



European Community Reference Laboratory
for monitoring bacteriological and viral
contamination of bivalve molluscs



Report on *E.coli* / *Salmonella* EQA, 2005/6

CRL ring trial reference : RT13 (*E. coli* / *Salmonella* EQA, 2005/6)

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Introduction

Council Regulation (EC) 882/2004 designates the Centre for Environment, Fisheries and Aquaculture (CEFAS) Weymouth as the European Community Reference Laboratory (CRL) for monitoring bacteriological and viral contamination of bivalve molluscs. The CRL collaborates with the UK Health Protection Agency (HPA) on the application of a Shellfish External Quality Assurance (EQA) Scheme for proficiency testing among laboratories analysing bivalve molluscan shellfish. The Shellfish EQA scheme is primarily targeted at analysis of the statutory determinants *Escherichia coli* and *Salmonella* spp. in bivalve molluscan shellfish.

NRLs support the use of the CRL/HPA Shellfish EQA Scheme as the primary means of comparative bacteriological testing between NRLs. At the last annual workshop in 2005 it was resolved that all NRLs would continue to participate in the CRL/HPA Shellfish EQA scheme for *E. coli* and *Salmonella* spp. testing with 3 annual distributions. Individual NRLs agreed to cover the costs of their own participation in this scheme. Annual reports for 2002, 2003, 2004 and 2005 detailing participation and laboratory performance in the EQA scheme are available on the CRL website (www.cricefas.org).

This report covers the 3 EQA distributions March 2005 and the end of February 2006. For further details on the results of the EQA samples, please see the individual reports for distributions SF020, SF021 and SF022 (www.hpa.org.uk).

Samples

CRL/HPA Shellfish EQA samples consist of a LENTICULE disc format mixture of fully characterised bacterial isolates. The proportions and types of organisms in the reconstituted samples are designed to mirror those that may be found in real bivalve molluscs. They are constructed to simulate the flora from bivalve molluscs from harvesting sites. Examination should be in accordance with the Regulations (EC) 854/2004/EEC and (EC) 2073/2005. These regulations set out requirements *inter alia* regarding levels of *E. coli* in 100g of flesh and absence of *Salmonella* spp in 25g of flesh.

Sample vials are packaged according to IATA regulations, UN3373 as diagnostic specimens, division 6.2 under the packing instruction code 650 and distributed by UK Royal Mail airmail priority service. Relevant transport documentation, examination request forms and instructions on handling and sample reconstitution accompany sample vials. The date by which results must be returned is indicated at the foot of the request forms. Report forms appropriate for the five tube most probable number (MPN) method with the modified confirmation method that requires the use of a chromogenic agar, are included with the samples.

Quality Control

The examinations required, as listed on the request form, are performed in the HPA Food EQA Laboratory on a minimum of 10 samples during the examination period. The results from these samples are termed the reference results. The methods used to obtain the reference results were ISO TS 16649-3 for *E. coli* enumeration and EN ISO 6579 (*Salmonella* spp.).

Participants' Results

NRLs' results are assessed by comparison with those of all Shellfish EQA participants, and also the reference results. Scores are allocated for a) the results reported for *E. coli* MPNs and b) results for examination for *Salmonella* spp.

***E.coli* MPNs**

Statistical Analyses

Statistical analyses are performed on results submitted for *E. coli* enumerations reported by NRLs using a five tube MPN method. The analyses have been amended since the scoring system was introduced. Each NRL's reported MPN value is compared with the median MPN of all participants' (due to the relatively small number of NRLs). The median is used rather than the mean because it is less affected by outlying results than the mean value. All the analyses are based on the tube combinations reported, not the final MPNs and are as follows:

i) Within replicate variation

This analysis determines whether each tube combination reported by each participant is statistically acceptable.

ii) Comparison with the participants' median MPN

This analysis determines the participants' median and compares each NRL's MPN value, as calculated from the tube combination reported, with the median ± 3 and ± 5 standard deviations. The standard deviation is based on the expected inherent variability of the three by five tube MPN method, which on a \log_{10} scale has a value of 0.26.

iii) Between sample variation

This analysis is performed when two samples in a distribution are from the same batch. The analysis determines whether there is a significant difference between the results reported for the two samples.

Results Charts

NRL results and the reference results for an *E. coli* enumeration are plotted on the same chart. The results charts are compiled from the MPN value reported by the NRL's. The results charts also indicate the median MPN value for all participants (both NRL's and others) and the values calculated for 3 and 5 standard deviations.

Results Analysis and Scoring System

E.coli MPN

The NRLs' MPN results reported for each sample are allocated scores up to a maximum of 12 points. Points are deducted if a tube combination reported shows significant within replicate variation (where applicable) and/or differs significantly from the participants' median value. If the reported tube combination results in an MPN value falls outside the 5 standard deviation (SD) values then five points are deducted. If the reported tube combination result in an MPN value falls between the 3 and 5 standard deviation values then three points are deducted. A further two points may be deducted if the MPN value reported is inconsistent with the tube combination. **NRLs returning only a single MPN result for a sample will be allocated scores out of a maximum score of seven points.**

Normally scores are not allocated for high-censored results e.g. (>16000 per 100g etc). All NRLs' who return results will be allocated a minimum of two points regardless of the quality of the results reported.

Salmonella spp.

NRLs' results for presence/absence examinations for *Salmonella* spp. are allocated scores as follows:

Result	Score
Fully correct result	2
Result partially misleading (e.g. incorrect serotype designatio	1
Grossly misleading result, e.g (failure to isolate <i>Salmonella</i>)	0

Performance Assessments

Performance assessments are undertaken after every distribution and take into account a participant's performance over three consecutive distributions. Cumulative performance assessments over distributions SF020, SF021 and SF022 for *E. coli* MPNs and *Salmonella* examinations for participating NRLs are summarised in Tables 7 and 8 respectively.

Participant's experiencing problems i.e. those who achieve <40% of the maximum possible

score in a single distribution, or <70% of the maximum possible score over three distributions will be offered advice by the scheme organisers. In addition participant's who fail with *Salmonella* spp. isolation on two consecutive distributions will be contacted.

Participation

Uptake of the Shellfish EQA scheme has continued to be very good with 20 designated NRLs from EU Member States now registered. Sweden, Slovenia, Slovakia, Czech Republic, Finland and Estonia signed up to the scheme in 2004-5 and participated in all 3 distributions. Lithuania registered for the scheme in 2004 but did not return any results in 2005-6.

To date, of the three current candidate countries (Turkey, Romania and Bulgaria) just Romania has enrolled and returned results for all 3 distributions for 2005-6. Neither designated NRL in the EFTA (Norway and Iceland) have joined the scheme.

Table 1. Participation in the Shellfish EQA by NRLs

Member State	Participation in Shellfish EQA for	
	<i>E. coli</i>	<i>Salmonella</i>
Austria	yes	yes
Belgium & Luxembourg	yes	yes
Czech Republic ¹	yes	yes
Denmark	yes	yes
Estonia	yes	yes
Finland	yes	yes
France	yes	yes
Germany ²	partial	partial
Greece	yes	yes
Ireland ³	partial	partial
Italy	yes	yes
Latvia	no	no
Lithuania ¹	yes	yes
Netherlands ⁴	partial	partial
Poland	no	no
Portugal	yes	yes
Slovakia	yes	yes
Slovenia	yes	yes
Spain	yes	yes
Sweden	yes	yes
United Kingdom ²	partial	partial

Candidate country		
Bulgaria	no	no
Romania	yes	yes
Turkey	no	no
ETFA		
Norway	no	no
Iceland	no	no

¹ no results returned for all distributions

² no results returned for SF0048 and SF0049

³ no results returned for SF0050, SF0051, SF0052 and SF0053

⁴ no results returned for SF0050 and SF0051

DISTRIBUTION SF020: SAMPLE SF0048

Sample - Raw shellfish from a new shellfish bed

Contents - *Escherichia coli*, *Citrobacter freundii*, *Klebsiella aerogenes* and *Salmonella Liverpool*

Reference results - *E. coli* MPN

	Median MPN/100g	Median MPN/100g- 3SD	Median MPN/100g -5SD	Median MPN/100g +3SD	Median MPN/100g+ 5SD
Reference results	1.3x10 ⁵	2.2x10 ⁴	6.5x10 ³	7.8x10 ⁵	2.6x10 ⁶
NRL results	9.1x10 ⁴	1.5 x10 ⁴	4.6x10 ³	5.5x10 ⁵	1.8x10 ⁶

Reference results - The intended result was *Salmonella* spp. present in 25g of shellfish flesh. *Salmonella* spp. was detected in all of the samples selected for quality control testing before and during the distribution period.

NRL results - SF0048 (Table 2 and Figure 1)

***E.coli* MPN**

NRLs 701 and 658 did not submit results for SF0048. The duplicate results reported by NRLs for *E. coli* MPNs for sample SF0048 are plotted in Figure 1, the reference results are also included. NRL 605 failed to return both replicates this laboratory was awarded a maximum of 7 points. NRL 594 reported one replicate tube combination incorrectly with the MPN value thus two points were deducted. NRL 662 reported both replicate results below 5 SD from the median. NRL 684 recorded high-censored results. All other NRLs reported both replicate results between 3 and 5 SD from the median.

***Salmonella* spp.**

NRLs 701 and 658 did not return results for SF0048. NRL 493 reported *Salmonella* spp. as not detected in the sample. All other NRLs who undertook the examination correctly detected *Salmonella* spp. in the sample and received a maximum score of 2.

Table 2: Results reported by participants and scores allocated - SF0048

Lab number	E. coli (per 100g)			Salmonella spp.	
	Replicate 1	Replicate 2	Score	Salmonella spp.	Score
121	7.0x10 ⁴	1.3x10 ⁵	12	present	2
391	5.4x10 ⁴	7.0x10 ⁴	12	present	2
403	1.1x10 ⁵	1.6x10 ⁵	12	present	2
493	1.6x10 ⁴	>1.8x10 ⁴	12	nd	0
593	>1.8x10 ⁴	>1.8x10 ⁴	12	present	2
594	4.9x10 ⁴	3.1x10 ⁴	10	present	2
596	2.4x10 ⁴	1.1x10 ⁵	12	present	2
597	7.0x10 ⁴	1.3x10 ⁵	12	present	2
601	7.5x10 ⁴	1.3x10 ⁵	12	present	2
604	1.3x10 ⁵	5.0x10 ⁴	12	present	2
605	4.9x10 ⁴		7	present	2
629	9.5x10 ⁴	9.1x10 ⁴	12	present	2
651	7.5x10 ⁴	2.4x10 ⁴	12	present	2
653	9.1x10 ⁴	5.4x10 ⁴	12	present	2
657	5.0x10 ⁴	7.5x10 ⁴	12	present	2
658	nr	nr	0	nr	0
660	5.0x10 ⁴	1.1x10 ⁵	12	present	2
662	3.8x10 ³	3.1x10 ³	2	present	2
684	>1.8x10 ⁴	>1.8x10 ⁴	12	present	2
701	nr	nr	0	nr	0

nr-not returned, nd-not detected

DISTRIBUTION SF020: SAMPLE SF0049

Sample - Raw shellfish from a new shellfish bed

Contents - *Escherichia coli*, *Citrobacter freundii*, *Pseudomonas fluorescens* and *Bacillus pumilus*

Reference results - *E. coli* MPN

	Median MPN/100g	Median MPN/100g- 3SD	Median MPN/100g -5SD	Median MPN/100g +3SD	Median MPN/100g+ 5SD
Reference results	50	0	1	3.0×10^2	1.0×10^3
NRL results	40	1	1	2.4×10^2	8.0×10^2

Reference results - The intended result was *Salmonella* spp. not present in 25g of shellfish flesh. *Salmonella* spp. was not detected from any of the samples selected for quality control testing before and during the distribution period.

NRL results - SF0049 (Table 3 and Figure 2)

E.coli MPN

NRLs 701 ad 658 did not submit results. The duplicate results reported by NRLs for *E. coli* MPNs for sample SF0049 are plotted in Figure 2, the reference results are also included. NRL 605 failed to return both replicates this laboratory was awarded a maximum of 7 points. NRL 594 reported one replicate tube combination incorrectly with the MPN value thus two points were deducted. NRL 596 reported both replicate tube combination incorrectly with the MPN value thus two points were deducted. All other NRLs reported both replicate results between 3 and 5 SD from the median.

Salmonella spp.

NRL 701 did not submit results. All other NRLs who undertook the examination did not detect *Salmonella* spp. in the sample and received a maximum score of 2.

Table 3: Results reported by participants and scores allocated – SF0049

Lab number	E. coli (per 100g)			Salmonella spp.	
	Replicate 1	Replicate 2	Score	Salmonella spp.	Score
121	70	20	12	nd	2
391	130	110	12	nd	2
403	20	40	12	nd	2
493	110	70	12	nd	2
593	<20	<20	12	nd	2
594	45	40	10	nd	2
596	210	45	10	nd	2
597	<18	<18	12	nd	2
601	70	50	12	nd	2
604	40	40	12	nd	2
605	<20		7	nd	2
629	40	20	12	nd	2
651	50	20	12	nd	2
653	70	90	12	nd	2
657	70	70	12	nd	2
658	nr	nr	0	nr	0
660	20	90	12	nd	2
662	40	40	12	nd	2
684	40	<20	12	nd	2
701	nr	nr	0	nr	0

nr-not returned, ne-not examined, nd-not detected

DISTRIBUTION SF021: SAMPLE SF0050

Sample - Raw shellfish from a new shellfish bed

Contents - *Escherichia coli*, *Citrobacter freundii*, *Pseudomonas fluorescens* and *Bacillus pumilus*

Reference results - *E. coli* MPN

	Median MPN/100g	Median MPN/100g- 3SD	Median MPN/100g -5SD	Median MPN/100g +3SD	Median MPN/100g+ 5SD
Reference results	3.1×10^2	52	1	1.9×10^3	6.2×10^3
NRL results	1.6×10^2	27	1	9.6×10^2	3.2×10^3

Reference results - The intended result was *Salmonella* spp. not present in 25g of shellfish flesh. *Salmonella* spp. was not detected from any of the samples selected for quality control testing before and during the distribution period.

NRL results - SF0050 (Table 4 and Figure 3)

E. coli MPN

NRLs 121, 604 and 605 did not submit results. The duplicate results reported by NRLs for *E. coli* MPNs for sample SF0050 are plotted in Figure 3, the reference results are also included. NRL 593 failed to return both replicates this laboratory was awarded a maximum of 7 points. NRL 596 returned one replicate result between 3 and 5 SD lower than the participants' median thus three points were deducted. NRL 701 reported one replicate result with a low censored value thus three points were deducted. All other NRLs reported both replicate results between 3 and 5 SD from the median.

Salmonella spp.

NRLs 121, 604 and 605 did not submit results. NRL 593 did not examine the sample for *Salmonella* spp. All other NRLs who undertook the examination did not detect *Salmonella* spp. in the sample and received a maximum score of 2.

Table 4: Results reported by participants and scores allocated – SF0050

Lab number	E. coli (per 100g)			Salmonella spp.	
	Replicate 1	Replicate 2	Score	Salmonella spp.	Score
121	nr	nr	0	nr	0
391	130	50	12	nd	2
403	130	200	12	nd	2
493	40	70	12	nd	2
593	320		7	ne	0
594	130	170	12	nd	2
596	40	20	9	nd	2
597	45	93	12	nd	2
601	110	220	12	nd	2
604	nr	nr	0	nr	0
605	nr	nr	0	nr	0
629	310	310	12	nd	2
651	70	90	12	nd	2
653	40	40	12	nd	2
660	90	110	12	nd	2
662	310	200	12	nd	2
684	220	310	10	nd	2
701	<20	40	9	nd	2

nr-not returned, ne-not examined, nd-not detected

DISTRIBUTION SF021: SAMPLE SF0051

Sample - Raw shellfish from a new shellfish bed

Contents - *Salmonella Indiana*, *Pseudomonas putida*, *Hafnia Alvei*, *Klebsiella aerogenes* and *Escherichia coli*.

Reference results - *E. coli* MPN

	Median MPN/100g	Median MPN/100g- 3SD	Median MPN/100g -5SD	Median MPN/100g +3SD	Median MPN/100g+ 5SD
Reference results	1.5×10^4	2.4×10^3	7.5×10^2	8.7×10^4	2.9×10^5
NRL results	7.5×10^3	1.2×10^3	3.8×10^2	4.5×10^4	1.5×10^5

Reference results - The intended result was *Salmonella* spp. present in 25g of shellfish flesh. *Salmonella* spp. was detected in all of the samples selected for quality control testing before and during the distribution period.

NRL results - SF0051 (Table 5 and Figure 4)

E. coli MPN

NRLs 121, 604 and 605 did not submit results. The duplicate results reported by NRLs for *E. coli* MPNs for sample SF0051 are plotted in Figure 4, the reference results are also included. NRL 593 failed to return both replicates this laboratory was awarded a maximum of 7 points. NRL 653 reported one replicate tube combination incorrectly with the MPN value thus two points were deducted and returned both replicate results between 3 and 5 SD from the median. All other NRLs who undertook the examination were awarded the maximum 12 points.

Salmonella spp.

NRLs 121, 604 and 605 did not submit results. All other NRLs who undertook the examination did not detect *Salmonella* spp. in the sample and received a maximum score of 2.

Table 5: Results reported by participants and scores allocated – SF0051

Lab number	E. coli (per 100g)			Salmonella spp.	
	Replicate 1	Replicate 2	Score	Salmonella spp.	Score
121	nr	nr	0	nr	0
391	5.4x10 ³	9.2x10 ³	12	present	2
403	9.1x10 ³	9.1x10 ³	12	present	2
493	1.1x10 ⁴	7.5x10 ³	12	present	2
583	7.0x10 ³	1.6x10 ⁴	12	present	2
593	2.4x10 ³		7	present	2
594	4.9x10 ³	1.3x10 ⁴	12	present	2
596	9.1x10 ³	3.5x10 ³	12	present	2
597	7.0x10 ³	7.0x10 ³	12	present	2
601	7.5x10 ³	3.1x10 ³	12	present	2
604	nr	nr	0	nr	0
605	nr	nr	0	nr	0
629	3.5x10 ³	5.4x10 ³	12	present	2
651	9.1x10 ³	7.5x10 ³	12	present	2
653	9.1x10 ⁴	5.4x10 ⁴	4	present	2
660	2.4x10 ⁴	5.0x10 ³	12	present	2
662	9.1x10 ³	5.4x10 ³	12	present	2
684	5.4x10 ³	3.5x10 ³	12	present	2
701	9.1x10 ³	1.7x10 ⁴	12	present	2

nr-not returned ne-not examined

DISTRIBUTION SF022: SAMPLE SF0052

Sample - Raw shellfish from a new shellfish bed

Contents - *Citrobacter freundii*, *Enterobacter cloacae* and *Pseudomonas putida*.

Reference results - The intended result was <20 *E.coli* per 100g of shellfish flesh. *E.coli* was reported as <20MPN/100g for all samples selected for quality control testing before and during the distribution period.

Reference results - The intended result was *Salmonella* spp. not present in 25g shellfish flesh. *Salmonella* spp. was not detected from any of the samples selected for quality control testing before and during the distribution period.

NRL results - SF0052 (Tables 6 and 5)

***E.coli* MPN**

The duplicate set of results reported by NRLs for *E. coli* MPNs for samples SF0052 are plotted in Figure 5, the reference results are also included. NRL 662 reported one replicate MPN result incorrectly as present. All other NRLs returning results correctly reported that *E.coli* concentration was less than their limit of detection.

***Salmonella* spp.**

All NRLs who undertook the examination did not detect *Salmonella* spp. in the sample and received a maximum score of 2.

Table 6: Results reported by participants and scores allocated – SF0052

Lab number	E. coli (per 100g)			Salmonella spp.	
	Replicate 1	Replicate 2	Score	Salmonella spp.	Score
121	<20	<20	12	nd	2
391	<20	<20	12	nd	2
403	<20	<20	12	nd	2
493	<20	<20	12	nd	2
583	<20	<20	12	nd	2
593	<20	<20	12	nd	2
594	<18	<18	12	nd	2
596	<20	<20	12	nd	2
597	<18	<18	12	nd	2
601	<20	<20	12	nd	2
604	<20	<20	12	nd	2
605	<20	<20	12	nd	2
629	<20	<20	12	nd	2
651	<20	<20	12	nd	2
653	0	0	12	nd	2
657	<20	<20	12	nd	2
660	<20	<20	12	nd	2
662	<20	20	7	nd	2
684	<20	<20	12	nd	2
701	<20	<20	12	nd	2

nr-not returned ne-not examined

DISTRIBUTION SF022: SAMPLE SF0053

Sample - Raw shellfish from a new shellfish bed

Contents - *Bacillus Licheniformis*, *Enterobacterr cloacae*, *Escherichia coli*, and *Klebsiella oxytoca*.

Reference results - *E. coli* MPN

	Median MPN/100g	Median MPN/100g- 3SD	Median MPN/100g -5SD	Median MPN/100g +3SD	Median MPN/100g+ 5SD
Reference results	1.0x10 ²	0	1	6.0x10 ²	2.0x10 ³
NRL results	70	1	1	4.2x10 ⁵	1.4x10 ³

Reference results - The intended result was *Salmonella* spp. not present in 25g of shellfish flesh. *Salmonella* spp. was not detected from any of the samples selected randomly from the batch for quality control testing.

NRL results - SF0053 (Tables 6 and Figure 5)

E.coli MPN

The duplicate set of results reported by NRLs for *E. coli* MPNs for samples SF0053 are plotted in Figure 5, the reference results are also included. NRLs 593 and 684 reported one replicate tube combination incorrectly with the MPN value thus two points were deducted. All other NRLs who undertook the examination were awarded the maximum 12 points.

Salmonella spp.

All NRLs who undertook the examination did not detect *Salmonella* spp. in the sample and received a maximum score of 2.

Table 6: Results reported by participants and scores allocated – SF0053

Lab number	E. coli (per 100g)			Salmonella spp.	
	Replicate 1	Replicate 2	Score	Salmonella spp.	Score
121	40	40	12	nd	2
391	50	50	12	nd	2
403	220	20	12	nd	2
493	50	50	12	nd	2
583	70	70	12	nd	2
593	160	160	10	nd	2
594	68	78	12	nd	2
596	40	40	12	nd	2
597	78	<18	12	nd	2
601	50	40	12	nd	2
604	70	110	12	nd	2
605	50	20	12	nd	2
629	90	110	12	nd	2
651	90	110	12	nd	2
653	40	110	12	nd	2
657	90	90	12	nd	2
660	110	50	12	nd	2
662	70	50	12	nd	2
684	130	230	10	nd	2
701	70	40	12	nd	2

nr-not returned ne-not examined

Performance by NRLs

Cumulative performance assessments over distributions SF020, SF021 and SF022 for *E. coli* MPNs and *Salmonella* spp. examinations for participating NRLs are summarised in Tables 7 and 8.

E. coli MPN - Table 7

In *E. coli* assessments 8 NRLs achieved a maximum 100% score for the three distributions, however for 3 of these performance assessments are provisional as three distributions were not completed in 2004-05. 6 NRLs scored in excess of the 70% poor performance assessment limit set for the EQA scheme. Of the 6 that scored a cumulative total of <70% across the three distributions all 6 did so due to failure to return results for one, two or all of the distributions.

Salmonella spp. - Table 8

13 from the twenty participating laboratories achieved maximum scores of 12 across the three distributions. The 7 NRLs scoring <100% did so due to failure to return results for one, two or all of the distributions with only 1 laboratory reporting an incorrect result for distribution SF048.

Summary

The overall performance of NRLs in the CRL/HPA Shellfish scheme is reasonably good with 20 NRL participants registered as of January 1 2005. However, 6 laboratories failed to achieve cumulative scores of >70% over three distributions. Failures were generally attributable to non-return of results.

The responsibilities of both the Community and National Reference Laboratories with regard to comparative (proficiency) testing are clearly identified in both regulation and through NRL resolution. The CRL/HPA Shellfish scheme is the principal mechanism for *E.coli* and *Salmonella* proficiency testing (PT) between NRLs. Thus it is important that NRLs maintain their commitment to this scheme. It is strongly recommended that laboratories introduce mechanisms into their quality systems preventing EQA failure due to non-return of results and that NRLs that are not currently registered do so in 2006.

Table 7. Summary of performance of NRLs over three Shellfish EQA distributions, SF020, SF021 and SF022 - *E. coli*

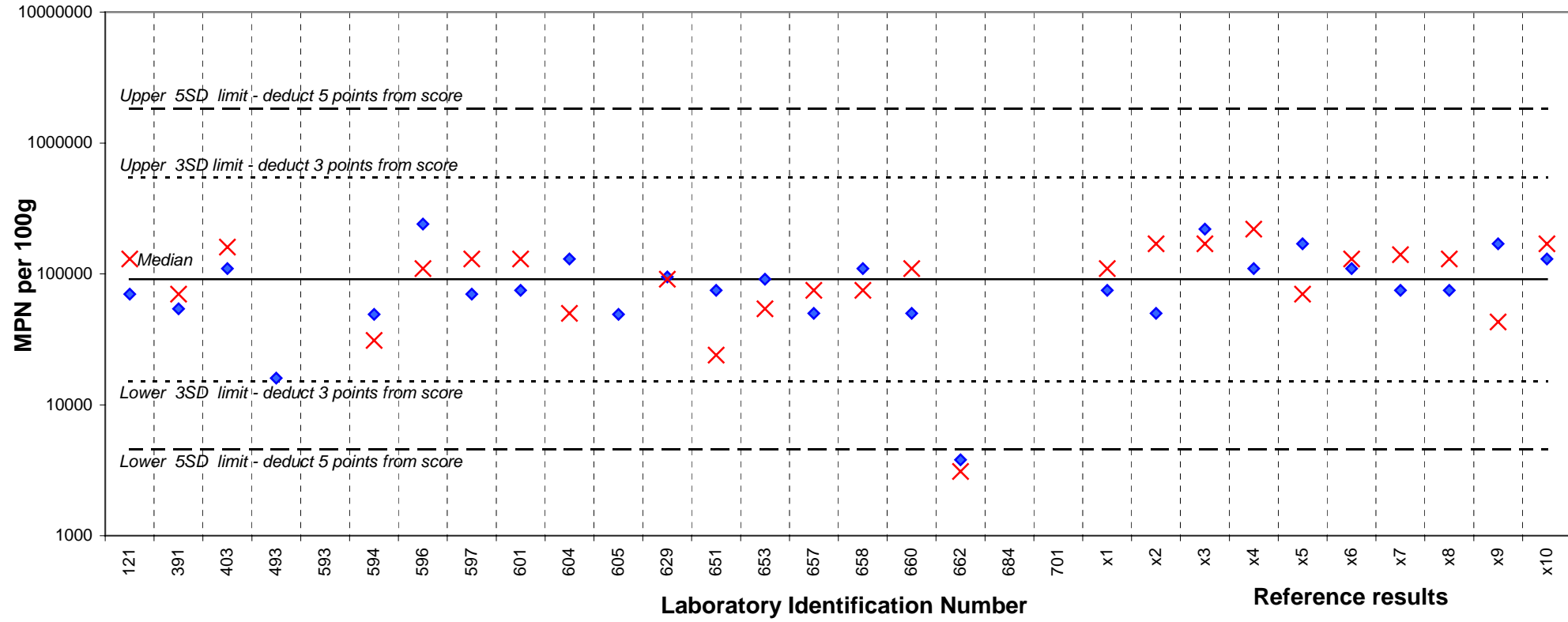
Lab no.	Distribution SF020		Distribution SF021		Distribution SF022		All distributions		
	SF004 8	SF004 9	SF005 0	SF005 1	SF005 2	SF005 3	Cumulative score	Max score	%
121	12	12	0	0	12	12	48	72	67
391	12	12	12	12	12	12	72	72	100
403	12	12	12	12	12	12	72	72	100
493	12	12	12	12	12	12	72	72	100
583	-	-	-	12	-	12	24	72	33
593	12	12	7	7	12	10	60	72	83
594	10	10	12	12	12	12	68	72	94
596	12	10	9	12	12	12	67	72	93
597	12	12	12	12	12	12	72	72	100
601	12	12	12	12	12	12	72	72	100
604	12	12	0	0	12	12	48	72	67
605	7	7	0	0	12	12	38	72	53
629	12	12	12	12	12	12	72	72	100
651	12	12	12	12	12	12	72	72	100
653	12	12	12	4	12	12	64	72	89
657	12	12	-	-	12	12	48	72	67
660	12	12	12	12	12	12	72	72	100
662	2	12	12	12	7	12	57	72	79
684	12	12	10	12	12	10	68	72	94
701	0	0	9	12	12	12	45	72	63

Table 8. Summary of performance of NRLs over three Shellfish EQA distributions, SF020, SF021 and SF022 - *Salmonella* spp.

Lab no.	Distribution SF020		Distribution SF021		Distribution SF019		All distributions		
	SF004 8	SF004 9	SF005 0	SF005 1	SF005 2	SF005 3	Cumulative score	Max score	%
121	2	2	0	0	2	2	8	12	67
391	2	2	2	2	2	2	12	12	100
403	2	2	2	2	2	2	12	12	100
493	0	2	2	2	2	2	10	12	83
583	-	-	-	2	2	2	6	12	50
593	2	2	0	2	2	2	10	12	83
594	2	2	2	2	2	2	12	12	100
596	2	2	2	2	2	2	12	12	100
597	2	2	2	2	2	2	12	12	100
601	2	2	2	2	2	2	12	12	100
604	2	2	0	0	2	2	8	12	67
605	2	2	0	0	2	2	8	12	67
629	2	2	2	2	2	2	12	12	100
651	2	2	2	2	2	2	12	12	100
653	2	2	2	2	2	2	12	12	100
657	2	2	2	2	2	2	12	12	100
660	2	2	2	2	2	2	12	12	100
662	2	2	2	2	2	2	12	12	100
684	2	2	2	2	2	2	12	12	100
701	0	0	2	2	2	2	8	12	67

Figure 1. DISTRIBUTION SF020: SAMPLE SF0048

SF0048: MPN Results for NRL testing Labs



Key: ◆ SF0048 REPLICATE 1
× SF0048 REPLICATE 2

Figure 2. DISTRIBUTION SF020: SAMPLE SF0049

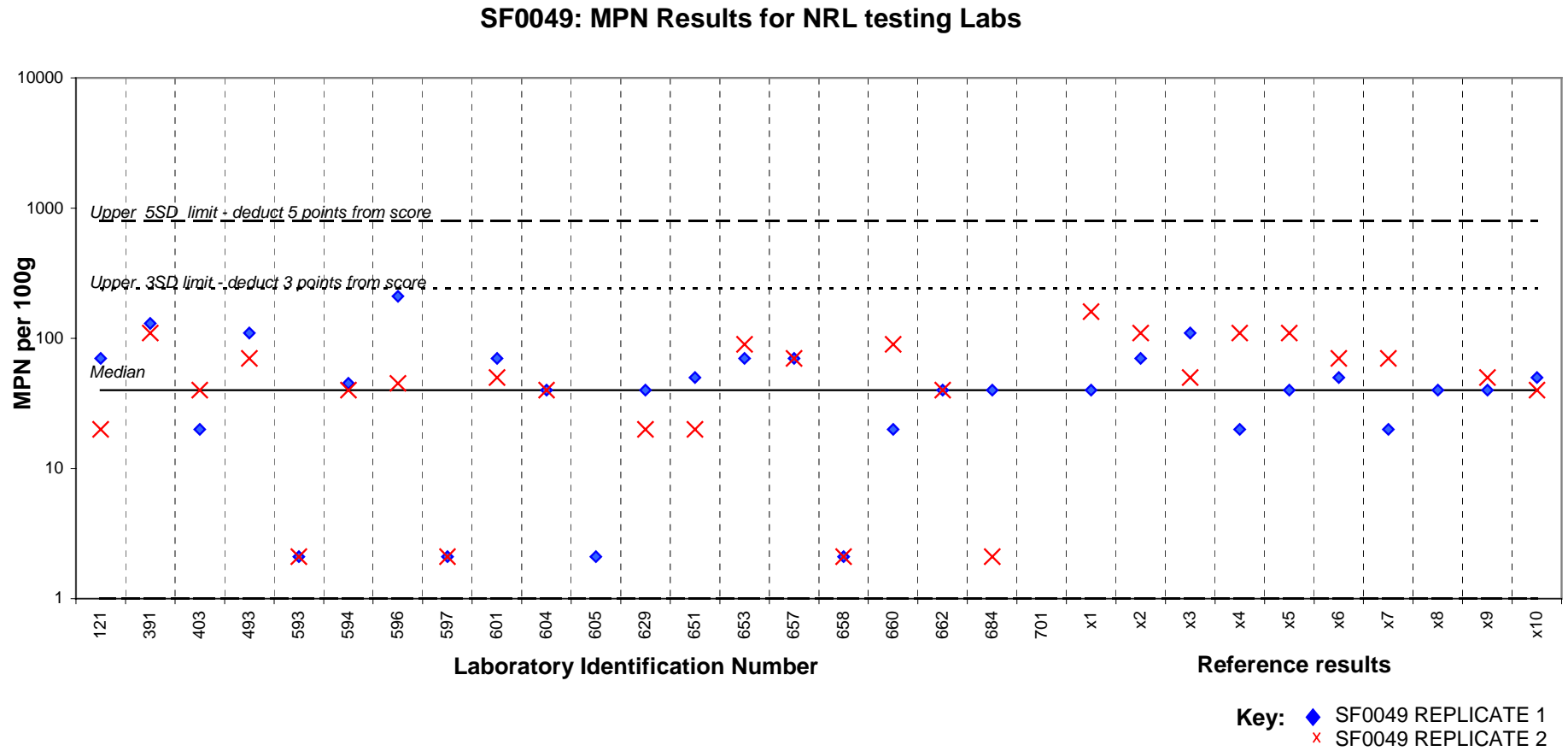


Figure 3. DISTRIBUTION SF021: SAMPLE SF0050

SF0050: MPN Results for NRL testing Labs

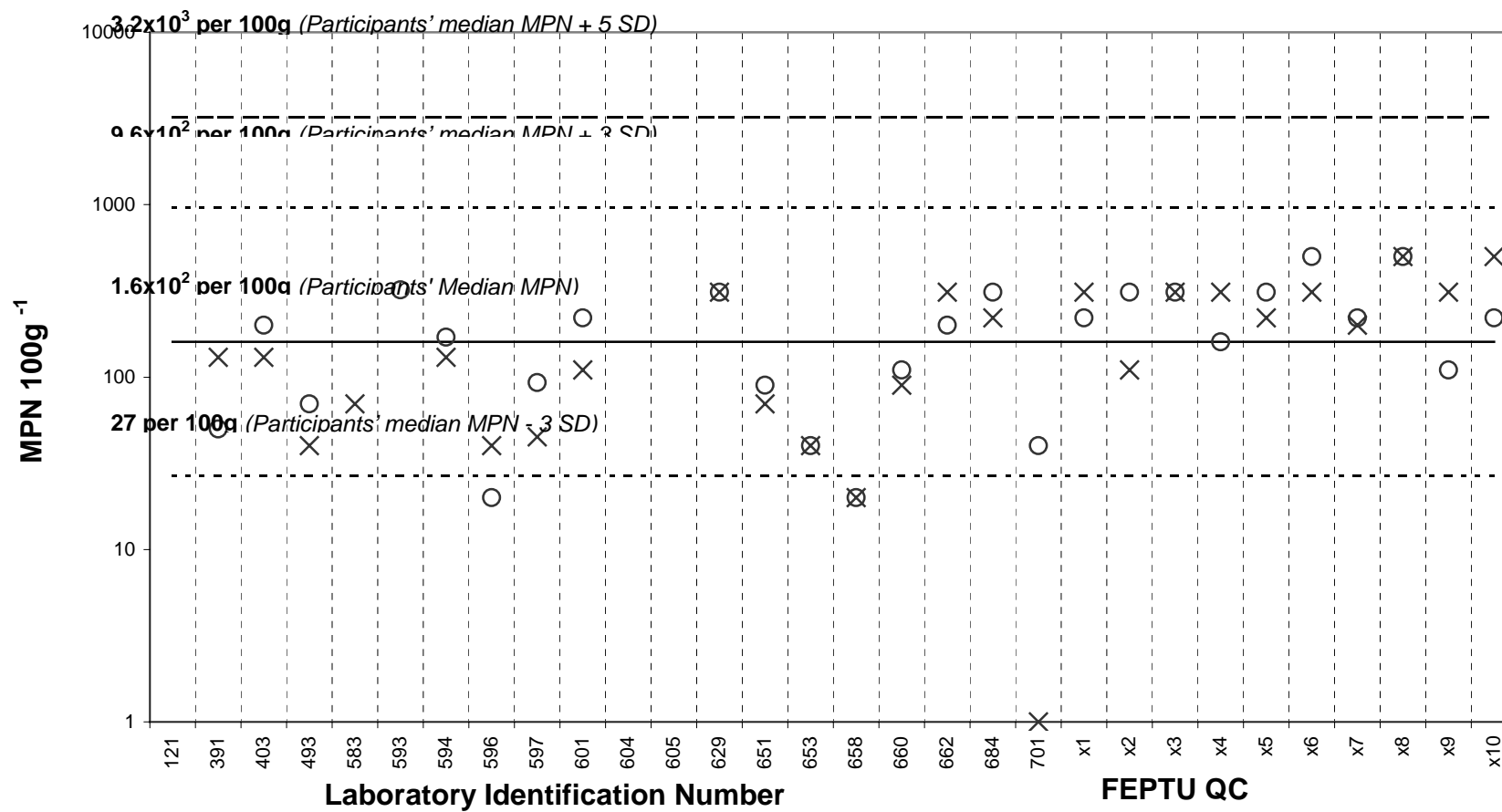


Figure 4. DISTRIBUTION SF021: SAMPLE SF0051

SF0051: MPN Results for NRL testing Labs

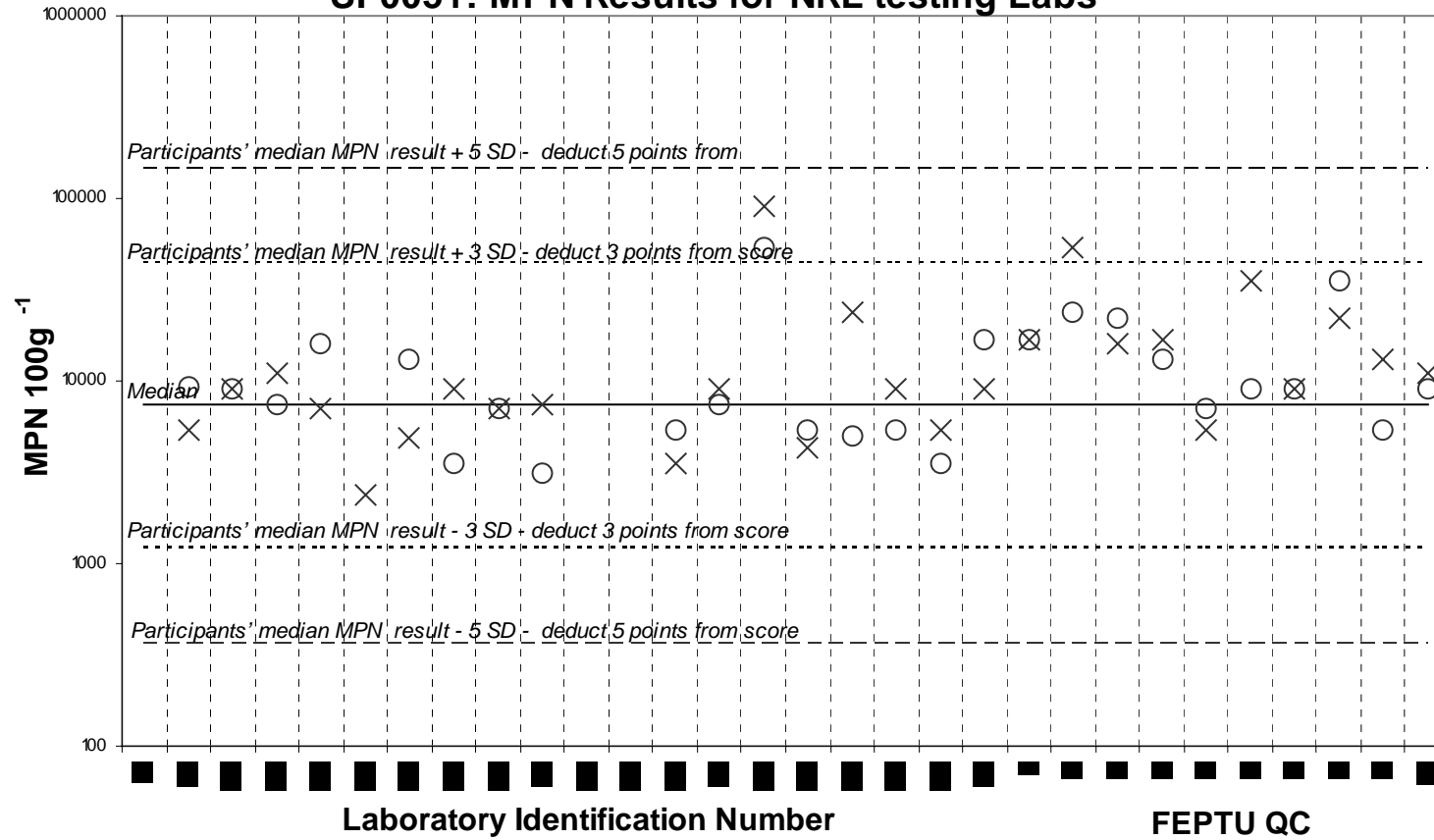


Figure 5. DISTRIBUTION SF022: SAMPLE SF0053

