NMBAQC
The National Marine Biological Analytical Quality Control Scheme

NMBAQC Scheme
PSA for Supporting Biological Analysis Questionnaire Results

Prue Addison, Environment Agency

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Collection

Methodological Differences Highlighted in Questionnaire:

- Source of PSA sub-sample (biology, chemistry or separate grab)
- Method of sub-sample collection from grab (depth integrated core/mixed sample/surface sample)
- Sample volume

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Collection

Green Book states:

Green Book Tables V12:

> 'The PSA sample used to support benthic community analysis should be a ***representative collected from a separate grab***.... A ***separate sample*** should be collected for particle size analysis ***to support the contaminants data***. The fraction less than 63um should be determined on this sample.'

Appendix 3. Procedural Guidelines for subtidal sediment sampling:

> 'Take the sample from the surface to a ***minimum depth of 5 cm*** (a core previously used for redox analysis is acceptable). Transfer samples to ***containers that can withstand freezing***, such as plastic bags or pots.'

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Collection

Questionnaire Results - Source of the PSA Sample

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Separate sample			✓		✓	✓
Sub-sample from biology sample		✓		✓		
Sub-sample from chemistry sample	✓*					

*prior to 2008 – biology

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Collection

Questionnaire Results - Source of the PSA Sample

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Surface sample	2cm plastic scoop (250mL)					
Depth integrated core		5cm plastic corer (500mL)	5cm metal scoop (300-500mL)	1.4cm plastic corer (100g)		5 - 15cm plastic scoop (50g)
Mixed sample					plastic scoop (200mL)	

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Collection

Questionnaire Results - Minimum Size of PSA Sample Taken

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Gravel	250g	500mL	300-500mL	100g	100g	50g
Sand	250g	500mL	300-500mL	100g	50g	50g
Mud	50g	500mL	300-500mL	100g	25g	50g

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Collection

Workshop discussion needed on:

- Source of PSA sub-sample
  - Biology, chemistry or separate grab?
- Method of sub-sample collection from grab
  - Depth integrated core/mixed sample/surface sample?
  - Sample volume?
- Can biology PSA be used for supporting chemistry sediment samples (for CSEMP)?

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Methodological Differences Highlighted in Questionnaire:

- Sample preservation (Freezing/not freezing/oven drying)
- Removal of organic material with hydrogen peroxide vs. no removal of organic material
- Removal of conspicuous fauna (i.e. snail shells, urchins, etc.) vs. no removal of fauna
- Volume of sub-sample used for laser and sieve analysis
- Obscuration range of laser analysis
- The use of a dispersant vs. no dispersant
- Wet/Dry sieving (to what size) to separate laser and sieve fraction

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Green Book states:

Appendix 3. Procedural Guidelines for subtidal sediment sampling:

'Keep samples cool and freeze them as soon as possible. This prevents decomposition from affecting grain size. Record the method of preservation.'

Appendix 9. Procedural Guidelines for analysis of sediment supporting determinands:

'PSA for analysis of sediment supporting determinands ***to be added by NMBAQC group***'!

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Questionnaire Results:

- Samples frozen by all, except EA
- Hydrogen peroxide (to remove organic material) used only by AFBI
- Removal of conspicuous fauna by all
  - only CEFAS record weight and fraction which fauna were present in and identification completed if possible

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Questionnaire Results:

- Volume of sub-sample used for laser and sieve analysis

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Gravel	All sample	All sample	<1g	All sample	100g	100g -sieving; teaspoon full (~5mL) for laser
Sand	50 g	All sample	<1g	0.1-0.5g	50g	"
Mud	20 - 30 g	All sample	<1g	0.1-0.5g	25g	"

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Questionnaire Results:

- Obscuration range of laser analysis

AFBI	CEFAS	EA	FRS	NIEA	SEPA
up to 25%*	5-15% (no greater than 20%)*	5-20%*	5-15% ± 2%*	15%	15-20%

* Outside of Malvern suggestion of 10 - 20 %

- Dispersant used in laser analysis only by NIEA

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Questionnaire Results:

- Separating sieve and laser fractions

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Wet/Dry sieve	Wet	Wet	Wet	Dry	Dry	Dry
Mesh size	0phi (1000um)	4phi (63um)	-1phi (2000um)	-1phi (2000um)	0phi (1000um)	0phi (1000um)

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Questionnaire Results:

- Sieve analysis

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Wet/Dry sieve	Dry	Dry	Wet	Dry	Dry	Dry
Min	0phi (1000um)	4phi (63um)	-1phi (2000um)	-0.49phi (1400um)	0phi (1000um)	0phi (1000um)
Max	< -3phi (8000um)	-6phi (63000um)	-3phi (8000um)	-4phi (16000um)	-4phi (16000um)	-3Phi (8mm)
Interval	1/2phi	1/2phi	1phi	1phi	1phi	1phi

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Questionnaire Results:

- Laser analysis

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Min	16phi (0.01um)	>13phi (<0.1um)	16phi (0.01um)	15phi (0.03um)	15.5phi (<0.02um)	>8phi (<3.85um)
Max	0phi (1000um)	4phi (63um)	-1phi (2000um)	-1phi (2000 mm)	-0.5phi (1414um)	0phi (1000um)
Interval	1/2phi	1/2phi	1/2phi	1/2phi	1/2phi	1/2phi

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Sample Analysis

Workshop discussion needed on:

- Sample preservation (Freezing/not freezing/oven drying)?
- Removal of organic material with hydrogen peroxide?
- Removal of conspicuous fauna (i.e. snail shells, urchins, etc.) - weigh and id?
- Volume of sub-sample used for laser and sieve analysis?
- Obscuration range of laser analysis?
- The use of a dispersant?
- Wet/Dry sieving (to what size) to separate laser and sieve fraction?

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Data Interpretation and Reporting

Methodological Differences Highlighted in Questionnaire:

- Calculating derived statistics via Malvern Software vs. Own Spreadsheets.
- The derived stats reported (Inclusive vs Moments).

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Data Interpretation and Reporting

Green Book states:

Green Book Tables V12

'The full range of parameters detailed in Table 1.1 should be determined on this sample.'

Statistics:

Code	Description	Unit
GSKURT	Grain size kurtosis	Scale
GSMEA	Grain size mean	mm
GSSKEW	Grain size skewness	Scale
GSSORT	Grain size sorting	Scale
GSMED	Grain size median	mm

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Data Interpretation and Reporting

Green Book states:

Green Book Tables V12

Fractions (%):

Code	Description
GSMF>8000	Grain Size Mass Fraction >8000
GSMF>4000<8000	Grain Size Mass Fraction >4000<8000
GSMF>2000<4000	Grain Size Mass Fraction >2000<4000
GSMF>1000<2000	Grain Size Mass Fraction >1000<2000
GSMF>500<1000	Grain Size Mass Fraction >500<1000 µm
GSMF>250<500	Grain Size Mass Fraction >250<500 µm
GSMF>125<250	Grain Size Mass Fraction >125<250 µm
GSMF>63<125	Grain Size Mass Fraction >63<125 µm
GSMF63	Grain Size Mass Fraction <63 µm
GSMF20*	Grain Size Mass Fraction <20 µm

* Used for chemistry interpretation

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Data Interpretation and Reporting

Questionnaire Results:

- Sieve and Laser data merged and stats and fractions calculated in:

AFBI	CEFAS	EA	FRS	NIEA	SEPA
Own spreadsheet and Gradistat	Own spreadsheet	Malvern Software	Malvern Software	Own spreadsheet	Own spreadsheet

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Data Interpretation and Reporting

Questionnaire Results:

- Derived stats reported into MERMAN

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Mean	Inclusive	Moments	Inclusive	Inclusive	Inclusive	$M_\Phi = (\Phi_{16} + \Phi_{84})/2$
Median	ϕ50	ϕ50	ϕ50	ϕ50	ϕ50	ϕ50
Sorting	Inclusive	Moments	Inclusive	Inclusive	Inclusive	Inclusive
Skewness	Inclusive	-	Inclusive	Inclusive	Inclusive	Inclusive
Kurtosis	Inclusive	Moments	Inclusive	Inclusive	Inclusive	Inclusive

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

Data Interpretation and Reporting

Workshop discussion needed on:

- Calculating fractions and statistics via Malvern Software vs. Own Spreadsheets?
- Derived stats reported (Inclusive vs Moments)?
  - Should statistics be reported ***at all*** into national databases?

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

QA/QC

Methodological Differences Highlighted in Questionnaire:

- External QA - All CMA PSA labs signed up to NMBAQC PS component (plus 6 private labs)
- Internal QC - Varying levels of internal QA/QC done by laboratories.

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

QA/QC

Green Book States:

Nothing!

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

QA/QC

Questionnaire Results:

- Internal QC

	AFBI	CEFAS	EA	FRS	NIEA	SEPA
Equipment Checks:						
Malvern Laser serviced/calibrated regularly	y	y	y	y	y	
Malvern Laser check (with certified reference material)	y	y	y	y	y	
Malvern Laser – repeating analysis of some samples to check variations	y	y	y			
Balance checked daily	n		y			
Balance checked (with calibrated weight)	n	y	y			
Re-analysis of a certain amount of samples (e.g. 1 in 10):	n	n	n	n	y	y

NMBAQC
The National Marine Biological Analytical Quality Control Scheme

QA/QC

Workshop discussion needed on:

- Internal QC?