National Marine Biological Analytical Quality Control (AQC) Scheme

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1. Summary

This report presents the findings of the first year of operation of the National Marine Biological Analytical Quality Control Scheme.

The Scheme consisted of three components; analysis of two macrobenthic samples, analysis of four sediment sample, and identification of four sets of twenty animal specimens. Results for each component are given and discussed.

The analysis of the macrobenthic samples presented a variety of problems and highlighted a number of areas for possible future consideration. Overall analytical performance was good though large numbers of individuals in one of the samples and associated sub-sampling complicated interpretation of the results. There was generally good agreement between the results of the analysis of a sample by a participating laboratory and the results from analysis of the same sample by Unicomarine Ltd. Comments are provided in those instances where agreement was poor.

A number of different techniques were employed for particle size analysis of the distributed sediment samples including sieves, laser diffraction and pipette analysis. In spite of this there was generally good agreement between participating laboratories although the finer samples caused problems for those using sieves rather than laser analysis. Sub-contractors were utilised to undertake the analysis in a number of cases (identified in the appropriate Tables) and hence the actual number of laboratories involved is smaller for this component of the Scheme.

Four sets of twenty animal specimens were distributed and there was generally good agreement between the identifications made by the participating laboratories and those made by Unicomarine Ltd. A small number of laboratories performed less well and comments are made in the appropriate Section. Performance over the four circulations was reasonably consistent. A small number of taxa generated the majority of problems and in most cases these had been anticipated. Variation between participating laboratories is discussed.

Comments are provided on the performance of the participating laboratories in each of the above components. A number of areas for possible future components of the Scheme are indicated and the significance of some of the findings for the National Monitoring Plan is discussed.

2. General Introduction to the Scheme

The aim of the Scheme was to obtain information on possible variation between laboratories in the quality of data collected for the National Monitoring Plan. Three aspects were involved:

- The processing of macrobenthic samples.
- The identification of fauna.
- The determination of physical parameters of sediments.

A series of exercises were designed to examine the above aspects involving the distribution of test materials to participating laboratories and the centralised examination of returned data and samples.

This report presents the results of the first year of operation of the scheme and provides a discussion of the results of the various components. The Scheme is ongoing and some processing of aspects of the results from the first year is still in progress. Where relevant this is indicated in the appropriate sections. It is considered that the major observations of the scheme would be unaffected by any changes resulting from this additional analysis.

Test samples and specimens were distributed to twenty-five laboratories and for the majority of exercises results were received from twenty-three. Two laboratories (LabCodes LB12 and LB24) did not submit results for any part of the scheme.

3. Description of the Scheme Components

As indicated above the scheme consisted of three components, each of which is described below. An outline of the information which was to be obtained from each component is given, together with a description of the preparation of the necessary materials and brief details of the processing instructions given to each of the participating laboratories.

3.1 Macrobenthic Samples (MB)

Two unsorted grab samples, one of marine and one of estuarine origin, were distributed approximately six months apart. This part of the scheme was to examine differences in sample processing efficiency and identification and their combined influence on the results of multivariate analysis. In addition, an examination of the estimates of biomass made by each of the participating laboratories was to be undertaken.

3.1.1 Preparation of the Samples

Two sets of sediment samples were collected from different areas using a 0.1m² Day Grab. In both cases sampling was carried out while at anchor and samples for one distribution were collected within a four hour period. All grabs taken were full. Sieving was carried out on-board using a mesh of 1.00mm (coastal sample) or 500µm

(estuarine sample), followed by fixing in buffered formaldehyde solution. Samples were washed after eight days in the fixative, prior to transfer to 70% IMS, in which condition they were distributed. Collection of the marine and estuarine samples followed the same procedure.

Sample MB01 was collected from the central part of the Wash in an area of mixed, fairly coarse, sediments experiencing fully saline conditions. Sample MB02 was from the Orwell estuary, an area of finer sediments and lower salinity.

3.1.2 Analysis required - MB

Each participating laboratory was required to carry out sorting, identification and enumeration of the contained macrobenthic fauna in the two samples. Precise protocols were not provided; participating laboratories were instructed to employ their normal methods. The extracted fauna was to be separated and stored in individually labelled vials. Labels were provided and cross-referenced to the recording sheets.

In addition, measurements of the biomass of the recorded taxa were requested. More detailed instructions were provided for this component; measurements were to be blotted wet weights to 0.0001g and to be made for each of the taxa recorded during the enumeration.

Two months were allowed for completion of this analysis. All sorted and unsorted sediments and extracted fauna were to be returned to Unicomarine Ltd., together with the data on counts and biomass determinations.

3.1.3 Post-return analysis

Upon return to Unicomarine Ltd. the various components of the MB samples were re-examined. All extracted fauna was re-identified and re-counted for comparison with the participating laboratory's own counts. The sediment was re-sorted and any missed fauna removed, identified and counted. All fauna weighed by the participating laboratories was re-weighed to 0.0001g by the same operator using the same technique.

3.2 Particle Size Analysis (PS)

Four samples of naturally occurring sediments, covering a range of particle size, were distributed over the year. This component was intended to provide information on the degree of variation between participating laboratories in the production of basic statistics on the sediment characteristics.

3.2.1 Preparation of the Samples

An attempt was made to ensure that each of the participating laboratories received a similar sample with little inter-sample variation. Bulk sediment for each of the four circulations was collected from a number of estuarine and coastal locations covering a range of sediment types from mud to coarse sand. This was returned to the laboratory and coarse sieved (2.0mm) to remove stones. The sediment for an individual PS

circulation was well mixed in a large tray following sieving and allowed to settle for a week. Each sediment was sub-sampled by coring and the cores were divided vertically with a septum. One half-core was stored as the 'A' component, the other as the 'B'. To ensure sufficient weight for analysis, and to further reduce variation between distributed PS samples, this process was repeated three times for each sample sent, ie. a distributed sample was a composite of three 'half-cores'.

The 'divided-core' approach was less successful for the coarser sediments. For these sediments cores were taken as adjacent pairs, one of the pair forming the 'A' component, the second the 'B'. Each final component (A or B) consisted of at least two such cores. A total of 30 sediment samples were prepared in this way (allowing for five spare sets), each sample consisting of an A and a B component. All samples were stored in a freezer prior to distribution. The same preparation technique was repeated for each of the four circulations.

The numbering of the resulting samples was random. All of the 'odd-numbered 'B' component (a total of 15) were sent for particle size analysis to assess the degree of inter-sample variation. The 'A' components were distributed to the participating laboratories.

3.2.2 Analysis required

The participating laboratories were required to carry out particle size analysis on the sample using their normal technique or sub-contractor and to return basic statistics on the sample including mean, median, sorting and skewness. Also requested was a breakdown of the particle size distribution of the sediment, to be expressed as a weight of sediment in half-phi (ϕ) intervals.

3.3 Ring Test Specimens (RT)

Four sets of twenty specimens were distributed over the year. The specimens included representatives of the major phyla and approximately 50% of the taxa were polychaete worms. This component of the Scheme was to examine inter-laboratory variation in the ability to identify fauna and to attempt to determine whether any errors were the result of inadequate keys, or through the incorrect use of satisfactory keys.

3.3.1 Preparation of the Samples

The specimens distributed were obtained from a range of surveys held in store. The geographical distribution was from Dorset to the northern North Sea as indicated in Figure 1. Every attempt was made to provide animals in good condition and of similar size for each laboratory. Each specimen sent was uniquely identifiable by means of a coded label and all material has been retained for subsequent checking. In a number of instances, particularly with small species, two specimens were distributed. Where relevant every effort was made to ensure all specimens of a given species were of the same sex.

Where possible, to minimise the likelihood of including multiple species under a single RT code in a circulation, all specimens of a given species were from a single

original sample (usually a Day Grab). In a few cases this was not possible and the material distributed came from a small number of original samples. In every case these were replicate grabs from within a single survey and in most cases they were replicates from a single sampling station.

3.3.2 Analysis required

The participating laboratories were required to identify each of the RT specimens to the level of species. Also requested was the Marine Conservation Society code for the specimen (where available) and brief information on the keys or other literature used to determine the identification. All specimens were to be returned to Unicomarine Ltd. for verification and resolution of any disputed identifications.

3.4 Logistics

It was clear that a large traffic of samples and information would result from the scheme and some thought was given to the labelling, packing and tracking of each set of samples to be distributed. Overall this was successful and all materials and data can be traced to individual laboratories.

3.4.1 Sample distribution

Samples of the Ring Test and Particle Size components of the Scheme were distributed together in a single polythene bucket (5 litre). Each set of RT specimens was protected in foam tubes surrounding a 250ml polythene bottle containing the PS sample. The MB samples were distributed in similar buckets. The partially drained sample being placed in a polythene bag within a sealed container which was in turn placed in a bag, sealed, and firmly wedged in a bucket for distribution.

All forms and a disc (see below) for the return of data was securely attached to the bucket and distribution was by courier. The approach appears to have been successful - no reports of damaged containers or samples were received.

3.4.2 Data returns

A fundamental part of the Scheme was the return of samples and the results of the various analyses by the participating laboratories. It was anticipated that this would result in a considerable volume of data to be analysed in potentially a different format from each participating laboratory. Accordingly, prepared paper forms were distributed with each of the circulations to reduce inter-laboratory variations in format and ensure that all requested information was received.

In addition to the paper copies, floppy-disc versions of the same forms were also distributed. The forms on each disc were identical in structure to the paper forms but in a variety of software formats and were tailored to the receiving laboratory with their Laboratory Codes (see below).

It is worth noting that the participating laboratories were found to be utilising a wide range of data storage methods and software and no single format could be employed

by all participating laboratories. Both PCs and Apple Macs were used and the most common software formats employed were:

Database - dBase III, IV, Paradox
Spreadsheets - Excel (ver. 3, 4, 5), Lotus (various), SuperCalc, MS Works
Text - Tab delimited, CSV (derived from Excel).

All were converted to Excel ver. 5.00 for storage and analysis. This finding clearly has significance to the successful implementation of data transfer in the National Monitoring Plan as a whole.

In spite of the variation between participating laboratories the discs were invaluable and removed the need for re-keying of data (with the associated risk of introducing errors) in all but a few instances where only paper copies were returned. Upon receipt all disc-based files were copied twice to hard-disc storage as a working copy and also a backup stored copy. The former was modified as necessary to enable importing into the final analysis package while the latter was left unmodified as a backup of the floppy-disc version.

3.4.3 Confidentiality

To preserve the confidentiality of participating laboratories each was randomly assigned a two-digit Laboratory Code eg. LB99. This code was utilised in place of the laboratory's name in all cases where results were distributed to other participating laboratories and is the means by which laboratories are identified in the present report.

4. Results

Twenty-five laboratories were distributed with all samples and data return forms for the Scheme. Overall most participating laboratories met the requested dates for the return of data and samples. In many cases data were faxed to ensure it arrived on time. The summer period seemed to present most problems for laboratories; staff absences combining with increased internal fieldwork load. No data were returned from laboratories LB12 or LB24.

4.1 Macrobenthic Samples (MB)

4.1.1 General comments

This proved to be the most involved component of the Scheme involving a considerable amount of post-distribution processing of the samples. It was also considered to be the most involved by the participating laboratories. The two samples MB01 (coastal) and MB02 (estuarine) presented quite different problems.

The sediment of the former samples was coarse grit and shell gravel with an average of approximately 23 species in generally small numbers covering a variety of phyla. A few bivalve species were present in large numbers and extraction of these was a problem in some cases.

Sample MB02 was estuarine with a smaller number of taxa (average of 14) but with certain taxa, notably polychaete and oligochaete worms, occurring in very large numbers. In addition the samples generally contained significant amounts of vegetable detritus. Most laboratories felt that it was necessary to reduce the amount of material to be sorted and accordingly they sub-sampled the material distributed. No protocol was provided for this, though participating laboratories were asked to detail the technique used. Although the sample clearly raised a number of problems as to an appropriate method for analysis and complicated the interpretation of the results, it is considered that it represented a realistic example of a reduced-salinity / particle size fauna.

4.1.2 Efficiency of sample sorting

Table 1 presents for the MB01 sample the numbers of taxa and individuals and the measurements of overall biomass made by each of the participating laboratories. Also given in the Table is the corresponding count or weight made by Unicomarine Ltd. following re-analysis of the same samples. For each of the three parameters (number of taxa, number of individuals, total weight of biomass) the percentage difference between the value provided by the participating laboratory and that obtained by Unicomarine Ltd. is given. The participating laboratories have been ranked in the Table in order of decreasing size of percentage difference. Equivalent information for the second circulation, MB02, is presented in Table 2.

4.1.2.1 Examination of sub-sampling of MB02

Although not a designed component of the Scheme it was considered valuable to examine the variation between laboratories in the sub-sampling technique employed to estimate the numbers of the dominant taxa. A number of approaches to the problem were taken, and these are tabulated in brief in Table 3. In most cases sub-sampling was only undertaken for the estimation of the numbers of the dominant taxa. The general approach was to divide the sample by sieving and / or floatation techniques into 'heavy' and 'light' fractions. The former was normally fully sorted and all specimens extracted. The latter was sub-sampled using a variety of techniques; the proportion of the sample examined by the participating laboratories varied from approximately 5% to 100%. In some cases laboratories appear to have examined only the sub-sample and extrapolated results for all taxa rather than just the dominants.

Following their return to Unicomarine Ltd. each of the MB02 samples was treated in a similar fashion and re-sorted as follows. The sample was sieved through a variety of mesh sizes (4.0, 2.0, 1.0 & 0.5 mm) to divide it into fractions of more uniform size. This has been found from experience to facilitate sorting and extraction of the fauna. Each of the resulting fractions was then elutriated to separate them into a light 'float' fraction consisting of detritus and the majority of fauna (other than molluscs) and a 'heavy' fraction of sediment particles and molluscs shells. Inspection of the resulting fractions indicated that most contained 'manageable' numbers of fauna and were therefore fully sorted, without sub-sampling. Typically one of the light fractions contained large numbers of oligochaetes and certain polychaete worms. This fraction

was sub-sampled by actively distributing the material in a volume of water in a sub-divided cylinder and allowing it to settle into four compartments in the base section. In the majority of cases one-eighth of the total sample was examined, all oligochaetes were extracted from this and identified. The exercise was not intended to find the best approach to sub-sampling, but simply to apply the same technique to all samples. In practice the technique was similar to that which had been employed by many laboratories.

4.1.3 Uniformity of identification

Examination of the raw data returned by the participating laboratories indicated that there was considerable variation in the approach taken to the identification of small specimens or juveniles. In some cases juveniles of a named species would be distinguished, in others they would be reduced to the level of genus. The size at which a specimen was termed "juvenile" varied between laboratories. With some groups, particularly the oligochaetes in sample MB02, no determination of species was made, all individuals being grouped as "Oligochaeta indet." or similar. This complicated the analysis somewhat and has significant implications for data interchange.

4.1.4 Comparison of Similarity Indices (Bray-Curtis)

The fauna list for each sample obtained by the participating laboratory was compared with the list obtained for the same sample following its re-examination by Unicomarine Ltd. The comparison was made by calculating the Bray-Curtis similarity index for the pair of samples. Abundances were fourth root transformed. Tables 4 and 5 present the values of the similarity indices for circulations MB01 and MB02 respectively.

For the second macrobenthic sample (MB02), because of the large variation in numbers of oligochaetes and differences in the degree to which oligochaete species were individually identified, a second comparison was also made. This ignored individual oligochaete species and considered only 'oligochaetes'. This second comparison is included in Table 5.

It can be seen that values for the Bray-Curtis index vary between 77 % and 99% for sample MB01 and 68% and 91% for MB02 (considering all taxa). When oligochaete species are pooled for MB02 the Bray-Curtis varies between 74% and 99%.

4.1.5 Comparison of the results of multivariate analysis

The analysis described in Section 4.1.4 above has been taken a stage further by performing cluster analysis of the full data set of twenty three samples. Two analyses have been made; the first using the pooled data from the twenty-three participating laboratories from which results have been received, the second using the data resulting from re-analysis of the same set of samples by Unicomarine Ltd.. The dendrograms resulting from these two analyses are presented in Figures 2 and 3. To date this has only been carried out for the first of the two macrobenthic circulations.

The data from the participating laboratories have not been modified to change names of fauna in those situations where mistakes have clearly been made. In this respect the analysis represents a 'worst-case' in that slightly better agreement between the set of samples could have been obtained in some cases. However, it does represent the situation that would arise if data were utilised without any pre-analysis checking or attempt to rationalise lists of taxa. In spite of these limitations the overall level of similarity between the samples found in the two analyses is not markedly different.

The main differences between the two cluster dendrograms is the wider range of similarity index (approximately 45% to 78%) in Figure 2 (analysis by participating laboratories), compared to a range of (approximately 55% to 77%) in Figure 3 (analysis by Unicomarine Ltd.). In addition there appear to be more discrete cluster groupings in Figure 2 (laboratory data) than in Figure 3 (Unicomarine Ltd. data). This appears to be the result of artificial groupings arising when two or more participating laboratories agreed on the identification of certain taxa which were identified differently by other laboratories. The dendrogram for the AQC data Figure 3 shows more evidence of 'chaining' which is considered in this case to have resulted from the general similarity of the samples. Groups are still recognisable, however, and in some cases are also seen in Figure 2. For example the sample pairs, S04 & S22, S02 & S17 and S3 & S06 are visible in both Figures.

4.1.6 Biomass determinations

Most participating laboratories reported concerns over the practicalities of obtaining the weights of small numbers or single specimens of particularly the smaller species. Evaporation of alcohol from the blotted specimens resulted in weights continuing to fall for some time.

A comparison of the estimates of the overall biomass made by the participating laboratories and Unicomarine Ltd. for the two circulations is presented in Table 21 The percentage difference between the two sets of measurements for each circulation is also given.

4.1.7 Discussion of Macrobenthic results

The two samples each involved extracting and counting large numbers of a small number of taxa, though the problems presented by the two samples were quite different. Sample MB01 contained many small bivalves, especially *Mysella bidentata* and these were easily overlooked or hidden in dead shells. Overall the sample was 'clean' however, with little material to cause problems with extraction. Most participating laboratories achieved high extraction efficiencies with generally good agreement between the laboratory's count of individuals and that of Unicomarine Ltd. There was more variation in the number of taxa recorded.

The second sample, MB02, undoubtedly caused analytical problems and this is reflected in the much greater variation between the values returned by the participating laboratories and those obtained by Unicomarine Ltd. Most of the differences in the number of taxa were due to differing levels of separation of oligochaeta. The numbers of individuals were estimates, in most cases from relatively

small sub-samples; this is true for the data from both the participating laboratories and from Unicomarine Ltd. Some of the more extreme differences are spurious and are due to insufficient information on the actual sub-sample taken, such cases are being resolved.

In both samples the values for the estimates of total biomass vary by factor of between approximately 1.0 and 30.0. In the majority of cases measurements of biomass made by Unicomarine Ltd. were lower than those made by the participating laboratory for the same sample. The precise reasons for the variation are not clear though weight loss after storage in alcohol is a recognised problem. It is also possible that the samples were more thoroughly blot-dried by Unicomarine Ltd. prior to being weighed.

4.2 Particle Size Analysis

4.2.1 General comments

It had been expected that this part of the Scheme would be relatively straightforward; participating laboratories would be providing numerical results for a defined set of parameters. In practice however, a number of unexpected problems arose.

There were several variations in the ways of presenting the particle size distribution information. The basic units of particle size were either phi or microns. The size intervals varied according to the original units used. Results presented in phi (as requested) gave size intervals in phi, though in some cases integral phi intervals were used (eg. 1ϕ - 2ϕ, 2ϕ - 3ϕ)and in others half-phi intervals (eg. 1ϕ - 1.5ϕ, 1.5ϕ to 2.0ϕ). Results presented in microns had in some cases been converted to discrete phi intervals, in others the interval were based on the microns values and did not correspond to phi values. In either case the value for the amount of sediment in each interval was presented in one of three formats; as a weight in grams; as a percentage of the total weight of sediment measured; or as a cumulative total percentage.

An unexpected finding was an apparent difference between laboratories in their interpretation of the bounds of size intervals used to describe the sediment. Where laboratories had used a single figure to describe an interval (rather than explicitly stating the interval as requested) not all had used the same convention in their results. Each laboratory was contacted requesting clarification and in most cases it was found that where a single value was given as a phi interval (eg. 2.5 ϕ) it denoted the upper bound of the interval, *ie.* represented 2.0 to 2.5 phi. In at least three the reverse was true, the phi value given was to indicate the lower bound (representing 2.5 to 3.0 phi). It was clear from discussion with individuals laboratories that it was not immediately known which convention had been adopted. Resolution of this difference was clearly important before detailed interpretation of inter-laboratory differences, particularly the size distribution curves, could be made. The problem seems to arise because of confusion between the interpretation of size when dealing with phi units which are inversely related to the true size of a particle.

It was also clear from the returns made by the participating laboratories that sub-contractors were used for this component of the Scheme and hence that the results presented are actually for a smaller number of analytical laboratories. Where it is known that another laboratory was used for an analysis this is indicated in Table 6. Laboratories were not explicitly asked for this information and so it is possible that other instances occurred.

4.2.2 Analysis of sample replicates

Each set of fifteen replicate samples from the four PS circulations was analysed using a Malvern laser analyser. Each set was treated as a batch and analysis was carried out within a period of approximately two hours. The results of these analyses are given in Tables 7 to 10 and the size distribution curves are presented in Figures 4 to 7. The four PS samples covered the range from approximately 1.0 phi to 6.5 phi. Overall there is a high degree of similarity between the replicates from a given sediment type indicating that the fairly simple method of preparing the replicate samples had been successful.

4.2.3 Results from participating laboratories

Summary statistics for each of the four PS circulations are presented in Tables 11 to 14. After resolution of the differences in presentation of results described in Section 4.2.1 above, the size distribution curves for each of the four sediment samples were plotted and are presented in Figures 8 to 11. Included on each of these Figures for comparison is the mean distribution curve for the fifteen replicate samples.

4.2.3.1 PS01

The distribution curves for two of the laboratories (LB13 & LB15) have a similar shape to the others (Figure 8) but are distinctly offset towards smaller phi values (*ie.* indicating larger sediment size). This seems to indicate a presentational problem and is being investigated. It is worth noting that in this instance the same sub-contractor was used for the analysis as was used for the analysis of the replicate samples.

4.2.3.2 PS02

The general form of most curves is similar (Figure 9) although a number are truncated probably because of the use of sieves on a relatively fine sediment.

4.2.3.3 PS03

A single curve in Figure 10, that for laboratory LB17, is offset towards finer sediments (larger phi) by one phi unit. This seems likely to be an interpretation error although this has not been confirmed to date.

4.2.3.4 PS04

After allowing for the somewhat truncated curves, as described above, there is an overall similarity of shape of the distribution curves although the grouping is much less pronounced than for samples PS01 to PS03. Examination of the curves for the

replicate samples (Figure 7) indicates that there was more variation between replicates than for the first three samples. The distribution curves from the majority of participating laboratories were below that for the average of the replicate samples. This was not the case for the other three circulations where the curves were more closely associated with that from the replicate samples.

The curve for laboratories LB14 and LB18 are off-set to the left of the Figure indicating a coarser sediment, although the shape is similar. The curve from LB20 and LB22 is more flattened than the others; this is being re-examined.

4.2.4 Discussion of Particle Size Analysis results

4.2.4.1 Differences by Analytical technique

The information presented in the Tables and Figures of size distribution indicate that there are differences between analytical techniques. Laser diffraction systems typically provide a much extended breakdown of the finer fraction of sediments compared to sieve analysis. This was particularly clear for sample PS04 which was the finest distributed with a median particle size of approximately 6.0 phi, representing coarse silt to silt. It may be seen from Figure 11 that a number of the particle size distribution curves for the participating laboratories end abruptly (or rise steeply) at a grain size of between 4 and 5 phi. This size corresponds to a sieve mesh of 63 μm, which is commonly the finest mesh used in routine particle size determinations. Such abrupt changes are commonly a problem where the data from two analytical techniques are joined. A number of laboratories, in particular those using sieves rather than laser diffraction, specifically reported problems because of the small grain size. Generally those laboratories using laser diffraction provided extended size distributions, frequently to 10 or 11 phi, as the technique is better suited to the finer fractions.

4.3 Ring Test Circulations

4.3.1 General comments

Overall this aspect of the Scheme presented fewer unexpected problems than either the MB or PS components. There were two cases where a participating laboratory reported more than one species in the vial. In one of these, this is not considered to have been the case, in the other a small gastropod was wedged inside the mouth of the actual specimen. In one instance where possible confusion over the specimen to be identified was considered to have been a problem the specimens were recirculated separately and until all results have been returned, have been excluded from the analysis.

A number of comments were received from participating laboratories over the four RT circulations. In several cases requests were made for more detailed geographical information about the original location from which the specimens were obtained. Following consultation with the NMBAQC committee no additional information was

provided in any of these cases. In addition a number of participating laboratories felt that the fauna of their own areas was under-represented.

4.3.2 Returns from participating laboratories

Each laboratory returned a list of their identifications of the taxa together with the specimens. The identifications made by the participating laboratories were then compared with the AQC identification to determine the number of differences. A simple character-for-character comparison of the text of the two names (the AQC identification and the laboratory identification) was the starting point for this determination and provided a 'flag' to all those instances where (for whatever reason) the names differed. Each of these instances was examined to determine the reason for the difference.

The main cause of an identification being 'flagged' (ie. different from the AQC identification) was through differences in spelling of what was clearly intended to be the same species. There were three main reasons for these differences:

- Variation in the 'accepted' spellings, eg. *Nepthys, Nephtys, hombergi & hombergii.*
- Use of a different synonym for a species, eg. *Nucula turgida* for *Nucula nitidosa.*
- Simple mis-spelling of a name, eg. *Erichonius* for *Ericthonius.*

NB. For the purposes of calculating the total number of differences in identification made by each laboratory a difference was ignored if it was clearly a result of one of the above.

Tables 16 to 19 present the identifications made by each of the participating laboratories for each of the twenty specimens in each of the four RT circulations. For clarity the name is given only in those instances where the generic or specific name given by the laboratory differed from the AQC identification. Where it was considered that the name referred to the same species as the AQC identification but differed for one of the reasons indicated above then the name is presented in brackets "[name]". Errors of spelling or the use of a different synonym are not bracketed in this way if the species to which the laboratory was referring was not the same as the AQC identification. A dash "-" in the Tables indicates that the name of the genus (and / or species) given by the laboratory was considered to be the same as the AQC identification.

4.3.2.1 Scoring of RT results

The method of scoring was to increase a laboratory's score by one for each difference between their identification and the AQC identification *ie.* for each instance where text other than a dash or a bracketed name appears in the appropriate column in Tables 16 to 19. Two separate scores were maintained; for differences at the level of genus and species. These are not independent values, if the specific level identification was incorrect then the generic identification would also be incorrect, though the reverse is not necessarily the case. A summary of the laboratory scores at the level of genus and species is presented in Table 20 for each of the four RT circulations.

4.3.3 Ring Test distribution results

Overall there appeared to be a considerable degree of agreement between participating laboratories. There remain a few problems of identification to be resolved but it is not considered that the overall pattern presented would change markedly. It should be recognised when examining the results that the number of differences recorded was generally low.

4.3.3.1 First distribution - RT01

Table 16 presents the results for the first RT circulation (RT01). Most of the circulated taxa seemed to present few problems though there were several clear exceptions. Three taxa, *Cossura longocirrata* (RT0102), *Caulleriella zetlandica* (RT0107) and *Retusa umbilicata* (RT0117), accounted for 35 of the 77 recorded differences (45%) at the level of species and a similar proportion (21 of 47, 45%) of the differences at the level of genus. The different identifications are likely to have resulted for different reasons. Each of these taxa is being re-examined although this process has not been fully completed to date.

This set of specimens of *Cossura* is being re-examined, identification relies on details of the number of segments in certain regions. All specimens are considered to be the same. Identification of gastropoda, including *Retusa umbilicata,* relies more than many groups on the observation of subtle differences in shape. These differences may be clear when comparing specimens of different species simultaneously but are less easily detected when comparing a specimen in isolation with a line drawing. These specimens have been re-examined by Dr. Shelagh Smith and the identification of all specimens as *Retusa umbilicata* has been confirmed. The polychaete family Cirratulidae has been revised on a number of occasions recently and is generally regarded as one of the problematic families. A number of species have still to be firmly assigned to a genus. This set of specimens is being re-examined.

4.3.3.2 Second distribution - RT02

Table 17 presents the results for the second RT circulation (RT02). In general the results were similar to those for RT01 with two taxa generating the majority of differences of identification; 15 of a total of 30 (50%) at the level of genus and 27 of 63 (43%) at the level of species.

The anemone *Anemonia viridis* was identified as *Actinia equina* by the majority of participating laboratories. This is likely to have been a 'default' identification reflecting the difficulty of identifying anemones collected in the normal method ie. as part of a bulk-fixed grab sample rather than as an individually collected, relaxed and fixed and preserved specimen.

The other specimen resulting in many differences was another gastropod *Rissoa interrupta* and similar comments to those given above for *Retusa* are valid. Also of significance in this case was the difference between keys in the treatment of two species *Rissoa parva* and *Rissoa interrupta*. In some texts the latter is viewed as a sub-species of the former ie. *Rissoa parva* var. *interrupta* (eg. Graham, 1988) while in

Smith and Heppell, 1991 and Howson, 1987, it is elevated to the status of a separate species.

4.3.3.3 Third distribution - RT03

Table 18 presents the results for the third RT circulation (RT03). Four taxa accounted for the majority of differences at the level of species; 52 of a total of 109 (48%). The situation was similar at the level of genus where the same taxa accounted for 18 of 45 differences (40%).

The polychaete family Capitellidae contains a number of similar species and there are in addition uncertainties over the identification of members of the genus *Capitella.* Specimens of another polychaete genus, *Aricidea,* were identified differently by large number of participating laboratories. One of the key features in this genus is the nature of chaetal structure in posterior segments. These can be frequently difficult to find, even on complete specimens. The distributed specimens are being re-examined to check the identifications, though all are considered to be the same species.

The two remaining species were molluscs, a gastropod, *Odostomia turrita* and a small bivalve *Turtonia minuta.* The former was in most cases correctly identified as an *Odostomia* species but as one of the other species in the genus, either *O. plicata* or *O. unidentata.* Similar comments may be made about the identification of the species of the genus as were made for *Retusa umbilicata* (Section 4.3.3.1, above). The correct identification requires comparison of subtle differences in shapes. The specimens have been re-examined by Dr. Shelagh Smith and the identification of all as *Odostomia turrita* has been confirmed.

In contrast to the three species described above, the fourth species, *Turtonia minuta* was generally not correctly identified to genus, being most commonly confused with small specimens of *Mysella bidentata.* This seems to have been a simple result of mis-interpreting characters in a small species.

4.3.3.4 Fourth distribution - RT04

Two species accounted for 26 of 76 differences (%) in RT04. In each case identifications differed only at the level of species. The amphipod *Ericthonius punctatus* was generally identified as *Ericthonius brasiliensis* while the polychaete *Sphaerosyllis taylori* was identified in most cases as *Sphaerosyllis thomasi* or *S. hystrix.* The former genus was revised by Myers & McGrath (1984). The species of the genus *Sphaerosyllis* are extremely small and there is some uncertainty over the division of a number of similar species.

4.3.4 Differences between participating laboratories.

Figure 12 presents for each of the four RT circulations the number of differences recorded at the level of genus for each of the participating laboratories. The laboratories are placed in order of increasing average number of differences considering the four circulations. The number of differences recorded at the level of

species are presented in a similar manner in Figure 13 and the participating laboratories are also ordered in terms of increasing average number of differences.

When examining these Figures it should be noted that the overall differences between participating laboratories at opposite ends of the x-axis are quite small and that there is variation between circulations for any given laboratory. There does appear to be some indication of consistency however, the scores for laboratories to the left of the x-axis are generally low while those to the right are generally higher.

An attempt has been made to provide a summary of the performance of each laboratory over the four RT circulations. For each circulation the average number of differences at the specific level has been calculated and this figure is given in Table 20. Each laboratory's score for each circulation (number of differences at the specific level calculated as described in Section 4.3.2.1) has been compared with the average score for the same circulation and the ratio:

$$\frac{\text{laboratory score for circulation}}{\text{average score for circulation}}$$

has been calculated. Thus if a laboratory's score is above average (*ie*. the laboratory identified as different to the AQC identification more taxa than the average for the circulation) the ratio will be greater than one. If the score is less than average then the ratio will be less than one. The resulting ratios have been plotted for each circulation and each laboratory in Figures 14 and 15, for generic and specific differences, respectively. A horizontal line indicates a ratio of one indicating that the score for the laboratory was the same as the average score for the circulation.

As an indicator of the laboratory's relative performance the mean value of the above ratios for all circulations has been calculated. The points representing this mean are indicated with a cross in Figures 14 and 15 and are linked for clarity with a continuous line. The sequence of laboratories in the Figure has been determined by placing them in order of increasing magnitude of this mean. Thus laboratories to the right of the Figure have generally higher scores than average after correcting for the average for each circulation. A dashed horizontal line indicates a ratio of one, *ie* where the score for a circulation was the same as the average score.

4.3.5 Differences by taxonomic group.

It is clear from the results that certain of the taxa generated most of the reported differences of identification. The total number of differences for each of the major phyla and for all circulations is summarised in Table 21.

The gastropod molluscs seem to have caused most problems and have a rate of differences per distributed specimen clearly much higher than the other groups; possible reasons for this are given above (Section 4.3.3.1). The crustacea were on the whole identified correctly although a number of participating laboratories commented on the small size of specimens. The major group distributed, the polychaete worms,

generated an intermediate number of problems per distributed species and most of the differences reported were for recognised problem groups.

It also appears from information in Table 21 that the nature of the mis-identification differed between the taxonomic groups. Higher rates of difference for gastropod mollusca and the "other" category suggests that more of the identifications were more markedly different.

4.3.6 General discussion of the RT results

Overall most participating laboratories seemed to agree on the identification of the majority of the distributed taxa. Where differences occurred they were in taxa which are generally accepted as posing some difficulty. One benefit of this component of the Scheme may be to highlight such problem areas for future taxonomic work.

5. Discussion of Results

5.1 General observations

5.1.1 Macrobenthic Analyses

A number of areas for future effort were highlighted by the MB component of the Scheme. General guidance as to the appropriate number of individuals to count when faced with samples containing thousands of individuals being of some importance. Standardisation on the taxonomic level to which taxa should be identified when small is also required and equally importantly what defines small or juvenile. Variation in these and other aspects may not be a problem within a study area but are of fundamental importance when attempting to compare information from a number of areas.

5.1.2 Ring Test distributions

The influence of past workshops and new literature can be seen and a number of areas for future effort are clear. Where differences of identification arose they were generally the result of genuine differences of opinion or lack of experience with a particular genus rather than careless mis-identification.

It appeared from an initial examination of the returns most participating laboratories were using a similar set of keys. Certain groups have widely accepted standard texts (eg. Lincoln, 1979; Gammaridean Amphipoda) backed up by specific pieces of literature for recent changes. Other groups are less well covered by recent texts and for some the 'standard work' may be over 70 years old. Although issued as 'working' keys and not intended as formal publication of new species the majority of laboratories were utilising at least some of keys produced during the course of the many Estuarine & Coastal Sciences Association (ECSA) workshops which have been held on the major phyla.. Use of names occurring only in such keys may cause nomenclatural problems at a later date. This situation needs to be resolved in the light

of the fact that in many cases they represent the best knowledge available for the family or genus concerned. A compilation of references to the keys used by the participating laboratories is being produced; this will be supplemented where relevant with comments as to the current suitability of certain keys in view of recent taxonomic changes.

5.1.3 Particle Size Analyses

In spite of the number of different analytical techniques utilised by the participating laboratories the results from the PS component of the Scheme were remarkably uniform. Clearly the finer sediments caused problems, particularly for those laboratories using sieves. This is particularly significant for those working in estuaries and other areas with soft generally muddy sediments.

5.2 Comparison of participating laboratories.

The overall purpose of the Scheme was to obtain information on the performance of laboratories in the three main aspects of benthic sample analysis. Overall the participating laboratories seemed to be operating to a similar and generally good level of accuracy. A few exceptions to this are noted below in the comments for individual laboratories and a brief summary of the performance of each participating laboratory is given in Table 22.

The differences between participating laboratories in the macrobenthic exercise resulted from two components; species identification and sample sorting. There was more variation between laboratories in the former in the first exercise (MB01) and in the latter in the second (MB02). With the exception of the estimation of numbers of the dominant polychaetes in MB02, which was complicated by the requirement for sub-sampling, the overall counts of the numbers of individuals were similar to those made by Unicomarine Ltd. Differences in the number of taxa were often a result of differences of opinion over divisions between adults and juveniles. It should be remembered when considering differences in the Bray-Curtis indices presented that in most cases higher values (greater similarity) would have been obtained if obvious differences of identification had been resolved prior to the analysis.

Of the three components, the most straightforward to comment upon is the analysis of particle size. There did not appear to be any consistent major departures from the average results derived from the replicate samples. A small number of participating laboratories differed from the remainder in their convention used to refer to particle size intervals. Such differences are important for inter-laboratory comparisons but are easily resolved if the upper and lower bounds of an interval are stated explicitly. Differences between participating laboratories seem in the main to be associated with the technique in use rather than necessarily representing incorrect practices. This is apparent from a comparison of the estimates of the [%<63μm] fraction in Table 15. In general those laboratories using laser analysis tended to over-estimate the value while those using sieve analysis tended to under-estimate.

The Ring Test circulations provided the most easily quantifiable results of the three components. It should be noted however that in some cases differences between participating laboratories were the result of valid differences of opinion over the identification of a specimen. Some attempt to allow for this has been made by expressing 'scores' relative to each of the four circulations. Further analysis of the results to consider the accuracy of identification at higher taxonomic levels is underway.

The following section provides comments on the performance of individual laboratories. More detailed comments are given in those instances where the performance of the participating laboratory was in the lower quartile for the exercise concerned, or where there was some clear difference between the performance of the laboratory and the performance of the majority of participating laboratories. The comments should be viewed as pointers to possible problem areas for the laboratory in question but in many cases will be of relevance to all participating laboratories.

To date no absolute standards of performance have been set by the NMBAQC Committee for the Scheme and no further significance should be assigned to the performance levels used to determine when comments would be made. The fact that a participating laboratory falls into the lower quartile in any given exercise does not necessarily indicate unsatisfactory performance.

5.2.1 Comments on individual laboratories.

Laboratory - LB01

Macrobenthos

The low Bray-Curtis index in MB01 was the result of identification of *Abra alba* as *Abra nitida*. If difference ignored then Bray-Curtis index becomes similar to majority of participating laboratories. Otherwise good agreement with all other parameters in both MB01 and MB02.

Particle size

General agreement with majority of parameters, some indication that for PS01 and PS02 [% <63µm] was low, relative to analysis of the replicates.

Ring Test

Three of the four circulations had species scores above the average for the circulation. RT02 poor agreement with AQC identifications - joint maximum number of generic differences; maximum number of specific differences, for the circulation. This circulation main reason for positioning of the laboratory to the right of x-axis in Figures 14 & 15.

Laboratory - LB02

Macrobenthos

Generally small differences between AQC and laboratory analysis of MB01 and MB02 samples. Biomass estimation for MB01 relatively large difference due mainly to presence in sample of a few large, fluid containing, specimens of *Aphrodita aculeata* and *Echinocardium cordatum.* Results for MB02 lower, but comparable to those for majority of laboratories.

Particle size

Some indication that the estimation of [% <63μm] for PS01 was rather high.

Ring Test

The number of differences from the AQC identifications for each of the four RT circulations were consistently below the average value for the circulation (*ie.* indicating high level of agreement).

Laboratory - LB03

Macrobenthos

MB01 similarity index high, though relatively large difference (underestimation) in number of taxa. Values for MB02 not given as considerable difference between enumeration by Unicomarine Ltd. and the laboratory suggested calculation error or mis-understanding of the results provided.

Particle size

The estimation of [% <63μm] for PS01 was high.

Ring Test

The number of differences from the AQC identifications for two of the four RT circulations were above the average value for the circulation (*ie.* indicating a lower level of agreement). The average score for the four circulations was very similar to the average for all participating laboratories.

Laboratory - LB04

Macrobenthos

MB01 number of taxa somewhat underestimated though only small numbers of individuals involved. Similarity index for MB01 and MB02 indicated good agreement with AQC analyses.

Particle size

All results generally in good agreement with AQC replicates.

Ring Test

The number of differences from the AQC identifications for each of the four RT circulations were consistently below the average value for the circulation (*ie.* indicating high level of agreement).

Laboratory - LB05

Macrobenthos

Similarity index for MB01 and MB02 indicated very good agreement with AQC analyses. Large difference in biomass estimation for MB02 the result of sub-sampling, and unlikely to reflect laboratory's methods.

Particle size

All results showed generally good agreement with AQC replicates.

Ring Test

One of the five circulations had slightly more than the average number of differences, though overall level of differences was similar to the average considering all participating laboratories.

Laboratory - LB06

Macrobenthos

Very good agreement with MB01 analysis, fair agreement for MB02. Large difference in biomass estimation for MB02 likely to be the result of sub-sampling, although estimate for *Tubificoides benedii* somewhat higher than obtained by Unicomarine Ltd., possibly due to differences in blotting.

Particle size

All results generally in good agreement with AQC replicates.

Ring Test

The number of differences from the AQC identifications for each of the four RT circulations were consistently below the average value for the circulation (*ie.* indicating high level of agreement).

Laboratory - LB07

Macrobenthos

Good agreement with similarity index for both MB01 and MB02. Other parameters showed good agreement for MB01 somewhat less so for MB02.

Particle size

All results showed generally good agreement with AQC replicates.

Ring Test

One of the four circulations had more than the average number of differences, though overall level of differences was similar to the average considering all participating laboratories.

Laboratory - LB08

Macrobenthos

Very good agreement with Bray-Curtis index and other parameters for both MB01 and MB02.

Particle size

The estimation of [% <63μm] for PS01 was high. No information for PS03. Other results in general agreement.

Ring Test

The number of differences from the AQC identifications for each of the four RT circulations were consistently below the average value for the circulation (*ie.* indicating high level of agreement).

Laboratory - LB09

Macrobenthos

Very good agreement with Bray-Curtis index and other parameters for both MB01 and MB02.

Particle size

No derived parameters supplied; all distribution curves similar to those from analysis of the replicate samples.

Ring Test

Generally low level of agreement with AQC identifications; three of the four RT circulations had species scores above the average for the circulation.

Laboratory - LB10

Macrobenthos

Main reason for low Bray-Curtis index in MB01 was identification of *Mysella bidentata* as *Tellimya ferruginosa*, species occurred in large numbers and had major influence on index. Other parameters good for MB01 and fair for MB02.

Particle size

Estimate of PS01 [% <63μm] was high, results for other analyses similar to replicates.

Ring Test

Three of the four circulations had species scores below the average for the circulation. Overall good agreement.

Laboratory - LB11

Macrobenthos

Good agreement with Bray-Curtis index for MB01 and MB02. Other parameters good for MB01 and fair for MB02.

Particle size

Generally good agreement with AQC analyses. Estimates for PS02 [% <63μm] and [median] high.

Ring Test

The number of differences from the AQC identifications for each of the four RT circulations were consistently below the average value for the circulation (*ie.* indicating high level of agreement).

Laboratory - LB12

Did not take part in Year One of the Scheme

Laboratory - LB13

Macrobenthos

Very good agreement with MB01 analysis, fair agreement for MB02. Other parameters good agreement for MB01 and fair for MB02. Estimation of number of individuals for MB02 showed relatively large difference.

Particle size

Difference from estimate for PS01 [median] very high. Distribution curve clearly offset to smaller particle size. Near identical curve produced by LB15.

Ring Test

The number of differences from the AQC identifications for two of the four RT circulations were above the average value for the circulation (*ie.* indicating a lower level of agreement). The average number of differences for the four circulations was below the average for all participating laboratories.

Laboratory - LB14

Macrobenthos

Very good agreement with Bray-Curtis index for both MB01 and MB02 analyses. Generally good agreement with other parameters for both circulations.

Particle size

Generally good agreement with AQC analyses.

Ring Test

The number of differences from the AQC identifications for one of the four RT circulations was above the average value for the circulation (*ie.* indicating a lower level of agreement). The average number of differences for the four circulations was below the average for all participating laboratories.

Laboratory - LB15

Macrobenthos

Good agreement with Bray-Curtis index and other parameters for both MB01 and MB02 analyses.

Particle size

Difference from estimate for PS01 [median] very high. Distribution curve clearly offset to smaller particle size. Near identical curve produced by LB13. Difference from replicate estimate for PS03 [% <63μm] also very high.

Ring Test

The number of differences from the AQC identifications for one of the four RT circulations was above the average value for the circulation (*ie.* indicating a lower level of agreement). The average number of differences for the four circulations was below the average for all participating laboratories.

Laboratory - LB16

Macrobenthos

Good agreement with Bray-Curtis index for MB01. Poor agreement for MB02 analysis the result of differences in the degree to which oligochaetes were identified to species and in the naming of other taxa. Other parameters had fair agreement for MB01. Estimation of the number of individuals and biomass for MB02 not strictly comparable as varying (non-specified) sub-samples taken, an overall estimate has been used.

Particle size

Derived parameters supplied for PS01 only; all distribution curves similar to those from analysis of the replicate samples.

Ring Test

The number of differences from the AQC identifications for each of the four RT circulations were consistently above the average value for the circulation (*ie.* indicating a low level of agreement).

Laboratory - LB17

Macrobenthos

Fair agreement with Bray-Curtis index for MB01 and MB02. Good agreement with other parameters for MB01 and MB02 though somewhat larger difference in the estimation of the overall number of individuals for MB02.

Particle size

Apparently some confusion over the interval to which the given phi values referred. Distribution curve for PS03 (possibly also PS02 and PS04) offset towards larger phi values (finer sediments). Derived parameters in general agreement with those from analysis of the replicates samples.

Ring Test

The number of differences from the AQC identifications for two of the four RT circulations were above the average value for the circulation (*ie.* indicating a lower level of agreement). The average score for the four circulations was very similar to the average for all participating laboratories.

Laboratory - LB18

Macrobenthos

Very good agreement with Bray-Curtis index and other parameters for MB01. No information available for sample MB02.

Particle size

Estimates of [% <63μm] were high compared with the replicates for PS01, PS02 and PS04. Other parameters similar apart from [median] for PS04 which was high.

Ring Test

Generally few differences from AQC identifications. One of the four circulations had more than the average number of differences, though overall

level of differences was below the average considering all participating laboratories.

Laboratory - LB19

Macrobenthos

Fair agreement with Bray-Curtis index for MB01 and MB02. More taxa extracted by laboratory than recorded by Unicomarine Ltd. in returned material was main reason for slightly lower Bray-Curtis index . Difference in biomass likely to be due to presence of single specimen of *Echinocardium cordatum*.

Particle size

The estimation of [% <63μm] for PS03 was low. No information for PS03. Other results in general agreement.

Ring Test

Generally low level of agreement with AQC identifications; three of the four RT circulations had species scores above the average for the circulation.

Laboratory - LB20

Macrobenthos

Very good agreement in Bray-Curtis index for MB01, rather less so for MB02. Largely due to difference in estimation of single taxon. Other parameters close to AQC estimates for MB01 and MB02 with exception of biomass estimation for MB02.

Particle size

Results in general agreement with those from analysis of the replicates.

Ring Test

The number of differences from the AQC identifications for each of the four RT circulations were consistently below the average value for the circulation (*ie.* indicating high level of agreement).

Laboratory - LB21

Macrobenthos

Relatively poor agreement as shown by Bray-Curtis index for MB01 due to underestimation of a number of taxa. This was particularly true for bivalves where three species were either not extracted or identified. The dominant taxon *Mysella bidentata* was underestimated by a factor of 2.3. Biomass estimations were comparable with the majority of participating laboratories. Sample material not available for MB02.

Particle size

PS02 and PS03 had high values for the estimate of [median], PS02 estimate of [% <63μm] also high.

Ring Test

The number of differences from the AQC identifications for each of the four RT circulations were consistently well above the average value for the circulation

(*ie.* indicating a low level of agreement). In two of the circulations (PS01 & PS04) recorded the maximum number of differences at both the level of genus and species of all the participating laboratories.

Laboratory - LB22

Macrobenthos

Very good agreement with Bray-Curtis index for MB01, fair for MB02. Estimates for other parameters for MB01 and MB02 similar to those made by Unicomarine Ltd. with exception of the number of taxa for MB02 which was under-estimated.

Particle size

Generally close agreement with the AQC estimates with the exception of PS04 for which the estimate of [median] was low.

Ring Test

The number of differences from the AQC identifications for two of the four RT circulations were above the average value for the circulation (*ie.* indicating a lower level of agreement). The average score for the four circulations was similar to the average for all participating laboratories. Most differences were recorded for RT03 where the maximum number for the circulation were recorded. This circulation was generally perceived as the most difficult of the four.

Laboratory - LB23

Macrobenthos

Good agreement for MB01 as indicated by Bray-Curtis index, less so for MB02. The latter due to in the main to differences in the identification of a few taxa together with some influence of the estimation in overall numbers of oligochaetes. Other parameters in general showed good agreement with AQC estimations.

Particle size

Estimates for PS02 [median] and [%<63μm] were low, other parameters generally similar.

Ring Test

The number of differences from the AQC identifications for three of the four RT circulations were above the average value for the circulation (*ie.* indicating a lower level of agreement) although the average score for the four circulations was similar to the average for all participating laboratories.

Laboratory - LB24

Did not take part in Year One of the Scheme

Laboratory - LB25

Macrobenthos

Very good agreement with Bray-Curtis index for MB01 and good agreement for MB02. Other parameters showed good agreement for MB01, fair for MB02 mainly due to differences in estimation of numbers resulting from requirement for sub-sampling.

Particle size

Derived values for the [median] not supplied general appearance of distribution curves in agreement with replicates.

Ring Test

The number of differences from the AQC identifications for one of the four RT circulations (RT04) was above the average value for the circulation (*ie.* indicating a lower level of agreement). The average number of differences for the four circulations was below the average for all participating laboratories.

6. Conclusions

The first year of the Scheme has provided a useful insight into the major areas of operation in benthic laboratories. Overall it is felt that the results are encouraging with participating laboratories showing a generally high level of performance. When examining local fauna it is anticipated that general standards of identification would be at least as high.

Although not a component of the scheme by design, the problems discussed above with the handling of the data from the MB samples and the RT circulations highlight the need for the use of a standardised list of taxa - preferably a coded list. Without this, pooling a large number of data-sets from a range of sources in a variety of formats will prove unmanageable.

7. References

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TABLES

Table 1. Totals for the number of taxa, individuals and biomass of the fauna extracted from the MB01 samples sorted by the participating laboratories, following re-sorting by Unicomarine Ltd. Laboratories arranged in order of decreasing difference.

Taxa

Lab.	Lab. analysis	AQC Analysis	% Diff. LB vs. AQC
LB02	33	33	0.0
LB23	19	19	0.0
LB25	24	24	0.0
LB01	30	31	-3.2
LB08	23	24	-4.2
LB09	23	22	4.5
LB14	23	22	4.5
LB10	22	23	-4.3
LB11	20	21	-4.8
LB17	34	32	6.3
LB13	26	28	-7.1
LB22	22	24	-8.3
LB15	22	20	10.0
LB18	31	27	14.8
LB05	22	19	15.8
LB06	19	22	-13.6
LB07	19	16	18.8
LB04	24	28	-14.3
LB19	35	28	25.0
LB20	28	22	27.3
LB03	19	25	-24.0
LB16	15	20	-25.0
LB21	21	31	-32.3
LB12	-	-	-
LB24	-	-	-

Individuals

Lab.	Lab. analysis	AQC Analysis	% Diff. LB vs. AQC
LB14	279	279	0.0
LB16	593	591	0.3
LB13	495	502	-1.4
LB09	762	773	-1.4
LB23	1080	1096	-1.5
LB15	317	312	1.6
LB08	683	672	1.6
LB04	286	294	-2.7
LB11	189	183	3.3
LB18	1189	1149	3.5
LB22	333	321	3.7
LB01	624	652	-4.3
LB02	456	436	4.6
LB06	532	508	4.7
LB10	390	410	-4.9
LB05	527	499	5.6
LB17	1001	947	5.7
LB20	797	751	6.1
LB19	349	383	-8.9
LB03	729	664	9.8
LB25	1435	1295	10.8
LB07	964	836	15.3
LB21	967	430	124.9
LB12	-	-	-
LB24	-	-	-

Biomass

Lab.	Lab. analysis	AQC Analysis	% Diff. LB vs. AQC
LB04	14.1690	14.1446	0.2
LB17	45.0845	45.6647	-1.3
LB25	22.7215	22.3869	1.5
LB14	4.2892	4.4083	-2.7
LB11	6.6654	6.9508	-4.1
LB09	12.4460	11.9240	4.4
LB10	19.5345	18.4721	5.8
LB08	8.4055	7.9186	6.1
LB05	13.0508	12.2884	6.2
LB03	10.6811	11.6670	-8.5
LB23	13.5480	12.4097	9.2
LB20	27.2926	24.5630	11.1
LB18	18.1316	20.7213	-12.5
LB06	8.1925	7.0610	16.0
LB22	5.4349	4.6652	16.5
LB21	34.1846	29.2890	16.7
LB15	3.5014	4.2749	-18.1
LB13	10.8700	9.0992	19.5
LB07	12.9065	10.5662	22.1
LB02	47.4311	38.6874	22.6
LB01	15.9693	12.8673	24.1
LB16	13.0589	10.4550	24.9
LB19	18.7733	32.4672	-42.2
LB12	-	-	-
LB24	-	-	-

Table 2. Totals for the number of taxa, individuals and biomass of the fauna extracted from the MB02 samples sorted by the participating laboratories, following re-sorting by Unicomarine Ltd. Laboratories arranged in order of decreasing difference.

Taxa

Lab.	Lab. analysis	AQC Analysis	% Diff. LB vs. AQC
LB03	14	14	0.0
LB17	15	14	7.1
LB04	14	15	-6.7
LB08	13	14	-7.1
LB09	13	14	-7.1
LB20	12	13	-7.7
LB23	12	13	-7.7
LB15	17	19	-10.5
LB13	16	18	-11.1
LB01	15	17	-11.8
LB06	15	17	-11.8
LB05	13	10	30.0
LB14	17	21	-19.0
LB07	16	12	33.3
LB19	15	19	-21.1
LB16	14	18	-22.2
LB25	21	15	40.0
LB11	10	13	-23.1
LB10	13	17	-23.5
LB02	11	17	-35.3
LB22	8	13	-38.5
LB12	-	-	-
LB18	-	-	-
LB21	-	-	-
LB24	-	-	-

Individuals

Lab.	Lab. analysis	AQC Analysis	% Diff. LB vs. AQC
LB02	2544	2551	-0.3
LB01	2969	2957	0.4
LB20	350	354	-1.1
LB06	2433	2461	-1.1
LB10	899	915	-1.7
LB14	3006	2944	2.1
LB04	1059	1035	2.3
LB22	1503	1544	-2.7
LB19	3559	3130	13.7
LB23	3132	2582	21.3
LB15	2205	1809	21.9
LB11	1715	1347	27.3
LB08	7654	4889	56.6
LB09	7654	4889	56.6
LB16	676	400	69.0
LB25	2906	1704	70.5
LB17	4981	2888	72.5
LB07	5851	3366	73.8
LB13	5068	1489	240.4
LB03	5883	344	1610.2
LB05	2602	123	2015.4
LB12	-	-	-
LB18	-	-	-
LB21	-	-	-
LB24	-	-	-

Biomass

Lab.	Lab. analysis	AQC Analysis	% Diff. LB vs. AQC
LB19	3.2615	3.2706	-0.3
LB17	1.6344	1.5642	4.5
LB23	14.7139	14.0181	5.0
LB08	3.0020	2.8537	5.2
LB09	3.0020	2.8537	5.2
LB11	10.8934	10.1483	7.3
LB01	4.1104	3.6619	12.2
LB16	2.0130	2.3099	-12.9
LB15	1.6785	2.0600	-18.5
LB22	6.4517	8.0152	-19.5
LB04	1.5612	1.2682	23.1
LB06	2.2572	1.7434	29.5
LB14	4.1381	3.1055	33.3
LB10	1.2747	0.9252	37.8
LB02	4.1303	2.7984	47.6
LB07	13.6140	7.5780	79.7
LB03	2.6873	1.4398	86.6
LB13	6.2100	3.1842	95.0
LB20	0.8266	0.3972	108.1
LB25	2.3259	0.6569	254.1
LB05	2.6800	0.0823	3156.4
LB12	-	-	-
LB18	-	-	-
LB21	-	-	-
LB24	-	-	-

Table 3. Summary of the sub-sampling techniques used by the participating laboratories for the analysis of sample MB02.

LabCode	Approximate size of sub-sample taken	Brief summary of method
LB01	#N/K	#N/K
LB02	-	Not sub-sampled
LB03	1/20 Annelids	2 fractions -heavy & light -both completely picked. All taxa except annelids identified.Annelids into grid of 100 squares of which 5 id'ed, counted & weighed. remaining 95 squares weighed. Nos calculated for sample
LB04	1/16 Sample	1/16 sample sorted & id'ed. Counts & biomass given in data return are for 1/16 sample & have not been corrected
LB05	#N/K	#N/K
LB06	1/4 Sample	1/4 of sample removed for sorting & id
LB07	1/10 Oligochaetes 1/10 Nematode	Nematodes subsampled at counting stage, oligochaetes at counting & id stage. All subsampled specimens placed in 1litre of water, mixed, 10% poured into 100ml beaker. For nematodes x3 counts, oligochaetes x4 (4th count used for id)
LB08	1/2 of 1.00mm fraction 1/8 of 0.5mm fraction	Sample divided into 0.5m and 1.00mm fractions using elutriation. Separate sub-samples taken of the two fractions.
LB09	100 or 200 individuals examined Biomass only & id of Oli's	Sediment totally picked & counted, including total count for oligochaetes, Capitella and Manayunkia. For biomass subsample of 100 individuals of oligochaetes & Capitella, 200 of Manayunkia. subsample of 100 oligochaetes for id. Nos then multiplied up
LB10	1/4 Light fraction	Sample mixed in 5litre bucket -heavy fraction completley picked, light fraction mixed & poured onto 5(?)mm sieve, 1/4 removed for analysis. Total count =SSx4 + count from heavy fraction. Also done for biomass.
LB11	1/10 oligochaetes / small polychaetes	Sample divided into >1.00mm and <1.00mm fractions. Fine fraction elutriated and a 10% sub-sample taken from both 'light' and 'heavy' sub-fractions using a divided tray.
LB12	#N/D	#N/D
LB13	1/10 Light fraction	Heavy material + >4mm light + residue form SS sorted completely. 1/10 of light material + <4mm sorted. SS by siphoning from beaker into series of measuring cylinders, stir with magnetic stirrer
LB14	1/7 - oligochaetes	#N/K
LB15	#N/K	#N/K
LB16	10%-38% of sample	Sieved through 1mm & 0.5mm to give 4 fractions (2 heavy,2 light). Each fraction weighed & a portion removed for sorting. Total taxa derived using the 2 weights. Whole sample sorted to collect large individuals.
LB17	1/8 Light fraction 100 Oligochaetes & Nematodes for species ratio	Heavy fraction completely sorted & id'ed. Light fraction placed in sorting tray & 1/8 removed, sorted & counted. An estimate of the ratio of oligoch. & nematode spp was made by examining approx. 100 of each group. Remaining 7/8 checked for spp not in 1/8.
LB18	#N/D	#N/D
LB19	All oligochaetes extracted, 100 individuals examined.	All oligochaetes extracted from sample and weighed. 100 individuals selected from this total using random squares on sub-divided tray and used to estimate proportions of individual species in whole sample.
LB20	1/24	#N/K
LB21	#N/K	#N/K
LB22	1/8 light fraction	Floatation used to separate light fraction into sieve. 1/8 of light fraction derived from 4/32 samples of premarked tray. All other material fully sorted.
LB23	1/10 Oligochaetes	Nematodes recorded as present but not removed. Entire sample sorted. Oligochaetes subsampled prior to id -spread over sorting tray, computer chosen grids sorted; repeated until at least 100 oligochaetes removed -10% of tray.
LB24	#N/D	#N/D
LB25	2 x 100 individuals	Two sub-samples taken of at least 100 oligochaetes each. Variation on technique suggested by Mike Milligan at 1994 oligochaete workshop.

#N/D - no data
#N/K - not known

Table 4. Calculated values of the Bray-Curtis Similarity index comparing the data resulting from analysis of the MB01 sample by the participating laboratories with that from analysis of the corresponding sample by Unicomarine Ltd.

LabCode	Bray-Curtis
LB01	78.98
LB02	95.68
LB03	95.41
LB04	95.12
LB05	97.79
LB06	99.48
LB07	92.18
LB08	95.02
LB09	96.81
LB10	77.18
LB11	91.10
LB12	#N/A
LB13	96.58
LB14	99.14
LB15	96.89
LB16	96.84
LB17	89.27
LB18	97.56
LB19	88.32
LB20	99.22
LB21	79.79
LB22	98.00
LB23	98.12
LB24	#N/A
LB25	98.94

Table 5. Calculated values of the Bray-Curtis Similarity index comparing the data resulting from analysis of the MB02 sample by the participating laboratories with that from analysis of the corresponding sample by Unicomarine Ltd.

	Oligochaetes as separate species	Oligochaete taxa pooled
LB01	-	94.7
LB02	78.4	84.9
LB03	-	-
LB04	80.9	84.1
LB05	-	88.9
LB06	75.2	81.0
LB07	89.1	93.9
LB08	87.2	88.0
LB09	91.4	99.7
LB10	77.1	82.3
LB11	86.2	84.6
LB12	#N/D	#N/D
LB13	87.9	88.3
LB14	86.3	97.6
LB15	81.3	92.1
LB16	68.3	74.8
LB17	77.1	83.2
LB18	#N/D	#N/D
LB19	-	83.9
LB20	82.6	79.2
LB21	-	-
LB22	-	83.4
LB23	-	80.0
LB24	#N/D	#N/D
LB25	75.0	85.8

Table 6. Method used and an indication of the use of sub-contractors by participating laboratories for Particle Size analysis.

LabCode	Methods	Internal / External
LB01	Dry Sieve / Laser	Internal
LB02	Dry Sieve / Laser	Internal
LB03	Dry Sieve	Internal
LB04	Dry Sieve / Laser	Internal
LB05	Wet Sieve / Dry Sieve	Internal
LB06	Wet Sieve / Dry Sieve	Internal
LB07	Wet Sieve / Dry Sieve	Internal
LB08	Laser	Sub-contractor A
LB09	Laser	Sub-contractor B
LB10	Laser	Sub-contractor A
LB11	Laser	Sub-contractor B
LB12	#N/A	
LB13	Dry Sieve / Laser	Sub-contractor C
LB14	Laser	Sub-contractor B
LB15	Dry Sieve / Laser	Sub-contractor C
LB16	Laser	Sub-contractor B
LB17	Laser	Sub-contractor A
LB18	Wet Sieve / Dry Sieve / Pipette	Internal
LB19	Dry Sieve / Pipette	Internal ?
LB20	Wet Sieve / Dry Sieve / Pipette (if >5% silt) / Coulter (if >10%silt)	Internal
LB21	Wet Sieve / Dry Sieve / Laser	Internal + Sub-contractor
LB22	Wet Sieve / Dry Sieve / Sedigraph	Internal
LB23	Dry Sieve / Laser	Internal
LB24	#N/A	-
LB25	Wet Sieve / Dry Sieve / Coulter	Internal

Table 7. Summary of the results of particle size analysis (Malvern Laser) of the replicate samples from sediment circulation PS01.

	% Clay & Silt	Median (phi)	Mean (phi)	Sorting	Skew
PS01-1B	4.57	2.71	2.68	0.52	0.176
PS01-3B	2.73	2.59	2.55	0.46	0.086
PS01-5B	3.25	2.68	2.64	0.49	0.116
PS01-7B	4.88	2.70	2.65	0.56	0.161
PS01-9B	8.15	2.84	2.81	0.66	0.250
PS01-11B	4.34	2.70	2.65	0.54	0.144
PS01-13B	5.25	2.70	2.66	0.56	0.192
PS01-15B	4.24	2.69	2.64	0.54	0.131
PS01-17B	4.55	2.71	2.65	0.54	0.146
PS01-19B	4.07	2.67	2.62	0.52	0.121
PS01-21B	2.92	2.65	2.61	0.48	0.107
PS01-23B	3.25	2.71	2.65	0.51	0.096
PS01-25B	4.39	2.68	2.63	0.54	0.137
PS01-27B	4.74	2.70	2.65	0.56	0.149
PS01-29B	3.83	2.67	2.62	0.52	0.123

Table 8. Summary of the results of particle size analysis (Malvern Laser) of the replicate samples from sediment circulation PS02.

	% Clay & Silt	Median (phi)	Mean (phi)	Sorting	Skew
PS02-1B	46.50	3.87	3.83	2.01	0.590
PS02-3B	51.92	4.06	3.95	2.06	0.544
PS02-5B	51.15	4.03	3.92	2.08	0.545
PS02-7B	54.63	4.19	4.00	2.13	0.511
PS02-9B	54.52	4.19	3.98	2.12	0.501
PS02-11B	56.23	4.27	4.06	2.11	0.500
PS02-13B	55.36	4.22	4.05	2.09	0.513
PS02-15B	54.81	4.20	4.08	2.08	0.538
PS02-17B	58.53	4.42	4.09	2.14	0.444
PS02-19B	58.74	4.43	4.07	2.15	0.432
PS02-21B	57.19	4.33	4.12	2.10	0.494
PS02-23B	58.49	4.40	4.11	2.10	0.462
PS02-25B	55.83	4.25	4.10	2.10	0.526
PS02-27B	58.75	4.41	4.12	2.13	0.457
PS02-29B	49.37	3.97	3.95	2.02	0.596

Table 9. Summary of the results of particle size analysis (Malvern Laser) of the replicate samples from sediment circulation PS03.

	% Clay & Silt	Median (phi)	Mean (phi)	Sorting	Skew
PS03-1B	25.70	0.86	1.07	2.41	0.754
PS03-3B	35.12	0.79	1.17	2.46	0.806
PS03-5B	20.28	0.67	0.80	2.06	0.793
PS03-7B	26.62	0.75	1.04	2.35	0.815
PS03-9B	31.08	0.83	1.16	2.38	0.787
PS03-11B	14.54	0.70	0.83	1.56	0.778
PS03-13B	31.08	0.85	1.16	2.51	0.795
PS03-15B	48.66	3.82	1.55	2.39	-0.198
PS03-17B	18.27	0.69	0.91	2.03	0.822
PS03-19B	26.89	0.73	1.02	2.35	0.822
PS03-21B	23.49	0.76	1.00	2.42	0.800
PS03-23B	25.80	0.74	1.02	2.31	0.818
PS03-25B	33.59	0.81	1.14	2.47	0.799
PS03-27B	39.51	0.94	1.25	2.42	0.753
PS03-29B	34.61	0.82	1.17	2.39	0.8

Table 10. Summary of the results of particle size analysis (Malvern Laser) of the replicate samples from sediment circulation PS04.

	% Clay & Silt	Median (phi)	Mean (phi)	Sorting	Median (μm)	Mean (μm)	Skew
PS04-1B	83.49	5.92	4.84	1.48	16.49	35.01	-0.207
PS04-3B	84.30	6.30	4.91	1.50	12.68	33.34	-0.391
PS04-5B	89.39	6.49	5.35	1.38	11.12	24.59	-0.427
PS04-7B	89.93	6.42	4.69	1.37	11.68	38.83	-0.395
PS04-9B	72.19	5.01	4.20	1.67	31.06	54.59	0.055
PS04-11B	74.20	5.14	4.37	1.62	28.33	48.25	0.067
PS04-13B	82.85	6.26	4.03	1.60	13.06	61.24	-0.400
PS04-15B	83.17	6.39	4.63	1.57	11.96	40.31	-0.444
PS04-17B	71.57	4.73	4.29	1.50	37.77	50.97	0.260
PS04-19B	79.44	5.45	4.79	1.52	22.95	36.22	0.012
PS04-21B	82.41	6.24	4.79	1.54	13.20	36.18	-0.358
PS04-23B	78.43	5.31	4.56	1.52	25.28	42.29	0.058
PS04-25B	80.51	5.74	4.53	1.56	18.74	43.14	-0.159
PS04-27B	83.84	6.18	4.62	1.50	13.81	40.68	-0.332
PS04-29B	81.50	5.81	4.90	1.51	17.78	33.57	-0.156

Table 11. Summary of the particle size information received from participating laboratories for the first particle size distribution - PS01.

Lab	Method	% < 63μm	Median	Mean	Sort	IGS (SKi)
LB01	DS/L	1.80	2.82	2.93	0.41	0.26
LB02	L	11.78	2.74	2.73	1.14	0.42
LB03	DS	1.47	2.84	2.90	0.38	0.87
LB04	DS/L	3.22	2.80	2.83	0.33	0.31
LB05	WS/DS	4.83	2.98	#N/D	0.40	0.32
LB06	WS/DS	5.40	#N/D	#N/D	#N/D	#N/D
LB07	WS/DS	5.41	2.85	2.96	0.61	0.79
LB08	L	8.90	2.70	2.84	0.65	0.53
LB09	L	Format	Format	Format	Format	Format
LB10	L	7.50	2.62	2.73	0.66	0.53
LB11	L	4.13	2.67	2.72	0.70	0.08
LB12	-	#N/D	#N/D	#N/D	#N/D	#N/D
LB13	L	5.44	1.01	1.02	0.92	0.41
LB14	L	3.84	Format	Format	0.86	0.54
LB15	L	6.26	1.00	1.03	1.01	0.46
LB16	L	3.96	2.45	Format	0.38	-0.03
LB17	L	5.43	2.59	2.68	0.62	0.54
LB18	WS/DS/P	1.44	2.73	2.81	0.59	0.24
LB19	DS/P	2.62	2.25	2.86	0.61	0.23
LB20	DS/P	3.19	3.00	3.05	Extr. good	0.56
LB21	FD/DS	3.10	3.00	3.03	0.40	0.24
LB22	WS/FD/DS/SG	4.37	2.90	2.92	0.39	0.29
LB23	FD/DS	2.80	2.85	2.92	0.56	0.28
LB24	-	#N/D	#N/D	#N/D	#N/D	#N/D
LB25	FD/WS/DS/CC	2.62	#N/D	2.93	0.46	0.72

PS01

Summary	% < 63μm	Median	Mean	Sort	IGS (SKi)
Number of values	22	19	18	20	21
Mean of laboratories	4.52	2.57	2.66	0.60	0.41
Mean of 15 replicates	4.34	2.69	2.65	0.53	0.14
Laboratory minimum	1.44	1.00	1.02	0.33	-0.03
Laboratory maximum	11.78	3.00	3.05	1.14	0.87

Table 12. Summary of the particle size information received from participating laboratories for the second particle size distribution - PS02.

Lab	Method	% < 63μm	Median	Mean	Sort	IGS (SKi)
LB01	DS/L	36.20	3.76	4.54	1.92	0.61
LB02	L	61.95	4.85	4.11	2.17	0.27
LB03	DS	52.19	4.00	3.88	0.48	-1.40
LB04	WS/DS/L	57.70	4.57	5.34	2.04	0.26
LB05	S/P	56.80	4.30	5.33	1.78	0.60
LB06	WS/DS	48.36	3.95	#N/D	#N/D	#N/D
LB07	WS/DS	45.68	3.91	3.89	0.62	-0.9
LB08	L	55.50	4.05	3.44	0.59	-0.49
LB09	L	Format	Format	Format	Format	Format
LB10	L	56.40	4.11	3.92	0.67	-0.61
LB11	L	65.90	5.13	5.05	1.58	-0.12
LB12	-	#N/D	#N/D	#N/D	#N/D	#N/D
LB13	L	55.46	4.27	3.87	2.38	0.48
LB14	L	64.64	4.68	Format	1.48	1.47
LB15	L	55.62	4.26	3.59	2.28	0.37
LB16	L	#N/D	#N/D	#N/D	#N/D	#N/D
LB17	L	56.17	4.11	3.93	0.65	-0.60
LB18	WS/DS/P	36.67	3.75	3.81	0.77	-0.01
LB19	DS/P	54.31	3.63	4.25	1.16	0.38
LB20	DS/P/CC	44.19	3.90	5.21	2.26	0.40
LB21	FD/L	80.43	6.12	5.85	1.87	-0.14
LB22	WS/FD/DS/SG	54.80	4.38	4.39	2.14	0.63
LB23	FD/DS	21.91	3.35	3.42	0.69	0.13
LB24	-	#N/D	#N/D	#N/D	#N/D	#N/D
LB25	FD/WS/DS/CC	44.89	#N/D	4.83	1.84	0.44

PS02

Summary	% < 63μm	Median	Mean	Sort	IGS (SKi)
Number of values	21	20	19	20	19
Mean of laboratories	52.66	4.25	4.35	1.47	0.14
Mean of 15 replicates	54.80	4.22	4.03	2.09	0.51
Laboratory minimum	21.91	3.35	3.42	0.48	-1.40
Laboratory maximum	80.43	6.12	5.85	2.38	1.47

Table 13. Summary of the particle size information received from participating laboratories for the third particle size distribution - PS03.

Lab	Method	% < 63μm	Median	Mean	Sort	IGS (SKi)
LB01	DS/L	0.40	1.61	1.43	0.84	-0.33
LB02	L	5.47	1.54	1.53	0.82	0.33
LB03	DS	0.06	1.59	1.29	0.98	-0.74
LB04	WS/DS/L	1.03	1.60	1.05	1.01	-0.49
LB05	S	0.16	1.62	1.05	1.03	-0.49
LB06	WS/DS	0.83	1.58	#N/D	#N/D	-0.32
LB07	WS/DS	0.71	1.45	1.32	1.05	-0.34
LB08	#N/D	#N/D	#N/D	#N/D	#N/D	#N/D
LB09	L	Format	Format	Format	Format	Format
LB10	L	0.80	1.33	1.18	0.91	-0.11
LB11	L	3.57	1.54	1.69	0.97	0.09
LB12	-	#N/D	#N/D	#N/D	#N/D	#N/D
LB13	L	2.25	1.55	1.05	0.89	-0.38
LB14	L	2.97	Format	Format	0.82	0.74
LB15	L	6.85	1.55	1.34	1.08	0.19
LB16	L	Format	Format	Format	Format	Format
LB17	L/S	0.90	1.39	1.27	0.85	0.11
LB18	WS/DS/P	0.27	1.45	1.29	1.16	-0.21
LB19	DS/P	0.25	0.90	1.24	1.03	-0.23
LB20	DS/P	0.20	1.60	1.30	0.96	-0.78
LB21	FD/DS	0.37	1.89	1.25	0.79	0.04
LB22	WS/FD/DS/SG	0.57	1.65	1.28	0.96	-0.52
LB23	FD/DS	0.24	1.40	1.30	0.97	-0.23
LB24	-	#N/D	#N/D	#N/D	#N/D	#N/D
LB25	FD/WS/DS/CC	0.15	#N/D	1.36	0.97	-0.85

PS03

Summary	% < 63μm	Median	Mean	Sort	IGS (SKi)
Number of values	20	18	18	19	20
Mean of laboratories	1.40	1.51	1.29	0.95	-0.23
Mean of 15 replicates	3.20	1.45	1.21	0.82	-0.04
Laboratory minimum	0.06	0.90	1.05	0.79	-0.85
Laboratory maximum	6.85	1.89	1.69	1.16	0.74

Table 14. Summary of the particle size information received from participating laboratories for the fourth particle size distribution - PS04.

Lab	Method	% < 63μm	Median	Mean	Sort	IGS (SKi)
LB01	#N/D	#N/D	#N/D	#N/D	#N/D	#N/D
LB02	DS/L	86.52	6.43	5.06	1.90	-0.10
LB03	WS/DS	86.94	4.00	0.06	0.26	-6.00
LB04	DS/L	96.00	6.24	6.36	1.49	0.03
LB05	S/P	84.90	5.50	6.23	2.05	0.36
LB06	WS/DS	90.96	#N/D	#N/D	#N/D	#N/D
LB07	WS/DS	89.86	4.44	4.35	0.57	-5.29
LB08	L	86.70	4.42	4.36	0.24	-4.93
LB09	L	Format	Format	Format	Format	Format
LB10	L	87.30	4.43	4.36	0.27	-4.45
LB11	L	78.80	5.63	5.36	1.50	-0.30
LB12	-	#N/D	#N/D	#N/D	#N/D	#N/D
LB13	L	73.85	4.82	4.37	1.48	0.24
LB14	L	74.90	Format	Format	1.61	1.59
LB15	L	78.10	5.39	4.45	1.56	-0.01
LB16	L	Format	Format	Format	Format	Format
LB17	L	86.93	4.43	4.36	0.26	-4.86
LB18	WS/DS/P	24.00	3.30	3.40	2.00	0.20
LB19	DS/P	92.34	5.06	5.86	1.62	0.27
LB20	DS/P/CC	79.90	#N/D	6.88	2.08	-0.87
LB21	WS/DS	91.58	4.81	4.80	0.59	0.00
LB22	WS/FD/DS/SG	85.56	8.00	8.22	3.40	0.08
LB23	FD/L	86.00	4.90	5.28	1.44	0.44
LB24	-	#N/D	#N/D	#N/D	#N/D	#N/D
LB25	-	#N/D	#N/D	#N/D	#N/D	#N/D

PS04

Summary	% < 63μm	Median	Mean	Sort	IGS (SKi)
Number of values	19	16	17	18	18
Mean of laboratories	82.17	5.11	4.93	1.35	-1.31
Mean of 15 replicates	81.15	5.83	4.63	1.52	-0.19
Laboratory minimum	24.00	3.30	0.06	0.24	-6.00
Laboratory maximum	96.00	8.00	8.22	3.40	1.59

Table 15. Summary of the percentage differences between the estimate of the specified parameter made by the participating laboratory and that resulting from analysis of the fifteen replicate samples of the same sediment.

PS03

	Method	% < 63μm	Median	Mean	Sort	IGS (SKi)
LB01	DS/L	-87.5	11.2	18.6	1.9	635.0
LB02	L	71.1	6.4	26.9	-0.1	-838.8
LB03	DS	-98.1	10.1	6.7	19.5	1542.9
LB04	WS/DS/L	-67.8	10.5	-12.9	23.1	993.8
LB05	S	-95.0	11.9	-12.9	25.4	989.3
LB06	WS/DS	-74.0	9.1	-	-	614.3
LB07	WS/DS	-77.8	0.1	9.5	27.9	658.9
LB08	#N/D	-	-	-	-	-
LB09	L	-	-	-	-	-
LB10	L	-75.0	-8.1	-2.1	10.9	145.5
LB11	L	11.7	6.4	40.2	18.2	-300.9
LB12	-	-	-	-	-	-
LB13	L	-29.6	7.0	-12.9	8.4	748.2
LB14	L	-7.1	-	-	0.2	-1747.3
LB15	L	114.2	7.0	11.2	31.6	-521.9
LB16	L	-	-	-	-	-
LB17	L/S	-71.9	-4.0	5.4	3.6	-345.5
LB18	WS/DS/P	-91.6	0.1	7.0	41.3	362.1
LB19	DS/P	-92.2	-37.8	2.9	25.5	413.4
LB20	DS/P	-93.7	10.5	7.9	17.0	1641.1
LB21	FD/DS	-88.4	30.5	3.7	-3.7	-196.0
LB22	WS/FD/DS/SG	-82.2	14.0	6.2	17.0	1060.7
LB23	FD/DS	-92.5	-3.3	7.9	18.2	413.4
LB24	-	-	-	-	-	-
LB25	FD/WS/DS/CC	-95.3	-	12.8	18.2	1797.3

PS04

Method	% < 63μm	Median	Mean	Sort	IGS (SKi)
#N/D	-	-	-	-	-
DS/L	6.6	10.4	9.2	24.8	-46.2
WS/DS	7.1	-31.3	-98.6	-82.7	3092.2
DS/L	18.3	7.1	37.3	-2.1	-116.0
S/P	4.6	-5.6	34.5	34.6	-291.7
WS/DS	12.1	-	-	-	-
WS/DS	10.7	-23.7	-6.2	-62.6	2716.8
L	6.8	-24.1	-5.9	-84.2	2525.1
L	-	-	-	-	-
L	7.6	-24.0	-5.9	-82.3	2269.5
L	-2.9	-3.4	15.7	-1.5	59.7
-	-	-	-	-	-
L	-9.0	-17.3	-5.7	-2.8	-225.7
L	-7.7	-	-	5.5	-945.6
L	-3.8	-7.5	-4.0	2.5	-96.8
L	-	-	-	-	-
L	7.1	-24.0	-5.9	-82.9	2487.9
WS/DS/P	-70.4	-43.4	-26.6	31.3	-206.5
DS/P	13.8	-13.1	26.5	6.4	-243.8
DS/P/CC	-1.5	-	48.5	36.6	363.3
WS/DS	12.9	-17.4	3.7	-61.1	-99.1
WS/FD/DS/SG	5.4	37.3	77.4	123.3	-142.6
FD/L	6.0	-15.9	14.0	-5.4	-334.3
-	-	-	-	-	-
-	-	-	-	-	-

Analytical Methods

CC - Coulter Counter
DS - Dry Sieve
FD - Freeze Dry
L - Malvern Laser Diffraction
P - Pipette
SG - Sedigraph
WS - WetSieve

Table 16. The identifications of the fauna made by participating laboratories for RT01. Names are given only where different to the AQC identification.

RT	Taxon	LB01	LB02	LB03	LB04	LB05	LB06	LB07
RT01	Hesionura elongata	- -	- -	- -	- -	- -	- -	- -
RT02	Cossura longocirrata	- sp.	- -	- sp.	- -	- [(longicirrata?)]	- -	- sp
RT03	Nephtys cirrosa	- -	- -	- -	- -	- caeca	- -	[Nepthys] -
RT04	Paramphinome jeffreysii	- -	- -	Pseudeurythoe hemuli	- -	- -	- -	- -
RT05	Protodorvillea kefersteini	- -	- -	- [kefersteinia]	- -	- -	- -	- -
RT06	Streblospio shrubsolii	- sp.	- -	- -	- -	- -	- [shrubsoli]	- -
RT07	Caulleriella zetlandica	Chaetozone sp. B	- -	- -	- -	Tharyx killariensis	Chaetozone setosa	- -
RT08	Mediomastus fragilis	- -	- -	- -	- -	- -	- -	- -
RT09	Ophelina modesta	- -	- -	- -	- -	- -	- -	- -
RT10	Lanice conchilega	- -	- -	- -	- -	- -	- -	- -
RT11	Tubifex costatus	Oligochaeta n/a	- -	- -	- -	- -	- -	- -
RT12	Argissa hamatipes	- -	- -	- -	- -	- -	- -	- -
RT13	Bathyporeia pilosa	- -	- -	- -	- -	- -	- -	- -
RT14	Eudorella truncatula	- -	- -	- -	- -	- -	- -	- -
RT15	Crangon allmanni	- [allmani]	- [allmani]	- crangon	- -	- [allmani]	- [allmani]	- [allmani]
RT16	Onoba aculeus	Odostomia sp.	- semicostata	- -	- -	- -	- -	- -
RT17	Retusa umbilicata	- -	- -	- truncatula	- obtusa	Cylichna cylindracea	Cylichna cylindracea	- truncatula
RT18	Nucula nitidosa	- -	- -	- sulcata	- -	- -	- -	- -
RT19	Abra alba	- -	- -	- -	- -	- -	- -	- -
RT20	Ophiura albida	- -	- -	- -	- -	- -	- -	- affinis

RT	Taxon	LB14	LB15	LB16	LB17	LB18	LB19	LB20
RT01	Hesionura elongata	- -	- -	- -	- -	- -	- -	- -
RT02	Cossura longocirrata	- -	- -	- [longicirrata]	- -	- -	- -	- soyeri
RT03	Nephtys cirrosa	- -	- -	- -	- -	- -	- -	- -
RT04	Paramphinome jeffreysii	- -	[Paramphionome] -	Pseudeurythoe hemuli	Polyphysia crassa	- -	- -	- -
RT05	Protodorvillea kefersteini	- -	- -	- [ketersteini]	- -	- -	- -	- -
RT06	Streblospio shrubsolii	- -	- [shrubsolli]	Scolelepsis (tridentata)?	- -	- -	- -	- -
RT07	Caulleriella zetlandica	Chaetozone n.sp.	Chaetozone spp	Chaetozone gibber	Chaetozone setosa	- -	- -	- -
RT08	Mediomastus fragilis	- -	- -	- -	- -	- -	- -	- -
RT09	Ophelina modesta	- -	Opheliidae spp juv	Travisia forbesi	- -	Ophelia limacina	- -	- -
RT10	Lanice conchilega	- -	- -	- -	- -	- -	- -	- -
RT11	Tubifex costatus	- -	- -	OLIGOCHAETA n/a	Oligochaeta unident	- -	- -	- -
RT12	Argissa hamatipes	- -	- -	- -	Lysianassidae n/a	- -	Lysianassa ceratina	- -
RT13	Bathyporeia pilosa	- -	- sarsi	- -	- -	- -	- sarsi	- -
RT14	Eudorella truncatula	- -	[Endorella] -	- -	- -	- -	- -	- -
RT15	Crangon allmanni	- [allmani]	- [allmani]	- [allmani]	- -	- -	- -	- -
RT16	Onoba aculeus	- -	[Onova] [juv (aculeus)]	- -	- -	- -	Chrysallida decussata	- semicostata
RT17	Retusa umbilicata	- truncatula	Cylichna cylindracea	Cylinchna cylindracea	- -	- -	- -	- -
RT18	Nucula nitidosa	- -	- -	- -	- [turgida]	- -	- sulcata	- -
RT19	Abra alba	- -	- -	- -	- -	- -	- -	- -
RT20	Ophiura albida	- -	- -	- -	- -	- -	- -	- -

Table 16. The identifications of the fauna made by participating laboratories for RT01. Names are given only where different to the AQC identification.

RT	Taxon	LB08	LB09	LB10	LB11	LB12	LB13
RT01	Hesionura elongata	- -	- -	- -	- -	n/d n/d	- -
RT02	Cossura longocirrata	- indet.	- [longocirrata?]	Cossuridae n/a	n/d n/d	n/d n/d	- -
RT03	Nephtys cirrosa	- -	- -	- -	- -	n/d n/d	- -
RT04	Paramphinome jeffreysii	- -	Ud polychaete	- -	- -	n/d n/d	- -
RT05	Protodorvillea kefersteini	- -	Ud polychaete	- -	- -	n/d n/d	- -
RT06	Streblospio shrubsolii	- -	- -	- -	- -	n/d n/d	- -
RT07	Caulleriella zetlandica	Chaetozone sp.	Chaetozone n.sp ?	- -	- -	n/d n/d	- -
RT08	Mediomastus fragilis	- -	- -	- -	- -	n/d n/d	[Mediomasus] -
RT09	Ophelina modesta	- -	Ophelia bicornis ?	- -	- -	n/d n/d	Ophelia sp. indet.
RT10	Lanice conchilega	- -	Eupolymnia nesidensis	- -	- -	n/d n/d	- -
RT11	Tubifex costatus	- -	- -	- -	- -	n/d n/d	- -
RT12	Argissa hamatipes	- -	- -	- -	- -	n/d n/d	- -
RT13	Bathyporeia pilosa	- -	- -	- -	- -	n/d n/d	- -
RT14	Eudorella truncatula	- -	- -	- -	- -	n/d n/d	- -
RT15	Crangon allmanni	- -	- [allmani]	- [allmani]	- [allmani]	n/d n/d	- [allmani]
RT16	Onoba aculeus	- -	Cingula semicostata?	- -	- -	n/d n/d	- -
RT17	Retusa umbilicata	- truncatula	- -	- truncatula	- truncatula	n/d n/d	- -
RT18	Nucula nitidosa	- -	- [turgida]	- -	- -	n/d n/d	- -
RT19	Abra alba	- -	- -	- -	- -	n/d n/d	- -
RT20	Ophiura albida	- -	- ophiura	- sp.	- -	n/d n/d	- -

RT	Taxon	LB21	LB22	LB23	LB24	LB25
RT01	Hesionura elongata	- -	- -	Sphaerosyllis erinaceus	n/d n/d	- -
RT02	Cossura longocirrata	Apelochaeta marioni	- -	Aphelochaeta sp.	n/d n/d	- -
RT03	Nephtys cirrosa	- -	- -	- -	n/d n/d	- -
RT04	Paramphinome jeffreysii	Euphrosine armadillo	- -	- -	n/d n/d	- [jeffreysi]
RT05	Protodorvillea kefersteini	- -	- -	- -	n/d n/d	- -
RT06	Streblospio shrubsolii	- [shrubsolli]	- -	- -	n/d n/d	- -
RT07	Caulleriella zetlandica	Aphelochaeta multibranc	Chaetozone Type B	Chaetozone N. sp	n/d n/d	[Caullierella] -
RT08	Mediomastus fragilis	- -	- -	- -	n/d n/d	- -
RT09	Ophelina modesta	Levinsinia gracilis	- -	- -	n/d n/d	- -
RT10	Lanice conchilega	Nicolea zostericola	- -	- -	n/d n/d	- -
RT11	Tubifex costatus	Tubificoide sp n/a	- -	- -	n/d n/d	- -
RT12	Argissa hamatipes	- [hematipes]	- -	- -	n/d n/d	- -
RT13	Bathyporeia pilosa	- elegans	[Bathyporiea] -	- -	n/d n/d	- -
RT14	Eudorella truncatula	- emarginata	- -	- -	n/d n/d	- -
RT15	Crangon allmanni	Pontophilus trispinosus	- -	- -	n/d n/d	- [allmani]
RT16	Onoba aculeus	[Onuba] -	- -	- -	n/d n/d	- -
RT17	Retusa umbilicata	Cylichna cyclindracea	- obtusa	- truncatula	n/d n/d	- -
RT18	Nucula nitidosa	- hanylii	- -	- -	n/d n/d	- -
RT19	Abra alba	- -	- -	- -	n/d n/d	- -
RT20	Ophiura albida	- robusta	- -	- -	n/d n/d	- -

Table 17. The identifications of the fauna made by participating laboratories for RT02. Names are given only where different to the AQC identification.

	Taxon	LB01	LB02	LB03	LB04	LB05	LB06	LB07
01	Anemonia viridis	Actinia equina	Urticina eques	Actinia equina	- -	Actinia equina	Actinia equina	Actinia equina
02	Exogone verugera	- hebes	- -	- -	- -	[Exogene] -	- -	- -
03	Fabricia sabella	- -	- -	- -	- -	- -	- -	- -
04	Ampelisca spinipes	- -	- -	- -	- -	- -	- -	[Ampelisa] -
05	Caprella linearis	- -	- -	- -	- -	- -	- -	- -
06	Pagurus bernhardus	- -	- -	- -	- -	- -	- -	- -
07	Sabellaria spinulosa	- -	- -	- -	- -	- -	- -	- -
08	Melinna palmata	Sabellides octocirrata	- -	- -	- -	- -	- -	- -
09	Parvicardium ovale	- -	- -	Cerastoderma edule	- -	- -	- -	- -
10	Echinocyamus pusillus	- -	- -	- -	- -	- -	- -	- -
11	Tubularia indivisa	Colonial hydroid n/d	- -	- sp.	- -	- -	- -	[Tubalaria] -
12	Sternaspis scutata	- -	[Sternapsis] -	- -	[Sternapsis] -	- -	- -	- -
13	Magelona minuta	- -	- -	- -	- -	- -	- -	[Magalona] -
14	Scalibregma inflatum	- -	- -	- -	- -	- -	- -	- -
15	Lumbrineris gracilis	- latreilli	- -	- -	[Lumbrinereis] -	- -	- -	[Lumbrinereis] latreilli
16	Rissoa interrupta	Hydrobia ulvae	- [parva (smooth form)]	- -	- -	- parva	- [parva (? interrupta)]	- parva
17	Jassa marmorata	- -	- [mamorata]	- -	- -	- -	- -	- -
18	Ascidiella aspersa	Ciona intestinalis	[Ascidella] -	- -	- -	- -	- -	- -
19	Phyllodoce mucosa	[Anaitides] -	[Anaitides] -	[Anaitides] -	[Anaitides] -	[Anaitides] -	- -	- -
20	Scolelepis squamata	- tridentata	- -	[Parascololepis] tridentata	- sp. indet.	[Scololepis] -	- -	- -

	Taxon	LB14	LB15	LB16	LB17	LB18	LB19	LB20
01	Anemonia viridis	- -	[(Anemonia)] [(viridis)]	Actinia equina	Actinaria unident	Actinia equina	Actinia equina	- -
02	Exogone verugera	- -	- -	- -	[Exogene] -	- -	- -	- -
03	Fabricia sabella	- [stellaris]	- -	- -	- -	- -	- -	- -
04	Ampelisca spinipes	- -	- -	- -	- -	- -	- -	- -
05	Caprella linearis	- -	- -	- septentrionalis	- -	- -	- -	- -
06	Pagurus bernhardus	- -	[Pagarus] -	- pubescens	- -	- -	- -	- -
07	Sabellaria spinulosa	- -	- -	- -	- -	- -	- -	- -
08	Melinna palmata	- -	- -	- -	[Melina] -	- -	- -	- -
09	Parvicardium ovale	- -	- -	- -	- -	- -	- -	- -
10	Echinocyamus pusillus	- -	- -	- [puillus]	- -	- -	- -	- -
11	Tubularia indivisa	- -	- -	- -	- -	- -	- -	- -
12	Sternaspis scutata	[Strenaspis] -	[Sternapsis] -	[Sternapsis] -	[Sternapsis] -	- -	[Sternapsis] -	[Sternapsis] -
13	Magelona minuta	- -	[Megalona] -	- -	- -	- -	- filiformis	- -
14	Scalibregma inflatum	- -	- -	- -	- -	- -	- -	- -
15	Lumbrineris gracilis	[Lumbrinereis] -	- (latreilli)?	- -	[Lumbrinereis] -	- -	- latreilli	- -
16	Rissoa interrupta	- [parva var interrupta]	- parva	- parva	- -	- parva	- parva	- -
17	Jassa marmorata	- -	- -	- -	- pusilla/falcata	- -	Gammoropsis nitida	- -
18	Ascidiella aspersa	Ascidiidae n/d	- [aspera]	Ascidiidae n/d	- -	- scabra	- -	- -
19	Phyllodoce mucosa	- -	- -	[Phyllodoce(anaitides)] -	[Anatides] -	- -	[Anaitides] -	[Anaitides] -
20	Scolelepis squamata	- -	[Scololepis] -	- mesnili	[Scolelepsis] -	- -	- -	- -

Table 17. The identifications of the fauna made by participating laboratories for RT02. Names are given only where different to the AQC identification.

RT	Taxon	LB08	LB09	LB10	LB11	LB12	LB13
RT01	Anemonia viridis	- -	Actinia equina	- -	Actinia equina	n/d n/d	Actinia equina
RT02	Exogone verugera	- -	- -	- -	- -	n/d n/d	- -
RT03	Fabricia sabella	- -	Fabriciola baltica	- -	- -	n/d n/d	- -
RT04	Ampelisca spinipes	- -	- -	- -	- -	n/d n/d	- -
RT05	Caprella linearis	- -	- -	- -	- -	n/d n/d	- -
RT06	Pagurus bernhardus	- -	- -	- -	- -	n/d n/d	- -
RT07	Sabellaria spinulosa	- -	- -	- -	- -	n/d n/d	- -
RT08	Melinna palmata	- -	- -	- -	- -	n/d n/d	- -
RT09	Parvicardium ovale	- -	Cerastoderma lamarcki	- -	- -	n/d n/d	- -
RT10	Echinocyamus pusillus	- -	- -	- -	- -	n/d n/d	- -
RT11	Tubularia indivisa	- -	- -	- -	- -	n/d n/d	- -
RT12	Sternaspis scutata	- -	Sternaspidae n/d	- -	- -	n/d n/d	- -
RT13	Magelona minuta	- -	- -	- -	[Megalona] -	n/d n/d	- -
RT14	Scalibregma inflatum	- -	- -	- -	- -	n/d n/d	- -
RT15	Lumbrineris gracilis	- -	- -	- -	- -	n/d n/d	- latreilli
RT16	Rissoa interrupta	- parva	- parva	- parva	- [parva var interupta]	n/d n/d	- parva
RT17	Jassa marmorata	- -	- -	- -	- -	n/d n/d	- -
RT18	Ascidiella aspersa	- -	- -	- -	- -	n/d n/d	- -
RT19	Phyllodoce mucosa	[Anaitides] -	- -	- -	- -	n/d n/d	- -
RT20	Scolelepis squamata	- -	- -	[Scolelepis (Scolelepis)] -	- -	n/d n/d	- -

RT	Taxon	LB21	LB22	LB23	LB24	LB25
RT01	Anemonia viridis	Actinia equina	- -	Actinia equina	n/d n/d	- -
RT02	Exogone verugera	[Exogene] naidena	- hebes	- -	n/d n/d	- -
RT03	Fabricia sabella	- -	- -	- [stellaris]	n/d n/d	- -
RT04	Ampelisca spinipes	- -	- -	- -	n/d n/d	- -
RT05	Caprella linearis	- -	- tuberculata	- -	n/d n/d	- -
RT06	Pagurus bernhardus	- -	- -	- -	n/d n/d	- -
RT07	Sabellaria spinulosa	- -	- -	- -	n/d n/d	- -
RT08	Melinna palmata	Amage adspersa	- -	- -	n/d n/d	- -
RT09	Parvicardium ovale	- -	- -	- -	n/d n/d	- -
RT10	Echinocyamus pusillus	- -	- -	- -	n/d n/d	- -
RT11	Tubularia indivisa	- -	- -	- -	n/d n/d	- -
RT12	Sternaspis scutata	[Sternapsis] -	- -	- -	n/d n/d	- -
RT13	Magelona minuta	Capitellides giardi	- -	- -	n/d n/d	filiformis(?)
RT14	Scalibregma inflatum	- -	- -	- -	n/d n/d	- -
RT15	Lumbrineris gracilis	[Lumbrinereis] -	- -	- latreilli	n/d n/d	- -
RT16	Rissoa interrupta	Hydrobia ulvae	- [parva var interrupta]	- -	n/d n/d	- -
RT17	Jassa marmorata	- ocia	- -	- -	n/d n/d	- -
RT18	Ascidiella aspersa	- [aspera]	- -	- -	n/d n/d	- -
RT19	Phyllodoce mucosa	Mysta picta	[Anaitides] -	- -	n/d n/d	- -
RT20	Scolelepis squamata	- -	- tridentata	- -	n/d n/d	- -

Table 18. The identifications of the fauna made by participating laboratories for RT03. Names are given only where different to the AQC identification.

RT	Taxon	LB01	LB02	LB03	LB04	LB05	LB06	LB07
RT01	Aonides paucibranchiata	- -	- -	- -	- -	- -	- -	- -
RT02	Capitella capitata	- -	- -	Capitomastus minimus	- -	- sp.complex	Capitomastus minimus	- sp
RT03	Polydora cornuta	- socialis	- -	- [ligni]	- ciliata	- ciliata	- [ligni]	- [ligni]
RT04	Syllis cornuta	[Langerhansia] -	- -	[Langerhansia] -	[Langerhansia] -	[Langerhansia] -	- -	[Langerhansia] -
RT05	Aricidea catherinae	- suecica	- [catharinae]	- -	[Aricidia] suecica	- cerrutii	- -	- cerrutii
RT06	Poecilochaetus serpens	- -	- -	- -	- -	- -	- -	- -
RT07	Heteromastus filiformis	- -	- -	Mediomastus fragilis	- -	- -	Capitella capitata	- [filformis]
RT08	Pygospio elegans	- -	- -	- -	- -	- -	- -	- -
RT09	Sphaerodoropsis minuta	- -	- -	- -	- balticum	- -	- -	[Sphaerdoropsis] balticum
RT10	Aphelochaeta marioni	- -	- -	[Tharyx] -	[Tharyx] -	[Tharyx] -	- -	- -
RT11	Corbula gibba	- -	- -	- -	- -	- -	- -	- -
RT12	Turtonia minuta	- -	Mysella bidentata	- -	- -	Mysella bidentata	- -	Mysella bidentata
RT13	Cingula trifasciata	- [cingillus]	- -	- [cingillus]	- [cingillus]	- [cingullus]	- -	- -
RT14	Amphipholis squamata	- -	- -	- -	- -	- -	- -	- -
RT15	Odostomia turrita	- unidentata	- unidentata	- -	- plicata	- plicata	- -	- -
RT16	Dynamene bidentata	- -	- -	- -	- -	- -	- -	- -
RT17	Cumella pygmaea	- -	- -	- -	- -	- -	- -	- -
RT18	Corophium acherusicum	- -	- -	- -	- -	- -	- -	- -
RT19	Guernea coalita	- -	- -	- -	- -	- -	- -	- -
RT20	Bathyporeia tenuipes	- -	- pelagica	- -	- -	- sarsi	- -	- -

RT	Taxon	LB14	LB15	LB16	LB17	LB18	LB19	LB20
RT01	Aonides paucibranchiata	Prionospio cf multibranchiata	- -	- -	- -	- -	- -	- -
RT02	Capitella capitata	- spp complex	- -	- [capitata sp. comp.]	Capitomastus minimus	- (complex)?	- -	- sp.
RT03	Polydora cornuta	- -	- -	- -	- [ligni]	- [ligni]	- [ligni]	- [ligni]
RT04	Syllis cornuta	[Langerhansia] -	- -	- -	[Langerhansia] -	- -	Trypanosyllis coeliaca	[Langerhansia] -
RT05	Aricidea catherinae	- -	- ?cerrutii	[Arcidea] cerrutii	- suecica	- cerruti	- -	- -
RT06	Poecilochaetus serpens	- -	- -	- -	- -	- -	- ?(fulgoris)	- -
RT07	Heteromastus filiformis	- -	- -	- -	- -	- -	- -	- -
RT08	Pygospio elegans	- -	- -	- -	Microspio atlantica	- -	[Pygiospio] -	- -
RT09	Sphaerodoropsis minuta	- -	[Sphaerodropsis] -	Sphaerodoridium n/d	[Sphaerodopsis] -	Sphaerodoridium balticum	[Sphaerodopsis] -	- balticum
RT10	Aphelochaeta marioni	- -	[Tharyx] -	- -	[Tharyx] multibranchiis	- multibranchiis(?)	- -	[Tharyx] -
RT11	Corbula gibba	- -	- -	- -	- -	- -	- -	- -
RT12	Turtonia minuta	- -	- -	Mysella bidentata	- -	Mysella bidentata	Mysella bidentata	- -
RT13	Cingula trifasciata	- [?trifasciata]	- [cingullis / trifasciata]	Barleeia unifasciata	- [cingillis]	- -	Barleeia unifasciata	- [cingillus]
RT14	Amphipholis squamata	- -	- -	- -	Juvenile ophiuroidea	- -	Amphiura chiajei	- -
RT15	Odostomia turrita	- ?unidentata	- -	- [turrita??]	Brachystomia eulimoides	- -	Brachyostomia rissoides	- unidentata
RT16	Dynamene bidentata	-	- -	- -	- -	- -	- -	- -
RT17	Cumella pygmaea	- -	- -	- -	- -	- -	Leucon nasica	- -
RT18	Corophium acherusicum	- -	- acutum	- -	- [acherusicum (F)]	- -	- -	- -
RT19	Guernea coalita	- -	- -	Tryphosella sarsi	- -	- -	Gammaridea(juv.) n/d	- -
RT20	Bathyporeia tenuipes	- gracilis	- -	- -	- sarsi	- sarsi	- pilosa	- -

Table 18. The identifications of the fauna made by participating laboratories for RT03. Names are given only where different to the AQC identification.

RT	Taxon	LB08	LB09	LB10	LB11	LB12	LB13
RT01	Aonides paucibranchiata	"	Paraonis fulgens	Minuspio cf. multibranchiata	"	n/d n/d	"
RT02	Capitella capitata	" [capitata complex]	" species complex	" sp.	" [capitata spp complex]	n/d n/d	"
RT03	Polydora cornuta	" [ligni]	" ciliata-complex	"	Pseudopolydora antennata	n/d n/d	"
RT04	Syllis cornuta	Typosyllis sp.	"	[Langerhansia] "	"	n/d n/d	"
RT05	Aricidea catherinae	" cerrutii	" cerrutii	[Aricidia] "	" cerrutii	n/d n/d	"
RT06	Poecilochaetus serpens	"	Poecilochaetidae n/d	"	"	n/d n/d	"
RT07	Heteromastus filiformis	"	"	"	"	n/d n/d	"
RT08	Pygospio elegans	"	"	"	"	n/d n/d	"
RT09	Sphaerodoropsis minuta	"	" [minutum]	"	[Sphaerodoridium] [minutum]	n/d n/d	"
RT10	Aphelochaeta marioni	[Tharyx] "	"	" multibranchiis	"	n/d n/d	"
RT11	Corbula gibba	"	"	"	"	n/d n/d	"
RT12	Turtonia minuta	"	Mysella bidentata	"	"	n/d n/d	"
RT13	Cingula trifasciata	" [cingillus]	"	"	"	n/d n/d	"
RT14	Amphipholis squamata	"	"	"	"	n/d n/d	"
RT15	Odostomia turrita	" indet.	" plicata	[Odostomata] plicata	"	n/d n/d	" unidentata
RT16	Dynamene bidentata	"	"	"	"	n/d n/d	"
RT17	Cumella pygmaea	"	"	"	"	n/d n/d	"
RT18	Corophium acherusicum	" crassicorne	" insidiosum	"	"	n/d n/d	"
RT19	Guernea coalita	"	"	Hyale nilssoni	"	n/d n/d	"
RT20	Bathyporeia tenuipes	"	"	"	" gracilis	n/d n/d	"

RT	Taxon	LB21	LB22	LB23	LB24	LB25
RT01	Aonides paucibranchiata		Paraonis fulgens	" oxycephala	n/d n/d	"
RT02	Capitella capitata	Capitomastus minimus	"	Capitomastus minimus	n/d n/d	" [capitata complex]
RT03	Polydora cornuta	" [ligni]	" [ligni]	" caeca	n/d n/d	" [ligni]
RT04	Syllis cornuta	Typosyllis "	[Langerhansia] "	"	n/d n/d	[Langerhansia] "
RT05	Aricidea catherinae	" spp.	" minuta	" capensis bansei	n/d n/d	"
RT06	Poecilochaetus serpens	"	Paraeurythoe borealis	"	n/d n/d	"
RT07	Heteromastus filiformis	"	"	"	n/d n/d	"
RT08	Pygospio elegans	"	"	"	n/d n/d	"
RT09	Sphaerodoropsis minuta	"	" philippi	"	n/d n/d	"
RT10	Aphelochaeta marioni	" vivipera	[Tharyx] multibranchiis	"	n/d n/d	"
RT11	Corbula gibba	"	"	"	n/d n/d	"
RT12	Turtonia minuta	Mysella bidentata	Mysella bidentata	"	n/d n/d	Tellimya ferruginosa
RT13	Cingula trifasciata	"	" [cingillus]	"	n/d n/d	"
RT14	Amphipholis squamata	"	"	"	n/d n/d	Amphiura chiajei
RT15	Odostomia turrita	" plicata	" plicata	Brachystomia eulimoides	n/d n/d	" umbilicaris
RT16	Dynamene bidentata	"	"	"	n/d n/d	"
RT17	Cumella pygmaea	"	Pseudocuma similis	Nannastacus unguiculatus	n/d n/d	"
RT18	Corophium acherusicum	" volutator	" insidiosum	"	n/d n/d	" insidiosum
RT19	Guernea coalita	Lysianassid spp.	"	"	n/d n/d	"
RT20	Bathyporeia tenuipes	" gracilis	" pilosa	"	n/d n/d	"

Table 19. The identifications of the fauna made by participating laboratories for RT04. Names are given only where different to the AQC identification.

RT	Taxon	LB01	LB02	LB03	LB04	LB05	LB06	LB07
RT01	Pisidia longicornis	"	"	"	"	"	"	"
RT02	Pandalina brevirostris	"	"	"	"	"	[brevrostris]	"
RT03	Nucula nucleus	"	"	"	"	"	"	sulcata
RT04	Crepidula fornicata	"	[Crepedula]	"	"	Tectura testudinalis	"	Pleurobranchus membranaceus
RT05	Pomatoceros lamarcki	triquiter	"	triqueter	"	[lamarki]	[Pomatocerus] triqueter	"
RT06	Nephtys hombergii	[hombergi]	caeca	"	"	"	"	[hombergi]
RT07	Spiophanes bombyx	"	"	"	"	"	"	"
RT08	Photis longicaudata	"	"	[longicordata]	"	"	"	"
RT09	Achelia echinata	"	"	"	"	"	"	hispida
RT10	Ericthonius punctatus	Jassa pusilla	"	difformis	"	"	brasiliensis	brasiliensis
RT11	Macoma balthica	"	"	"	"	"	"	"
RT12	Eteone longa	flava	"	flava	"	"	flava	flava / longa ?
RT13	Sphaerosyllis taylori	hystrix	"	[hystrix/taylori]	"	[Sphaerocystis] hystrix	"	thomasi
RT14	Levinsenia gracilis	[Levensenia]	"	"	[Levensenia]	"	"	"
RT15	Phoronis muelleri	"	"	"	"	[Photis]	"	"
RT16								
RT17	Jaera albifrons	"	"	"	forsmani	sp	"	forsmani
RT18	Tubificoides swirencoides	amplivasatus	"	"	"	"	"	insularis
RT19	Syllidia armata	"	"	"	"	"	"	"
RT20	Microprotopus maculatus	"	"	"	"	"	"	"

RT	Taxon	LB14	LB15	LB16	LB17	LB18	LB19	LB20
RT01	Pisidia longicornis	"	"	"	"	"	"	"
RT02	Pandalina brevirostris	"	"	"	"	"	"	"
RT03	Nucula nucleus	hanleyi	"	"	"	"	sulcata	sulcata
RT04	Crepidula fornicata	"	"	"	Helicon pellucidum	"	"	"
RT05	Pomatoceros lamarcki	[lamarki]	"	"	"	Filogranula calyculata	"	"
RT06	Nephtys hombergii	"	"	"	"	"	"	"
RT07	Spiophanes bombyx	"	"	"	"	"	"	"
RT08	Photis longicaudata	"	"	"	"	"	"	"
RT09	Achelia echinata	hispida	"	hispida	"	Nymphon lurtum	"	"
RT10	Ericthonius punctatus	"	brasiliensis	brasiliensis	brasiliensis	[Erichthonius] brasiliensis	brasiliensis	"
RT11	Macoma balthica	"	"	"	"	"	"	"
RT12	Eteone longa	cf flava	"	"	"	picta	"	[cf. longa]
RT13	Sphaerosyllis taylori	"	hystrix	thomasi	"	thomasi	thomasi	"
RT14	Levinsenia gracilis	"	[Levensenia]	"	"	"	"	"
RT15	Phoronis muelleri	"	"	sp.	"	"	"	"
RT16								
RT17	Jaera albifrons	"	"	[albifrons(sp.gp.)]	"	forsmani	"	"
RT18	Tubificoides swirencoides	insularis	"	[swirenocoides]	"	"	"	"
RT19	Syllidia armata	"	"	"	"	Kefersteinia cirrata	"	HESIONIDAE sp. indet
RT20	Microprotopus maculatus	"	"	"	"	"	"	"

Table 19 The identifications of the fauna made by participating laboratories for RT04 Names are given only where different to the AQC identification

RT	Taxon	LB08	LB09	LB10	LB11	LB12	LB13
RT01	Pisidia longicornis	- -	- -	- -	[Pisidae] -	n/d n/d	- -
RT02	Pandalina brevirostris	- -	- -	- -	- -	n/d n/d	- -
RT03	Nucula nucleus	- -	- -	- -	- -	n/d n/d	- -
RT04	Crepidula fornicata	- -	- -	- -	- -	n/d n/d	elicon pellucidu
RT05	Pomatoceros lamarcki	- -	- -	- -	- [lamarki]	n/d n/d	- -
RT06	Nephtys hombergii	- -	- [hombergi]	[Nepthys] -	[hombergi]	n/d n/d	- assimilis
RT07	Spiophanes bombyx	- -	- -	- -	- -	n/d n/d	- -
RT08	Photis longicaudata	- -	- -	- -	- -	n/d n/d	- -
RT09	Achelia echinata	- -	- -	- -	[Echelia] -	n/d n/d	- -
RT10	Ericthonius punctatus	[Erichthonius] difformis	- brasiliensis	- brasiliensis	- brasiliensis	n/d n/d	ichthonius] diffor
RT11	Macoma balthica	- -	-	- -	- -	n/d n/d	- -
RT12	Eteone longa	- -	- -	- -	- -	n/d n/d	- -
RT13	Sphaerosyllis taylori	- -	- hystrix	- hystrix	- -	n/d n/d	- hystrix
RT14	Levinsenia gracilis	- -	- -	- -	- -	n/d n/d	- -
RT15	Phoronis muelleri	- -	- -	- -	- -	n/d n/d	- -
RT16							
RT17	Jaera albifrons	- -	- ["albifrons" group]	- forsmani	- -	n/d n/d	- forsmani
RT18	Tubificoides swirencoides	- -	- -	- -	- [swirenocoides]	n/d n/d	- -
RT19	Syllidia armata	- -	- -	- -	- -	n/d n/d	- -
RT20	Microprotopus maculatus	- -	- -	- -	- -	n/d n/d	- -

RT	Taxon	LB21	LB22	LB23	LB24	LB25
RT01	Pisidia longicornis	- -	- -	- -	n/d n/d	- -
RT02	Pandalina brevirostris	- -	- -	- -	n/d n/d	- -
RT03	Nucula nucleus	- turgida	- -	nitidosa	n/d n/d	- sulcata
RT04	Crepidula fornicata	Helcion pellucidum	- -	Capulus ungaricus	n/d n/d	- -
RT05	Pomatoceros lamarcki	- triqueter	- -	- -	n/d n/d	- triqueter
RT06	Nephtys hombergii	- -	- -	- assimilis	n/d n/d	- [hombergi]
RT07	Spiophanes bombyx	- -	- -	- -	n/d n/d	- -
RT08	Photis longicaudata	- -	- -	- -	n/d n/d	- -
RT09	Achelia echinata	- -	- hispida	- laevis	n/d n/d	- -
RT10	Ericthonius punctatus	- brasiliensis	- -	- -	n/d n/d	- -
RT11	Macoma balthica	- -	- -	- -	n/d n/d	- -
RT12	Eteone longa	- picta	- -	- -	n/d n/d	- flava
RT13	Sphaerosyllis taylori	Exogone hebes	- hystrix	- erinaceus	n/d n/d	- -
RT14	Levinsenia gracilis	- -	- -	- -	n/d n/d	[Levensenia] -
RT15	Phoronis muelleri	- -	- -	- [mulleri]	n/d n/d	- -
RT16						
RT17	Jaera albifrons	- -	- forsmani	- -	n/d n/d	- forsmani
RT18	Tubificoides swirencoides	Capitella spp	- -	- [swirenocoides]	n/d n/d	- [swirenocoides]
RT19	Syllidia armata	- -	- -	-	n/d n/d	Nereimyra punctata
RT20	Microprotopus maculatus	Gammaropsis sophiae	- -	- -	n/d n/d	- -

Table 20. Summary of the number of differences at the level of genus and species for each of the participating laboratories and each RT circulation.

	RT01		RT02		RT03		RT04			
Lab	Genus	Species	Genus	Species	Genus	Species	Genus	Species	Genus average	Species average
LB01	3	5	5	8	0	3	1	5	2.25	5.25
LB02	0	1	1	1	1	3	0	1	0.50	1.50
LB03	1	5	2	4	2	2	0	3	1.25	3.50
LB04	0	1	0	1	0	4	1	2	0.25	2.00
LB05	2	3	1	2	1	6	1	3	1.25	3.50
LB06	2	2	1	1	2	2	0	3	1.25	2.00
LB07	0	3	1	3	1	4	1	8	0.75	4.50
LB08	1	3	0	1	1	4	0	1	0.50	2.25
LB09	6	7	4	5	3	8	0	2	3.25	5.50
LB10	1	3	0	1	2	5	0	3	0.75	3.00
LB11	1	2	1	1	1	3	0	1	0.75	1.75
LB12									#N/A	#N/A
LB13	1	1	1	3	0	1	1	5	0.75	2.50
LB14	1	2	1	1	1	4	0	4	0.75	2.75
LB15	3	4	0	2	0	2	0	2	0.75	2.50
LB16	6	6	2	6	4	5	1	5	3.25	5.50
LB17	4	4	1	2	4	7	1	2	2.50	3.75
LB18	1	1	1	3	2	6	4	8	2.00	4.50
LB19	2	4	2	5	7	9	0	3	2.75	5.25
LB20	0	2	0	0	0	3	1	2	0.25	1.75
LB21	8	12	5	7	4	8	5	9	5.50	9.00
LB22	1	2	0	3	4	10	0	3	1.25	4.50
LB23	3	4	1	2	3	6	2	6	2.25	4.50
LB24									#N/A	#N/A
LB25	0	0	0	1	2	4	2	6	1.00	2.75
Average	2.0	3.3	1.3	2.7	2.0	4.7	0.9	3.8		

Table 21. Summary by taxonomic level of the number of differences of identification recorded in the RT circulations.

		Total number of differences		Differences per distributed specimen	
Major group	Number distributed	Genus	Species	Genus	Species
Crustacea	19	13	60	0.7	3.2
Echinodermata	3	3	7	1.0	2.3
Mollusca - bivalves	7	12	22	1.7	3.1
Mollusca - gastropods	6	21	55	3.5	9.2
Polychaeta	39	68	158	1.7	4.1
Others	6	20	28	3.3	4.7

Table 22. Comparative summary of the performance of the participating laboratories in selected elements of each of the three components of the Scheme.

1	2	3	4	5	6	7	8	9	10
Macrobenthic Exercises		Particle Size Analysis				Ring Test Specimens			
MB01	MB02	PS01	PS02	PS03	PS04	At level of genus		At level of species	
Lab.	Bray-Curtis	Lab.	Bray-Curtis	Lab.	% Diff. from replicate median	Lab.	% Diff. from replicate median	Lab.	% Diff. from replicate median	Lab.	% Diff. from replicate median	Lab.	Avg. score ratio	Circulations with above average ratio	Lab.	Avg. score ratio	Circulations with above average ratio
LB06	99.48	LB09	99.7	LB08	0.2	LB15	1.0	LB07	0.1	LB11	-3.4	LB08	0.25	0	LB02	0.39	0
LB20	99.22	LB14	97.6	LB11	-0.9	LB13	1.3	LB18	0.1	LB05	-5.6	LB04	0.28	1	LB20	0.44	0
LB14	99.14	LB01	94.7	LB18	1.2	LB05	2.0	LB23	-3.3	LB04	7.1	LB20	0.28	1	LB11	0.46	0
LB25	98.94	LB07	93.9	LB02	1.7	LB10	-2.5	LB17	-4.0	LB15	-7.5	LB02	0.32	0	LB04	0.51	0
LB23	98.12	LB15	92.1	LB10	-2.7	LB17	-2.5	LB02	6.4	LB02	10.4	LB15	0.37	1	LB06	0.54	0
LB22	98.00	LB05	88.9	LB17	-3.8	LB22	3.9	LB11	6.4	LB19	-13.1	LB10	0.38	1	LB08	0.59	0
LB05	97.79	LB13	88.3	LB04	4.0	LB08	-3.9	LB13	7.0	LB23	-15.9	LB14	0.44	0	LB25	0.70	1
LB18	97.56	LB08	88.0	LB01	4.7	LB03	-5.1	LB15	7.0	LB13	-17.3	LB11	0.44	0	LB14	0.72	1
LB15	96.89	LB25	85.8	LB03	5.5	LB06	-6.3	LB10	-8.1	LB21	-17.4	LB13	0.59	1	LB15	0.72	1
LB16	96.84	LB02	84.9	LB23	5.8	LB07	-7.2	LB06	9.1	LB07	-23.7	LB07	0.60	1	LB13	0.73	2
LB09	96.81	LB11	84.6	LB07	6.0	LB20	-7.5	LB03	10.1	LB10	-24.0	LB22	0.63	1	LB10	0.78	1
LB13	96.58	LB04	84.1	LB22	7.6	LB04	8.4	LB04	10.5	LB17	-24.0	LB06	0.69	1	LB05	0.92	1
LB02	95.68	LB19	83.9	LB16	-9.0	LB01	-10.8	LB20	10.5	LB08	-24.1	LB03	0.76	2	LB17	0.98	2
LB03	95.41	LB22	83.4	LB05	10.5	LB14	11.0	LB01	11.2	LB03	-31.3	LB25	0.81	2	LB03	1.04	2
LB04	95.12	LB17	83.2	LB20	11.4	LB18	-11.1	LB05	11.9	LB22	37.3	LB05	0.84	1	LB22	1.15	2
LB08	95.02	LB10	82.3	LB21	11.4	LB19	-13.9	LB22	14.0	LB18	-43.4	LB17	1.47	3	LB18	1.19	3
LB07	92.18	LB06	81.0	LB19	-16.5	LB02	15.0	LB21	30.5	LB01	-	LB23	1.50	3	LB23	1.19	3
LB11	91.10	LB23	80.0	LB13	-62.5	LB23	-20.5	LB19	-37.8	LB06	-	LB19	1.52	2	LB07	1.24	2
LB17	89.27	LB20	79.2	LB15	-62.9	LB11	21.7	LB08	-	LB09	-	LB01	1.60	3	LB19	1.43	3
LB19	88.32	LB16	74.8	LB06	-	LB21	45.2	LB09	-	LB14	-	LB18	1.68	2	LB09	1.53	3
LB21	79.79	LB03	-	LB09	-	LB09	-	LB14	-	LB16	-	LB09	1.88	3	LB01	1.59	3
LB01	78.98	LB21	-	LB14	-	LB16	-	LB16	-	LB20	-	LB16	1.91	4	LB16	1.59	4
LB10	77.18	LB18	-	LB25	-	LB25	-	LB25	-	LB25	-	LB21	3.84	4	LB21	2.55	4

Explanation of columns

1, 2 Bray-Curtis Similarity index for macrobenthic circulations MB01 & MB02. Labs sorted in descending order (ie. decreasing similarity to AQC analysis).

3 - 6 Percentage difference between laboratory and AQC estimates of median particle size. Labs. sorted in order of increasing magnitude of the difference (poorer agreement)

7, 9 Ratio of laboratory score to average score for the four Ring Tests. Average value for the four Ring Tests. Labs. sorted in order of increasing ratio (poorer agreement).

8, 10 Number of occasions a laboratory's average score ratio was greater (worse) than average.

FIGURES

Figure 1. Approximate location of the sampling positions from which the Macrobenthic samples and Ring Test specimens were obtained.

Figure 2. Dendrogram resulting from cluster analysis (Bray-Curtis: group average) of the data generated by the participating laboratories from analysis of macrobenthic sample MB01.

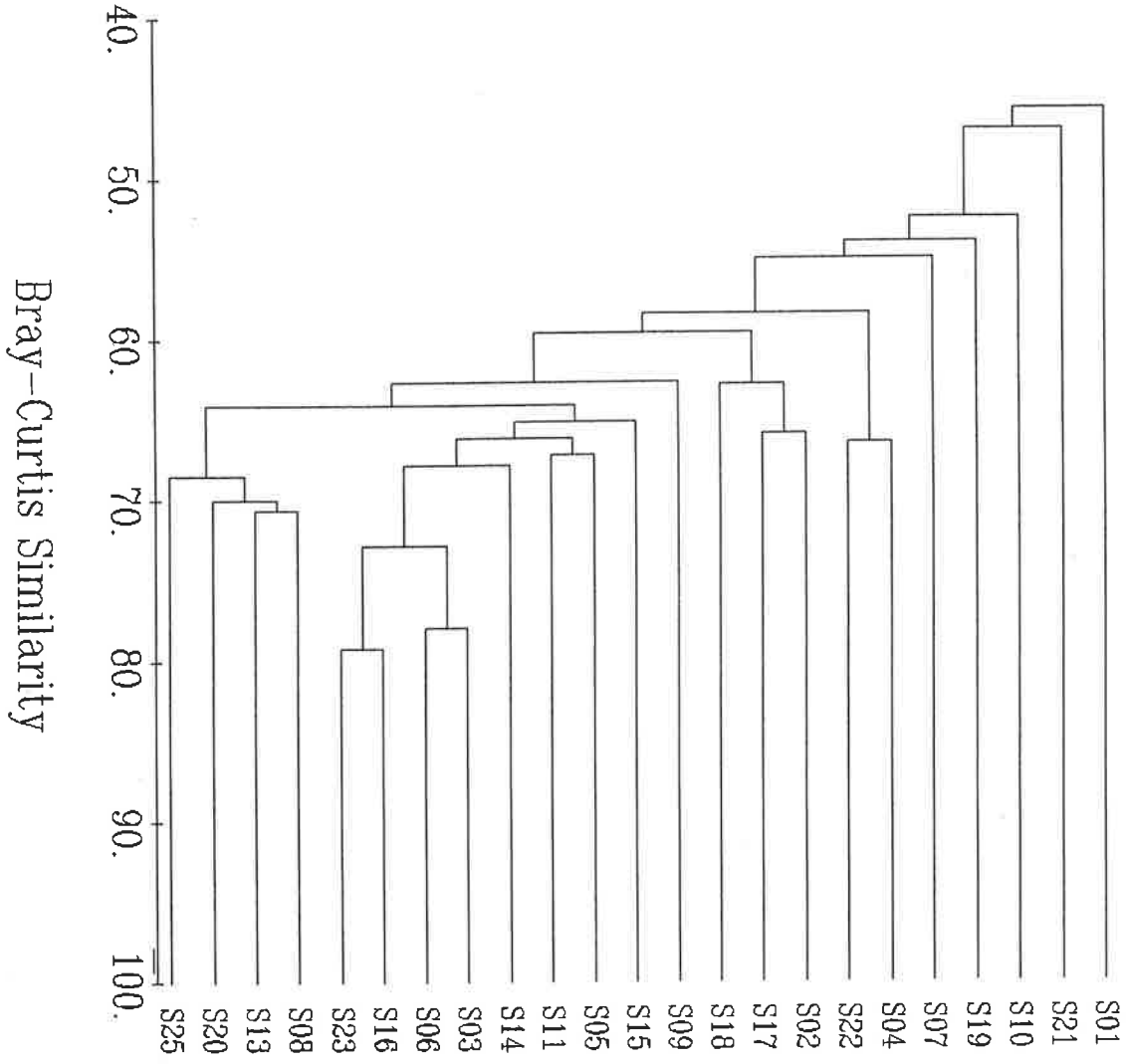

Figure 3. Dendrogram resulting from cluster analysis (Bray-Curtis: group average) of the data generated by Unicomarine Ltd. from re-analysis of macrobenthic sample MB01.

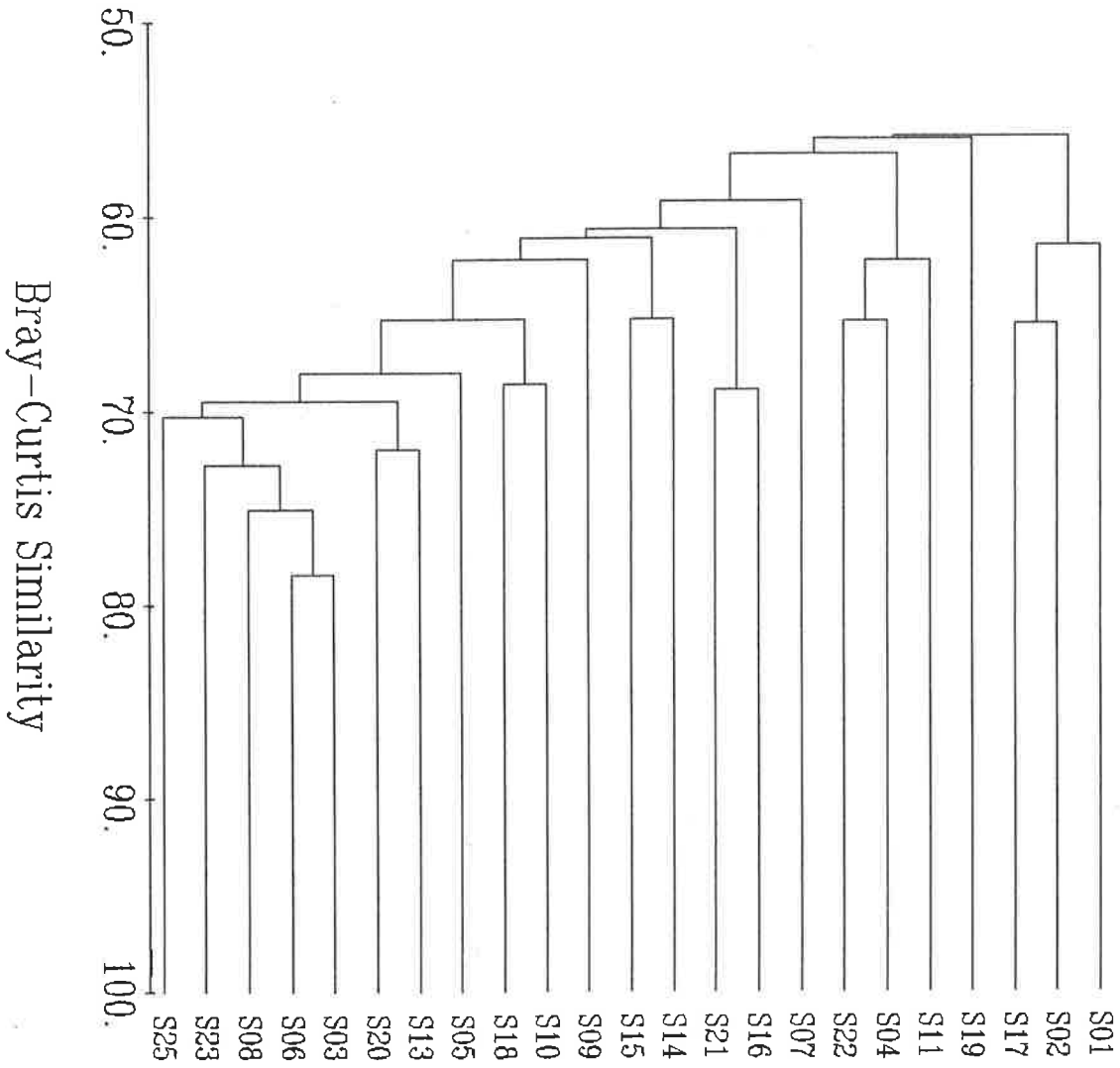

Figure 4. Particle size distribution curves resulting from Malvern Laser analysis of the fifteen replicate sediment samples from PS01.

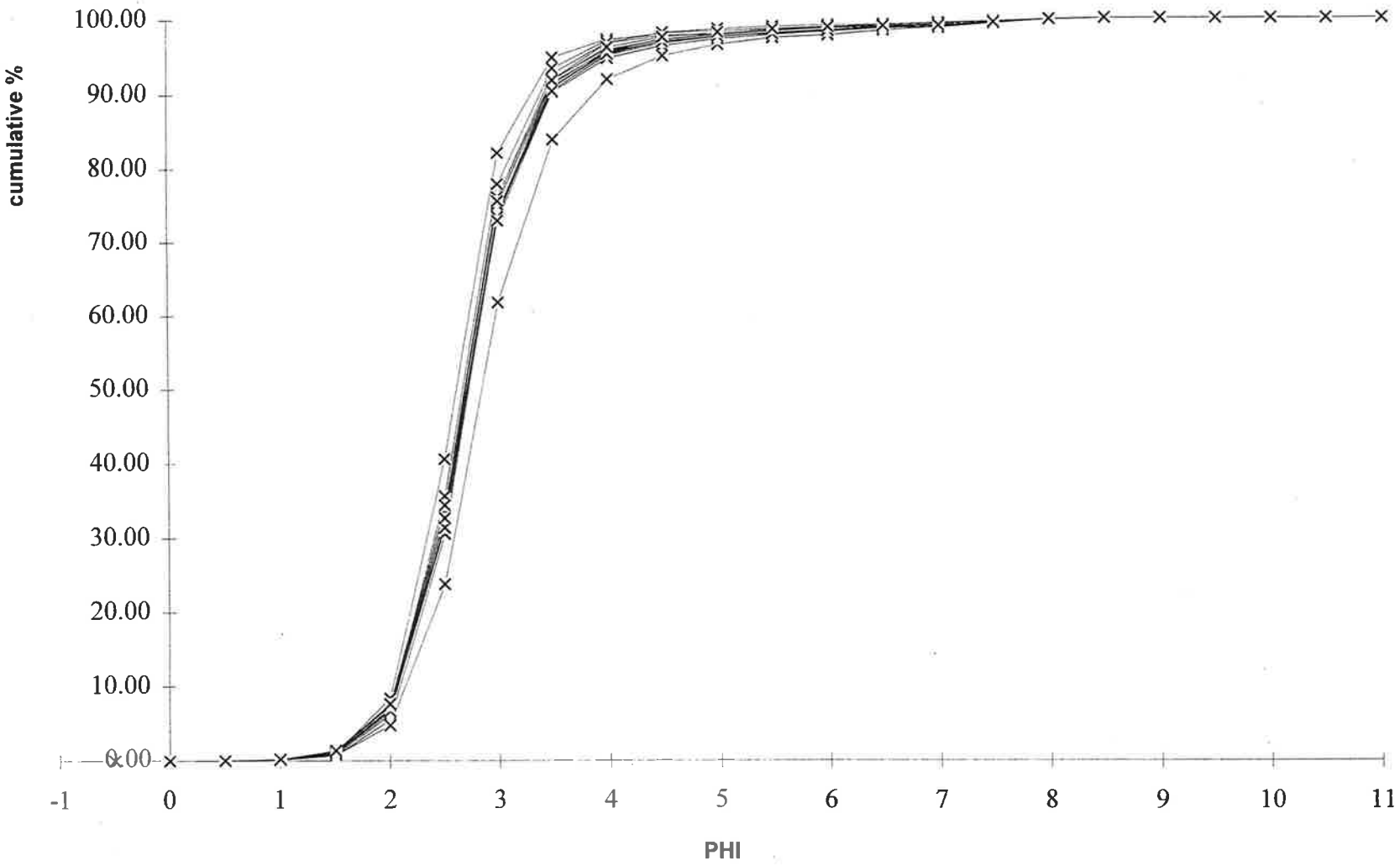

Figure 5. Particle size distribution curves resulting from Malvern Laser analysis of the fifteen replicate sediment samples from PS02.

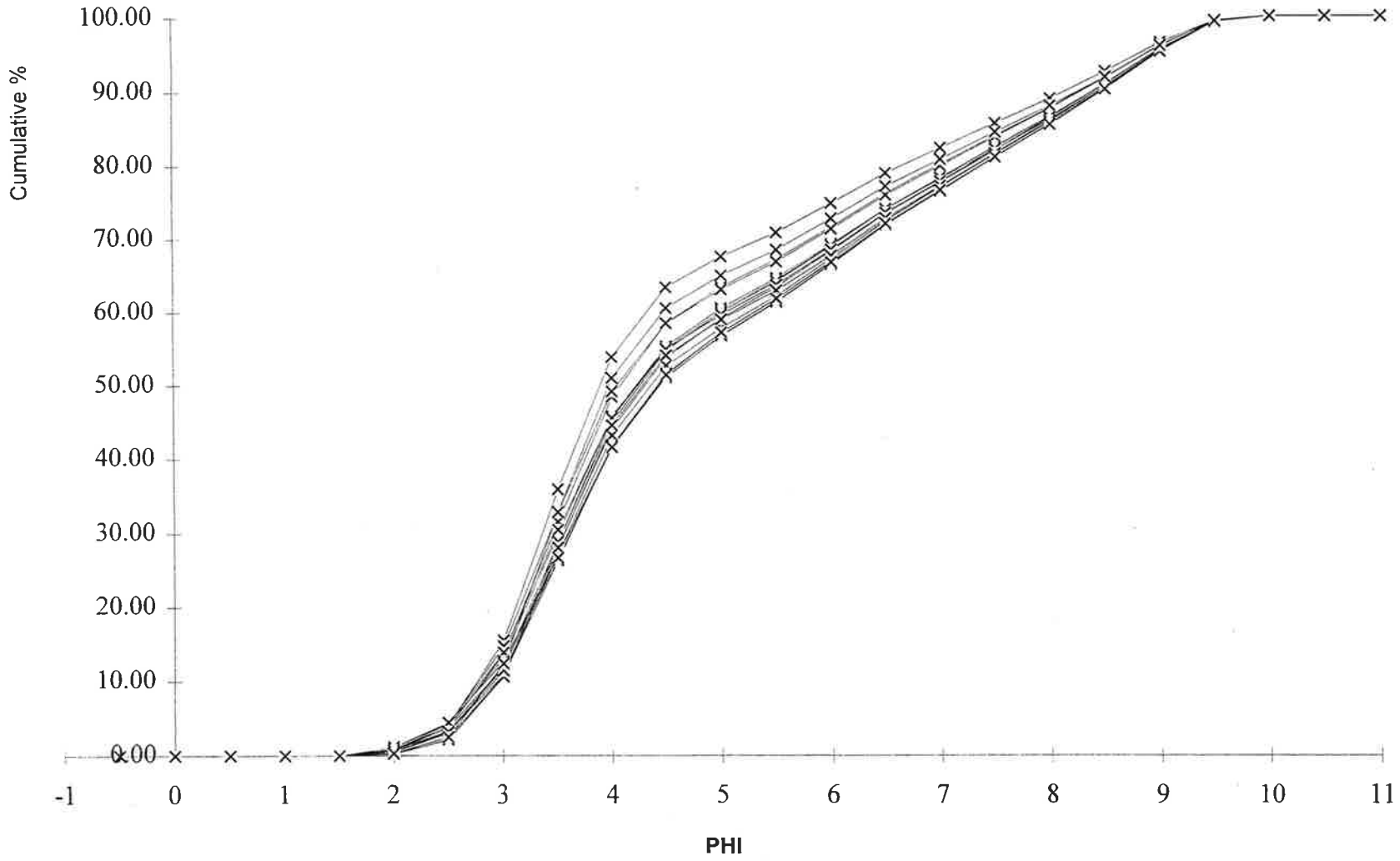

Figure 6. Particle size distribution curves resulting from Malvern Laser analysis of the fifteen replicate sediment samples from PS03.

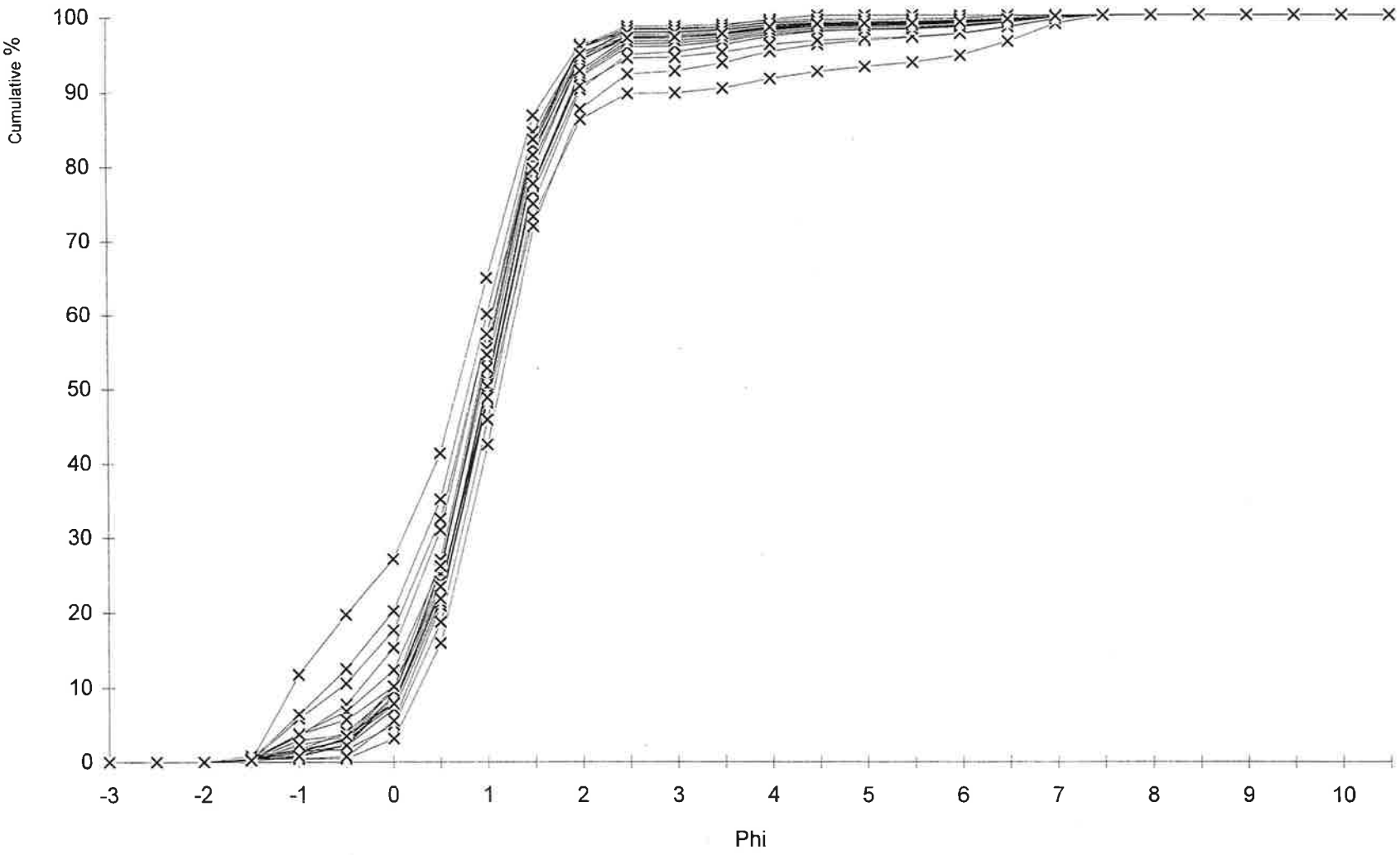

Figure 7. Particle size distribution curves resulting from Malvern Laser analysis of the fifteen replicate sediment samples from PS04.

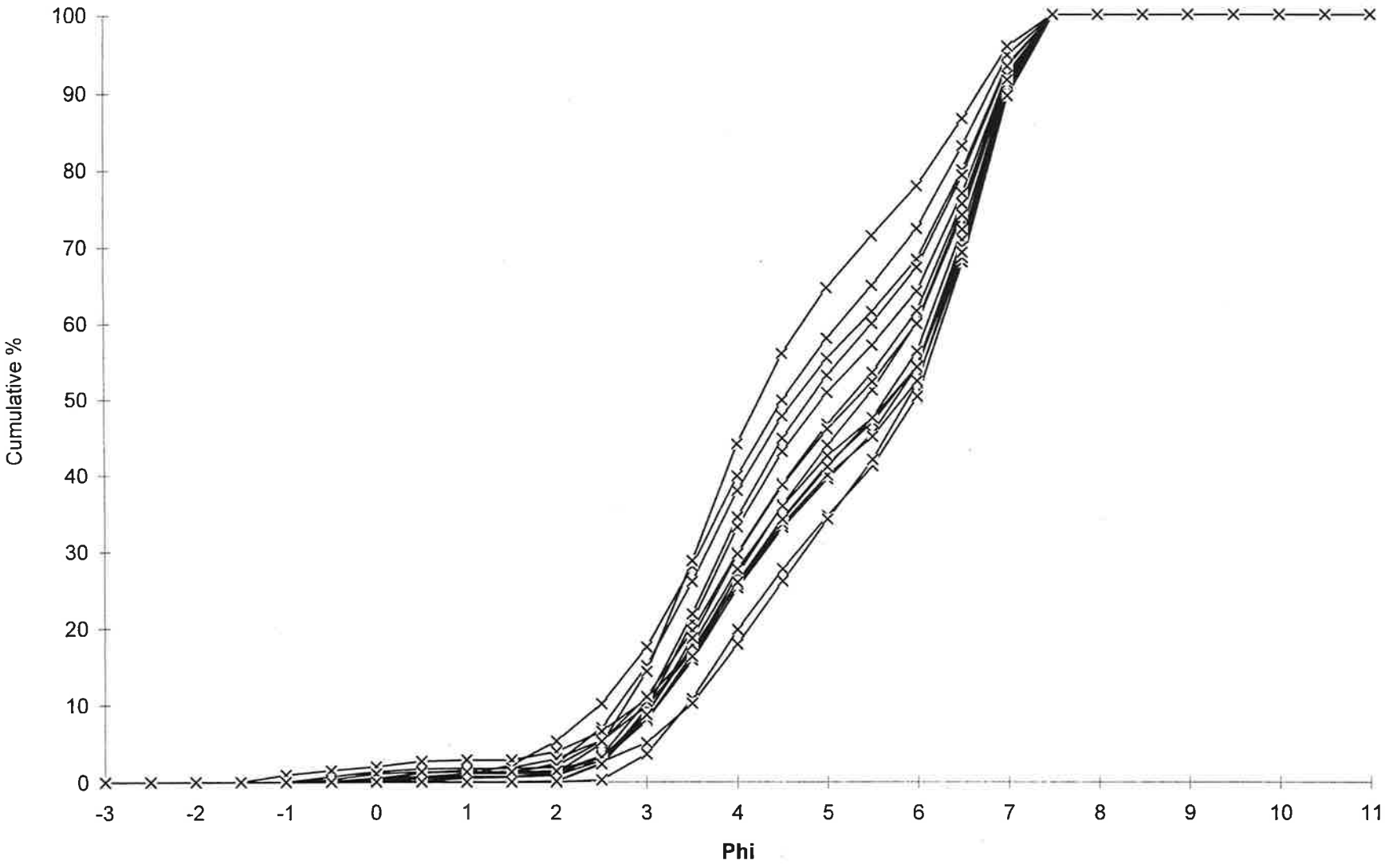

Figure 8. Particle size distribution curves resulting from analysis of sediment sample PS01 by the participating laboratories.

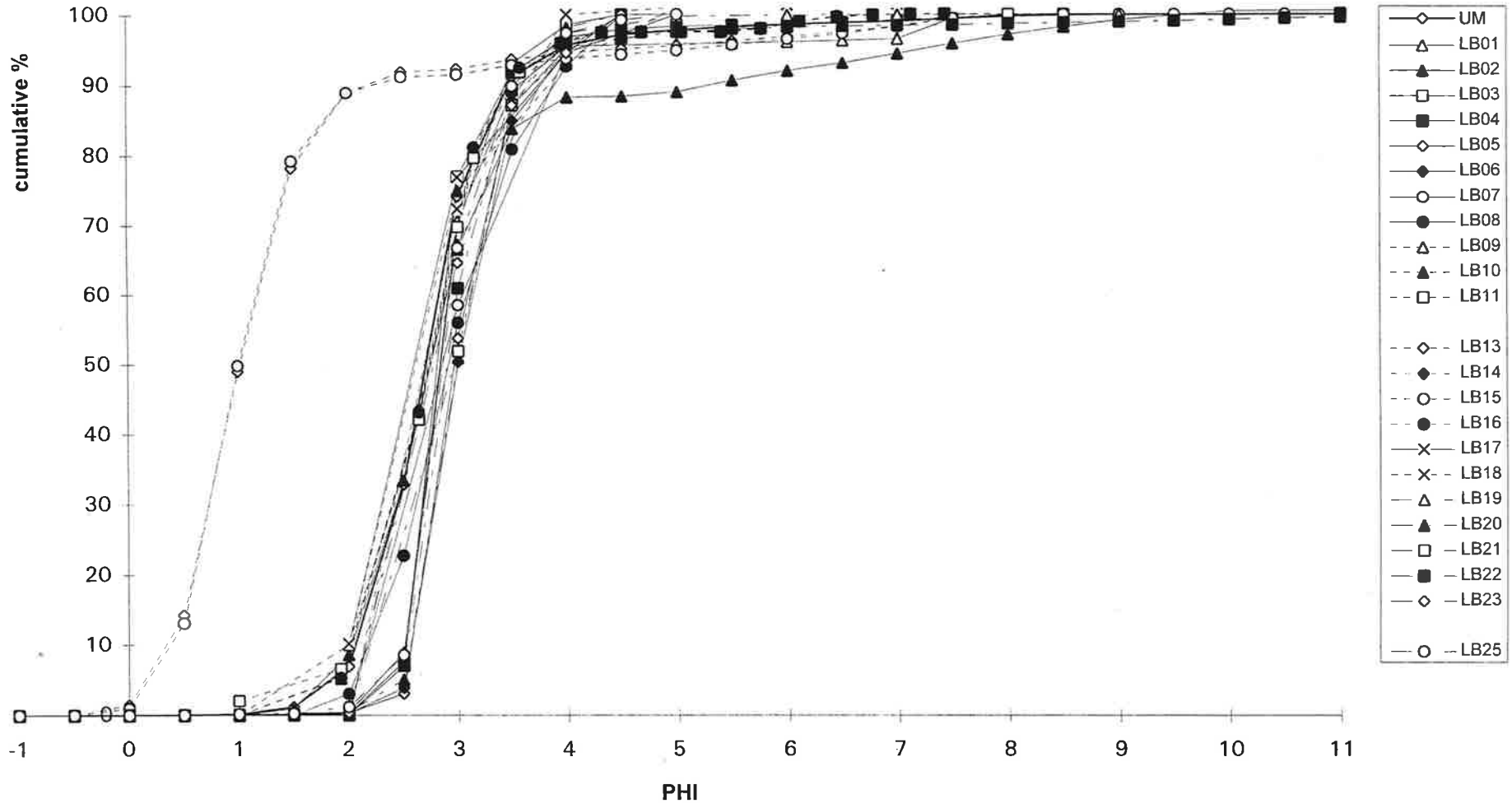

Figure 9. Particle size distribution curves resulting from analysis of sediment sample PS02 by the participating laboratories.

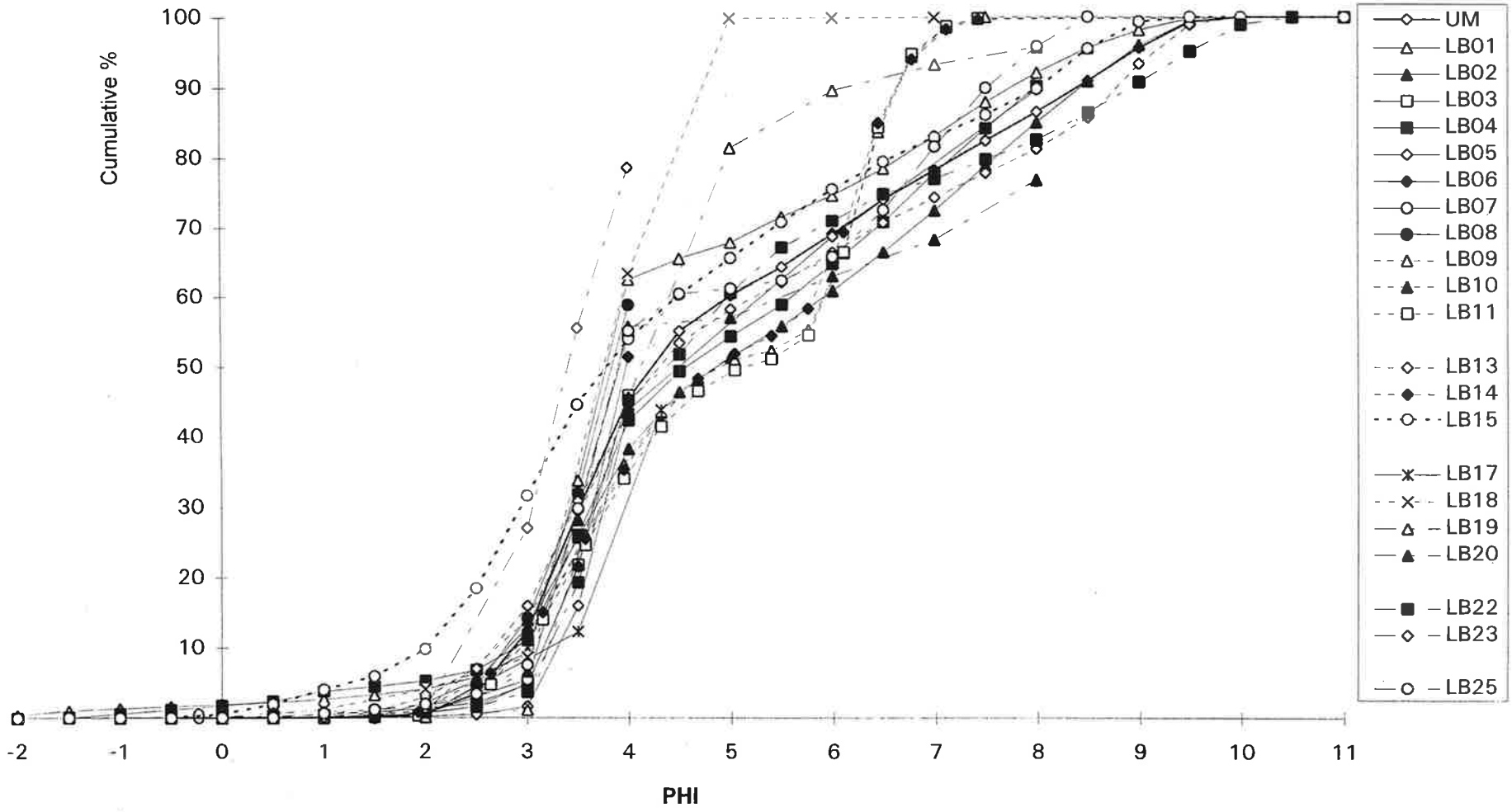

Figure 10. Particle size distribution curves resulting from analysis of sediment sample PS03 by the participating laboratories.

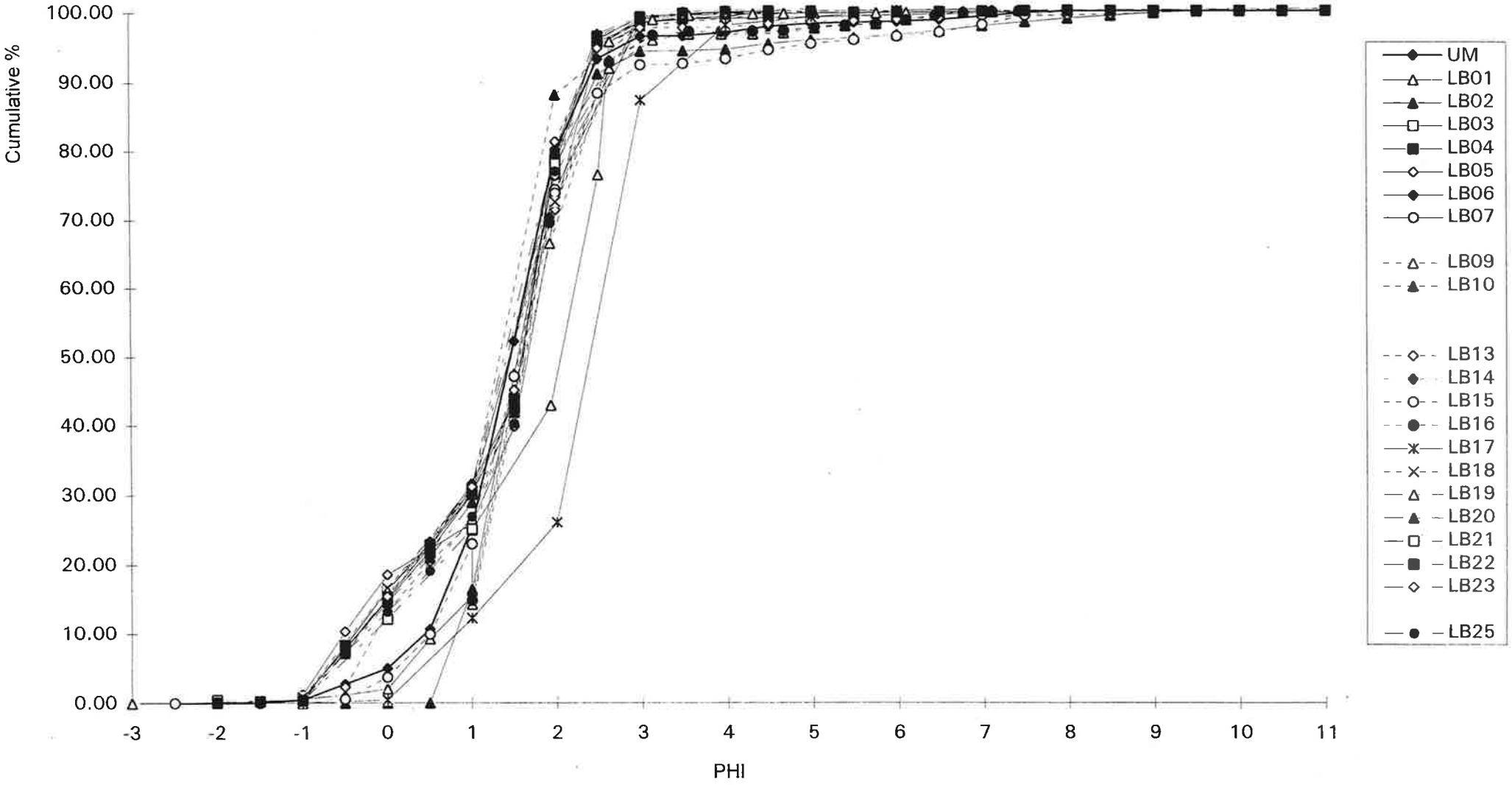

Figure 11. Particle size distribution curves resulting from analysis of sediment sample PS04 by the participating laboratories.

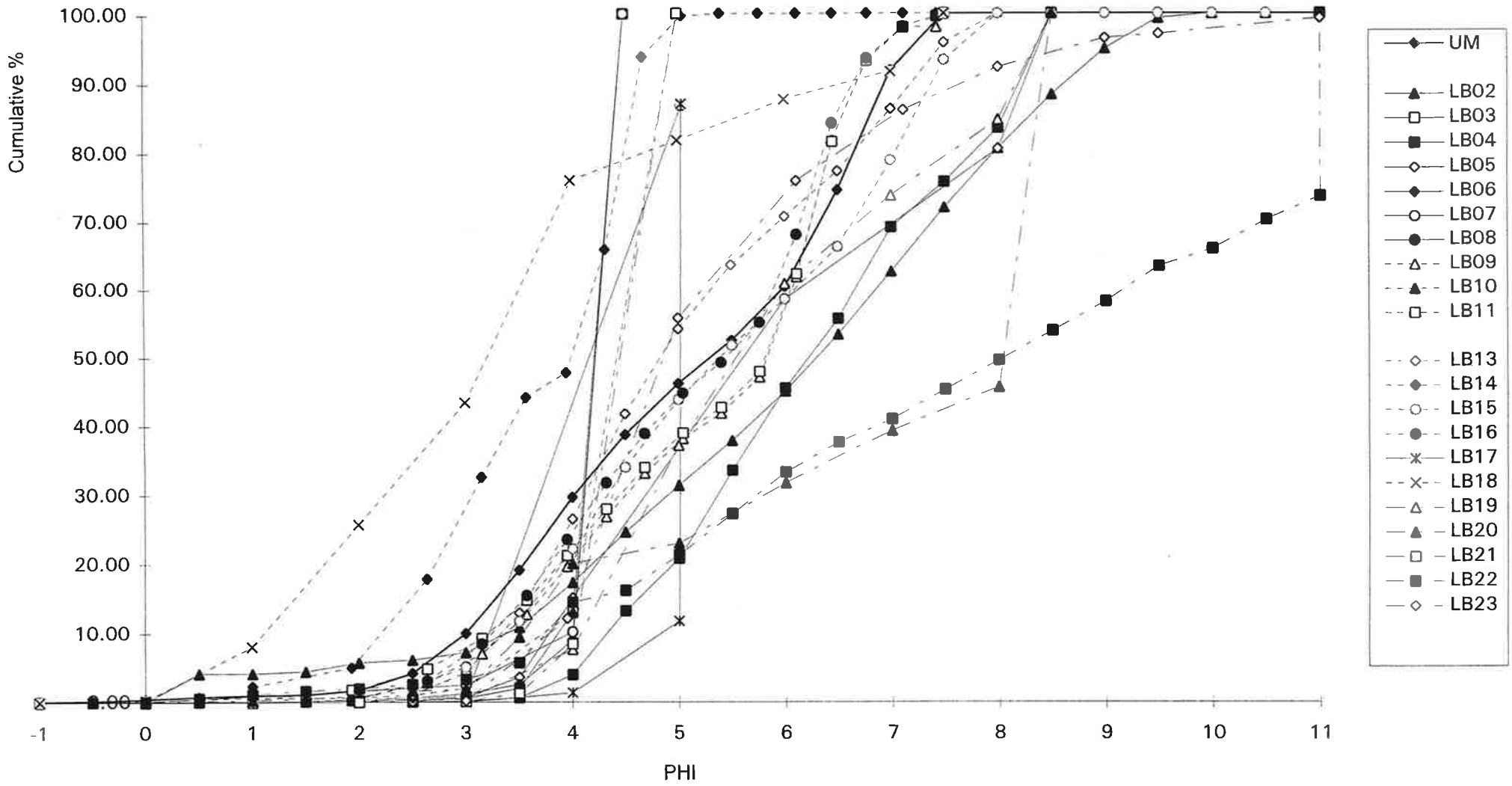

Figure 12. The number of differences at the level of genus recorded for each of the participating laboratories and each of the RT circulations. Laboratories arranged in order of increasing average number of differences.

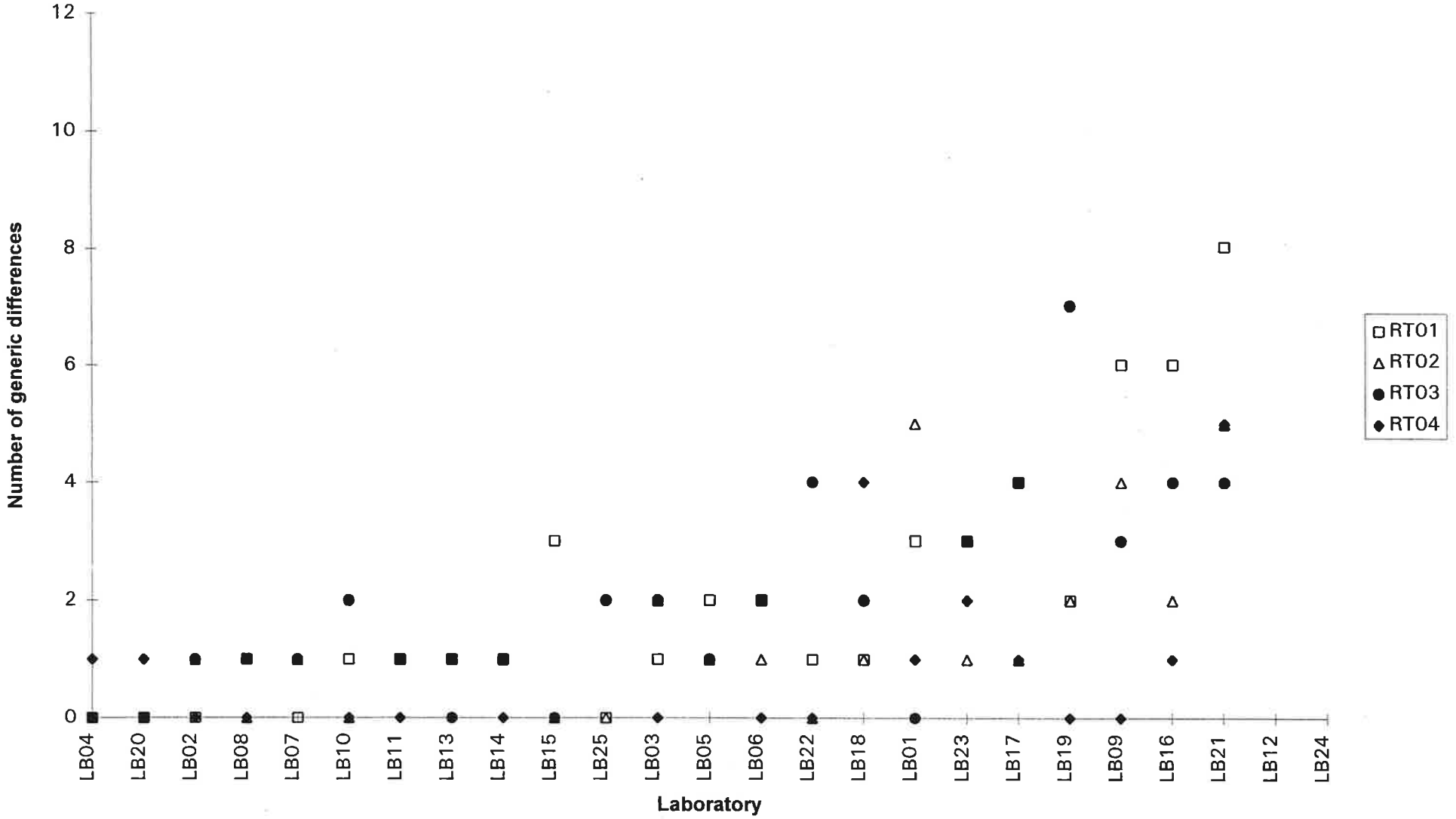

Figure 13. The number of differences at the level of species recorded for each of the participating laboratories and each of the RT circulations. Laboratories arranged in order of increasing average number of differences.

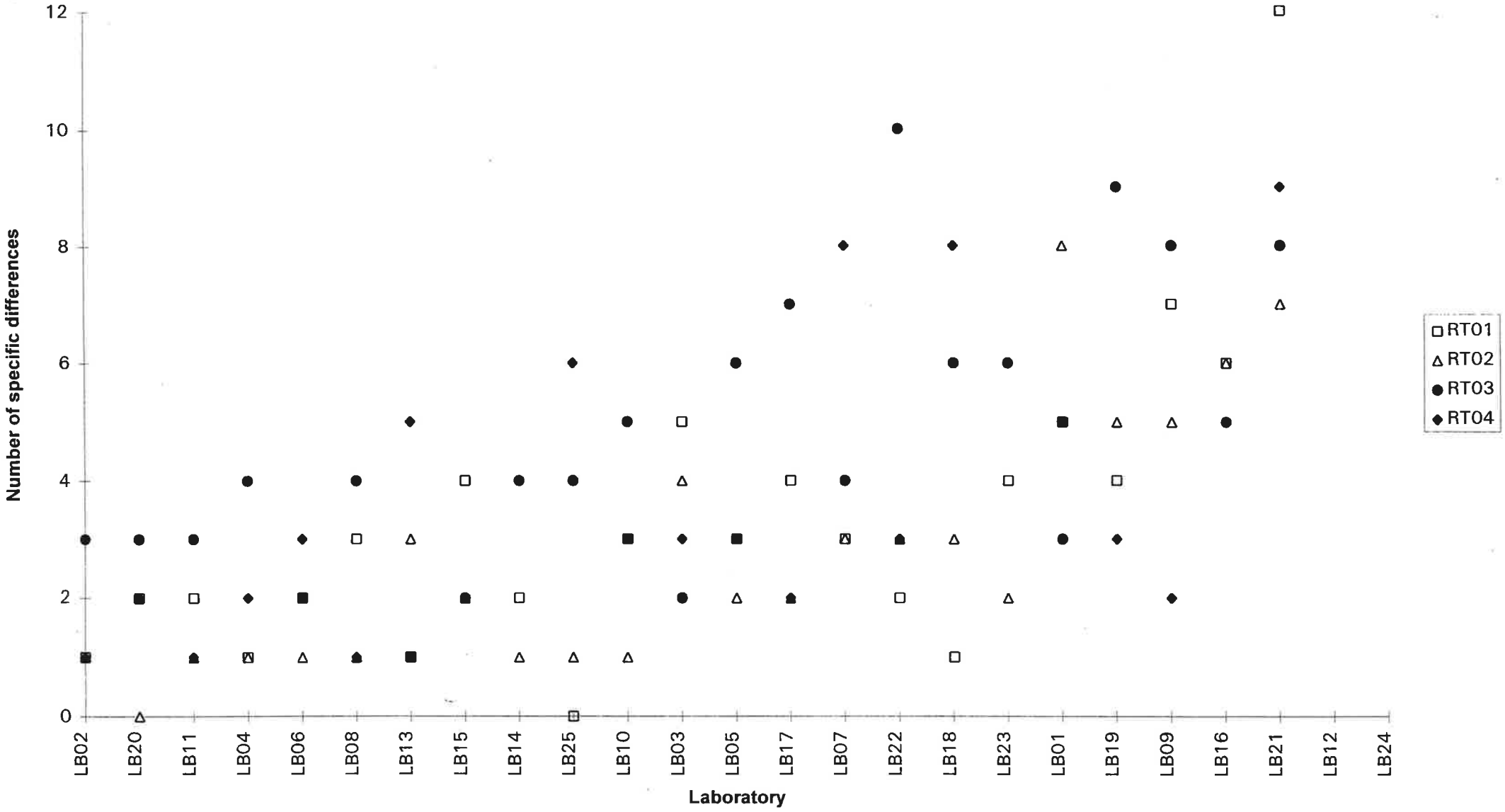

Figure 14. The ratio of the number of generic differences for each laboratory to the average number of differences for all laboratories for each of the four Ring Test circulations. Arranged in order of increasing average ratio.

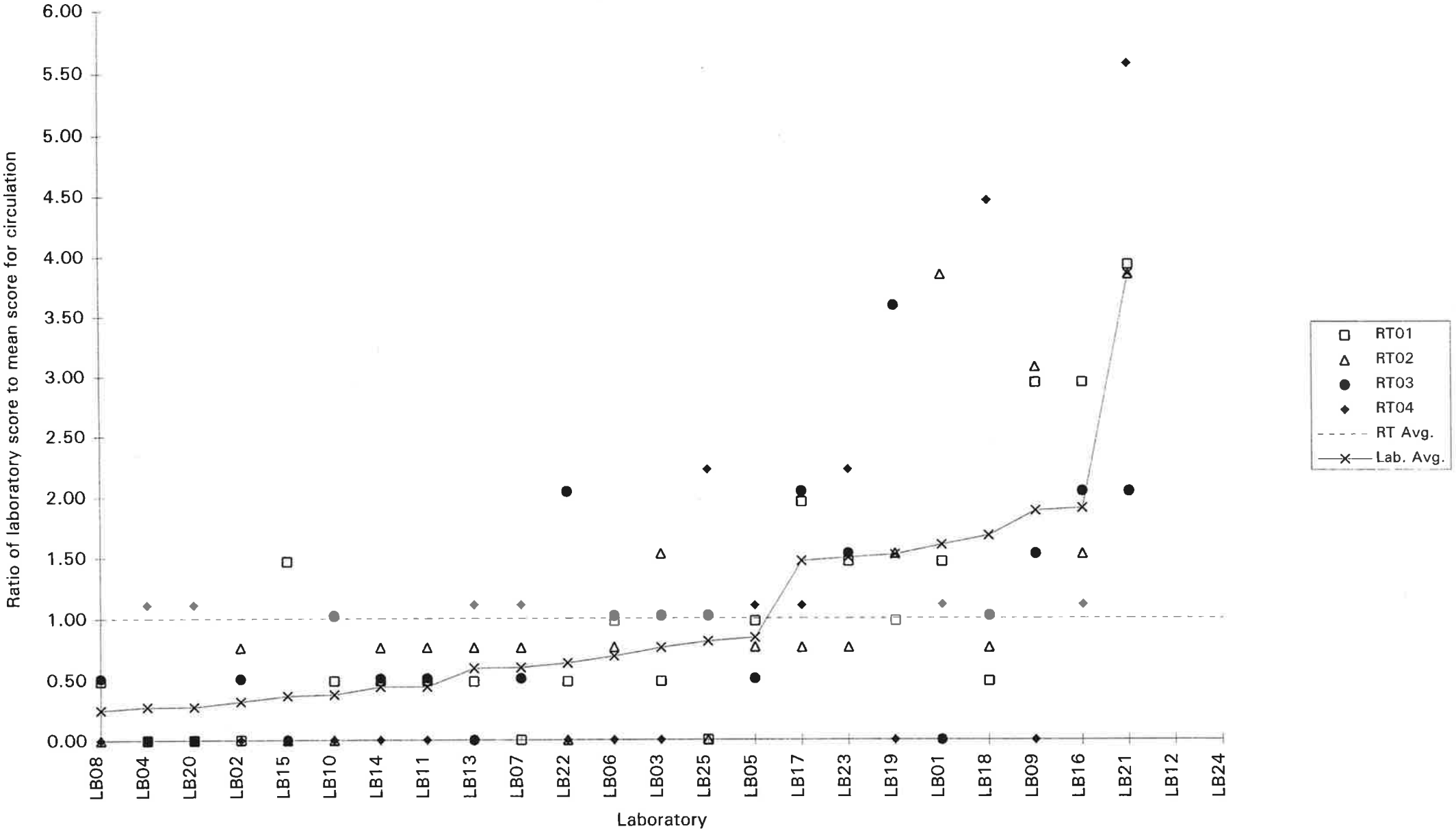

Figure 15. The ratio of the number of specific differences for each laboratory to the average number of differences for all laboratories for each of the four Ring Test circulations. Arranged in order of increasing average ratio.