SASS PROFICIENCY TESTING PROCEDURE

Introduction

This procedure is based on that used for accreditation of the SASS method at Umgeni Water according to the requirements of Standard ISO/IEC 17025, as assessed by the South African National Accreditation System (SANAS). (ISO - International Standards Organisation, IEC - International Electrotechnical Committee).

Sample description and method of tests

A routine SASS sample will be collected and preserved with formalin in the field. This will be returned to the laboratory and stained with Rose Bengal (or similar stain, to preferentially stain aquatic invertebrates). Obvious large plant debris and stone material is removed from the sample. After preservation and staining the sample is then drained of excess fluid. The "damp sample" is then placed in a wide mouth container padded with damp cotton wool or foam, to prevent excessive movement of the sample, and sequentially circulated to participants. The origin of the sample for testing will be varied to increase the diversity of families seen by practitioners. This will eventually involve regional co-ordinators collecting and preparing a single sample for dispatch into the "analysis chain". Initially results and reports will be centrally analysed and co-ordinated (to begin with at Umgeni Water).

Each participant analyses the sample with the following brief:

- notify Umgeni Water when sample has arrived
- carefully re-suspend preserved sample in a tray of clean water
- notify Umgeni Water if there is extensive damage to the invertebrates in the sample
- analyse the sample as per routine bankside SASS analysis ***not spending more than half an hour identifying invertebrates***
- score all invertebrates found on a standard SASS field sheet and calculate SASS Score (Score), Number of Taxa and Average Score per Taxon (ASPT)
- fill-in electronic spreadsheet template with results and post to mark.graham@umgeni.co.za
- if no email facility is available, field sheets with scores to be returned to UW for analysis
- drain sample (till just damp) and return to sample container and post to the next person on the list of sequential analysts
- notify Umgeni Water when sample has been sent (either by email or phone call)

Results

Each analyst (practitioner) is given a code so that they can track their own performance. Individual practitioners results will be assessed by looking at both the summary SASS metrics (indices), as well as respective families identified. This is done as follows:

SASS metrics/indices

Outlier results are assessed according to the method advocated by the American Society for Testing and Materials (ASTM) (1979).

Z scores are used to assist evaluation of performance of the respective labs.

Briefly:

Z score is based on the distribution of results around the mean

$$\text{Z score, Z} = \frac{\text{individual analysts result-overall mean value}}{\text{standard deviation}}$$

The ideal Z score is zero (0) and values of Z scores ≤ ±2 are satisfactory, Z scores between ±2 and ±3 are questionable and Z ≥ 3 are unsatisfactory (Smith, 1998).

SASS families

The SASS metrics presented (Score, ASPT, Taxa) are simply summary indices for the method. Behind them lies a set of family data with records of their abundance. A "model" score sheet is derived by majority agreement – assessed from data returned by participants. As there is no "external/independent assessor" of the sample for this PTS, consensual agreement on what was seen will indicate where there may be problems according to the criteria below. For example if only 3 out of 4 analysts observe an aquatic invertebrate family that is abundant (i.e. >10 individuals), this would indicate the fourth analyst may be having problems with identification of this particular family.

To assess the performance of analysts at the level of aquatic invertebrate family identification (the true essence of this PTS) the procedures used are as follows:

Does the analyst's score sheet:

1. Have any families (with approximate abundance) missing compared to the "model" score sheet? **(PASS = NO families with >10 individuals missing)**
2. Have any families (with approximate abundance) erroneously included compared to "model" score sheet? **(PASS = NO families with >10 individuals erroneously added)**
3. Show a difference between analysts number of families & "model" score sheet number of families? **(PASS = <20% difference in number of families)**

NOTE: **Any FAIL constitutes an overall FAIL**
Any discrepancies in identification and abundance will be noted.

A future refinement to the presentation of the data will be to portray SASS results as an ordination diagram. The results are essentially multivariate data i.e. for a single sample (practitioner) there are a range of SASS families that may have been identified. Obviously in an ideal world all participating practitioners would have found the same families, and in similar abundances. However this is rarely likely to be the case. Using ordination diagrams (and underlying multivariate statistical analysis) the data may be represented as an ordination 'graph' where the central tendency for all samples is the origin of both axes. This point would represent a hypothetical "average" sample containing all SASS families seen in their average abundance. The further away samples are from this origin the further that sample is away from the "average sample". The aim of ordinations is to arrange samples such that points on the diagram that are close together correspond with samples that are similar in SASS family composition. Obviously samples that are further apart correspond with samples that are dissimilar in composition. An example can be seen in the attached sheet.

Conclusions and remarks

The greater the number of analysts participating in this scheme the more robust the calculated statistics and ordination diagrams.

It is likely that to maintain the integrity and confidence of data being used in and by the RHP, the time will come when only data from certified practitioners will be accepted by the programme. One of the key requirements of certification of practitioners will be participation in such a PTS.

NOTE:

There is an obvious relationship between time spent observing and identifying invertebrates and the probability of encountering them. It should therefore be emphasised that to maintain some standard, exceeding the recommended ***half an hour of analysis*** should be avoided at all costs. It is also possible that results from analysts exceeding the half hour could stand-out from the "average" condition as determined by the majority of analysts – particularly when analysed with the multivariate ordination techniques.

References

American Society for Testing and Materials (ASTM) 1979. Annual Book of ASTM Standards, Part 31 - Water. Philadelphia, Pennsylvania.

Smith R, 1998. Proficiency Testing Course. Part 1: Proficiency Testing - Basic Principles, Organisation and Evaluation. SANAS, Pretoria, June 1998.

For further information contact Mark Graham at Umgeni Water (mark.graham@umgeni.co.za)