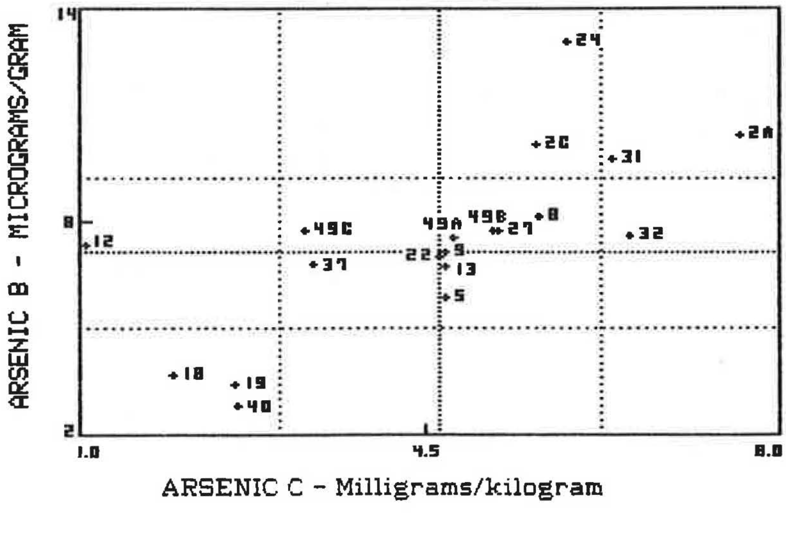
Sample A	25 ± 5	(21%)	21, 0
Sample B	7.1 ± 2.1	(29%)	19, 1
Sample C	4.6 ± 1.6	(35%)	20, 0

Methods of sample preparation are almost equally divided between (i) closed vessel decompositions with nitric acid alone or in combination with perchloric or sulphuric acids, (ii) open beaker decompositions with nitric acid or nitric acid in combination with sulphuric acid, or (iii) dry ashing. One lab carried out an oxygen combustion of the sample and two labs which used instrumental neutron activation analysis (INAA) did not treat the sample at all.

Slightly over half the labs used a hydride generation (HG) technique followed by atomic absorption spectrometry (AAS) in order to measure the arsenic, except in one case where spectrophotometry was used. The majority of the others used GFAAS, generally adding nickel to the sample prior to electrothermal atomization. Three labs employed INAA and one, ICP atomic emission spectrometry.

There are no apparent relationships between methodologies and performance. The close grouping of a number of laboratories about the means are representative of almost all methods of sample decomposition and arsenic measurement. The poor precision between laboratories, especially for Samples B and C, is disappointing. The 35 percent RSD for Sample C represents an almost six-fold difference between the lowest and highest samples. Because of the high general scatter between labs only one set of results in all three samples was identified as an outlier.

ARSENIC B vs ARSENIC C



The plot of Sample B against Sample C on page 12 shows little indication of erraticism, just a general spread from low to high results with some bunching near the means.

The submitted data for arsenic are listed on pages 38 to 40.

Cadmium

Cadmium results for Samples A and B are equivalent in quality to those achieved for zinc, especially considering the rather low concentrations of cadmium relative to those of zinc. However, the interlaboratory precision deteriorates markedly for Sample C, which is not too surprising considering the low concentration of 0.06 mg/kg cadmium in this sample.

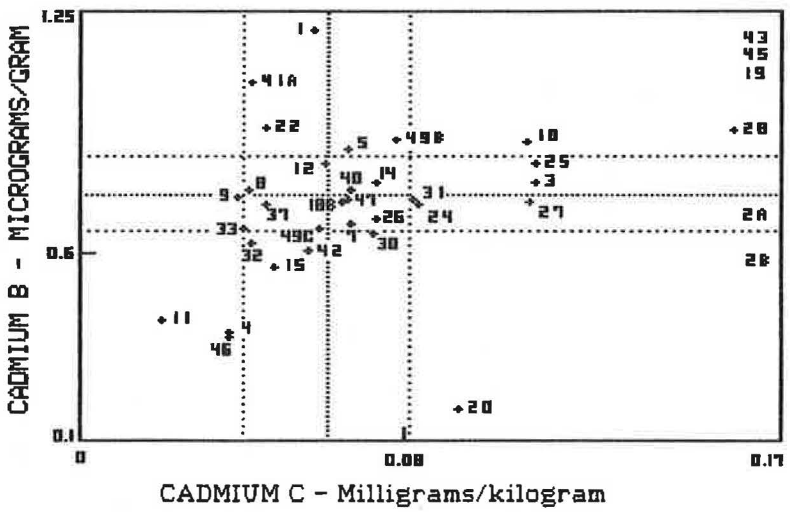
Summaries of the results are listed beside the graphs on page 14 and the overall final means and standard deviations are shown below in Table VI.

TABLE VI

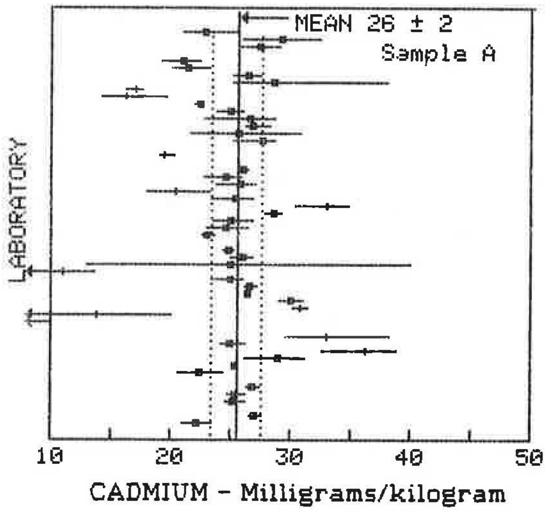
CADMIUM CONCENTRATIONS - mg/kg

Sample A	26 ± 2	(8%)	37,11
Sample B	0.75 ± 0.10	(13%)	37,10
Sample C	0.06 ± 0.02	(38%)	31, 6

CADMIUM B vs CADMIUM C



CADMIUM DATA

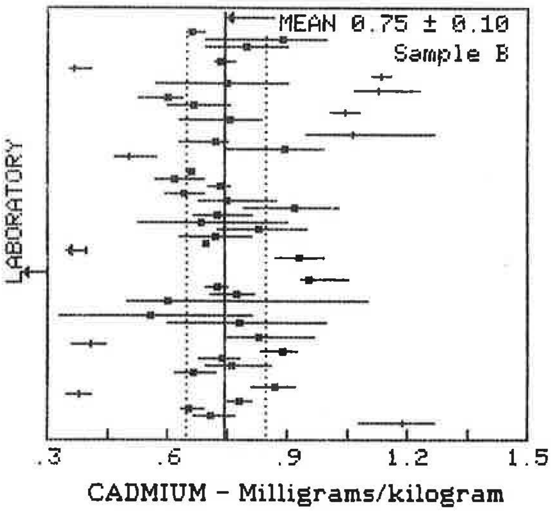


48 labs submitted results ranging from 5.2 to 40 mg/kg.

All labs submitted quantitative values with a mean of 25 ± 5 mg/kg.

A *t* test rejected the results of 11 of these labs.

The mean of the results of the remaining 37 labs is 26 ± 2 mg/kg. The relative standard deviation is 8 percent.

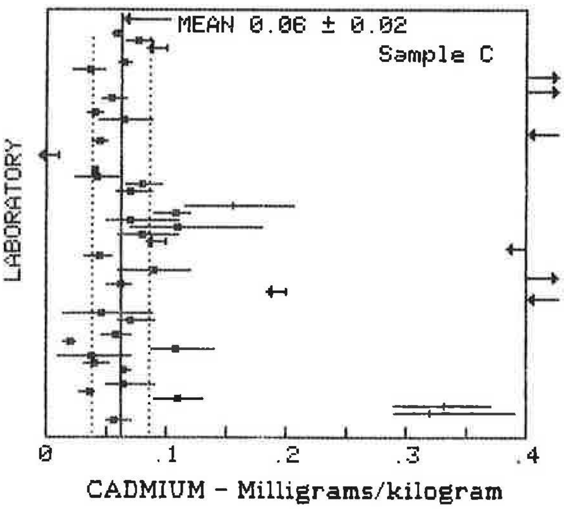


48 labs submitted results ranging from 0.12 to 1.27 mg/kg.

47 labs submitted quantitative values over the same range with a mean of 0.75 ± 0.20 mg/kg.

A *t* test rejected the results of 10 of these labs.

The mean of the results of the remaining 37 labs is 0.75 ± 0.10 mg/kg. The relative standard deviation is 13 percent.



44 labs submitted results ranging from 0.01 to 0.85 mg/kg.

37 labs submitted quantitative values over the same range with a mean of 0.13 ± 0.17 mg/kg.

A *t* test rejected the results of 6 of these labs.

The mean of the results of the remaining 31 labs is 0.06 ± 0.02 mg/kg. The relative standard deviation is 38 percent.

Methods of sample preparation are generally the same as for copper and zinc. About 40 and 30 percent of the participants used FAAS and GFAAS respectively to measure cadmium in Sample A. However, these percentages were approximately reversed for Sample B, and fifty percent of the analysts used GFAAS for cadmium in Sample C.

More than half of all results rejected for Samples A and B were obtained using GFAAS. Also, almost all the results biased both high and low with respect to Sample B, shown below in the plot of Sample B against Sample C, resulted from GFAAS measurements. However, the majority of the same labs produced acceptable values for the much lower concentration of cadmium in Sample C.

The results of three of the nine labs using FAAS without prior concentration of the cadmium for Sample C were rejected, and another three were biased rather high for this sample as seen in the plot on page 13. FAAS may not be sensitive enough to provide reliable results for cadmium at less than 0.1 mg/kg without some form of preconcentration unless great care is taken.

It is also apparent that inductively coupled plasma atomic emission spectrometry is not sensitive enough to analyze for cadmium at this level without preconcentration.

The submitted data for cadmium are listed on pages 40 to 45.

Mercury

About three quarters of the responding laboratories submitted results for mercury. In spite of the inherently low concentrations of mercury in these samples the great majority of labs that analyze for mercury are apparently capable of producing good results.

Summaries of the results are listed beside the graphs on page 16 and the overall final means and standard deviations are shown in Table VII below.

TABLE VII

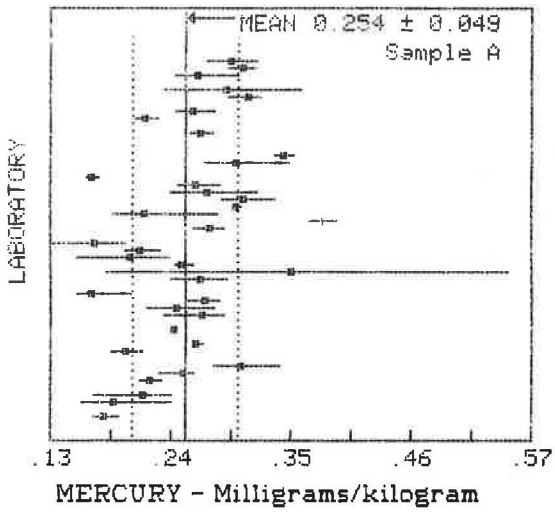
MERCURY CONCENTRATIONS - mg/kg

Sample A	0.254 ± 0.049	(19%)	36, 1
Sample B	0.081 ± 0.012	(10%)	31, 4
Sample C	0.056 ± 0.009	(16%)	30, 5

The majority of labs (57 percent) prefer to digest the sample with nitric acid or a mixture or nitric and sulphuric and/or perchloric acids, sometimes followed by an oxidant such as hydrogen peroxide, potassium permanganate or vanadium pentoxide. About 30 percent of the participants used a closed vessel decomposition (BOMB) with nitric acid or the same mixed acids as the former group. A few labs destroyed the organic material using oxygen combustion followed by acid dissolution of the residue.

All but three of the labs used some form of cold vapour atomic absorption spectrometry (CVAAS) to determine the mercury. Only a few of these collected the mercury on gold before evolution of the metal into the absorption cell. One lab used INAA, another an electroanalytical procedure and a third isotope dilution mass spectrometry.

MERCURY DATA

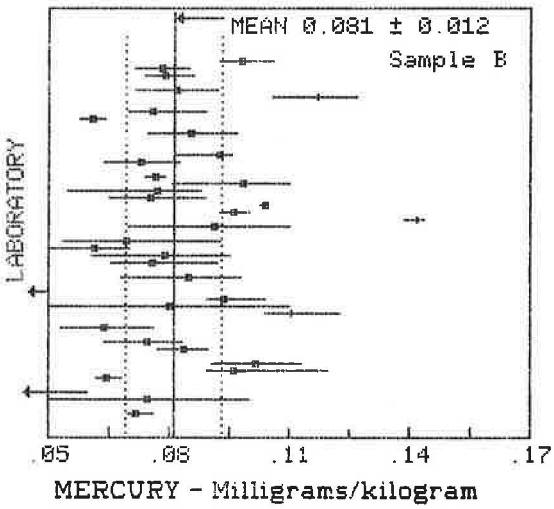


37 labs submitted results ranging from 0.13 to 0.549 mg/kg.

All labs submitted quantitative values with a mean of 0.258 ± 0.052 mg/kg.

A *t* test rejected the results of 1 of these labs.

The mean of the results of the remaining 36 labs is 0.254 ± 0.049 mg/kg. The relative standard deviation is 19 percent.

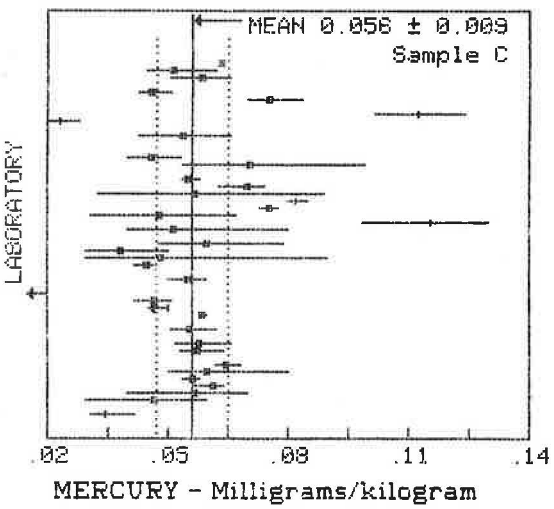


36 labs submitted results ranging from less than 0.01 to 0.144 mg/kg.

35 labs submitted quantitative values with a range of 0.03 to 0.144 and a mean of 0.084 ± 0.019 mg/kg.

A *t* test rejected the results of 4 of these labs.

The mean of the results of the remaining 31 labs is 0.081 ± 0.012 mg/kg. The relative standard deviation is 15 percent.



37 labs submitted results ranging from less than 0.01 to 0.13 mg/kg.

35 labs submitted quantitative values with a range of 0.021 to 0.13 and a mean of 0.059 ± 0.018 mg/kg.

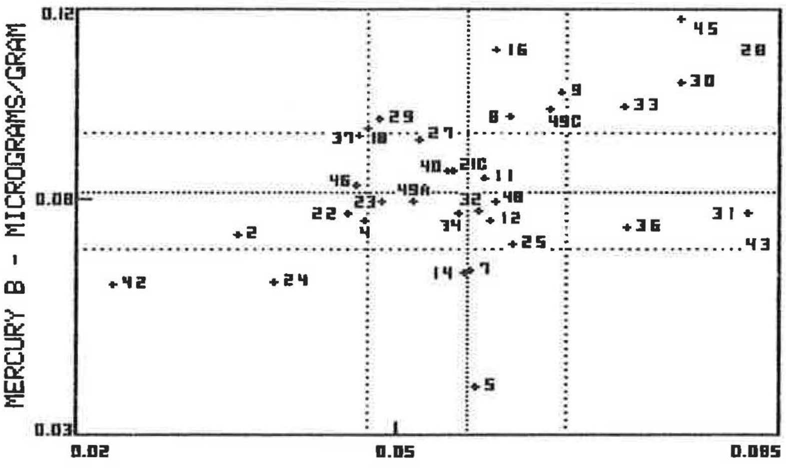
A *t* test rejected the results of 5 of these labs.

The mean of the results of the remaining 30 labs is 0.056 ± 0.009 mg/kg. The relative standard deviation is 16 percent.

There are no apparent relationships between methodologies and performance.

The plot of Sample B against Sample C below again shows little indication of erraticism. There is a generally a greater bias to high values rather than to low, but overall the results are excellent considering the low mercury concentrations.

MERCURY B vs MERCURY C



The submitted data for mercury are listed on pages 45 to 48.

Lead

About 85 percent of the labs submitted results for lead in Sample A. This number decreased to 65 percent and 75 percent for Samples B and C respectively with the changes in lead concentrations.

The results for lead are disappointing, showing no improvement over the 6th Intercomparison Exercise. Even at the 6 mg/kg level the relative standard deviation of 36 labs (6 having been rejected) is 30 percent, a figure indicating a four-fold difference between the lowest and highest means of the group.

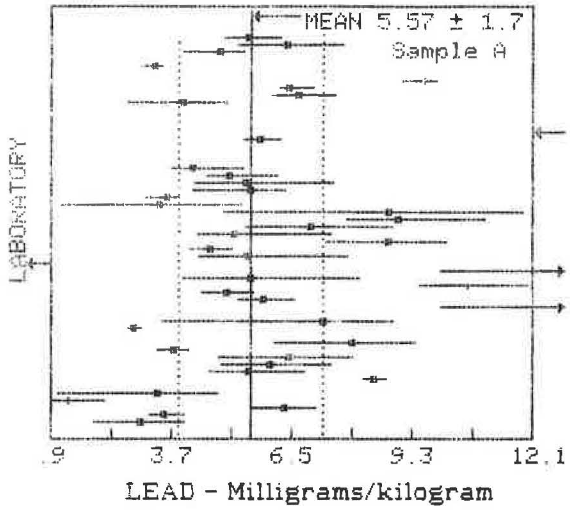
Although there is a possibility of some interbottle inhomogeneity for lead in Samples B and C this probably accounts for only a minor fraction of the interlab variance for these samples. The RSD of 41 percent for both of these samples represents a greater than nine-fold factor between low and high values.

Summaries of the results are listed beside the graphs on page 18 and the overall final means and standard deviations are shown on page 19 in Table VIII.

Samples for lead analyses were generally prepared as for copper, zinc and cadmium.

About half the labs employed GFAAS for lead in Sample A and 30 percent used FAAS. A few labs used electroanalytical methods and some others inductively coupled plasma atomic emission spectrometry (ICP-AES). Three labs concentrated the lead before measurement by FAAS

LEAD DATA

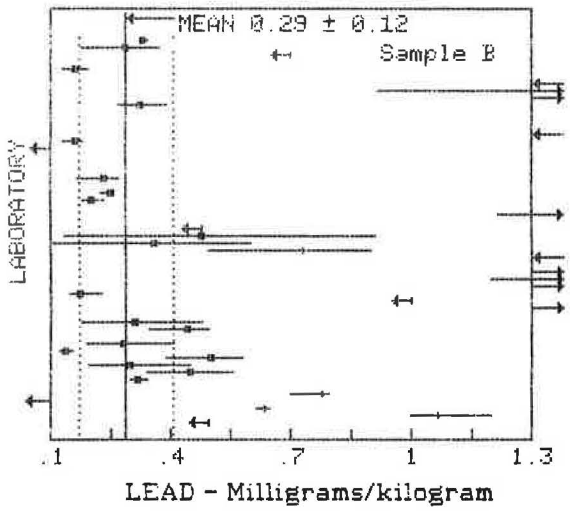


43 labs submitted results ranging from 0.6 to 63 mg/kg.

42 labs submitted quantitative values with the same range and a mean of 6.65 ± 5.94 mg/kg.

A *t* test rejected the results of 6 of these labs.

The mean of the results of the remaining 36 labs is 5.57 ± 1.70 mg/kg. The relative standard deviation is 30 percent.

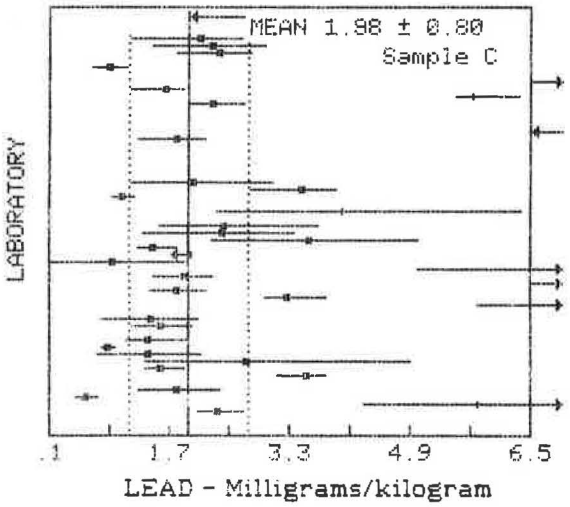


39 labs submitted results ranging from 0.065 to less than 25 mg/kg.

31 labs submitted quantitative values with a range of 0.065 to 18 and a mean of 1.41 ± 2.90 mg/kg.

A *t* test rejected the results of 11 of these labs.

The mean of the results of the remaining 20 labs is 0.29 ± 0.12 mg/kg. The relative standard deviation is 41 percent.



38 labs submitted results ranging from 0.1 to less than 25 mg/kg.

36 labs submitted quantitative values with a range of 0.1 to 18.8 and a mean of 3.29 ± 3.38 mg/kg.

A *t* test rejected the results of 7 of these labs.

The mean of the results of the remaining 29 labs is 1.98 ± 0.80 mg/kg. The relative standard deviation is 41 percent.

or GFAAS. The proportion of those reporting quantitative results using FAAS declines with lead concentration to about 20 percent in Samples B and C.

TABLE VIII

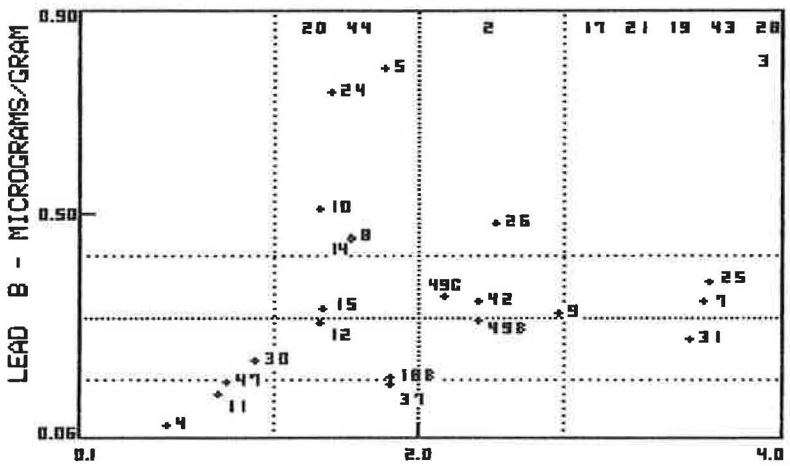
LEAD CONCENTRATIONS - mg/kg

Sample A	5.57 ± 1.70	(30%)	36, 6
Sample B	0.29 ± 0.12	(41%)	20,11
Sample C	1.98 ± 0.80	(41%)	29, 7

There is no clear relationship between methodology and performance for Sample A. Three of the six rejected sets were obtained using FAAS.

Five of the eleven and eight sets rejected respectively for Samples B and C were from FAAS data. These represent about two-thirds of all the FAAS results for these samples.

LEAD B vs LEAD C



LEAD C - Milligrams/kilogram

The tendency toward high biased results is obvious from the plot of Sample B against Sample C on page 21. Four of the six values in the upper right quadrant come from FAAS results. On the other hand, four of the five high results for Sample B (but acceptable for C) are GFAAS values.

The submitted data for lead are listed on pages 49 to 52.

Other Metals

Results for 14 other metals were received from a number of laboratories: sodium (1), magnesium (1), phosphorus (1), potassium (1), calcium (1), chromium (5), manganese (12), iron (13), cobalt (7), nickel (11), selenium (5), bromine (1), strontium (2) and silver (2). There were not sufficient data for any of these metals to provide for an adequate analysis. Means and standard deviations were calculated for all metals where there were at least 5 sets of data (chromium, manganese, iron, cobalt, nickel and selenium). These are listed below in Tables IX to XIV and the submitted data for those metals are list on pages 53 to 57.

There was no attempt to eliminate even obvious outliers from individual sets of results. The results of lab 21 were arbitrarily deleted from the nickel calculations.

TABLE IX

CHROMIUM CONCENTRATIONS - mg/kg

n = 5

Sample A	2.40 ± 1.22	(51%)
Sample B	0.61 ± 0.37	(60%)
Sample C	1.45 ± 0.54	(37%)

TABLE X

MANGANESE CONCENTRATIONS - mg/kg

n = 12

Sample A	20.4 ± 3.8	(19%)
Sample B	1.96 ± 2.12	(108%)
Sample C	14.6 ± 4.90	(34%)

TABLE XI

IRON CONCENTRATIONS - mg/kg

n = 13

Sample A	167 ± 29.9	(18%)
Sample B	23.3 ± 11.4	(49%)
Sample C	136 ± 26.7	(20%)

TABLE XII

COBALT CONCENTRATIONS - mg/kg

n = 7

Sample A	0.67	±	0.36	(54%)
Sample B	0.20	±	0.12	(59%)
Sample C	0.07	±	0.02	(30%)

TABLE XIII

NICKEL CONCENTRATIONS - mg/kg

n = 10

Sample A	2.69	±	0.97	(36%)
Sample B	0.38	±	0.19	(49%)
Sample C	0.74	±	0.37	(50%)

TABLE XIV

SELENIUM CONCENTRATIONS - mg/kg

n = 5

Sample A	6.9	±	1.0	(14%)
Sample B	0.63	±	0.33	(53%)
Sample C	2.46	±	0.34	(14%)

3. SUMMARIES

The results for the six core metals in the three samples are summarized in Table XV on page 23.

Table XVI on page 24 is an attempt to show the pattern of results achieved by each laboratory for the six metals in the three samples. The symbols in the table represent

**	Results reported and accepted by a *t* test.
LD	Results reported, but less than a limit of detection.
RT	Results reported, but rejected by a *t* test.
--	No results reported.

The list of participating laboratories (Table XVII) is on pages 25 to 28.

A set of charts indicating individual laboratory precision and bias for each of the six core metals in each sample is appended (pages 58 to 75).

4. CONCLUSIONS

This exercise has demonstrated that the good majority of the participants can produce comparable and accurate data for the trace metals copper, zinc, cadmium and mercury at levels found in fish and shellfish tissues.

A number of laboratories have problems with cadmium at the less than 0.1 mg/kg level, but at least half the participants do fairly well even at this low level.

The analysis for arsenic seems to present problems even to the minority of laboratories that submitted arsenic results. The reason for this is not evident from this study but is probably related to sample preparation and the efficiency of arsine generation. About half of the arsenic participants produce comparable and probably accurate results.

Lead continues to be a problem element. Most laboratories using flame atomic absorption spectrometry have troubles at the two mg/kg level. The majority of the others produce an unsatisfactory spread of values (RSD = 41%) at this concentration. Also, only a small number of laboratories can successfully cope with a sample containing lead at a sub mg/kg concentration. It would appear that the plaice sample (C) may have been contaminated with respect to lead during preparation.

Comparable "dry weights" can be achieved with samples such as used in this study by drying for a few hours in an oven at 105 to 115 degrees Celcius.

5. ACKNOWLEDGEMENTS

The authors gratefully acknowledge the help of Dr. Graham Topping (DAF Marine Laboratory, Aberdeen) in the planning of this exercise. We would also like to thank Dr. Uwe Harms (Bundesforschungsanstalt für Fischerei, Hamburg), and Dr. Jack Uthe and Dr. Chiu Long Chou (Fisheries and Oceans Canada, Halifax) for their contributions, as well as Vincent Clancy of this laboratory for his help in packaging and circulating the materials.

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TOPPING, G. 1982. *Report on the 6th ICES trace metal exercise for cadmium and lead in biological tissue.* ICES Coop. Res. Rep., No. 111.

TOPPING, G. and A.V. HOLDEN. 1978. *Report on intercalibration analysis in ICES North Sea and North Atlantic baseline studies.* ICES Coop. Res. Rep., No. 80.

TABLE XV

SUMMARY OF RESULTS

milligrams per Kilogram

SAMPLE A

	Copper	Zinc	Arsenic	Cadmium	Mercury	Lead
Total range	110-508	90.9-335	10.2-38.5	5.2-40	0.13-0.549	0.6-63
No. of labs	49	49	21	48	37	43
Quant. values	110-508	90.9-335	10.2-38.5	5.2-40	0.13-0.549	0.6-63
No. of labs	49	49	21	48	37	42
Mean	333±45	177±32	25±5	25±5	0.258±0.052	6.65±5.94
After ≠ test	236-437	153-222	10.2-38.5	19.3-40	0.13-0.549	1.1-11.9
No. of labs	45	38	21	37	36	36
Mean	331±32	179±10	25±5	26±2	0.254±0.049	5.57±1.70
RSD	10%	6%	21%	8%	19%	30%

SAMPLE B

	Copper	Zinc	Arsenic	Cadmium	Mercury	Lead
Total range	0.48-9.9	32-98	2.32-13.6	0.12-1.27	<0.01-0.144	0.065-<25
No. of labs	48	48	20	48	36	39
Quant. values	0.48-9.9	32-98	2.32-13.6	0.12-1.27	0.03-0.144	0.065-18
No. of labs	48	48	20	47	35	31
Mean	3.9±1.0	58±12	7.4±2.4	0.75±0.20	0.084±0.019	1.41±2.90
After ≠ test	0.48-9.9	47.1-79	2.32-11.6	0.33-1.1	0.05-0.12	0.065-0.91
No. of labs	41	40	19	37	31	20
Mean	3.7±0.6	58±5	7.1±2.1	0.75±0.10	0.081±0.012	0.29±0.12
RSD	16%	9%	29%	13%	15%	41%

SAMPLE C

	Copper	Zinc	Arsenic	Cadmium	Mercury	Lead
Total range	1.0-8.1	59-187	0.85-8.5	0.01-0.85	<0.01-0.13	0.1-<25
No. of labs	49	48	20	44	37	38
Quant. values	1.0-8.1	59-187	0.85-8.5	0.01-0.85	0.021-0.13	0.1-18.8
No. of labs	49	48	20	37	35	36
Mean	3.5±1.3	98±23	4.6±1.6	0.13±0.17	0.059±0.018	3.29±3.38
After ≠ test	1.0-5.46	59-117	0.85-8.5	0.02-0.18	0.031-0.0995	0.1-5.0
No. of labs	42	42	20	31	30	29
Mean	3.1±0.8	93±9	4.6±1.6	0.06±0.02	0.056±0.009	1.98±0.80
RSD	27%	10%	35%	38%	16%	41%

TABLE XVI

PATTERN OF RESULTS

Lab	Copper	Zinc	Arsenic	Cadmium	Mercury	Lead
1	** ** **	-- -- --	-- -- --	** RT **	-- -- --	** LD --
2A	** ** **	** ** **	** ** **	** ** RT	** ** RT	-- -- --
2B	-- ** **	-- -- --	** ** --	-- ** RT	-- -- --	** RT **
2C	-- -- --	-- -- --	** ** **	-- -- --	-- -- --	-- -- --
3	** ** **	** ** **	-- -- --	** ** **	-- -- --	** RT RT
4	** ** **	** ** **	-- -- --	** RT **	** ** **	RT ** **
5	** ** **	** ** **	** ** **	** ** **	** RT **	** RT **
6	-- -- --	-- -- --	-- -- **	-- -- --	-- -- **	-- -- --
7	** ** **	** ** **	-- -- --	** ** **	** ** **	** ** **
8	** ** **	** ** **	** ** **	** ** **	** ** **	** ** **
9	** ** **	** ** **	** ** **	** ** **	** ** **	** ** **
10	** -- RT	RT ** **	-- -- --	RT ** **	-- -- --	** ** **
11A	** ** **	** ** **	** -- --	** RT **	** ** **	** ** **
11B	** ** **	** ** **	-- -- --	-- -- --	-- -- --	-- -- --
12	** ** **	** ** **	** ** **	RT ** **	** ** **	-- -- --
13	-- -- --	** RT RT	** ** **	-- -- --	-- -- --	-- -- --
14	** ** **	RT ** **	-- -- --	RT ** **	** ** **	** ** **
15	RT ** **	** ** **	-- -- --	RT ** **	-- -- --	** ** **
16	** -- --	** ** **	-- -- --	RT -- --	** RT **	-- -- --
17	** ** **	** ** **	-- -- --	** ** LD	** ** LD	RT RT RT
18A	** ** **	** ** **	** ** **	** ** LD	** ** **	** LD **
18B	** ** **	RT ** **	-- -- --	** ** **	-- -- --	** ** **
19	** ** **	RT RT RT	** ** **	** ** RT	** LD LD	RT RT RT
20	RT ** **	RT RT **	-- -- --	RT RT **	-- -- --	** RT **
21A	** ** **	-- -- --	-- -- --	** -- --	** -- --	RT RT RT
21B	-- -- --	-- -- --	-- -- --	-- -- --	** ** **	-- -- --
22	** ** **	** ** **	** ** **	** ** **	** ** **	RT -- **
23A	** ** **	** ** **	-- -- --	** LD LD	** ** **	** LD LD
23B	-- ** **	-- -- --	-- -- --	-- ** LD	-- -- --	-- LD LD
24	** RT RT	** ** RT	** RT **	** ** **	** ** **	** RT **
25	** ** **	** ** **	-- -- --	** ** **	** ** **	** ** **
26	** ** **	** ** **	-- -- --	** ** **	-- -- --	** ** **
27A	** ** **	** ** **	** ** **	** ** **	** ** **	** LD **
27B	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	** -- --
28	** ** **	RT ** **	-- -- --	RT ** RT	RT RT RT	** RT RT
29	RT ** **	RT RT RT	-- -- --	** ** --	** ** **	** -- --
30	** ** **	RT ** **	-- -- --	RT ** **	** ** **	** ** **
31	** ** **	** ** **	** ** **	** ** **	** ** RT	** ** **
32	** ** **	** ** **	** ** **	** ** **	** ** **	** -- **
33A	** ** **	** ** **	-- -- --	** ** **	** ** **	** ** --
33B	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	** -- --
34	-- -- --	-- -- --	-- -- --	-- -- --	** ** **	-- -- --
35	** -- --	RT -- --	-- -- --	RT RT LD	-- -- --	-- -- --
36	-- RT --	-- ** --	-- -- --	-- ** --	** ** **	-- LD --
37	** RT RT	** ** **	** ** **	** ** **	** ** **	** ** **
38	** RT RT	RT ** **	-- -- --	** RT LD	-- -- --	LD LD LD
39	** -- **	** -- **	-- -- --	** -- --	-- -- --	-- -- --
40	** ** **	** ** **	** ** **	** ** **	** ** **	-- -- --
41A	** RT **	** ** **	-- -- --	** RT **	-- -- --	-- -- --
41B	** ** **	** ** **	-- -- --	** ** --	-- -- --	-- -- --
42	** RT RT	** RT **	-- -- --	RT ** **	** ** RT	** ** **
43	RT ** RT	** RT RT	-- -- --	RT RT RT	** ** RT	** RT RT
44	** ** **	** RT **	-- -- --	** ** --	-- -- --	** RT **
45	** RT RT	** ** **	-- -- --	** RT RT	** RT **	RT LD RT
46	** ** **	RT RT RT	-- -- --	** RT **	** ** **	-- -- --
47	** ** **	** ** **	-- -- --	** ** **	-- -- --	** ** **
48	-- -- --	-- -- --	-- -- --	-- -- --	** ** **	-- -- --
49A	** ** **	** ** **	** ** **	** ** LD	** ** **	** LD **
49B	** ** **	** ** **	** ** **	** ** **	-- -- --	** ** **
49C	** ** **	** ** **	** ** **	** ** **	** ** **	** ** **

TABLE XVII

PARTICIPATING LABORATORIES

BELGIUM	7	Instituut voor Scheikundig Onderzoek Museumlaan 5 B 1980 Tervuren	R. De Borger J.R. Istas
	13	Instituut voor Nucleaire Wetenschappen Rijksuniversiteit-Gent Proeftuinstraat 86 9000 Gent	R. Dams
	45	Analytische Scheikunde Faculteit der Toegepaste Wetenschappen Vrije Universiteit Brussel Pleinlaan 2 1050 Brussel	I. Elskens
CANADA	2	Institute for Environmental Studies University of Toronto Toronto, Ontario M5S 1A1	Jon Van Loon
	10	Atlantic Research Laboratory National Research Council Halifax, Nova Scotia B3H 3Z1	Roger Guevremont
	16	Centre Champlain des Sciences de la Mer Pêches et Océans B.P. 15500 901, Cap Diamant Québec, P.Q. G1K 7Y7	Daniel Cossa
	37	Fisheries Research Laboratory P.O. Box 550 Halifax, Nova Scotia B3J 2S7	Chiu Long Chou Jack Uthe
	49	Division of Chemistry National Research Council Montreal Road Ottawa, Ontario K1A 0R9	Shier Berman Victor Boyko Armand Desauiniers Alex Mykytiuk Michael Siu
		Institute of Scientific Research Univerity of Québec Rimouski P.Q.	Daniel Cossa
DENMARK	6	Danish Isotope Centre Skelbaekgade 2 DK 1717 Copenhagen V	Iver Drabaek
	33	Marine Pollution Laboratory Kavalergarden 6 DK-2920 Charlottenlund	Arne Jensen
	36	Water Quality Institute 11, Agern Alle DK-2970 Horsholm	Merete Reuss
	40	National Food Institute 19, Morkhoj Bygade DK-2860 Soborg	Allan Andersen Gitte Rasmussen

FINLAND	50	National Board of Waters Research Laboratory Kylasaarenkatu 10 00550 Helsinki	Kirsti Haapala
FRANCE	24	Institut Scientifique et Technique des Pêches Maritimes Rue de l'Ille d'Yeu B.P. 1049 44037 Nantes Cedex	Yves Thibaud
GERMAN DEMOCRATIC REPUBLIC	14	Institut für Meereskunde Schliessfach 38 Seestrasse 15 DDR-2530 Rostock-Warnemunde	L. Brügmann
	42	Hygeine Institut Rostock Abteilung Lebensmittel und Ernährungshygiene Gertrudenstrasse 9 DDR-2500 Rostock	G. Manthey
GERMAN FEDERAL REPUBLIC	9	Bodenseewerk Perkin-Elmer & Co Gmbh Postfach 1120 D-7770 Uberlingen	Bernhard Welz
	11	Bundsforschungsanstalt für Fischerei Labor für Radiookologie der Gewasser Wustand 2 D-2000 Hamburg 55	Uwe Harms
	22	Bundesanstalt für Gewasserkunde Kaiserin Augusta Anlagen 15-17 D-5400 Koblenz	W. Speer
	35	Institut für Meereskunde an der Universitat Kiel Dusternbrooker Weg 20 D 2300 Kiel 1	H. Fischer
IRELAND	46	Fisheries Research Centre Abbotstown Castleknock Co. Dublin	Mairin O Sullivan
NETHERLANDS	5	Government Institute of Sewage and Waste Water Treatment Hereweg 99a 9721 AA Groningen	W. Wilts
	31	Rijks-Kwaliteitsinstituut Postbus 230 6700 AE Wageningen	M. Heuver
	32	Division for Nutrition and Food Research TNO P.O. Box 183 1970 AD IJmuiden	J.B. Luten
	48	Netherlands Institute for Fishery Investigations P.O. Box 68 1970 AA IJmuiden	H. Pieters
NORWAY	12	Institute of Nutrition Directorate of Fisheries P.O. Box 4285 Lars Hilles gt. 26 N-5013 Nygaardstangen	Olaf R. Braekkan Kare Julshamn

	18	Central Institute for Industrial Research P.O. Box 350 Blindern Oslo 3	Beate Enger Lilla Madsen
	28	Fiskeridirectoratet Postboks 185 Mollendalsveien 4 5001 Bergen	Norvald Losnegard John Nielsen
		Central Laboratory Directorate of Fisheries Mollendalsveien 5 N-5000 Bergen	Bjarne Boe
POLAND	29	Morski Instytut Rybacki w Gdyni Al. Zjednoczenia 1 81-345 Gdynia	A. Ropelewski
	43	Institute of Marine Food Technology Kazimierza Krolewicza 3 71-550 Szczecin	Mikolaj Protasowicki
PORTUGAL	34	Instituto Nacional de Investigacao das Pescas Avenida de Brasilia 1400 Lisboa	Carmen Lima
	38	Instituto Hidrografico Rua des Trinas P-1296 Lisboa	Carlos F.D. Souto
	44	Instituto de Ciencias Biomedicas "Abel Salazar" Largo do Professor Abel Salazar, 2 4000 Porto	Joao Coimbra
		National Institute for Fisheries Research Avenida de Brasilia 1400 Lisboa	Carlos Vale
SPAIN	4	Instituto Espanol de Oceanografia San Pedro de Pinatar P.O. Box 22 Murcia	J. Guerrero
SWEDEN	8	Swedish Environment Protection Board Water Research Laboratory P.O. Box 1302 S-171 Solna	Hans Borg Karin Holm
	15	Swedish Environment Protection Board S-170 11 Drottningholm	Eva Skold
	21	Swedish Environment Protection Board S-170 11 Drottningholm	Ingemar Gustavsson Astrid Edin
	30	Institute of Natural Sciences University of Kalmar P.O. Box 903 39129 Kalmar	Anders Olsson B. Lindvall
	47	Swedish Environment Protection Board S-170 11 Drottningholm	Kertin Aslund
UNION of SOVIET SOCIALIST REPUBLICS	20	Institute of Thermophysics and Electrophysics Paldiski Street 1 Tallinn 200031 USSR	Harri Jankovski
		Baltic Fisheries Research Institute Tallinn Branch Apteegi Street 1 200001 Tallinn	T. Palm

UNITED KINGDOM	3	Clyde River Purification Board Rivers House Murray Road East Kilbride Glasgow G75 0LA	A.J.N. Haig
	17	Fisheries Laboratory Remembrance Avenue Burnham-on-Crouch Essex CM0 8HA	Robin Law
	19	Agricultural and Food Chemistry Department Queen's University Newforge Lane Belfast BT9 5PX	N. Gault
	23	Institute for Marine Environmental Research Environmental Research Prospect Place The Hoe Plymouth PL1 3DH	J. Cleary
	25	Forth River Purification Board Colinton Dell House West Mill Road Colinton Edinburgh EH13 0PH	W.F. Collett T. Leatherland
	26	Institute of Offshore Engineering Heroit-Watt University Research Park Riccarton Edinburgh EH14 4AS	Wells C. Grogan
	27	Marine Laboratory P.O. Box 101 Victoria Road Aberdeen AB9 8DB	J.C. McKie Graham Topping
UNITED STATES	1	NOAA Northeast Fisheries Center Milford Laboratory 212 Rogers Avenue Milford, Connecticut 06460	Richard A. Greig
	39	NOAA Northeast Fisheries Center Sandy Hook Laboratory Highlands, New Jersey 07732	Vincent S. Zdanowicz John Pearce
	41	NOAA Southeast Fisheries Center Beaufort Laboratory Beaufort, North Carolina 25516	Peter J. Hanson
	51	Skidaway Institute of Oceanography P.O. Box 13687 Savannah, Georgia 31416	Herb Windom Ralph Smith
		EPA-ERLN South Ferry Road Narragansett, Rhode Island 02882	Donald Phelps
		Moss Landing Marine Laboratories P.O. Box 225 Moss Landing, California 95039	John Martin

COPPER DATA

Lab	Mean	RSD						
1			HNO_3-GFAAS					
	299	6.2	320	305	265	304	305	297
	4.43	8.7	3.73	4.35	4.85	4.43	4.7	4.49
	1.91	12.8	1.69	2.23	1.87	1.99	2.09	1.58
2A			BOMB/HNO_3/$HClO_4$-ICP					
	346	1.1	345	339	345	351	347	347
	4.53	10.0	5.4	4.1	4.6	4.4	4.4	4.3
	4.87	4.4	4.8	5.0	5.1	4.8	5.0	4.5
2B			BOMB/HNO_3/$HClO_4$-GFAAS					
	----	----	No data					
	4.62	5.2	4.6	5.0	4.4	4.5	4.8	4.4
	3.70	3.4	3.9	3.7	3.7	3.5	3.7	3.7
3			HNO_3/$HClO_4$/HCl-FAAS					
	316	1.4	318	311	323	317	316	311
	3.83	11.9	3.7	4.5	3.4	3.5	4.3	3.6
	3.13	1.6	3.2	3.1	3.1	3.1	3.1	3.2
4			HNO_3-FAAS					
	330	0.8	330	332	334	327	328	330
	4.08	20.2	3.38	3.98	3.50	3.42	5.02	5.20
	4.74	10.1	4.35	4.29	4.71	5.46	5.17	4.44
5			BOMB/HNO_3-FAAS(A)-GFAAS(B/C)					
	341	0.9	341	341	346	343	341	337
	3.23	18.9	4.0	3.1	3.7	2.4	2.7	3.5
	2.53	11.9	2.9	2.5	2.9	2.3	2.4	2.2
6			NO DATA					
7			DRY ASH/HNO_3/H_2O_2-FAAS					
	328	0.9	331	332	327	327	325	326
	3.68	3.8	3.51	3.85	3.83	3.59	3.59	3.69
	4.67	3.4	4.38	4.75	4.61	4.78	4.75	4.78
8			HNO_3/H_2O_2-FAAS					
	326	1.3	327	332	324	329	324	320
	3.60	32.3	4.1	2.1	2.7	4.4	5.2	3.1
	2.83	7.3	3.1	3.0	2.9	2.6	2.8	2.6
9			BOMB/HNO_3-GFAAS					
	398	5.5	376	420	397			
	3.74	11.5	3.26	3.86	4.09			
	3.18	0.9	3.2	3.2	3.15			
10			HNO_3/$HClO_4$-ICP					
	387	2.2	401	379	390	388	387	378
	----	----	No data					
	5.89^{KT}	24.4	5.45	3.30	5.97	6.80	6.43	7.41
11A			BOMB/HNO_3-EXTN-FAAS					
	344	3.2	351	349	327	357	335	347
	3.88	10.6	3.3	3.9	4.4	3.5	4.1	4.1
	2.65	7.8	2.8	2.5	2.8	2.9	2.4	2.5
11B			BOMB/HNO_3-FAAS					
	359	4.7	358	382	330	362	364	358
	3.70	15.5	3.0	3.9	3.2	4.6	3.9	3.6
	2.42	18.9	2.3	2.5	1.8	2.7	3.1	2.1

COPPER DATA

Lab	Mean	RSD	
12			BOMB/HNO$_3$/HClO$_4$-FAAS
	332	0.7	330 333 331 329 335 333
	3.25	16.9	2.85 3.00 2.89 2.91 3.67 4.18
	3.12	29.9	2.90 2.98 2.97 2.64 2.27 4.94
13			NO DATA
14			BOMB/HNO$_3$-GFAAS
	296	2.6	303 297 286 288 298 305
	3.43	41.3	4.1 5.1 2.7 1.9 4.8 2.0
	1.73	21.5	2.0 2.0 1.0 1.8 1.8 1.8
15			HNO$_3$/H$_2$O$_2$-GFAAS
	163[RT]	31.1	140 110 220 110 220 180
	2.72	50.0	2.5 5.4 2.5 2.0 2.3 1.6
	2.02	19.2	1.7 2.3 2.2 2.4 2.1 1.4
16			BOMB/HNO$_3$-FAAS
	382	1.1	377 376 384 387 383 383
	----	----	No data
	----	----	No data
17			HNO$_3$/H$_2$O$_2$-FAAS
	352	1.2	350 350 350 350 350 360
	2.95	9.3	2.6 3.1 3.1 2.6 3.1 3.2
	2.62	17.4	2.2 2.7 3.3 2.7 2.2
18A			DRY ASH/HNO$_3$-ICP
	307	0.7	305 307 309 309 307 304
	3.59	8.6	3.67 3.68 3.32 3.56 3.23 4.10
	3.23	3.6	3.37 3.35 3.13 3.12 3.13 3.27
18B			DRY ASH/HNO$_3$-EXTN(B&C)-FAAS
	299	1.6	303 306 294 298 301 294
	3.97	5.8	3.94 4.07 3.86 3.93 3.66 4.35
	3.24	4.8	3.42 3.36 3.28 3.02 3.25 3.08
19			DRY ASH/HCl-FAAS
	324	7.8	345 309 280 345 328 335
	3.48	13.7	3.25 2.83 3.35 4.09 3.98 3.35
	3.59	3.7	3.74 3.63 3.52 3.52 3.74 3.41
20			HNO$_3$-GFAAS
	424[RT]	12.6	472 508 382 383 393 404
	3.42	19.2	3.0 4.1 4.4 2.9 3.0 3.1
	2.55	31.4	1.6 2.3 3.4 2.5 1.9 3.6
21			BOMB/HNO$_3$/H$_2$SO$_4$(A)-HNO$_3$/HClO$_4$(B/C)-ASV
	373	8.7	388 418 373 349 336
	4.77	28.5	3.2 5.5 5.6
	4.43	21.0	3.4 5.2 4.7
22			HNO$_3$/HCl-FAAS(A)/GFAAS(B/C)
	328	1.5	334 320 331 331 330 325
	3.07	22.2	3.0 3.6 2.6 4.0 3.1 2.1
	2.83	20.3	2.8 2.3 2.9 3.8 3.0 2.2
23A			HNO$_3$-FAAS-0.25 g samples
	316	2.7	311 311 309 316 317 332
	3.68	15.5	4.7 3.3 4.0 3.4 3.2 3.5
	2.25	14.3	2.2 2.1 1.7 2.5 2.5 2.5

COPPER DATA

Lab	Mean	RSD						
23B			HNO_3-FAAS-1 g samples					
	----	----	No data					
	3.58	34.0	2.2	2.7	3.6	5.7	4.0	3.3
	2.20	8.1	2.4	2.2	2.2	2.4	2.0	2.0
24			BOMB/HNO_3/H_2SO_4-FAAS					
	363	2.5	351	363	365	375	353	369
	5.38[KT]	9.5	6.3	5.4	5.5	5.1	4.8	5.2
	7.52[KT]	5.3	7.3	7.6	8.1	6.9	7.6	7.6
25			HNO_3/$HClO_4$-FAAS					
	318	4.0	335	334	313	313	305	310
	3.86	12.1	3.7	4.2	3.2	3.8	4.4	
	4.32	4.3	4.6	4.5	4.2	4.2	4.2	4.2
26			DRY ASH/HNO_3-DCP					
	277	1.6	276	284	279	274	271	277
	4.21	81.7	0.48	9.90	6.55	1.97	3.18	3.15
	3.65	4.6	3.79	3.61	3.44	3.88	3.50	3.67
27A			HNO_3-FAAS					
	360	1.4	361	353	364	363	366	356
	4.14	8.8	4.62	3.97	4.11	3.55	4.35	4.23
	2.83	3.4	2.92	2.87	2.96	2.76	2.73	2.76
27B			NO DATA					
28			HNO_3-GFAAS					
	375	4.6	369	369	382	406	368	356
	4.64	26.3	3.29	4.31	5.90	6.22	4.68	3.45
	3.92	8.7	3.70	3.79	4.43	4.23	3.81	3.54
29			HNO_3-GFAAS					
	441[ET]	3.4	435	450	443	415	458	445
	3.27	7.7	2.87	3.28	3.51	3.09	3.36	3.51
	4.72	1.3	4.66	4.77	4.77	4.66	4.66	4.77
30			DRY ASH/HCl/HNO_3-FAAS					
	274	5.1	278	272	292	250	271	282
	2.97	5.1	3.02	3.24	2.94	2.92	2.82	2.85
	2.49	7.6	2.33	2.40	2.36	2.84	2.56	2.45
31			DRY ASH/HNO_3/HCl-FAAS					
	319	3.5	326	325	306			
	2.93	5.2	2.8	3.1	2.9			
	2.63	5.8	2.8	2.5	2.6			
32			BOMB/HNO_3-HCl-GFAAS					
	353	7.5	360	370	370	380	320	320
	3.90	37.7	4.6	6.5	2.4	3.1	3.1	3.7
	1.82	18.2	1.6	1.7	1.4	1.8	2.1	2.3
33			HNO_3/$HClO_4$-FAAS					
	353	1.0	354	352	357	348	357	351
	3.30	17.8	3.3	4.4	3.4	3.0	2.8	2.9
	2.47	3.3	2.6	2.4	2.4	2.5	2.5	2.4
34			NO DATA					
35			HNO_3/$HClO_4$-XRF					
	322	19.3	297	326	300	420	356	236
	----	----	No data					
	----	----	No data					

COPPER DATA

Lab	Mean	RSD	
36			$HNO_3/H_2SO_4/H_2O_2$-EXTN-GFAAS
	----	----	No data
	1.90^{RT}	8.7	1.79 2.11 1.83 2.09 1.84 1.71
	----	----	No data
37			No procedure-AAS
	363	3.1	350 372 378 368 357 354
	5.37^{RT}	12.5	5.44 5.82 6.16 5.68 4.53 4.59
	5.46^{RT}	9.0	5.57 6.00 5.33 4.57 5.54 5.76
38			HNO_3/H_2O_2-FAAS
	288	13.0	320 323 299 237 263
	7.04^{RT}	13.4	5.71 7.10 7.12 8.53 7.30 6.45
	6.16^{RT}	9.4	6.85 6.44 6.11 6.10 5.28
39			HNO_3/H_2O_2-FAAS
	301	2.5	300 296 300 293 314 306
	----	----	No data
	3.80	2.6	3.71 3.85 3.75 3.87 3.94 3.70
40			$HNO_3/H_2SO_4/H_2O_2$-EXTN-FAAS
	330	7.2	349 295 307 348 350 333
	4.09	15.7	3.74 4.13 4.33 5.13 3.20 4.02
	3.71	7.1	3.40 3.76 3.74 4.11 3.56
41A			BOMB/HNO_3-GFAAS
	338	1.2	341 337 338 333 334 344
	2.38^{RT}	49.9	4.7 1.6 2.2 2.1 2.3 1.4
	2.90	4.9	2.9 2.9 3.1 3.0 2.8 2.7
41B			HNO_3-FAAS
	286	3.4	284 304 290 280 281 278
	2.92	13.4	3.4 2.9 3.4 2.6 2.6 2.6
	3.60	5.3	3.8 3.6 3.8 3.3 3.6 3.5
42			HNO_3-DRY ASH/HNO_3/HCl-ASV
	394	9.8	382 437 363
	7.57^{RT}	29.9	5.2 7.8 9.7
	5.03^{RT}	13.2	5.2 4.3 5.6
43			DRY ASH/HNO_3-FAAS
	407^{RT}	2.7	408 400 421 416 405 390
	4.62	5.1	4.61 4.60 4.45 4.92 4.83 4.29
	5.46^{RT}	5.0	5.43 5.02 5.35 5.80 5.47 5.67
44			DRY ASH/HNO_3-FAAS
	346	1.6	345 339 349 352
	4.53	12.1	4.14 4.59 5.28 4.10
	4.05	4.7	4.28 3.91 3.88 4.13
45			BOMB/HNO_3/HCl/H_2O_2-FAAS
	338	1.8	330 336 345 343 337
	5.40^{RT}	17.2	3.95 6.22 4.76 5.55 6.46 5.44
	5.78^{RT}	5.8	6.09 6.19 5.65 5.77 5.25 5.71
46			HNO_3/H_2O_2-GFAAS
	310	3.8	322 325 309 305 304 294
	2.53	13.7	2.28 2.02 2.84 2.43 2.72 2.90
	2.76	2.3	2.73 2.68 2.78 2.85 2.74

COPPER DATA

Lab	Mean	RSD	
47			HNO_3/H_2O_2-GFAAS
	272	3.7	266 261 282 287 267 271
	4.18	9.6	4.71 4.21 4.38 3.69 4.35 3.72
	2.44	8.7	2.82 2.40 2.28 2.50 2.22 2.39
48			NO DATA
49A			$HNO_3/HClO_4$-ICP
	298	4.7	308 293 316 282 290
	4.23	23.5	4.5 5.5 3.3 3.6
	3.25	11.6	3.2 3.0 3.0 3.8
49B			HNO_3/H_2O_2-FAAS(A)-GFAAS(B/C)
	313	0.9	310 315 312 310 312 317
	4.40	15.7	4.5 4.5 5.4 3.5 4.1
	3.20	16.3	3.0 2.7 2.9 2.9 4.0 3.7
49C			HNO_3-EP-IDSSMS
	322	7.6	296 329 353 312
	3.35	6.2	3.69 3.12 3.42 3.44 3.22 3.22
	3.19	6.7	2.99 3.22 3.47 3.06
50			HNO_3-GFAAS
	342	3.3	341 347 346 321 348
	3.58	28.2	2.5 4.1 2.8 5.0 3.0
	2.02	4.1	2.1 1.9 2.0 2.0 2.1
51			No procedure
	357	1.6	360 360 350
	-----	-----	No data
	2.53	13.6	2.4 2.6 2.8 1.9 2.7 2.8

ZINC DATA

Lab	Mean	RSD	
1			NO DATA
2			BOMB/$HNO_3/HClO_4$-ICP
	184	1.1	186 185 185 184 184 180
	60.3	2.0	61 58 61 61 61 60
	92.8	2.4	90 92 94 91 96 94
3			$HNO_3/HClO_4/HCl$-FAAS
	165	1.1	163 164 164 167 167 167
	56.0	5.8	62 55 57 54 53 55
	92.2	3.6	96 93 87 90 92 95
4			HNO_3-FAAS
	176	1.9	179 180 171 175 177 174
	57.5	1.9	57.8 57 56.8 57.4 56.6 59.6
	97.4	4.5	93.5 93.8 97.3 105.7 97.5 96.6
5			BOMB/HNO_3-FAAS
	162	1.1	162 165 161 163 160 163
	52.6	1.1	52.3 52.5 53.2 51.7 53.1 52.8
	82.3	1.7	82 81 82 82 82 85

ZINC DATA

Lab	Mean	RSD						
6			NO DATA					
7			DRY ASH/HNO_3/H_2O_2-FAAS					
	178	4.0	190	179	179	168	176	178
	57.1	1.8	57.7	58.6	57.1	56.9	56.4	55.7
	103.7	4.2	98.7	108	105	102	99.4	109
8			HNO_3/H_2O_2-FAAS					
	166	1.1	169	167	165	164	167	166
	59.7	1.7	61	58	60	60	59	60
	96.7	2.2	95	94	98	96	97	100
9			BOMB/HNO_3-FAAS					
	174	0.6	175	174	173			
	57.0	2.8	59.0	56.0	56.5			
	94.5	1.3	96.0	94.5	93.5			
10			HNO_3/$HClO_4$-ICP					
	210[RT]	2.5	213	200	212	215	211	211
	65.0	1.8	65.4	64.4	65.6	66.7	63.3	64.3
	112.7	1.1	112	111	113	112	114	114
11A			BOMB/HNO_3-EXTN-FAAS					
	181	3.1	180	177	186	173	185	187
	63.2	5.3	58	62	68	64	62	65
	105.8	7.5	111	102	101	109	95	117
11B			BOMB/HNO_3-FAAS					
	182	6.7	188	168	198	185	167	188
	63.3	7.9	62	67	63	71	57	60
	104.5	6.1	113	102	112	98	101	101
11C			BOMB/HNO_3-ICP					
	172	4.8	171	176	180	175	173	156
	59.9	6.8	61.4	65	63.7	58.1	55.4	55.7
	92.3	8.7	101	91	103	84	85	90
12			BOMB/HNO_3/$HClO_4$-FAAS					
	179	3.7	170	188	185	175	181	178
	58.7	1.8	59	57	59.9	58.2	59.6	58.2
	99.1	3.3	98.3	103	98.5	96.4	95.2	103
13			PELLET-INAA					
	194	10.5	173	221	190	217	181	180
	76.2[RT]	4.9	82	76	77	73	73	
	115.7[RT]	9.4	127	122	127	106	108	104
14			BOMB/HNO_3-FAAS					
	138[RT]	1.9	139	135	136	138	136	142
	49.3	2.1	48	51	50	49	49	49
	77.0	1.4	77	76	79	77	76	77
15			HNO_3/H_2O_2-FAAS					
	183	35.6	160	120	150	140	250	280
	58.8	19.3	53	58	49	50	79	64
	83.8	7.6	90	83	72	86	88	84
16			BOMB/HNO_3-FAAS					
	194	1.2	193	192	192	197	196	192
	67.2	2.4	68	64	68	68	68	67
	102.7	2.0	103	100	103	103	101	106

ZINC DATA

Lab	Mean	RSD						
17			HNO_3/H_2O_2-FAAS					
	180	3.5	170	180	180	180	190	180
	58.7	2.8	58	57	60	61	57	59
	97.3	2.1	100	96	96	96	96	100
18A			DRY ASH/HNO_3-ICP					
	166	0.6	166	166	168	166	166	165
	56.5	0.6	56.7	56.5	56.2	57	56.4	56
	84.5	0.6	84.3	85.5	84.6	84.6	84.1	84.1
18B			DRY ASH/HNO_3-FAAS					
	146^{RT}	2.6	152	148	148	144	146	141
	50.8	1.1	51.5	51.1	50.5	51.1	50	50.5
	83.3	2.6	84	86	83.3	84	82.8	79.5
19			DRY ASH/HCl-FAAS					
	265^{RT}	15.8	237	324	313	248	233	235
	92.4^{RT}	3.6	98	92	92	90	90	
	141.7^{RT}	5.0	143	141	154	141	132	139
20			HNO_3-FAAS					
	147^{RT}	3.3	147	156	145	142	145	150
	36.8^{RT}	8.5	40	37	39	36	32	
	76.0	13.9	88	76	69	80	59	84
21			NO DATA					
22			HNO_3/HCl-FAAS					
	170	1.0	169	169	170	170	173	168
	51.7	0.9	52.1	50.8	51.7	51.9	51.5	52
	90.2	2.1	91.9	89.9	92	91.5	88.3	87.7
23A			HNO_3-FAAS-0.25 g samples					
	188	5.5	200	185	175	196	177	193
	60.4	3.6	64.4	59.4	58.9	58.9	59.3	61.5
	94.8	3.2	94.4	93.7	92.3	96.6	91.8	99.9
23B			NO DATA					
24			BOMB/HNO_3/H_2SO_4-FAAS					
	162	4.1	170	163	164	167	154	154
	48.7	3.4	49	49	49	51	46	48
	172.5^{RT}	7.2	186	187	164	177	161	160
25			$HNO_3/HClO_4$-FAAS					
	163	6.6	162	160	155	153	165	183
	55.6	13.1	58	56	44	56	64	
	88.7	4.1	89	89	85	84	92	93
26			DRY ASH/HNO_3-DCP					
	172	3.5	178	176	175	163	174	166
	52.8	7.5	50	59	55.8	48.2	52.3	51.8
	95.0	2.9	90.9	93.8	94	97.1	95.8	98.6
27A			HNO_3-FAAS					
	195	1.9	199	193	193	200	196	191
	63.7	1.9	65.7	62.6	63.6	63.7	62.5	64.3
	96.0	3.0	98.4	97.4	99.7	94	92.7	93.8
27B			NO DATA					
28			HNO_3-GFAAS					
	110^{RT}	5.6	104	105	112	110	108	121
	48.0	10.7	57.4	48.1	47.1	43.3	43.6	48.3
	76.5	5.4	71.8	73.5	75.7	75.9	78.9	83.4

ZINC DATA

Lab	Mean	RSD	
29			HNO_3-FAAS
	319[RT]	6.5	314 335 334 280 329 321
	79.9[RT]	6.0	83.6 76.9 82.5 82 71.4 82.9
	151.3[RT]	4.7	161 149 155 156 144 143
30			DRY ASH/HCl/HNO_3-FAAS
	154[RT]	6.0	145 140 157 160 161 162
	48.4	1.4	48.7 48.9 48.6 49.1 47.4 47.8
	81.9	5.5	84.6 83.7 88.7 78.9 77.8 77.4
31			DRY ASH/HNO_3/HCl-FAAS
	162	2.9	167 159 159
	55.7	1.7	55.2 56.8 55.1
	90.4	0.9	89.7 91.3 90.1
32			BOMB/HNO_3-HCl-GFAAS
	198	6.2	190 192 222 196 198 189
	59.2	2.8	62 59 59 58 58
	99.7	10.5	101 118 103 89 91 96
33			HNO_3/$HClO_4$-FAAS
	182	0.9	180 182 184 182 183 180
	61.7	1.3	62 62 60 62 62 62
	97.3	1.8	100 96 96 97 99 96
34			NO DATA
35			HNO_3/$HClO_4$-XRF
	131[RT]	16.6	132 137 116 160 144 98
	----	----	No data
	----	----	No data
36			HNO_3/H_2SO_4/H_2O_2-EXTN-GFAAS
	----	----	No data
	57.6	1.8	56.8 59.5 57.6 56.6 57.6 57.4
	----	----	No data
37			NO DATA-AAS
	185	3.4	188 185 195 176 183 186
	67.6	6.9	67.6 67.8 70.1 74.7 63.9 61.4
	104.1	3.5	103.8 103.4 97.4 105.6 106.9 107.2
38			HNO_3/H_2O_2-FAAS
	104[RT]	11.7	117 110 90.9 96.2
	64.3	2.2	62.7 63.1 64.3 64.2 64.9 66.7
	101.5	4.4	99.9 107.6 104.5 99 96.4
39			HNO_3/H_2O_2-FAAS
	174	2.3	177 180 172 173 172 169
	----	----	No data
	86.9	5.9	84.4 96.5 85.8 85.4 88 81.5
40			HNO_3/H_2SO_4/H_2O_2-EXTN-FAAS
	180	3.4	188 178 180 184 172
	64.5	10.1	66.5 58.9 60.3 61.2 76.6 63.2
	111	1.3	110 110 113 111
41A			BOMB/HNO_3-GFAAS
	183	9.7	183 172 206 163 173 204
	60.8	2.6	60.2 60 60.6 63.6 61.4 59.1
	91.0	10.6	86 83 89 110 88 90

ZINC DATA

Lab	Mean	RSD	
41B			HNO_3-FAAS
	193	2.3	196 192 197 196 186 189
	59.1	0.6	59.7 58.6 59.2 59.1 58.8 59.1
	97.9	1.2	99.6 97.5 96.7 98.5 98.7 96.6
42			HNO_3-DRY ASH/HNO_3/HCl-ASV
	181	1.1	179 182 183
	42.0[KT]	15.6	43 35 48
	79.0	5.9	84 78 81 73
43			DRY ASH/HNO_3-FAAS
	190	2.1	185 187 189 193 189 196
	71.8[KT]	6.2	68.8 66.8 76.9 72.7 68.4 76.9
	119.7[KT]	5.2	119 115 119 131 113 121
44			DRY ASH/HNO_3-FAAS
	185	2.2	180 190 184 185
	76.5[KT]	14.0	64.3 71 83.5 87.2
	98.5	2.3	101 95.4 98.6 98.9
45			BOMB/HNO_3/HCl/H_2O_2-FAAS
	178	4.0	184 175 167 183 181
	57.0	0.8	56.3 57 57.2 56.5 57.3 57.5
	92.1	1.9	92.6 90.8 92.7 90.6 95.1 91
46			HNO_3/H_2O_2-FAAS
	147[KT]	4.0	153 153 147 142 151 139
	42.6[KT]	11.3	43 38.2 48.3 47.7 36.5 41.8
	154.8[KT]	5.1	162 144 156 162 150
47			HNO_3/H_2O_2-GFAAS
	174	1.9	178 170 178 172 175 173
	59.6	4.5	57.9 59.1 59.6 58 64.8 57.9
	103.7	4.2	111 100 101 102 101 107
48			NO DATA
49A			HNO_3/$HClO_4$-ICP
	170	3.4	167 178 163 170 173
	55.8	4.7	57.6 57 52.8
	80.8	1.6	82.4 79.2 80.5 81
49B			HNO_3/H_2O_2-FAAS
	188	1.0	192 187 188 187 188 188
	58.2	1.3	59 57 58 59 58 58
	94.3	3.4	96 92 94 100 92 92
49C			HNO_3-EP-IDSSMS
	174	3.2	174 180 172 181 174 166
	61.1	3.4	59.4 64.5 60.2 62.7 59.4 60.3
	94.3	3.4	96.8 90.9 92.2 97.1
50			HNO_3-GFAAS
	179	4.5	175 186 178 170 188
	53.2	7.8	57 47 51 55 56
	85.0	7.5	79 79 84 90 93
51			NO DATA

ARSENIC DATA

Lab	Mean	RSD						
1			NO DATA					
2A			BOMB/HNO_3/$HClO_4$-ICP					
	27.8	5.3	26.1	27.4	27.0	27.2	29.4	29.9
	10.4	3.1	10.6	10.2	10.8	10.5	10.3	9.9
	7.6	7.7	7.2	8.3	8	7.9	6.8	7.2
2B			BOMB/HNO_3/$HClO_4$-Ni/GFAAS					
	26.9	1.9	27.1	26.6	26.6	26.5	26.6	27.8
	7.8	3.7	8.2	8.2	7.7	7.7	7.6	7.6
	----	----	No data					
2C			NO PREP-INAA					
	32.9	4.0	33.6	31.5	34.3	32		
	10.1	10.4	11.6	9.7	9.2	9.8		
	5.6	6.0	5.1	5.6	5.9	5.6		
3			NO DATA					
4			NO DATA					
5			BOMB/HNO_3-HG-AAS					
	24.7	11.7	23	25	29	27	22	22
	5.9	10.5	6.6	6.1	5.2	5.8	6.4	5.1
	4.7	17.7	3.8	4.2	3.8	5.5	5.5	5.2
6			NO PREP-INAA					
	----	----	No data					
	----	----	No data					
	5.5	2.2	5.34	5.59	5.63	5.4	5.48	
7			NO DATA					
8			DRY ASH/HCl/KI-HG-AAS					
	30.0	2.1	29	30	30	30	31	30
	8.1	2.4	8.1	8.2	8.3	7.8	8.0	8.3
	5.6	1.5	5.7	5.6	5.5	5.5	5.6	5.5
9			O_2 COMBUSTION-HNO_3-HG-AAS					
	24.6	2.9	25.7	24	25.1	23.7	24.6	24.7
	7.1	4.1	7.3	7.0	6.8	7.3	6.7	7.4
	4.7	3.0	4.7	4.8	4.4	4.6	4.7	4.7
10			NO DATA					
11			BOMB/HNO_3-HG-AAS					
	19.3	17.5	21	17	25	20	17	16
	----	----	No data					
	----	----	No data					
12			BOMB/HNO_3/$HClO_4$-Ni/GFAAS					
	28.9	6.7	30.0	29.4	30.7	27.7	30.0	25.5
	7.3	8.5	8.00	7.54	7.49	7.59	6.80	6.31
	1.1	22.3	0.96	1.05	1.51	1.07	0.85	0.91
13			PELLET-INAA					
	23.7	6.4	21	24	24	25	25	23
	6.7	5.7	6.3	7.3	6.5	6.6	7.1	6.6
	4.7	3.3	4.8	4.8	4.6	4.7	4.6	4.4
14			NO DATA					
15			NO DATA					
16			NO DATA					

ARSENIC DATA

Lab	Mean	RSD						
17			NO DATA					
18			HNO_3-HG-AAS					
	15.9	5.3	15.9	15.3	15.3	15.1	16.3	17.3
	3.6	7.1	4.0	3.4	3.6	3.5	3.9	3.4
	1.9	13.4	2.2	1.9	1.9	2.2	1.9	1.5
19			DRY ASH/HCl/KI-HG-AAS					
	18.8	3.9	17.5	19.1	19.6	18.5	19.1	19.1
	3.4	9.6	2.9	3.5	3.7	3.0	3.5	3.5
	2.6	9.2	2.6	2.3	2.9	2.5	2.7	2.3
20			NO DATA					
21			NO DATA					
22			NO PREP-INAA					
	25.0	---	25.0					
	7.0	---	7.0					
	4.6	---	4.6					
23A			NO DATA					
23B			NO DATA					
24			BOMB/HNO_3/H_2SO_4-GFAAS					
	21.2	4.3	22.2	21.0	20.4			
	13.0[RT]	5.5	13.1	13.6	12.2			
	5.9	6.9	6.1	5.4	6.1			
25			NO DATA					
26			NO DATA					
27A			HNO_3/H_2SO_4-HG-AAS					
	24.7	7.7	24.1	28.2	25.6	23.5	23.2	23.8
	7.7	6.4	7.2	7.2	8.5	7.7	8.0	7.8
	5.2	8.9	5.1	5.8	5.7	5.0	4.8	4.7
27B			NO DATA					
28			NO DATA					
29			NO DATA					
30			NO DATA					
31			DRY ASH/HNO_3/HCl-HG-AAS					
	36.3	8.6	37.6	38.5	32.7			
	9.7	5.6	9.48	10.3	9.28			
	6.3	7.6	6.84	6.10	5.95			
32			DRY ASH/HNO_3-HG-SPEC					
	29.5	6.6	29.3	28.6	29.3	28.6	27.8	33.3
	7.6	10.6	7.2	6.4	7.9	7.9	8.5	
	6.5	23.9	4.5	6.2	8.5	7.4	5.7	
33			NO DATA					
34			NO DATA					
35			NO DATA					
36			NO DATA					
37			HNO_3-Ni/GFAAS					
	26.4	3.9	28.0	25.5	27.0	25.9	26.6	25.3
	6.8	4.2	6.45	6.77	6.38	6.91	6.94	7.09
	3.3	2.6	3.17	3.38	3.35	3.37	3.31	3.42

ARSENIC DATA

Lab	Mean	RSD						
38			NO DATA					
39			NO DATA					
40			$HNO_3/H_2SO_4/H_2O_2$-HG-AAS					
	14.2	23.3	10.7	17.4	13.1	16.8	17.1	10.2
	2.7	13.7	2.32	2.58	2.42	3.21	2.72	3.16
	2.6	17.4	2.58	2.15	2.15	2.39	3.12	3.14
41			NO DATA					
42			NO DATA					
43			NO DATA					
44			NO DATA					
45			NO DATA					
46			NO DATA					
47			NO DATA					
48			NO DATA					
49A			HNO_3/H_2O_2-Ni/GFAAS					
	25.7	8.0	27.1	24.1	22.8	25.2	28.5	26.2
	7.5	3.6	7.07	7.79	7.51	7.40	7.78	7.41
	4.7	9.2	4.2	5.4	4.6	4.6	5.1	4.5
49B			HNO_3/H_2SO_4-HG-AAS					
	23.0	3.8	21.9	22.7	23.2	24		
	7.7	3.8	7.40	7.58	7.81	8.08		
	5.1	3.9	4.90	5.20	5.36	5.04		
49C			DRY ASH/$MG(NO_3)_2$-GC					
	25.9	8.4	28.2	23.1	25.2	25.0	28.0	
	7.7	3.7	7.62	7.47	7.75	8.17	7.48	
	3.2	15.0	3.06	3.42	3.97	2.66	3.11	
50			NO DATA					
51			NO DATA					

CADMIUM DATA

Lab	Mean	RSD						
1			HNO_3-GFAAS					
	22.4	3.8	22.1	22.6	23.4	22.1	21.0	23.1
	1.19[RT]	5.8	1.17	1.18	1.18	1.26	1.27	1.08
	0.06	14.4	0.06	0.06	0.05	0.07	0.05	0.05
2A			BOMB/$HNO_3/HClO_4$-ICP					
	27.2	2.0	27.8	26.7	26.8	27.3	27.8	26.6
	0.71	5.1	0.73	0.77	0.71	0.71	0.67	0.68
	0.32[RT]	11.7	0.39	0.33	0.31	0.29	0.29	0.31
2B			BOMB/$HNO_3/HClO_4$-GFAAS					
	----	----	No data					
	0.66	3.0	0.69	0.65	0.65	0.65	0.64	
	0.33[RT]	8.0	0.33	0.37	0.33	0.33	0.35	0.29

CADMIUM DATA

Lab	Mean	RSD						
3			$HNO_3/HClO_4/HCl$-FAAS					
	25.3	2.3	26.2	24.6	25.8	25.0	25.1	25.3
	0.78	2.9	0.81	0.79	0.77	0.75	0.77	0.80
	0.11	11.5	0.11	0.11	0.11	0.09	0.11	0.13
4			HNO_3-GFAAS					
	25.5	1.7	25.8	25.5	26.2	25.4	24.9	25.4
	0.38[KT]	6.1	0.38	0.35	0.39	0.36	0.41	0.40
	0.04	12.1	0.036	0.028	0.039	0.039	0.040	0.036
5			BOMB/HNO_3-FAAS(A)-GFAAS(B/C)					
	26.9	1.3	27.3	26.9	26.8	27.4	26.7	26.5
	0.87	4.8	0.85	0.88	0.85	0.92	0.81	0.91
	0.07	25.3	0.05	0.05	0.06	0.06	0.09	0.08
6			NO DATA					
7			DRY ASH/HNO_3/H_2O_2-FAAS(A)-GFAAS(B/C)					
	22.5	7.2	21.6	24.5	20.6	23.7	21.1	23.6
	0.67	5.2	0.65	0.68	0.66	0.72	0.69	0.62
	0.07	4.8	0.069	0.070	0.063	0.065	0.062	0.066
8			HNO_3/H_2O_2-FAAS(A)-GFAAS(B/C)					
	25.5	0.7	25.7	25.4	25.4	25.6	25.7	25.3
	0.76	7.3	0.78	0.72	0.86	0.76	0.76	0.70
	0.04	18.0	0.052	0.036	0.033	0.044	0.041	
9			O_2 COMBUSTION-HNO_3-GFAAS					
	29.1	6.8	27.8	26.3	31.3	28.1	30.3	30.8
	0.74	5.3	0.73	0.78	0.77	0.74	0.68	
	0.04	60.4	0.01	0.04	0.07	0.06	0.02	0.03
10			$HNO_3/HClO_4$-ICP					
	36.3[KT]	6.3	36.3	32.7	38.1	38.9	37.1	34.6
	0.89	4.1	0.859	0.924	0.929	0.906	0.838	0.882
	0.11	18.6	0.108	0.095	0.140	0.094	0.088	0.123
11			BOMB/HNO_3-EXTN-GFAAS					
	25.1	3.0	25.2	25.4	25.2	24.3	24.3	26.3
	0.41[KT]	6.7	0.414	0.448	0.426	0.426	0.402	0.366
	0.02	17.5	0.018	0.015	0.023	0.021	0.025	0.020
12			BOMB/$HNO_3/HClO_4$-GFAAS					
	33.1[KT]	9.5	38.3	33.3	29.7	31.8	35.0	30.7
	0.83	11.2	0.88	0.97	0.89	0.76	0.75	0.75
	0.06	13.8	0.064	0.062	0.046	0.055	0.070	0.061
13			NO DATA					
14			BOMB/HNO_3-GFAAS					
	8.6[KT]	7.9	9.1	7.9	9.3	9.1	7.7	8.6
	0.78	18.8	0.9	0.8	1.0	0.6	0.7	0.7
	0.07	16.3	0.09	0.07	0.07	0.08	0.06	0.06
15			HNO_3/H_2O_2-GFAAS					
	13.9[KT]	48.0	20.0	12.0	19.0	5.2	7.3	20.0
	0.56	37.4	0.81	0.33	0.70	0.37	0.42	0.73
	0.05	66.3	0.075	0.031	0.061	0.088	0.016	0.014
16			BOMB/HNO_3-FAAS					
	30.9[KT]	1.7	30.2	30.3	30.9	31.4	31.4	31.2
	----	----	No data					
	----	----	No data					

CADMIUM DATA

Lab	Mean	RSD	
17			HNO_3/H_2O_2-FAAS
	30.0	2.1	30 29 30 30 30 31
	0.6	40.8	0.5 0.5 0.5 0.5 0.5 1.1
	-----	-----	Less than 0.5
18A			DRY ASH/HNO_3-ICP
	26.4	0.5	26.6 26.5 26.5 26.4 26.4 26.2
	0.78	6.1	0.72 0.81 0.79 0.71 0.80 0.82
	-----	-----	Less than 0.2
18B			DRY ASH/HNO_3-EXTN(B/C)-FAAS
	26.7	1.4	27.1 26.3 26.6 26.8 27.2 26.3
	0.73	2.5	0.70 0.75 0.74 0.72 0.74 0.72
	0.06	12.9	0.07 0.06 0.07 0.07 0.06 0.05
19			DRY ASH/HCl-FAAS
	25.2	3.8	26.1 24.6 23.5 25.5 25.6 25.6
	0.96	4.7	0.94 0.94 0.94 1.05 0.94 0.94
	0.55[RT]	0	0.55 0.55 0.55 0.55 0.55 0.55
20			HNO_3-GFAAS
	11.0[RT]	16.7	11.18 13.72 12.61 9.30 9.16 10.19
	0.18[RT]	28.9	0.17 0.15 0.12 0.25 0.22
	0.09	28.0	0.10 0.08 0.12 0.12 0.06 0.07
21			BOMB/HNO_3/H_2SO_4(A)-$HNO_3/HClO_4$(B/C)-ASV
	25.0	45.8	30 28 40 14 13
	-----	-----	No data
	-----	-----	No data
22			HNO_3/HCl-FAAS(A)/GFAAS(B/C)
	26.0	2.8	26.9 25.1 26.4 25.3 26.5 25.8
	0.93	5.3	0.99 0.88 0.93 0.87 0.98 0.93
	0.05	18.2	0.043 0.033 0.053 0.054 0.050 0.040
23A			HNO_3-FAAS-0.25 g samples
	25.0	1.2	24.4 25.0 25.3 25.0 25.1 25.1
	-----	-----	Less than 0.4
	-----	-----	Less than 0.4
23B			HNO_3-FAAS-1 g samples
	-----	-----	No data
	0.70	0	0.7 0.7 0.7 0.7 0.7 0.7
	-----	-----	Less than 0.1
24			BOMB/HNO_3/H_2SO_4-GFAAS
	23.2	1.8	22.8 23.3 22.6 23.6 23.6 23.3
	0.73	10.0	0.63 0.73 0.65 0.79 0.74 0.81
	0.08	21.1	0.08 0.09 0.07 0.06 0.11 0.08
25			$HNO_3/HClO_4$-FAAS
	24.8	5.6	26.0 25.5 23.7 23.1 23.8 26.4
	0.83	9.8	0.85 0.95 0.79 0.84 0.73
	0.11	41.1	0.18 0.15 0.09 0.10 0.07 0.07
26			DRY ASH/HNO_3-DCP(A)-GFAAS(B/C)
	25.1	4.7	25.7 26.9 24.0 23.6 25.2 25.0
	0.68	19.4	0.57 0.66 0.90 0.53 0.75 0.70
	0.07	29.8	0.06 0.07 0.11 0.06 0.05 0.08

CADMIUM DATA

Lab	Mean	RSD						
27A			HNO_3-FAAS					
	28.7	2.0	28.9	28.1	28.5	29.2	29.3	27.9
	0.73	6.6	0.67	0.81	0.74	0.74	0.71	0.70
	0.11	13.6	0.09	0.12	0.09	0.12	0.11	0.12
27B			NO DATA					
28			HNO_3-GFAAS					
	33.0[KT]	6.6	34.7	34.9	32.1	30.4		
	0.92	9.3	0.906	0.796	0.970	1.030	0.966	0.856
	0.16[KT]	18.5	0.207	0.116	0.150	0.159	0.154	0.158
29			HNO_3-EXTN-FAAS					
	25.5	4.9	23.4	26.9	26.2	25.5	26.2	24.8
	0.75	11.6	0.68	0.87	0.71	0.69	0.86	0.71
	----	----	No data					
30			DRY ASH/HCl/HNO_3-FAAS					
	20.4[KT]	9.2	23.3	18.0	19.6	20.8	19.2	21.5
	0.65	4.9	0.649	0.691	0.666	0.599	0.628	0.650
	0.07	17.4	0.070	0.065	0.058	0.085	0.088	0.062
31			DRY ASH/HNO_3/HCl-ASV					
	25.9	6.7	23.9	27.1	26.6			
	0.73	3.8	0.742	0.704	0.758			
	0.08	18.2	0.067	0.078	0.096			
32			BOMB/HNO_3-HCl-DPASV					
	24.8	4.8	22.9	25.9	25.5	23.9	24.7	25.7
	0.62	8.2	0.69	0.57	0.66	0.57	0.64	0.59
	0.04	29.2	0.042	0.035	0.049	0.040	0.061	0.025
33			HNO_3/$HClO_4$-FAAS					
	26.2	1.2	25.9	26.3	26.5	25.7	26.1	26.4
	0.66	1.5	0.67	0.67	0.66	0.65	0.67	0.65
	0.04	0	0.04	0.04	0.04	0.04	0.04	0.04
34			NO DATA					
35			HNO_3/$HClO_4$/H_2O_2-XRF					
	19.5[KT]	2.0	19.2	19.5	19.1	19.4	19.6	20.2
	0.51[KT]	6.9	0.49	0.57	0.50	0.52	0.49	0.47
	----	----	Less than 0.01					
36			HNO_3/H_2SO_4/H_2O_2-EXTN-GFAAS					
	----	----	No data					
	0.90	9.5	0.994	0.947	0.923	0.867	0.901	0.747
	----	----	No data					
37			NO DATA-AAS					
	27.6	4.6	28.8	28.7	27.6	27.6	25.3	27.7
	0.72	6.8	0.635	0.688	0.750	0.750	0.750	0.750
	0.05	12.2	0.038	0.050	0.040	0.043	0.050	0.050
38			HNO_3/H_2O_2-FAAS					
	25.6	15.2	28.3	30.9	22.4	24.8	21.8	
	1.07[KT]	13.6	1.23	1.27	0.98	0.98	0.95	0.98
	----	----	Less than 0.6					
39			HNO_3/H_2O_2-FAAS					
	26.9	2.7	26.9	28.2	26.4	27	26.2	26.4
	----	----	No data					
	----	----	No data					

CADMIUM DATA

Lab	Mean	RSD	
40			$HNO_3/H_2SO_4/H_2O_2$-EXTN-FAAS
	26.6	9.0	27.5 22.9 24.3 28.1 28.7 28.1
	0.76	9.5	0.634 0.768 0.725 0.834 0.784 0.811
	0.07	30.0	0.056 0.089 0.044 0.073
41A			BOMB/HNO_3-GFAAS
	25.2	3.1	25.8 25.0 26.0 24.7 23.9 25.6
	1.05[KT]	2.6	1.05 1.07 1.08 1.01 1.02 1.05
	0.04	12.3	0.045 0.047 0.045 0.043 0.037 0.034
41B			HNO_3-FAAS
	22.5	1.1	22.5 22.7 22.6 22.2 22.7 22.1
	0.67	9.2	0.68 0.76 0.60 0.69 0.60 0.69
	----	----	No data
42			HNO_3-DRY ASH/HNO_3/HCl-ASV
	16.2[KT]	14.7	19.6 16.0 15.0 14.2
	0.60	10.1	0.63 0.64 0.53
	0.06	14.8	0.057 0.066 0.046 0.054
43			DRY ASH/HNO_3-FAAS
	17.1[KT]	3.1	16.3 17.0 17.7 17.7 16.9 17.0
	1.13[KT]	5.8	1.08 1.23 1.08 1.13 1.18 1.07
	0.53[KT]	7.6	0.59 0.56 0.48 0.50 0.54 0.52
44			DRY ASH/HNO_3-FAAS
	28.6	21.8	38.0 25.5 25.3 25.7
	0.75	18.1	0.77 0.76 0.90 0.57
	----	----	No data
45			BOMB/HNO_3/HCl/H_2O_2-FAAS
	26.5	3.0	26.8 27.5 25.3 26.4 26.7
	1.14[KT]	1.6	1.12 1.11 1.15 1.14 1.16 1.14
	0.80[KT]	5.4	0.77 0.75 0.81 0.84 0.85 0.76
46			HNO_3/H_2O_2-GFAAS
	21.4	6.6	23.3 22.5 20.9 20.4 20.0
	0.37[KT]	6.8	0.357 0.357 0.408 0.359
	0.04	34.8	0.048 0.023 0.028 0.046
47			HNO_3/H_2O_2-GFAAS
	21.2	4.9	21.6 19.3 21.3 21.2 22.5 21.2
	0.74	3.2	0.72 0.72 0.72 0.76 0.77 0.72
	0.07	8.4	0.06 0.07 0.07 0.06 0.07 0.06
48			NO DATA
49A			$HNO_3/HClO_4$-ICP
	27.5	4.3	26.8 28.6 25.9 26.9 27.5 29.0
	0.80	12.5	0.8 0.9 0.7
	----	----	Less than 0.1
49B			HNO_3/H_2O_2-GFAAS
	29.3	8.1	26.1 27.9 30.1 29.8 32.4
	0.89	13.7	0.70 0.79 1.00 0.97 0.91 0.99
	0.08	11.9	0.074 0.066 0.089 0.083 0.072
49C			HNO_3-EP-IDSSMS
	22.8	6.6	25.5 22.7 22.8 21.0 23.0 21.9
	0.66	2.4	0.659 0.691 0.651 0.668 0.648 0.655
	0.06	4.4	0.055 0.062 0.058 0.057 0.059

CADMIUM DATA

Lab	Mean	RSD						
50			HNO_3-GFAAS					
	25.8	4.2	26	26	26	24	27	
	0.43^{KT}	11.7	0.44	0.46	0.40	0.50	0.37	
	0.03^{KT}	9.7	0.030	0.033	0.037	0.029	0.032	
51			No procedure					
	26.0	---	27	25				
	----	----	No data					
	0.05	30.6	0.04	0.05	0.05	0.02	0.05	0.06

MERCURY DATA

Lab	Mean	RSD						
1			NO DATA					
2			BOMB/HNO_3/$HClO_4$-CVAAS					
	0.180	5.5	0.192	0.171	0.192	0.178	0.171	0.174
	0.072	3.2	0.072	0.070	0.076	0.071	0.070	0.073
	0.035^{KT}	10.8	0.033	0.031	0.034	0.035	0.034	0.042
3			NO DATA					
4			HNO_3-CVAAS					
	0.188	14.4	0.18	0.18	0.18	0.19	0.16	0.24
	0.075	27.6	0.07	0.05	0.10	0.1	0.07	0.06
	0.047	26.0	0.05	0.04	0.06	0.04	0.03	0.06
5			BOMB/HNO_3-CVAAS					
	0.215	10.9	0.22	0.22	0.22	0.22	0.24	0.17
	0.040^{KT}	27.4	0.04	0.04	0.06	0.04	0.03	0.03
	0.057	18.2	0.04	0.06	0.06	0.05	0.06	0.07
6			NO PREP-INAA					
	----	----	No data					
	----	----	No data					
	0.062	4.2	0.0629	0.0628	0.0569	0.0635	0.0609	0.0639
7			H_2SO_4/H_2O_2-CVAAS					
	0.220	3.5	0.221	0.222	0.215	0.232	0.212	
	0.064	4.0	0.062	0.062	0.066	0.064	0.068	
	0.056	2.7	0.057	0.056	0.054	0.058	0.057	
8			HNO_3-CVAAS					
	0.252	5.3	0.26	0.26	0.26	0.24	0.26	0.23
	0.097	12.5	0.10	0.12	0.09	0.09	0.09	0.09
	0.060	21.1	0.08	0.06	0.05	0.05	0.05	0.07
9			O_2 COMBUSTION-HNO_3-CVAAS					
	0.305	6.5	0.30	0.28	0.34	0.30	0.30	0.31
	0.102	8.5	0.091	0.107	0.092	0.105	0.103	0.113
	0.065	3.7	0.066	0.064	0.063	0.062	0.068	
10			NO DATA					
11			BOMB/HNO_3-CVAAS					
	0.199	5.5	0.207	0.214	0.201	0.186	0.200	0.187
	0.084	6.0	0.087	0.081	0.090	0.081	0.077	0.088
	0.058	7.1	0.053	0.064	0.056	0.061	0.055	0.057

MERCURY DATA

Lab	Mean	RSD	
12			$HNO_3/H_2SO_4/H_2O_2$-CVAAS
	0.263	2.0	0.26 0.27 0.26 0.26 0.26 0.27
	0.075	10.5	0.064 0.066 0.081 0.077 0.077 0.083
	0.058	9.2	0.053 0.062 0.066 0.057 0.052 0.058
13			NO DATA
14			BOMB/$HNO_3/KMNO_4$-CVAAS
	0.243	0.5	0.242 0.242 0.245 0.243 0.242 0.244
	0.064	14.1	0.060 0.056 0.076 0.053 0.068 0.071
	0.056	6.9	0.051 0.058 0.062 0.055 0.056 0.053
15			NO DATA
16			H_2SO_4/HNO_3-CVAAS
	0.269	7.8	0.272 0.279 0.253 0.285 0.235 0.290
	0.111[RT]	6.5	0.115 0.104 0.109 0.111 0.123 0.104
	0.059	1.4	0.058 0.058 0.059 0.059 0.058 0.060
17			HNO_3/H_2O_2-CVAAS
	0.245	9.2	0.25 0.22 0.26 0.23 0.23 0.28
	0.08	25.0	0.11 0.09 0.05 0.08 0.08 0.07
	-----	-----	Less than 0.05
18			HNO_3-CVAAS
	0.272	4.6	0.260 0.272 0.281 0.28 0.285 0.254
	0.094	5.9	0.104 0.090 0.090 0.098 0.092 0.092
	0.047	6.8	0.045 0.046 0.049 0.051 0.042 0.048
19			$HNO_3/HClO_4$-CVAAS
	0.169	10.7	0.156 0.168 0.204 0.157 0.159 0.170
	-----	-----	Less than 0.01
	-----	-----	Less than 0.01
20			NO DATA
21A			BOMB/H_2SO_4/HNO_3-ASV
	0.352	40.7	0.229 0.373 0.481 0.181 0.549 0.300
	-----	-----	No data
	-----	-----	No data
21B			BOMB/HNO_3-CVAAS
	0.268	6.7	0.274 0.291 0.272 0.275 0.251 0.242
	0.085	14.8	0.076 0.091 0.068 0.098 0.093
	0.055	6.5	0.057 0.052 0.055 0.055 0.050 0.060
22			$HNO_3/H_2SO_4/KMNO_4/K_2S_2O_8$-CVAAS
	0.251	2.3	0.246 0.253 0.247 0.245 0.252 0.260
	0.076	12.3	0.079 0.074 0.068 0.092 0.078 0.066
	0.045	4.7	0.047 0.042 0.047 0.044 0.044 0.047
23A			$H_2SO_4/KMNO_4$-CVAAS
	0.203	16.7	0.224 0.238 0.228 0.169 0.206 0.155
	0.079	16.3	0.090 0.076 0.095 0.083 0.061 0.069
	0.048	45.5	0.031 0.043 0.051 0.030 0.090 0.045
23B			NO DATA
24			$H_2SO_4/HNO_3/KMNO_4$-CVAAS
	0.212	6.3	0.20 0.22 0.20 0.20 0.23 0.22
	0.062	15.9	0.05 0.07 0.06 0.05 0.07 0.07
	0.038	19.6	0.03 0.05 0.03 0.04 0.04 0.04

MERCURY DATA

Lab	Mean	RSD						
25			02-H_2SO_4/$KMNO_4$-CVAAS					
	0.172	14.5	0.13	0.16	0.20	0.19	0.18	0.17
	0.070	20.8	0.093	0.076	0.068	0.054	0.072	0.055
	0.060	18.8	0.068	0.055	0.079	0.057	0.054	0.048
26			NO DATA					
27			02-H_2SO_4/$KMNO_4$-CVAAS					
	0.276	4.1	0.27	0.28	0.29	0.28	0.26	
	0.092	18.8	0.11	0.11	0.07	0.08	0.10	0.08
	0.052	28.5	0.08	0.05	0.05	0.04	0.05	0.04
28			H_2SO_4/HNO_3-CVAAS					
	0.380[RT]	2.5	0.377	0.371	0.383	0.393	0.387	0.369
	0.142[RT]	1.6	0.139	0.140	0.142	0.144	0.144	
	0.116[RT]	9.8	0.122	0.116	0.099	0.120	0.130	0.106
29			H_2SO_4/HNO_3-CVAAS					
	0.218	20.3	0.190	0.190	0.189	0.188	0.283	0.267
	0.097	2.5	0.098	0.096	0.100	0.097	0.095	0.093
	0.048	28.3	0.051	0.044	0.067	0.058	0.031	0.036
30			No procedure					
	0.302	---	0.298	0.305				
	0.104	---	0.103	0.105				
	0.076	---	0.073	0.078				
31			BOMB/HNO_3-CVAAS					
	0.307	8.3	0.287	0.336	0.299			
	0.076	16.2	0.065	0.089	0.073			
	0.082[RT]	3.1	0.080	0.085	0.082			
32			BOMB/HNO_3-CVAAS					
	0.273	10.5	0.29	0.32	0.24	0.25	0.27	0.27
	0.077	17.5	0.055	0.088	0.088	0.077	0.077	
	0.057	31.5	0.033	0.089	0.055	0.055	0.055	0.055
33			HNO_3/H_2SO_4/V_2O_5-Au-CVAAS					
	0.264	5.0	0.286	0.264	0.254	0.267	0.247	0.264
	0.099	11.0	0.094	0.110	0.081	0.098	0.101	0.11
	0.070	5.9	0.063	0.071	0.068	0.073	0.073	0.074
34			HNO_3/H_2O_2-CVAAS					
	0.169	2.1	0.169	0.167	0.165	0.170	0.175	0.166
	0.077	2.4	0.076	0.074	0.075	0.079	0.077	0.078
	0.055	2.7	0.054	0.055	0.055	0.055	0.058	0.054
35			NO DATA					
36			HNO_3/H_2SO_4-CVAAS					
	0.301	9.3	0.348	0.272	0.281	0.29	0.318	0.296
	0.073	9.1	0.0703	0.0783	0.0716	0.0639	0.0718	0.0829
	0.070	23.1	0.0995	0.0678	0.0683	0.0575	0.0539	0.0757
37			HNO_3/H_2SO_4-CVAAS					
	0.344	1.8	0.340	0.346	0.354	0.336	0.341	0.346
	0.093	6.0	0.082	0.096	0.092	0.096	0.096	0.096
	0.046	8.9	0.046	0.046	0.040	0.046	0.053	0.046
38			NO DATA					

MERCURY DATA

Lab	Mean	RSD						
39			NO DATA					
40			HNO_3/H_2SO_4-CVAAS					
	0.269	3.6	0.261	0.279	0.279	0.258	0.273	0.261
	0.086	8.8	0.085	0.085	0.097	0.075	0.081	0.090
	0.054	16.1	0.066	0.063	0.053	0.049	0.043	0.051
41			NO DATA					
42			COLD STANNITE RED/Au-CVAAS					
	0.218	2.9	0.214	0.218	0.220	0.209	0.228	0.216
	0.061	3.3	0.062	0.061	0.062	0.064	0.058	0.060
	0.024[RT]	11.0	0.024	0.023	0.028	0.024	0.021	0.021
43			$HNO_3/HClO_4$-Au-CVAAS					
	0.261	5.2	0.245	0.273	0.250	0.280	0.262	0.255
	0.076	9.4	0.078	0.070	0.070	0.089	0.073	0.076
	0.113[RT]	7.4	0.113	0.102	0.124	0.110	0.107	0.121
44			NO DATA					
45			BOMB/HNO_3/HF-H_2SO_4/$KMNO_4$-CVAAS					
	0.311	3.4	0.323	0.313	0.319	0.305	0.312	0.293
	0.117[RT]	6.6	0.116	0.127	0.113	0.125	0.118	0.106
	0.076	6.8	0.071	0.084	0.074	0.076	0.070	0.078
46			No procedure					
	0.293	14.7	0.234	0.308	0.262	0.291	0.36	0.3
	0.082	8.9	0.084	0.078	0.079	0.088	0.092	0.072
	0.046	7.0	0.044	0.043	0.043	0.046	0.048	0.051
47			NO DATA					
48			BOMB/HNO_3-CVAAS					
	0.265	7.3	0.302	0.257	0.268	0.261	0.259	0.245
	0.079	5.2	0.076	0.080	0.074	0.086	0.079	0.078
	0.059	8.6	0.058	0.066	0.061	0.059	0.051	0.056
49A			$HNO_3/HClO_4$-CVAAS					
	0.307	3.5	0.308	0.318	0.313	0.315	0.293	0.295
	0.079	6.9	0.083	0.072	0.085	0.078	0.075	
	0.051	12.9	0.052	0.062	0.05	0.047	0.045	
49B			NO DATA					
49C			$HNO_3/HClO_4/H_2SO_4$-EP-IDSSMS					
	0.295	6.7	0.284	0.321	0.311	0.273	0.288	
	0.098	6.9	0.096	0.106	0.093			
	0.064	---	0.063	0.064				
50			HNO_3/H_2SO_4-CVAAS					
	0.433[RT]	4.3	0.43	0.42	0.41	0.46	0.43	0.45
	0.197[RT]	5.1	0.21	0.20	0.20	0.18	0.19	0.20
	0.178[RT]	4.5	0.17	0.17	0.19	0.18	0.19	0.20
51			NO DATA					

LEAD DATA

Lab	Mean	RSD	
1			HNO_3-GFAAS
	3.00	25.4	2.31 3.38 4.02 1.94 3.34 3.01
	----	----	Less than 0.5
	----	----	No data
2			BOMB/HNO_3/$HClO_4$-GFAAS
	3.53	8.5	3.2 4.0 3.4 3.8 3.4 3.4
	1.07[KT]	7.7	1.1 1.1 1.2 1.0 1.0 1.0
	2.37	10.6	2.1 2.3 2.4 2.7 2.6 2.1
3			HNO_3/$HClO_4$/HCl-FAAS
	6.35	11.4	7.0 5.6 6.9 5.9 7.1 5.6
	0.64[KT]	1.6	0.62 0.64 0.64 0.65 0.64 0.63
	5.80[KT]	21.5	4.7 6.9 4.3 5.1 6.6 7.2
4			HNO_3-GFAAS
	1.33[KT]	34.9	1.54 2.14 0.95 1.37 1.10 0.90
	0.08	17.1	0.076 0.065 0.093 0.075 0.099
	0.60	19.4	0.61 0.64 0.66 0.46 0.75 0.46
5			BOMB/HNO_3-GFAAS
	3.42	36.0	1.1 3.5 4.8 3.7 3.6 3.8
	0.78[KT]	5.7	0.8 0.8 0.8 0.8 0.7
	1.80	22.8	2.4 1.3 1.5 2.1 1.9 1.6
6			NO DATA
7			DRY ASH/HNO_3/H_2O_2-GFAAS
	8.44	2.1	8.48 8.23 8.49 8.25 8.45 8.72
	0.32	5.7	0.30 0.30 0.34 0.33 0.32 0.34
	3.54	7.1	3.14 3.56 3.37 3.59 3.78 3.80
8			HNO_3/H_2O_2-GFAAS
	5.54	16.1	5.0 6.1 6.8 4.6 5.2
	0.45	17.7	0.56 0.34 0.46 0.42 0.46
	1.60	13.3	1.6 1.9 1.4 1.7 1.4
9			O_2 COMBUSTION-HNO_3-GFAAS
	6.05	14.5	7.4 6.3 5.5 6.5 5.7 4.9
	0.30	30.9	0.45 0.22 0.27 0.36 0.20 0.31
	2.74	51.3	2.7 3.1 1.6 1.4 4.9
10			HNO_3/$HClO_4$-ICP
	6.45	20.2	6.92 6.51 7.95 7.52 4.95 4.83
	0.51	13.8	0.566 0.392 0.517 0.463 0.581 0.526
	1.43	38.8	1.96 1.05 1.63 1.05 0.76 2.12
11			BOMB/HNO_3-EXTN-GFAAS
	3.80	6.9	4.1 3.6 4.0 3.8 3.4 3.9
	0.14	7.7	0.133 0.127 0.151 0.144 0.140 0.156
	0.88	8.0	0.937 0.853 0.844 0.807 0.843 0.992
12			BOMB/HNO_3/$HClO_4$-GFAAS
	7.94	13.8	9.41 6.14 8.06 7.4 8.41 8.2
	0.28	26.2	0.30 0.19 0.29 0.25 0.41 0.25
	1.43	21.9	1.51 1.98 1.46 1.14 1.36 1.13
13			NO DATA
14			BOMB/HNO_3-GFAAS
	2.83	4.8	2.8 3.0 2.8 3.0 2.7 2.7
	0.45	12.1	0.35 0.49 0.43 0.44 0.50 0.46
	1.60	17.2	2.0 1.2 1.7 1.6 1.4 1.7

LEAD DATA

Lab	Mean	RSD	
15			HNO_3/H_2O_2-GFAAS
	7.26	30.0	3.5 8.6 7.7 7.6 8.9
	0.31	31.3	0.18 0.28 0.32 0.31 0.48 0.29
	1.45	28.4	0.82 1.4 2.1 1.4 1.4 1.6
16			NO DATA
17			$HNO_3/H_2$02-FAAS
	16.8[KT]	12.7	15 16 16 17 16 21
	8.70[KT]	9.3	9.4 9.4 8.0 8.0 7.9 9.5
	7.25[KT]	17.9	7.3 5.8 8.7 8.7 7.2 5.8
18A			DRY ASH/HNO_3-ICP
	5.86	10.1	6.6 5.5 5.3 5.5 6.4
	----	----	Less than 1
	3.28	9.5	3.1 3.0 3.8 3.3 3.2
18B			DRY ASH/HNO_3-EXTN-FAAS
	5.03	9.9	5.36 5.08 4.60 4.47 5.64
	0.18	18.5	0.15 0.15 0.19 0.19 0.15 0.23
	1.82	17.6	1.47 1.52 1.87 2.2 2.05
19			DRY ASH/HCl-FAAS
	10.6[KT]	7.9	10.6 10.2 12.0 9.5 10.5 11.0
	3.48[KT]	5.9	3.67 3.67 3.14 3.56 3.35 3.46
	17.4[KT]	6.4	18.3 17.5 18.8 17.4 16.0 16.2
20			HNO_3-GFAAS
	5.58	32.4	4.3 4.0 4.1 7.5 8.1 5.5
	2.26[KT]	51.1	3.5 1.2 1.3 3.5 1.8
	1.90	16.0	2.1 1.5 2.3 1.9 1.6 2
21			BOMB/HNO_3/H_2SO_4(A)-$HNO_3/HClO_4$(B/C)-ASV
	40.0[KT]	58.3	14 56 63 27
	14.3[KT]	23.2	14 18 15 10
	8.67[KT]	37.1	5 10 11
22			HNO_3/HCl-GFAAS
	0.64[KT]	8.6	0.7 0.6 0.6 0.7 0.6
	----	----	No data
	0.95	74.7	0.1 0.9 1.5 0.2 1.9 1.1
23A			HNO_3-FAAS-0.25 g SAMPLES
	5.48	22.5	5.3 7.8 4.8 5.8 4.8 4.4
	----	----	Less than 2
	----	----	Less than 2
23B			HNO_3-FAAS-1 g SAMPLES
	----	----	No data
	----	----	Less than 0.5
	----	----	Less than 0.5
24			BOMB/HNO_3/H_2SO_4-GFAAS
	4.65	8.7	4.8 4.2 5.1 4.3 4.4 5.1
	0.73[KT]	20.5	0.7 0.5 0.7 0.9 0.9 0.7
	1.50	11.9	1.5 1.3 1.8 1.4 1.6 1.4
25			$HNO_3/HClO_4$-FAAS
	8.77	12.4	8.1 9.1 7.3 9.8 8.2 10.1
	0.36	54.1	0.3 0.1 0.5 0.3 0.6
	3.57	26.3	2.8 2.3 3.6 3.9 5.0 3.8

LEAD DATA

Lab	Mean	RSD	
26			DRY ASH/HNO_3-DCP(A)-GFAAS(B/C)
	5.17	22.4	4.37 4.38 4.51 5.13 5.19 7.41
	0.48	55.2	0.14 0.43 0.41 0.91 0.35 0.64
	2.41	38.0	3.16 1.70 1.70 3.37 1.35 3.17
27A			HNO_3-FAAS
	6.95	22.0	5.8 5.4 7.7 8.9 8.3 5.6
	----	----	Less than 0.48
	2.45	28.4	1.6 2.3 3.7 2.2 2.6 2.3
27B			HNO_3-GFAAS
	8.98	17.0	7.8 7.8 9.3 11
	----	----	No data
	----	----	No data
28			HNO_3-GFAAS
	8.78	37.7	4.94 4.97 11.8 11.2 7.88 11.9
	2.15[KT]	31.4	1.58 1.22 2.21 2.11 2.95 2.81
	4.03[KT]	33.9	4.21 2.35 3.78 3.13 6.38 4.32
29			HNO_3-EXTN-FAAS
	3.43	42.9	3.57 4.54 5.37 3.12 1.13 2.82
	----	----	No data
	----	----	No data
30			DRY ASH/HCl/HNO_3-FAAS
	3.59	9.4	3.86 3.34 3.09 3.84 3.92 3.48
	0.21	10.8	0.227 0.237 0.188 0.205 0.178 0.205
	1.08	11.4	0.985 0.963 1.02 1.25 1.05 1.22
31			DRY ASH/HNO_3/HCl-ASV
	5.60	21.5	6.38 6.20 4.21
	0.25	6.9	0.26 0.23 0.26
	3.47	17.0	2.80 3.68 3.92
32			DRY ASH/HNO_3-ASV
	5.48	19.6	5.3 4.3 7.5 5.5 5.0 5.3
	----	----	No data
	2.03	33.7	2.5 1.7 3.1 1.6 1.2 2.1
33A			HNO_3/$HClO_4$-FAAS
	5.07	12.0	4.5 5.1 5.0 6.2 4.6 5.0
	0.24	15.4	0.25 0.26 0.27 0.24 0.22 0.17
	----	----	No data
33B			HNO_3/$HClO_4$-GFAAS
	4.25	14.3	3.7 4.3 4.1 5.4 3.8 4.2
	----	----	No data
	----	----	No data
34			NO DATA
35			NO DATA
36			HNO_3/H_2SO_4/H_2O_2-EXTN-GFAAS
	----	----	No data
	----	----	Less than 0.1
	----	----	No data
37			No procedure
	5.82	5.5	5.95 5.47 5.40 6.23 5.97 5.88
	0.16	9.6	0.181 0.168 0.168 0.157 0.158 0.135
	1.82	21.7	1.77 1.41 2.15 2.07 1.29 2.21

LEAD DATA

Lab	Mean	RSD	
38			HNO_3/H_2O_2-FAAS
	----	----	Less than 25
	----	----	Less than 25
	----	----	Less than 25
39			NO DATA
40			NO DATA
41			NO DATA
42			DRY ASH/HNO_3/HCl-ASV
	4.03	29.6	5.0 4.4 2.7
	0.32	18.9	0.39 0.31 0.27
	2.30	12.8	2.2 2.0 2.3 2.7
43			DRY ASH/HNO_3-FAAS
	6.67	7.2	6.07 6.66 7.52 6.79 6.57 6.42
	2.53[KT]	12.0	2.54 3.11 2.33 2.32 2.52 2.33
	5.74[KT]	5.5	6.34 5.52 5.54 5.75 5.53 5.74
44			DRY ASH/HNO_3-FAAS(A)/EXTN-FAAS(B/C)
	6.45	5.9	6.26 6.28 7.02 6.23
	1.32[KT]	40.3	1.92 0.92 1.11
	1.64	23.3	1.2 1.91 1.8
45			BOMB/HNO_3/HCl-FAAS
	9.60[KT]	3.6	9.9 9.7 9.7 9.1
	----	----	Less than 4.5
	12.1[KT]	17.1	12.0 10.8 10.6 12.0 16.1 10.9
46			NO DATA
47			HNO_3/H_2O_2-GFAAS
	3.35	4.8	3.36 3.05 3.40 3.32 3.41 3.53
	0.16	16.7	0.17 0.19 0.13 0.13 0.19 0.17
	0.92	19.8	0.78 1.07 0.70 1.13 0.79 1.04
48			NO DATA
49A			$HNO_3/HClO_4$-ICP
	4.85	13.3	4.7 5.3 5.4 4.0
	----	----	Less than 0.7
	2.38	21.3	2.1 2.8 2.8 1.8
49B			HNO_3/H_2O_2-GFAAS
	6.40	16.7	5.8 6.8 5.3 7.7
	0.28	30.3	0.21 0.18 0.31 0.36 0.37
	2.30	26.3	1.5 2.7 1.9 2.4 3.0
49C			HNO_3-EP-IDSSMS
	5.53	8.7	5.25 5.99 6.23 5.30 4.97 5.43
	0.33	---	0.322 0.340
	2.12	32.3	2.53 2.54 2.66 2.51 1.21 1.27
50			HNO_3-GFAAS
	2.50	8.7	2.5 2.5 3.1 2.4 2.0
	----	----	Less than 0.1
	6.60[KT]	38.6	6.8 3.5 6.3 9.7
51			NO DATA

CHROMIUM DATA

Lab	Mean	RSD						
13			INAA					
	3.5	---	3.5					
	1.0	---	1.0					
	1.8	---	1.8					
15			HNO_3/H_2O_2-GFAAS					
	1.9	59.7	0.59	1.6	2.4	0.83	2.1	3.6
	0.27	45.7	0.09	0.19	0.22	0.39	0.32	0.40
	1.1	57.1	0.53	2.00	0.50	1.80	0.88	1.00
18			DRY ASH/HNO_3-ICP					
	4.1	6.0	3.89	4.14	4.05	3.97	4.53	3.87
	1.08	11.9	0.99	1.11	0.90	1.27	1.07	1.15
	1.6	4.2	1.70	1.61	1.69	1.53	1.60	1.56
27			HNO_3-FAAS					
	2.0	4.0	2.0	2.1	1.9	2.1	2.0	2.1
	0.31	9.2	0.30	0.32	0.28	0.29	0.32	0.36
	1.0	10.7	1.04	1.20	1.06	1.05	1.04	0.85
49			$HNO_3/HClO_4$-ICP					
	1.3	33.0	1.1	1.1	2.0	1.1	1.0	
	0.73	30.7	0.7	1.1	0.6	0.6	0.5	0.9
	2.2	8.3	2.4	2.0	2.1	2.3		

MANGANESE DATA

Lab	Mean	RSD						
10			$HNO_3/HClO_4$-ICP					
	27.6	2.2	27.5	26.5	27.9	28.1	28.1	27.5
	1.48	7.2	1.66	1.54	1.39	1.4	1.4	1.5
	19.6	5.4	21.7	19.3	19.1	19.0	19.0	19.2
11A			BOMB/HNO_3-GFAAS					
	24.6	5.8	23	24.3	23.8	24.4	25	27.2
	1.37	10.0	1.3	1.4	1.4	1.6	1.2	1.3
	19.8	12.6	21.6	22.2	22.4	16.8	17.7	18.3
11B			BOMB/HNO_3-ICP					
	21.8	7.5	21.5	19.8	24.6	22.2	22.2	20.7
	----	----	No data					
	14.2	7.3	15.0	14.1	15.8	13.2	13.2	13.9
14			BOMB/HNO_3-FAAS					
	16.8	4.5	17	16	18	16	17	17
	2.60	16.5	2.6	2.1	3.1	2.1	3.0	2.7
	13.2	5.7	14	12	14	13	13	13
15			HNO_3/H_2O_2-GFAAS					
	16.2	49.3	11	19	10	12	29	
	0.74	22.6	0.95	0.53	0.62	0.83	0.77	
	6.60	52.8	5.4	5.9	4.2	2.6	9.3	12
18			DRY ASH/HNO_3-ICP					
	19.9	0.7	19.8	19.9	20.1	19.9	19.8	19.7
	1.12	2.8	1.14	1.11	1.09	1.08	1.16	1.14
	12.8	0.9	12.9	12.9	12.7	12.8	12.7	13.0

MANGANESE DATA

Lab	Mean	RSD	
23A			HNO_3-FAAS-0.25 g samples
	22.0	3.1	21.4 22.1 21.5 21.5 23.2 22.1
	1.25	16.6	1.5 1.0 1.0 1.3 1.4 1.3
	15.4	2.8	14.8 14.9 15.8 15.7 15.5 15.7
23B			HNO_3-FAAS-1 g samples
	----	----	No data
	0.75	14.0	0.7 0.7 0.6 0.8 0.8 0.9
	12.2	2.2	12.4 12.6 12.0 12.1 11.9 12.0
26			DRY ASH/HNO_3-DCP
	21.2	2.9	22.2 21.3 21.3 20.3 21.3 21.0
	1.50	1.9	1.49 1.52 1.51 1.48 1.54 1.46
	18.8	3.4	19.1 18.1 18.0 19.5 18.7 19.4
38			HNO_3/H_2O_2-FAAS
	14.7	11.0	15.7 14.5 12.2 14.8 16.5
	7.80	0.3	7.81 7.77 7.79 7.78 7.79 7.84
	8.60	4.6	8.33 8.77 8.36 8.34 9.23
49			$HNO_3/HClO_4$-ICP
	18.0	3.2	18.4 17.6 17.8 18.7 17.3
	0.98	20.9	0.9 1.2 0.8 0.8 1.2
	10.7	2.5	10.3 10.8 10.6 10.9
51			No procedure
	22.3	22.1	19 20 28
	----	----	No data
	22.8	10.1	20 25 23 21 22 26

IRON DATA

Lab	Mean	RSD	
10			$HNO_3/HClO_4$-ICP
	222	3.3	218 210 223 232 225 222
	29.5	13.5	25.6 25.8 30.4 30.6 35.2
	173	2.9	170 171 176 176 166 180
11A			BOMB/HNO_3-FAAS
	200	6.4	212 180 210 209 191 197
	13.9	12.0	14.7 13.8 14.7 16.1 12.7 11.4
	142	5.3	133 145 145 139 136 154
11B			BOMB/HNO_3-ICP
	157	5.0	158 148 156 158 170 150
	15.0	20.5	11.3 17.6 19.7 13.9 13.8 13.6
	125	8.2	132 127 136 118 111
14			BOMB/HNO_3-FAAS
	140	3.0	140 148 137 139 136 139
	26.7	16.0	24 32 30 29 24 21
	154	8.3	165 145 172 141 158 144
15			HNO_3/H_2O_2-GFAAS
	132	24.2	92 170 120 120 160
	23.8	35.3	17 24 25 37 16
	123	10.3	120 110 120 140

IRON DATA

Lab	Mean	RSD	
16			BOMB/HNO_3-FAAS
	177	1.9	175 173 178 176 180 182
	----	----	No data
	160	9.3	154 149 160 152 186
18			DRY ASH/HNO_3-ICP
	162	2.7	168 156 165 161 159 160
	19.7	7.1	18.8 19.4 18.5 18.7 21.3 21.7
	124	1.6	125 123 121 124 123 127
23A			HNO_3-FAAS-0.25 g samples
	166	6.4	152 156 170 173 166 180
	19.5	14.8	18.2 20.9 19.6 23.8 19.1 15.1
	141	9.6	134 162 124 144 134 150
23B			NO DATA
26			DRY ASH/HNO_3-DCP
	159	6.1	177 158 160 150 159 151
	16.5	25.8	22.4 13.5 21.4 14.5 15.0 12.4
	142	3.7	143 143 132 148 143 141
35			$HNO_3/HClO_4$-XRF
	136	18.8	153 134 118 173 139 100
	----	----	No data
	----	----	No data
44			DRY ASH/HNO_3-FAAS
	212	6.8	200 209 206 233
	52.2	12.7	46.0 47.5 60.1 55.1
	168	2.0	163 169 168 171
49			$HNO_3/HClO_4$-ICP
	132	4.5	134 135 139 131 123
	16.4	16.9	16.2 19.9 16.2 12.1 15.0 18.7
	104	4.9	99 102 105 111
51			No procedure
	180	5.6	190 180 170
	----	----	No data
	81.0	10.9	74 78 96 78 73 87

COBALT DATA

Lab	Mean	RSD	
11			BOMB/HNO_3-EXTN-GFAAS
	0.60	5.2	0.58 0.60 0.56 0.54 0.53 0.53
	0.17	10.2	0.17 0.14 0.17 0.19 0.16 0.18
	0.08	9.7	0.069 0.069 0.080 0.088 0.074 0.080
13			INAA
	0.95	---	0.95
	0.26	---	0.26
	0.12	---	0.12
15			HNO_3/H_2O_2-GFAAS
	0.50	33.7	0.45 0.65 0.73 0.55 0.22 0.59
	0.20	51.1	0.32 0.16 0.09 0.20 0.11 0.33
	0.07	19.1	0.075 0.083 0.088 0.064 0.060 0.054

COBALT DATA

Lab	Mean	RSD	
21			BOMB/HNO_3/H_2SO_4-ASV
	1.30	42.9	1.5 0.7 1.6 1.9 0.7
	----	----	No data
	----	----	No data
47			HNO_3/H_2O_2-GFAAS
	0.70	4.6	0.66 0.71 0.75 0.70 0.73 0.68
	0.14	17.7	0.11 0.15 0.17 0.15 0.13 0.11
	0.07	18.8	0.05 0.08 0.06 0.08 0.06 0.06
49			HNO_3/$HClO_4$-ICP
	0.30	16.1	0.3 0.3 0.3 0.4 0.4
	0.34	57.3	0.5 0.2 0.2 0.2 0.6
	0.10	0	0.1 0.1 0.1
51			No procedure
	0.54	6.5	0.54 0.58 0.51
	----	----	No data
	0.04	18.8	0.05 0.04 0.05 0.03 0.05 0.04

NICKEL DATA

Lab	Mean	RSD	
3			HNO_3/$HClO_4$/HCl-FAAS
	3.48	7.1	3.6 3.2 3.9 3.4 3.3 3.5
	0.47	9.2	0.49 0.51 0.51 0.43 0.43 0.42
	1.23	7.2	1.27 1.25 1.21 1.08 1.24 1.35
14			BOMB/HNO_3-FAAS
	1.17	10.4	1.2 1.3 1.3 1.1 1.1 1.0
	0.10	0	0.1 0.1 0.1 0.1 0.1 0.1
	1.42	10.4	1.6 1.2 1.5 1.3 1.5 1.4
15			HNO_3/H_2O_2-GFAAS
	3.10	36.3	1.3 2.2 3.5 4.0 3.4 4.2
	0.35	66.7	0.12 0.35 0.18 0.76 0.24 0.44
	0.68	48.9	0.43 0.65 0.21 1.10 0.70 0.98
18			DRY ASH/HNO_3-ICP
	3.26	8.5	3.03 3.76 3.21 3.04 3.37 3.13
	0.44	6.8	0.42 0.42 0.44 0.45 0.43 0.50
	0.68	5.0	0.72 0.64 0.64 0.68 0.71 0.69
21			BOMB/HNO_3/H_2SO_4(A)-HNO_3/$HClO_4$(B/C)-ASV
	15.2	43.5	19 25 12 10 10
	7.8	---	7.8
	8.1	---	8.1
23A			HNO_3-FAAS-0.25 g samples
	3.05	48.0	2.5 2.8 2.4 2.5 6.0 2.1
	----	----	Less than 0.8
	----	----	Less than 0.8
23B			HNO_3-FAAS-1 g samples
	----	----	No data
	0.38	57.1	0.2 0.7 0.3 0.2 0.5
	0.30	21.1	0.3 0.4 0.3 0.2 0.3 0.3

NICKEL DATA

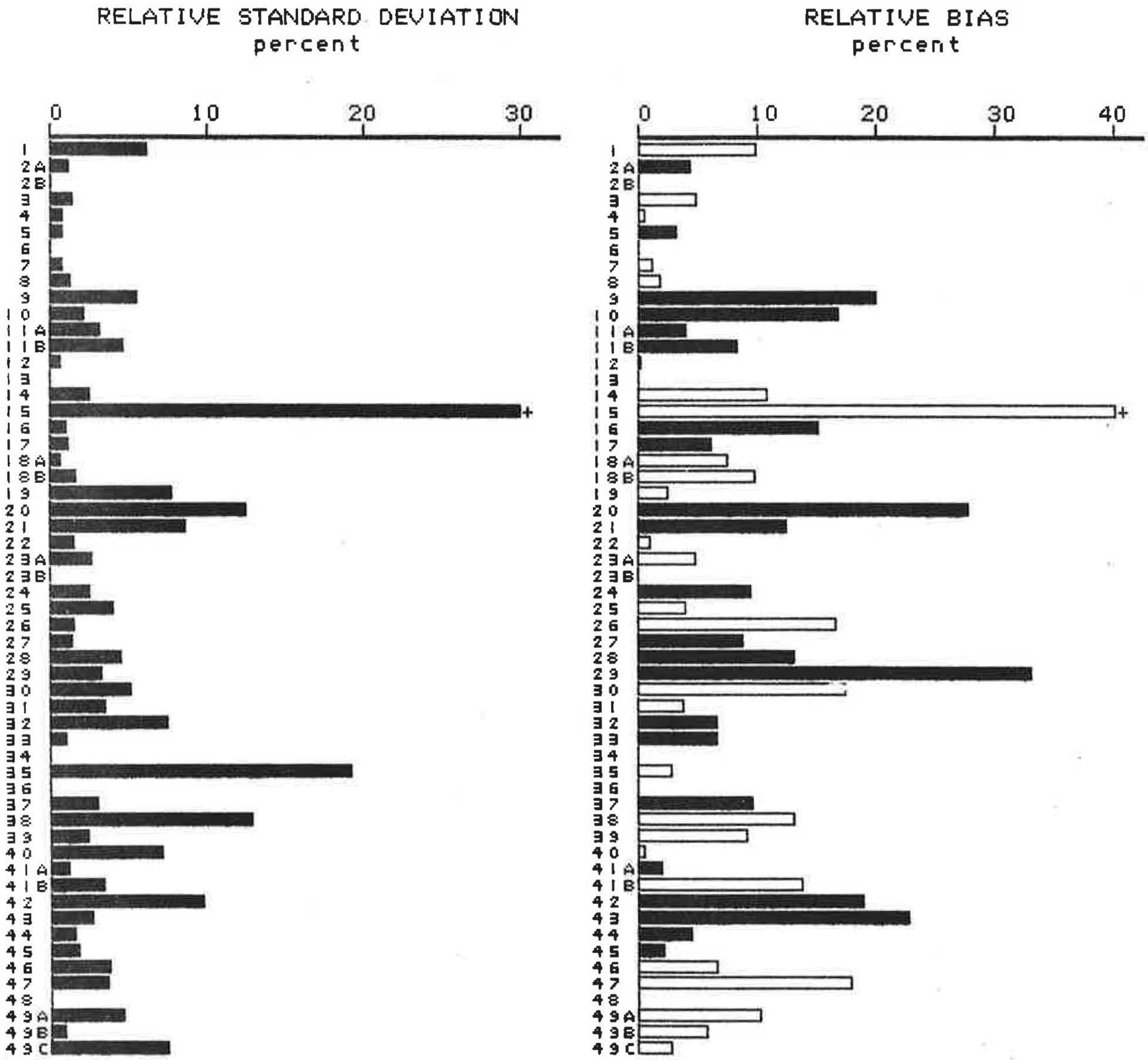
Lab	Mean	RSD	
25			$HNO_3/HClO_4$-FAAS
	1.90	16.3	1.8 1.9 1.8 1.6 1.8 2.5
	0.36	31.7	0.3 0.2 0.4 0.4 0.5
	0.50	16.7	0.60 0.45 0.40 0.60 0.50 0.45
27			HNO_3-FAAS
	2.64	2.2	2.74 2.59 2.58 2.61 2.63 2.66
	----	----	Less than 0.29
	0.61	5.7	0.60 0.55 0.65 0.59 0.63 0.61
49			$HNO_3/HClO_4$-ICP
	2.54	10.6	2.5 2.3 3.0 2.5 2.4
	0.57	26.6	0.3 0.7 0.5 0.6 0.6 0.7
	0.68	7.4	0.7 0.7 0.6 0.7
51			No procedure
	3.47	4.4	3.3 3.5 3.6
	----	----	No data
	0.56	15.2	0.58 0.59 0.41 0.60 0.62

SELENIUM DATA

Lab	Mean	RSD	
9			O_2 COMBUSTION-HNO_3-HG-AAS
	6.2	5.7	6.4 6.0 6.3 5.5 6.4 6.3
	0.70	11.7	0.75 0.84 0.67 0.69 0.65 0.61
	2.6	6.6	2.8 2.6 2.6 2.7 2.7 2.3
12			BOMB/$HNO_3/HClO_4$-NI-GFAAS
	6.9	4.5	6.45 7.28 6.66 6.92 7.09 7.12
	0.77	7.9	0.86 0.83 0.70 0.74 0.76 0.74
	2.1	7.5	1.90 1.97 1.94 2.23 2.23 2.19
13			INAA
	7.7	---	7.7
	1.4	---	1.4
	3.0	---	3.0
40			HNO_3/H_2SO_4-HG-AAS
	8.3	7.8	8.27 8.00 7.24 9.22 8.48 8.30
	0.14	0	0.14 0.14 0.14 0.14 0.14 0.14
	2.8	9.7	2.53 2.87 2.45 2.82 2.78 3.21
48			BOMB/HNO_3-FLUOR
	6.1	3.5	6.32 6.02 6.15 6.15 6.38 5.78
	0.86	5.6	0.86 0.93 0.82 0.84
	2.3	5.8	2.35 2.35 2.16 2.37 2.40 2.08

COPPER - SAMPLE A

LOBSTER HEPATOPANCREAS - 331 mg/kg



POSITIVE BIAS

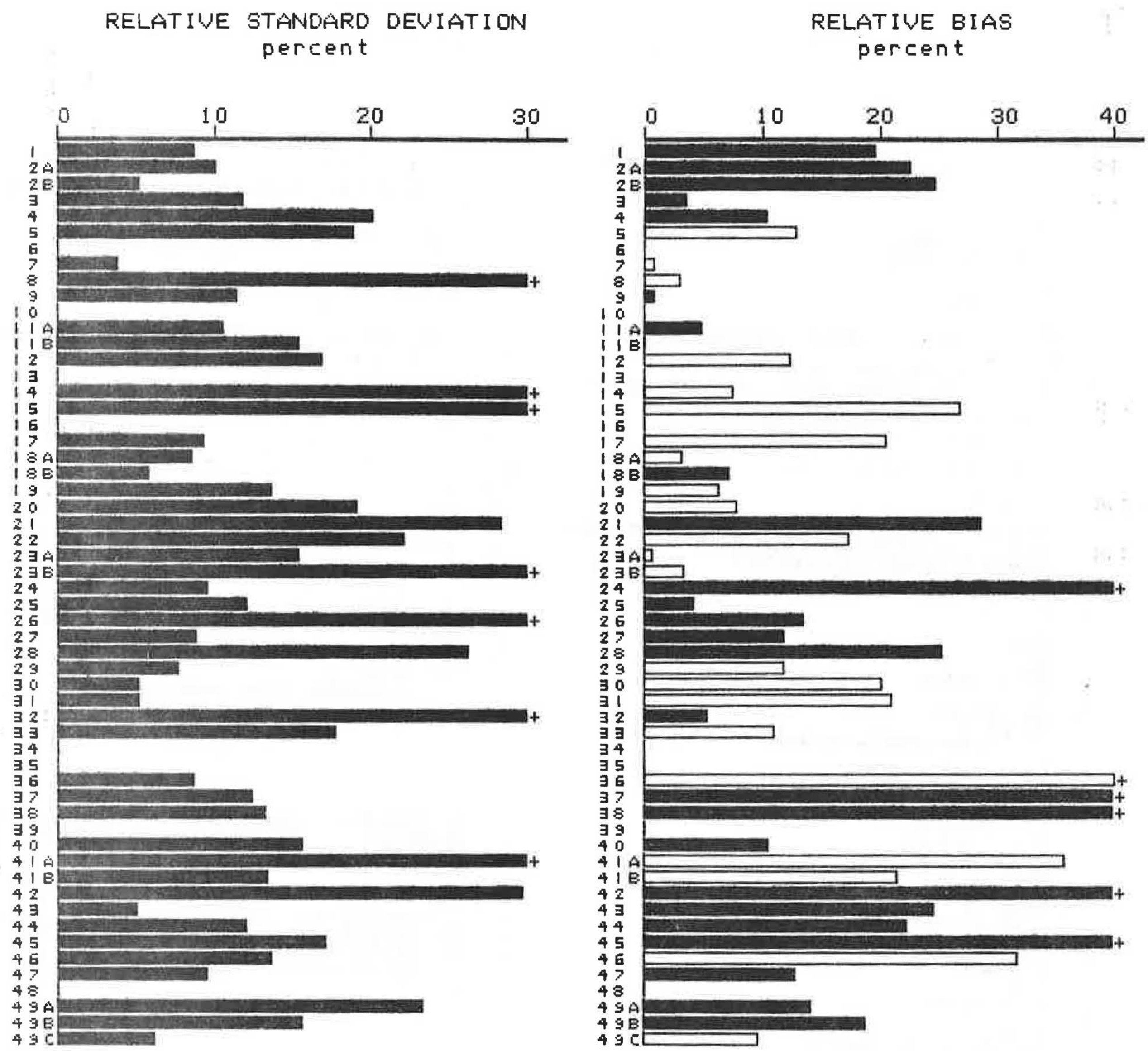
NEGATIVE BIAS

\+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

COPPER — SAMPLE B

SCALLOPS ADDUCTOR MUSCLE - 3.7 mg/kg



POSITIVE BIAS

NEGATIVE BIAS

\+ - BEYOND RANGE OF GRAPH

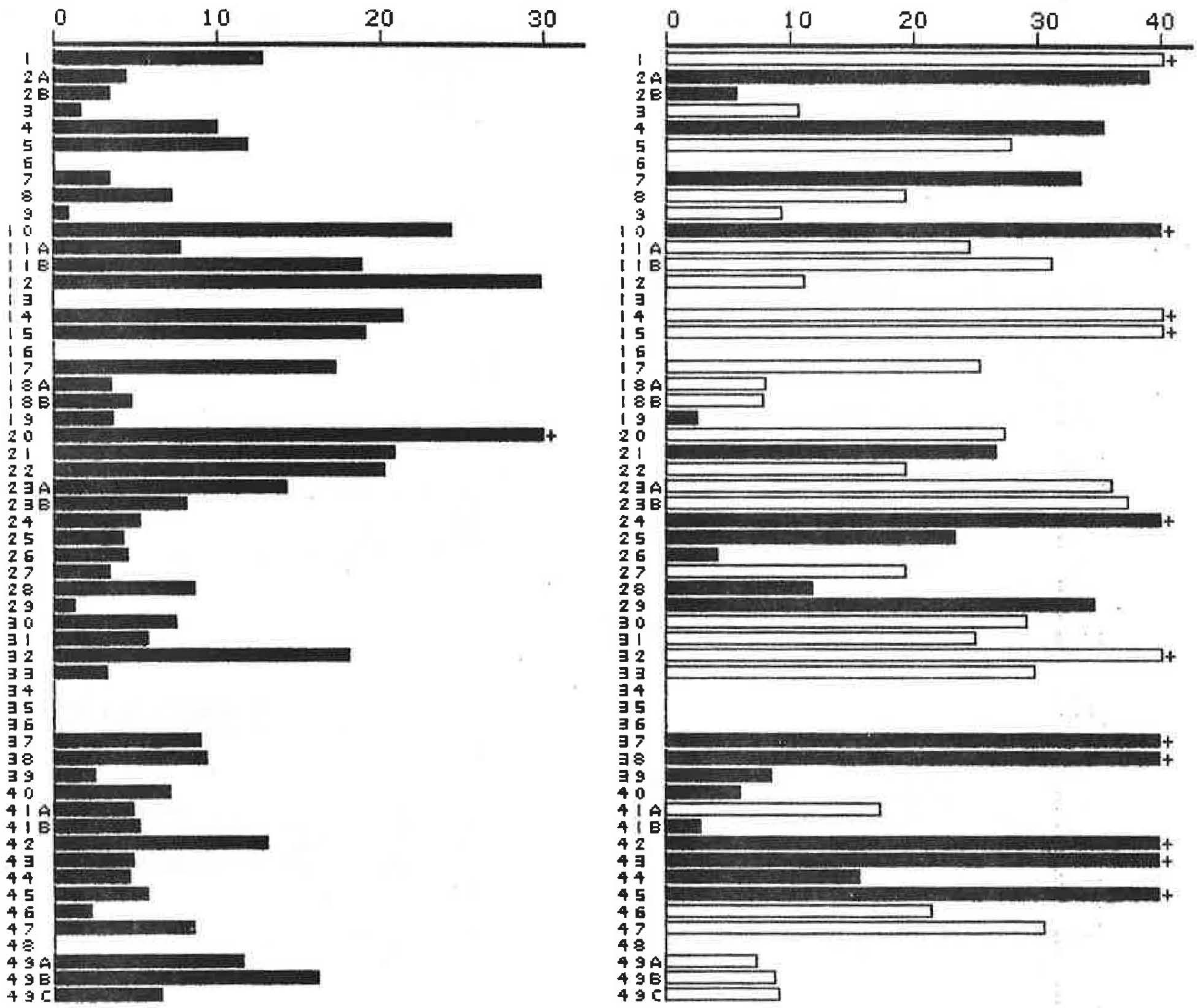
THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

COPPER - SAMPLE C

PLAICE MUSCLE - 3.1 mg/kg

RELATIVE STANDARD DEVIATION percent

RELATIVE BIAS percent



POSITIVE BIAS

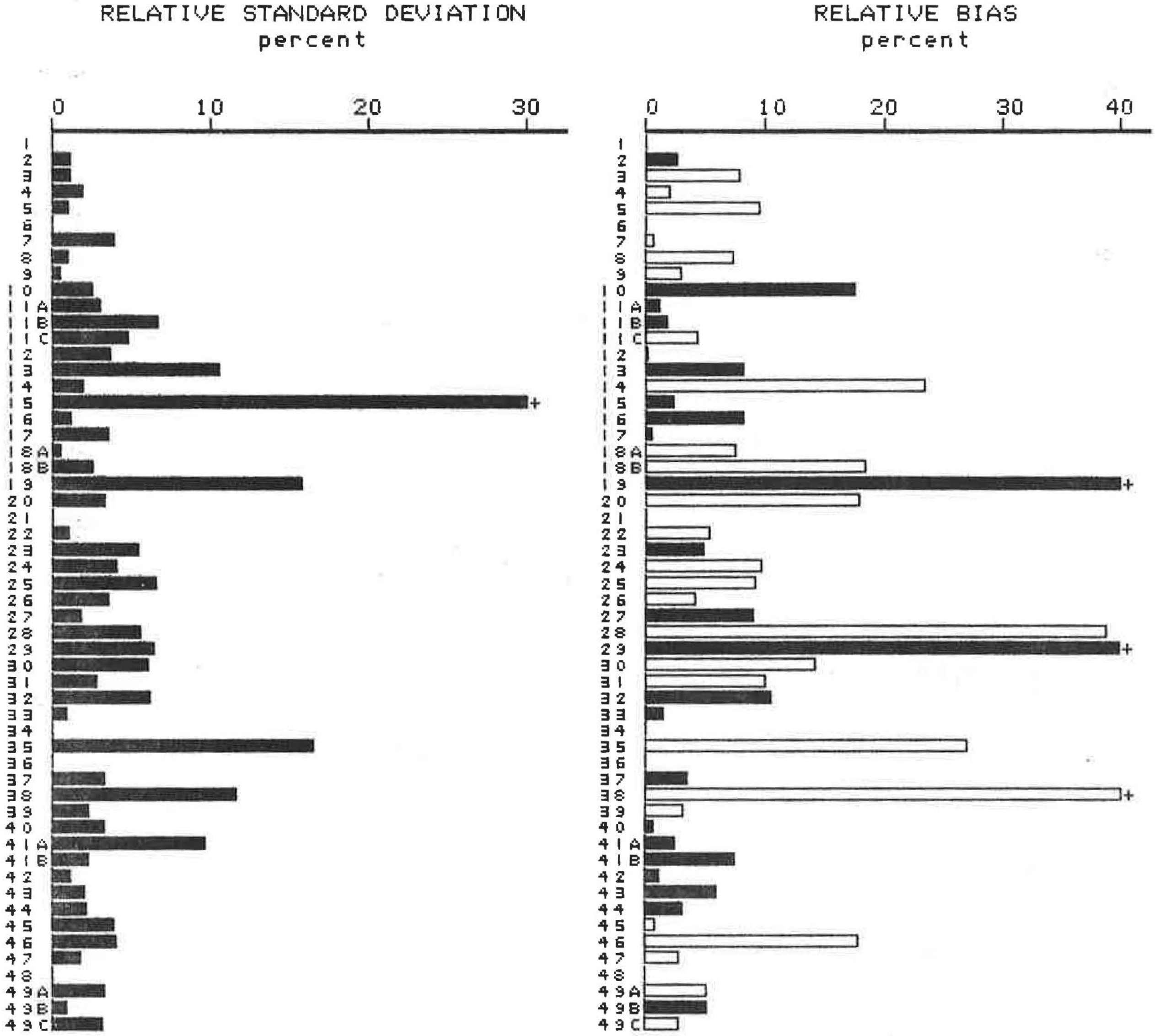
NEGATIVE BIAS

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

ZINC - SAMPLE A

LOBSTER HEPATOPANCREAS - 179 mg/kg



POSITIVE BIAS

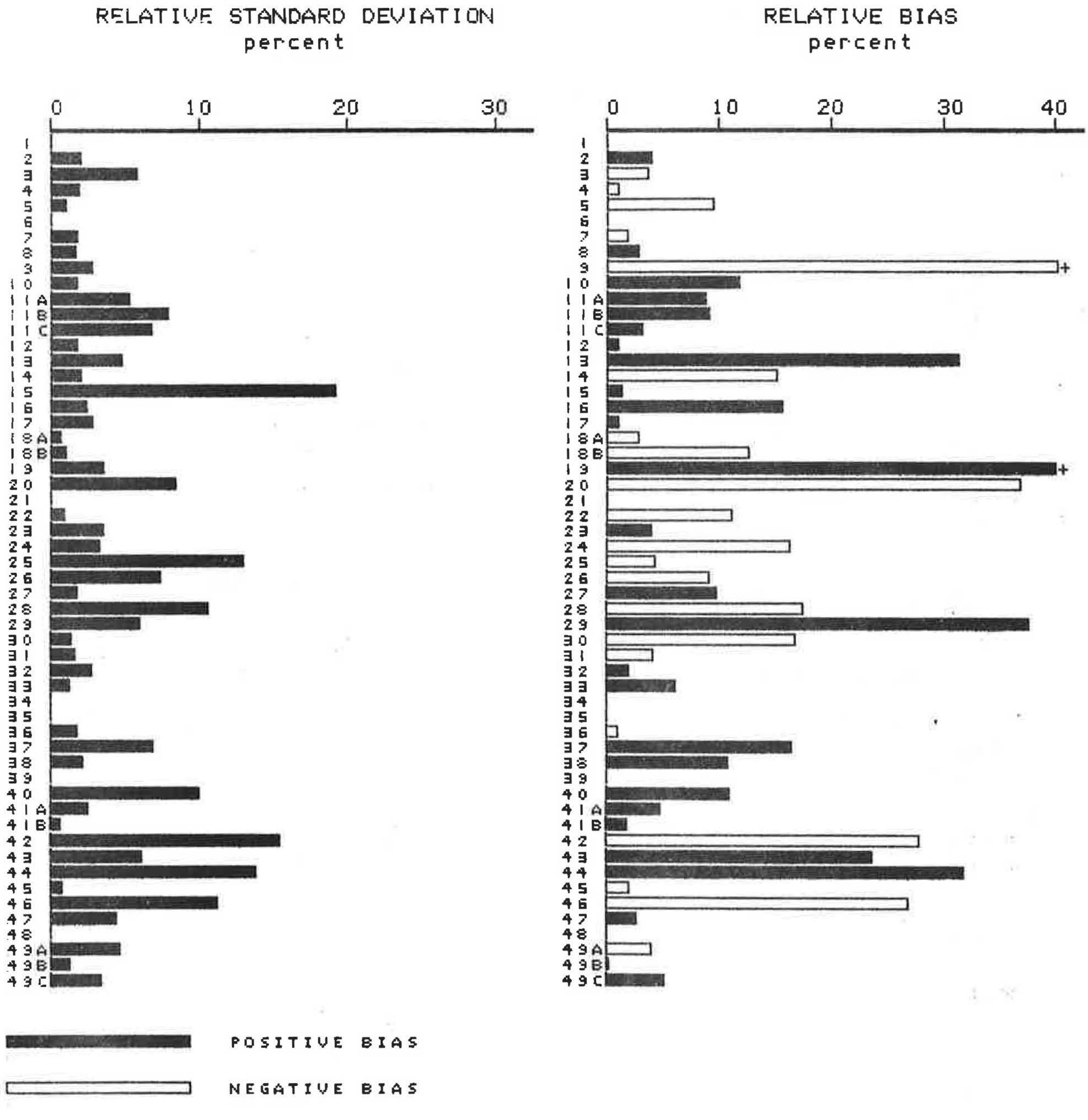
NEGATIVE BIAS

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

ZINC - SAMPLE B

SCALLOPS ADDUCTOR MUSCLE - 58 mg/kg

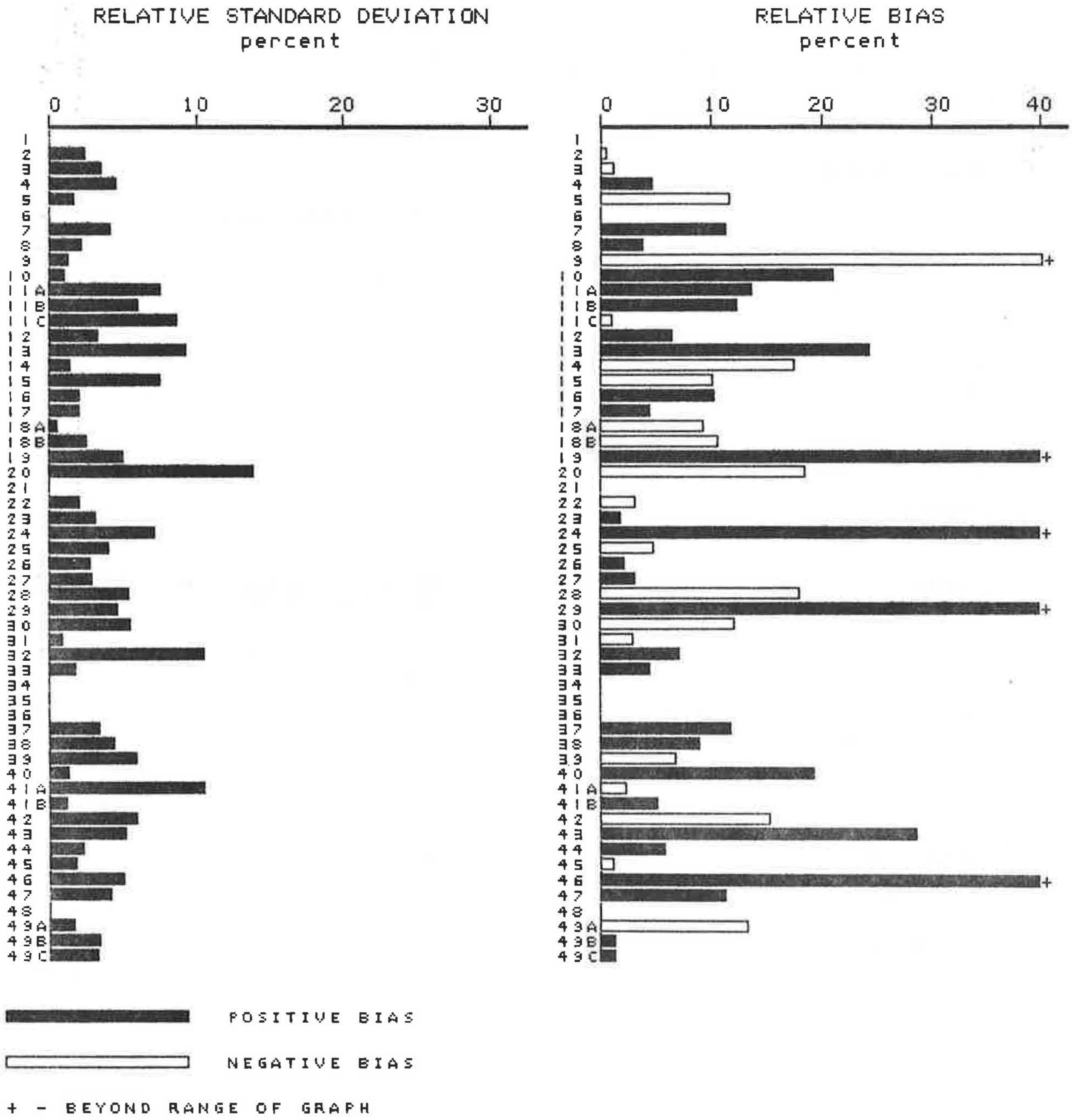


\+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

ZINC — SAMPLE C

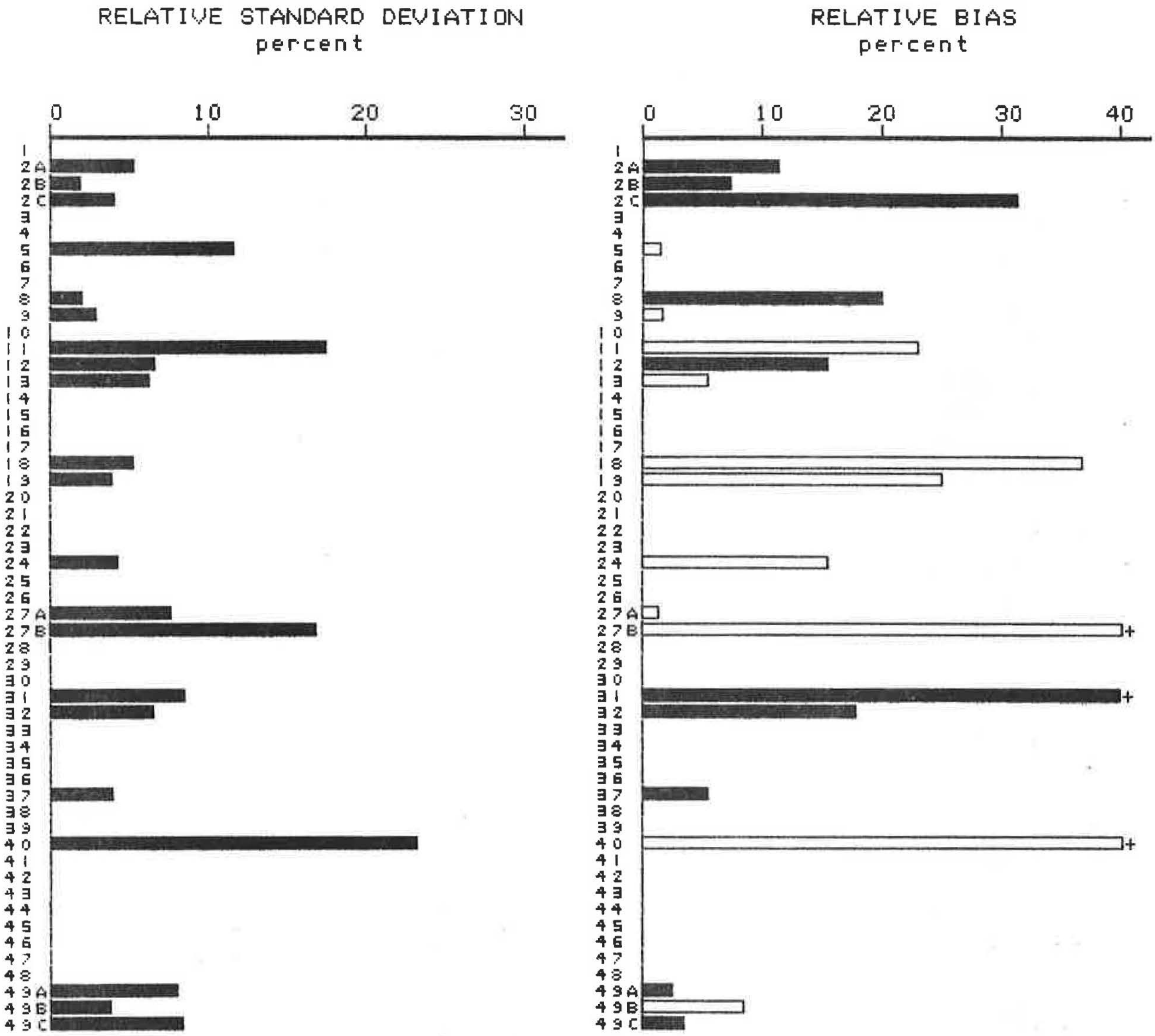
PLAICE MUSCLE - 93 mg/kg



THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

ARSENIC - SAMPLE A

LOBSTER HEPATOPANCREAS - 25 mg/Kg



POSITIVE BIAS

NEGATIVE BIAS

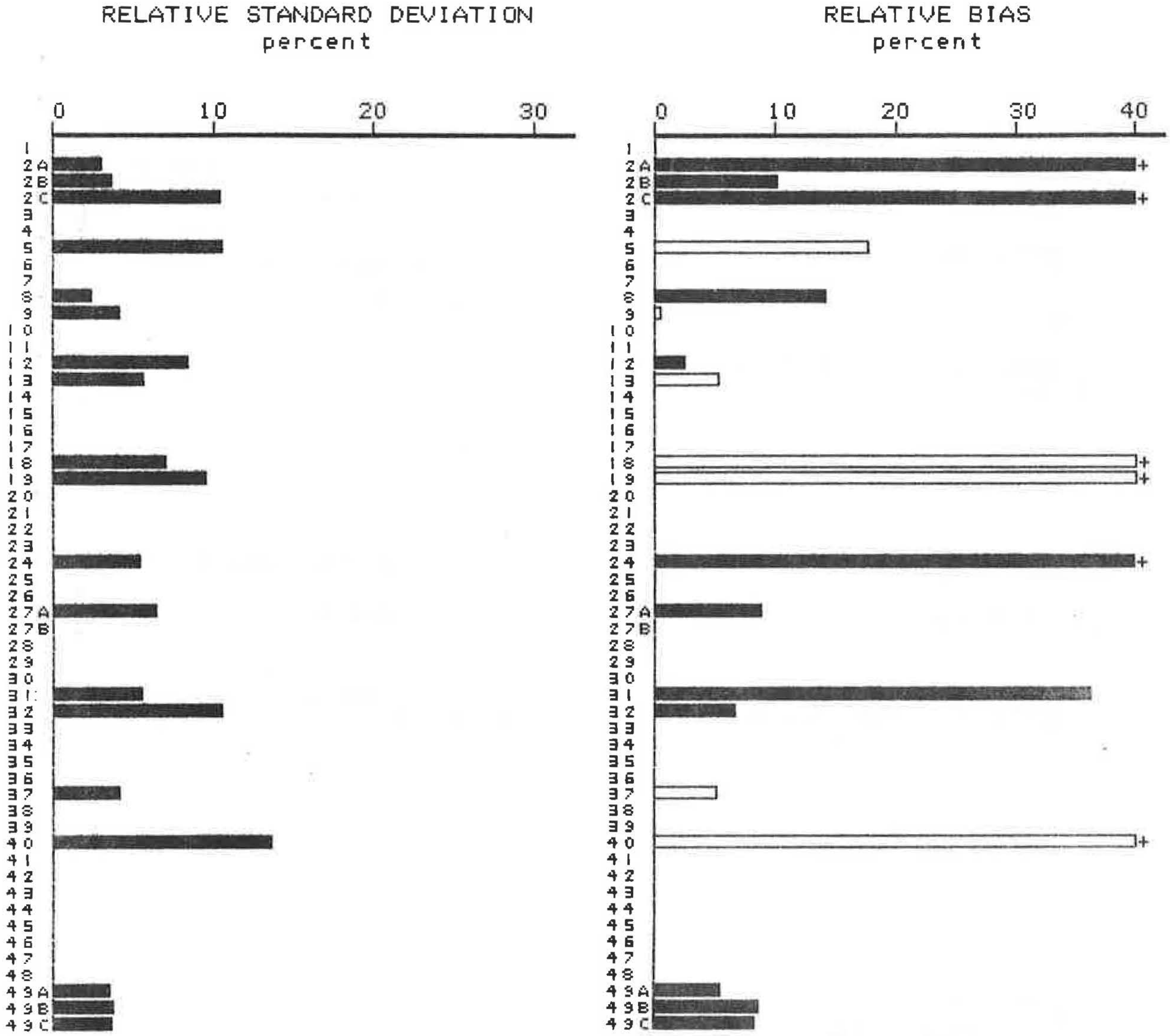
- - NO BIAS (BASED ON ONLY ONE RESULT)

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

ARSENIC - SAMPLE B

SCALLOPS ADDUCTOR MUSCLE - 7.1 mg/kg



POSITIVE BIAS

NEGATIVE BIAS

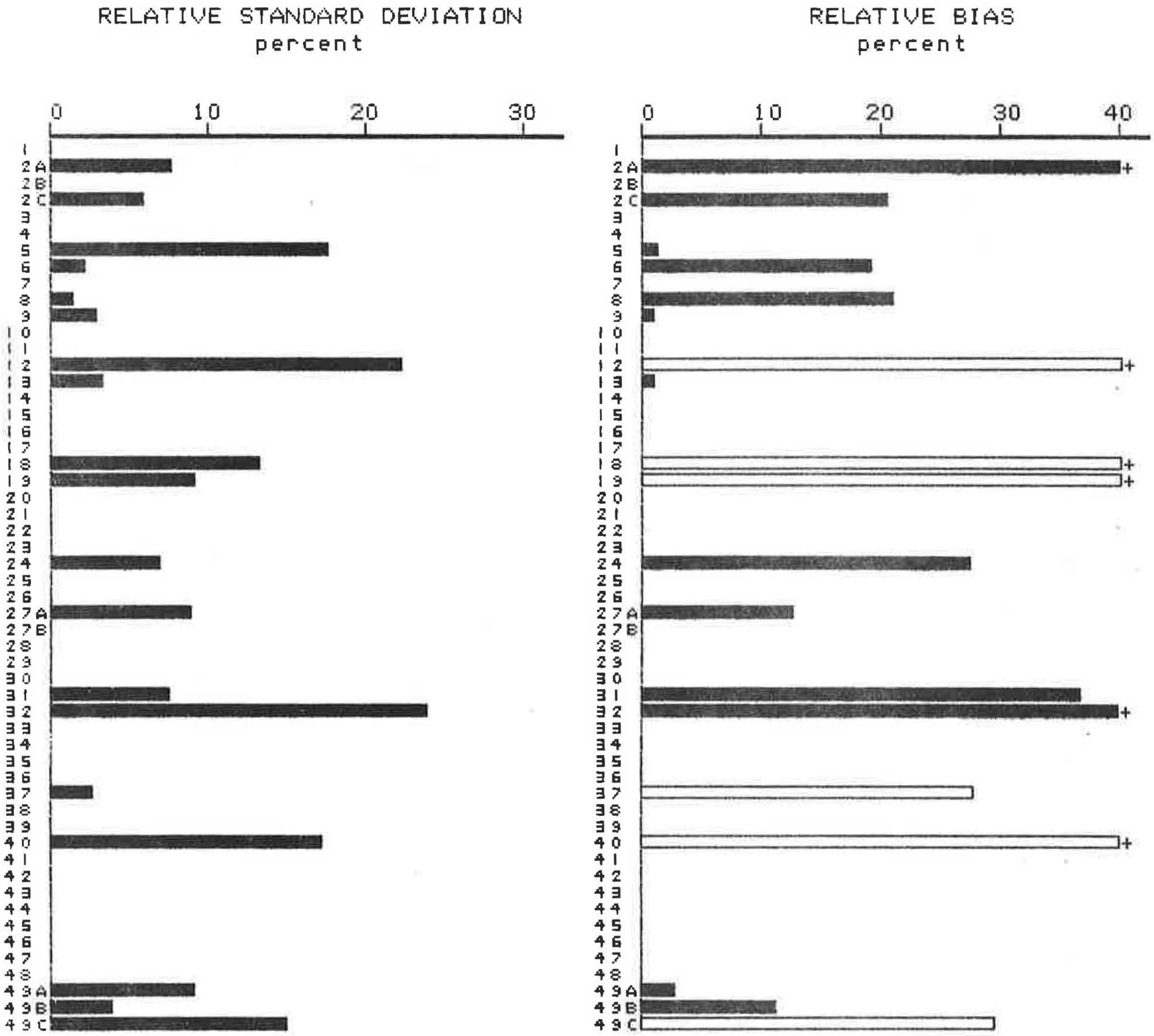
- - NO BIAS (BASED ON ONLY ONE RESULT)

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

ARSENIC - SAMPLE C

PLAICE MUSCLE - 4.6 mg/kg



POSITIVE BIAS

NEGATIVE BIAS

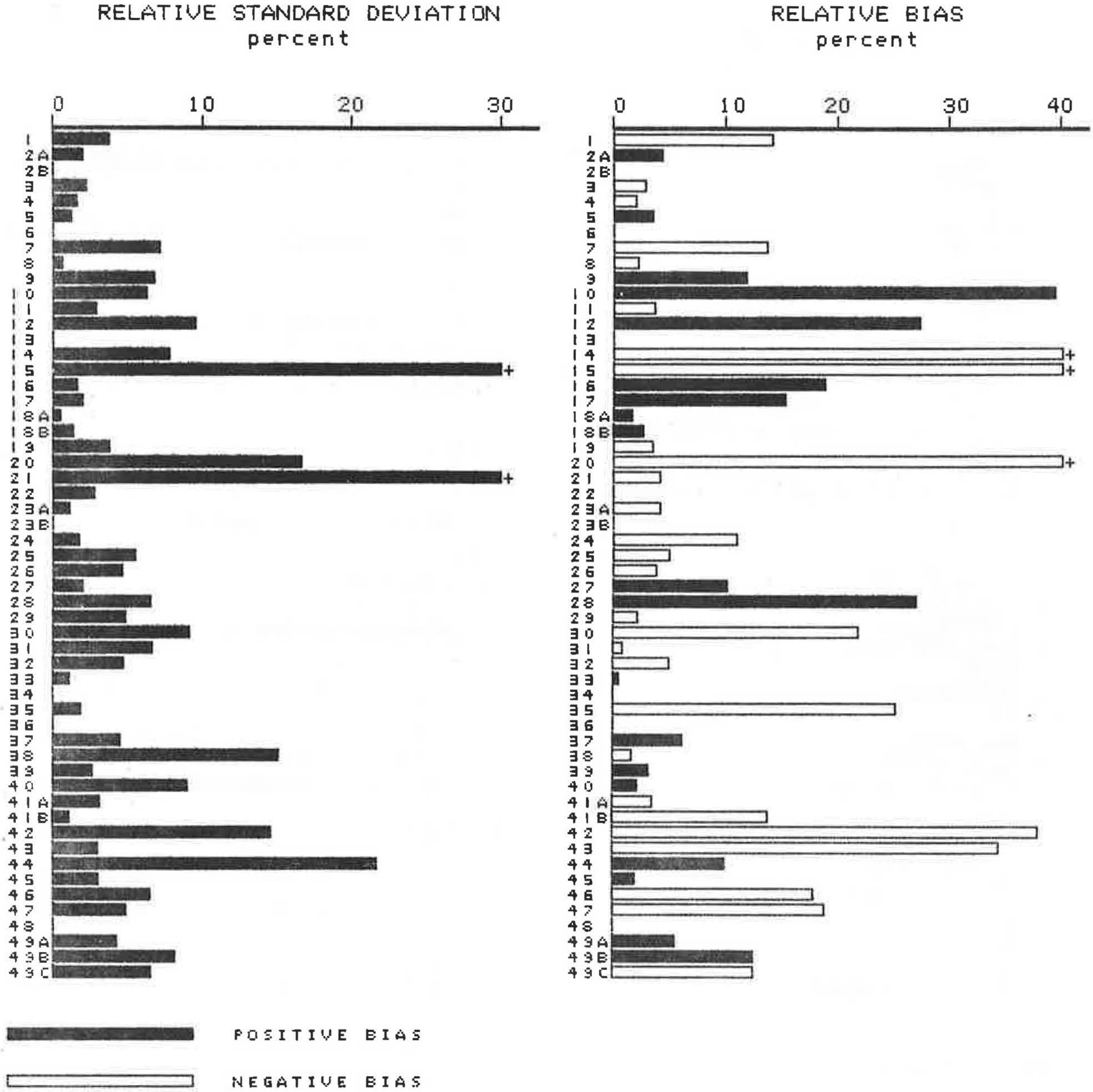
- - NO BIAS (BASED ON ONLY ONE RESULT)

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

CADMIUM — SAMPLE A

LOBSTER HEPATOPANCREAS - 26 mg/kg

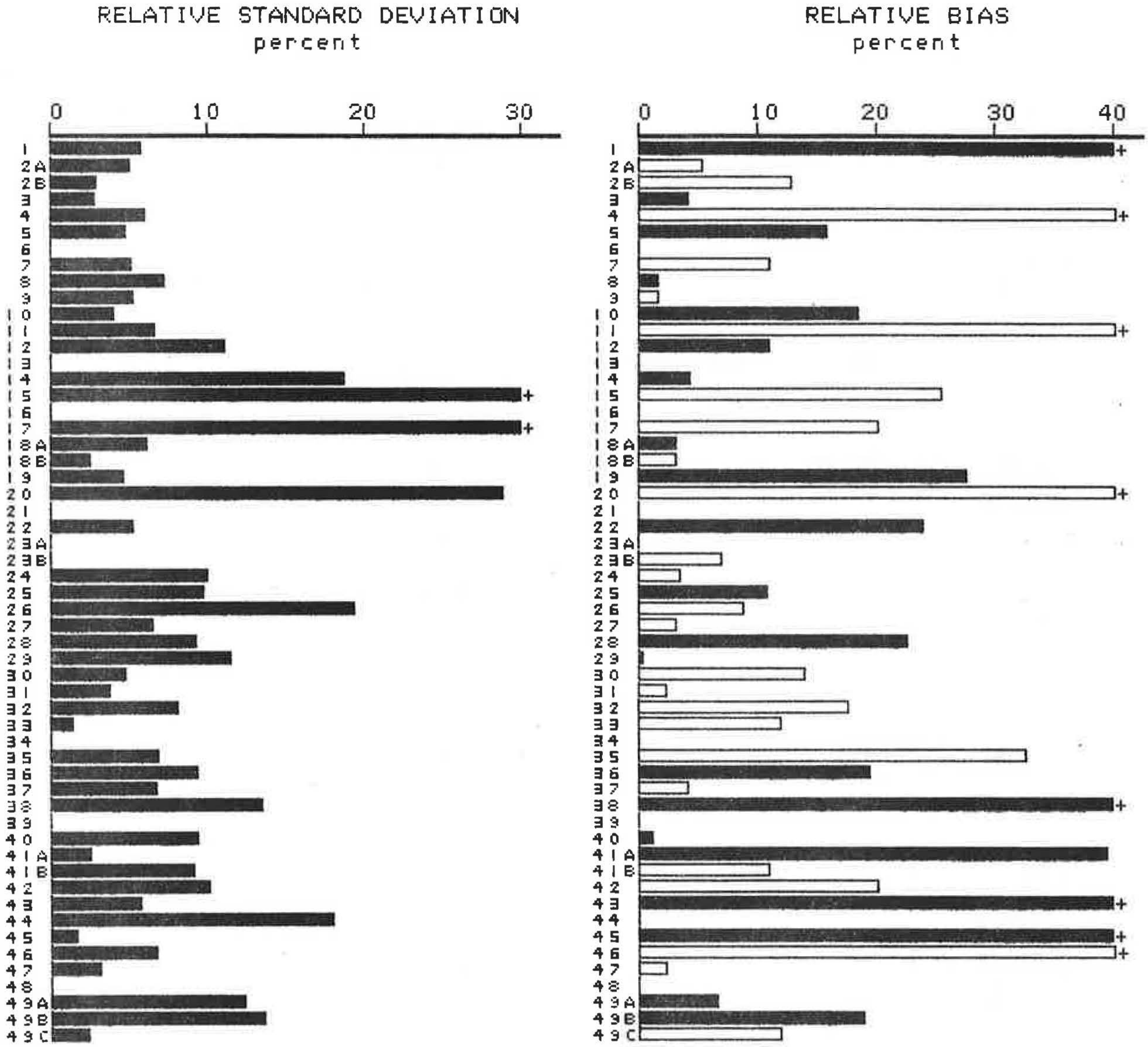


\+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

CADMIUM — SAMPLE B

SCALLOPS ADDUCTOR MUSCLE - 0.75 mg/kg



POSITIVE BIAS

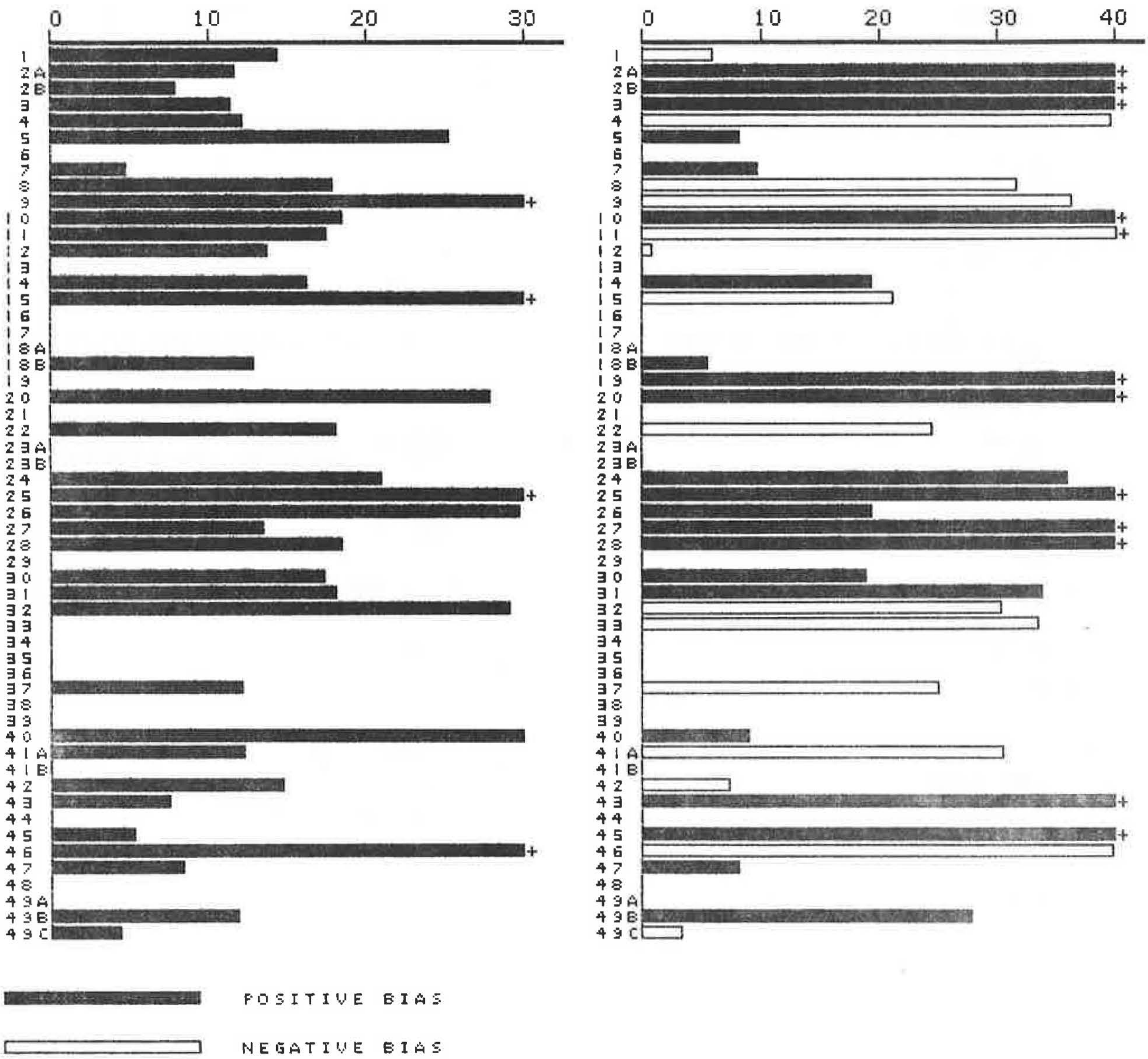
NEGATIVE BIAS

\+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

CADMIUM - SAMPLE C

PLAICE MUSCLE - 0.06 mg/kg



POSITIVE BIAS

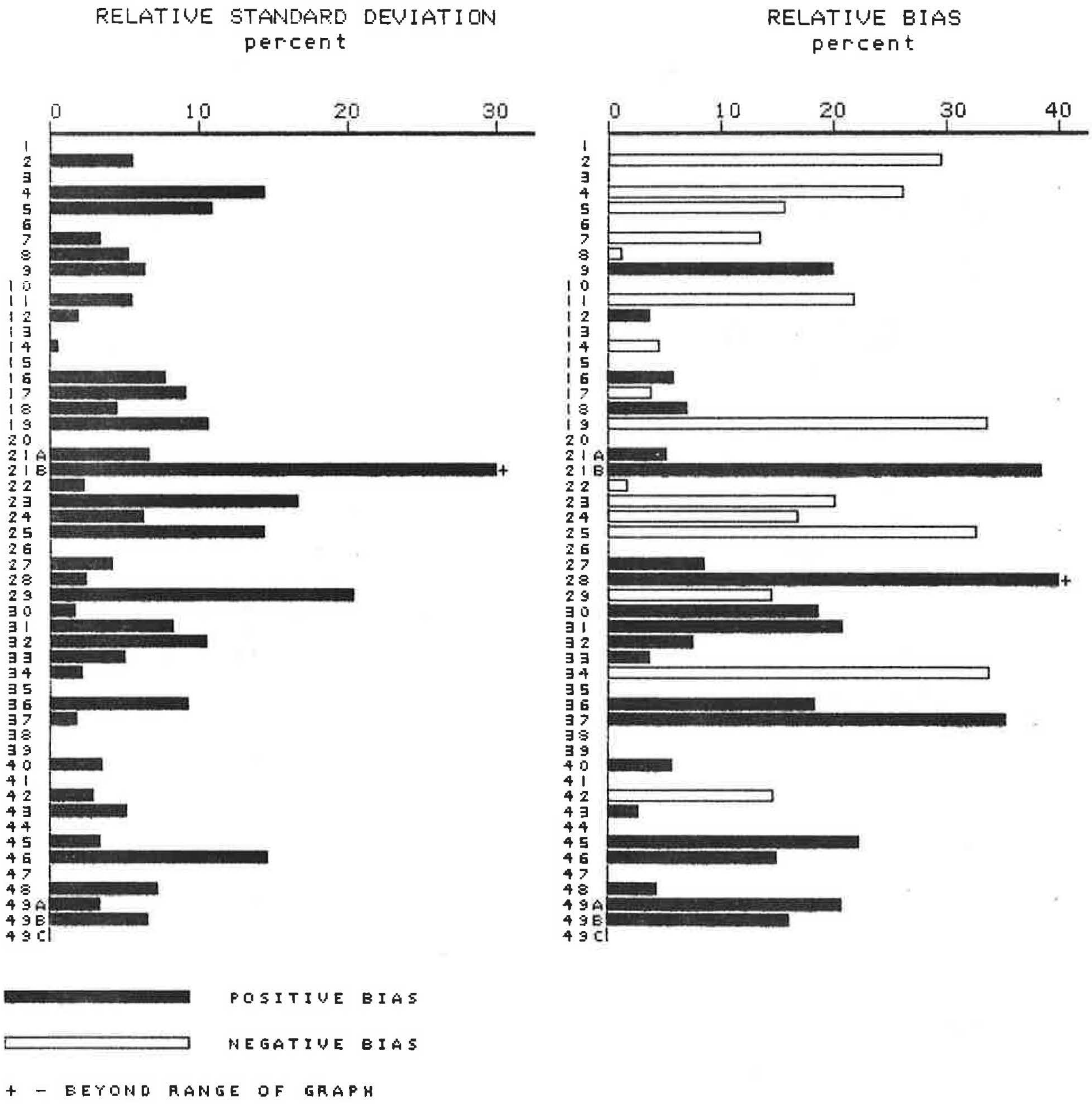
NEGATIVE BIAS

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

MERCURY - SAMPLE A

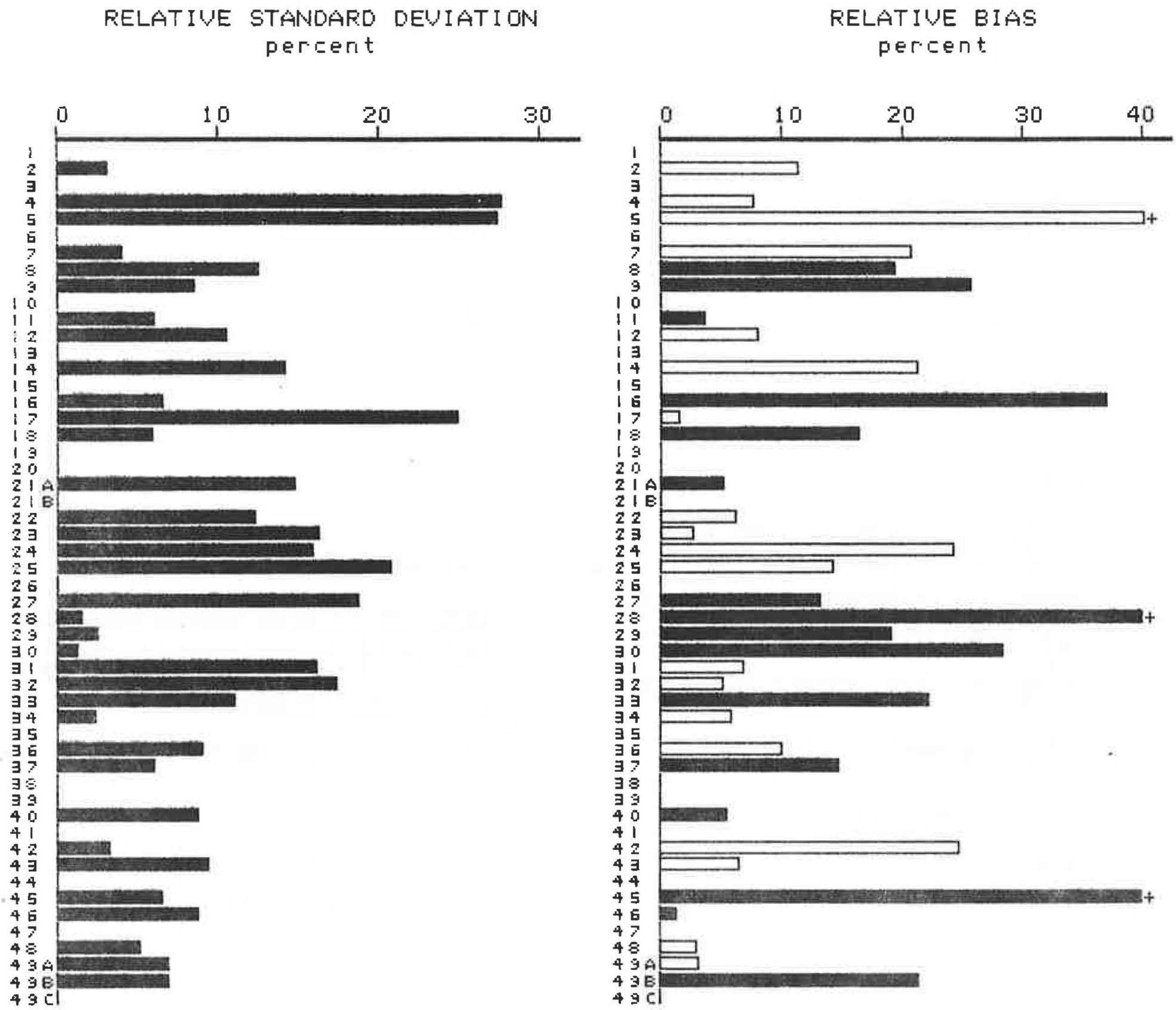
LOBSTER HEPATOPANCREAS - 0.254 mg/kg



THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

MERCURY — SAMPLE B

SCALLOPS ADDUCTOR MUSCLE - 0.081 mg/kg



POSITIVE BIAS

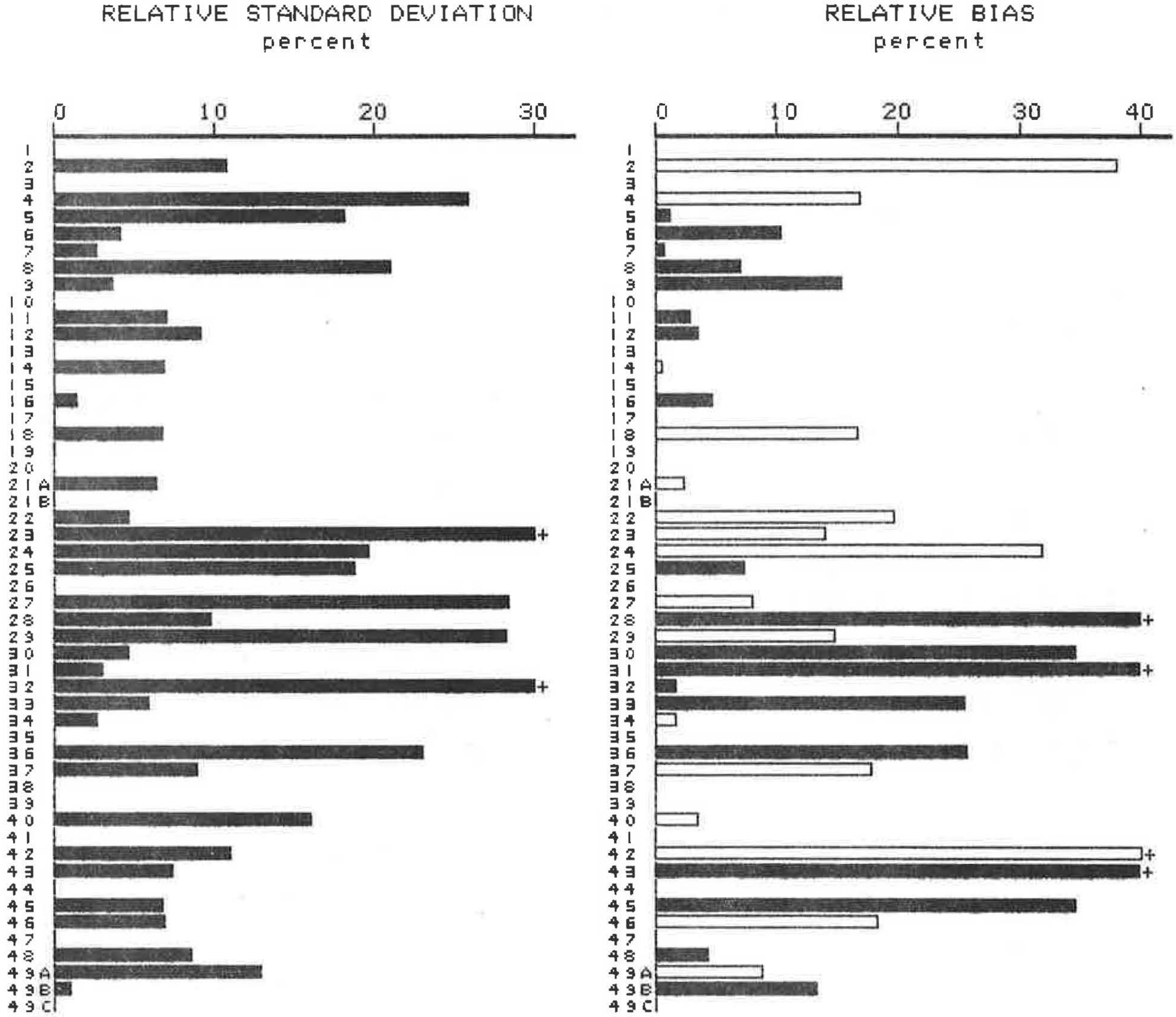
NEGATIVE BIAS

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

MERCURY - SAMPLE C

PLAICE MUSCLE - 0.056 mg/kg



POSITIVE BIAS

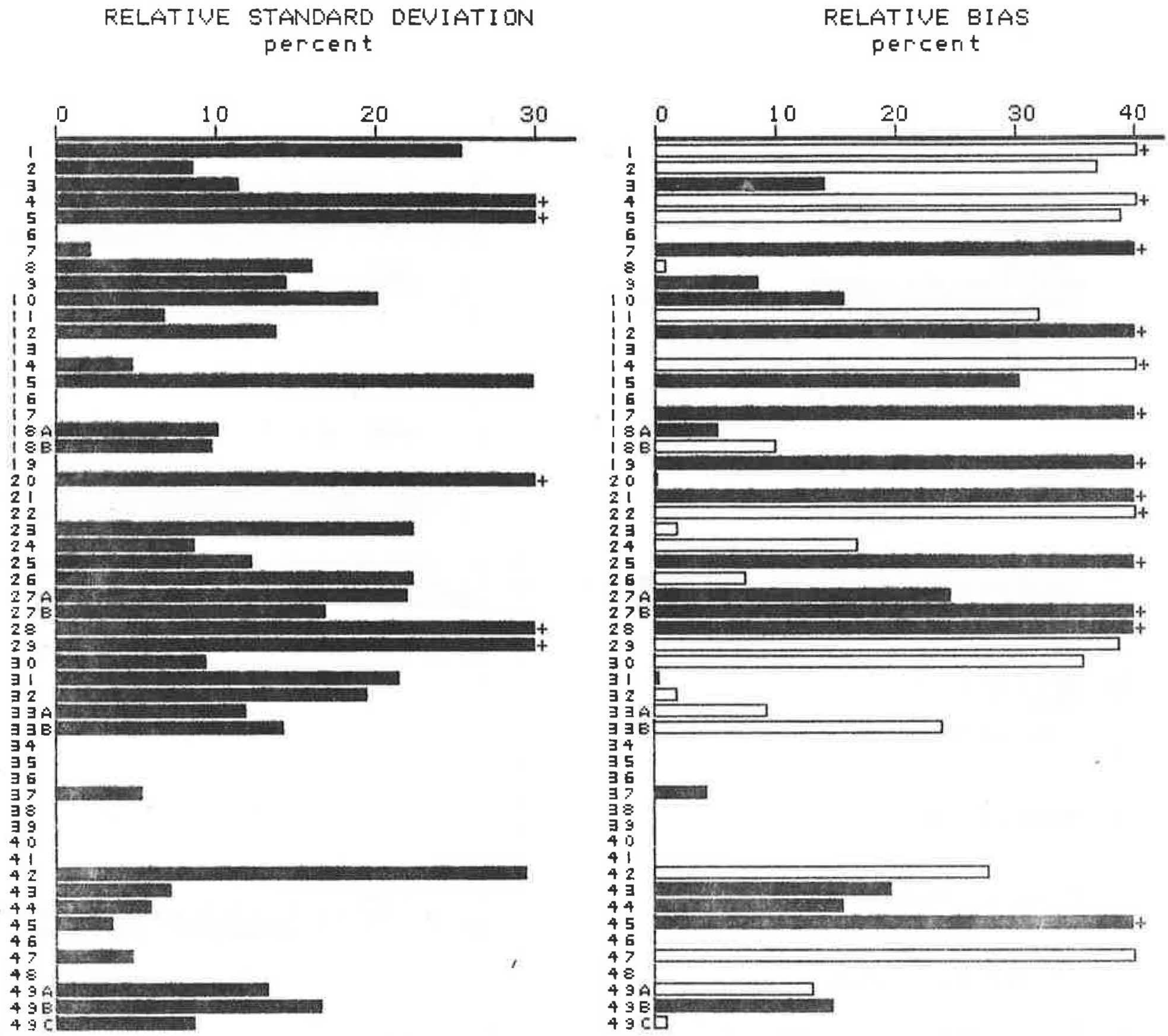
NEGATIVE BIAS

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

LEAD - SAMPLE A

LOBSTER HEPATOPANCREAS - 5.57 mg/kg



POSITIVE BIAS

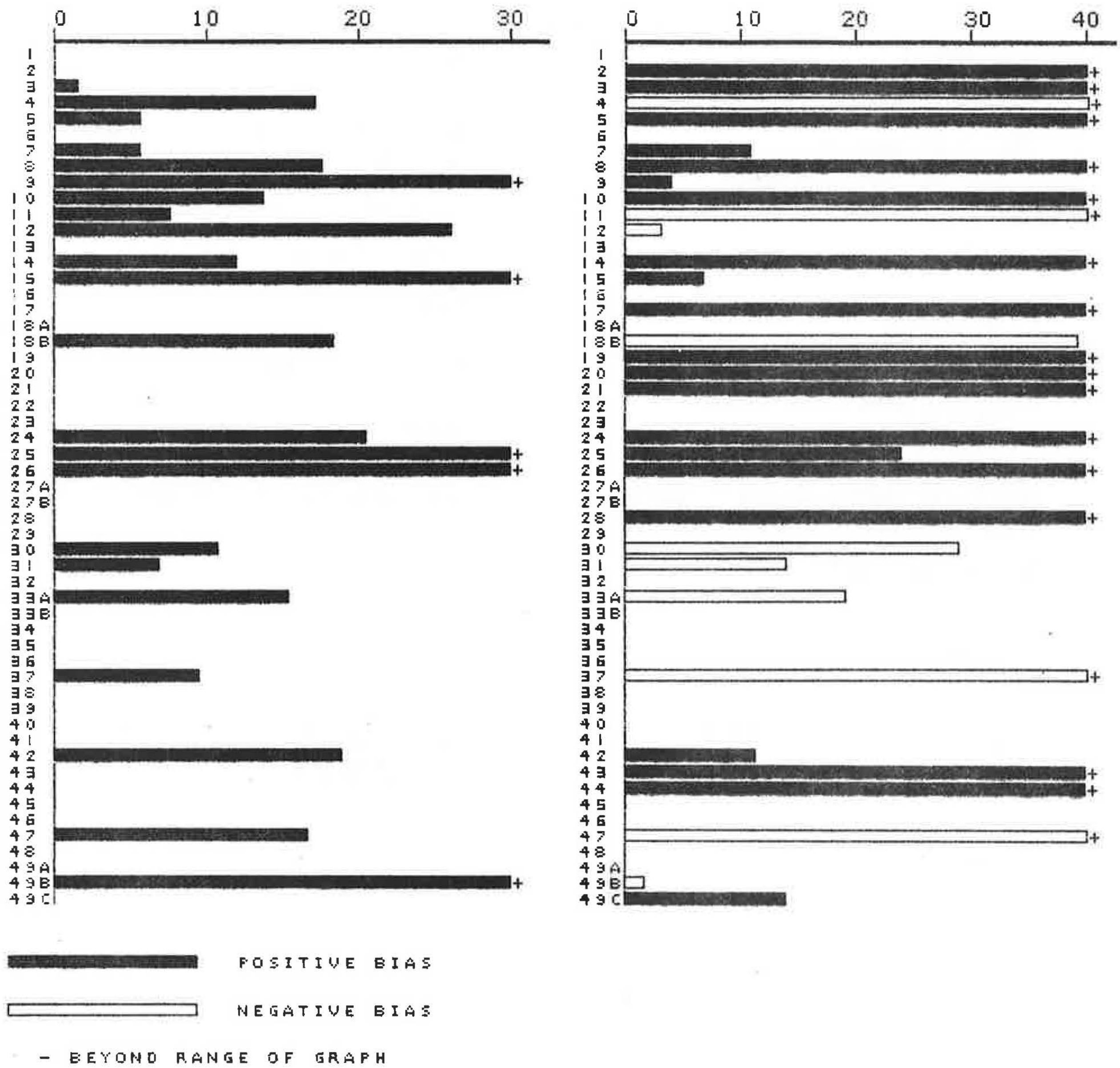
NEGATIVE BIAS

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

LEAD - SAMPLE B

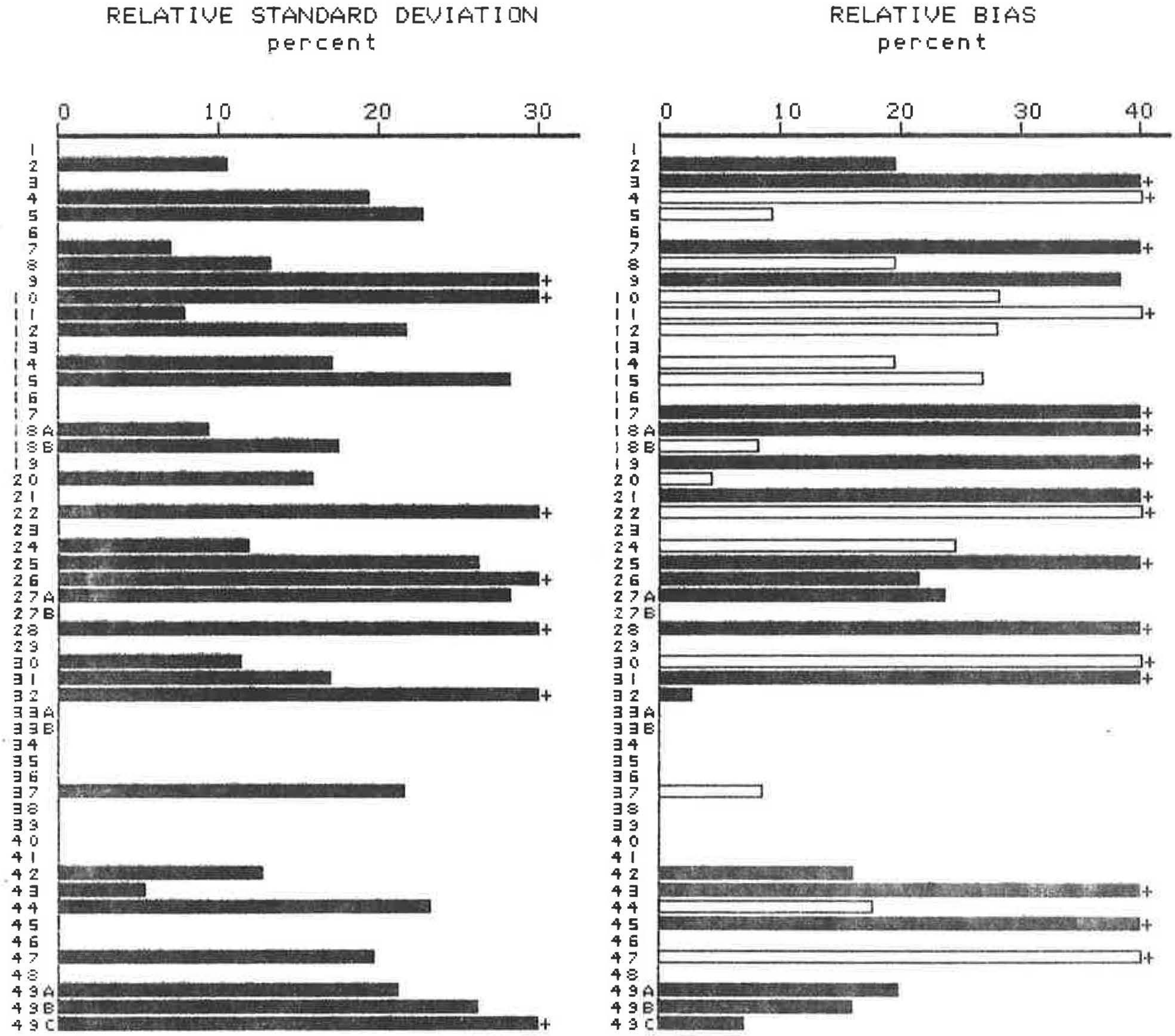
SCALLOPS ADDUCTOR MUSCLE - 0.29 mg/kg



THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

LEAD — SAMPLE C

PLAICE MUSCLE - 1.98 mg/kg



POSITIVE BIAS

NEGATIVE BIAS

+ - BEYOND RANGE OF GRAPH

THERE ARE NO RESULTS FROM A LAB WHOSE RSD AND BIAS ARE BOTH ZERO

Indication of spine colours

Reports of the Advisory Committee on Fishery Management	Red
Reports of the Advisory Committee on Marine Pollution	Yellow
Fish Assessment Reports	Grey
Pollution Studies	Green
Others	Black

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