National Marine Biological
Analytical Quality Control Scheme

Final Report
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Unicomarine Ltd.
National Marine Biological AQC Committee

NATIONAL MARINE BIOLOGICAL ANALYTICAL QUALITY CONTROL SCHEME

REPORT 1995/1996.

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NATIONAL MARINE BIOLOGICAL ANALYTICAL QUALITY CONTROL SCHEME

1. INTRODUCTION AND SUMMARY

The National Marine Biological AQC Scheme has successfully completed its 2nd year

The scheme is designed primarily to assess the performance of those laboratories submitting benthic data to the NMP. Other marine laboratories are also welcomed into the scheme. Exercises are also included to assess the ability of laboratories to perform particle size analysis and data analysis and interpretation. .

During year 2, 24 'NMP' laboratories took part in the scheme, including 4 commercial contractors , one down from year 1.

Unicomarine remained as the contractor operating the scheme under the management of the Clyde River Purification Board (now SEPA West Region).

The programme for year 2 placed greater emphasis on real samples with a slightly reduced number of circulations.

The results of the circulations completed in 1995/96 follow this summary . The report details individual laboratory performance and overall quality for the year.

Results were consistent with those from year one and participants found the user supplied or real samples to be of particular benefit.

Particle size exercises again demonstrated the high degree of consistency within laboratories using particular techniques. However, it was clear that a number of systematic and reporting difficulties still need to be resolved. It has been decided to consult recognised experts in this field to assist in this matter.

Two standards have now been developed which will allow an individual laboratories ' performance to be assessed. A simple standard based on user supplied samples will apply for NMP purposes with a more general standard reflecting overall performance.

Progress has now been made in applying the NODC coding system to the Marine Conservation Society Species Listing. The AQC scheme is now assisting with the publication of the 2nd edition of the MCS Species Directory.

The Co-ordinating committee has been requested to assist in the analysis and interpretation of the NMP benthic data.

Plans are underway to organise a workshop on problem taxa sometime during 1996/97 with a second workshop comprising field AQC exercises to be held in the spring of 1997.

2. SCOPE OF THE SCHEME 1995-96

Based on experience obtained from year 1 of the scheme and participant feed back through a questionnaire, the basic elements of the scheme were altered to include:

i) Scheduled circulations:

a) Macrobenthic sample - from a lower estuarine site;

b) Participant supplied routine benthic sample - either estuarine or marine - preferably from a real NMP station;

c) ring test to be reduced to three times per year but to include 25 specimens;

d) particle size circulations to be reduced to three a year, in line with the ring tests; the contractor to explore the possibility of obtaining a reference sediment to replace one of the routine distributions.

ii) Special projects . In addition to the scheduled circulations the contractor was engaged to undertake a number of special projects as follows:

a) develop standard list of taxonomic references based on information obtained from ring test returns and macrobenthic exercises;

b) identify problem taxa;

c) investigate the possibility of having twinned sediment samples analysed perhaps using different analytical techniques to allow comparison of methods.

Work on the first of these is completed. During the course of the year it became apparent that a more structured analysis of particle size data was required and the co-ordinating committee agreed to seek the advice of Dr J McManus University of St Andrews. Ms K Dalziel (Statistician at SEPA West Region) has been co-opted onto the committee to assist with the statistical interpretation of particle size data.

REPORT FROM THE CONTRACTOR FOR 1995/1996 : RESULTS

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1. Summary

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

The Scheme consisted of four components; analysis of a single macrobenthic sample; analysis of three sediment samples; identification of three sets of twenty-five animal specimens; analysis by Unicomarine Ltd. of a sampled supplied by the participating laboratories. With the exception of the sample received from the participating laboratories, analysis of each component by the participating laboratories was the same as for the first year of the Scheme. The results for each of the Scheme components are presented and discussed.

Analysis of the macrobenthic sample by the participating laboratories and subsequent re-analysis by Unicomarine Ltd. provided information on the efficiency of extraction of the fauna; accuracy of enumeration and identification and the reproducibility of biomass estimations. Overall agreement between the laboratories and Unicomarine Ltd. was generally good. Extraction efficiency in respect of the number of taxa and individuals was in all cases better than 80% and in the majority of cases better than 95%. Comments are provided in those instances where agreement was poor.

Comparison of the results from the laboratories with those from analysis by Unicomarine Ltd. was made using the Bray-Curtis similarity index. The value of the index varied between approximately 20% and 95%. Examination of the data indicated that differences between the participating laboratories and Unicomarine Ltd. in the treatment of a small number of taxa accounted for the majority of the larger discrepancies. Re-calculation of the index taking these difference into consideration resulted in all cases in an increase in the index to above 80% and in the majority of cases to above 95%.

The results for the Own sample were similar to those from the Macrobenthic sample. Agreement between the laboratories and Unicomarine Ltd. was good. In all cases the values for the Bray-Curtis similarity index were greater than 90% and in the majority of cases greater than 95%.

The influence of analytical technique on the results returned for the Particle Size exercises was marked and two of the circulations were designed to examine the effect further. In most cases the results from

a laboratory were similar to those from other participating laboratories using the same technique.

Three sets of twenty-five 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 three circulations was reasonably consistent. A small number of taxa generated the majority of problems and in most cases these had been anticipated. Some possible explanations for this are discussed. Variation between participating laboratories is discussed.

Comments are provided on the performance of the participating laboratories in each of the above components. 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 is to obtain information on possible variation between laboratories in the quality of data collected for the National Monitoring Plan. The Scheme is addressing three main areas involved in the collection of data:

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

In the first year of the Scheme a series of exercises were undertaken and which were designed to examine the relative performance of laboratories. Each exercise involved the distribution of test materials to participating laboratories and the centralised examination of returned data and samples. The structure of the second year, in terms of the nature of the Scheme components, was in the main very similar to the first. During the course of the first year of the Scheme however, a number of areas in need of possible modification or more detailed examination were identified. Accordingly the components of the second year were modified or supplemented to provide additional information. Each component of the Scheme is discussed below and the results of the second year of operation of the scheme are presented and discussed.

For a variety of reasons a small number of laboratories were unable to continue their participation in the Scheme in the second year and the overall number of participants was slightly reduced.

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

3. Description of the Scheme Components

The three components which formed the main exercises in year one; Macrobenthic sample analysis (MB), Ring Test identification (RT), and Particle Size analysis (PS), were continued into the second year. As indicated above a number of modifications were made, generally involving a change in the overall number of individual exercises. Participating laboratories identified the frequency of circulations as one area of concern and accordingly the overall number of circulations was reduced, although in the case of the Ring Test circulations their content was increased slightly.

In addition to the three components mentioned above a fourth element was introduced. This was termed the Own Sample exercise (OS) and involved the re-analysis of a macrobenthic sample received from the participating laboratories. The aim of the exercise was to examine the performance of the laboratory when processing one of their own samples. This removed any possible influence of 'regional bias' on the results. A number of participating laboratories had indicated in year one that the circulated MB samples were unlike the samples with which they normally worked, in terms of both the fauna and physical nature of the sample.

The scheme components are described below. A brief 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)

A single unsorted grab sample from inshore waters was distributed to each participating laboratory. 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

Sample MB03 was collected from the outer part of the Stour in Essex in an area of mixed, sediments including broken shell and experiencing fully saline conditions. A set of sediment samples were collected using a 0.1m² Day Grab. Sampling was carried out while at anchor and samples for 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, followed by fixing in buffered formaldehyde solution. Samples were washed after a week in the fixative, prior to transfer to 70% IMS, in which condition they were distributed.

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)

Three samples of sediment, covering a range of particle sizes, 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. One of the samples was derived from natural sediments (as for year one) while a further two were produced artificially from weighed sediment fractions (as detailed below). In each case replicates of the distributed samples were analysed using both laser diffraction and sieve analysis techniques.

3.2.1 Preparation of the Samples

3.2.1.1 Natural samples

Bulk sediment for each of the four circulations was collected from an estuarine 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 in pairs. One core of a pair 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*. each distributed sample was a composite of three cores.

The numbering of the resulting samples was random. All of the odd-numbered 'B' components (a total of 12) were sent for particle size analysis to assess the degree of inter-sample variation. Half the replicates were analysed using laser and half by sieve and pipette. The 'A' components were distributed to the participating laboratories.

3.2.1.2 Artificial samples

In an attempt to control more accurately the composition of the distributed sediment two of the PS samples distributed were produced artificially by combining known masses of different size fractions. Individual fractions were obtained by sieving (wet or dry) sediments from a number of sources covering a wide size range. Participating laboratories were issued with an additional note to ensure that these sediment samples were well mixed prior to analysis.

To examine the differences between the two main analytical techniques (laser and sieve) the second of the two artificial samples was deliberately biased towards the fine end of the sediment scale.

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)

Three sets of twenty-five 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 from around the UK covering a similar geographical area to that of the samples from year one. 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.

A number of species distributed had formed part of earlier circulations. This was due in part to the increasing difficulty of obtaining sufficient material, in suitable condition, of new species. In addition it was considered of interest to examine the performance of participating laboratories when re-examining previously distributed species.

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 Own Sample (OS)

Each laboratory was requested to send a sample from their regular sampling programme. This was to be processed using the laboratory's normal procedures. The aim of the exercise was to examine laboratory analytical performance on material from their own area. It was felt by a number of laboratories that the results from this exercise would more accurately reflect their efficiency.

3.4.1 Analysis required

Participating laboratories were instructed to carry out macrobenthic analysis of a sample using their normal procedures. Samples requiring sub-sampling were to be avoided where possible. All procedures were to be documented and details returned with the

sample components. All material from the sample was to be sent to Unicomarine Ltd. broken down as follows:

Sorted residue - material from which all animals had been removed and counted.
Separated taxa - individually labelled vials containing the identified fauna.
Other fractions - *eg.* material containing fauna which had been counted *in situ.*

Identification was to be to the normal taxonomic level employed by the laboratory (usually species). The names and counts of specimens were to be recorded on a matrix and linked to the vials through a specimen code number. Biomass analysis was to be carried out in the same manner as for the MB exercise.

Upon receipt at Unicomarine Ltd. all OS samples were re-analysed by the same operator. The sorted residue was re-examined and any countable material extracted. Identified fauna was checked for the accuracy of enumeration and identification and all specimens were re-weighed using the same procedure as for the MB exercise.

3.5 Logistics

The labelling and distribution procedures employed successfully in year one were maintained and details may be found in the report from the first year. For the Own Sample exercise participating laboratories were issued with instructions detailing the way samples should be sent to Unicomarine Ltd. In general samples were received in good condition, in a few cases individual vials had broken although all specimens were retained by surrounding polyethylene bags.

3.5.1 Data returns

Returns of data to Unicomarine Ltd. also followed the same process as in year one. Pre-formatted discs with spreadsheet based forms (tailored to the receiving laboratory) were distributed with each circulation in addition to paper copies of the same. As had been previously found a range of file formats were required to cover all applications in use by participating laboratories. All returned data have been converted to Excel ver. 5.00 for storage and analysis.

3.5.2 Confidentiality

To preserve the confidentiality of participating laboratories The two-digit Laboratory Code (assigned in year one) 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-four laboratories were distributed with all samples and data return forms for the Scheme. Overall most laboratories met the requested dates for the return of data and samples, although the summer period and general workload presented problems. Delays in returns did complicate analysis of the results in some cases. No data were returned from laboratories LB12 or LB24.

4.1 Macrobenthic Samples (MB)

4.1.1 General comments

The distributed sediment (MB03) was from a firm mud with stones and broken shell with an average of forty-two species in generally small numbers covering a variety of phyla. Analysis of the distributed sample seemed to pose relatively few problems to laboratories. The larger shell fragments formed a suitable substratum for epifaunal taxa and the treatment of these differed between laboratories. The majority of samples had been stained with Rose Bengal.

4.1.2 Efficiency of sample sorting

Table 1 presents for sample MB03 a summary of the estimate of numbers of taxa and individuals made by each of the participating laboratories together with the corresponding count made by Unicomarine Ltd. following re-analysis of the same samples. For the number of taxa and number of individuals the percentage difference between the value provided by the participating laboratory and that obtained by Unicomarine Ltd. is given. It was clear from the results that there were a number of approaches to the treatment of epifaunal taxa (for example hydroids). These varied from complete disregard, with only 'quantitative taxa' being considered to the complete extraction and identification of all such taxa. For this reason epifaunal taxa are considered separately in Table 1.

It may be seen from Table 1 (column 5) that in most cases the number of taxa (excluding colonial taxa) differed by less than 5% indicating that the overall estimate of the number of taxa by Unicomarine Ltd. and the participating laboratories was very similar. In the same Table columns 6 and 7 indicate the total numbers of taxa in the sample *including* colonial taxa. Similar information is presented for the participating laboratories and Unicomarine Ltd. for the number of individuals (columns 8 to 11). Differences between the two sets of results are again small and in most cases less than 5%.

Re-sorting of the sample residue retrieved small numbers of individuals from most samples following analysis by the participating laboratories. These data are presented in columns 12 to 14 of Table 1. The values presented for the number of taxa not extracted (column 12) represent taxa not recorded or extracted (even if mis-identified) elsewhere in the results. In a number of cases a second value is presented in parenthesis which is the total including colonial taxa.

The number of individuals not extracted from the sample (column 13) is given as a percentage of the total number in the sample (including those missed) in column 14 (*ie.* column 14 = column 13 / column 9 %). Missed individuals represented generally less than 2% of the true total number in the sample, though larger numbers were recorded in a few instances. A more detailed breakdown of the missed individuals by taxonomic group is presented in Table 2.

4.1.3 Uniformity of identification

Overall most identifications made by participating laboratories were in agreement with those made by Unicomarine Ltd. The major area where differences were clear was in the

identification of polychaete worms of the family Cirratulidae. Most samples contained at least four species, including *Caulleriella killariensis*, *Caulleriella zetlandica*, *Aphelochaeta marioni* and *Cirriformia tentaculata*. The identification and true assignment of most species in the family is currently in a state of some flux, and the variation between participating laboratories in the identification of this group was not surprising. This had a major impact on the multivariate analysis, as described below. A similar situation was found for the Oligochaeta although the overall influence on the results was less as the numbers involved were generally smaller.

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. Data were not transformed. In view of the variation in the estimates of the number of taxa and individuals resulting from the taxonomic uncertainty described above, two separate determinations of the Bray-Curtis similarity index were made. In both cases colonial taxa were excluded from the analysis. The first calculation (Table 1, column 16) presents the value for the index obtained from an analysis of the data provided by the participating laboratory and that from re-examination of the same sample by Unicomarine Ltd. No adjustments to the data sets were made. This represents the 'worst case' situation. In the second analysis (Table 1, column 17) all taxa in the family Cirratulidae were pooled and the number of individuals combined. The same adjustment was made for the Oligochaeta. It may be seen from Table 1 that this has a major effect upon the value of the Bray-Curtis similarity index. The values resulting from analysis using the adjusted data set are all in excess of 88% and the majority are over 95% similarity (range 88% to 98%). Those for the unadjusted data show a much wider range (from 20% to 96%).

4.1.5 Biomass determinations

A comparison of the estimates of the biomass made by the participating laboratories and Unicomarine Ltd. broken down by major taxonomic group for the MB03 circulation is presented in Table 3. Overall differences between the two estimates were all less than 30% and in most cases less than 15%. Estimates made by Unicomarine Ltd. were in all but one case greater than those made by the participating laboratory.

4.1.6 Discussion of Macrobenthic results

As described above extraction of the fauna was efficient in most cases. Identification was also accurate in most cases, with the exception of the Cirratulidae as discussed. The importance of variations in the treatment of dominant taxa like the Cirratulidae is illustrated by their major effect upon multivariate methods, such as cluster analysis.

The values for the estimates of total biomass differed by up to approximately 26% between the participating laboratory and Unicomarine Ltd., though in most cases were much smaller. 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. A similar observation was made in the first year of the Scheme (samples MB01 and MB02).

4.2 Own Sample (OS)

4.2.1 General comments

In an attempt to examine more closely the performance of laboratories when processing material from their own region and with which they were presumably familiar a fourth component was introduced into the Scheme. Each participating laboratory was invited to provide for re-examination a sample from their regular sampling area, this was termed the Own Sample (OS) exercise. Fourteen samples were received together with descriptions of their origin and the collection and analysis procedures employed. Ten of these data sets also included biomass values for the individual taxa recorded. The samples were varied, with the number of taxa recorded ranging from 11 to 40, and individuals from 74 to 894. The majority of samples received had been stained with Rose Bengal.

4.2.2 Efficiency of sample sorting.

Table 4 displays a summary of the data obtained from the analysis of the Own Sample exercise. All taxa identified by the participating laboratory were included in the analysis. This differed slightly from the MB exercise in which epifaunal taxa were treated separately because of the variation between laboratories in their approach to this group. In all but four cases the numbers of taxa recorded by the participating laboratories were identical to those obtained by Unicomarine Ltd. (Table 4, column 4). In the four exceptions the difference was at most two taxa. Similarly the data for the numbers of individuals recorded (Table 4, columns 6 & 7) showed on the whole a difference of less than 2%. All the participating laboratories managed to extract representatives of every taxon within the sample from the residue (Table 4, column 10), and in the worst case only eleven individuals (but no new taxa) were missed during sorting.

4.2.3 Uniformity of identification.

Taxonomic differences between participating laboratory and Unicomarine Ltd. results were limited to only a very few instances. There was no pattern discernible, and in view of the variety of sample types received this was unsurprising.

4.2.4 Comparison of Similarity indices (Bray-Curtis).

The procedure for the calculation of the similarity index was as used for MB03, except that in this case no adjustments were made to the original data sets before analysis. The Bray-Curtis similarity index figures (Table 4, column 14) range from 92 to 100% indicating a generally high degree of similarity between the data-sets produced separately from the same sample by Unicomarine Ltd. and the participating laboratories.

4.2.5 Biomass determinations

It was not possible to make a comparison of the biomass determination in all cases; in some no data were provided, in others data were pooled by group rather than by taxon. Table 5 shows the comparison of the participating laboratory and Unicomarine Ltd. biomass figures by major taxonomic groups. With the exception of three laboratories the values obtained by the participating laboratories were within 12% of those obtained by Unicomarine Ltd. The largest discrepancy was a 211% difference between the two sets of results (the laboratory estimation was less than AQC). The difference for two other laboratories was between 30% and 40% (the laboratories' estimations were more than

AQC). These reason for the large differences is unknown but is presumably a combination of variations in apparatus (*eg.* calibration) and operator technique (*eg.* period of drying).

4.2.6 Discussion of Own Sample results.

Where both OS and MB data were available, all laboratories performed better in the OS01 exercise than in MB03. This is perhaps expected due to the familiarity of the samples and benthos. All Bray-Curtis indices were in excess of 92% and in most cases the exemption from 100% was due to only a few count or taxonomic variances. It should be noted however that in most cases the samples received could be considered somewhat more straightforward than those distributed as MB03.

4.3 Particle Size Analysis (PS)

4.3.1 General comments

Variations in the format used to return data again presented problems in comparing the results from the analysis of the PS05, PS06 and PS07 samples. All of the variants employed in the first year of the Scheme were continued.

As previously reported a number of sub-contractors were used for this component of the Scheme and hence the results presented are actually for a smaller number of analytical laboratories.

As described above two of the distributed samples (PS06 and PS07) differed from the earlier samples in that they were prepared artificially from known weights of sediment.

4.3.2 Analysis of sample replicates

Replicates of sample PS05 were analysed by Malvern Laser as for earlier distributions. The results for these replicates are presented in Table 6 and Figure 1. As has previously been found there was a high degree of similarity between the replicates.

A slightly different approach was taken to the analysis of the replicates from samples PS06 and PS07. Earlier results indicated a difference between the results returned from laboratories using laser analysis and those using sieve (and pipette); results tending to group according to the analytical method employed. Accordingly replicates from the artificial samples were analysed using both methods. Half of the replicates (six samples) were analysed using the Malvern laser (as for the first year of the Scheme) and half by the sieve and pipette technique. The results for these two samples appear in Tables 7 and 8 and Figures 2 and 3. While the overall form of the distribution curves is similar the results from the two techniques are clearly grouped.

4.3.3 Results from participating laboratories

Summary statistics for each of the three PS circulations are presented in Tables 9 to 11. After resolution of the differences in presentation of results above, the size distribution curves for each of the sediment samples were plotted and are presented in Figures 4 to 6. Included on each of these Figures for comparison is the mean distribution curve(s) for the replicate samples.

4.3.3.1 *PS05*

The circulation appeared to pose few problems and the results formed two close groups reflecting the two major analytical techniques.

4.3.3.2 *PS06*

The circulation appeared to pose few problems and the results again formed two close groups reflecting the two major analytical techniques. Results for two laboratories were clearly anomalous. These are being investigated with the laboratories concerned.

4.3.3.3 *PS07*

The greater proportion of fines in the sediment sample (over 50% clay and silt) appears to have resulted in considerably more variation in the results, particularly for those laboratories using sieves. The size distribution curves for a number of laboratories were of clearly different shape.

4.3.4 *Discussion of Particle Size Analysis results*

4.3.4.1 *Differences by Analytical technique*

The marked difference between the results associated with the analytical technique was apparent from the PS circulations. This difference will need to be addressed before pooling data from different laboratories possibly using different techniques.

4.4 Ring Test Circulations (RT)

4.4.1 *General comments*

The implementation of this part of the Scheme was basically the same as for the first Year. Three circulations of specimens were made (rather than four) each containing twenty-five specimens (rather than twenty). In a number of cases species were circulated which had been included in a previous circulation. In one instance two specimens of the same species were (intentionally) included in a circulation.

4.4.2 *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.

As previously found 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 12 to 14 present the identifications made by each of the participating laboratories for each of the twenty-five specimens in each of the three 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.

4.4.2.1 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 12 to 14. Two separate scores were maintained; for differences at the level of genus and species. These are not independent values, if the generic level identification was incorrect then the specific identification would normally 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 15 for each of the three RT circulations.

4.4.3 Ring Test distribution results

As for the first year there was a high level of agreement between participating laboratories and in most cases identifications made were in agreement with those made by Unicomarine Ltd. A small number of taxa were again responsible for the majority of differences and these are described briefly below. More detailed examination of the RT results including the production of a summary of the likely reasons for the various mis-identifications is in progress.

4.4.3.1 Fifth distribution - RT05

Table 12 presents the results for the fifth RT circulation (RT05). Two specimens accounted for 22 of 81 differences (27%) at the level of genus. The mollusc, *Lacuna vincta* and a polychaete species *Spio decorata* were each identified differently by approximately half of the participating laboratories. Another species, *Sabella pavonina* was identified as *Sabella flabellata* by a significant number of laboratories. The identification of this species as *Sabella pavonina* has been confirmed by P. Knight-Jones who also indicated that *Sabella flabellata* was probably incorrectly included in a key commonly in use by participating laboratories.

4.4.3.2 *Sixth distribution - RT06*

Table 13 presents the results for the sixth RT circulation (RT06). The level of agreement was generally high for this circulation which appeared to present few problems. A single specimen considered to be *Echinogammarus obtusatus* was identified differently by the majority of participating laboratories and was responsible for 16 of 78 differences (21%) overall. This identification of the specimens is currently being re-examined.

4.4.3.3 *Seventh distribution - RT07*

Table 14 presents the results for the seventh RT circulation (RT07). There was generally lower level of agreement at the level of species with the AQC identification for this circulation although the agreement at the level of genus was comparable to that found for RT05 or RT06. Three species were appeared to pose a particular problem. *Ensis americanus* and *Ampelisca spinipes* were identified correctly by all participating laboratories at the generic level but differently at the level of species by more than half of the laboratories returning results. A third species *Molgula manhattensis* was also identified differently by more than half of the participating laboratories. These three species together accounted for 38 of 98 differences (39%) at the level of species.

4.4.4 *Differences between participating laboratories.*

Figure 7 presents for the three RT circulations the number of differences recorded at the level of genus for each of the participating laboratories. The laboratories are ordered by increasing average number of differences considering the three circulations. The number of differences recorded at the level of species are presented in a similar manner in Figure 8 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.

4.4.5 *Differences by taxonomic group.*

The total number of differences for each of the major phyla and for all circulations is summarised in Table 16. The molluscs again seem to have caused most problems and have a rate of differences per distributed specimen somewhat higher than the other groups in which more than one specimen was distributed. The difference between groups is less marked than for the circulations made in year one.

4.4.6 *General discussion of the RT results*

The results were comparable with those from the first year and most participating laboratories agreed on the identification of the majority of the distributed taxa. Further examination of the species causing the majority of differences is underway and will facilitate the 'targetting' of specific problem areas. The production of more detailed information on the identification of a number of the problem groups (including the Cirratulidae) is underway.

To date seven RT circulations (RT01 to RT07) have been made. In each circulation a similar pattern to the differences between the AQC identification and those made by the participating laboratories is apparent. Typically most taxa are identified by most participating laboratories the same as the AQC identification (ignoring any differences of spelling or synonymy). In most cases there is a relatively small number of taxa (usually less than three) producing the majority of differences. In some cases a species may be identified differently by most laboratories. Where this happens examination of the identifications made indicates that two broad groups may be recognised. In some cases most laboratories agree on an identification (though different to the AQC identification); in others, no single identification is favoured, and a variety of alternative names is provided. There are several possible explanations for the observations but following an examination of the taxa involved some of the possible explanations for the two main trends are suggested below.

Consistent, but different, identification by participating laboratories.

1. AQC identification wrong.
2. Laboratories using different keys which may not include the species concerned.
3. Participating laboratories using same key but all making same mistake in it's interpretation.

Inconsistent identification by participating laboratories.

1. Specimens distributed were different.
2. Laboratories using different keys which may not include the species concerned.
3. Identifications were 'best guess' or 'default' identifications.

Further examination of the data from the RT exercises is in progress and a more comprehensive consideration of the identifications made of all of the distributed taxa is in preparation. This will attempt to identify the reasons for the differences in each case, and highlight certain taxa (individual species, genera or higher) for taxonomic consideration (such as workshops).

As an illustration of the different categories the identifications made of a number of the taxa distributed in RT05 to RT07 have been examined in more detail. Table 17 illustrates those taxa for which there were more than five differences of identification at the level of species. The number of differences at the level of genus and species is indicated for each specimen. Also given is the number of alternative identifications made by participating laboratories and the number of laboratories choosing the most frequently used alternative.

Although it is impossible to draw a firm division between the categories some examples may be given. Two amphipod species (*Ampelisca spinipes* and *Echinogammarus obtusatus*) illustrate the category of different and consistent identification described above. In the same category is the mollusc *Ensis americanus*. In each case more than one third of the participating laboratories identified the specimens in the same way - generally as another species within the genus.

Rather more scatter in the identifications made is apparent for the polychaete, *Tharyx vivipara*, the tanaid, *Araphura brevimana*, and the bivalve mollusc, *Moerella pygmaea*.

Each was identified differently at the generic level by approximately one-quarter and at the specific level by approximately one-third of participating laboratories. Five or more alternative names were supplied for each specimen, though none was used by more than two laboratories. This group (and others) is considered to represent the different and inconsistent category.

The problems of identification do not appear to be associated with a particular taxonomic group, most are represented in the Table though species of Crustacea and Mollusca fill seven of the top ten places. The results from all the RT exercises (RT01 to RT07) seem to indicate that molluscs (and gastropods in particular) pose more problems than other groups. Within the Polychaeta the Cirratulidae and Syllidae are also clearly areas of difficulty.

Lack of experience of a sufficiently wide range of species may explain some of the incorrect identifications made. In number of groups successful identification depends upon the correct recognition of sometimes subtle differences in shape. This is most noticeable in the molluscs, perhaps particularly so in the gastropods, but is also true for other groups. In these cases the standard key approach is less satisfactory as identification is not simple a question of presence or absence. Instead separation of species requires, for example, determining the degree of curvature of a margin or the relative proportions of a gnathopod. Such judgements are made easier through experience of a variety of material and by careful comparison to diagrams (often absent from keys) and reference material.

5. Discussion of Results

5.1 General observations

5.1.1 Macrobenthic Analyses

The results from analysis of the MB sample (particularly the problems associated with identification of the Cirratulidae and Oligochaeta) indicated the importance of prior examination of the raw data. Analysis of a data set consisting of the results from the participating laboratories without such pre-processing would generate quite different results to that resulting from an analysis of 'adjusted' data. The level of intervention required will differ according to the faunal component of the samples.

5.1.2 Own Sample analysis

All participating laboratories performed well in the OS exercise, with values of the Bray-Curtis similarity index somewhat higher than for the (corrected) values from the MB exercise. As noted above the samples received from laboratories had in most cases a smaller number of taxa (by a factor of 2 to 3) and individuals. This should not detract from the results if the samples were representative of the material routinely encountered by the laboratory.

5.1.3 Ring Test distributions

The results from RT05 to RT07 were comparable to those from the earlier circulations (RT01 to RT04). Most of the problems of identification were associated with a

relatively small number of the distributed taxa. In most cases the species concerned were from recognised 'problem' groups and in many cases the differences of identification had been predicted in advance.

5.1.4 Particle Size Analyses

The results (particularly those from PS06 and PS07) confirmed the importance of the analytical technique. Participating laboratories using laser diffraction analysis were in the main grouped with others using the same technique and a similar situation was found for those using sieve analysis. If results from laboratories using different methods are to be compared then any system to be used for storing information on sediment particle size distribution will require provision for also storing the analytical technique employed.

5.2 Comparison of participating laboratories.

Individual comments on each of the participating laboratories for each of the four components of the second year of the Scheme are given below. For a variety of reasons a number of laboratories were unable to submit results for some exercises; this is indicated where appropriate.

The new component of the Scheme, termed the Own Sample (OS) exercise, provided similar information to that obtained from the MB exercise. Most laboratories considered the OS to be more appropriate however, as the sample involved was, by definition, from their own area. As such the sample reflected the substratum and fauna with which they were familiar and addressed some of the criticisms made of the MB exercise. Further similar exercises are intended for the third year. The general level of agreement between the participating laboratories and Unicomarine Ltd. (as measured by the Bray-Curtis similarity index) was higher for OS01 than MB03, possibly reflecting the laboratories familiarity. It should be noted however that the majority of OS01 samples received were more straightforward (in terms of the number of species and individuals they contained) than those distributed as MB03.

The differences between participating laboratories in the macrobenthic exercise resulted primarily from differences in the identification of Cirratulidae and Oligochaeta. General sorting and extraction efficiency was high.

In most cases distribution curves for PS05 and PS06 were comparable with those from other laboratories using same analytical technique. This was not true for PS07 which clearly posed more analytical problems. The spread of results was much greater, presumably as result of the higher proportion of silt and clay. Comments are provide below for those laboratories where the distribution curves were clearly different. Further examination of the data is in progress.

There was fair degree of consistency between RT circulations in the performance of individual laboratories. In the comments below an indication is given of the placing of a laboratory with respect to all participating laboratories in terms of their average 'score' (see above) at the level of species. This value is the total number of differences from the AQC identification at the level of species. The laboratories have been divided into three

groups termed Low, Mid and High. The naming reflects the average species score and correspond to ranges of 0 to 3.5, 3.5 to 5.0 and greater than 5.0 differences, respectively. Thus a laboratory in the Low third shows better agreement with the AQC identification than one in the High third. It should be stressed that this does not represent a particular standard, but rather a relative placement of each laboratory. More detailed examination of the results from the Ring Test circulations is underway including an exercise to identify a set of standard taxa.

5.2.1 Comments on individual laboratories.

Laboratory - LB01

Macrobenthos

Several animals not extracted from sediment. Some differences in identification of Hesionidae, Syllidae, Cirratulidae and Oligochaeta. Anthozoans apparently weighed with small stones attached. Very low Bray-Curtis similarity index using raw data the result of differences in handling Cirratulidae. Good agreement if Cirratulidae combined.

Own Sample

No sample received.

Particle size

No results received.

Ring Test

Number of differences from AQC identification in High group.

Laboratory - LB02

Macrobenthos

Significant number of specimens not extracted from sediment, though almost half were small pycnogonida. Some Taxon pots included headless material which added to the biomass recorded. Bray-Curtis similarity index same (89%) for raw and adjusted data.

Own Sample

One taxonomic error. Three individuals not extracted from sediment. Bray-Curtis similarity index high.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in Low group.

Laboratory - LB03

Macrobenthos

Problems with Cirratulid, Oligochaete and Mollusc identification; Several animals not extracted from sediment. Colonials not recorded. Bray-Curtis similarity index improved from 51% to 98% after adjustment for Cirratulidae and Oligochaeta.

Own Sample

No sample received.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in Mid group.

Laboratory - LB04

Macrobenthos

Problems with Cirratulid identification. Several animals not extracted from sediment. Bray-Curtis similarity index improved from 56% to 90% after adjustment for Cirratulidae.

Own Sample

Identical results for counts and identification; Bray-Curtis similarity index correspondingly high.

Particle size

Size distribution curve for PS07 markedly depressed.

Ring Test

Number of differences from AQC identification in Mid group.

Laboratory - LB05

Macrobenthos

Problems with Cirratulid and Oligochaete identification. A vial labelled as 'Tails, Debris & Unidentified Material' contained seventeen countable individuals (six Taxa). Bray-Curtis similarity index improved from 20% to 89% after adjustment for Cirratulidae.

Own Sample

Two taxonomic differences; Eight animals not extracted from sediment. Bray-Curtis similarity index high. Values for biomass estimation very much lower (by factor of two) throughout.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in High group.

Laboratory - LB06

Macrobenthos

Problems with Cirratulid identification. Several animals not extracted from sediment. No biomass information available. Bray-Curtis similarity index high.

Own Sample

No sample received.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in Low group.

Laboratory - LB07

Macrobenthos

Problems with Cirratulid identification; Several animals not extracted from sediment. Bray-Curtis similarity index improved from 43% to 96% after adjustment for Cirratulidae.

Own Sample

Two animals not extracted from sediment. Bray-Curtis similarity index high.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in Mid group.

Laboratory - LB08

Macrobenthos

No sample returned.

Own Sample

One taxonomic error; Eleven animals not extracted from sediment. Bray-Curtis similarity index high.

Particle size

No major differences PS05 or PS07; PS06 results clearly offset in possible error of interpretation.

Ring Test

Number of differences from AQC identification in Low group.

Laboratory - LB09

Macrobenthos

No sample returned.

Own Sample

Sub-sampling of a small number of Oligochaetes (76) failed to retrieve two taxa. Bray-Curtis similarity index high.

Particle size

Results only available for PS05, no major differences.

Ring Test

Results only available for RT05, number of differences from AQC identification in High group.

Laboratory - LB10

Macrobenthos

Problems with Cirratulid identification. Bray-Curtis similarity index improved from 39% to 93% after adjustment for Cirratulidae.

Own Sample

Two unrecorded individuals within Taxon pots; Ten animals not extracted from sediment. Bray-Curtis similarity index high.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in High group.

Laboratory - LB11

Macrobenthos

Some Taxon pots also included headless material which added to the biomass figures recorded (uncertain as to which species these 'bits' belong). Colonials not recorded. Bray-Curtis similarity index high with little influence of pooling Cirratulidae and Oligochaeta.

Own Sample

One unrecorded individual within Taxon pot. Bray-Curtis similarity index high.

Particle size

PS05 and PS06 no major differences; elevated estimation of fines in PS07.

Ring Test

Number of differences from AQC identification in Low group.

Laboratory - LB12

Macrobenthos

No sample returned.

Own Sample

No sample received.

Particle size

No sample received.

Ring Test

No results received.

Laboratory - LB13

Macrobenthos

Some Taxon pots also included headless material which added to the biomass figures recorded (uncertain as to which species these 'bits' belong). Biomass figures provided but rounded or estimated to two decimal places only and excluded from analysis. Bray-Curtis similarity index high with little influence of pooling Cirratulidae.

Own Sample

Two unrecorded individuals within Taxon pots; Three animals not extracted from sediment; Biomass figures provided but of low precision and therefore have been excluded from analysis. Bray-Curtis similarity index high.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in Low group.

Laboratory - LB14

Macrobenthos

No sample returned.

Own Sample

No sample received.

Particle size

Results only available for PS05, no major differences.

Ring Test

No results received.

Laboratory - LB15

Macrobenthos

Problems with Cirratulid identification; Some Taxon pots also included headless material which added to the biomass figures recorded (uncertain as to which species these 'bits' belong). . Some animals not extracted from sediment. Bray-Curtis similarity index improved from 23% to 94% after adjustment for Cirratulidae.

Own Sample

Six animals not extracted from sediment; Laboratory biomass figures on the whole lower. Bray-Curtis similarity index high.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in High group.

Laboratory - LB16

Macrobenthos

Problems with Oligochaete identification. Colonial taxa not recorded. Bray-Curtis similarity index high with little influence of pooling Cirratulidae.

Own Sample

No sample received.

Particle size

No major differences in PS05 or PS06; elevated estimation of fines in PS07.

Ring Test

Number of differences from AQC identification in Mid group.

Laboratory - LB17

Macrobenthos

No sample returned.

Own Sample

Four taxonomic differences. Bray-Curtis similarity index high.

Particle size

No major differences in PS05. Clear offset of curves in PS06 and PS07, apparently due to miscalculation of Phi intervals.

Ring Test

Number of differences from AQC identification in Mid group.

Laboratory - LB18

Macrobenthos

No sample returned.

Own Sample

Two taxonomic errors, two animals not extracted from the sediment. Bray-Curtis similarity index high.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in Low group.

Laboratory - LB19

Macrobenthos

No sample returned.

Own Sample

Two taxonomic errors. No biomass data available. Bray-Curtis similarity index high.

Particle size

No major differences. No data for PS07.

Ring Test

Number of differences from AQC identification in High group.

Laboratory - LB20

Macrobenthos

No biomass data available. Colonial taxa not recorded. Bray-Curtis similarity index high with little influence of pooling Cirratulidae.

Own Sample

No sample received.

Particle size

No major differences PS05 and PS06. Clear offset of size distribution curve in PS07.

Ring Test

Number of differences from AQC identification in Low group.

Laboratory - LB21

Macrobenthos

No sample returned.

Own Sample

No sample received.

Particle size

No major differences.

Ring Test

Number of differences from AQC identification in High group.

Laboratory - LB22

Macrobenthos

No sample returned.

Own Sample

No sample received.

Particle size

No major differences PS05 and PS06. No data for PS07.

Ring Test

Number of differences from AQC identification in Mid group.

Laboratory - LB23

Macrobenthos

Colonial taxa not recorded. Some Taxon pots also included headless material which added to the biomass figures recorded (uncertain as to which species these 'bits' belong). Bray-Curtis similarity index high with no influence of pooling Cirratulidae.

Own Sample

Five taxonomic differences. Three animals not extracted from sediment. No biomass figures available. Bray-Curtis similarity index high.

Particle size

No major differences PS05 and PS06. Clear offset of size distribution curve in PS07.

Ring Test

Number of differences from AQC identification in Mid group.

Laboratory - LB24

Macrobenthos

No sample returned.

Own Sample

No sample received.

Particle size

No sample received.

Ring Test

No results received.

Tables

Table 1. Results from the analysis of Macrobenthic sample MB03 by the participating laboratories.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Number of Taxa (excl. epi)				Num. Taxa (inc. epi)		Number of Individuals				Not extracted			Individuals	Similarity index	
	PL	UM	Diff (n)	%max	PL	UM	PL	UM	Diff (n)	%max	Taxa	Ind	%ind	Count Error	Raw	Adjusted
.B01	35	40	-5	12.5	36	41	386	390	-4	1.0	2	19	4.9	15	20.36	95.53
.B02	38	39	-1	2.6	42	44	205	247	-42	17.0	2	42	17.0	0	88.94	88.94
.B03	44	47	-3	6.4	44	50	634	642	-8	1.2	1 (4)	10	1.6	2	51.25	97.65
.B04	61	61	0	0.0	77	78	600	609	-9	1.5	1 (2)	11	1.8	2	56.25	89.99
.B05	31	33	-2	6.1	35	37	298	336	-38	11.3	1	1	0.3	-37	20.19	89.27
.B06	39	39	0	0.0	40	43	301	307	-6	2.0	1 (4)	14	4.6	8	-	-
.B07	52	53	-1	1.9	55	58	728	721	7	1.0	1 (3)	14	1.9	21	43.62	95.79
.B08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.B09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.B10	43	41	2	4.7	47	45	259	261	-2	0.8	1	3	1.1	1	38.92	93.26
.B11	33	34	-1	2.9	33	41	299	301	-2	0.7	1 (8)	3	1.0	1	93.00	95.00
.B12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.B13	65	65	0	0.0	72	73	775	792	-17	2.1	0	3	0.4	-14	94.32	96.11
.B14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.B15	26	25	1	3.8	31	31	198	198	0	0.0	0 (1)	7	3.5	7	22.67	93.70
.B16	35	37	-2	5.4	35	40	286	292	-6	2.1	1 (4)	2	0.7	-4	94.81	97.58
.B17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.B18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
.B19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B20	56	57	-1	1.8	58	63	804	801	3	0.4	0 (4)	4	0.5	7	91.09	98.57
B21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B23	30	30	0	0.0	31	34	287	288	-1	0.3	0 (3)	2	0.7	1	96.00	96.00
B24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 2. Comparison of the efficiency of extraction of fauna by the participating laboratories for the major taxonomic groups present in sample MB03.

LabCode		Polychaeta	Oligochaeta	Pycnogonida	Crustacea	Echinodermata	Mollusca	Other	Overall
LB01	UM count	299	44	14	4	-	3	26	390
	missed	12	3	2	2	-	0	0	19
	%missed	4.0	6.8	14.3	50.0	-	0.0	0.0	4.9
LB02	UM count	151	0	43	17	3	8	25	247
	missed	10	0	22	5	1	4	0	42
	%missed	6.6	-	51.2	29.4	33.3	50.0	0.0	17.0
LB03	UM count	495	82	14	4	3	4	40	642
	missed	2	2	5	0	0	1	0	10
	%missed	0.4	2.4	35.7	0.0	0.0	25.0	0.0	1.6
LB04	UM count	322	6	174	12	4	46	45	609
	missed	1	0	8	0	0	0	2	11
	%missed	0.3	0.0	4.6	0.0	0.0	0.0	4.4	1.8
LB05	UM count	305	6	3	5	0	2	15	336
	missed	0	0	1	0	0	0	0	1
	%missed	0.0	0.0	33.3	0.0	-	0.0	0.0	0.3
LB06	UM count	175	8	86	4	0	16	18	307
	missed	5	0	6	0	0	1	2	14
	%missed	2.9	0.0	7.0	0.0	-	6.3	11.1	4.6
LB07	UM count	568	30	69	7	1	7	39	721
	missed	6	1	5	0	0	0	2	14
	%missed	1.1	3.3	7.2	0.0	0.0	0.0	5.1	1.9
LB10	UM count	183	7	50	4	0	4	13	261
	missed	2	0	0	0	0	1	0	3
	%missed	1.1	0.0	0.0	0.0	-	25.0	0.0	1.1
LB11	UM count	134	4	33	6	2	9	113	301
	missed	3	0	0	0	0	0	0	3
	%missed	2.2	0.0	0.0	0.0	0.0	0.0	0.0	1.0
LB13	UM count	489	60	168	32	4	18	21	792
	missed	1	0	0	0	0	1	1	3
	%missed	0.2	0.0	0.0	0.0	0.0	5.6	4.8	0.4
LB15	UM count	167	0	16	5	0	1	9	198
	missed	6	0	1	0	0	0	0	7
	%missed	3.6	-	6.3	0.0	-	0.0	0.0	3.5
LB16	UM count	221	8	14	3	1	7	38	292
	missed	0	0	2	0	0	0	0	2
	%missed	0.0	0.0	14.3	0.0	0.0	0.0	0.0	0.7
LB20	UM count	512	102	122	12	0	14	39	801
	missed	1	0	0	0	0	0	3	4
	%missed	0.2	0.0	0.0	0.0	-	0.0	7.7	0.5
LB23	UM count	188	5	75	7	0	2	11	288
	missed	1	0	0	0	0	0	1	2
	%missed	0.5	0.0	0.0	0.0	-	0.0	9.1	0.7

Table 3. Comparison of the estimates of biomass made by the participating laboratories with those made by Unicomarine Ltd. for the major taxonomic groups present in sample MB03.

LabCode		Nemertea	Polychaeta	Oligochaeta	Pycnogonida	Crustacea	Echinodermata	Mollusca	Other	Overall
LB01	PL	0.0001	0.9225	0.0056	0.0050	0.0015	-	0.0122	4.7466	5.6935
	UM	0.0001	0.5162	0.0030	0.0031	0.0009	-	0.0107	3.6699	4.2039
	%diff.	0.0	44.0	46.4	38.0	40.0	-	12.3	22.7	26.2
LB02	PL	-	1.0867	0.0006	0.1675	0.0101	14.2161	1.2276	5.5383	22.2469
	UM	-	0.7733	0.0002	0.1573	0.0046	12.3004	1.2124	3.9673	18.4155
	%diff.	-	28.8	66.7	6.1	54.5	13.5	1.2	28.4	17.2
LB03	PL	-	0.6364	0.0074	0.0034	0.1887	0.0069	0.0301	3.1775	4.0504
	UM	-	0.5914	0.0069	0.0041	0.2023	0.0069	0.0293	2.8116	3.6525
	%diff.	-	7.1	6.8	-20.6	-7.2	0.0	2.7	11.5	9.8
LB04	PL	0.0007	2.2235	0.0007	0.1069	0.3314	0.0129	109.5952	16.5533	128.8246
	UM	0.0007	2.2043	0.0005	0.0834	0.3186	0.0118	110.3506	13.2241	126.1940
	%diff.	0.0	0.9	28.6	22.0	3.9	8.5	-0.7	20.1	2.0
LB05	PL	-	0.6070	-	0.1180	0.0070	-	0.0280	9.3240	10.0840
	UM	-	0.5145	-	0.1163	0.0062	-	0.0291	7.6206	8.2867
	%diff.	-	15.2	-	1.4	11.4	-	-3.9	18.3	17.8
LB07	PL	-	1.5375	0.0015	0.0439	0.0030	0.0005	0.0185	3.3941	4.9990
	UM	-	1.4834	0.0017	0.0379	0.0024	0.0004	0.0178	3.1556	4.6992
	%diff.	-	3.5	-13.3	13.7	20.0	20.0	3.8	7.0	6.0
LB10	PL	0.0001	0.8311	0.0011	0.0177	0.0182	-	0.0073	2.3953	3.2708
	UM	0.0001	0.7101	0.0007	0.0200	0.0159	-	0.0062	2.2966	3.0496
	%diff.	0.0	14.6	36.4	-13.0	12.6	-	15.1	4.1	6.8
LB11	PL	0.0449	0.5054	0.0004	0.0177	0.0336	2.4899	0.0612	2.2973	5.4504
	UM	0.0385	0.4379	0.0005	0.0145	0.0307	1.9824	0.0565	2.0737	4.6347
	%diff.	14.3	13.4	-25.0	18.1	8.6	20.4	7.7	9.7	15.0
LB13	PL	-	-	-	-	-	-	-	-	0.0000
	UM	-	-	-	-	-	-	-	-	0.0000
	%diff.	-	-	-	-	-	-	-	-	-
LB15	PL	-	0.2798	-	0.0028	0.1974	-	0.0001	1.9152	2.3953
	UM	-	0.3220	-	0.0055	0.2040	-	0.0001	1.9353	2.4669
	%diff.	-	-15.1	-	-96.4	-3.3	-	0.0	-1.0	-3.0
LB16	PL	-	0.6542	0.0002	0.0092	0.0012	0.0012	0.5248	3.3854	4.5762
	UM	-	0.4507	0.0006	0.0088	0.0012	0.0011	0.3022	2.4913	3.2559
	%diff.	-	31.1	-200.0	4.3	0.0	8.3	42.4	26.4	28.9
LB20	PL	-	-	-	-	-	-	-	-	0.0000
	UM	-	-	-	-	-	-	-	-	0.0000
	%diff.	-	-	-	-	-	-	-	-	-
LB23	PL	-	0.5718	0.0007	0.0398	0.0611	-	0.0139	2.7856	3.4729
	UM	-	0.4338	0.0005	0.0459	0.0578	-	0.0151	2.6122	3.1653
	%diff.	-	24.1	28.6	-15.3	5.4	-	-8.6	6.2	8.9

Table 4. Results from the analysis of the Own sample OS01 by the participating laboratories and re-analysis by Unicomarine Ltd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Number of Taxa				Number of Individuals				Not extracted				
	PL	UM	Diff (n)	%max	PL	UM	Diff (n)	%max	Taxa	Ind	%ind	Count Error	Similarity index
LB01	-	-	-	-	-	-	-	-	-	-	-	-	-
LB02	19	19	0	0.0	118	122	-4	3.3	0	3	2.5	-1	97.91
LB03	-	-	-	-	-	-	-	-	-	-	-	-	-
LB04	14	14	0	0.0	74	74	0	0.0	0	0	0.0	0	100.00
LB05	16	16	0	0.0	159	167	-8	4.8	0	8	4.8	0	92.73
LB06	-	-	-	-	-	-	-	-	-	-	-	-	-
LB07	15	15	0	0.0	299	303	-4	1.3	0	2	0.7	-2	99.34
LB08	11	11	0	0.0	881	894	-13	1.5	0	11	1.2	-2	97.17
LB09	10	12	-2	16.7	515	514	1	0.2	0	0	0.0	1	98.54
LB10	11	12	-1	8.3	884	892	-8	0.9	0	10	1.1	2	99.44
LB11	30	31	-1	3.2	184	185	-1	0.5	0	0	0.0	-1	98.10
LB12	-	-	-	-	-	-	-	-	-	-	-	-	-
LB13	21	21	0	0.0	247	251	-4	1.6	0	3	1.2	-1	98.18
LB14	-	-	-	-	-	-	-	-	-	-	-	-	-
LB15	13	13	0	0.0	82	83	-1	1.2	0	6	7.2	5	95.76
LB16	-	-	-	-	-	-	-	-	-	-	-	-	-
LB17	32	32	0	0.0	146	147	-1	0.7	0	0	0.0	-1	92.83
LB18	19	19	0	0.0	91	90	1	1.1	0	2	2.2	3	-
LB19	25	25	0	0.0	124	124	0	0.0	0	0	0.0	0	93.55
LB20	-	-	-	-	-	-	-	-	-	-	-	-	-
LB21	-	-	-	-	-	-	-	-	-	-	-	-	-
LB22	-	-	-	-	-	-	-	-	-	-	-	-	-
LB23	39	40	-1	2.5	749	752	-3	0.4	0	3	0.4	0	97.94
LB24	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5. Comparison of the estimates of biomass made by the participating laboratories with those made by Unicomarine Ltd. for the major taxonomic groups present in sample OS01.

LabCode		Nemertea	Polychaeta	Oligochaeta	Pycnogonida	Crustacea	Echinodermata	Mollusca	Other	Overall
LB02	PL	0.0096	0.5182	-	-	0.0853	0.4781	6.4419	0.0845	7.6176
	UM	0.0068	0.3392	-	-	0.0511	0.4329	6.3686	0.0491	7.2477
	%diff.	29.2	34.5	-	-	40.1	9.5	1.1	41.9	4.9
LB04	PL	-	0.8136	0.0030	-	-	-	0.0143	-	0.8309
	UM	-	0.4928	0.0014	-	-	-	0.0114	-	0.5056
	%diff.	-	39.4	53.3	-	-	-	20.3	-	39.2
LB05	PL	0.0004	0.1083	0.0001	-	-	-	0.0004	0.0004	0.1096
	UM	0.0013	0.3376	0.0002	-	-	-	0.0016	0.0004	0.3411
	%diff.	-225.0	-211.7	-100.0	-	-	-	-300.0	0.0	-211.2
LB07	PL	-	0.1251	0.0005	-	0.0756	-	3.1409	0.0001	3.3422
	UM	-	0.0972	0.0004	-	0.0537	-	3.0488	0.0001	3.2002
	%diff.	-	22.3	20.0	-	29.0	-	2.9	0.0	4.2
LB09	PL	-	0.0490	0.0170	-	0.1070	-	-	-	0.1730
	UM	-	0.0448	0.0047	-	0.1187	-	-	-	0.1682
	%diff.	-	8.6	72.4	-	-10.9	-	-	-	2.8
LB10	PL	-	1.4000	0.0031	-	0.0106	-	3.2914	0.0023	4.7074
	UM	-	1.2744	0.0020	-	0.0150	-	3.4761	0.0015	4.7690
	%diff.	-	9.0	35.5	-	-41.5	-	-5.6	34.8	-1.3
LB11	PL	0.0119	1.0747	0.0010	-	0.6516	1.5418	46.4641	0.0017	49.7468
	UM	0.0091	0.8193	0.0432	-	0.5793	1.4843	44.6527	0.0011	47.5890
	%diff.	23.3	23.8	-4220.0	-	11.1	3.7	3.9	35.3	4.3
LB13	PL	-	0.6900	-	-	0.0300	-	0.0400	0.0100	0.7700
	UM	-	0.5177	-	-	0.0006	-	0.0136	0.0003	0.5322
	%diff.	-	25.0	-	-	98.0	-	66.0	97.0	30.9
LB15	PL	-	1.1266	0.0016	-	0.0125	-	1.9852	0.0002	3.1261
	UM	-	1.3273	0.0019	-	0.0203	-	2.1444	0.0001	3.4940
	%diff.	-	-17.8	-18.8	-	-62.4	-	-8.0	50.0	-11.8
LB17	PL	-	0.1784	-	-	0.0206	0.0044	3.3893	0.0646	3.6573
	UM	-	0.1827	-	-	0.0211	0.0019	3.2130	0.0746	3.4933
	%diff.	-	-2.4	-	-	-2.4	56.8	5.2	-15.5	4.5

Table 6. Summary of the results of particle size analysis (Malvern Laser) of the replicate samples from sediment circulation PS05.

	% Clay & Silt	Median (phi)	Mean (phi)	Sorting	Skew
PS05-1B- laser	3.57	3.02	2.93	0.48	0.049
PS05-3B- laser	4.01	3.10	3.01	0.51	-0.007
PS05-5B- laser	2.75	2.97	2.88	0.48	0.027
PS05-7B- laser	3.17	3.04	2.98	0.47	0.040
PS05-9B- laser	3.52	3.02	2.93	0.48	0.047
PS05-11B- laser	2.57	3.00	2.90	0.46	0.024
PS05-13B- laser	2.52	2.96	2.86	0.47	0.025
PS05-15B- laser	2.39	2.99	2.88	0.47	0.017
PS05-17B- laser	2.61	2.95	2.85	0.49	0.030
PS05-19B- laser	3.20	3.03	2.92	0.47	0.028
PS05-21B- laser	3.39	3.03	2.85	0.48	0.029
PS05-23B- laser	2.94	3.04	2.95	0.47	0.022

Table 7. Summary of the results of particle size analysis (Malvern Laser and Sieve) of the replicate samples from sediment circulation PS06.

	% Clay & Silt	Median (phi)	Mean (phi)	Sorting	Skew
PS06-5 - laser	4.91	2.17	2.01	0.65	0.030
PS06-6 - laser	5.47	2.09	1.84	0.95	0.084
PS06-7 - laser	5.49	2.22	2.12	0.79	0.214
PS06-8 - laser	5.73	2.23	2.02	0.84	0.176
PS06-9 - laser	4.90	2.17	1.73	0.71	-0.063
PS06-10 - laser	4.02	2.17	1.91	0.65	-0.054
PS06-15 - sieve	2.12	2.44	2.32	0.55	-0.220
PS06-16 - sieve	1.47	2.46	2.25	0.57	-0.370
PS06-17 - sieve	1.71	2.50	2.33	0.55	-0.310
PS06-18 - sieve	1.59	2.46	2.31	0.53	-0.280
PS06-19 - sieve	1.52	2.48	2.32	0.54	-0.300
PS06-20 - sieve	1.58	2.48	2.32	0.54	-0.300

Table 8. Summary of the results of particle size analysis (Malvern Laser and Sieve) of the replicate samples from sediment circulation PS07.

	% Clay & Silt	Median (phi)	Mean (phi)	Sorting	Skew
PS07-5 - laser	55.49	4.17	3.94	2.02	0.482
PS07-6 - laser	46.36	3.88	3.70	1.76	0.462
PS07-7 - laser	45.72	3.87	3.68	1.71	0.450
PS07-8 - laser	54.36	4.12	3.88	1.85	0.442
PS07-9 - laser	51.30	4.03	3.84	1.87	0.476
PS07-10 - laser	60.76	4.41	4.03	2.06	0.398
PS07-15 - sieve	63.68	4.54	6.14	2.85	0.560
PS07-16 - sieve	62.62	4.50	6.08	2.86	0.550
PS07-17 - sieve	63.79	4.52	6.11	2.82	0.560
PS07-18 - sieve	63.21	4.52	6.09	2.84	0.550
PS07-19 - sieve	62.88	4.48	6.16	2.93	0.570
PS07-20 - sieve	62.53	4.49	6.09	2.87	0.560

Table 9. Summary of the particle size information received from participating laboratories for the fifth particle size distribution - PS05.

Lab	Method	% < 63μm	Median	Mean	Sort	IGS (SKi)
LB01	DS/L	-	-	-	-	-
LB02	L	8.75	3.10	2.93	0.79	0.24
LB03	DS	4.52	3.24	3.26	0.41	0.02
LB04	DS/WS/L	5.71	3.27	3.28	0.37	0.11
LB05	WS/DS	5.65	3.37	3.37	0.33	-0.04
LB06	WS/DS	-	-	-	-	-
LB07	WS/DS	6.68	3.41	3.36	0.54	-1.26
LB08	L	-	-	-	-	-
LB09	L	-	-	-	-	-
LB10	L	-	-	-	-	-
LB11	L	6.58	3.15	3.09	0.75	-0.04
LB12	-	-	-	-	-	-
LB13	L	2.68	3.09	3.04	0.45	0.04
LB14	L	6.06	3.15	3.30	0.66	0.58
LB15	L	-	-	-	-	-
LB16	L	-	-	-	-	-
LB17	L	5.63	3.04	3.05	0.57	0.12
LB18	WS/DS/P	2.33	3.42	3.42	0.56	-0.27
LB19	DS/P	7.29	2.96	3.44	0.54	-0.07
LB20	DS/P	2.59	3.05	2.99	0.65	-1.99
LB21	FD/DS	5.85	3.40	3.42	0.37	0.06
LB22	WS/FD/DS/SG	6.81	3.40	3.35	0.44	0.22
LB23	FD/DS	5.38	3.35	3.38	0.38	0.12
LB24	-	-	-	-	-	-
LB25	FD/WS/DS/CC	-	-	-	-	-

PS05

Summary	% < 63μm	Median	Mean	Sort	IGS (SKi)
Number of values	15	15	15	15	15
Mean of laboratories	5.50	3.23	3.25	0.52	-0.14
Mean of 15 replicates (laser)	3.18	3.02	2.92	0.48	0.03
Laboratory minimum	2.33	2.96	2.93	0.33	-1.99
Laboratory maximum	8.75	3.42	3.44	0.79	0.58

Table 10. Summary of the particle size information received from participating laboratories for the sixth particle size distribution - PS06.

Lab	Method	%<63μm	Median	Mean	Sort	IGS (SKi)
LB01	DS/L	-	-	-	-	-
LB02	L	5.77	2.12	2.01	0.90	0.20
LB03	DS	0.72	2.47	2.32	0.68	-1.03
LB04	WS/DS/L	2.15	2.44	2.34	0.59	-0.32
LB05	S/P	0.76	2.55	2.35	0.62	-0.44
LB06	WS/DS	1.99	-	-	-	-
LB07	WS/DS	1.54	2.40	2.30	0.72	-0.64
LB08	L	-	-	-	-	-
LB09	L	-	-	-	-	-
LB10	L	1.90	2.09	2.03	0.74	0.08
LB11	L	5.20	2.18	2.09	0.89	-0.21
LB12	-	-	-	-	-	-
LB13	L	3.54	2.17	1.99	0.62	-0.04
LB14	L	-	-	-	-	-
LB15	L	3.27	2.25	2.09	0.56	-0.02
LB16	L	-	-	-	-	-
LB17	L	1.56	2.09	2.04	0.71	0.06
LB18	WS/DS/P	6.90	3.45	3.33	0.69	-0.33
LB19	DS/P	1.45	1.89	2.22	0.69	-0.20
LB20	DS/P/CC	0.54	2.20	2.11	0.67	-0.72
LB21	FD/L	-	-	-	-	-
LB22	WS/FD/DS/SG	1.42	2.40	2.55	0.62	-0.46
LB23	FD/DS	0.76	2.30	2.33	0.62	-0.25
LB24	-	-	-	-	-	-
LB25	FD/WS/DS/CC	-	-	-	-	-

PS06

Summary	%<63μm	Median	Mean	Sort	IGS (SKi)
Number of values	16	15	15	15	15
Mean of laboratories	2.47	2.33	2.27	0.69	-0.29
Mean of 6 replicates (laser)	5.09	2.18	1.94	0.77	0.06
Mean of 6 replicates (sieve)	1.67	2.47	2.31	0.55	-0.30
Laboratory minimum	0.54	1.89	1.99	0.56	-1.03
Laboratory maximum	6.90	3.45	3.33	0.90	0.20

Table 11. Summary of the particle size information received from participating laboratories for the seventh particle size distribution - PS07.

Lab	Method	% < 63μm	Median	Mean	Sort	IGS (SKi)
LB01	DS/L	-	-	-	-	-
LB02	L	66.64	4.89	4.15	2.15	0.25
LB03	DS	43.00	3.91	3.85	0.45	-1.27
LB04	WS/DS/L	81.70	6.29	5.83	1.96	-0.24
LB05	S	64.60	4.60	5.17	1.96	0.41
LB06	WS/DS	-	-	-	-	-
LB07	WS/DS	49.03	3.97	3.82	0.76	-0.72
LB08	L	63.90	4.22	4.02	0.66	-0.80
LB09	L	-	-	-	-	-
LB10	L	-	-	-	-	-
LB11	L	63.40	4.75	4.86	1.57	0.03
LB12	-	-	-	-	-	-
LB13	L	-	-	-	-	-
LB14	L	-	-	-	-	-
LB15	L	64.35	4.58	4.16	2.06	0.37
LB16	L	-	-	-	-	-
LB17	L/S	64.50	4.23	4.03	0.64	-0.83
LB18	WS/DS/P	62.10	4.44	4.98	1.82	0.33
LB19	DS/P	-	-	-	-	-
LB20	DS/P/CC	36.78	3.65	4.44	2.62	0.43
LB21	FD/DS	-	-	-	-	-
LB22	WS/FD/DS/SG	-	-	-	-	-
LB23	FD/DS	27.20	3.60	3.53	0.86	-0.07
LB24	-	-	-	-	-	-
LB25	FD/WS/DS/CC	-	-	-	-	-

PS07

Summary	% < 63μm	Median	Mean	Sort	IGS (SKi)
Number of values	12	12	12	12	12
Mean of laboratories	57.27	4.43	4.40	1.46	-0.18
Mean of 6 replicates (laser)	52.33	4.08	3.85	1.88	0.45
Mean of 6 replicates (sieve)	63.12	4.51	6.11	2.86	0.56
Laboratory minimum	27.20	3.60	3.53	0.45	-1.27
Laboratory maximum	81.70	6.29	5.83	2.62	0.43

Table 12. The identifications of the fauna made by participating laboratories in RT05. Names are given only where different to the AQC identification.

RT05	Taxon	LB01	LB02	LB03	LB04	LB05	LB06
RT0501	Gnathia oxyuraea	--	--	--	--	--	--
RT0502	Sabellaria alveolata	--	--	--	--	Lygdamis muratus	--
RT0503	Sabella pavonina	--	--	--	- flabellata	--	- flabellata
RT0504	Bittium reticulatum	--	--	--	--	Cerithiopsis tubercularis	--
RT0505	Lacuna vincta	Cingulopsis fulgida	--	--	- parva	--	- parva
RT0506	Mytilus edulis	--	--	Modiolula phaseolina	--	--	--
RT0507	Pisione remota	--	--	--	--	--	--
RT0508	Goodallia triangularis	--	--	--	--	--	--
RT0509	Pandalus montagui	--	--	--	--	--	--
RT0510	Hydrobia ulvae	--	--	--	--	- neglecta	--
RT0511	Diplocirrus glaucus	--	--	--	--	--	--
RT0512	Moerella pygmaea	--	--	--	--	Fabulina fabula	--
RT0513	Typosyllis variegata	Syllis amica	--	--	[Syllis] sp. B	--	--
RT0514	Polygordius lacteus	--	--	--	--	--	--
RT0515	Atylus falcatus	--	--	--	--	--	--
RT0516	Exogone hebes	--	--	--	--	--	[Exegone] -
RT0517	Urothoe marina	- pulchella	--	--	--	--	--
RT0518	Streptosyllis websteri	--	--	--	--	- bidentata	--
RT0519	Stenothoe monoculoides	--	--	--	--	--	--
RT0520	Ampithoe rubricata	--	--	--	--	--	--
RT0521	Araphura brevimana	Typhlotanais aequiremis	--	--	--	- finmarchica	[Leptognathia] breviremis
RT0522	Ampharete lindstroemi	--	--	--	--	Scololepis squamata	--
RT0523	Spio decorata	--	--	--	--	--	--
RT0524	Magelona mirabilis	--	--	--	--	--	[Magelone] -
RT0525	Spio martinensis	--	--	--	--	--	--

RT05	Taxon	LB13	LB14	LB15	LB16	LB17	LB18
RT0501	Gnathia oxyuraea	--	- [oxyurea]	0 0	--	--	- vorax
RT0502	Sabellaria alveolata	--	--	0 0	--	--	--
RT0503	Sabella pavonina	--	--	0 0	- [pavonia]	Pseudopotamilla reniformis	--
RT0504	Bittium reticulatum	--	--	0 0	Cerithiopsis tubercularis	--	--
RT0505	Lacuna vincta	- parva	- parva	0 0	--	--	--
RT0506	Mytilus edulis	--	--	0 0	--	--	--
RT0507	Pisione remota	--	--	0 0	--	--	--
RT0508	Goodallia triangularis	--	--	0 0	--	--	--
RT0509	Pandalus montagui	--	--	0 0	--	--	--
RT0510	Hydrobia ulvae	--	--	0 0	--	--	--
RT0511	Diplocirrus glaucus	--	Flabelligera affinis	0 0	--	--	--
RT0512	Moerella pygmaea	--	--	0 0	Angulus tenuis	--	--
RT0513	Typosyllis variegata	[Syllis] hyalina	[Syllis (Typosyllis)] -	0 0	[Syllis] -	[Syllis] armillaris	[Syllis] [type C]
RT0514	Polygordius lacteus	--	n/d n/d	0 0	--	--	--
RT0515	Atylus falcatus	--	--	0 0	--	--	--
RT0516	Exogone hebes	--	--	0 0	--	[Exogene] -	--
RT0517	Urothoe marina	--	--	0 0	--	--	--
RT0518	Streptosyllis websteri	--	--	0 0	--	--	--
RT0519	Stenothoe monoculoides	--	--	0 0	--	--	--
RT0520	Ampithoe rubricata	[Amphithoe] -	--	0 0	--	--	--
RT0521	Araphura brevimana	[Leptognathia] -	--	0 0	Pseudoparatanais batei ?	[Leptognathia] breviremis	- [brevimanus]
RT0522	Ampharete lindstroemi	--	- [sp.cf.lindstroemi]	0 0	--	--	--
RT0523	Spio decorata	- filicornis	- filicornis	0 0	- filicornis	- martinensis	--
RT0524	Magelona mirabilis	--	- ["mirabilis" form A]	0 0	--	--	--
RT0525	Spio martinensis	--	--	0 0	[illegible]	- armata	--

Table 12. The identifications of the fauna made by participating laboratories in RT05. Names are given only where different to the AQC identification.

RT05	Taxon	LB07	LB08	LB09	LB10	LB11	LB12
RT0501	Gnathia oxyuraea	--	--	--	--	--	0 0
RT0502	Sabellaria alveolata	--	--	--	--	--	0 0
RT0503	Sabella pavonina	Bispira volutacornis	--	Bispira volutacornis	Bispira volutacornis	--	0 0
RT0504	Bittium reticulatum	--	--	--	--	--	0 0
RT0505	Lacuna vincta	- parva	--	Cingulopsis fulgida	n/d n/d	Eatonina fulgida	0 0
RT0506	Mytilus edulis	--	--	Modiolus modiolus	--	Modiolus modiolus	0 0
RT0507	Pisione remota	--	--	--	--	--	0 0
RT0508	Goodallia triangularis	--	--	[Astarte] -	--	--	0 0
RT0509	Pandalus montagui	--	--	--	--	--	0 0
RT0510	Hydrobia ulvae	[Hybrobia] -	--	--	--	--	0 0
RT0511	Diplocirrus glaucus	--	--	--	--	Brada villosa	0 0
RT0512	Moerella pygmaea	--	--	[Tellina] donacina	--	- donacina	0 0
RT0513	Typosyllis variegata	[Syllis] sp B	[Syllis] -	[Syllis] -	[Syllis] sp. B	[Syllis] -	0 0
RT0514	Polygordius lacteus	--	--	--	--	--	0 0
RT0515	Atylus falcatus	--	--	--	--	--	0 0
RT0516	Exogone hebes	--	--	--	n/d n/d	--	0 0
RT0517	Urothoe marina	--	--	--	--	--	0 0
RT0518	Streptosyllis websteri	--	--	--	--	Gyptis propinquua	0 0
RT0519	Stenothoe monoculoides	--	--	--	Metopa solsbergi	--	0 0
RT0520	Ampithoe rubricata	--	--	[Amphithoe] -	--	[Amphithoe] -	0 0
RT0521	Araphura brevimana	[Leptognathia] manca	--	Tanaissus lilljeborgi	--	[Leptognathia] -	0 0
RT0522	Ampharete lindstroemi	- [lindstromi]	--	--	--	- [sp. cf. lindstoemi]	0 0
RT0523	Spio decorata	- filicornis	--	- filicornis	--	- filicornis	0 0
RT0524	Magelona mirabilis	[Magalona] -	--	- [mirabilis Form A]	--	[Megalona] [mirabilis (type a)]	0 0
RT0525	Spio martinensis	--	--	Microspio mecznikowianus	--	--	0 0

RT05	Taxon	LB19	LB20	LB21	LB22	LB23	LB24
RT0501	Gnathia oxyuraea	--	--	--	--	--	0 0
RT0502	Sabellaria alveolata	- spinulosa	--	- [alvelata]	--	--	0 0
RT0503	Sabella pavonina	Bispira volutacornis	--	- flabellata	- flabellata	--	0 0
RT0504	Bittium reticulatum	--	Cerithiopsis tubercularis	--	--	--	0 0
RT0505	Lacuna vincta	Cingulopsis fulgida	--	Rissoella opalina	- parva	--	0 0
RT0506	Mytilus edulis	--	Modiolus adriaticus	Modiolus modiolus	--	--	0 0
RT0507	Pisione remota	--	--	--	--	--	0 0
RT0508	Goodallia triangularis	--	--	--	--	--	0 0
RT0509	Pandalus montagui	--	--	- [montagu]	--	--	0 0
RT0510	Hydrobia ulvae	--	--	n/d n/d	--	--	0 0
RT0511	Diplocirrus glaucus	--	--	--	--	--	0 0
RT0512	Moerella pygmaea	Mya arenaria	--	n/d n/d	--	Abra prismatica	0 0
RT0513	Typosyllis variegata	[Syllis] -	--	[Syllis] -	--	[Syllis] [variegata (Sp. C)]	0 0
RT0514	Polygordius lacteus	--	--	n/d n/d	--	--	0 0
RT0515	Atylus falcatus	--	--	--	--	--	0 0
RT0516	Exogone hebes	--	--	--	--	--	0 0
RT0517	Urothoe marina	--	--	--	--	--	0 0
RT0518	Streptosyllis websteri	--	--	--	--	--	0 0
RT0519	Stenothoe monoculoides	--	--	--	--	--	0 0
RT0520	Ampithoe rubricata	--	--	--	--	- ramondi	0 0
RT0521	Araphura brevimana	Heterotanais oerstedi	--	--	Typhlotanais aequiremis	Subulella scotti	0 0
RT0522	Ampharete lindstroemi	--	--	--	--	--	0 0
RT0523	Spio decorata	--	--	Scolelepis mesnili	- filicornis	--	0 0
RT0524	Magelona mirabilis	--	--	--	--	--	0 0
RT0525	Spio martinensis	- [martinenis]	--	--	--	--	0 0

Table 13. The identifications of the fauna made by participating laboratories in RT06. Names are given only where different to the AQC identification.

RT06	Taxon	LB01	LB02	LB03	LB04	LB05	LB06
RT0601	Littorina littorea	- -	- -	- -	- -	- -	- -
RT0602	Echinogammarus obtusatus	- -	[Eulimnogammarus] -	- stoerensis	- marinus	- marinus	[Chaetogammarus] pirloti
RT0603	Schistomysis spiritus	- -	- -	- -	- -	- -	- -
RT0604	Perioculodes longimanus	- -	- -	- -	- -	- -	- -
RT0605	Rissoa membranacea	Alvania semistriata	[Rissostomia] -	Hydrobia ulvae	- -	- -	[Rissostomia] -
RT0606	Chaetozone setosa	- sp.	- -	- -	- -	- -	- -
RT0607	Magelona filiformis	- alleni	- -	- -	- alleni	- mirabilis	- -
RT0608	Tubificoides amplivasatus	- -	- -	- -	- -	- -	- -
RT0609	Leucothoe incisa	- -	- -	- -	- -	- lilljeborgi	- -
RT0610	Onoba aculeus	- -	- -	- -	Ceratia proxima	- -	- -
RT0611	Pariambus typicus	- -	- -	- -	- -	- -	- -
RT0612	Ophelia rathkei	- -	- -	- -	- -	- limacina	- -
RT0613	Harpinia pectinata	- -	- -	- -	- -	- -	- -
RT0614	Nereis diversicolor	- -	- -	[Hediste] -	[Hediste] -	[Hediste] -	- -
RT0615	Littorina saxatilis	- -	- -	- -	- [saxatilis rudis]	- [saxatilis var. rudis]	- -
RT0616	Lepidochitona cinereus	Leptochiton assellus	[Lepidochitonida] -	- -	- -	- -	- -
RT0617	Tubificoides benedii	- [benedeni]	- [benedeni]	- [benedeni]	- [benedeni]	- [benedeni]	- [benedeni]
RT0618	Eudorellopsis deformis	- -	- -	- -	- -	- -	- -
RT0619	Cerastoderma edule	- -	- -	- -	- glaucum	- -	- -
RT0620	Corophium arenarium	- volutator	- -	- -	- -	- -	- -
RT0621	Pholoe synophthalmica	- inornata	- inornata	- -	- [synopthalmica]	- inornata	- -
RT0622	Eumida bahusiensis	- sp.	- -	- sanguinea	- -	- -	- -
RT0623	Aricidea minuta	- -	- -	- -	- -	[Aricidia] -	- -
RT0624	Corophium arenarium	- volutator	- -	- -	- -	- -	- -
RT0625	Elminius modestus	- -	- -	Balanus balanoides	- -	- -	- -

RT06	Taxon	LB13	LB14	LB15	LB16	LB17	LB18
RT0601	Littorina littorea	- -	0 0	- -	- -	- -	- -
RT0602	Echinogammarus obtusatus	[Chaetogammarus] marinus	0 0	- pirloti	[Chaetogammarus] marinus	- marinus	Gammarus ? tigrinus
RT0603	Schistomysis spiritus	- -	0 0	- sp.	- -	- -	- [spiritis]
RT0604	Perioculodes longimanus	- -	0 0	- -	- -	[Perioculoides] -	- -
RT0605	Rissoa membranacea	- -	0 0	- -	[Rissoma(Rissostomia)] -	- lilacina	[Rissotomia] -
RT0606	Chaetozone setosa	- -	0 0	Caulleriella killariensis	- -	- [setosa (Type A)]	- [setosa (B)]
RT0607	Magelona filiformis	- -	0 0	- minuta	- alleni	- -	- -
RT0608	Tubificoides amplivasatus	- -	0 0	? ?	Monopylephorus irroratus	- [amplivastus]	- -
RT0609	Leucothoe incisa	- -	0 0	- -	- -	- -	- -
RT0610	Onoba aculeus	- -	0 0	Ceratia proxima	[Onobia] -	- -	- -
RT0611	Pariambus typicus	- -	0 0	- -	- -	- -	- -
RT0612	Ophelia rathkei	- -	0 0	- -	Tharyx vivipara	- [rathkeyi]	- -
RT0613	Harpinia pectinata	- -	0 0	- -	- -	- -	- -
RT0614	Nereis diversicolor	- -	0 0	[Hediste] -	[Nereis(Hediste)] -	- -	[Neanthes] [diversicolour]
RT0615	Littorina saxatilis	- -	0 0	- nigrolineata	- [saxatilis rudis]	- -	- -
RT0616	Lepidochitona cinereus	- -	0 0	- -	- -	- -	- -
RT0617	Tubificoides benedii	- -	0 0	- [benedeni]	- -	- [benedeni]	- [benedeni]
RT0618	Eudorellopsis deformis	[Euderellopsis] -	0 0	- -	- -	- -	- -
RT0619	Cerastoderma edule	- -	0 0	- glaucum	- glauca	- -	- -
RT0620	Corophium arenarium	- -	0 0	- -	- [arenarium (female)]	- -	- -
RT0621	Pholoe synophthalmica	- [synopthalmica]	0 0	- inornata	- -	- -	- [synopthalmica]
RT0622	Eumida bahusiensis	- -	0 0	- sp.	- -	- -	- -
RT0623	Aricidea minuta	- -	0 0	- -	- -	- -	- -
RT0624	Corophium arenarium	- volutator	0 0	- volutator	- [arenarium (male)]	- -	- -
RT0625	Elminius modestus	- -	0 0				

Table 13. The identifications of the fauna made by participating laboratories in RT06. Names are given only where different to the AQC identification.

RT06	Taxon	LB07	LB08	LB09	LB10	LB11	LB12
RT0601	Littorina littorea	- -	- -	0 0	- -	- -	0 0
RT0602	Echinogammarus obtusatus	- marinus	- -	0 0	[Chaetogammarus] stoerensi	- marinus	0 0
RT0603	Schistomysis spiritus	- -	- -	0 0	- -	- -	0 0
RT0604	Perioculodes longimanus	- -	- -	0 0	- -	- -	0 0
RT0605	Rissoa membranacea	- -	- -	0 0	[Rissostomia] -	- -	0 0
RT0606	Chaetozone setosa	- -	- -	0 0	- -	- -	0 0
RT0607	Magelona filiformis	- -	- -	0 0	- -	- -	0 0
RT0608	Tubificoides amplivasatus	- -	- -	0 0	- -	- -	0 0
RT0609	Leucothoe incisa	- -	- -	0 0	- -	- -	0 0
RT0610	Onoba aculeus	- -	- semicostata	0 0	Ceratia proxima	- -	0 0
RT0611	Pariambus typicus	- -	- -	0 0	- -	- -	0 0
RT0612	Ophelia rathkei	- -	- -	0 0	- -	- -	0 0
RT0613	Harpinia pectinata	- -	- -	0 0	- -	- -	0 0
RT0614	Nereis diversicolor	- -	- -	0 0	- -	- -	0 0
RT0615	Littorina saxatilis	- -	- [rudis]	0 0	- [saxatilis var. rudis]	[Hediste] -	0 0
RT0616	Lepidochitona cinereus	- -	- -	0 0	Tonicella rubra	- -	0 0
RT0617	Tubificoides benedii	- [benedeni]	- -	0 0	- [benedeni]	- -	0 0
RT0618	Eudorellopsis deformis	- -	- -	0 0	- -	- -	0 0
RT0619	Cerastoderma edule	- -	- -	0 0	- -	- -	0 0
RT0620	Corophium arenarium	- -	- -	0 0	- -	- -	0 0
RT0621	Pholoe synophthalmica	- -	- -	0 0	- -	- -	0 0
RT0622	Eumida bahusiensis	- -	- -	0 0	- inornata	- [synopthalmica]	0 0
RT0623	Aricidea minuta	- -	- -	0 0	- -	- -	0 0
RT0624	Corophium arenarium	- -	- -	0 0	- -	- -	0 0
RT0625	Elminius modestus	- -	- -	0 0	- -	- -	0 0

RT06	Taxon	LB19	LB20	LB21	LB22	LB23	LB24
RT0601	Littorina littorea	Littorinidae sp	- -	- -	- -	- -	0 0
RT0602	Echinogammarus obtusatus	[Eulimnogammarus] -	Gammarus finmarchicus	[Chaetogammarus] marinus	Gammarus finmarchicus	- pirloti	0 0
RT0603	Schistomysis spiritus	Heteromysis formosa	- -	Mysid n/d	- -	- -	0 0
RT0604	Perioculodes longimanus	- -	- -	- -	- -	- -	0 0
RT0605	Rissoa membranacea	Alvania semistriata	- -	n/d n/d	- -	- -	0 0
RT0606	Chaetozone setosa	- [setosa (type A)]	- -	- -	- -	- [sp. Type B]	0 0
RT0607	Magelona filiformis	- -	- -	- -	- -	- -	0 0
RT0608	Tubificoides amplivasatus	- -	- -	Capitella capitata	- -	- -	0 0
RT0609	Leucothoe incisa	- lilljeborgi	- -	- -	- -	- -	0 0
RT0610	Onoba aculeus	- semicostata	- -	n/d n/d	- -	- -	0 0
RT0611	Pariambus typicus	Parvipalpus capillaceous	- -	Caprellid n/d	- -	- -	0 0
RT0612	Ophelia rathkei	- -	- -	- -	- -	- -	0 0
RT0613	Harpinia pectinata	- -	- -	- -	- -	- -	0 0
RT0614	Nereis diversicolor	- -	[Hediste] -	- -	[Hediste] -	- virens	0 0
RT0615	Littorina saxatilis	- neritoides	- -	- littorea	- nigrolineata	- -	0 0
RT0616	Lepidochitona cinereus	- -	- -	- -	- -	- -	0 0
RT0617	Tubificoides benedii	- -	- [benedeni]	oligochaete n/d	- [benedeni]	- [benedeni]	0 0
RT0618	Eudorellopsis deformis	- -	[Eudorelopsis] -	- -	- -	- -	0 0
RT0619	Cerastoderma edule	- -	- -	- -	- -	- -	0 0
RT0620	Corophium arenarium	- -	- -	n/d n/d	- -	- -	0 0
RT0621	Pholoe synophthalmica	- -	- -	- inornata	- -	- -	0 0
RT0622	Eumida bahusiensis	- -	- -	Phyllodocid n/d	- -	- -	0 0
RT0623	Aricidea minuta	- -	- -	- -	- -	- -	0 0
RT0624	Corophium arenarium	- -	- -	n/d n/d	- volutator	- -	0 0
RT0625	Elminius modestus	Semibalanus balanoides	- -	- - -		Balanus balanoides	0 0

Table 14. The identifications of the fauna made by participating laboratories in RT07. Names are given only where different to the AQC identification.

RT07	Taxon	LB01	LB02	LB03	LB04	LB05
RT0701	Lacuna crassior	Littorina saxatilis	- -	- -	- -	- -
RT0702	Schistomysis kervillei	- ornata	- -	- spiritus	- -	- -
RT0703	Atylus swammerdami	- [swammerdamei]	- -	- -	- -	- [swammerdamei]
RT0704	Caulleriella alata	- bioculata	- -	- -	- -	- -
RT0705	Unciola crenatipalma	Microdeutopus damnoniensis	- -	- -	- -	- -
RT0706	Nucula nucleus	- -	- -	- -	- -	- -
RT0707	Typosyllis variegata	Ehlersia cornuta	- -	- -	- -	Trypanosyllis zebra
RT0708	Praunus flexuosus	- inermis	- -	- -	- -	- -
RT0709	Mediomastus fragilis	- sp.	- -	- -	- -	- -
RT0710	Owenia fusiformis	- -	- -	- -	- -	- -
RT0711	Anoplodactylus petiolatus	- -	- -	- -	- -	- -
RT0712	Asterias rubens	- -	- -	- -	- -	- -
RT0713	Crangon crangon	- -	- -	- -	- -	- -
RT0714	Caulleriella killariensis	Aphelochaeta marioni	[Tharyx] -	- zetlandica	- -	- zetlandica
RT0715	Tharyx vivipara	[Aphelochaeta] -	Chaetozone gibber	- -	- marioni	- killariensis
RT0716	Tanaissus lilljeborgi	- -	- -	Leptognathia gracilis	- -	Leptognathia paramanca
RT0717	Molgula manhattensis	- occulta	- oculata	- sp.	Polycarpa fibrosa	- oculata
RT0718	Skeneopsis planorbis	- -	- -	- -	- -	Skenea serpuloides
RT0719	Ampelisca brevicornis	Argissa hamatipes	- -	- -	- -	- -
RT0720	Paranais litoralis	Tubificidae sp.	- -	- -	- -	- -
RT0721	Eteone longa / flava	- [flava]	- [longa]	- [longa]	- [longa]	- [flava]
RT0722	Ampelisca spinipes	- diadema	- diadema	- diadema	- diadema	- sp.
RT0723	Ensis americanus	- arcuatus	- ensis	- arcuatus	- arcuatus	- arcuatus
RT0724	Leptocheirus pectinatus	- hirsutimanus	- -	- hirsutimanus	- hirsutimanus	- -
RT0725	Poecilochaetus serpens	- -	- -	- -	- -	- -

RT07	Taxon	LB13	LB14	LB15	LB16	LB17
RT0701	Lacuna crassior	- [crassicor]	0 0	- -	- -	- -
RT0702	Schistomysis kervillei	- -	0 0	- -	- -	- -
RT0703	Atylus swammerdami	- -	0 0	- -	- -	- -
RT0704	Caulleriella alata	- -	0 0	- -	- -	- -
RT0705	Unciola crenatipalma	[Unicola] -	0 0	- -	Lembos websteri	[Unicola] -
RT0706	Nucula nucleus	- -	0 0	- -	- -	- -
RT0707	Typosyllis variegata	[Syllis] [varigerata]	0 0	- hyalina	[Syllis] -	[Syllis] -
RT0708	Praunus flexuosus	- -	0 0	- -	- -	- -
RT0709	Mediomastus fragilis	- -	0 0	- -	- -	- -
RT0710	Owenia fusiformis	- -	0 0	- -	- -	- -
RT0711	Anoplodactylus petiolatus	[Anaplodactylus] -	0 0	- -	- -	- -
RT0712	Asterias rubens	- -	0 0	- -	- -	- -
RT0713	Crangon crangon	- -	0 0	- -	- -	Philocheras trispinosus
RT0714	Caulleriella killariensis	[Tharyx] -	0 0	- zetlandica	[Tharyx] -	Aphelochaeta marioni
RT0715	Tharyx vivipara	[Aphelochaeta] -	0 0	Caulleriella zetlandica	Caulleriella zetlandica	[Aphelochaeta] [vivipera]
RT0716	Tanaissus lilljeborgi	- -	0 0	Typhlotanais microcheles	- -	- -
RT0717	Molgula manhattensis	[Mogula] -	0 0	- -	- -	- occulata
RT0718	Skeneopsis planorbis	- -	0 0	- -	- -	- -
RT0719	Ampelisca brevicornis	- -	0 0	- -	[Amplisca] -	- -
RT0720	Paranais litoralis	- -	0 0	- -	Tubificoides pseudogaster	- -
RT0721	Eteone longa / flava	- [longa]	0 0	- [flava]	- [longa]	- [flava]
RT0722	Ampelisca spinipes	- -	0 0	- diadema	[Amplisca] -	- -
RT0723	Ensis americanus	- -	0 0	- arcuatus	- arcuatus	- arcuatus
RT0724	Leptocheirus pectinatus	- -	0 0	- -	- -	- -
RT0725	Poecilochaetus serpens	- -	0 0	- -	- -	-

Table 14. The identifications of the fauna made by participating laboratories in RT07. Names are given only where different to the AQC identification.

RT07	Taxon	LB06	LB07	LB08	LB09	LB10	LB11	LB12
RT0701	Lacuna crassior	Paludinella littorina	- -	- -	0 0	- -	- -	0 0
RT0702	Schistomysis kervillei	Praunus inermis	- -	- -	0 0	- spiritus	- -	0 0
RT0703	Atylus swammerdami	- -	- -	- -	0 0	- -	- -	0 0
RT0704	Caulleriella alata	- -	- -	- -	0 0	- -	- -	0 0
RT0705	Unciola crenatipalma	- -	[Unicola] -	- -	0 0	- -	- -	0 0
RT0706	Nucula nucleus	- -	[Nulcula] sulcata	- -	0 0	- -	- -	0 0
RT0707	Typosyllis variegata	[Syllis] -	[Syllis] -	- -	0 0	[Syllis] hyalina	[Syllis] -	0 0
RT0708	Praunus flexuosus	- -	- -	- -	0 0	- -	- -	0 0
RT0709	Mediomastus fragilis	- -	- -	- -	0 0	- -	- -	0 0
RT0710	Owenia fusiformis	- -	- -	- -	0 0	- -	- -	0 0
RT0711	Anoplodactylus petiolatus	- -	- -	- -	0 0	- -	- -	0 0
RT0712	Asterias rubens	- -	- -	- -	0 0	- -	- -	0 0
RT0713	Crangon crangon	- -	- -	- -	0 0	- -	- -	0 0
RT0714	Caulleriella killariensis	[Tharyx] -	Aphelochaeta marioni	[Tharyx] -	0 0	[Tharyx] -	[Tharyx] [killeriensis]	0 0
RT0715	Tharyx vivipara	[Aphelochaeta] [vivapara]	[Aphelochaeta] -	- -	0 0	[Aphelochaeta] [vivipera]	Chaetozone gibba	0 0
RT0716	Tanaissus lilljeborgi	- [liljeborgi]	Leptognathia gracilis	Leptognathia gracilis	0 0	- -	- -	0 0
RT0717	Molgula manhattensis	- -	- occulta	Eugyra arenosa	0 0	n/d n/d	- -	0 0
RT0718	Skeneopsis planorbis	- -	- -	- -	0 0	- -	- -	0 0
RT0719	Ampelisca brevicornis	- -	- -	- -	0 0	- -	- -	0 0
RT0720	Paranais litoralis	Tubificoides pseudogaster	- -	- -	0 0	Tubificoides crenecoleus	- -	0 0
RT0721	Eteone longa / flava	- [longa]	- [longa]	- [longa]	0 0	- [longa]	- [longa]	0 0
RT0722	Ampelisca spinipes	- diadema	- diadema	- diadema	0 0	- diadema	- diadema	0 0
RT0723	Ensis americanus	- [americana]	- -	- [directus]	0 0	- ciliqua	- arcuatus	0 0
RT0724	Leptocheirus pectinatus	- hirsutimanus	- -	- -	0 0	- pilosus	- -	0 0
RT0725	Poecilochaetus serpens	- -	- -	- -	0 0	- -	- -	0 0

RT07	Taxon	LB18	LB19	LB20	LB21	LB22	LB23	LB24
RT0701	Lacuna crassior	- -	- parva	- -	0 0	0 0	- parva	0 0
RT0702	Schistomysis kervillei	- -	Paramysis arenosa	- ornata	0 0	0 0	Paramysis arenosa	0 0
RT0703	Atylus swammerdami	- -	- -	- -	0 0	0 0	- -	0 0
RT0704	Caulleriella alata	- -	- -	- -	0 0	0 0	- -	0 0
RT0705	Unciola crenatipalma	- -	Microdeutopus anomalus	- -	0 0	0 0	[Unicola] -	0 0
RT0706	Nucula nucleus	- hanleyi	- -	- -	0 0	0 0	- sulcata	0 0
RT0707	Typosyllis variegata	[Syllis] [Sp. C]	[Syllis] -	- -	0 0	0 0	[Syllis] -	0 0
RT0708	Praunus flexuosus	- -	- -	- -	0 0	0 0	- -	0 0
RT0709	Mediomastus fragilis	[Mediomastis] -	- -	- -	0 0	0 0	- -	0 0
RT0710	Owenia fusiformis	- -	- -	- -	0 0	0 0	- -	0 0
RT0711	Anoplodactylus petiolatus	- -	- pygmaeus	- -	0 0	0 0	- -	0 0
RT0712	Asterias rubens	- -	- -	- -	0 0	0 0	- -	0 0
RT0713	Crangon crangon	- -	- -	- -	0 0	0 0	- -	0 0
RT0714	Caulleriella killariensis	[Tharyx] -	[Tharyx] -	- -	0 0	0 0	- zetlandica	0 0
RT0715	Tharyx vivipara	[Aphelochaeta] -	[Aphelochaeta] [vivipera]	Chaetozone setosa	0 0	0 0	- -	0 0
RT0716	Tanaissus lilljeborgi	Akanthophoreus gracilis	Tanaidacea n/d	Leptognathia gracilis	0 0	0 0	Heterotanais oerstedi	0 0
RT0717	Molgula manhattensis	- occulata	- -	Eugyra arenosa	0 0	0 0	- -	0 0
RT0718	Skeneopsis planorbis	- -	- -	- -	0 0	0 0	[Skenopsis] -	0 0
RT0719	Ampelisca brevicornis	- -	- -	- -	0 0	0 0	- -	0 0
RT0720	Paranais litoralis	- -	- -	- -	0 0	0 0	- -	0 0
RT0721	Eteone longa / flava	- [longa]	- [longa]	- [longa]	0 0	0 0	- [longa]	0 0
RT0722	Ampelisca spinipes	- diadema	- -	- diadema	0 0	0 0	- diadema	0 0
RT0723	Ensis americanus	- siliqua	- siliqua	- arcuatus	0 0	0 0	- arcuatus	0 0
RT0724	Leptocheirus pectinatus	- -	Gammaridae n/d	Microdeutopus versiculatus	0 0	0 0	- -	0 0
RT0725	Poecilochaetus serpens	- -	- sp	- -	0 0	0 0		

Table 15. Summary of the number of differences at the level of genus and species for each of the participating laboratories and each RT circulation.

	RT05		RT06		RT07			
Lab	Genus	Species	Genus	Species	Genus	Species	Genus average	Species average
LB08	0	0	0	1	2	3	0.67	1.33
LB13	0	3	0	2	0	0	0.00	1.67
LB02	0	0	0	1	1	4	0.33	1.67
LB18	0	2	1	1	1	5	0.67	2.67
LB06	0	3	0	1	3	5	1.00	3.00
LB11	4	6	0	1	1	3	1.67	3.33
LB20	2	2	1	1	4	7	2.33	3.33
LB22	1	4	1	3	#N/A	#N/A	1.00	3.50
LB07	1	5	0	1	2	5	1.00	3.67
LB17	1	5	0	2	2	4	1.00	3.67
LB04	0	3	1	4	1	5	0.67	4.00
LB03	1	1	2	4	1	7	1.33	4.00
LB14	2	4	#N/A	#N/A	#N/A	#N/A	2.00	4.00
LB23	2	3	1	3	2	7	1.67	4.33
LB16	3	5	2	5	3	4	2.67	4.67
LB10	4	5	2	4	2	7	2.67	5.33
LB05	4	7	0	5	3	8	2.33	6.67
LB19	4	5	5	8	4	8	4.33	7.00
LB09	5	7	#N/A	#N/A	#N/A	#N/A	5.00	7.00
LB15	#N/A	#N/A	3	11	2	6	2.50	8.50
LB01	3	4	2	8	6	14	3.67	8.67
LB21	6	7	9	12	#N/A	#N/A	7.50	9.50
LB12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
LB24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Average	2.0	3.9	1.5	3.9	2.2	5.7		

Table 16. Summary by taxonomic level of the number of differences of identification recorded in the RT05 - RT07 circulations.

		Total number of differences		Differences per distributed specimen	
Major group	Number distributed	Genus	Species	Genus	Species
Crustacea	27	37	87	1.4	3.2
Echinodermata	1	0	0	0.0	0.0
Mollusca - bivalves	6	11	33	1.8	5.5
Mollusca - gastropods	10	23	39	2.3	3.9
Annelida	30	36	87	1.2	2.9
Others	1	4	11	4.0	11.0

Table 17. The taxa from RT05 to RT07 most frequently identified differently by participating laboratories.

Specimen	Group	Name	Differences		Alternative names	Most frequent	Comment
			Genus	Species			
RT0602	Crustacea	Echinogammarus obtusatus	3	16	5	8	Key terminology possibly misleading.
RT0722	Crustacea	Ampelisca spinipes	0	14	2	13	Small specimens tricky.
RT0723	Mollusca (b)	Ensis americanus	0	14	3	10	Species not in standard work. Best fit.
RT0505	Mollusca (g)	Lacuna vincta	6	12	3	6	Key difficulty - requires judgment of relative heights.
RT0717	Tunicata	Molgula manhattensis	4	11	5	4	Unfamiliar group.
RT0523	Polychaeta	Spio decorata	2	10	4	7	Taxonomy uncertain.
RT0716	Crustacea	Tanaissus lilljeborgi	9	9	5	5	Key difficulty - small species.
RT0521	Crustacea	Araphura brevimana	6	9	7	2	Key difficulty - small species.
RT0503	Polychaeta	Sabella pavonina	5	9	3	4	Key misleading and small specimens.
RT0512	Mollusca (b)	Moerella pygmaea	6	7	5	2	Comparison of shape - lack of experience.
RT0715	Polychaeta	Tharyx vivipara	5	7	5	2	Group still in state of uncertainty.
RT0702	Crustacea	Schistomysis kervillei	3	7	4	2	Incomplete examination.
RT0714	Polychaeta	Caulleriella killariensis	3	7	2	4	Key may be misleading
RT0724	Crustacea	Leptocheirus pectinatus	2	7	4	4	Incomplete examination.
RT0610	Mollusca (g)	Onoba aculeus	4	6	3	3	Similar species recorded, general unfamiliarity.
RT0513	Polychaeta	Typosyllis variegata	1	6	4	3	Group still in state of uncertainty.
RT0621	Polychaeta	Pholoe synophthalmica	0	6	1	6	Several keys in use - taxonomy still not settled.
RT0506	Mollusca (b)	Mytilus edulis	5	5	3	3	Juveniles may be a problem
RT0605	Mollusca (g)	Rissoa membranacea	4	5	3	2	Family usually correct, general unfamiliarity.
RT0624	Crustacea	Corophium arenarium	1	5	1	4	Incomplete examination.

Figures

Figure 1. Particle size distribution curves resulting from Malvern Laser analysis of the fifteen replicate sediment samples from PS05.

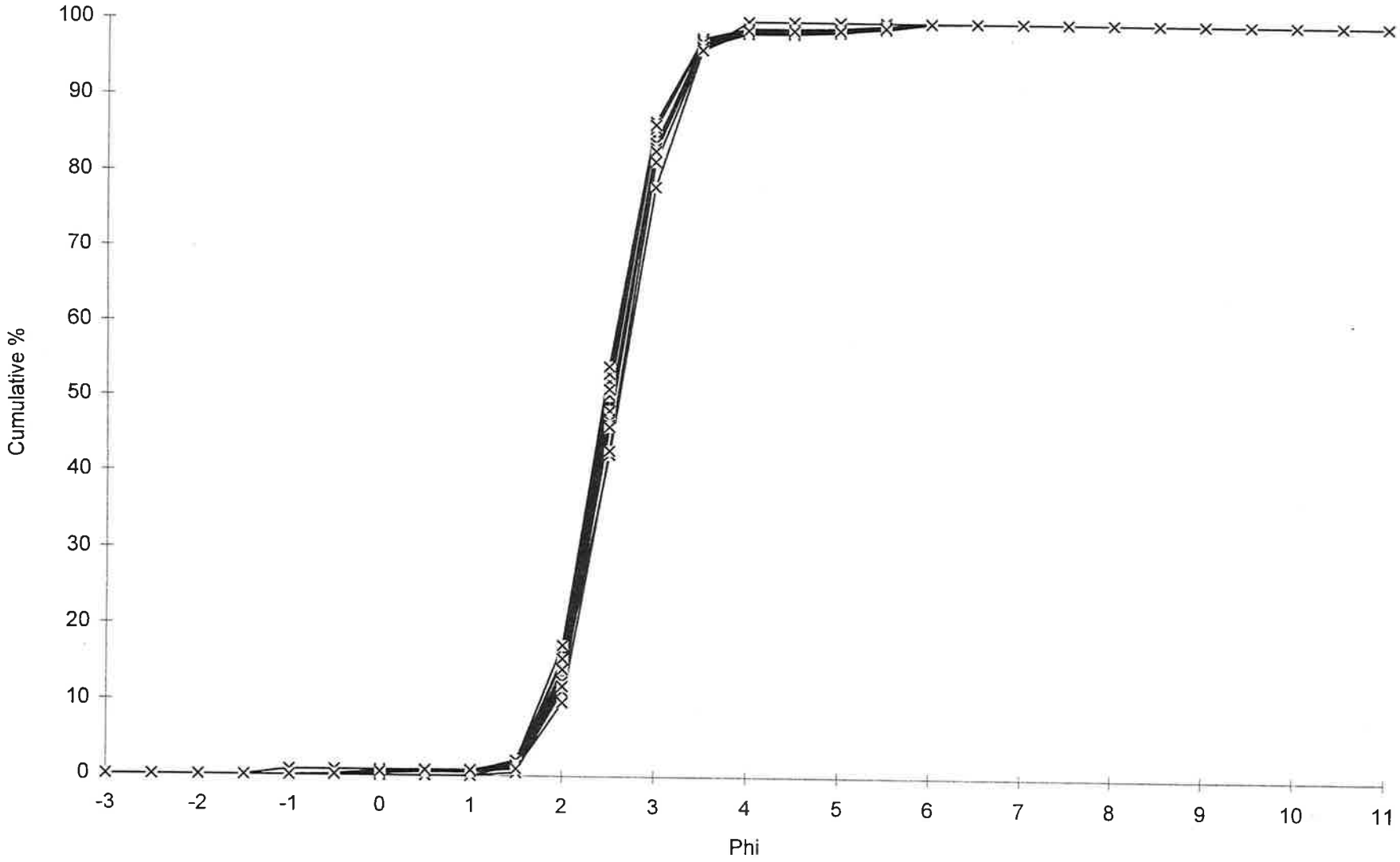


Figure 2. Particle size distribution curves resulting from analysis of twelve replicate samples of sediment distributed as PS06. Six analysed by Laser (solid lines, diamonds) six by Sieve + Pipette (dashed lines, triangles).

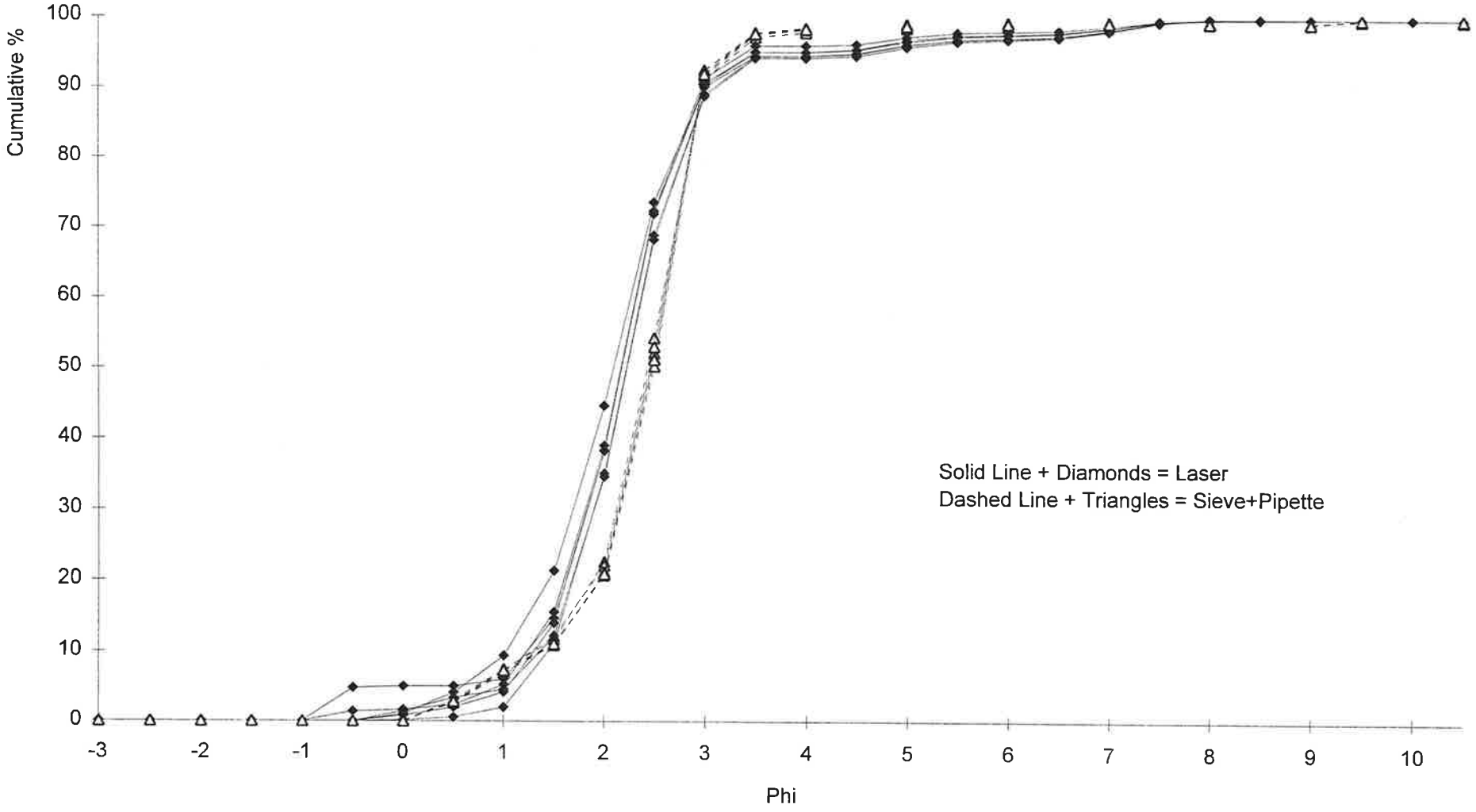


Figure 3. Particle size distribution curves resulting from analysis of twelve replicate samples of sediment distributed as PS07. Six analysed by Laser (solid lines, diamonds) six by Sieve + Pipette (dashed lines, triangles).

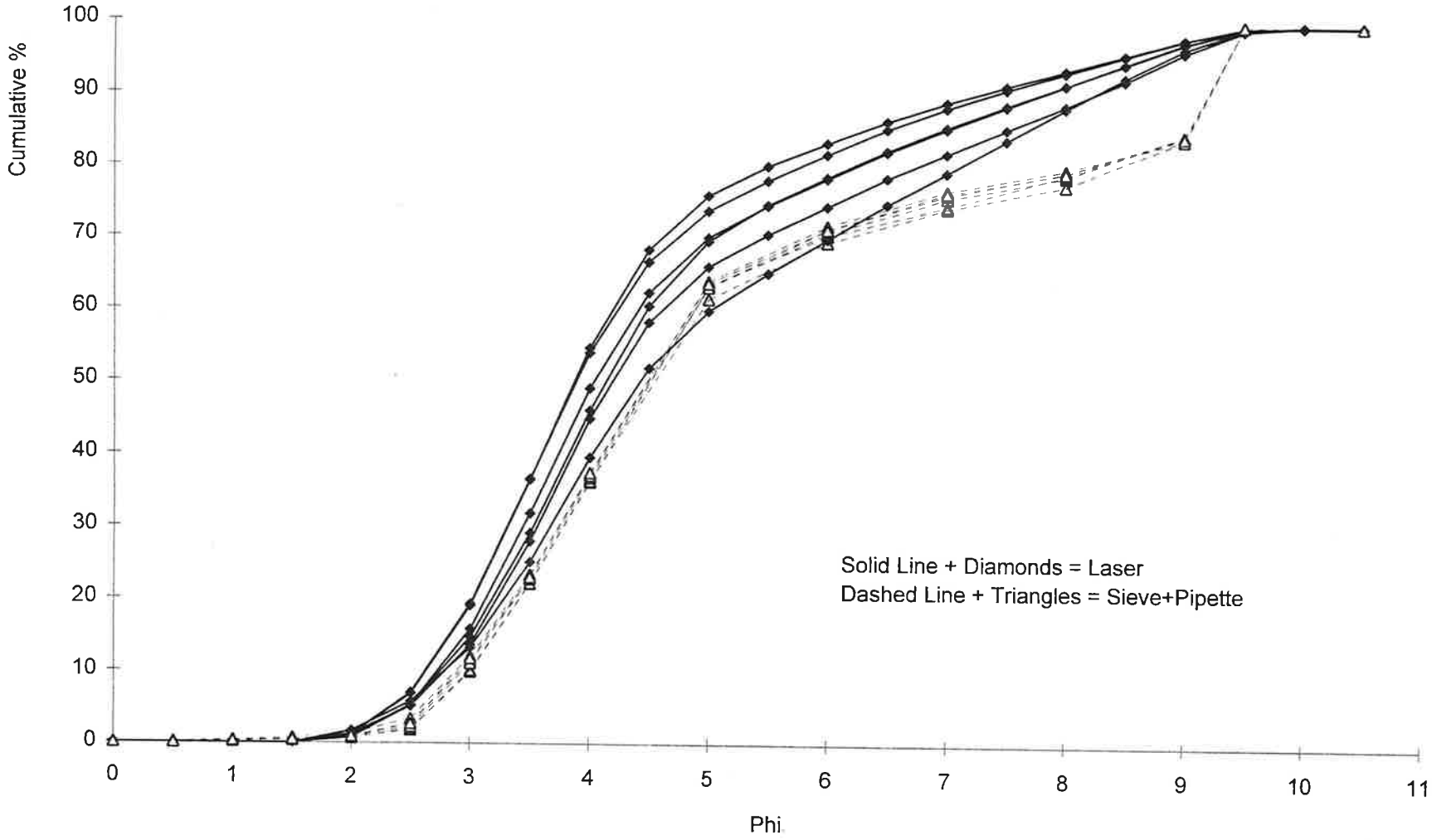


Figure 4. Particle size distribution curves resulting from analysis of sediment sample PS05 by the participating laboratories. Analytical method is indicated by line type; Laser = solid, Sieve = dashed.

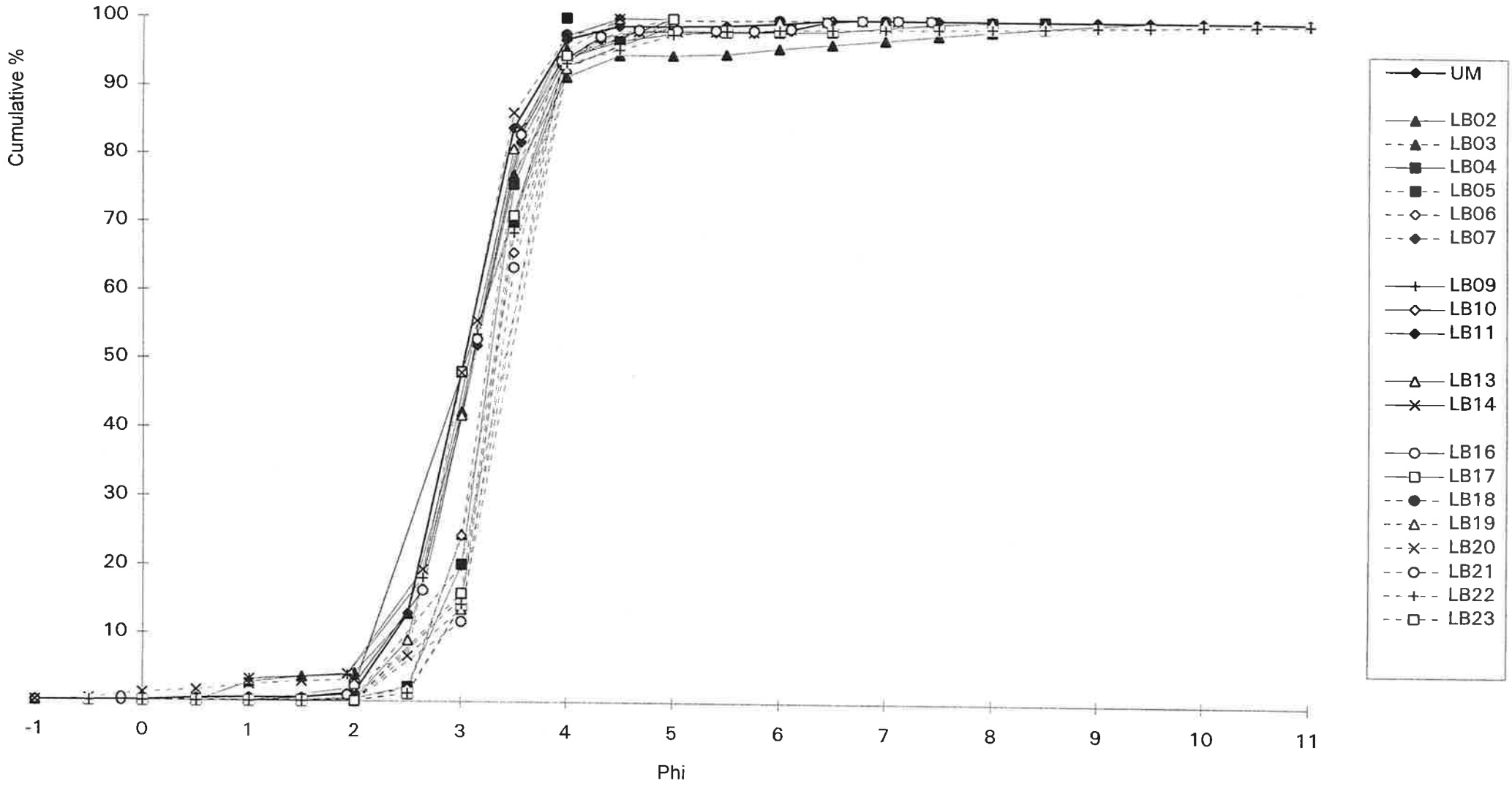


Figure 5. Particle size distribution curves resulting from analysis of sediment sample PS06 by the participating laboratories. Analytical method is indicated by line type; Laser = solid, Sieve = dashed.

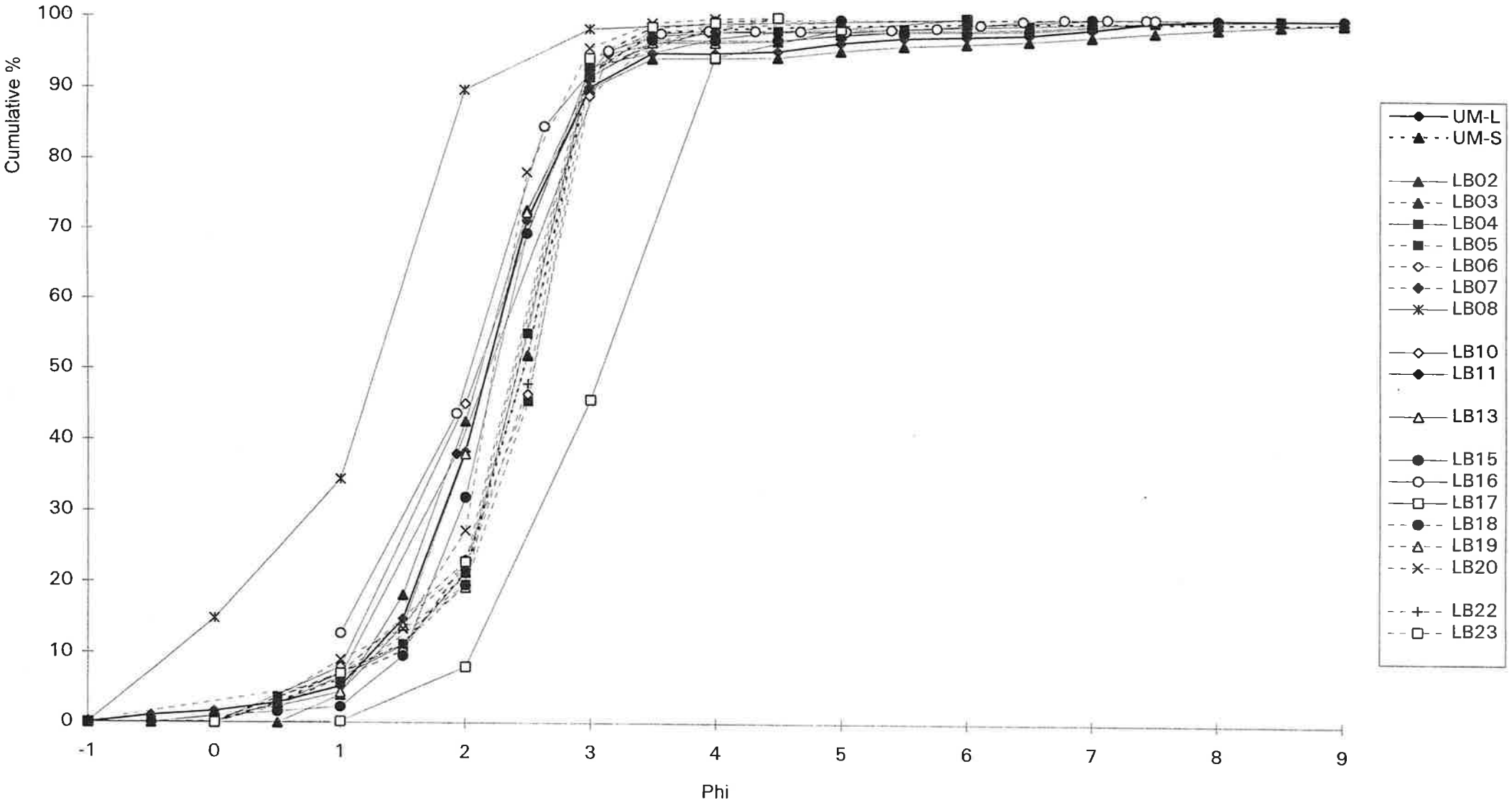


Figure 6. Particle size distribution curves resulting from analysis of sediment sample PS07 by the participating laboratories. Analytical method is indicated.

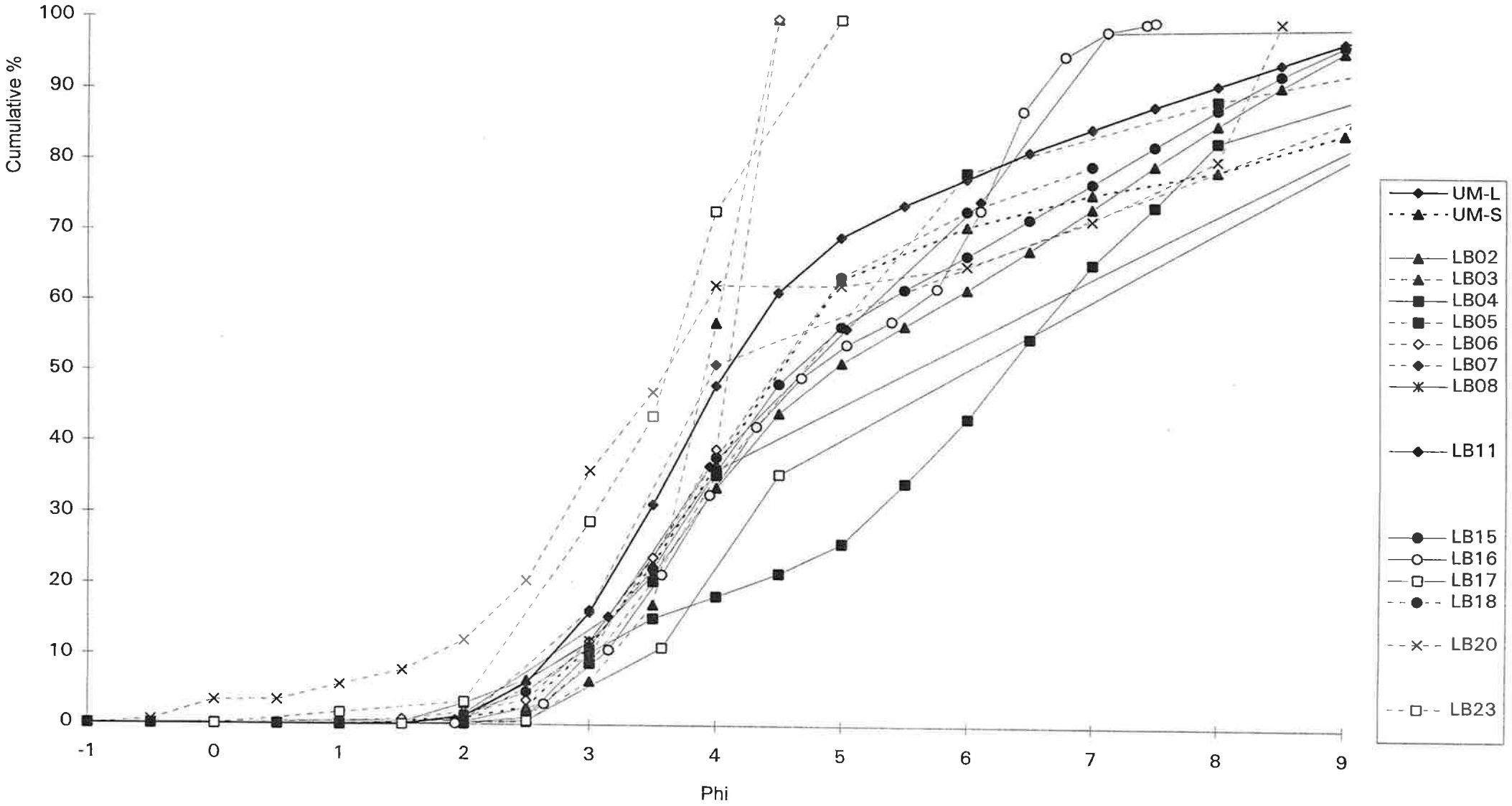


Figure 7. The number of differences at the level of genus recorded for each of the participating laboratories and each of the RT circulations. Laboratories arranged in order of increasing average number of differences.

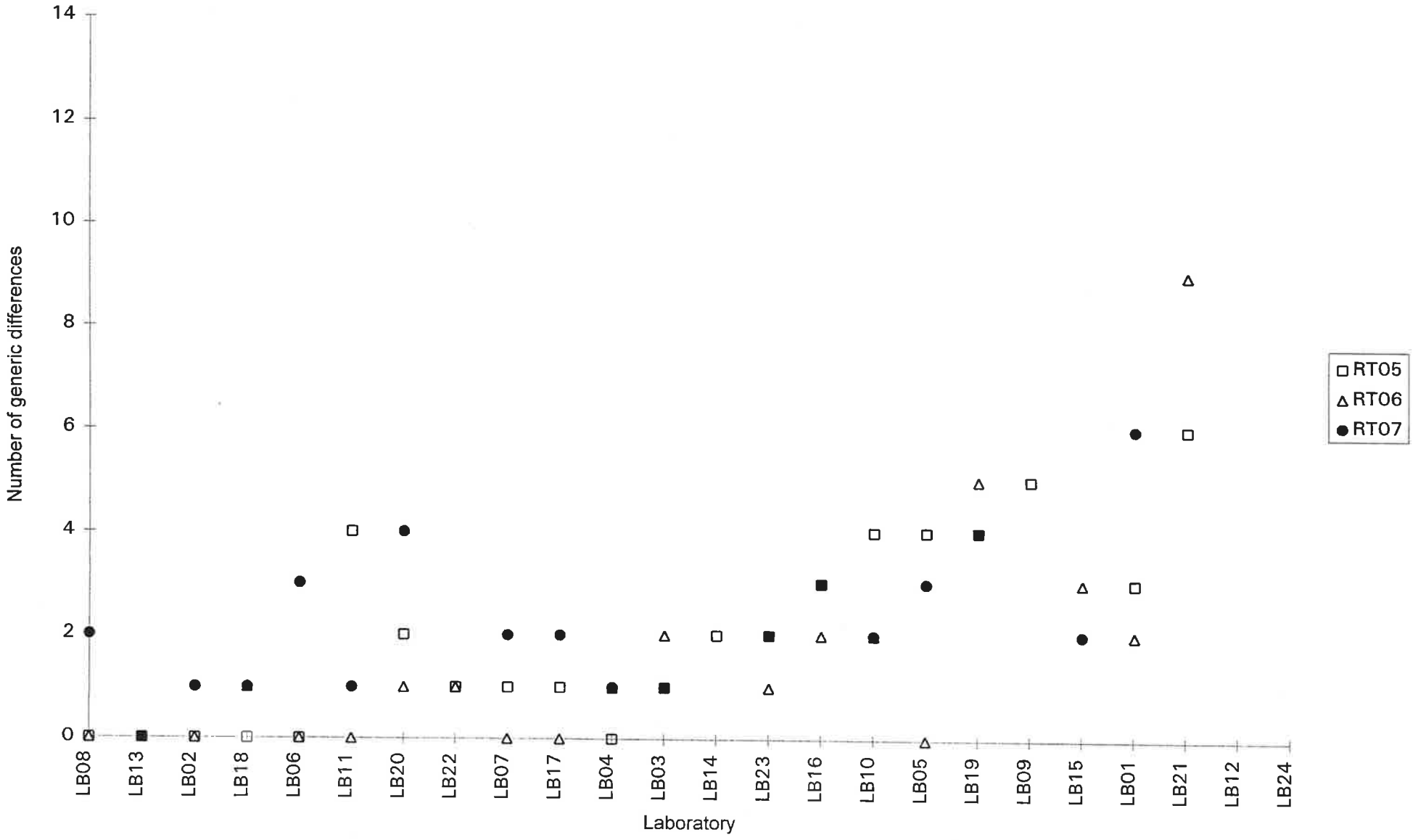
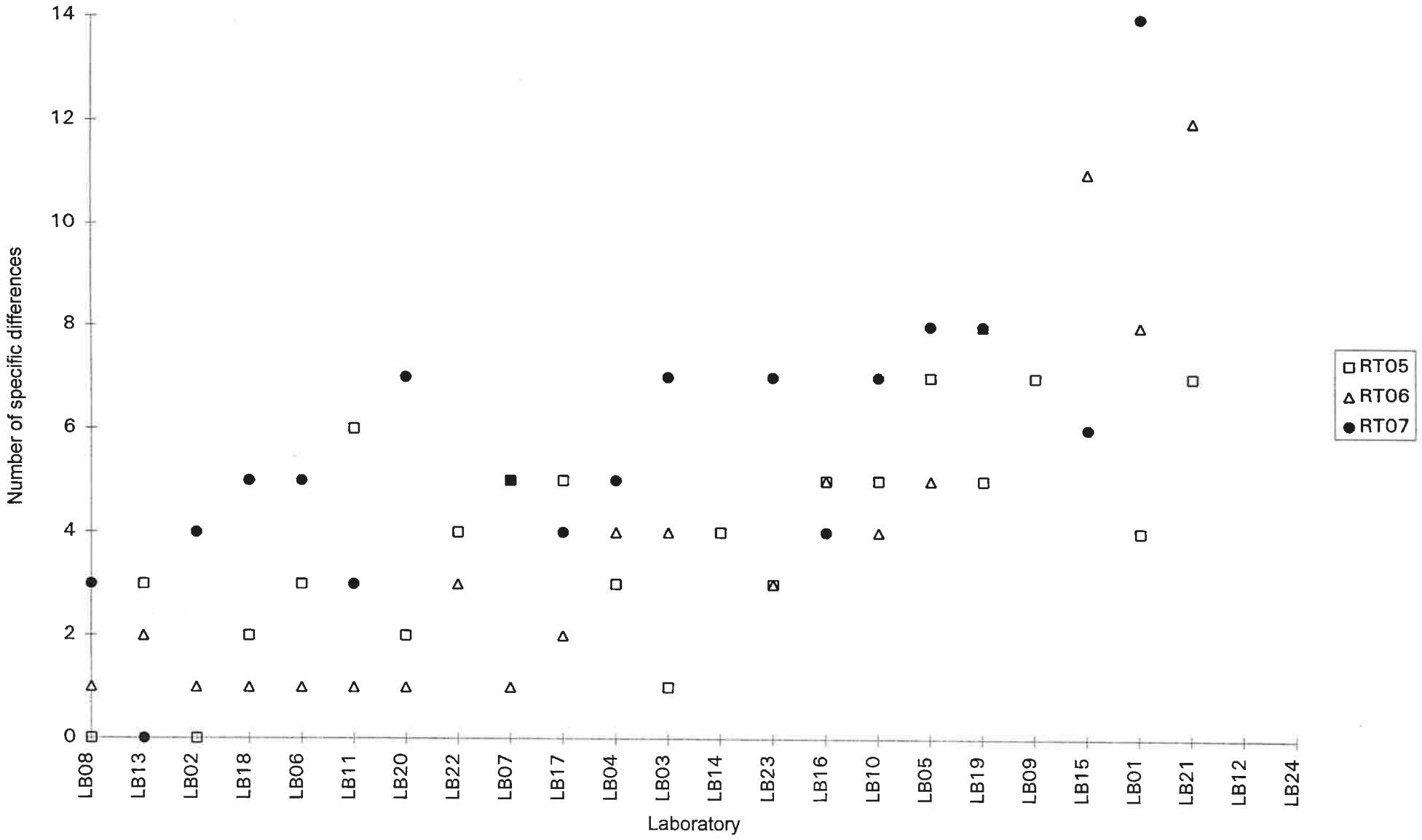


Figure 8. The number of differences at the level of species recorded for each of the participating laboratories and each of the RT circulations. Laboratories arranged in order of increasing average number of differences.



4. SCHEME PROPOSAL FOR 1996/1997

As the scheme moves into its third year it is anticipated that more effort will be channelled into the incorporation of user supplied or "real samples" into the planned circulations. On this same theme participants will also be requested to compile their own Ring Test set of species for return to the contractor for validation. The full programme for 1996-97 has been circulated and will be:

a) 3 participant supplied macrobenthic samples to be (re)analysed by the contractor;

b) Ring Tests as follows;
i) one normal ring test of twenty five species to be supplied by the contractor;
ii) a participant supplied set of twenty five species to be sent to the contractor for validation;
iii) A ring test targeted at problem taxa highlighted throughout the scheme;

It has been agreed that the contractor will identify the keys used in analysing the specimens in each Ring Test in the reports made to each laboratory

c) One contractor supplied macrobenthic sample.

d) particle size samples supplied with the ring tests.

5. CO-ORDINATING COMMITTEE ACTIVITIES

As well as the projects assigned to the contractor committee members undertook specific tasks on behalf of the scheme.

5.1 COMMITTEE PROJECTS

a) explore the possibility of organising a field methods workshop;
b) circulate disc(s) with merged NODC/MCS codes;
c) data analysis intercomparison - circulate data set for laboratories to produce derived variables and interpret - participation in this exercise to be on a voluntary basis only.

5.2 FIELD METHODS WORKSHOP

While it had originally been hoped to hold a field methods workshop in conjunction with the University College of North Wales making use on the RV Prince Madog logistical problems precluded this. However, plans are now underway to organise a workshop on ôproblem taxaö to be held in Scotland in the coming year. The co-ordinating committee hope to reschedule the field methods workshop for sometime in early 1997.

5.3 NODC CODES

The problem of merging the new edition of the MCS Species Directory with the NODC coding system was undertaken by Mr D.Moore (SOAEFD). This task proved problematic on two counts. While initial contact had been made with NODC in the US and the full list of species delivered to them further communication proved difficult. At the same time it became apparent that the Ulster Museum/MCS were making no progress with the publication of the second edition of the species directory. After discussion with the museum it was agreed that in order to facilitate the publication of the directory the AQC scheme would provide funding to assist with the compilation, editing and final proof reading of the directory.

5.4 DATA ANALYSIS INTERCOMPARISON

From the initial returns made to the scheme and following from the ECSA Data Analysis Workshop in March 1994 it became clear that the manner in which benthic data were analysed and interpreted could show considerable interlaboratory variability, particularly with reference to the calculation of univariate statistics and the operation of multivariate statistical packages. With that in mind a data-set based on real data was prepared by M Elliot (University of Hull) in the form of species abundance by station matrix along with accompaning physical data. This was circulated to all participants in the NMBAQC scheme who were then asked to analyse, interpret the data and generate a standard set of univariate variables.

5.5 NMP DATA

As the initial phase of the National Monitoring Plan began to move into the reporting phase the MPMMG recreated and restructured the NMP Working Group under the Chairmanship of Dr P Balls (SOAEFD). DOE also reached an agreement whereby the NRA (now EA) TAPS Centre would generate and co-ordinate a National Database for all NMP data. However, it is clear that any database of benthic data would have to be compatible with the coding systems recommended above. Furthermore, the NMP Working Group have taken the view that detailed interpretation of the benthic data will lie outside the scope of that group. Therefore, it has been agreed that the NMABAQC co-ordinating committee will liaise with working group and the TAPS centre and advise on the analysis and interpretation of the benthic data.

6. SETTING STANDARDS AND REPORTING PERFORMANCE

The committee decided after considerable debate and with feedback from the participants, to propose two standards for performance. The first of these relates specifically to NMP data based on the returns from user supplied samples. This is essentially a regional standard detailing a participant's ability to analyse samples from their normal operating area (see proforma EXAMPLE 1). The second standard relates to a more general guide to laboratory performance where components of the scheme were included in a more general standard (see proforma EXAMPLE 2). This latter will be especially applicable to those laboratories such as the

commercial contractors whose operational area may encompass a wide geographical area and where they do not participate in NMP sampling. Example proformas are appended.

6.1 LINKING AQC PERFORMANCE TO THE NMP.

6.1.1Benthos

For those labs participating in the NMP the only meaningful assessment of their capabilities with respect to their NMP samples is an assessment of their actual performance on those (or very similar) samples, and not on someone else's samples. Relevant user supplied samples should therefore be the sole basis for QA of NMP data.

As a benthic sample consists of an assessment of a number of quasi-determinands (i.e. total taxa, total abundance etc.), any assessment of a lab's performance should be made on the basis of these individual determinands. If these determinands were combined into some overall assessment, valuable information would be lost. The following separate standards are proposed, subject to review against actual data from lab-supplied samples:

Total Taxa Target - ±10% or 2 taxa whichever is greater. Based on comparison between lab and contractor value.

Total Abundance Target - ±10% or 2 individuals whichever is greater. Based on comparison between lab and contractor value. A more relaxed standard of ±20% may be applied to samples requiring subsampling.

Total Biomass Target - ±20%. Based on comparison between lab and contractor value.

Bray-Curtis Similarity Target - ≥90%. Based on comparison between lab and contractor value.

Taxa Correctly Identified Target -±5% or 2 taxa whichever is greater. Based on a comparison between lab and contractor value.

6.1.2. The standards are generally consistent with what a majority of labs achieved in previous contractor-supplied macrobenthos exercises. (It is likely that performance on lab-supplied samples would be at least as good as, if not better than this). They are also consistent with committee members' perceptions of what laboratories ought to be able to achieve and with some River Purification Board's (now SEPA East and West Region) experience of operating similar quality standards for benthic samples over the last two years.

6.1.3. The standards proposed are considered to cover all aspects of laboratory performance on a benthic sample. Labs would be assessed against each of these separate standards. Failure to meet a given standard would result in flagging only for the relevant determinand. While the standard for the number of correctly identified taxa duplicates to some extent the Bray-Curtis similarity target, its value lies in ensuring the accuracy of the identification of rarer species; this may be important if the NMP database is to be used, for example, for conservation purposes.

In the 1995/6 scheme, only one lab-supplied sample has been assessed. A provisional NMP assessment should be based on this. In future years of the scheme it is planned to assess a greater

number of lab supplied samples making it possible for the contractor to select samples for QA from a list previously supplied by the lab. If an NMP participant was analysing samples from a variety of different salinity bands and/or intermediate/offshore sites, it would be possible to test the lab over a range of sample types. Where multiple samples had been subject to QA it would be possible to report compliance with the standard for individual determinands either for the separate samples or as an average over several samples. The latter would probably be preferable in ironing out any occasional poor performance.

6.1.2 Sediment Particle Size.

The sediment particle size exercises have identified considerable variation in performance amongst labs and between different techniques. In terms of the different sediment determinands, labs seem to be most consistent on <63mm fraction, although samples comprising high levels of fine material may still cause problems. The <63mm fraction may also be an inadequate descriptor of sediment type, particularly if it is necessary to relate sediment differences to faunal community types. However, data on other sediment descriptors such as sorting coefficient are even less reliable.

In the absence of anything more suitable, a <63mm standard should be adopted in the interim. This would be ±10% total weight of sediment compared to the mean of all labs (i.e. if <63mm = 50%, any result between 40 and 60% would be acceptable). For most sediments, this appears to be achievable irrespective of method used, although as mentioned above, there may be problems with finer sediments. In the longer term, it might be more appropriate to have two sets of right answers - one obtained using lasers and the other using sieves as methodological differences appear to be one of the major contributors to variability.

6.2. UTILISATION OF OTHER ASPECTS OF THE AQC SCHEME.

The ring tests and contractor supplied samples are mostly aimed at educating participants and providing them with some feedback on their general level of competence with a range of different species and samples. Rather than producing a strict pass/fail or ranking system for these exercises, a more general banding of laboratories using quartiles, for example, might be more appropriate.

Such an approach would avoid the need for setting explicit standards, although labs would be free to compare their performance against the NMP standards for benthos samples should they so wish. These combined measures should provide individual labs (and their managers) with a rough idea of which if any areas might need attention. For instance, the fact that a lab was in quartile four for a given determinand would only be of concern if that lab was also falling way below what it felt to be a realistic level of performance.

It is proposed to report overall performance in terms of a laboratory activity report, which would cover all aspects of the scheme, including those elements assessed for NMP (see proforma Example 2).

6.2.2 Ring Test

Lab performance would be reported on the basis of quartiles read off from one of the contractor's graphs (i.e. from left to right (based on 25 labs), labs 1 to 6 are quartile 1, labs 7-12 are quartile 2 etc.). Labs may be ranked using either the standard average score or the contractor's "Error Index". The latter is possibly better in that it weights species according to difficulty, so that labs are penalised less heavily for getting a "difficult" species wrong than for getting an "easy" species wrong, with the degree of difficulty being defined by how many participants got it wrong (or right) in the ring test. Further work is being carried out to assess the relative merits of the options.

In order to provide labs with a better idea of relative performance, the average laboratory score for all the ring tests in that year would also be provided. In this way, labs in quartiles 3 or 4 would be able to compare their mean score with the average - obviously, a lab only 1 or two points below the average would be less concerned than one 7 or 8 points below. By combining all the ring tests for the year together, this would incorporate a rolling mean concept, thereby helping to reduce the effect of an isolated poor performance.

6.2.3 Contractor and Lab-supplied Benthos Samples.

As for the ring tests, labs would be assigned to quartiles using a simple numerical ranking system for each determinand. For each determinand labs would be ranked from 1 to 25 based on absolute % difference from contractor value. Ranked values would then be summed across determinands and labs assigned to quartiles on the basis of these combined rank scores.

As mentioned previously, if labs wanted to assess their performance on these samples, they would be free to use any standards they wished, including those recommended by the committee for the NMP samples.

6.2.4 Sediment Particle Size.

Lab performance would be reported in terms of quartiles with ranked values for individual particle size assessments summed and labs assigned to an overall quartiles on the basis of these combined rank scores. As for the ring test, lab performance compared to the mean of all labs would be presented to enable individual labs to gauge their performance against the NMP standard if they wished.

7 REFERENCES

NMBAQC Co-ordinating Committee (1995) First Annual Report on the National Marine Analytical Quality Control Scheme

EXAMPLE 1

NMBAQC PERFORMANCE REPORT: NMP

LAB CODE: 04

Lab Supplied Sample	MB##04	Sample Ref	Sample Ref	Average	NMP Flag
Total Taxa Target (abs % diff)	14			14	Fail
Total Abund. Target (abs. % diff)	3			3	Pass
Total Biomass Target (abs. % diff)	15			15	Pass
Bray-Curtis Similarity (% diff)	91			91	Pass
Taxa Correctly Identified Target (abs % diff)	4			4	Pass

Particle Size Analysis Material <63μm	PS0504	PS0604	PS0704	Average	NMP Flag
(% absolute difference from mean of all labs)	7	11	3	7	Pass

EXAMPLE 2

NMBAQC: LAB ACTIVTTY REPORT

LAB CODE: 04

Lab supplied sample	Sample Ref	Sample Ref	Sample Ref	Average
Total Taxa (abs % diff)	14			14
Total Abund. (abs % diff)	3			3
Total Biomass (abs % diff)	15			15
Bray-Curtis Similarity (% diff)	91			91
Taxa Correctly Identified Target (abs % diff)	9			9

Particle Size Analysis	Sample Ref	Sample Ref	Sample Ref
Lab value % <63μm	24	82	3.1
Mean of all labs % <63μm	32	75	1.8

Ring Test: Lab Score: 69/75 **Mean Lab Score: 68/75**

Contractor supplied benthos sample	Sample Ref	Sample Ref	Sample Ref	Average
Total Taxa (abs % diff)	6	8		7
Total Abundance (abs % diff)	9	3		6
Total Biomass (abs % diff)	23	13		18
Bray-Curtis Similarity (% diff)	95	97		96
Taxa Correctly Identified Target (abs % diff)	5	6		5

Lab supplied samples quartile: 1 2 3✓ 4

Particle size samples quartile: 1 2✓ 3 4

Ring Test quartile: 1 2✓ 3 4

Contractor supplied benthos samples quartile: 1 2✓ 3 4

Comments:

PARTICIPATING ORGANISATIONS IN NMBAQC SCHEME

MAFF
DANI
SOAFD
IRTU/Industrial Science Centre
Clyde RPB
North East RPB
Forth River RPB — SEPA
Tay River RPB
Solway RPB
Highland RPB
NRA Northumbrian
Thames
South West (2 labs)
Welsh — EA
North West (2 labs)
Anglian (2 labs)
Southern
SEAS Ltd
ENTEC (Europe Ltd)
Environmental Resources and Technology Ltd
Zeneca

GLOSSARY OF TERMS

ADRIS	Association of Directors and River Inspectors for Scotland
AQC	Analytical Quality Control
DANI	Department of Environment Northern Ireland
EA	Environment Agency
ECSA	Estuarine and Coastal Sciences Association
IRTU	Industrial Research and Technology Unit
MAFF	Ministry of Agriculture, Fisheries and Food
MCS	Marine Conservation Society
MPMMG	Marine Pollution Monitoring Management Group
NMB	National Marine Biological (AQC)
NMP	National Monitoring Plan
NODC	National Oceanographic Data Centre
NRA	National Rivers Authority
PSA	Particle Size Analysis
RPB	(Scottish) River Purification Board
SEPA	Scottish Environment Protection Agency
SOAFD	Scottish Office Agriculture and Fisheries Department
SOAEFD	Scottish Office Agriculture , Environment and Fisheries Department
TAPS	Toxic and Persistent Substances
QA	Quality Assurance