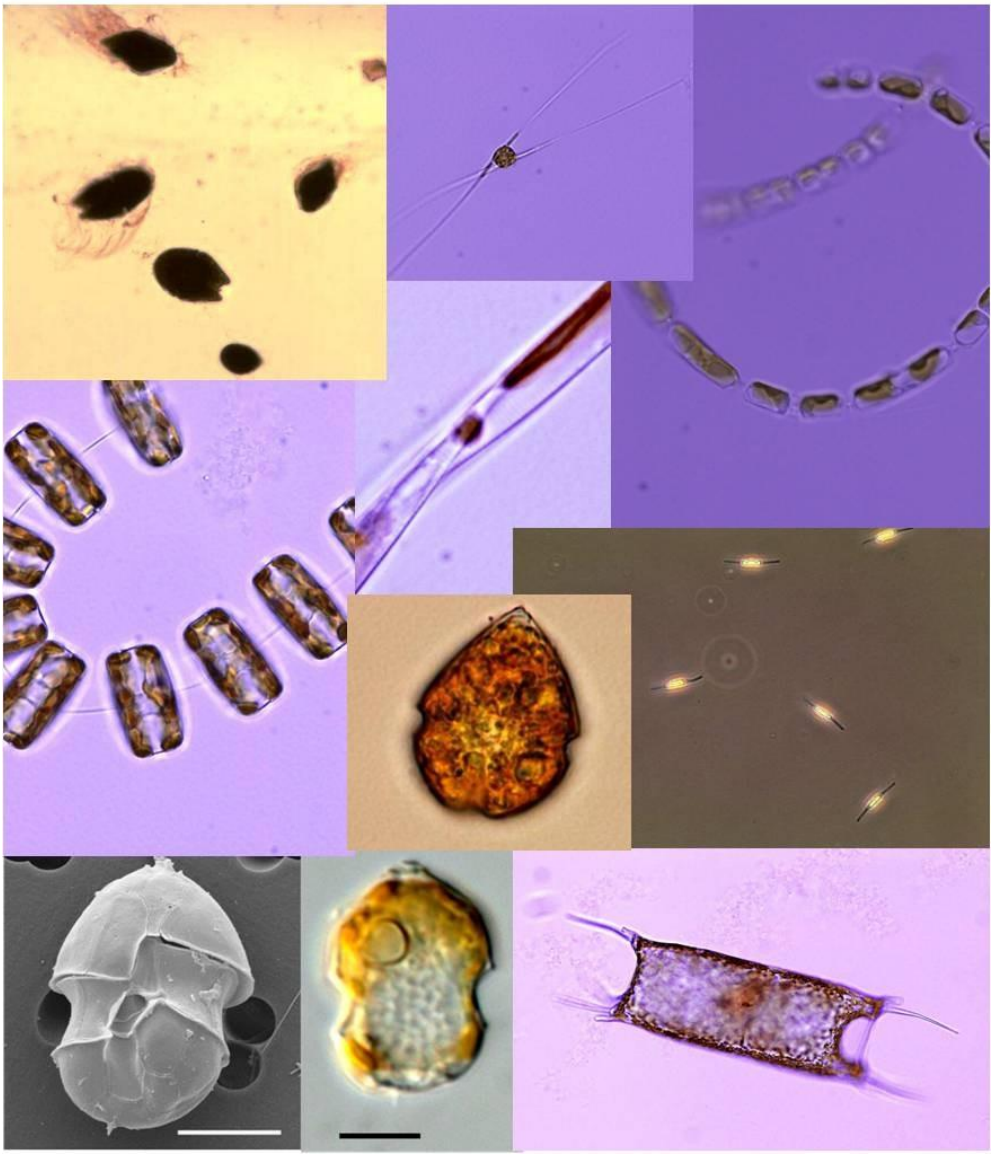
International Phytoplankton Intercomparison proficiency test in the abundance and composition of marine microalgae 2017 report

PHY-ICN-17-MI1 VR 1.0



Rafael Salas[1], Debbie Walsh[1] & Jacob Larsen[2]

[1] Marine Institute, Rinville, Oranmore, Co.Galway, Ireland

[2] IOC Science and Communication center on harmful algae
Department of Biology, University of Copenhagen, Øster Farimagsgade 2D
1353 Copenhagen K. Denmark

Table of Contents:

1. Summary of results

- 91 analysts from 45 laboratories took part in this intercomparison exercise. 91 analysts returned sample results and 84 completed the online HAB taxa quiz. 85% of participants come from European countries, 8% from South America, 4% from Australia and 3% from African countries. 18 countries are represented in this intercomparison.

- Nine species were used in this test. These were the dinoflagellates *Azadinium spinosum* Elbrächter & Tillmann, 2009, *Scrippsiella trochoidea* (Stein) Loeblich III, 1976, *Akashiwo sanguinea* (K.Hirasaka) G.Hansen & Ø.Moestrup, 2000, *Prorocentrum mexicanum* Osorio-Tafall, 1942 and the diatoms *Pseudo-nitzschia pungens* (Grunow ex Cleve) G.R.Hasle, 1993, *Trieres chinensis* (Greville) M.P.Ashworth & E.C.Theriot, 2013, *Cylindrotheca closterium* (Ehrenberg) Reimann & J.C.Lewin, 1964, *Chaetoceros danic*us Cleve, 1889 and *Chaetoceros curvisetus* Cleve, 1889.

- All the species consensus cell counts were used to generate z-scores and final results

- The average and confidence limit for each test item was calculated using the robust algorithm in annex C of ISO13528 which takes into account the heterogeneity of the samples and the between samples standard deviation from the homogeneity and stability test. ISO 13528 is only valid for quantitative data. We have used the consensus values from the participants.

- All measurands passed the expanded criterion for homogeneity according to ISO13528:2015 except for *P.pungens. P.pungens* and *P.mexicanum.* These species did not pass the stability test according to the harmonized protocol ISO13528:2015, but the test for significant hererogeneity according to the same protocol was undecided.

- The consensus values new Standard deviation (STD) was used for all measurands regardless of the Pass/Fail flags from the homogeneity test.

- There were a small number of action signals across all measurands. 5 Red flags in total (0.6%), 22 (2.7%) yellow flags and 29 (3.5%) non-id flags from 819 scores is evidence of good performance overall.

Nine analysts did not pass the full test with a below 80% score.

- The Ocean teacher online HAB quiz results suggests a high rate of proficiency. 72.62% of analysts achieved a score over 90% (Proficient). Another 20.24% of analysts above 80%, 5.95% between 70 and 80% and 1.19% need improvement.

- In the taxonomic online assessment, there was good consensus on the various identifications of *Chaetoceros* species from images in matching questions 1 to 5 of the quiz, over 90% matched the right answer. This contrasted with the ability to identify the same *Chaetoceros* in real samples where evidence suggests the consensus is not so clear (for example: at least 8 different species answers were given for *C.curvisetus*).

- The most difficult question in the quiz turned out to be a numerical question (Q6) where only 57% of participants gave correct answers. This question was based on a chain of *Chaetoceros curvisetus* where 8 cells were visible but not all the cells had the same amount of cytoplasmic content, with 4 cells showing that their chloroplasts had plasmolised. This has implications in real samples where a decision must be made on whether a cell should be counted or not.

- There were no real issues identifying dinoflagellates and on dinoflagellate terminology. Q10-Q14

2. Introduction

The Proficiency testing scheme IPI (formerly known as Bequalm) study in 2017 has been designed to test the ability of analysts to identify and correctly enumerate marine phytoplankton species in lugol's preserved water samples using the Utermöhl method. As in previous years, samples have been spiked using laboratory cultures.

These were the dinoflagellates *Azadinium spinosum* Elbrächter & Tillmann, 2009, *Scrippsiella trochoidea* (Stein) Loeblich III, 1976, *Akashiwo sanguinea* (K.Hirasaka) G.Hansen & Ø.Moestrup, 2000, *Prorocentrum mexicanum* Osorio-Tafall, 1942 and the diatoms *Pseudo-nitzschia pungens* (Grunow ex Cleve) G.R.Hasle, 1993, *Trieres chinensis* (Greville) M.P.Ashworth & E.C.Theriot, 2013, *Cylindrotheca closterium* (Ehrenberg) Reimann & J.C.Lewin, 1964, *Chaetoceros danicus* Cleve, 1889 and *Chaetoceros curvisetus* Cleve, 1889.

The collaboration between the Marine Institute in Ireland and the IOC UNESCO Centre for Science and Communication of Harmful algae in Denmark on the IPI exercise commenced in 2011. This collaboration involves the use of algal cultures from the Scandinavian Culture Collection of Algae and

Protozoa in Copenhagen, the elaboration of a marine phytoplankton taxonomy assessment (online HAB quiz) using the online platform 'Ocean Teacher' Global academy hosted by the IODE (International Oceanographic Data and information Exchange) office based in Oostende, Belgium, a project office of the IOC and the organization of a training workshop which is held annually to discuss the results of the intercomparison exercise and to provide training on phytoplankton taxonomy.

This workshop has become an important forum for phytoplankton taxonomists working on phytoplankton monitoring programmes from around the world to convene and be able to discuss taxonomical matters related to monitoring, new advances and finds, taxonomical nomenclature changes, looking at samples from different geographical areas and to listen to relevant stories from other laboratories about harmful algal events in their regions of relevant ecological importance.

This workshop has been held in various locations in previous years but over the last 4 years, it has taken the format of a full 3 days training workshop with at least 2 days dedicated to lectures on algal groups in rooms equipped with microscopes and using live cultures and preserved samples from participants and from locations across the globe (See Workshop agenda: Annex IV).

This year, 91 analysts from 45 laboratories took part in this intercomparison exercise. 91 analysts returned sample results and 84 completed the online HAB quiz. 85% of participants come from laboratories across Europe, 8% from South America, 4% from Australia and 3% from Africa (Figure 1).

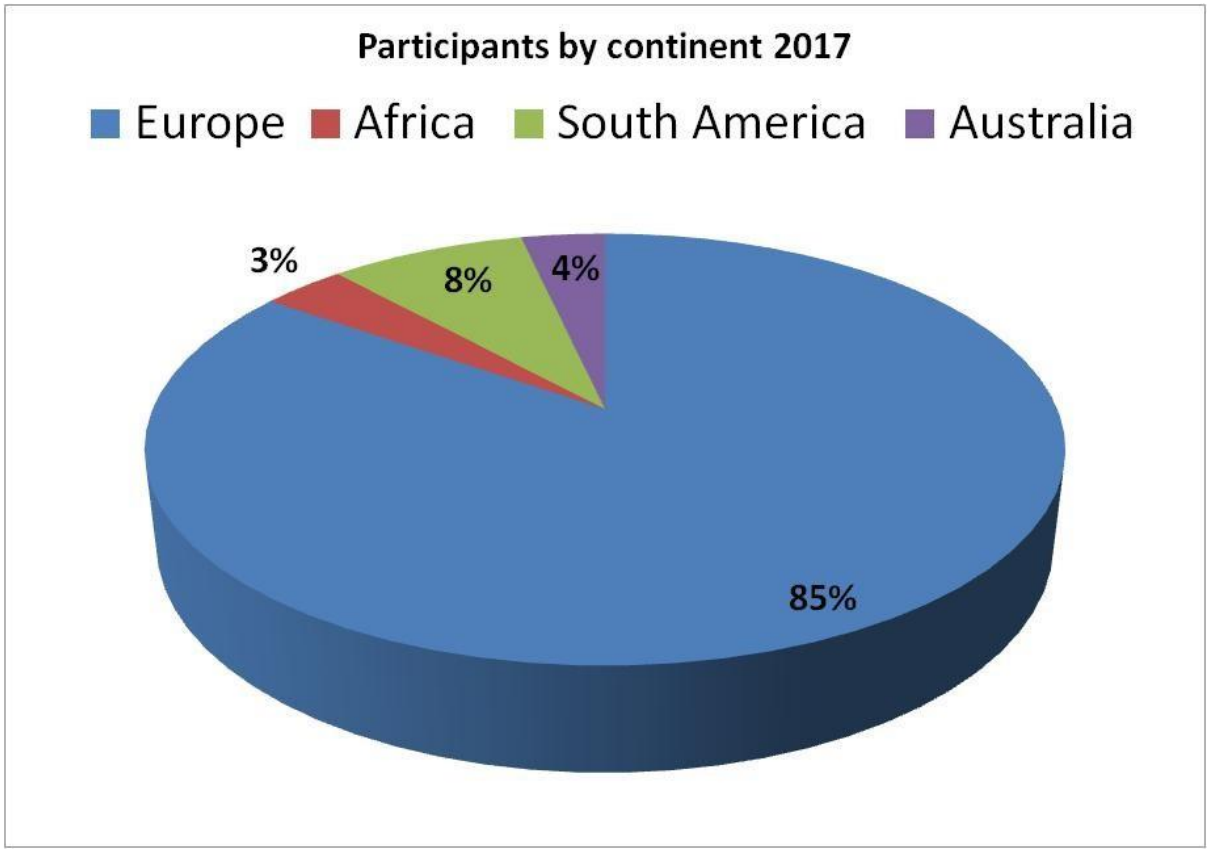


Figure 1:Breakdown of participants by continent

18 countries are represented in this intercomparison exercise. The list of participating laboratories can be found in Annex V and a breakdown of participation from each country in figure 2.

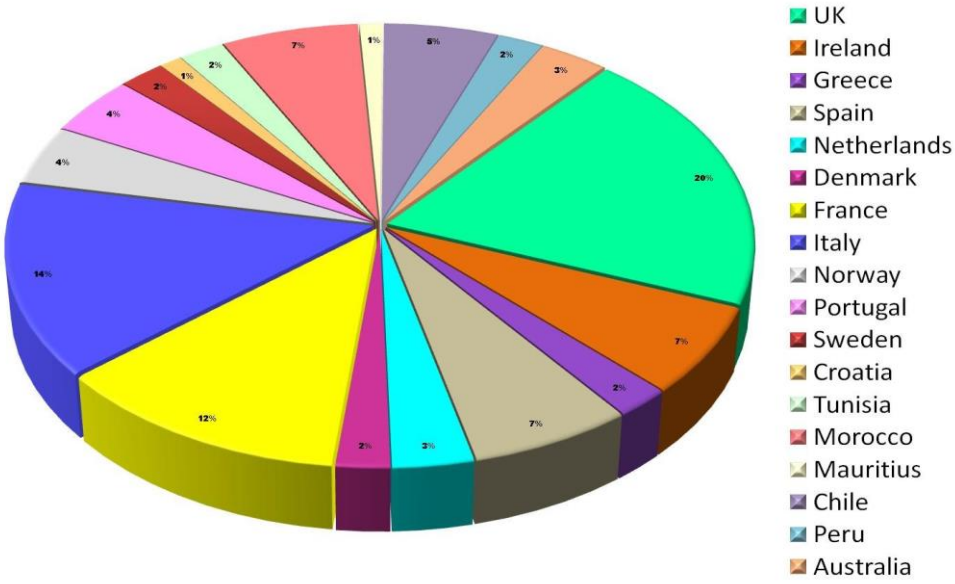


Figure 2: Breakdown participation per country of the Phytoplankton intercomparison exercise IPI 2017

This intercomparison exercise has been coded in accordance with defined protocols in the Marine Institute, for the purposes of quality traceability and auditing. The code assigned to the current study is PHY-ICN-17MI1. PHY standing for phytoplankton, ICN for intercomparison, 16 refers to the year 2016, MI refers to the Marine Institute and 1 is a sequential number of intercomparisons for the year. So, 1 indicates the first intercomparison for the year 2017.

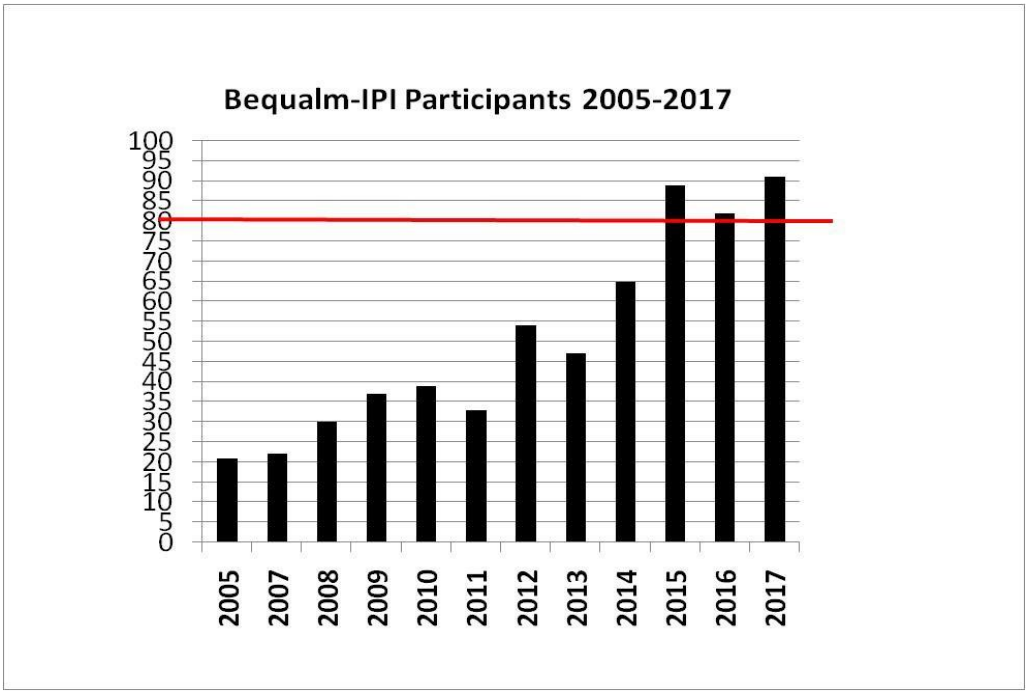


Figure 3: IPI participation in the last 10 years

As figure 3 indicates the number of IPI participants has increased appreciably since 2005 and the influence of the test has also been widened to all continents. In the last 3 years the number of participants have plateaued out around the 80-90 plus mark and while the majority of laboratories come from European countries (85%), a sizeable 15% is made up from laboratories in Africa, South America and Oceania.

This year, we asked participants if they were interested in the introduction of biovolume measurements for this year's intercomparison. For some laboratories, biovolume measurement is important while other laboratories do not have the need for carrying out these measurements, so we wanted to know how many laboratories of the IPI sphere would be interested in participating in this. 68% of the laboratories involved said they were not interested and 32% said they would be interested in taking part.

We understand that the majority of laboratories can see a benefit on carrying out these measurements and given that the introduction of biovolume would have caused an increase in fees for the intercomparison, we decided against its introduction. We are deferring this option for another year and we may try its introduction in a voluntary basis in future exercises.

3. Materials and Methods

3.1 Sample preparation, homogenization and spiking

All samples were prepared following this protocol: The seawater used in this experiment was natural field water collected at Ballyvaughan pier, Galway Bay, Ireland, filtered through 47mm GF/C Whatmann filters (Whatmann™, Kent, UK), autoclaved (Systec V100, Wettenberg , Germany) and preserved using neutral Lugol's iodine solution (Clin-tech, Dublin, Ireland). The centrifuge tubes (50ml volume) were made up to the required volume with sterile filtered seawater containing neutral lugol's iodine. This was carried out using an automatic eppendorf multipipette Xstream (0-50ml) (Eppendorf, Hamburg, Germany) and the volume weighted in a calibrated balance (ME414S Sartorius, AG Gottingen, Germany). The density of seawater was considered for this purpose to be 1.025g/ml. The final volume of each sample was 45 ml approximately before spiking.

A stock solution for each of the nine species was prepared using 50ml glass screw top bottles (Duran®, Mainz, Germany). Then, a working stock containing the nine species to the required cell concentration was prepared using a measured aliquot from each stock solution into a 2l Schott glass bottle. Then, the working stock was homogenized and sub-divided into four replicate working stocks containing 400ml each. These working stocks were then inverted 100 times to homogenise the samples and 5ml aliquots were pipetted out after each 100 times inversion using a calibrated 5ml pipette (Gilson, Middleton, USA) with 1-10ml pipette tips (Eppendorf, Hamburg, Germany) The 5ml aliquots were dispensed into the 50ml centrifuge tubes (Sardstedt, Nümbrech, Germany) containing 45ml seawater.

Samples were capped and labeled. Parafilm was used around the neck of the centrifuge tube to avoid water loss through evaporation or leaking, placed in padded envelopes and couriered via TNT or DHL couriers for a one day delivery across the world, in order for all the laboratories to have approximately the same arrival time.

3.2 Culture material, treatments and replicates.

Most of the laboratory cultures used in the 2017 exercise have been collected in Galway Bay and Bantry Bay during the months of February and May 2017 except for the *P.mexicanum* culture that came from China. The diatom cultures were isolated from samples collected using the micro-pipette technique into unialgal cultures. Most species were identified through light microscopy techniques using an inverted microscope Olympus IX-51 and a compound research Olympus microscope BX-53 (Olympus, UK) except for *Pseudo-nitzschia pungens* which was confirmed to species level using qPCR (Roche Lightcycler) species specific gene probes.

A total of 500 samples were produced for the enumeration and identification study. Each participant was sent a set of four samples, three for analysis plus one spare for a total of 364 samples to 45 laboratories. Another 15 samples were used by the expert laboratory to carry out the homogeneity and stability test. The data generated by this laboratory was used to test the homogeneity and stability of the samples. A minimum of 10 samples (50ml volume) were necessary for the homogeneity test and a minimum of 3 samples for the stability test. Samples had to be divided in two portions of 25ml each.

A time delay between the homogeneity test and the stability test is required. ISO 13528 indicates that this delay should be similar to that experienced by the participants in the test. As analysts have a month to return results from sample receipt, it was decided that this time delayed should be of one month as well.

3.3 Cell concentrations

Preliminary cell counts from the original stock solutions were made to establish the cell concentration of each species and this was carried out using a glass Sedgewick-Rafter cell counting chamber (Pyser-SGI, Kent, UK) to ascertain an approximation of the cell concentration of each species in the samples.

3.4 Sample randomization

All samples were allocated randomly to the participants using Minitab® Statistical Software Vr16.0 randomization tool.

3.5 Forms and instructions

A set of instructions and forms required were sent via e-mail to all the analysts to complete the exercise including their unique identifiable laboratory and analyst code. Form 1 (Annex I) to confirm the receipt of materials; number and condition of samples and correct sample code. Form 2 (Annex II) in an Excel spreadsheet format to input species composition and calculate abundance for each species. Form 2 was used for the identification and enumeration part of the exercise. All analysts were asked to read and follow the instructions (Annex III) before commencing the test.

At the end of the exercise and with the publication of this report, analysts will be issued with a statement of performance certificate (See Annex VI) which is tailored specifically for each test. This is an important document for auditing purposes and ongoing competency.

3.6 Statistical analysis

Statistical analysis was carried out using PROlab Plus version 2.14, dedicated software for the statistical analysis of intercalibration and proficiency testing exercises from Quodata, Minitab® Statistical Software Vr16.0 and Microsoft office Excel 2007.

We followed the standard ISO normative 13528:2015, which describes the statistical methods to be used in proficiency testing by interlaboratory comparisons. Here, we use this standard to determine and assess the homogeneity and stability of the samples, what to do with outliers, determining assigned values and calculating their standard uncertainty. Comparing these values with their standard uncertainty and calculating the performance statistics for the test through graphical representation and the combination of performance scores.

The statistical analysis of the data and final scores generated from this exercise has been carried out using the consensus values from the participants. The main transformation is the use of iteration to arrive at robust averages and standard deviations for each test item. This process allows for outliers and missing values to be dealt with, and it also allows for the heterogeneity of the samples to be taken into consideration when calculating these values.

3.7 IPI Ocean teacher online HAB quiz.

The online taxonomic assessment or HAB quiz was organized and set up by Jacob Larsen (IOC UNESCO, Centre for Science and Communication on Harmful Algae, Denmark), Rafael Salas and Debbie Walsh (Marine Institute, Ireland). The exercise was prepared in the web platform 'Ocean teacher'. The Ocean teacher training facility is run by the IODE (International Oceanographic Data and information Exchange) office based in Oostende, Belgium. The IODE and IOC organize some collaborative activities among them, the IOC training courses on toxic algae and the IPI online HAB quiz. The online quiz uses the open source software Moodle Vr2.0 (https://moodle.org).

First time participants had to register in the following web address: http://classroom.oceanteacher.org/ before allowed to access the quiz content, while analysts already registered from previous years, could go directly to the login page. Once registered, participants could login into the site and using a password, able to access the quiz. Three months time was given to analysts to register, complete and submit the online quiz. The course itself was found under the

courses tab in the main menu page. Analysts could link to the International Phytoplankton Intercomparison and quiz IPI 2017 HAB quiz content from here.

The test itself consisted of 14 questions (see Annex XVII). Most questions used in this quiz this year were 'matching type' Q1-Q5, matching questions have dropdown menus including an array of answers which analysts must choose from, numerical Q6-Q9, numerical questions must be answered using a numeral, drag and drop questions Q10-11, the participant must move (drag) with the mouse cursor the answer into its right location and multiple choice Q12-Q14, the participant must fill in the right choices from those given.
All questions have equal value and the quiz have a maximum grade of 100% for a perfect score.

The online quiz can only be submitted once. After that, no changes can be made. However, analysts can login and out as many times as they wish throughout the period of time allocated and changes to the quiz can be saved and accessed at a later stage, so the quiz doesn't have to be completed in one sitting.

4. Results

4.1 Homogeneity and stability study

The procedure for a homogeneity and stability test is recorded in annex b of ISO13528:2015. The assessment criteria for suitability, is also explained here. See Annex VII to see all the results from the homogeneity and stability test for each measurand.

The calculations have been carried out using ProLab Plus version 2.14 and the reports for homogeneity and stability are given separately for each measurand. The top of the report gives you information on the measurand, mean and analytical standard deviation for the homogeneity analysis and the homogeneity and stability mean comparison in the stability analysis. The reports also show the target standard deviation for each measurand which in this case was calculated manually using the consensus results of the participants and taking into consideration the heterogeneity of the samples as will be explained later.

The middle part of the report gives you the results of the different tests. ProLab Plus calculates whether the data has passed the criteria for the F-test and ISO13528:2015 test for homogeneity and significant heterogeneity. The bottom part of the report is the actual graphical representation of the sample results as box plots. The homogeneity test shows the 10 samples analysed for this test and calculates the heterogeneity standard deviation (SD between samples) and the analytical standard deviation (SD within samples). The stability test graph show the 10 samples of the homogeneity test plus the 3 samples of the stability test, thirteen in total and compare their mean values. This is done for each measurand.

Table 1 below shows the Cochran test for outliers. No outliers were found in any of the measurands. Only half the measurands passed the F-test (table 2) except for *A.sanguinea, Azadinium spinosum, Ceratoneis closterium, Prorocentrum mexicanum* and *Scrippsiella*. All measurands passed the expanded criterion for homogeneity according to ISO13528:2015 except for *P.pungens* (Table 3). *P.pungens* and *P.mexicanum* did not pass the stability test according to the harmonized protocol ISO13528:2015 but the test for significant hererogeneity according to the same protocol was undecided.

According to ISO 13528:2015, the heterogeneity standard deviation s(sample) between the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment. If the homogeneity test fails, the heterogeneity standard deviation has to be taken into account when calculating the standard deviation for the measurand. The consensus values new heterogeneity standard deviation (STD) was used for all measurands regardless of the Pass/Fail on the homogeneity test. For the proficiency test items, no significant heterogeneity can be identified, although the heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment. Hence, the proficiency test items can be considered homogeneous.

IPI2017

Homogeneity test

Overview of statistical values and results

Sample	Measurand	Unit	Mean	s(analytical) [%]	s(sample) [%]	Cochran outliers
WATER17	ASANG		1662	12	35	no outliers found
WATER17	ASPIN		4190	10	36	no outliers found
WATER17	CCLOS		3558	16	27	no outliers found
WATER17	CCURV		35118	9	7	no outliers found
WATER17	CDAN		9800	14	8	no outliers found
WATER17	PMEX		5018	9	12	no outliers found
WATER17	PPUN		28684	11	6	no outliers found
WATER17	STROC		2620	11	16	no outliers found
WATER17	TSIN		3168	17	0	no outliers found

Table 1: Homogeneity Cochran test

IPI2017

Homogeneity test

Overview of statistical values and results

Sample	Measurand	Unit	Mean	s(analytical)	s(sample)	F test
WATER17	CCURV	cells/Litre	35118	3255	2605	Ok
WATER17	CDAN	cells/Litre	9800	1395	738	Ok
WATER17	TSIN	cells/Litre	3168	554	0	Ok
WATER17	ASANG	cells/Litre	1662	194	579	Not OK
WATER17	ASPIN	cells/Litre	4190	433	1524	Not OK
WATER17	CCLOS	cells/Litre	3558	556	955	Not OK
WATER17	PMEX	cells/Litre	5018	455	617	Not OK
WATER17	PPUN	cells/Litre	28684	3168	1794	Ok
WATER17	STROC	cells/Litre	2620	284	408	Not OK

Table 2: F-test

ISO13528	Cochran outliers	F-test	Homogeneity test ISO 13528 for adequate homogeneity	Homogeneity test ISO 13528 for significant Heterogeneity	ISO 13528:2015	ISO 13528:2015 - expanded criterion	Stability test Harmonized Protocol / ISO 13528:2015-t-test	Stability test Harmonized Protocol - test for significant heterogeneity

Chaetoceros Curvisetus	no outliers found	Ok	Ok	Ok	Ok	Ok	Ok	Ok
Chaetoceros danicus	no outliers found	Ok	Ok	Ok	Ok	Ok	Ok	Ok
Trieres sinensis	no outliers found	Ok	Ok	Ok	Ok	Ok	Ok	no decision possible
Akashiwo sanguinea	no outliers found	Not OK	Not OK	Not OK	Not OK	Ok	Ok	no decision possible
Azadinium spinosum	no outliers found	Not OK	Not OK	Not OK	Not OK	Ok	Ok	Not OK
Ceratoneis Closterium	no outliers found	Not OK	Not OK	Not OK	Not OK	Ok	Ok	Not OK
Prorocentrum Mexicanum	no outliers found	Not OK	Not OK	Not OK	Not OK	Ok	Not OK	no decision possible
Pseudo-nitzschia Pungens	no outliers found	Ok	Not OK	Ok	Not OK	Not OK	Not OK	no decision possible
Scrippsiella Trochoidea	no outliers found	Not OK	Not OK	Not OK	Not OK	Ok	Ok	no decision possible

Table 3: Homogeneity and stability results according to ISO13528:2015

4.2 Outliers and missing values

Outliers in the data have been addressed by using the robust analysis as set out in Annex C algorithm A + S of ISO 13528:2015. The robust estimates for this exercise have been derived by iterative calculation, that is, by convergence of the modified data (Annex IX) for each measurand.

In relation to missing values, the standard proposes that participants must report 0.59 n replicate measurements, so in the case of three replicates, at least two replicate results from each measurand must be obtained from each participant for the data to be included in the statistical calculations. If this rule is not fulfilled results from these participants won't be included in the calculation of statistics that affect other laboratories but they may be used for the calculation of their own, for example z-scores.

4.3 Analysts' Data

The results of the participants were collated using Excel spreadsheets. 91 analysts from 45 laboratories returned results for this exercise. There were nine measurands in the samples and all of them were used for the final results.

The table of results from all participants can be found in Annex VIII at the end of this report. The average of the participant replicate results for each measurand were used to calculate the robust averages and standard deviations first by iteration, which then were used to calculate the confidence limits for the Z scores (See Annex X).

For the purpose of this exercise we have used the consensus standard deviation from the participants and we have calculated the new standard deviation for each test item by adding the between samples standard deviation from the homogeneity test according to the formula below (A) from ISO13528:2015.

$$\sigma_{r1} = \sqrt{\sigma_r^2 + s_s^2}$$

(A)

Where; σ_{r1} =the new SD for the

homogeneity test σ_r =between samples

Standard deviation and

Ss= the robust standard deviation for the test

Table 2 below show the results which are used to generate the confidence limits of this test for each measurand. These values are calculated using the robust analysis using algorithm A +S from annex C of the standard ISO13528. The calculations are generated by iteration and can be found for each measurand in this report in annex IX.

Species	*Trieres Sinensis*	*Akashiwo sanguinea*	*Azadinium spinosum*	*Chaetoceros danicus*	*Pseudo-nitzschia pungens*
Consensus SD	383	80	1384	3376	4835
Consensus SD + Between SD	398	584	2058	3455	5157
Species	*Ceratoneis closterium*	*Chaetoceros curvisetus*	*Prorocentrum mexicanum*	*Scrippsiella trochoidea*	
Consensus SD	1355	10888	612	563	
Consensus SD + Between SD	1658	11195	868	695	

Table 4: Standard deviations for each measurand based on consensus values (SD) and consensus values plus the between sample standard deviation (new SD) calculated using Excel.

4.4 Assigned value and its standard uncertainty

The assigned values (robust mean and standard deviation) for a test material is calculated as explained before using algorithm A in annex C from the consensus values of the participants (Annex IX). The standard uncertainty of the assigned value can then be calculated using the equation (B) below;

B) $$u_X = 1{,}25 \times s^* / \sqrt{p}$$

Where;

u_x= Standard uncertainty of the assigned

value, s^*= robust standard deviation for the

test p= number of analysts

	Trieres Sinensis	*Akashiwo sanguinea*	*Azadinium spinosum*	*Chaetoceros danicus*	*Pseudo-nitzschia pungens*	*Ceratoneis closterium*	*Chaetoceros curvisetus*	*Prorocentrum mexicanum*	*Scrippsiella trochoidea*
Robust mean x*	3193	134	2411	7211	25417	2686	26169	1528	2307
Robust Stdev s*	383	80	1384	3376	4835	1355	10888	612	563
Standard Ux	50	11	184	475	634	182	1443	81	74
n=	91	88	88	79	91	87	89	88	90
if Ux < 0.3xSTdev	115	24	415	1013	1451	407	3266	183	169
then Ux is negligible	neg	neg	neg	neg	neg	neg	neg	neg	neg
The equation is satisfied in all cases									

Table 5: Assigned values and standard uncertainties for the test.

If Ux is less than 0.3 times the standard deviation for the test, then this uncertainty is negligible for the test material. In our case, all our test materials satisfy the equation (Table 5).

4.5 Comparison of the assigned value

When the consensus values from the participants are used to calculate the standard uncertainty of the assigned values, the values can then be compared against a reference value from an expert laboratory. As we don't have a reference value as such, we used the homogeneity test results to compare these values against the values calculated by the participants using equation (C) below:

C) $$\sqrt{\frac{(1{,}25s^*)^2}{p} + {u_X}^2}$$

Where; u_x= Standard uncertainty of the

assigned value, s^*= robust standard

deviation for the test p= number of analysts

ISO13528:2015 states that if the difference between the consensus values and the reference values (homogeneity test values in our case) is more than twice its uncertainty, then possible reasons need to be sought regarding bias. In our comparison, only one cell count out of nine satisfy the equation (Table 6- green bottom).

	Trieres Sinensis	*Akashiwo sanguinea*	*Azadinium spinosum*	*Chaetoceros danicus*	*Pseudo-nitzschia pungens*	*Ceratoneis closterium*	*Chaetoceros curvisetus*	*Prorocentrum mexicanum*	*Scrippsiella trochoidea*
Robust mean x*	3193	134	2411	7211	25417	2686	26169	1528	2307
Robust Stdev s*	383	80	1384	3376	4835	1355	10888	612	563
Standard Ux	50	11	184	475	634	182	1443	81	74
n=	91	88	88	79	91	87	89	88	90
if Ux < 0.3xSTdev	115	24	415	1013	1451	407	3266	183	169
then Ux is negligible	neg	neg	neg	neg	neg	neg	neg	neg	neg
The equation is satisfied in all cases									
Cumulative distribution function cut off points for normal distribution									
x*-1.5s*	2619	14	1168	2148	18164	652	9837	611	1462
x*+1.5s*	3768	254	2095	12275	32669	4719	42500	2446	3151
Homogeneity test	*Trieres Sinensis*	*Akashiwo sanguinea*	*Azadinium spinosum*	*Chaetoceros danicus*	*Pseudo-nitzschia pungens*	*Ceratoneis closterium*	*Chaetoceros curvisetus*	*Prorocentrum mexicanum*	*Scrippsiella trochoidea*
Reference value mean	3168 1662 4190 9800 28684 3558 35118 5018 2620 377 595 1554 1232 2870 1032 3476 696 455								
Reference value stdev									
	Comparison with assigned value								
	Trieres Sinensis	*Akashiwo sanguinea*	*Azadinium spinosum*	*Chaetoceros danicus*	*Pseudo-nitzschia pungens*	*Ceratoneis closterium*	*Chaetoceros curvisetus*	*Prorocentrum mexicanum*	*Scrippsiella trochoidea*
x*-X	25	1528	1779	2589	3267	872	8949	3490	313
Uncertainty of diff.	71	15	261	671	896	257	2040	115	105
2* Uncertainty of diff.	142	30	522	1343	1792	514	4080	230	210
If diff. Is more than twice its Uncertainty then rule is not satisfied									

Table 6: Comparison of the assigned value.

4.6 Calculation of performance statistics

The performance statistics for the exercise have been calculated using ProLab Plus software version 2.14. The summary table of all the Z-scores can be found in Annex X of this report. The summary of laboratory means and statistical parameters (Annex XI) show the results by measurand and analyst of

all the results for the test including the Z-scores and outliers, the statistical method used for the data (Q/Hampel), means and standard deviations, measures of repeatability and reproducibility for each measurand, number of participants and other relevant information on the test. The graphical summary for each measurand by analyst can be found in Annex XII of this report.

4.6.1 Z-scores

The z-scores derived using the robust averages and standard deviations can be found in annex X. Any results in blue are within the specification of the test (2SD). The yellow triangles indicate warning signals (outside 2SD), red triangles indicate action signals (outside 3SD) and small red dots indicate nonidentifications.

There were a very small number of action signals across all measurands. 5 Red flags in total (0.6%), 22 (2.7%) yellow flags and 29 (3.5%) non-id flags from 819 scores is evidence of good performance overall. Nine analysts did not pass the full test with a below 80% score.

Overall, most analysts passed the test except for nine analysts which failed some items and are below the 80% of results necessary (see annex XI). Analysts 79/24/66/84 and 59 failed 2 items and are just below the below the threshold with 77.78% correct and requires a small improvement. Analysts 3(6 from 9)/ 80 (5 from 9)/ 13 (4 from 9) and 5 (1 from 9) need substantial improvement in the next round.

4.7 Combined performance scores

Mandel's h and k statistic present measures for graphically surveying the consistency of the data for all measurands in the test (Annex XIV). Mandel's h statistics determines the differences between the mean values of all the laboratories and measurand combinations and it may point out at particular patterns for specific laboratories. In this graph, laboratories may have positive or negative values. Laboratories with large all-positive values or all-negative values for all measurands may indicate laboratory bias.

The k statistics only produce positive results, zero is the baseline and it looks at repeatability precision between measurands. Generally analysts with larger values tend to have poorer repeatability precision between replicates than the consensus mean values.

4.7.1 Relative Laboratory Performance (RLP) and Rescaled Sum of Z-scores (RSZ)

The chart of RLP against RSZ (Annex XV) for all measurands combined shows systematic laboratory bias. Laboratories dotted within the green coloured area in the graph are within the consensus values shown by the analysts. Those outside it are showing a systematic bias towards over or under-estimating their counts in the samples, suggesting some kind of methodology bias.

4.7.2 Plots of repeatability standard deviation

The plots of repeatability standard deviations are used to identify analysts whose average and standard deviations are unusual from the consensus. They assume that the data is normally distributed and the null hypothesis is that there are no differences between the analyst means and standard deviations using the van Nuland circle technique (Annex XVI) for each measurand. There is positive bias in the *A. sanguinea* cell counts, but this is possibly due to the cell density being too close to the limit of detection for this measurand. There is a reasonable repeatability SD in most measurands and this is definitely better than the mean values with ostensibly larger differences found in several measurands. There is however poor repeatability for *C. closterium, C. curvisetus, C. danicus and A. spinosum* cell counts across the mean in both directions (over- and underestimation) with at least a third of the analysts outside the 0.1% level on these measurands.

4.8 Qualitative data

Table 7 shows the answers given by analysts on the identification of the measurands in the samples. Analysts were asked to give their answers to species level but for the purpose of the exercise and final marks, a correct answer at genus level is sufficient.

Species id	Number	%	Species id	Number	%
T.sinensis	80	87.91	*P.seriata* complex	66	72.53
Odontella sp.	8	8.79	*P.pungens*	12	13.19
T.mobiliensis	1	1.10	*P.australis*	6	6.59
T.regia	1	1.10	*P.delicatissima* complex	4	4.40
Trieres sp.	1	1.10	*P.fraudulenta*	1	1.10
Species id	Number	%	*P.multiseries*	1	1.10
Akashiwo sanguinea	88	96.70	*P.seriata*	1	1.10
Non Identified	3	3.30			

Species id	Number	%	Species id	Number	%
Heterocapsa/Azadinium	33	36.26	*Chaetoceros curvisetus*	53	58.24
Azadinium spinosum	24	26.37	*Chaetoceros (Hyalochates)*	28	30.77
Azadinium sp.	13	14.29	Not identified	3	3.30
Heterocapsa rotundata	7	7.69	*Chaetoceros lorenzianus*	3	3.30
Heterocapsa sp.	6	6.59	*Chaetoceros brevis*	1	1.10
Not identified	3	3.30	*Chaetoceros lauderii*	1	1.10
Heterocapsa minima	3	3.30	*Chaetoceros teres/cersatoporus*	1	1.10
Heterocapsa illdefina	1	1.10	*Chaetoceros teres/brevis*	1	1.10
Karlodinium veneficum	1	1.10	Species id	Number	%
Species id	Number	%	*Prorocentrum lima*	49	53.85
Chaetoceros danicus	70	76.92	*Prorocentrum mexicanum*	16	17.58
Not identified	12	13.19	*Prorocentrum aporum*	11	12.09
Chaetoceros (Phaeoceros)	8	8.79	*Prorocentrum maculosum*	6	6.59
Chaetoceros didymus	1	1.10	Not identified	3	3.30
Species id	Number	%	*Prorocentrum cordatum*	2	2.20
Scrippsiella trochoidea	43	47.25	*Prorocentrum emarginatum*	2	2.20
Scrippsiella sp.	38	41.76	*Prorocentrum concavum*	1	1.10
Pentapharsodinium dalei	4	4.40	*Prorocentrum triestinum*	1	1.10
Pentapharsodinium sp.	3	3.30	Species id	Number	%
Scrippsiella minuta	2	2.20	*Ceratoneis closterium*	87	95.60
Not identified	1	1.10	Not identified	4	4.40

Table 7: Qualitative data by measurand

4.9 Ocean Teacher online HAB quiz

The online HAB quiz consisted of 14 questions; annex XVII shows the questions and right answers for the online HAB quiz and annex XVIII show the final grades. 84 analysts completed and submitted this quiz.

There were a variety of question types in this assessment, Q1-5 were matching, Q6-9 were numerical, Q1011 were drag and drop and Q12-14 were multiple choice. Questions 1-5 tested analysts on their ability to identify species of the genus *Chaetoceros*. Tables 8 show the model response, the actual response given by the analyst, the partial credit for that answer and the frequency of the answer across analysts.

Q1	Model response	Actual response	Partial credit	Count	Frequency
	955 Arrow 1=: Foramen or opening	Foramen	20.00%	83	98.81%

	955 Arrow 1=: Apical setae	Apical setae	0.00%	1	1.19%
	956 Arrow 2=: Intercalary setae	Intercalary setae	20.00%	81	96.43%
	956 Arrow 2=: Apical setae	Apical setae	0.00%	3	3.57%
	957 Arrow 3=: Valve mantle in girdle view	Valve mantle in girdle view	20.00%	76	90.48%
	957 Arrow 3=: Central process	Central process	0.00%	3	3.57%
	957 Arrow 3=: Valve view	Valve view	0.00%	2	2.38%
	957 Arrow 3=: Opening	Opening	0.00%	1	1.19%
	957 Arrow 3=: Valvar plane	Valvar plane	0.00%	2	2.38%
	958 Arrow 4=: Point of fusion of sibling setae	Point of fusion of sibling setae	20.00%	84	100.00%
	959 Arrow 5=: Terminal setae	Terminal setae	20.00%	83	98.81%
	959 Arrow 5=: Apical setae	Apical setae	0.00%	1	1.19%
Q2	Model response	Actual response	Partial credit Count	Frequency	
	913 IdenBfy species 1 (Figs 1a,b): *C. peruvianus*	*C. peruvianus*	33.33%	83	98.81%
	913 IdenBfy species 1 (Figs 1a,b): *C. concavicornis*	*C. concavicornis*	0.00%	1	1.19%
	914 IdenBfy species 2 (Fig. 2): *C. aequatorialis*	*C. aequatorialis*	33.33%	81	96.43%
	914 IdenBfy species 2 (Fig. 2): *C. peruvianus*	*C. peruvianus*	0.00%	1	1.19%
	914 IdenBfy species 2 (Fig. 2): *C. atlanBcus*	*C. atlanticus*	0.00%	1	1.19%
	914 IdenBfy species 2 (Fig. 2): *C. concavicornis*	*C. concavicornis*	0.00%	1	1.19%
	915 IdenBfy species 3 (Fig. 3): *C. danicus*	*C. danicus*	33.33%	84	100.00%
Q3	Model response	Actual response	Partial credit Count	Frequency	
	927 IdenBfy species 1 (Figs 1a,b): *C. lorenzianus*	*C. lorenzianus*	33.33%	77	91.67%
	927 IdenBfy species 1 (Figs 1a,b): *C. decipiens*	*C. decipiens*	0.00%	5	5.95%
	927 IdenBfy species 1 (Figs 1a,b): *C. brevis*	*C. brevis*	0.00%	1	1.19%
	927 IdenBfy species 1 (Figs 1a,b): *C. atlanBcus*	*C. atlanticus*	0.00%	1	1.19%
	928 IdenBfy species 2 (Fig. 2): *C. affinis*	*C. affinis*	33.33%	80	95.24%
	928 IdenBfy species 2 (Fig. 2): *C. decipiens*	*C. decipiens*	0.00%	3	3.57%
	928 IdenBfy species 2 (Fig. 2): *C. brevis*	*C. brevis*	0.00%	1	1.19%
	929 IdenBfy species 3 (Figs 3a,b): *C. decipiens*	*C. decipiens*	33.33%	77	91.67%

	929 IdenBfy species 3 (Figs 3a,b): *C. lorenzianus*	*C. lorenzianus*	0.00%	5	5.95%
	929 IdenBfy species 3 (Figs 3a,b): *C. affinis*	*C. affinis*	0.00%	1	1.19%
	929 IdenBfy species 3 (Figs 3a,b*): C. compressus*	*C. compressus*	0.00%	1	1.19%
Q4	Model response	Actual response	Partial credit Count	Frequency	
	941 IdenBfy species 1 (Figs 1a,b,c): *C. atlanBcus*	*C. atlanticus*	50.00%	82	97.62%
	941 IdenBfy species 1 (Figs 1a,b,c): *C. lorenzianus*	*C. lorenzianus*	0.00%	1	1.19%
	941 IdenBfy species 1 (Figs 1a,b,c): *C. didymus*	*C. didymus*	0.00%	1	1.19%
	942 IdenBfy species 2 (Figs 2a,b): *C. concavicornis*	*C. concavicornis*	50.00%	84	100.00%
Q5	Model response	Actual response	Partial credit Count	Frequency	
	964 IdenBfy species 1 (Fig. 1): *C. didymus*	*C. didymus*	33.33%	84	100.00%
	965 IdenBfy species 2 (Figs 2a,b): *C. curvisetus*	*C. curvisetus*	33.33%	80	95.24%
	965 IdenBfy species 2 (Figs 2a,b): *C. debilis*	*C. debilis*	0.00%	4	4.76%
	966 IdenEy species 3 (Figs 3a,b,c*): C. socialis*	*C. socialis*	33.33%	83	98.81%
	966 IdenEy species 3 (Figs 3a,b,c): *C. lorenzianus*	*C. lorenzianus*	0.00%	1	1.19%

Table 8: Questions 1-5 Matching type answers

There were no difficulties on identifying the phytoplankton species depicted in Q1-Q5. The frequency is above 90% in all the 5 questions. This data conflicts with the identifications in real samples (see Table 9), where is likely that more than 7 or 8 answers are given for one species. In Q1, we gave 'opening' as a right answer as its meaning is similar to 'aperture' which is the word indicated in most taxonomy books, so we have corrected the scores for analysts using 'opening'. Otherwise, there were no issues with Chaetoceros terminology.

Chaetoceros diadema 2014

species	Number	%
	44	68.8
	4	6.3
Chaetoceros diadema	3	4.7
Chaetoceros debilis	3	4.7
Chaetoceros constrictus	2	3.1
Chaetoceros decipiens	2	3.1
Chaetoceros costatus	1	1.6
Chaetoceros sp.	1	1.6
Chaetoceros lauderi	1	1.6
Chaetoceros lorenzianus	1	1.6
Chaetoceros fallax	1	1.6

Species id	Number	%
Chaetoceros curvisetus	53	58.24
Chaetoceros (Hyalochates)	28	30.77
Not identified	3	3.30
Chaetoceros lorenzianus	3	3.30
Chaetoceros brevis	1	1.10
Chaetoceros lauderii	1	1.10
Chaetoceros teres/cersatoporus	1	1.10
Chaetoceros teres/brevis	1	1.10
Species id 2016	Number	%
Chaetoceros didymus	63	77.78
Chaetoceros diadema	6	7.41

Chaetoceros cerastosporus			*Chaetoceros decipiens*	3	3.70
Chaetoceros brevis			Ch [redacted]	2	2.47
			Chaetoceros ceratosporus	1	1.23
			aetoceros constrictus	1	1.23
not id	1	1.6	*Ch*		
			Chaetoceros debilis	2	2.47
Total	63	100	*Chaetoceros lorenzianus*	1	1.23
			NR	2	2.47

Table 9: The *Chaetoceros* complex 2014-2017

Q2 images depict single cell *Chaetoceros*, there were no problems recognizing *C.danicus* on a typical image showing a square cell and the setae on one side appears to be crossing each other and *C.peruvianus* could be distinguished by the terminal setae extending behind the cell valve compared to *C.aequatorialis* with the terminal setae extending forward before bending backwards.

Q3 depicted 3 straight chains of the genus *Chaetoceros* all with a prominent 'aperture', so the way to differentiate these cells were for *C.lorenzianus* the setae fuse and cross each other close to the valve face. For *C. affinis* the terminal setae have a particular shape and in *C.decipiens* the setae are fused and extend away from the valve before dividing.

In Q4, two species of the phaeoceros group were depicted, the difference here is that *C.concavicornis* cells in the chain are very close together while in *C.atlanticus* there is a large aperture between cells. Also, the setae extend away from the valve in a different way.

In Q5, *C.didymus* is easy to identify because of these protuberances in the valve between cells, *C.curvisetus* has a typical curved chain and all the setae are projected outwards from the curve, finally *C.socialis* is a colony forming species of this genus where cells are attached to a main stem.

Q6-9 depicted chain forming diatoms and analysts were asked to count the cells. Q6 caused most problems as it showed a diatom chain with 7 cells. In 4 cells, the chloroplasts were fully extended within the silica frustule covering most of the cell, where in the other 3 cells, the chloroplast appear to have divided to either side of the cell. 35 analysts only counted the 4 cells, rather than the 7 cells.

Q6	Actual response	Partial credit	Count	Frequency

7 (6-8)		7	100.00%	40	47.62%
7 (6-8)		6	100.00%	8	9.52%
[Did not match any answer]		4	0.00%	36	42.86%
Q7	Actual response	Partial credit	Count		Frequency
9 (8-10)		9	100.00%	64	76.19%
9 (8-10)		8	100.00%	12	14.29%
9 (8-10)		10	100.00%	1	1.19%
[Did not match any answer]		13	0.00%	6	7.14%
[Did not match any answer]		14	0.00%	1	1.19%
Q8	Actual response	Partial credit	Count		Frequency
26 (25..27)		26	100.00%	81	96.43%
26 (25..27)		25	100.00%	2	2.38%
26 (25..27)		27	100.00%	1	1.19%
Q9	Actual response	Partial credit	Count		Frequency
2 (2..2)		2	100.00%	83	98.81%
[Did not match any answer]		1	0.00%	1	1.19%

Table 10: Questions6-9 numerical

Q10	Model response	Partial credit	Count	Frequency
	1 1 apical plate	16.67%	82	97.62%
	1 [No response]	0.00%	2	2.38%
	2 ventral pore	16.67%	79	94.05%
	2 [No response]	0.00%	5	5.95%
	3 Apical pore complex	16.67%	82	97.62%
	3 [No response]	0.00%	2	2.38%
	4 Posterior sulcal plate	16.67%	72	85.71%
	4 [No response]	0.00%	12	14.29%
	5 6 pre cingular plate	16.67%	71	84.52%
	5 [No response]	0.00%	13	15.48%
	6 1 postcingular plate	16.67%	42	50.00%

	6 [No response]		0.00%	42	50.00%
Q11	Model response	Partial credit		Count	Frequency
	1 1. Peridiniales antapical view		100.00%	80	95.24%
	1 4. Gonyaulacales Sulcal view		0.00%	1	1.19%
	1 6. Peridiniales apical view		0.00%	2	2.38%
	1 9. Gonyaulacales antapical view		0.00%	1	1.19%
	2 2. Gonyaulacales ventral view		100.00%	80	95.24%
	2 10. Peridiniales ventral view		0.00%	4	4.76%
	3 3. Peridiniales dorsal view		100.00%	82	97.62%
	3 1. Peridiniales antapical view		0.00%	1	1.19%
	3 7. Gonyaulacales dorsal view		0.00%	1	1.19%
	4 4. Gonyaulacales Sulcal view		100.00%	78	92.86%
	4 5. Peridiniales sulcal view		0.00%	5	5.95%
	4 7. Gonyaulacales dorsal view		0.00%	1	1.19%
	5 5. Peridiniales sulcal view		100.00%	78	92.86%
	5 4. Gonyaulacales Sulcal view		0.00%	5	5.95%
	5 3. Peridiniales dorsal view		0.00%	1	1.19%
	6 6. Peridiniales apical view		100.00%	78	92.86%
	6 8. Gonyaulacales apical view		0.00%	4	4.76%
	6 1. Peridiniales antapical view		0.00%	2	2.38%
	7 7. Gonyaulacales dorsal view		100.00%	82	97.62%
	7 3. Peridiniales dorsal view		0.00%	1	1.19%
	7 9. Gonyaulacales antapical view		0.00%	1	1.19%
	8 8. Gonyaulacales apical view		100.00%	79	94.05%
	8 6. Peridiniales apical view		0.00%	4	4.76%
	8 9. Gonyaulacales antapical view		0.00%	1	1.19%
	9 9. Gonyaulacales antapical view		100.00%	81	96.43%
	9 1. Peridiniales antapical view		0.00%	1	1.19%

9 5. Peridiniales sulcal view	0.00%	1	1.19%
9 8. Gonyaulacales apical view	0.00%	1	1.19%
10 10. Peridiniales ventral view	100.00%	80	95.24%
10 2. Gonyaulacales ventral view	0.00%	4	4.76%

Table 11. Drag and drop dinoflagellate terminology

Dinoflagellate terminology did not pose any serious issues, it was the first time using this drag and drop technique and it seems that the position of the 1 post-cingular plate caused certain problems among analysts but probably it has more to do with the tag been hard to place rather than the analysts making a mistake. Q11 had an inherent bias in that if you placed one plate in the wrong place, then two answers would be wrong rather than just one. However, the scores were good for most analysts.

Q12	Partial credit	Count	Frequency
Lingulodinium polyedrum	1	74	88.10%
ProtoceraBum reBculatum	0.00%	9	10.71%
Gonyaulax spinifera	0.00%	1	1.19%
Q13	Partial credit	Count	Frequency
Protoperidinium depressum	100.00%	83	98.81%
Protoperidinium pentagonum	0.00%	1	1.19%
Q14	Partial credit	Count	Frequency
Protoperidinium leonis	100.00%	79	94.05%
Protoperidinium conicum	0.00%	3	3.57%
Protoperidinium crassipes	0.00%	1	1.19%
Protoperidinium pentagonum	0.00%	1	1.19%

Table 12. Q12-14 Dinoflagellates species identification

Lingulodinium polyedrum is the right answer in Q12, the sulcus in *Protoceratium* does not extend all the way to the hypotheca. In *Protoperidinium* taxonomy, the 1' plate and 2a intercalary plate are needed to differentiate species, *P.depressum* is known for its large size and typical shape, so no mistakes in Q13. The right answer in Q14 is *P.leonis* can be confused with *P.coniucum* as both are ortho-hexa but *P.conicum* differs from *P.leonis* on a typical inverted 'V' shape in ventral view and also their spines.

Questions	Question type	Question name	Attempts	Facility index

Q1	Matching	*Chaetoceros* terminology 1 IPI2017	84	97.14%
Q2	Matching	*Chaetoceros* 1 - IPI2017	84	98.41%
Q3	Matching	*Chaetoceros* 2 - IPI2017	84	92.86%
Q4	Matching	*Chaetoceros* 3 - IPI2017	84	98.81%
Q5	Matching	*Chaetoceros* 4 - IPI2017	84	98.02%
Q6	Numerical	Enumeration 1 IPI 2017	84	57.14%
Q7	Numerical	Enumeration 2 IPI 2017	84	91.67%
Q8	Numerical	Enumeration 3 IPI 2017	84	100.00%
Q9	Numerical	Enumeration 4 IPI 2017	84	98.81%
Q10	Drag and Drop	Armoured dinoflagellate taxonomy IPI2017	84	84.92%
Q11	Drag and Drop	Gonyaulacales versus Peridiniales IPI2017	84	95.00%
Q12	Multiple choice	Armoured Dinoflagellate identification IPI2017	84	88.10%
Q13	Multiple choice	*Protoperidinium* 1	84	98.81%
Q14	Multiple choice	*Protoperidinium* 4	84	94.05%

Table 13: Overall statistics by question and type.

Except for Q6 and Q10, the rest of the questions were above 90% of correct answers.

5. Discussion

The BEQUALM phytoplankton intercomparison changed its name to the International Phytoplankton Intercomparison (IPI) in 2016. The BEQUALM office closed its doors in 2014 and we have now become an independent PT scheme provider.

The format of this intercomparison exercise has evolved over the years but its present format has been in operation since 2011 and appears to be a successful working model. This test is divided into two clearly defined sections; 1. an online taxonomic assessment or online HAB test set up in a remote platform accessed via the web and 2. the analysis of lugol's preserved water samples for abundance and composition of marine phytoplankton. These samples are generally spiked with algal cultures, which allows for a better control of the spiked material in relation to their cell concentration and their identity.

The identification and enumeration exercise has been prepared in a similar fashion to previous years but a number of changes have taken place since 2013 in relation to the use of statistics. We are following the statistical methods laid out in ISO13528:2015 to calculate the performance statistics for the test. Also, some of the forms used to fill the test results have been revamped. The enumeration and identification logsheet (See Annex II) is set up as an Excel spreadsheet. The Excel spreadsheet contains an embedded reduced marine phytoplankton species list which is linked to the identification

log sheet table and appears as a dropdown menu list, where analysts must choose the right entries for each sample.

The advantages of using these forms set up in this way to include the analysts' results are various but primarily, the results are always readable, numerical transcription errors are avoided and no interpretation of the results are needed as it avoids common generic responses, e.g. unidentified armoured dinoflagellates, centric diatom, naked dinoflagellates, etc. There are also some disadvantages, as the reduced list can be construed to be an aid to the identification of the species and a deviation to the method.

The results of the exercise have been processed in a similar fashion to previous years particularly in relation to using the consensus values of all the analysts to form the basis of the final Z-scores. However, there are definite and important changes to the way we arrive at these averages and confidence interval values.

The new way of calculating these values using the robust averages and standard deviations from ISO 13528:2015 is a definitive departure from previous years. ISO 13528:2015 is the standard used for statistical methods in proficiency testing by inter-laboratory comparisons. It describes sound statistical methods and recommendations of their use which can be applied to demonstrate unacceptable levels of laboratory bias. It gives the statistical guidelines for the interpretation of tests and it is to be used as the reference document in future exercises. This standard is only applicable to quantitative data.

Since 2014, we have used the statistical software programme ProLab Plus version 2.14 to calculate the descriptive statistics for the test and the performance characteristics including the graphical representation of all the results.

Homogeneity and stability test

A homogeneity and stability test has been carried out each year since 2013 with a set of samples by an expert laboratory. The statistic parameters are calculated using ProLab Plus (Annex VII) and summarized in table 1. This test shows whether our samples are fully homogeneous and stable according to different statistical parameters or whether there is sample heterogeneity and a lack of stability over time. ISO 17043 sets the rules in relation to how these tests must be carried out.

Our experience since 2013 from running these homogeneity tests is that our samples are never quite fully homogeneous or fully heterogeneous. This is related to the way we homogenize our samples manually using the 'Paul-Schatz' figure of eight rotation method by 100 times, which is the best manual method known for carrying this type of work and possibly also due to the use of certain materials to store the samples, such as our 50ml plastic tubes.

At the beginning of the test, we try not to impose too many demands on homogenization. We run the Cochran test for outliers and the F-test, this tells us where our values are different from '0'. If they are not, then we can assume homogeneity under this criteria. Generally, all items usually pass this test. This year 5 items failed (*Akashiwo, Azadinium, Ceratoneis, Prorocentrum* and *Scrippsiella*). Secondly, we run the ISO13528:2015 test for adequate homogeneity. This test states that the between samples standard deviation should not exceed 30% of the standard deviation for the proficiency assessment, when this happens (which is the case for most of our items) we run the expanded criterion under ISO13528:2015 for significant heterogeneity. The expanded criterion allows us, even if we exceed that 30%, that not significant heterogeneity can be found. Generally, the expanded criterion is met by all of our items but if this expanded criterion was failed, we can add the in between standard deviation from the homogeneity test to widen the confidence limits for that item, which is what we have done for *Pseduo-nitzschia pungens* in this case.

The test for stability is slightly different in that samples from the homogeneity and stability are compared across the board with a time delay enforced for the stability samples. A t-test is run first to see if the mean values differ significantly. The criterion for stability is that the difference between mean values of the homogeneity and stability test items should not exceed 30%. Otherwise, the expanded criterion which takes into account the uncertainty of the standard deviation for the proficiency test is used. Generally, our items appear to be stable over a month time delay which is the time allowed for participants to return their results. Most items pass the ISO13528:2015 criterion, the rest passed the expanded criterion except for *P.pungens* and *P.mexicanum*.

The solution to this lack of homogeneity (but not significant heterogeneity) is given in ISO17043. This states, in note 3 : "In some cases, materials that are not sufficiently homogeneous or stable are the best available; in such cases, they can still be useful as proficiency test items, provided that the uncertainties of the assigned values or the evaluation of results take due account of this". We have calculated the standard uncertainty of the assigned values (table 5) from the consensus values of the participants and we have found that in all the test items used, in this round, the standard uncertainty is negligible.

Also, ISO13528 indicates that when the consensus values from the participants are used, the assigned value can be compared with a reference value in order to ascertain that there is no bias in the method. We have used the data generated in the homogeneity test by an expert laboratory (table 6) as reference data for comparison purposes and we found that the differences between the consensus values and the reference values by the expert laboratory are more than twice its uncertainty for most test items.

This suggests some level of bias in the measurement method either by the participants, by the expert laboratory or both. This is not critical but it demonstrates that certified reference materials are essential to investigate further where this bias lies. Also a repeatability study would be necessary to investigate how much of this variation is due to the analysts and how much is due to the analytical method.

ISO 17043 gives another option when the materials are not sufficiently homogeneous or stable which is to include the between sample standard deviation from the homogeneity test values to the assigned standard deviation calculated from the consensus values for each test item. This is usually sufficient to take into account the heterogeneity of the samples.

In this test, although not all the test items have failed the homogeneity test, we have decided to include the between sample standard deviation from the homogeneity test to all the measurands (see table 4). In any case, the addition of the in between sample SD effect is to widen the confidence limits for each test item allowing more participants to be within the set limits.

Calculation of performance statistics

The consensus values from the participants (Annex VIII) were used to calculate the performance statistics for the test. These values take into account the heterogeneity of the samples (between sample SD) from the homogeneity test and the assigned values for the test materials used in this round were calculated using the robust algorithm A in annex C of ISO13528, which are derived by an iterative calculation using the new modified averages and standard deviations until the process converges (Annex IX). This method deals with outliers in the dataset and missing values.

These assigned values for each measurand were then used to calculate the Z-scores (Annex X). Laboratory bias assumes a normal distribution of the data across zero and any results outside the

warning signal (+/2SD) or action signal (+/-3SD) would suggest an out of specification result. The results show that Z-scores are generally within the specification of the test for most analysts, with a number of warning and action signals. A warning signal is a result between 2 and 3SD of zero and an action signal is a result outside 3SD. Two warning signals in consecutive intercomparisons give rise to an action signal. An action signal signifies that an investigation of the causes by the laboratory should be carried out.

There are a number of warning and action signals arising from this intercomparison which can be found in the table of Z-scores in annex X. Generally, the performance is good for most analysts with perfect scores in all measurands. In this exercise, 5 Red flags in total (0.6%), 22 (2.7%) yellow flags and 29 (3.5%) non-id flags from 819 scores is evidence of good performance overall. Nine analysts did not pass the full test with a below 80% score.

Combined performance scores

It is common in any proficiency testing exercise to obtain results from several test items or measurands, in our case each species found in the samples is a test item or measurand. As this is generally the case during monitoring work, the individual scores for each measurand is analysed individually but also can be used to calculate combined effects for a particular laboratory or analysts such as correlation between results for different measurands. Graphical methods for this include histograms, bar plots and repeatability standard deviations plots.

Mandel's h and k statistics in annex XIV present measures for graphically surveying the consistency of the data and specific patterns of laboratory performance. The h plot represents all measurand-sample combination possible and reveals that a small number of analysts have consistently over or underestimated the cell counts which indicate a common source of laboratory bias. It is up to individual laboratories to investigate the causes which may cause these anomalies.

The k plot can be interpreted as a repeatability precision measure. Again, this graph represents all the measurand-sample combinations possible. Large values here indicate poor repeatability precision. Several large values indicate poor repeatability precision for some or all of the measurands.

The chart of RLP against RSZ (Annex XV) for all measurands combined indicates systematic laboratory bias. RSZ is based on the standardized sum of all the z-scores for each analyst and it can be interpreted as a single Z-score: that is an evaluation across all samples and measurands. If the RSZ value is within

the tolerance limits (2SD), there are no significant systematic deviations of the measurement values for that analyst compared to the rest. The RLP is the mean length of all the Z-scores for each analyst and is derived from the sum of the squared mean length of all the Z-scores. Deviations in RLP are accepted as long as the mean deviations for the analysts do not exceed 1.5 times the average deviations of all laboratories. This is the top of the green area of the rectangle. Laboratories dotted within the green coloured area in the graph are within the consensus values shown by the majority of analysts. Those outside it are showing a systematic bias towards over or under-estimating most of their counts in the samples, suggesting a methodology bias.

The plot of repeatability standard deviations shown in annex XVI uses a modified approach to the circle technique of van Nuland. This plot uses the average and standard deviation of each laboratory/analyst and plots one against the other. Because of this modified approach, the critical region drawn is no longer circular. This critical region corresponds to a significance level of 5% for the inner layer, 1% and 0.1% for the most outer layer. This plot determines which laboratories/analysts are having unusual averages and standard deviations. Plots of repeatability standard deviation assume that there is no difference between laboratories means +SD.

Qualitative data

The scope of ISO13528:2015 does not include qualitative results, but the correct identification of the organisms in the samples is still a very important part of the exercise, as correct/incorrect/not-identified flags will be given for this. The data received from the analysts (Table 7) shows that analysts are highly skilled in the identification of marine phytoplankton and the results suggest that there is consensus among analysts on most of the species identified in the samples with near perfect scores for all identifications.

This year we had a mixture of dinoflagellates and diatoms in the sample and also a mixture of toxic and non-toxic species. We had 4 dinoflagellates and 5 diatom species. We also had 3 toxin producing species from 9 in the sample. 12 analysts failed to identify *C. danicus* in the samples. They were possibly counted as part of *C.curvisetus*. *C. danicus* proved not difficult to identify otherwise, 77% identified correctly to species level. For *C. curvisetus* seven different species were identified in total but there was consensus on *C.curvisetus* (58%) followed by *Chaetoceros* (*Hyalochates*) (30%), not identified by 3 analysts and misidentified by other 7.

T.sinensis and *C.closterium* did not cause difficulties with 88% and 95% identifying correctly to species level.

P.pungens was identified as *P.seriata* group by 73% of analysts, 13% correctly identified to species level the rest gave various answers, the problematic one is that 4 analysts identified them as *P.delicatissima* group which is incorrect. Generally any *Pseudo-nitzschia* cells larger in valve width than 3µm are considered of the '*seriata* group'. Here we are giving these answers as correct because they are correct to genus level but this may change in the future as we move towards a standardised list of species that can be identified to species level, we will be asking analysts to give answers to the level of taxon required.

We expected difficulties identifying *A.spinosum* as this is a very small dinoflagellate and very similar to others in the genus *Amphidoma* and *Heterocapsa*. The results suggest that this is the case with 36% identifying as
Azadinium/Heterocapsa, 26% as *A.spinosum* and 14% as *Azadinium* sp. Another 17% as a diverse number of
Heterocapsa species. Any of these identifications were accepted as correct. Same applies to *Scrippsiella/pentapharsodinium/ensiculifera* complex for *Scrippsiella*. 98% identified as *Scrippsiella* and 2% as *Pentapharsodinium*.

Prorocentrum mexicanum caused the biggest taxonomic challenge. Over 50% mis-identified this as *P.lima*. This shows the difficulty with analyzing benthic *Prorocentrum* to species level. 54% identified as *P.lima*, 18% as *P.mexicanum*, 12% as *P.aporum* and 7% as *P.maculosum*.

We brought *P.mexicanum* to the annual workshop, as there were doubts about its proper identity, with many analysts identifying it as *P.lima*. We did calcofluor staining at the workshop and concluded that this culture was neither *P.mexicanum* nor *P.lima*. We are currently investigating which species it is and we believe, although we are looking at final confirmation using SEM and sequencing that is probably *P.cassubicum* pending final analysis. This does not change any results as they are all correct to genus level, but shows how difficult these species can be to identify fully and correctly.

We endeavour always to have the proper description of our cultures and obviously, when using cultures from other laboratories, we will be more cautious to have a definitive identification of the species before use in our intercomparisons.
Overall, from 819 possible correct identifications, there were a total of 789 correct answers at genus level which is 96.4% correct, 29 (3.5%) non identifications and 1 incorrect answer only. This indicates a high level of taxonomic proficiency amongst participants.

Online HAB quiz

The online quiz is set up to entice participants to get back to their taxonomy books and study their taxonomic literature in order to answer the questions, the difficulty of some of these questions therefore can be of a technical nature, we do this as a way to give participants the most up to date taxonomical information available and also to widen their knowledge on the perhaps lesser known organisms or group of organisms. The online quiz allows us to assess participants' taxonomic skills and compare those skills across laboratories and also even sometimes geographical areas. The consensus is generally quite good between participants and the scores suggest a high level of proficiency among participants.

There was good consensus on the various identifications of *Chaetoceros* species from images in questions 1 to 5. A discussion arose around the word 'opening' and whether this should be given as correct. We decided that since most literature uses the term 'aperture' in their descriptions and given that the word 'opening' has the same meaning, that this should be given also as a correct answer. Q6-9 depicted chain forming diatoms and analysts were asked to count the cells. Q6 caused most problems as it showed a diatom chain with 7 cells. In 4 cells, the chloroplasts were fully extended within the silica frustule covering most of the cell, where in the other 3 cells, the chloroplasts appear to have divided to either side of the cell. 35 analysts only counted the 4 cells, rather than the 7 cells.

In Q10 and Q11 we used, for the first time, drag and drop type questions, these are a bit more interactive than the other types, where the analyst may use the mouse cursor to move around tags and place them in the right place. They appeared to work quite well and analysts did not seem to have any problems using them. Our main concern here has to do with the quality of the images, as this seem to be lowered quite a bit by the programme and the drawings may appear a bit blurred once uploaded.

ANNEX I: Form 1 return slip and checklist

IPI PHY-ICN-17-MI1
FORM 1: CHECKLIST CONFIRMATION

Please ensure to complete the table below upon receipt of samples, then fax to + 353 91 387201 or scan and e-mail to rafael.salas@marine.ie	
Analyst Name:	
Laboratory Name:	
Analyst Code Assigned :	
Contact Tel. No. / e-mail	

CHECKLIST OF ITEMS RECEIVED	**(Please circle the relevant answer)**	
Please enter the sample codes here:_____	YES	NO
Set of Instructions	YES	NO
Enumeration and identification result log sheet (Form 2)	YES	NO

I confirm that I have received the items as detailed above and that the materials were received in good working conditions.

(If any of the above items are missing, please contact rafael.salas@marine.ie)

SIGNED: _____

DATE: _____

Form 1: Checklist confirmation

ANNEX II: Form 2 Enumeration and identification results log sheet

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

IPI 2017 Phytoplankton Intercomparison Exercise

Analyst Name:	
Laboratory Code:	
Analyst Code :	

Settlement date:			
Volume Chamber (ml)			
Analysis date:			
Sample No:			

Organism	Cell count	Cell count	Cell count	Multiplication factor			Number cells/L	Number cells/L	Number cells/L	Average
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!
										#DIV/0!

Comments:

Form 2: Results logsheet

ANNEX III: Test instructions

IPI Phytoplankton Proficiency Test PHY-ICN-17-MI1 Vr1.0
Instructions
Please note that these instructions are designed strictly for use in this Intercomparison only.

1. Introduction
2. Deadlines, checklists and forms
3. Test method
4. Equipment
5. Sedimentation chambers and sample preparation
6. Counting procedure and strategy
7. Samples
8. Counting guide IPI2017
9. Online HABs quiz

1. Introduction

The Marine Institute, Galway, Ireland, conducts an annual International Phytoplankton Intercomparison (IPI) (formerly BEQUALM) on the abundance and composition of marine phytoplankton in water samples since 2005. First, under the auspices of the BEQUALMNMBAQC umbrella and since 2011, in collaboration with the IOC Science and Communication Centre on Harmful Algae of UNESCO, in Copenhagen, Denmark. The design and organization of this exercise continued under the Marine Institute- IOC - BEQUALM banner until 2015.

Since 2016, the programme BEQUALM no longer exist and the intercomparison exercise has changed its name to IPI (International Phytoplankton Intercomparison) with the continued collaboration of the IOC Science and Communication Centre on Harmful Algae and in association with NMBAQC in the UK.

Registration information about this intercomparison exercise can be obtained in the IOC website; http://hab.ioc-unesco.org under the heading 'activities and training courses'. Registration to the exercise is through the Marine institute. You need to contact our administrator Fiona Bradley at fiona.bradley@marine.ie to register. Also, in the NMBAQC website (www.nmbaqcs.org) under scheme components and phytoplankton, you'll find information on the current timetable schedule for the exercise, the list of participants, previous reports and the workshop agenda from the previous exercises to give you an idea of the range of activities within this intercomparison exercise. There is also information of the other NMBAQC schemes.

The purpose of this exercise is to compare and evaluate the performance of testing laboratories and to monitor the laboratories continuing performance over time on the composition and abundance of marine microalgae in preserved marine samples. We work mainly with laboratories engaged in national official/non-official phytoplankton monitoring programmes, water framework directive, marine strategy framework directive and others (environmental agencies, consultancies, private companies) working in the area of analysis of water samples for marine phytoplankton.
The Marine Institute is accredited to ISO 17025 for toxic marine phytoplankton abundance and composition since 2005 and recognises that regular quality control assessments are crucial to ensure a high quality output of phytoplankton data. We are programmed to apply for the accreditation of this Proficiency Testing scheme under ISO 17043 for 2018. All our work is carried out following the technical and managerial requirements for PT schemes (ISO17043) and the data is statistically

analysed using the statistical methods as laid out in ISO13528 'Statistical methods for use in PT by interlaboratory comparisons'. We use the statistical database software ProLab Plus from QuoData to do the statistical evaluation of the participants' data.

Participants are asked to carry out microscopic analysis on three marine water samples spiked with cultured material and preserved with neutral lugol's iodine and return results on the composition of the samples to the highest possible taxon and the average abundance in cells per litre for each species in each sample. Each analyst receives an envelope containing four samples (only 3 needs to be analysed) with a 50ml volume in plastic centrifuge tubes.

Please adhere to the following instructions strictly and note that these instructions are specific to this ring test only.

2. Deadlines, checklists and forms

Upon receipt of the samples, every analyst must make sure that they have received everything listed in the checklist confirmation form (Form 1). Make sure that all the samples are intact and sealed properly and check that you have received the enumeration and identification results log sheet (Form 2) as an Excel workbook.

Please complete form 1: checklist confirmation form and send it back to me by fax to (+353 91 387201) or scan it as a pdf file and send it to me via e-mail to rafael.salas@marine.ie . If you send the form via e-mail, please name the file as Form 1 followed by the exercise code and your full name i.e. Form 1: IPI17 Rafael Salas. This validates the traceability of the samples from origin to the laboratories and that all materials have arrived into the testing laboratories to the analysts in good working condition.

Once samples have been receipt by the testing laboratories, analysts are given four weeks to complete the test and return all the results by e-mail (rafael.salas@marine.ie), fax (+353 91 387201) or post to Rafael Salas, Marine Institute, Phytoplankton laboratory, Rinville, Oranmore, Co. Galway, Ireland. If you decide to post your results, make sure first to make a copy of them and then send the originals to the address above. The enumeration and identification results log sheet (Form 2) must be received in the Marine Institute by Friday, July 7th 2017.

Please note: Results received after this date will not be included in the final report. Also, if you are posting your results make sure to make a copy for your records before sending the originals, just in case they don't arrive.

Form 2 is an Excel workbook named 'Enumeration and identification logsheet' for analysts to input their results. At the top of the form, first fill in your name, analyst and laboratory code. Fill in all the information relevant to the analysis of your samples, for example the settlement date, chamber volume used in 'mls', the analysis date and the sample number in the corresponding cells.

Under the column 'organism' a drop down menu appears with a list of possible species names. You must choose from this list your answers. The list of species is a reduced list and is designed to have more entries than species are in the samples, you must choose which ones you think have been inoculated in the samples and provide a cell count. If is not in the list, is not in the sample.

The number of rows under the column name 'organism' is arbitrary and independent of the number of species in the samples. There are 14 rows but this doesn't necessarily mean that you need to enter 14 names or that there are 14 species in the samples. The number and type of species inoculated in the samples is different from year to year.

In the comments box, you can write information about the test method you used, any deviation from the Utermöhl test method and how you performed your calculations if you think is necessary.

Once you have completed your samples and have reviewed your calculations in form 2, please send your form 2 back to me by fax to (+353 91 387201) or scan, pdf and send it via e-mail to rafael.salas@marine.ie . If you send the form via e-mail, please name the file as Form 2 followed by the exercise code and your full name i.e. Form 2: IPI17 Rafael Salas.

3. Test method

The Utermöhl cell counting method (Utermöhl 1931, 1958) is the standard quantitative and qualitative test method used in the Marine Institute phytoplankton national monitoring programme in Ireland. We use 25ml volume sedimentation chambers and we are accredited under ISO 17025 quality standard.

We advise the use of 25ml sedimentation chambers for the purpose of this intercomparison exercise if these are available. If not, other sub-sample volumes and/or chambers may be used. If a different method is used, please state all this information in your results.

4. Equipment

The following are the equipment requirements to complete this exercise:

Sedimentation chambers (25ml volume if possible but other volume chambers can be used).

Inverted Microscope: This should be equipped with long distance working lenses up to 40 x objective or higher and condenser of Numerical Aperture (NA) of 0.3 or similar and capable for bright field microscopy. Other types of reflected or transmitted light capabilities may be helpful depending on the type of organisms in the samples and can be used if required.

Tally counters

5. Sedimentation chambers and sample preparation

Sedimentation chambers consist of a clear plastic cylinder, a metal plate, a glass disposable cover-slip base plate and a glass cover plate (Fig 1). Three sedimentation chambers are required.

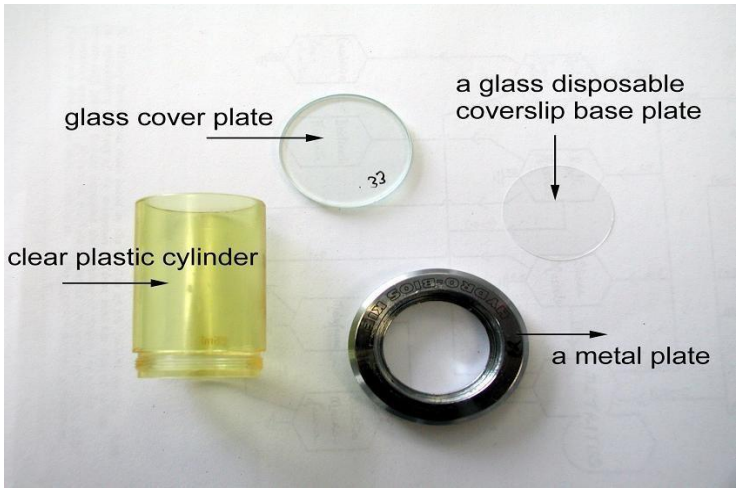


Fig 1: Sedimentation counting chamber

5.1 Storage of samples: If you are not analysing the samples straightaway or if you are analysing them in different dates, please ensure the samples are kept in a fridge at 2-5°C away from direct sunlight and in an upright position.

5.2 Temperature adaptation: Samples must be adapted to room temperature before sedimentation takes place. This reduces the risk of air bubbles inside the sedimentation chambers due to temperature differences between room and sample.

5.3 Chamber preparation:

5.3.1 All sedimentation chambers should be cleaned before you start

5.3.2 Place a new 'not used before' disposable cover slip base plate inside a cleaned metal plate.

5.3.3 Screw the plastic cylinder into the metal plate until tight. Extra care should be taken when setting up chambers. Disposable cover slip base plates are fragile and break easily causing cuts and grazes.

5.3.4 Once the chamber is set up, it should be tested for the possibility of leaks by filling the completed chamber with sterile filtered seawater and allowing it to
rest for a few minutes. If no leakage occurs, pour out the water, dry out completely and proceed with the next step.

5.4 Sample homogenisation and filling:

5.4.1 To set up a sample for analysis, firmly invert the sample at least 50 times before pouring the sample to ensure that the contents are homogenised properly. Avoid hard shaking of the samples

5.4.2 Place the chamber in a flat horizontal surface protected from vibration and strong sunlight and gently pour the sample into the counting chamber to the top. Cover the

chamber with the glass plate to complete the vacuum, making sure that there are no air bubbles or pockets between the sample and the cover glass.

5.4.3 Label the sedimentation chamber with the sample number from the sterilin tube.

5.6 Sedimentation time:

5.6.1 Settling time is dependent on the height of the chamber. 10ml chambers should be allowed to settle for a minimum of 8 hours, 25ml chambers for a minimum of 12 hours and 50ml chamber for a minimum of 24 hours.

5.6.2 Set the chamber on the inverted microscope and start the analysis.

6. Counting Procedure and strategy

a. Scan the entire chamber at low magnification first to get an initial overview of the density, distribution and composition of phytoplankton in the samples.

b. Assess the random distribution pattern of the organisms in the sample before starting the analysis. Larger organisms tend to sediment towards the edges and
smaller ones towards the centre if the temperature of the chamber is higher than the sample and vice-versa if the temperature of the chamber is lower than the sample. A visual inspection is enough to assess these patterns.

c. If the sample is not randomly distributed, then the sample will have to be returned to its original container and settled again after a period of acclimatization. This is particularly important if other counting strategies are to be used in some organisms other than the whole chamber count, in which case, the sample count wouldn't be affected.

d. Make a preliminary list of species and densities to help you choose the best counting strategy for the sample.

e. Choose the correct organism/s from the dropdown species list in the Excel worksheet Form 2.

f. Start at the lower magnification to count the larger species if present, depending on size even x 4 or x 10 objectives could be used. Then, go over the sample again at higher magnifications to count the rest of the species.

g. The smaller species should be counted at a higher objective magnification (x 20) or x 40 if necessary.

h. Each analyst should carry out a whole chamber cell count (WC) where possible of all the species identified in the samples.

i. Other counting strategies can also be used where the cell density in the sample for a particular organism is high. Show your calculations if using a half chamber (HC), field of view (FV) or transect (Tr) counting strategy.

j. If half of the chamber is to be counted, analyse every second transect.

k. If a transect counting strategy is used for one or several organism, count at least three transects and average your results. Be consistent as to which cells lying on which borders are to be counted or omitted.

l. Fields of view should be avoided if possible but if you need to use this counting strategy, count at least ten different randomly selected fields and average your results.

7. Samples

Analysts must analyse three samples in total to complete this part of the exercise. The samples are replicates. A fourth sample is additional and should be used as a replacement in case of one sample leaking or breaking. All the samples are made up in sterile filtered Seawater and spiked with culture material consisting of several species. Participants are asked to carry out a whole sedimentation chamber cell counts (where possible ; see section
6.) on each organism and sample.

How samples have been prepared ? First, seawater have been filtered through GF/C Whatmann filter paper and autoclaved using teflon bottles for 15 minutes at 121°C. The seawater was letf to cool first and then, 25mls of lugol's iodine per litre were used to stain and preserve the water in preparation for the addition of the inoculum. The Lugol's preserved sewater have been left to stand in the dark at room temperature over 24 hours to allow any impurities to deposit to the bottom and using an eppendorf 50ml dispenser, 47mls of the seawater have been pipette out into 50ml skirted centrifuge tubes and weighted in a four place calibrated balance. Only the first 4L out of a 5L glass bottle was dispensed out to avoid the deposited impurities at the bottom and therefore obtain a cleaner sample. The density of seawater have been taken into account to be 1.025g at room temperature when weighing the volumes. 400 samples have been prepared in this way.

The Master mix, then have been made up with different aliquots of cell cultures at different concentrations and estimates have been carried out in 1ml lugol's preserved samples and counted in Sedgewick-Rafter chambers for each species. This is done to check the condition and the densities of the cultures prior to inoculating into the Master mix.

Once the master mix have been made up with the target species at the required concentrations, this mixture has been homogenised 100 times using the Paul-Schatz method every 10 samples aliquoted. 3mls of the Master mix have been inoculated into the centrifuge tubes containing 47ml to a 50ml volume.

Each analyst must count and identify all phytoplankton species found in the samples.

8. Counting guide IPI2017

a. It is very important to spend some time becoming familiar with the samples and how the cells appear on the base plate before any count is carried out.

b. How to count single cell diatoms? Figures 2 to 5 show a series of pictures belonging to a diatom that is generally found solitary but that can form short chains when dividing.

Fig.2 These cells look like are undergoing division where the chloroplasts are migrating to both poles of the cells cytoplasm, however, there is only one set of elevations and spines at each end of the cell, so they should be counted as one cell.

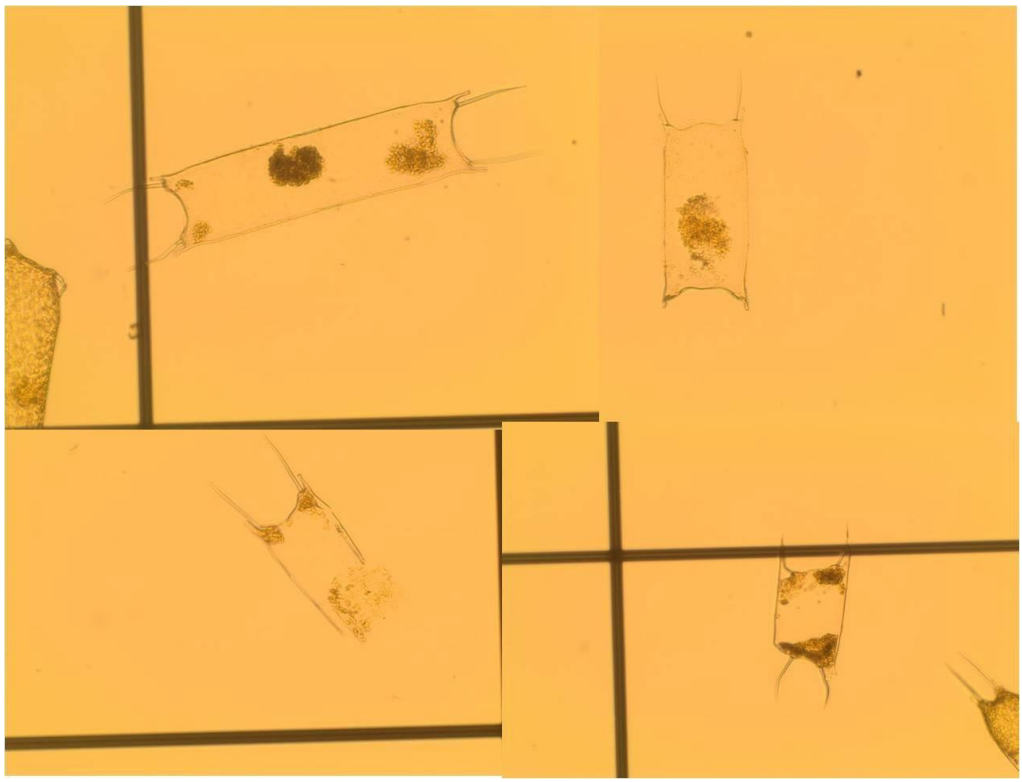


Fig.3 The cells are more or less empty of any cytoplasmic content and therefore should not be counted.

Fig.4 In this example, the cells are undergoing division and two sets of elevations and spines can be observed in each cell, showing fully developed cells that are still joint together. In this case, we would count two cells rather than one. Compare these images with Fig.2

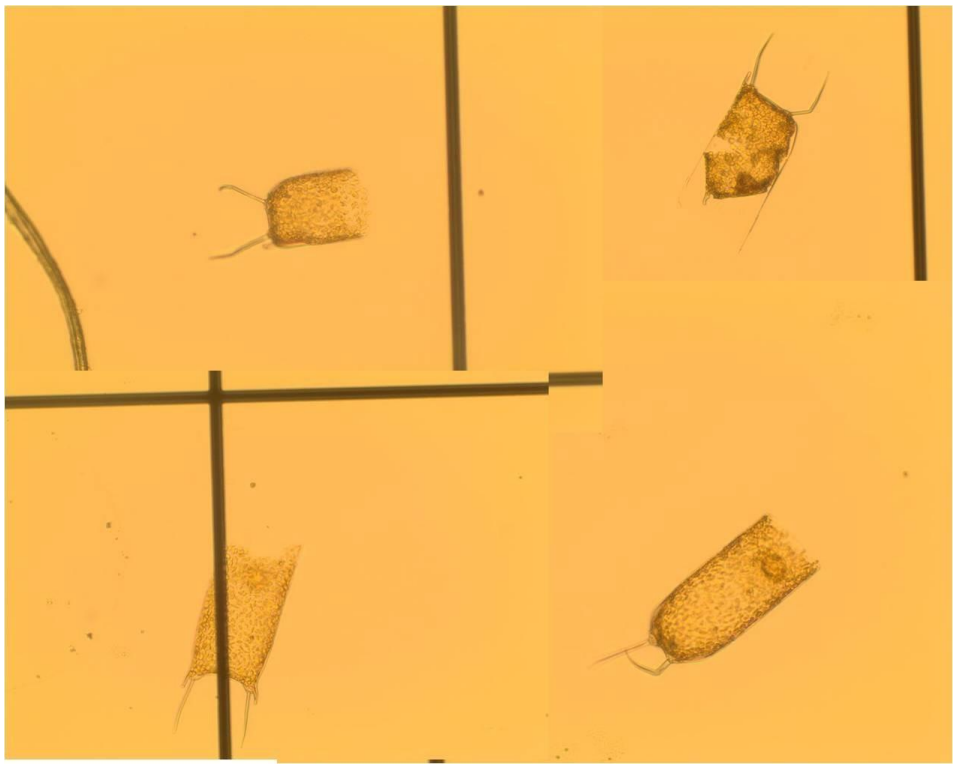


Fig.5 This is a difficult one, but as a general rule when counting, it is easier to count one cell rather than half, as tally counters only operate cell by cell rather than half by half and it is also possible that

you may only find one half of the cell in the sample and not the other. For this reason, even if only half cell is visible this should be counted as one at least for the purpose of this intercomparison.

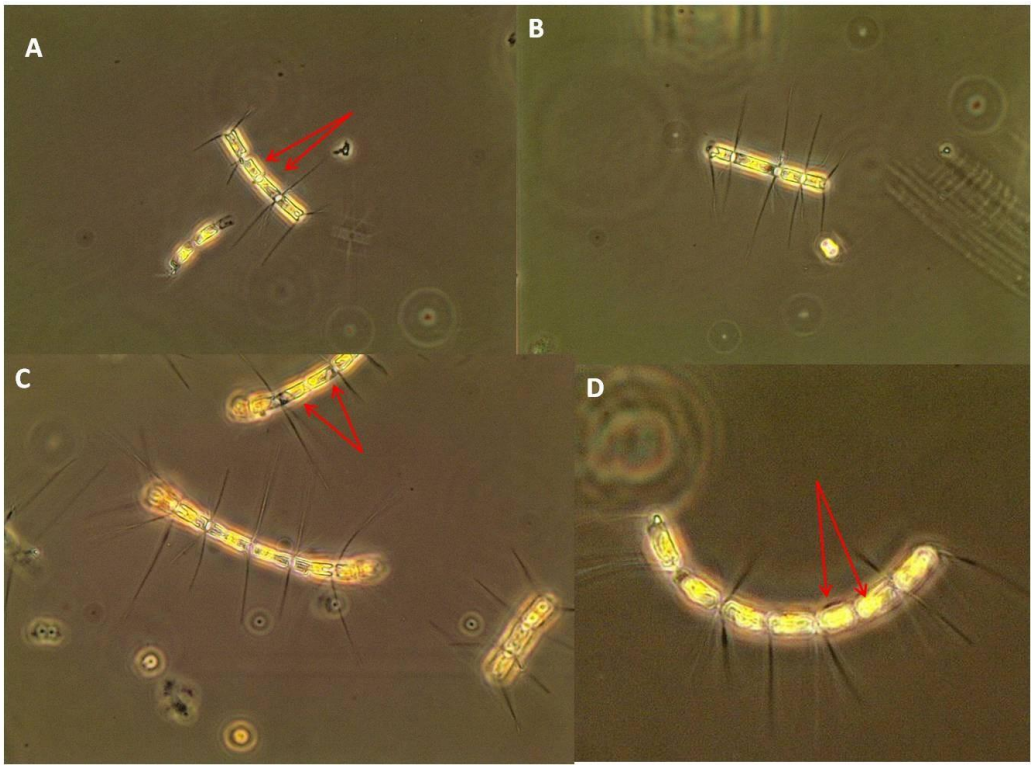


Fig.6 A-D show images of *Chaetoceros* where cells are well defined and differentiated within the chain, as there are pairs of setae (spines) arising from the valve of each cell pair (not in all cases) and they are reasonably in good condition as the chloroplasts are extended fully in the cytoplasm inside the frustule. In image A (red arrows), the middle cells have no setae between them, but the foramen between the cells is well developed, so we consider 2 cells here. The only difficulty could be with image C and D (red arrows) where 2 cells have divided but not setae are visible yet between the cell pair. In this case, as cells are well differentiated, count these as 2 cells rather than just 1.

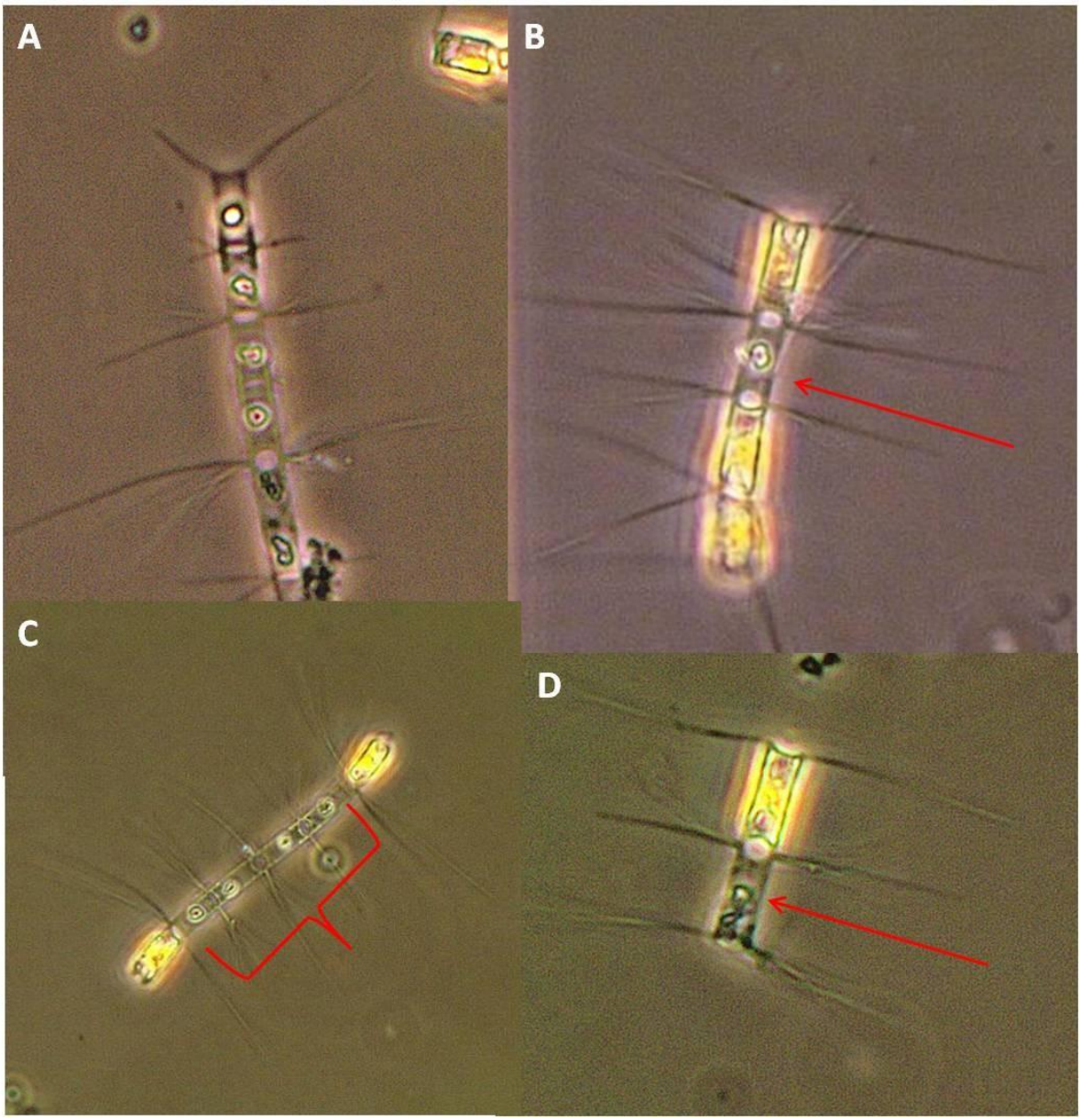


Fig.7 A-D images show chains of *Chaetoceros* where the cells are not in good condition, the chloroplasts are plasmolised and hardly visible in the chains. In this cases do not count these cells. Image A do not count. Image B count 3 cells but don't count the second cell in the chain. In image C count the terminal cells only and in image D only count one cell.

c. How to count dinoflagellates?

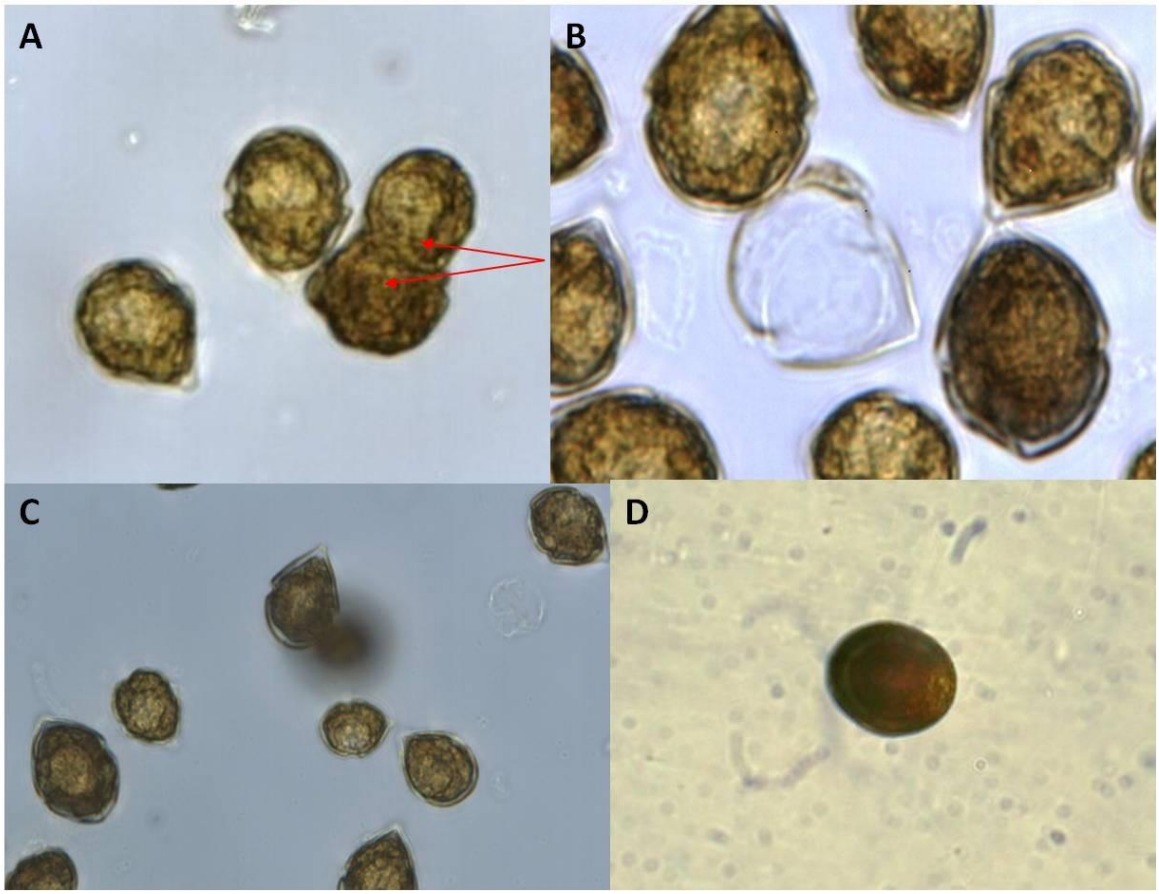


Fig.8 Image A shows two cells fusing or dividing, count only one cell. B: Dinoflagellates empty theca should not be counted. C: Cells may also vary in size, some cells will appear smaller than others, this is normal in culture conditions. Count all cells big or small. D: Sometimes Plasmolysis may occur and the cells appear naked and rounded. Do not count plasmolised cells as we don't know what they are.

These rules are applicable to this intercomparison exercise only.

9. Online HABs quiz

A HAB taxonomic quiz will be developed in the web platform 'Ocean teacher' and it should be ready by the end of June 2017. All participants will need access to the internet to complete this part of the exercise. More information on when participants will be able to access this exercise will be sent to you by e-mail later on.

In order to access the exercise you need to go to the webpage http://classroom.oceanteacher.org/ and login. Analysts which took part in the exercise in any of the previous years will already have a username and password which is still active, those using this facility for the first time need to register first.

When you go to the page http://classroom.oceanteacher.org/ in the top right hand corner of this page, you'll see a link to login. Press login and in the next page if you have already registered, then you only have to enter your username and password to access the course, if you forgot your password press the forgotten password link. If this is your first time using this system, then go to create new account and register your details. Once you register your details we will be able to activate your account. Participants should be able to self-enrol to this exercise, so once you are registered and logged in you must supply an enrolment key to access the exercise. This key is IPI2017. We will tell you the exact date the exercise is opened to be able to access the quiz.

So, how do you do access the course?, Once you are all logged in, in the main page go to my courses and in the drop down menu choose the IPI 2017 course, enter your enrolment key (IPI2017) and start your quiz. Make sure you enter the right course.

Analysts will have several months to complete the exercise once it opens (dates to be decided). Only one attempt to the exercise is allowed and once the exercise is submitted analysts won't have access to it, only to review it. So, make sure you review all your answers before submitting. There are a number questions and a maximum grade of 100% for a perfect score. All questions have the same score.

There are different types of questions (true/false, numerical, matching, multiple choice short answer, etc..). Please note that if you are asked for a number as the answer do not use text, use a numerical value. Also, in questions where you are asked to write the answer, please make sure that the grammar is correct. Incorrect grammar will give an incorrect answer. Please review your work carefully before submitting.

ANNEX IV: Workshop agenda

Agenda 'International Phytoplankton Intercomparison' (IPI) workshop

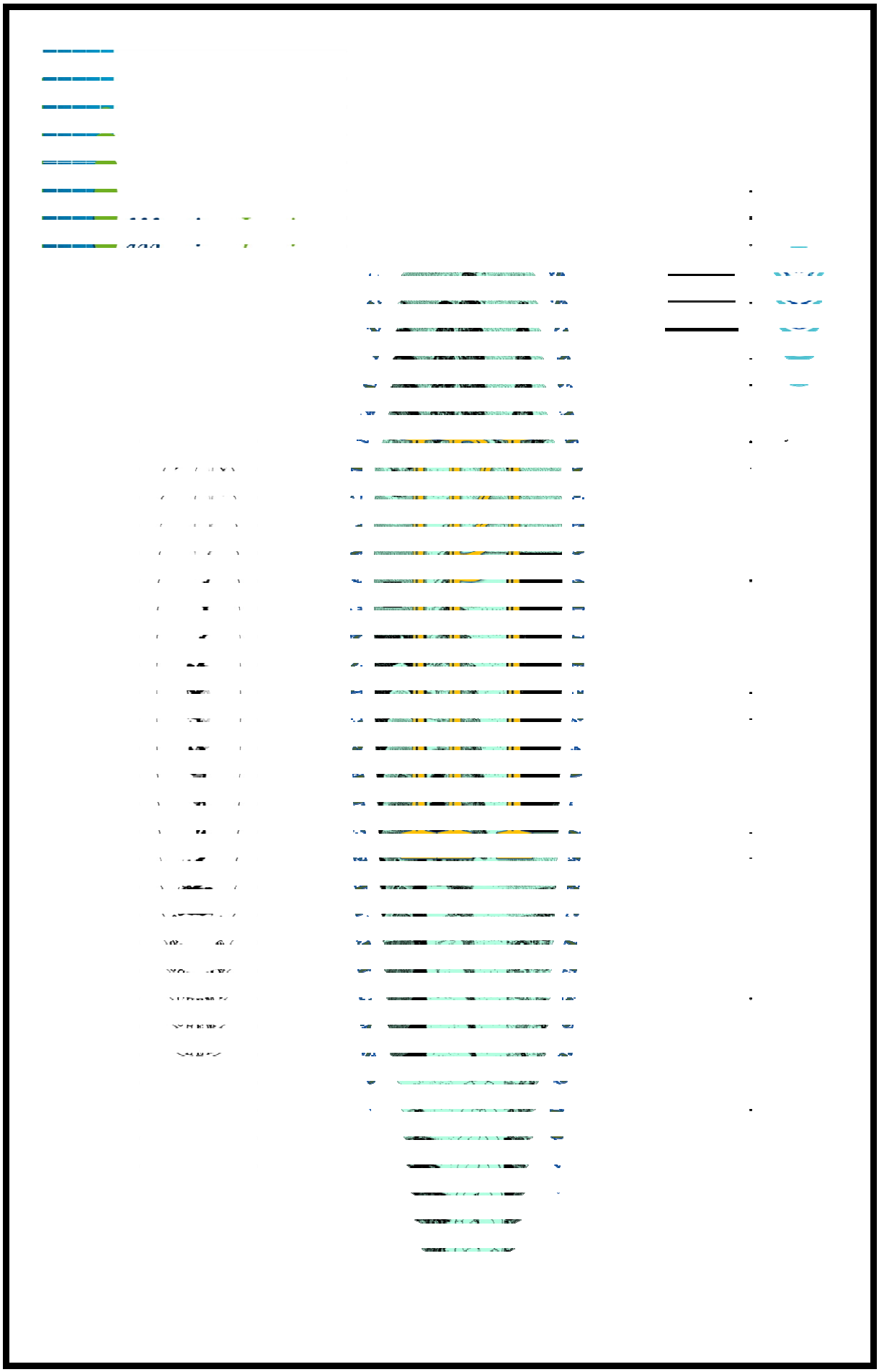
Danhostel, Hillerød, Denmark. 12-16 November 2017

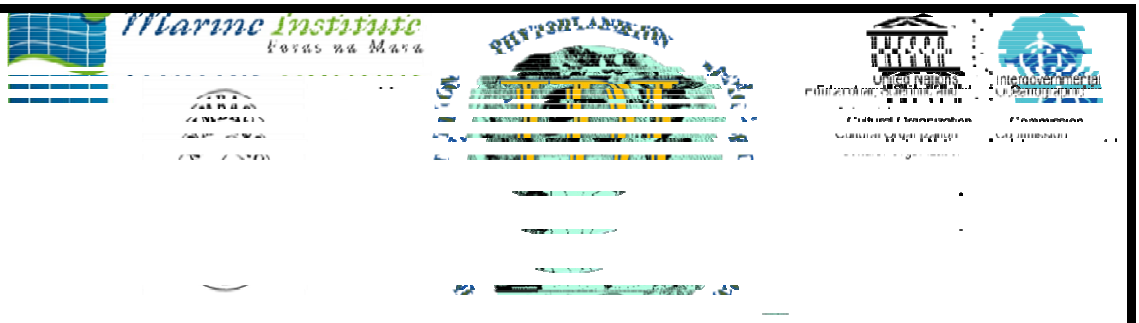
	Morning, 9.00-12.00	**Afternoon, 13.30-17.00**
Sunday, 12 Nov		Arrival to the venue, arr. time 16.00 Danhostel, Lejrskolevej 4, 3400 Hilleroed, Sandwich is served in the evening
Monday, 13 Nov	Results and discussion of the intercalibration and taxonomic quiz, Rafael, Debbie	Presentations by the participants Lecture and microscope demonstration: 'Non-preservable flagellates', Jacob
Tuesday, 14 Nov	Lecture and microscope demonstration: Taxonomic update on diatoms with focus on *Pseudo-nitzshia* and *Chaetoceros*, Nina	Taxonomic update on diatoms, continued Lecture Niels Daugbjerg: Molecular tools to identify and enumerate fish killing algae.
Wednesday, 15 Nov	Lecture and microscope demonstration: The Diplopsalis-group, Jacob Presentations by the participants, continued	Microscopy of own samples, mixed samples from different areas, Jacob Various news from recent publications, conferences etc. Rafael & Jacob
Thursday, 16 Nov	Breakfast, check-out at 10.00	

ANNEX V: Participating Laboratories

Company Name	Company Name	Company Name
Marine Institute	Fondazione Centro Ricerche Marine	National Institute of Science and Technology of the Sea
Microalgal Services	Scottish Environment Protection Agency	Sir Alister Hardy Foundation for Ocean Science (SAHFOS)
Orbicon A/S	DPIPWE	Instituto de Fomento Pesquero
Agri Food and Biosciences Institute (AFBI)	ARPAL	University of the Basque Country
ARPA FVG	ARPAE	IRTA
SAMS Research Services Ltd (SRSL)	IFREMER	ARPA Campania
UMR Marbec (IRD)	ARPA Puglia Dap Brindisi	LIttoral ENvironnement et Sociétés (LIENSs) - UMR 7266
Wageningen Marine Research	Biologia delle Acque - DAP Taranto - ARPA Pugia	Institut National de Recherche Halieutique
Istituto Zooprofilattico Sperimentale delle Venezie	Polo specializzazione Biologia avanzata Acque	ARPA Puglia - DAP BARI - U.O.S. Biologia delle Acque
Institut za oceanografiju i ribarstvo (IOR) (Institute of Oceanography and Fisheries)	Northern Ireland Environment Agency (NIEA)	IPMA (Portuguese Institute for Sea and Atmosphere)
Institute of Marine Research, Flødevigen	Dipartimento Provinciale di Lecce - ARPA Pugl a	Marine Scotland Marine Laboratory
Koeman en Bijkerk bv	Aristotle University of Thessaloniki	SMHI / Swedish Meteorological and Hydrological Institute
Cefas	Istituto Zooprofilattico Sperimentale della Sar legna	MEA-nl
NSF INASSA S.A.C.	APEM Limited	Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping
Laboratorio de Control de Calidad de los Recursos Pesqueros	Sydney Water	Inspectorate Services Perú S.A.C.

ANNEX VI: Statement of performance certificate





Biological Effects Quality Assurance in Monitoring Programmes / National Marine Biological Analytical Quality Control Scheme / Marine Institute

STATEMENT OF PERFORMANCE

Phytoplankton Component of Community Analysis Year 2017

Participant details:

Name of organisation:

Country:

Participant:

Year of joining:

Years of participation:

Statement Issued:	XX/XX/2017
Statement Number:	MI-IPI-17-001

Summary of results:

Component Name	Subcontracted	Results		Identification
		Z-score (+/- 2 Sigma limit)		
IPI 2017 Phytoplankton abundance and composition PHY-ICN-17-MI1	Marine Institute	*Akashiwo sanguinea*		
		Scrippsiella trochoidea		
		Tieres sinensis		
		Azadinium spinosum		
		Cheatoceros danicus		
		Pseudo-nitzschia pungens		
		Ceratoneis closterium		
		Cheatoceros curvisetus		
		Prorocentrum mexicanum		

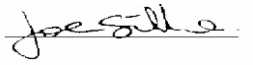
Overall Result Taxonomic quiz (Pass Mark 70%, over 90% proficient)		
IPI 2017 Phytoplankton Taxonomy quiz PHY-ICN-17-MI1	**IOC Science and communication Centre on Harmful algae**	

n/a: component not applicable to the participant; n/p: Participant not participating in this component; n/r: no data received from participant

The list shows the results for all components in which the participated. See over for laboratory details.

Notes:

Details certified by:



Joe Silke
Section manager

Rafael Gallardo Salas
Scientific Technical Officer

ANNEX VI

Description of Scheme components and associated performance standards

In the table overleaf, for those components on which a standard has been set, 'Proficient', 'Good', and ' "Pass" flags indicate that the participants results met or exceeded the standards set by the Bequalm Phytoplankton scheme; 'Participated' flag indicates that the candidate participated in the exercise but did not reach these standards. The Scheme standards are under continuous review.

Component	Annual exercises	Purpose	Description	Standard
Phytoplankton Enumeration Exercise	1	To assess the performance of participants using the Utermöhl cell counting technique on the analysis of prepared sample/s of Seawater preserved in Lugol's iodine spiked using biological or synthetic materials.	Prepared marine water sample/s distributed to participants for abundance and composition of marine phytoplankton species	Participants are required to enumerate the test/s material/s and give a result to within ±2SD or sigma limits of the robust average/s. The robust average/s is/are the mean calculated from the consensus values by the participants following the assessment criteria as set out in ISO13528, Annex c robust analysis: Algorithm A. Participants are also required to identify the organisms found in the samples correctly to the required taxon. Flags will be given as correct, incorrect or not identified
Phytoplankton Oceanteacher online HAB quiz	1	To assess the accuracy of identification of a wide range of Marine phytoplankton organisms.	This is a proficiency test in the identification of marine phytoplankton The exercise tests the participant's ability to identify organisms from photographs and/or illustrations supplied.	The pass mark for the identification exercise is 70%. Results above 90% are deemed proficient, results above 80% are deemed good, results above 70% are deemed acceptable, and results below 70% are reported as "Participated". There are no standards for phytoplankton identification. These exercises are unique and made from scratch.

ANNEX VII: Homogeneity and stability test using ProLab plus Akashiwo sanguinea homogeneity test

IPI2017

Survey of homogeneity test results

Sample: Water 17 Date: 20/09/2017
Measurand: Akashiwo sanguinea

Mean:	1662 cells/Litre
Analytical standard deviation:	194
Heterogeneity standard deviation s(samples):	579
Standard deviation for proficiency assessment:	80 (Manual)

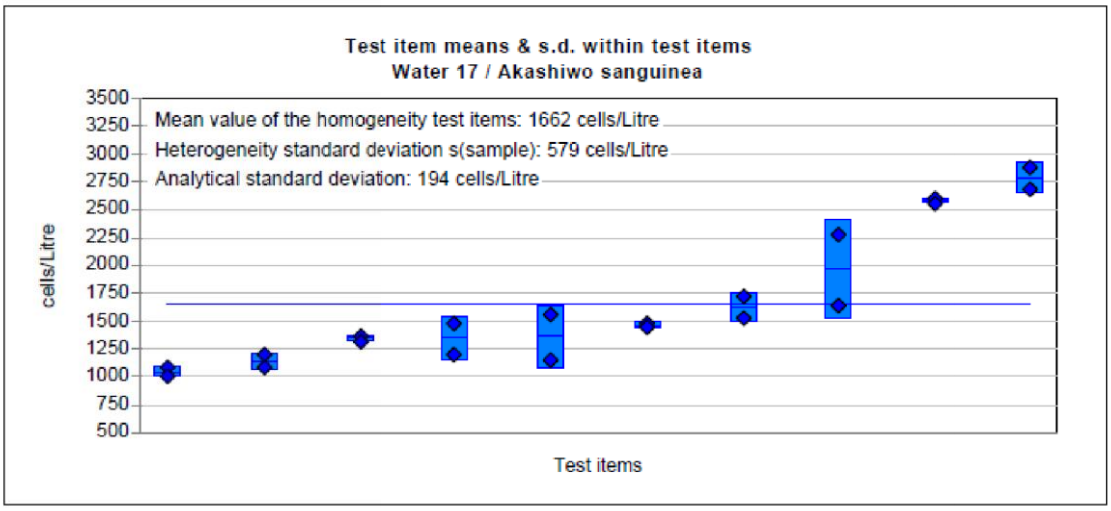
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand Akashiw o sanguinea w as analyzed 2 times. The mean across all 10 proficiency test items is 1662 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 194 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 579 cells/Litre.

F test
According to the F test, the heterogeneity standard deviation is significantly different from 0 (significance level 5 %), therefore the proficiency test items should be considered heterogeneous according to this criterion.

ISO 13528:2015 - Test for adequate homogeneity
According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment 80 cells/Litre (Manual), therefore the proficiency test items cannot be considered as adequately homogeneous, i.e. they have to be considered heterogeneous.

ISO 13528:2015 - Test for significant heterogeneity
The proficiency test items exhibit significant heterogeneity (5 % significance level). The specified standard deviation for proficiency assessment is 80 cells/Litre (Manual). The heterogeneity standard deviation s(sample) equals 579 cells/Litre and is significantly too high.



IPI2017

Survey of stability test results

Sample: Water 17 Date: 20/09/2017
Measurand: Akashiwo sanguinea

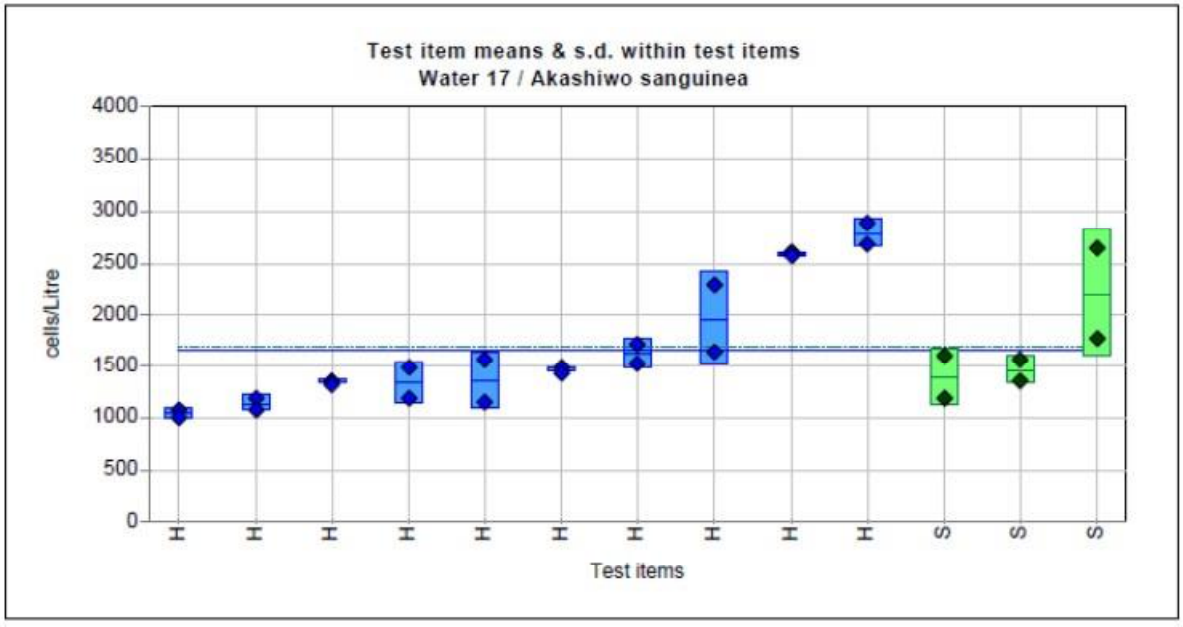
Mean of homogeneity:	1662 cells/Litre
Mean of stability:	1687 cells/Litre
Uncertainty of mean for homogeneity measurement:	188 cells/Litre
Uncertainty of mean for stability measurement:	257 cells/Litre
Standard deviation for proficiency assessment:	80 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand Akashiw o sanguinea has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 1662 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 1687 cells/Litre.
Therefore, the mean value of the stability analysis lies 1.5 % above the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference betw een the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
Although for the given standard deviation for proficiency assessment of 80 cells/Litre, the proficiency test items may not be considered as adequately stable, the expanded acceptance criterion by adding the uncertainty of the difference to the standard deviation for proficiency assessment is fulfilled. Hence, stability of the proficiency test items is given only according to the expanded criterion of ISO 13528:2015.

By means of the t test it is checked w hether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
The difference of the mean values is not statistically significant. Therefore the proficiency test items can be considered stable according to the t test.



IPI2017

Survey of homogeneity test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Azadinium spinosum**

Mean:	4190 cells/Litre
Analytical standard deviation:	433
Heterogeneity standard deviation s(samples):	1524
Standard deviation for proficiency assessment:	1384 (Manual)

Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand Azadinium spinosum w as analyzed 2 times. The mean across all 10 proficiency test items is 4190 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 433 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 1524 cells/Litre.

F test

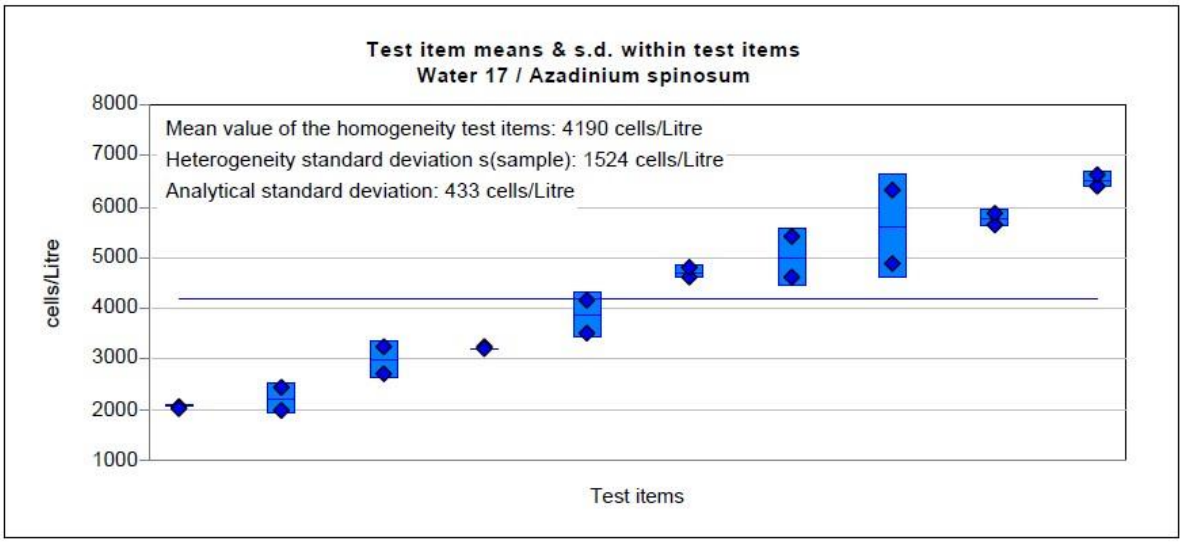
According to the F test, the heterogeneity standard deviation is significantly different from 0 (significance level 5 %), therefore the proficiency test items should be considered heterogeneous according to this criterion.

ISO 13528:2015 - Test for adequate homogeneity

According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment 1384 cells/Litre (Manual), therefore the proficiency test items cannot be considered as adequately homogeneous, i.e. they have to be considered heterogeneous.

ISO 13528:2015 - Test for significant heterogeneity

The proficiency test items exhibit significant heterogeneity (5 % significance level). The specified standard deviation for proficiency assessment is 1384 cells/Litre (Manual). The heterogeneity standard deviation s(sample) equals 1524 cells/Litre and is significantly too high.



IPI2017

Survey of stability test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Azadinium spinosum**

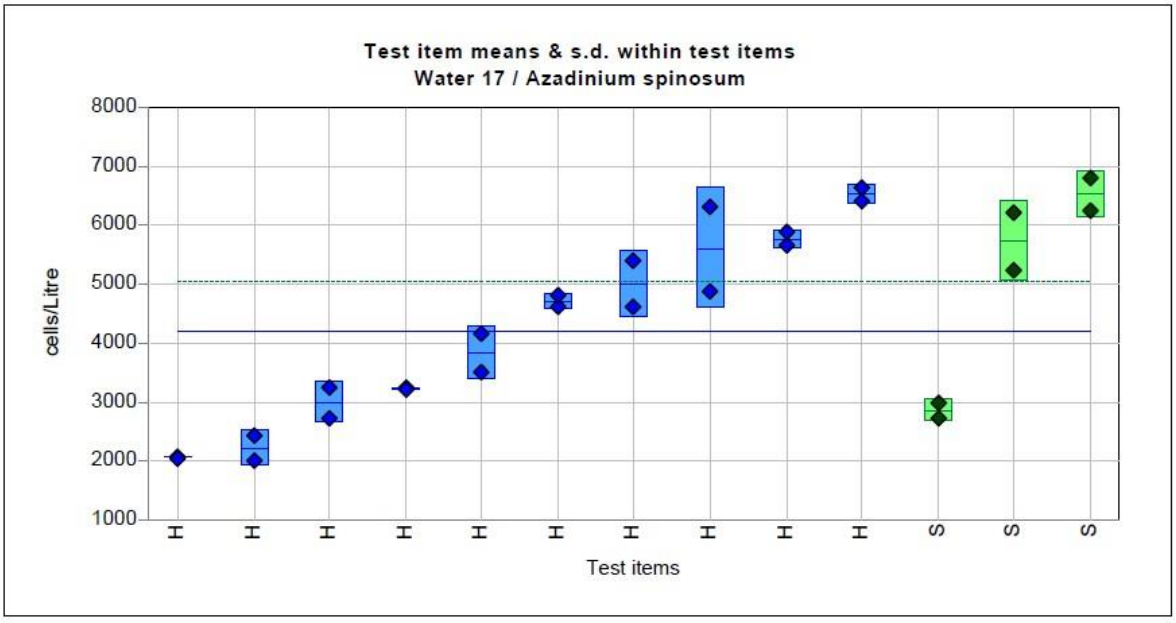
Mean of homogeneity:	4190 cells/Litre
Mean of stability:	5033 cells/Litre
Uncertainty of mean for homogeneity measurement:	492 cells/Litre
Uncertainty of mean for stability measurement:	1111 cells/Litre
Standard deviation for proficiency assessment:	1384 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand Azadinium spinosum has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 4190 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 5033 cells/Litre.
Therefore, the mean value of the stability analysis lies 20.1 % above the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference betw een the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
Although for the given standard deviation for proficiency assessment of 1384 cells/Litre, the proficiency test items may not be considered as adequately stable, the expanded acceptance criterion by adding the uncertainty of the difference to the standard deviation for proficiency assessment is fulfilled. Hence, stability of the proficiency test items is given only according to the expanded criterion of ISO 13528:2015.

By means of the t test it is checked w hether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
The difference of the mean values is not statistically significant. Therefore the proficiency test items can be considered stable according to the t test.



IPI2017

Survey of homogeneity test results

Sample: Water 17 Date: 20/09/2017
Measurand: Ceratoneis closterium

Mean:	3558 cells/Litre
Analytical standard deviation:	556
Heterogeneity standard deviation s(samples):	955
Standard deviation for proficiency assessment:	1355 (Manual)

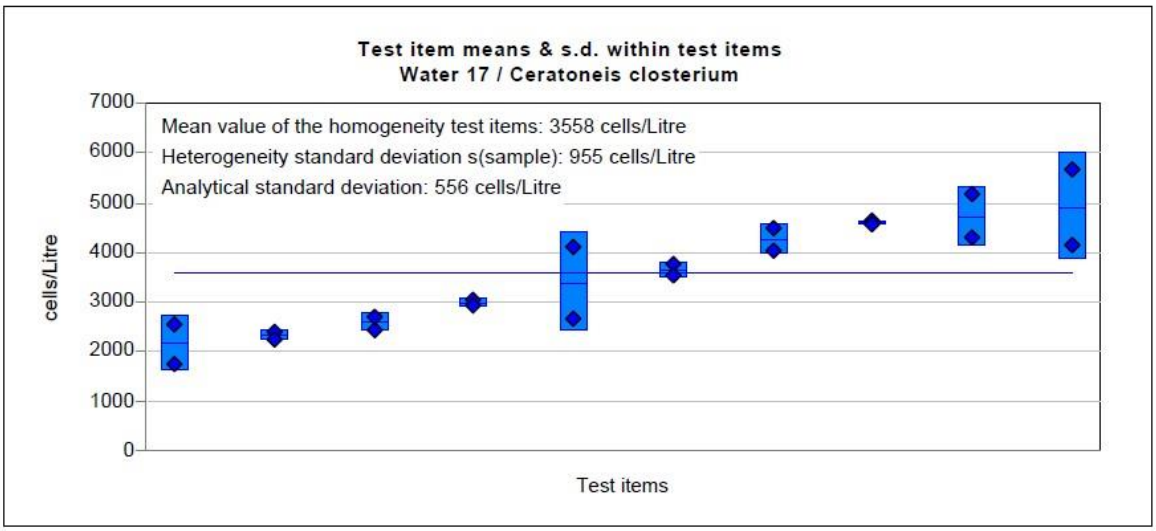
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand Ceratoneis closterium w as analyzed 2 times. The mean across all 10 proficiency test items is 3558 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 556 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 955 cells/Litre.

F test
According to the F test, the heterogeneity standard deviation is significantly different from 0 (significance level 5 %), therefore the proficiency test items should be considered heterogeneous according to this criterion.

ISO 13528:2015 - Test for adequate homogeneity
According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment 1355 cells/Litre (Manual), therefore the proficiency test items cannot be considered as adequately homogeneous, i.e. they have to be considered heterogeneous.

ISO 13528:2015 - Test for significant heterogeneity
The proficiency test items exhibit significant heterogeneity (5 % significance level). The specified standard deviation for proficiency assessment is 1355 cells/Litre (Manual). The heterogeneity standard deviation s(sample) equals 955 cells/Litre and is significantly too high.



IPI2017

Survey of stability test results

Sample: Water 17 Date: 20/09/2017
Measurand: Ceratoneis closterium

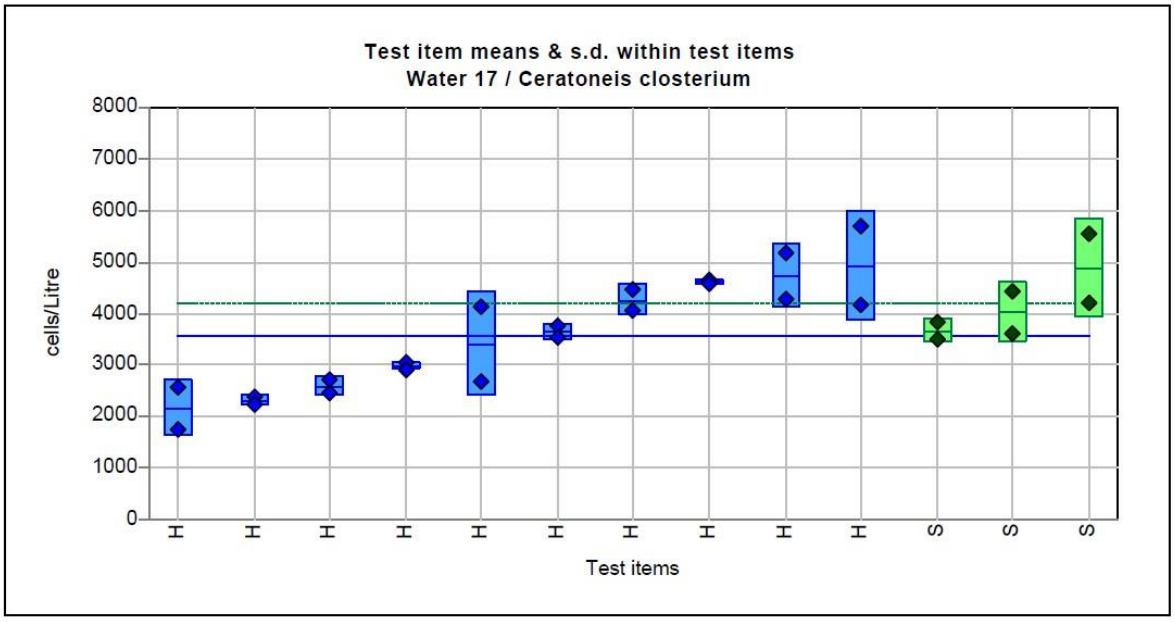
Mean of homogeneity:	3558 cells/Litre
Mean of stability:	4187 cells/Litre
Uncertainty of mean for homogeneity measurement:	326 cells/Litre
Uncertainty of mean for stability measurement:	362 cells/Litre
Standard deviation for proficiency assessment:	1355 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand Ceratoneis closterium has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 3558 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 4187 cells/Litre.
Therefore, the mean value of the stability analysis lies 17.7 % above the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference between the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
Although for the given standard deviation for proficiency assessment of 1355 cells/Litre, the proficiency test items may not be considered as adequately stable, the expanded acceptance criterion by adding the uncertainty of the difference to the standard deviation for proficiency assessment is fulfilled. Hence, stability of the proficiency test items is given only according to the expanded criterion of ISO 13528:2015.

By means of the t test it is checked whether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
The difference of the mean values is not statistically significant. Therefore the proficiency test items can be considered stable according to the t test.



Chaetoceros curvisetus

ANNEX VII: homogeneity test

IPI2017

Survey of homogeneity test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Chaetoceros curvisetus**

Mean:	35118 cells/Litre
Analytical standard deviation:	3255
Heterogeneity standard deviation s(samples):	2605
Standard deviation for proficiency assessment:	10888 (Manual)

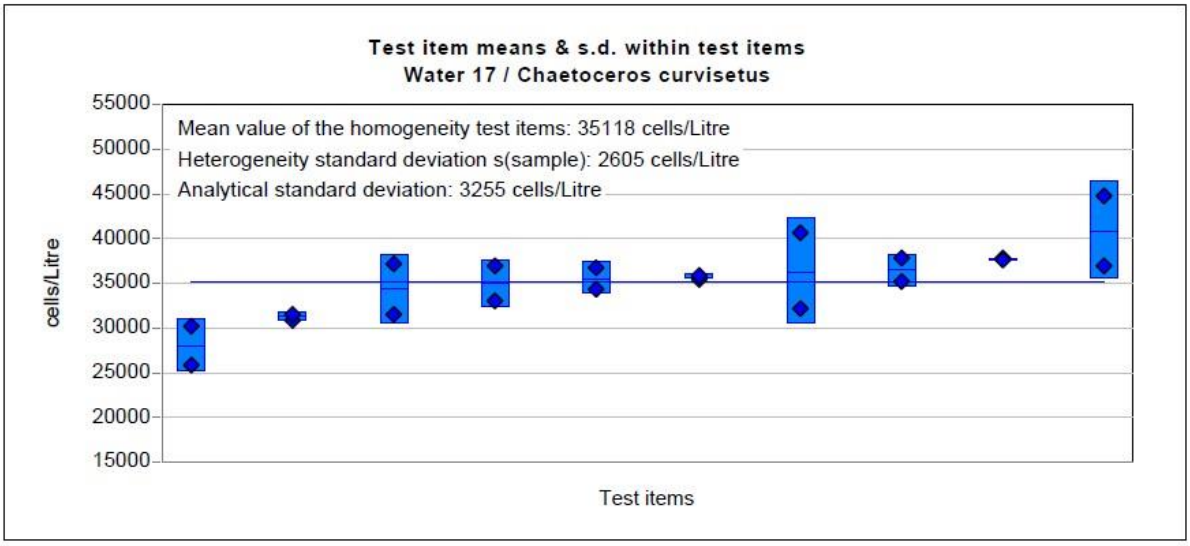
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand Chaetoceros curvisetus w as analyzed 2 times. The mean across all 10 proficiency test items is 35118 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 3255 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 2605 cells/Litre.

F test
According to the F test, the heterogeneity standard deviation is not significantly different from 0 (significance level 5 %), therefore the proficiency test items can be considered sufficiently homogeneous according to this criterion.

ISO 13528:2015 - Test for adequate homogeneity
According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is less than 30 % of the standard deviation for proficiency assessment 10888 cells/Litre (Manual), therefore the proficiency test items can be considered adequately homogeneous according to ISO 13528:2015.

ISO 13528:2015 - Test for significant heterogeneity
For the proficiency test items, no significant heterogeneity can be identified, therefore they can be considered homogeneous.



Chaetoceros curvisetus

ANNEX VII: stability test

IPI2017

Survey of stability test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Chaetoceros curvisetus**

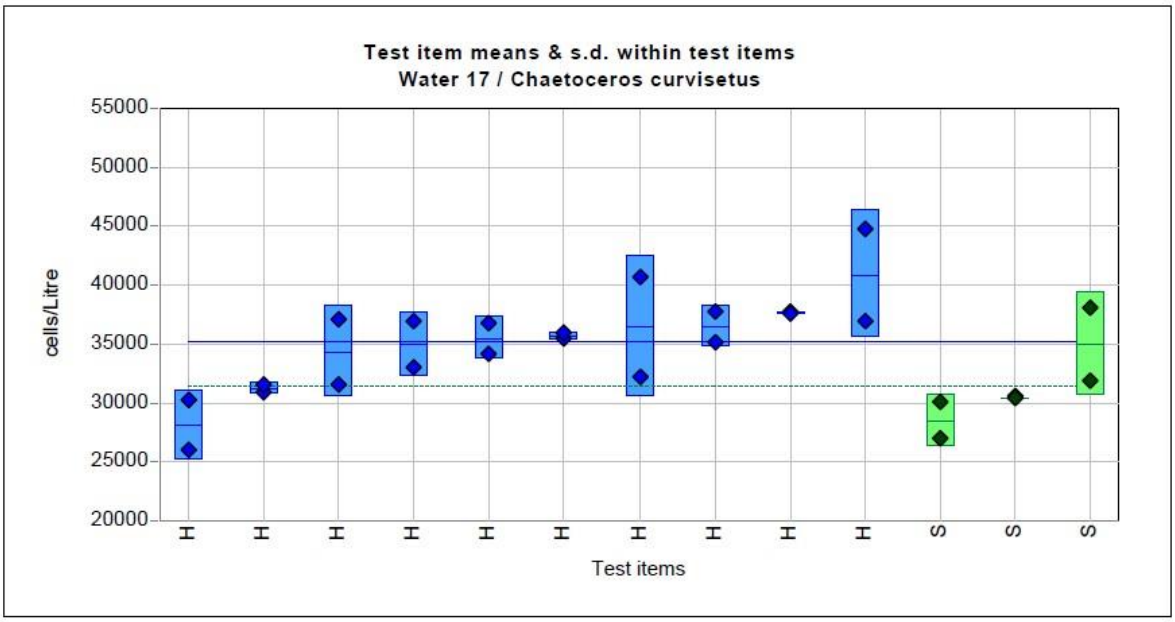
Mean of homogeneity:	35118 cells/Litre
Mean of stability:	31320 cells/Litre
Uncertainty of mean for homogeneity measurement:	1099 cells/Litre
Uncertainty of mean for stability measurement:	1909 cells/Litre
Standard deviation for proficiency assessment:	10888 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand Chaetoceros curvisetus has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 35118 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 31320 cells/Litre.
Therefore, the mean value of the stability analysis lies 10.8 % below the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference betw een the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
Although for the given standard deviation for proficiency assessment of 10888 cells/Litre, the proficiency test items may not be considered as adequately stable, the expanded acceptance criterion by adding the uncertainty of the difference to the standard deviation for proficiency assessment is fulfilled. Hence, stability of the proficiency test items is given only according to the expanded criterion of ISO 13528:2015.

By means of the t test it is checked w hether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
There is a statistically significant difference betw een the mean values. Therefore the proficiency test items cannot be considered stable according to the t test.



Chaetoceros danicus

ANNEX VII: homogeneity test

IPI2017

Survey of homogeneity test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Chaetoceros danicus**

Mean:	9800 cells/Litre
Analytical standard deviation:	1395
Heterogeneity standard deviation s(samples):	738
Standard deviation for proficiency assessment:	3376 (Manual)

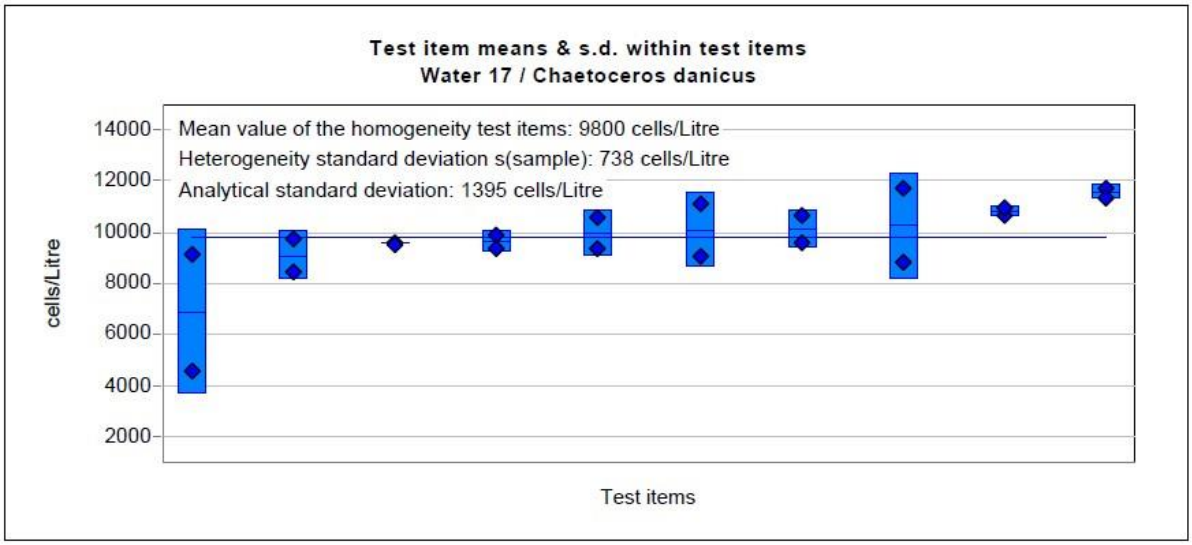
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand Chaetoceros danicus w as analyzed 2 times. The mean across all 10 proficiency test items is 9800 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 1395 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 738 cells/Litre.

F test
According to the F test, the heterogeneity standard deviation is not significantly different from 0 (significance level 5 %), therefore the proficiency test items can be considered sufficiently homogeneous according to this criterion.

ISO 13528:2015 - Test for adequate homogeneity
According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is less than 30 % of the standard deviation for proficiency assessment 3376 cells/Litre (Manual), therefore the proficiency test items can be considered adequately homogeneous according to ISO 13528:2015.

ISO 13528:2015 - Test for significant heterogeneity
For the proficiency test items, no significant heterogeneity can be identified, therefore they can be considered homogeneous.



Chaetoceros danicus

IPI2017

Survey of stability test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Chaetoceros danicus**

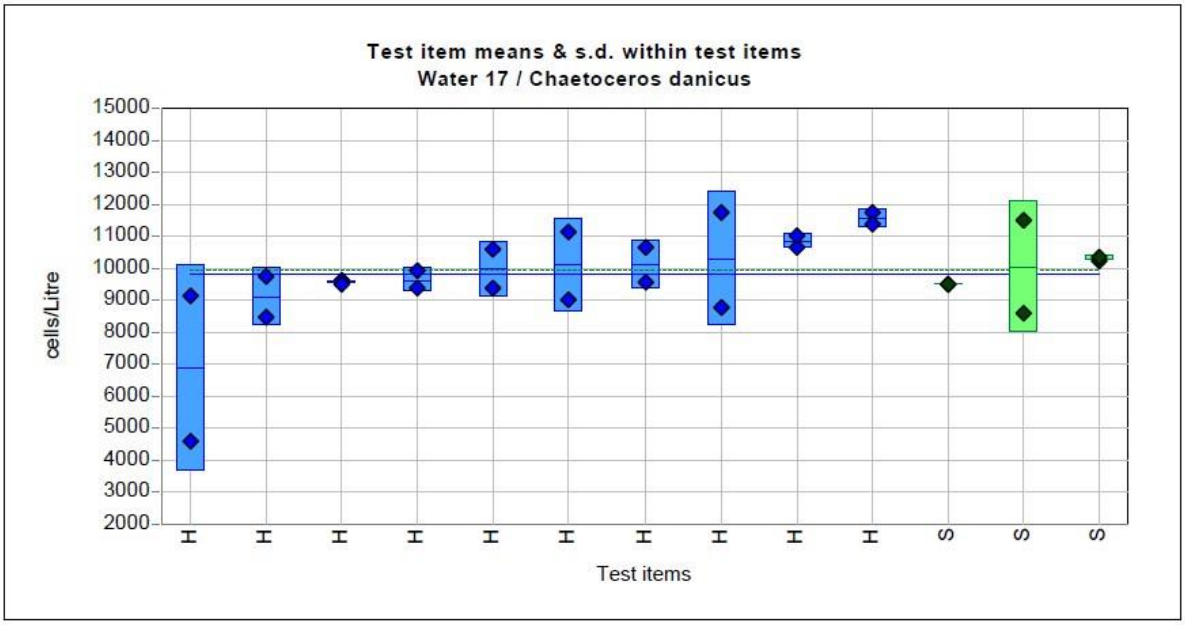
Mean of homogeneity:	9800 cells/Litre
Mean of stability:	9947 cells/Litre
Uncertainty of mean for homogeneity measurement:	390 cells/Litre
Uncertainty of mean for stability measurement:	480 cells/Litre
Standard deviation for proficiency assessment:	3376 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand Chaetoceros danicus has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 9800 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 9947 cells/Litre.
Therefore, the mean value of the stability analysis lies 1.5 % above the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference betw een the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
Therefore, given the standard deviation for proficiency assessment of 3376 cells/Litre, the proficiency test items may be considered as adequately stable.

By means of the t test it is checked w hether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
The difference of the mean values is not statistically significant. Therefore the proficiency test items can be considered stable according to the t test.



ANNEX VII: Prorocentrum mexicanum homogeneity test

IPI2017

Survey of homogeneity test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Prorocentrum mexicanum**

Mean:	5018 cells/Litre
Analytical standard deviation:	455
Heterogeneity standard deviation s(samples):	617
Standard deviation for proficiency assessment:	612 (Manual)

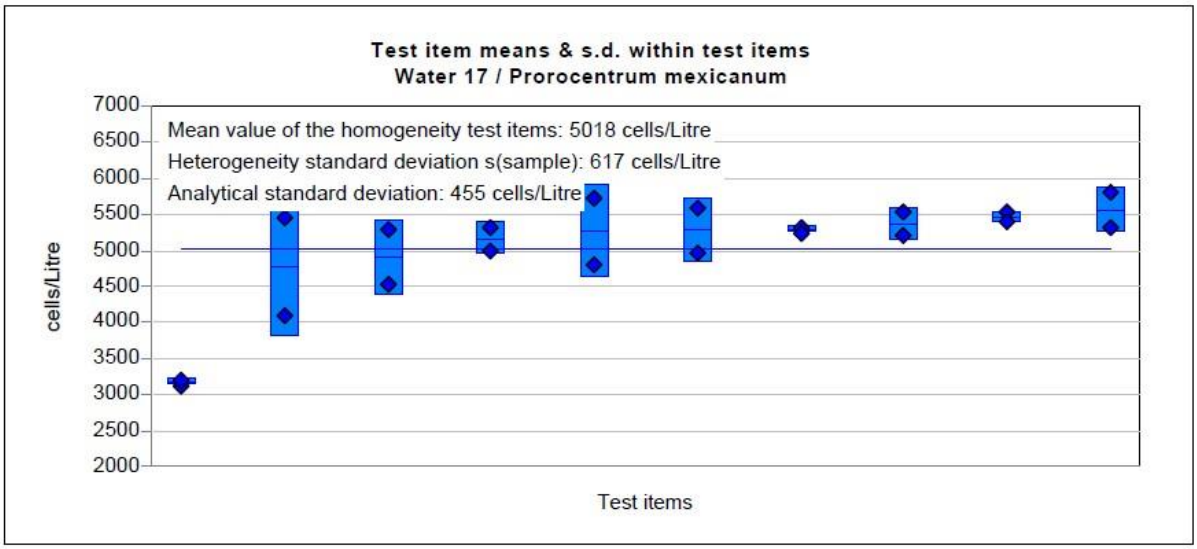
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand Prorocentrum mexicanum w as analyzed 2 times. The mean across all 10 proficiency test items is 5018 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 455 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 617 cells/Litre.

F test
According to the F test, the heterogeneity standard deviation is significantly different from 0 (significance level 5 %), therefore the proficiency test items should be considered heterogeneous according to this criterion.

ISO 13528:2015 - Test for adequate homogeneity
According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment 612 cells/Litre (Manual), therefore the proficiency test items cannot be considered as adequately homogeneous, i.e. they have to be considered heterogeneous.

ISO 13528:2015 - Test for significant heterogeneity
The proficiency test items exhibit significant heterogeneity (5 % significance level). The specified standard deviation for proficiency assessment is 612 cells/Litre (Manual). The heterogeneity standard deviation s(sample) equals 617 cells/Litre and is significantly too high.



IPI2017

Survey of stability test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Prorocentrum mexicanum**

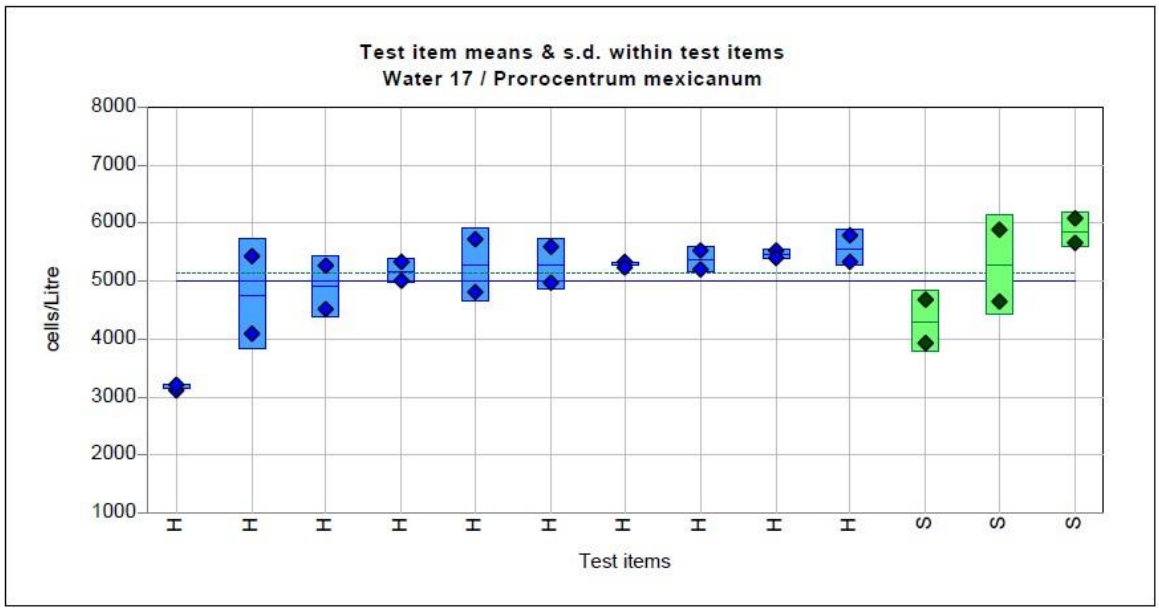
Mean of homogeneity:	5018 cells/Litre
Mean of stability:	5140 cells/Litre
Uncertainty of mean for homogeneity measurement:	220 cells/Litre
Uncertainty of mean for stability measurement:	454 cells/Litre
Standard deviation for proficiency assessment:	612 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand Prorocentrum mexicanum has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 5018 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 5140 cells/Litre.
Therefore, the mean value of the stability analysis lies 2.4 % above the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference betw een the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
Therefore, given the standard deviation for proficiency assessment of 612 cells/Litre, the proficiency test items may be considered as adequately stable.

By means of the t test it is checked w hether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
The difference of the mean values is not statistically significant. Therefore the proficiency test items can be considered stable according to the t test.



ANNEX VII: Pseudo-nitzschia pungens homogeneity test

IPI2017

Survey of homogeneity test results

Sample: Water 17 Date: 20/09/2017
Measurand: pPseudo-nitzschia pungens

Mean:	28684 cells/Litre
Analytical standard deviation:	3168
Heterogeneity standard deviation s(samples):	1794
Standard deviation for proficiency assessment:	4835 (Manual)

Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand pPseudo-nitzschia pungens w as analyzed 2 times. The mean across all 10 proficiency test items is 28684 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 3168 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 1794 cells/Litre.

F test

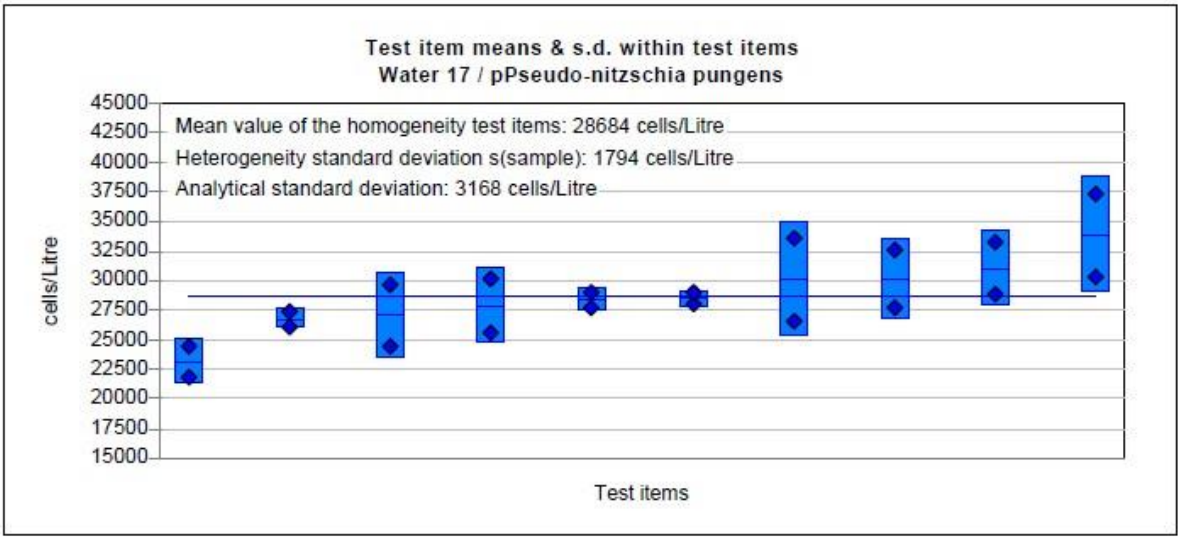
According to the F test, the heterogeneity standard deviation is not significantly different from 0 (significance level 5 %), therefore the proficiency test items can be considered sufficiently homogeneous according to this criterion.

ISO 13528:2015 - Test for adequate homogeneity

According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment 4835 cells/Litre (Manual), therefore the proficiency test items cannot be considered as adequately homogeneous, i.e. they have to be considered heterogeneous.

ISO 13528:2015 - Test for significant heterogeneity

For the proficiency test items, no significant heterogeneity can be identified, although the heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment. Hence, the proficiency test items can be considered homogeneous.



IPI2017

Survey of stability test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **pPseudo-nitzschia pungens**

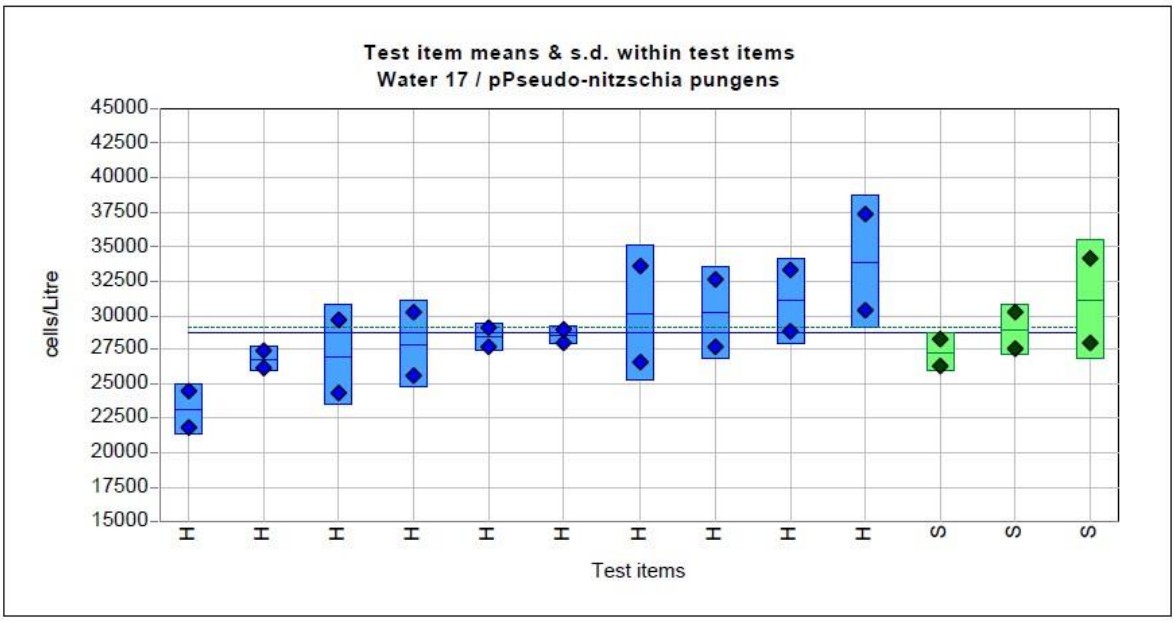
Mean of homogeneity:	28684 cells/Litre
Mean of stability:	29080 cells/Litre
Uncertainty of mean for homogeneity measurement:	908 cells/Litre
Uncertainty of mean for stability measurement:	1169 cells/Litre
Standard deviation for proficiency assessment:	4835 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand pPseudo-nitzschia pungens has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 28684 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 29080 cells/Litre.
Therefore, the mean value of the stability analysis lies 1.4 % above the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference betw een the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
Therefore, given the standard deviation for proficiency assessment of 4835 cells/Litre, the proficiency test items may be considered as adequately stable.

By means of the t test it is checked w hether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
The difference of the mean values is not statistically significant. Therefore the proficiency test items can be considered stable according to the t test.



ANNEX VII: Scrippsiella trochoidea homogeneity test

IPI2017

Survey of homogeneity test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Scrippsiella trochoidea**

Mean:	2620 cells/Litre
Analytical standard deviation:	284
Heterogeneity standard deviation s(samples):	408
Standard deviation for proficiency assessment:	563 (Manual)

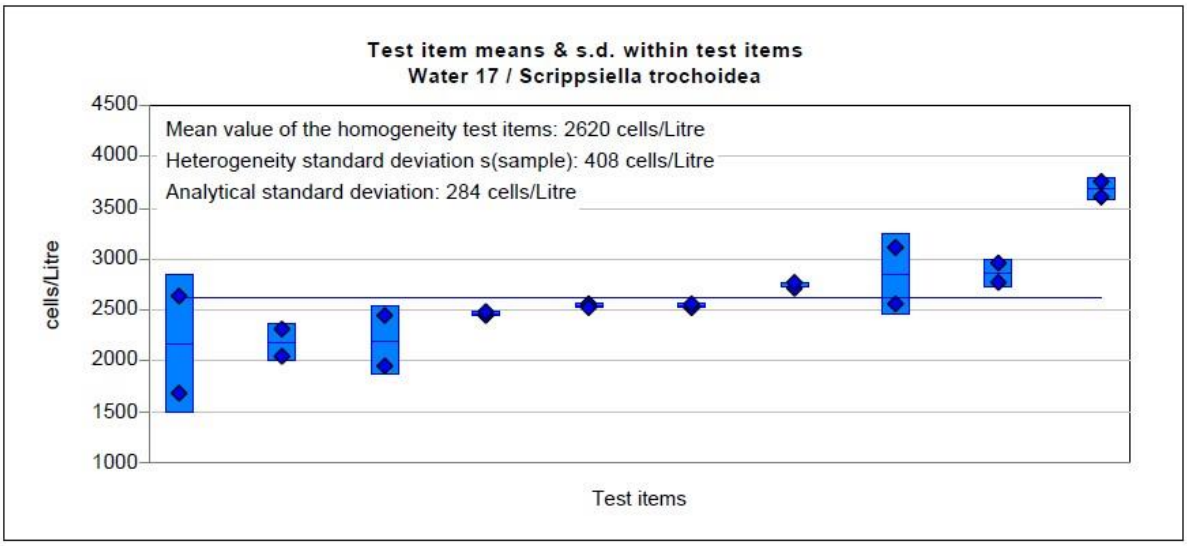
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand Scrippsiella trochoidea w as analyzed 2 times. The mean across all 10 proficiency test items is 2620 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 284 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 408 cells/Litre.

F test
According to the F test, the heterogeneity standard deviation is significantly different from 0 (significance level 5 %), therefore the proficiency test items should be considered heterogeneous according to this criterion.

ISO 13528:2015 - Test for adequate homogeneity
According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment 563 cells/Litre (Manual), therefore the proficiency test items cannot be considered as adequately homogeneous, i.e. they have to be considered heterogeneous.

ISO 13528:2015 - Test for significant heterogeneity
The proficiency test items exhibit significant heterogeneity (5 % significance level). The specified standard deviation for proficiency assessment is 563 cells/Litre (Manual). The heterogeneity standard deviation s(sample) equals 408 cells/Litre and is significantly too high.



ANNEX VII: Scrippsiella trochoidea stability test

Survey of stability test results

Sample: Water 17 Date: 20/09/2017
Measurand: Scrippsiella trochoidea

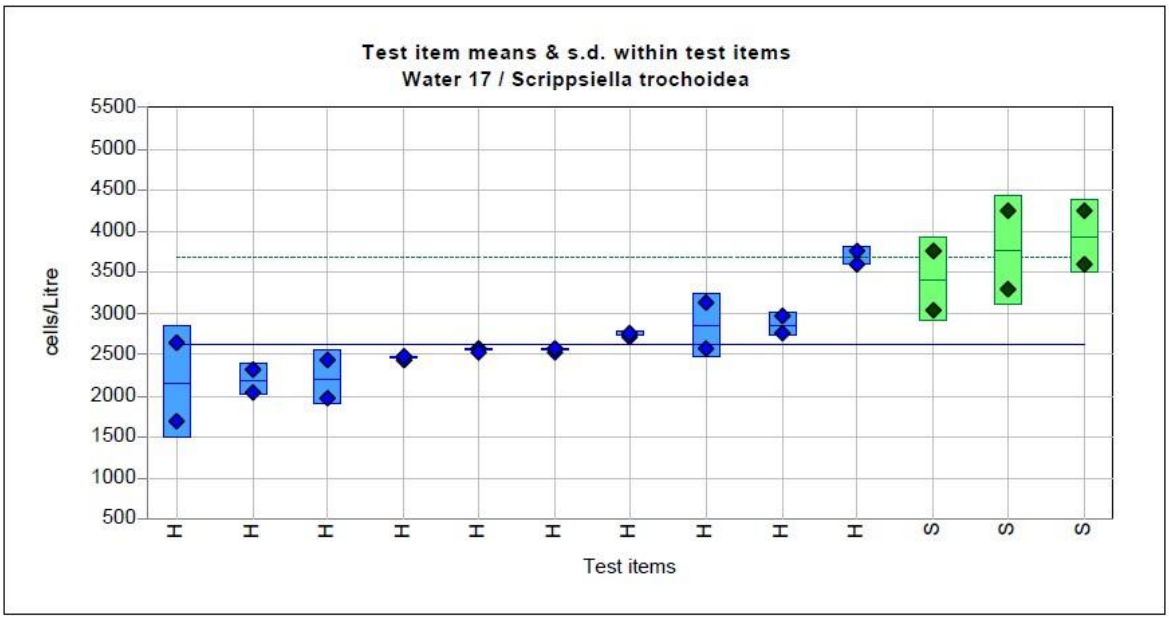
Mean of homogeneity:	2620 cells/Litre
Mean of stability:	3693 cells/Litre
Uncertainty of mean for homogeneity measurement:	144 cells/Litre
Uncertainty of mean for stability measurement:	227 cells/Litre
Standard deviation for proficiency assessment:	563 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand Scrippsiella trochoidea has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 2620 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 3693 cells/Litre.
Therefore, the mean value of the stability analysis lies 41.0 % above the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference betw een the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
For the given the standard deviation for proficiency assessment of 563 cells/Litre, the proficiency test items may not be considered as adequately stable. Not even if the uncertainty of the difference is taken into account (according to the expanded acceptance criterion of ISO 13528:2015).

By means of the t test it is checked w hether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
There is a statistically significant difference betw een the mean values. Therefore the proficiency test items cannot be considered stable according to the t test.



ANNEX VII: Trieres sinensis homogeneity test

IPI2017

Survey of homogeneity test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Trieres Sinensis**

Mean:	3168 cells/Litre
Analytical standard deviation:	554
Heterogeneity standard deviation s(samples):	0
Standard deviation for proficiency assessment:	383 (Manual)

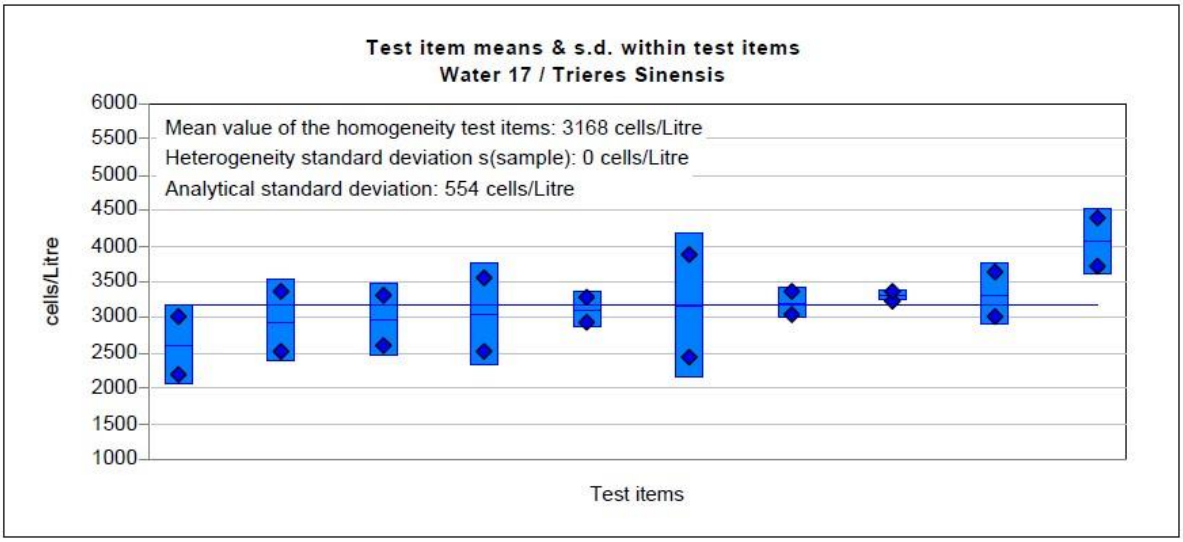
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 17 w ere randomly selected, and the measurand Trieres Sinensis w as analyzed 2 times. The mean across all 10 proficiency test items is 3168 cells/Litre. The standard deviation w ithin proficiency test items s(analytical) (=analytical precision) is 554 cells/Litre, and the standard deviation betw een proficiency test items s(sample) is 0 cells/Litre.

F test
The heterogeneity standard deviation s(sample) is 0 cells/Litre, and hence no statistically significant difference to 0 can be detected by the F test.

ISO 13528:2015 - Test for adequate homogeneity
According to ISO 13528:2015, the heterogeneity standard deviation s(sample) betw een the proficiency test items should not exceed 30 % of the standard deviation for proficiency assessment.
The heterogeneity standard deviation is less than 30 % of the standard deviation for proficiency assessment 383 cells/Litre (Manual), therefore the proficiency test items can be considered adequately homogeneous according to ISO 13528:2015.

ISO 13528:2015 - Test for significant heterogeneity
For the proficiency test items, no significant heterogeneity can be identified, therefore they can be considered homogeneous.



IPI2017

Survey of stability test results

Sample: **Water 17** Date: 20/09/2017
Measurand: **Trieres Sinensis**

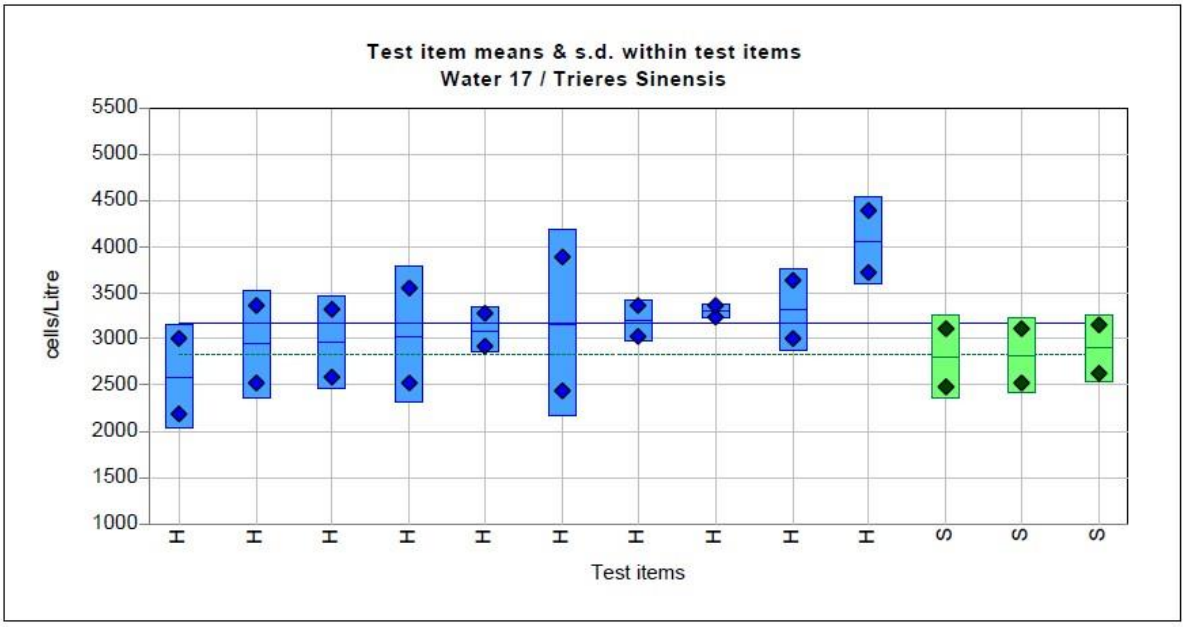
Mean of homogeneity:	3168 cells/Litre
Mean of stability:	2840 cells/Litre
Uncertainty of mean for homogeneity measurement:	124 cells/Litre
Uncertainty of mean for stability measurement:	170 cells/Litre
Standard deviation for proficiency assessment:	383 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 17 have been selected randomly and the measurand Trieres Sinensis has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 3168 cells/Litre, the mean value across all proficiency test items of the stability analysis equals 2840 cells/Litre.
Therefore, the mean value of the stability analysis lies 10.4 % below the mean value of the homogeneity analysis.

According to ISO 13528:2015, the absolute difference betw een the mean values of the homogeneity analysis and the stability analysis should not exceed 30 % of the standard deviation for proficiency assessment.
Although for the given standard deviation for proficiency assessment of 383 cells/Litre, the proficiency test items may not be considered as adequately stable, the expanded acceptance criterion by adding the uncertainty of the difference to the standard deviation for proficiency assessment is fulfilled. Hence, stability of the proficiency test items is given only according to the expanded criterion of ISO 13528:2015.

By means of the t test it is checked w hether the mean values of the homogeneity analysis and the stability analysis differ significantly (level of significance 5 %).
The difference of the mean values is not statistically significant. Therefore the proficiency test items can be considered stable according to the t test.



ANNEX VIII: Analysts results

Trieres sinensis (cells/L)					Akashiwo sanguinea (cells/L)					Azadinium spinosum (cells/L)				
sample 1	sample 2	sample 3	Average	Analyst Code	sample 1	sample 2	sample 3	Average	Analyst Code	sample 1	sample 2	sample 3	Average	Analyst Code
2125	3625	3625	3125	45	125	250	125	167	45	1250	1000	750	1000	45
3920	3420	3540	3627	44	160	300	180	213	44	6045	4538	4055	4879	44
2720	3120	4160	3333	2	40	400	0	147	2	3640	4640	2280	3520	2
4360	3360	2640	3453	61	80	160	80	107	61	4120	2320	2120	2853	61
3440	2840	3400	3227	69	80	120	80	93	69	3400	2760	2560	2907	69
4000	2960	2760	3240	15	160	0	120	93	0	15	1320	1520	880	1240	15
2360	2600	3880	2947	12		120	80	67	12	2120	2080	2320	2173	12
3600	4120	3120	3613	88	120	120	80	107	88	1280	880	1480	1213	88
2320	2800	2640	2587	21	160	160	160	160	21	2120	2600	2640	2453	21
3200	3480	3460	3380	91	180	280	120	193	91	3000	5060	3120	3727	91
2800	2720	3400	2973	42	80	40	120	80	42	1353	1230	6150	2911	42
2611	2849	3422	2961	87	187	111	112	137	87	2686	2479	2418	2528	87
2040	2040	2880	2320	11	160	120	80	120	11	560	600	1040	733	11
3520	3400	2960	3293	74	160	80	120	120	74	3800	2040	1720	2520	74
2640	2200	2480	2440	41	160	80	120	120	41	1680	2680	2600	2320	41
3700	2800	4250	3583	16	250	200	100	183	16	2400	2850	2150	2467	16
3080	3400	3440	3307	62	not id	not id	not id	not id	62	2440	1000	1120	1520	62
3320	3920	3160	3467	64	40	80	0	40	64	2160	3120	4040	3107	64
3160	3400	2480	3013	84	160	400	160	240	84	3800	3560	3000	3453	84
2040	2480	1680	2067	5	240	360	320	307	5	not id	not id	not id	not id	5
3300	3000	5000	3767	30	300	100	300	233	30	2800	3500	6300	4200	30
2000	1800	2080	1960	13	120	40	80	80	13	not id	not id	not id	not id	13
4000	4200	3800	4000	48	100	100	0	67	80	48	400	1900	1300	1200	48
3560	2400	2400	2787	4		40	0	40	4	2880	2280	1800	2320	4
3360	4480	3280	3707	39	240	320	160	240	0	39	1760	960	1840	1520	39
2440	2920	3800	3053	56		120	120	80	56	3920	1360	1360	2213	56
3320	4200	3040	3520	37	0	40	40	27	37	5240	2360	2840	3480	37
3040	3760	1840	2880	38	0	40	120	53	38	1320	760	840	973	38
2760	3560	3000	3107	7	0	320	200	173	7	3000	3160	3240	3133	7
2240	3760	3240	3080	49	400	360	120	293	49	1240	640	800	893	49
3120	1520	3280	2640	78	160	40	280	160	78	520	1720	2280	1507	78
2760	2040	2560	2453	14	80	160	120	120	14	1600	2160	2480	2080	14
2640	2880	2440	2653	22	80	120	320	173	22	2600	2840	3680	3040	22
3080	3320	2520	2973	96	40	80	120	80	96	5049	5967	5967	5661	96
2640	4000	3280	3307	20	80	40	80	67	20	2120	1960	2400	2160	20
2720	2920	3280	2973	83	40	80	40	53	83	2440	2240	2240	2307	83
2880	3240	3160	3093	9	160	160	40	120	9	200	240	280	240	9
3600	3600	4000	3733	71	0	200	500	233	71	4200	4400	4500	4367	71
3560	2840	2800	3067		40	0	80	40	28	1120	2160	1640	1640	28
3000	3300	3500	3267	28	200	300	400	300	46	3200	4300	3200	3567	46
				46										

ANNEX VIII: Analysts results

3200	4320	2760	3427	93	40	0	40	27	93	1600	1400	280	1093	93
3480	2320	3280	3027	36	0	0	120	40	36	1040	1200	560	933	36
3034	3695	4322	3684	17	77	122	34	78	17	5030	6821	6874	6242	17
2720	3680	4560	3653	92	0	40	40	27 43	92	760	1000	2240	1333	92
3174	3131	3609	3304			43	87	58	95	4348	3783	4478	4203	95
2960	4160	4320	3813	95	200	200	280	227	18	3120	2800	2320	2747	18
3510	2106	4914	3510	18 50	0	0	714	238	50	1404	3510	702	1872	50
3246	2751	4270	3422	79	224	149	412	262	79	522	3341	3189	2351	79
2880	3920	3040	3280	43	120	120	400	213	43	1120	1440	1400	1320	43
3400	3300	3300	3333	57	400	400	200	333	57	4700	5200	5700.	5200	57
3000	2800	4700	3500	70	200	0	300	167	70	5900	7900	6900	6900	70
2696	3000	3522	3073	63	174	87	87	116	63	5261	5913	4261	5145	63
4700	4400	1800	3633	66	0	0	200	67	66	700	600	700.	667	66
2720	2560	2880	2720	65	40	160	80	93	65	1120	840	1360.	1107	65
3250	3000	3650	3300	59	150	150	200	167	59	4300	4350	3950	4200	59
2300	2200	2300	2267	80	100	200	300	200	80	not id	not id	not id	not id	80
2800	2400	4000	3067	3	0	0	100	33	3	300	300	900	500	3

Trieres sinensis (cells/L)				Analyst Code	Akashiwo sanguinea (cells/L)				Analyst Code	Azadinium spinosum (cells/L)				Analyst Code
sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average	
2680	3220	2440	2780	85	240	20	60	107	85	1840	2020	1960	1940	85
4360	2800	3520	3560	32	120	40	240	133	32	400	960	640	667	32
2400	2760	2920	2693	31	80	240	160	160	31	2040	3264	1836	2380	31
4200	3440	2480	3373	54	0	80	120	67	54	1360	520	1440.	1107	54
2680	3240	3360	3093	47	120	320	80	173	47	7956	8262	6732.	7650	47
2800	2680	2840	2773	25	40	200	40	93	25	4480	3520	2440	3480	25
2480	3960	2160	2867	55	0	40	160	67	55	920	1360	3080	1787	55
2360	2800	2560	2573	51	40	120	80	80	51	200	1720	960.	960	51
3200	2800	3320	3107	76	160	120	40	107	76	3198	2706	3444.	3116	76
3240	2960	3040	3080	86	80	160	120	120	86	4560	2320	8600	5160	86
3600	2880	3240	3240	35	40	40	40	40	35	2240	4040	2360	2880	35
1880	3120	5000	3333	99	200	120	160	160	99	1920	1040	3080.	2013	99
2960	3760	2320	3013	98	160	240	80	160	98	840	2480	680.	1333	98
3320	3200	2920	3147	27	80	40	40	53	27	2760	3200	2800	2920	27
3240	2760	3080	3027	24	not id	not id	not id	not id	24	1240	960	1080.	1093	24
4000	3840	4160	4000	89	160	320	280	253	89	3960	2560	2240.	2920	89
2560	2920	3480	2987	60	280	200	160	213	60	1680	1520	1400.	1533	60
3280	3040	3600	3307	73	360	200	160	240	73	800	400	680	627	73
3640	2920	3680	3413	90	240	80	120	147	90	1400	840	1200.	1147	90
2423	2077	2962	2487	34	231	77	192	167	34	1423	3077	1920.	2140	34
3545	3684	3494.	3574	29	187	526	409	374	29	2822	3199	5272	3764	29
3160	3480	3680	3440	52	120	0	160	93	52	2120	3120	3280	2840	52
3520	2720	2720	2987	97	160	200	40	133	97	1200	1480	720.	1133	97
2840	3160	4240	3413	67	0	40	0	13	67	8680	4560	2240.	5160	67
2000	2000	5000	3000	58	1000	0	0	333	58	3000	2000	2000	2333	58
3440	3080	3120.	3213	75	120	40	40	67	75	4200	4000	2120	3440	75

ANNEX VIII: Analysts results

2400	2240	2720	2453	10	0	120	280	133	10	3240	3360	5200	3933	10
3563	3663	3963	3730	53	366	300	466	377	53	3230	3030	5195.	3818	53
2800	3000	2920	2907	77	200	240	240	227	77	880	800	1000	893	77
2997	7437	4154.	4863	1	37	185	36	86	1	1961	4625	1314	2633	1
3560	3680	3440	3560	6	360	360	320	347	6	1800	1640	1760	1733	6
2920	4160	2640	3240	19	not id	not id	not id	not id	19	1080	680	1120.	960	19
3360	2880	3680	3307	8	160	80	120	120	8	2120	1840	2600	2187	8
3440	2600	3440.	3160	94	0	80	120	67	94	1904	3264	1360	2176	94

Trieres sinensis (cells/L)					Akashiwo sanguinea (cells/L)					Azadinium spinosum (cells/L)				
sample 1	sample 2	sample 3	Average	Analyst Code	sample 1	sample 2	sample 3	Average	Analyst Code	sample 1	sample 2	sample 3	Average	Analyst Code
	T.sinensis		80			Akashiwo sanguinea		88			Heterocapsa/Azadinium			33
	Odontella sp.		8			Non Identified		3			Azadinium spinosum			24
	T.mobiliensis		1			Total		91			Azadinium sp.			13
	T.regia		1								Heterocapsa rotundata			7
	Trieres sp.		1								Heterocapsa sp.			6
	Total		91								Not identified			3
											Heterocapsa minima			3
											Heterocapsa illdefina			1
											Karlodinium veneficum			1
											Total			91

Chaetoceros danicus (cells/L)					Pseudo-nitzschia pungens (cells/L)					Ceratoneis closterium (cells/L)				
sample 1	sample 2	sample 3	Average	Analyst Code	sample 1	sample 2	sample 3	Average	Analyst Code	sample 1	sample 2	sample 3	Average	Analyst Code
750	1625	1750	1375	45	17750	23125	25625	22167	45	2125	1750	1500	1792	45
8578	8979	6565	8041	44	37880	34680	24880	32480	44	5392	4441	2993	4275	44
10320	5800	8320	8147	2	36080	29920	26360	30787	2	3680	3200	3800	3560	2
7480	8960	9120	8520	61	33560	26600	36200	32120	61	3920	2000	1960	2627	61
not id	not id	not id	not id	69	19480	19320	15760	18187	69	3600	4400	3000	3667	69
5600	2440	2600	3547	15	30840	22240	24000	25693	15	3560	2160	2040	2587	15
8480	6960	6280	7240	12	25160	27200	23280	25213	12	3800	3680	3200	3560	12
8720	4600	7880	7067	88	32040	25640	30280	29320	88	1600	2080	4280	2653	88
8080	6040	6680	6933	21	23920	28680	24120	25573	21	3000	2680	2800	2827	21
7680	7780	8680	8047	91	17740	19840	21960.	19847	91	2740	3680	3680.	3367	91

12920	13410	8610	11647	42	24350	35550	28540	29480	42	4059	3813	5904	4592	42
8355	10249	9672	9425	87	30847	23828	28384	27686	87	4215	4144	3757	4039	87
400	1240	1400	1013	11	17960	17800	23400	19720	11	480	880	880	747	11
5400	5640	4440	5160	74	28680	25880	28280	27613	74	not id	not id	not id	not id	74
6160	8560	7640	7453	41	22160	26560	34640	27787	41	2840	2160	2360	2453	41
8700	11450	8350	9500	16	26500	31550	22950	27000	16 62 64	4200	4350	4300	4283	16
4560	4120	3280	3987	62	25400	26880	24160	25480		3080	2800	2280	2720	62
5840	6880	7880	6867	64	30840	31280	33040	31720		2600	3520	4360	3493	64
not id	not id	not id	not id	84	16920	16200	9120	14080	84	2480	2280	1720	2160	84
not id	not id	not id	not id	5	10760	13640	11360	11920	5	not id	not id	not id	not id	5
10500	12500	13800	12267	30	21400	27200	33600	27400	30	5600	4300	3400	4433	30
not id	not id	not id	not id	13	18400	15600	17320	17107	13	not id	not id	not id	not id	13
1500	3900	1400	2267	48	22700	30100	24600	25800	48	600	1700	1700	1333	48
10000	10360	10160	10173	4	33360	25360	23560	27427	4	4840	3520	3160	3840	4
6320	4720	10880	7307	39	28320	17040	18560	21307	39	2240	1360	2160	1920	39
not id	not id	not id	not id	56	12520	19640	16840	16333	56	2200	2520	2960	2560	56
7600	9840	9160	8867	37	26800	20600	25360	24253	37	4080	5000	3640	4240	37
9120	5360	2600	5693	38	30760	28080	29640	29493	38	3040	2280	1720	2347	38
7560	8800	6600	7653	7	29320	30840	22240	27467	7	1680	3000	2080	2253	7
10120	10240	9080	9813	49	27600	24880	30640	27707	49 78	3400	1560	3480	2813	49
1560	3000	1280	1947	78	22840	14160	18760	18587	14 22	1680	1160	600	1147	78
7360	7240	9320	7973	14	16680	25280	21800	21253		1960	1400	3240	2200	14
5400	5160	5840	5467	22	30200	37440	25600	31080		3200	2680	2080	2653	22
13311	8721	11934	11322	96	59211	30294	27540	39015	96	640	600	760	667	96
not id	not id	not id	not id	20	23880	23760	23360	23667	20	1760	1520	2400	1893	20
9080	8360	9640	9027	83	20920	23160	22160	22080	83	3760	4040	4960	4253	83
3000	2880	5400	3760	9	17960	25800	23320	22360	9	800	1440	2400	1547	9
11000	10700	9500	10400	71	36300	24600	19200	26700	71	3900	4500	3300	3900	71
7160	7840	5880	6960	28	27720	26440	29400	27853	28	2600	3120	2400	2707	28
8100	8700	7600	8133	46	28700	26600	22000	25767	46	2500	3300	3300	3033	46
7960	8360	8000	8107	93	28120	29440	22760	26773	93	1960	3240	2120	2440	93
2560	3520	3760	3280	36	18800	31360	23840	24667	36	800	1200	1600	1200	36

11174	11124	11813	11370	17	29146	16402	27166	24238	17	3840	4588	4775	4401	17
10000	4600	4760	6453	92	21160	26040	26000	24400	92	2960	2200	2640	2600	92
9740	10087	11827	10551	95	29523	30871	28610	29668	95 18	5652	4218	5913.	5261	95
8240	9440	10000	9227	18 50	18480	21800	31680	23987	50 79 43	4040	2160	2840.	3013	18
11394	8546	8546	9495		14039	11933	16847	14273		2849	5697	2849.	3798	50
9515	11077	14172	11588	79 43	28881	45891	44641	39804		2351	4044	4783.	3726	79
600	560	720	627		31840	20640	36480	29653		200	320	320.	280	43
10000	11900	10300	10733	57	26500	29400	30200	28700	57	2700	4300	3800.	3600	57
11300	12000	12400	11900	70	33600	24300	17400	25100	70	4300	5200	5500.	5000	70
9696	10653	10913	10421	63	30219	28566	23436	27407	63	4870	5826	6044.	5580	63
not id	not id	not id	not id	66	8100	17100	11300	12167	66	700	700	300	567	66
8240	8960	7840	8347	65	24880	30280	19560	24907	65	1960	2720	2880	2520	65
45100	48650	49150	47633	59	24600	34800	25400	28267	59	4350	4450	4800	4533	59
500	0	200	233	80	4200	7900	8300.	6800	80	100	800	300.	400	80
not id	not id	not id	not id	3	8400	16300	7500.	10733	3	600	400	300.	433	3

Chaetoceros danicus (cells/L)				Analyst Code	Pseudo-nitzschia pungens (cells/L)				Analyst Code	Ceratoneis closterium (cells/L)				Analyst Code
sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average	
3660	4020	3180	3620	85	26160	18520	24920	23200	85 32	2520	2160	2380.	2353	85
2720	4880	3600	3733	32	26560	24320	36000	28960		960	1920	1840.	1573	32
6528	6324	5100	5984	31	26112	28968	33048	29376	31	2856	1836	816.	1836	31
2920	400	1240	1520	54	27960	27920	29680	28520	54	840	480	1080	800	54
7099	4809	4809	5572	47	25877	23129	24961	24656	47	800	560	760.	707	47
7320	9200	9160	8560	25	23400	27000	22360.	24253	25	3760	4520	4400.	4227	25
8000	7480	8400	7960	55	28280	28480	33280.	30013	55	4360	4000	3760.	4040	55
8000	8440	11280	9240	51	20480	22920	25880	23093	51	not id	not id	not id	not id	51
4674	13040	8118	8611	76	27060	30500	30750	29437	76	2214	3198	1968	2460	76
6760	6800	9640	7733	86	31480	25760	23040	26760	86	4440	2600	4560	3867	86
not id	not id	not id	not id	35	20480	22320	20240	21013	35 99	3080	1960	3120	2720	35
11240	12360	10040	11213	99 98	22800	30240	31040	28027		1960	2320	2560.	2280	99
1720	3080	3680	2827		23160	24520	24760	24147	98	1320	1600	1600	1507	98
not id	not id	not id	not id	27	18240	15880	17680	17267	27	4600	5560	5600.	5253	27

ANNEX VIII: Analysts results

840	920	960	907	24	30960	12760	31440	25053	24	1680	1480	1960.	1707	24
5360	3120	3840	4107	89	27400	24840	29280	27173	89	1600	1960	1680.	1747	89
5280	5040	3320	4547	60	35600	26120	21480	27733	60	2560	2320	2880	2587	60
4520	4840	7040	5467	73	36880	25960	39320.	34053	73	400	480	840.	573	73
6720	2680	4960	4787	90	28440	22160	35600.	28733	90	1520	840	1560.	1307	90
8731	11231	14312	11424	34	23500	27577	38921.	29999	34	3154	4615	3491.	3753	34
11817	8175	4238	8077	29	38098	28789	31115	32668	29	2117	3554	2636	2769	29
9320	8480	9320	9040	52	27000	29680	18080	24920	52	3760	3280	4760	3933	52
4480	7920	6200	6200	97	22680	22240	25200	23373	97	2320	3720	2080	2707	97
11640	11400	11240	11427	67	26680	27680	27440	27267	67	2760	2960	4400.	3373	67
1000	0	1000	667	58	34000	5000	17000	18667	58	1000	4000	1000.	2000	58
6280	3760	4200	4747	75	29680	32600	28040	30107	75	2640	2480	2320	2480	75
4040	5160	2480	3893	10	21480	27000	21480	23320	10	1480	1440	1680.	1533	10
7426	8658	10057	8714	53	12554	15984	16517	15018	53	2364	2231	2264.	2286	53
not id	not id	not id	not id	77	20400	18800	19200	19467	77	2160	2200	1920.	2093	77
8177	14985	9975.5	11046	1	24605	41218	31701.5.	32508	1	1554	4329	3266.	3050	1
not id	not id	not id	not id	6	23760	26080	25680.	25173	6	1600	1560	1640.	1600	6
1400	520	1480	1133	19	14920	20680	22080.	19227	19	840	480	760.	693	19
9560	9400	8840	9267	8	29360	21520	24640.	25173	8	3480	3760	3960.	3733	8
5168	4896	6256	5440	94	15080	24200	25240.	21507	94	3808	2176	2448.	2811	94

Chaetoceros danicus (cells/L)				Analyst Code	Pseudo-nitzschia pungens (cells/L)				Analyst Code	Ceratoneis closterium (cells/L)				Analyst Code
sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average	
	Chaetoceros danicus			70		P.seriata complex			66		Ceratoneis closterium			87
	Not identified			12		P.pungens			12		Not identified			4
	Chaetoceros (phaeoceros)			8		P.australis			6		Total			91
	Chaetoceros didymus			1		P.delicatissima complex			4					
	Total			91		P.fraudulenta			1					
						P.multiseries			1					
						P.seriata			1					
						Total			91					

Chaetoceros curvisetus (cells/L)				Analyst Code	Prorocentrum mexicanum (cells/L)				Analyst Code	Scrippsiella trochoidea (cells/L)				Analyst Code
sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average	

625	1000	7000	2875	45	1250	1250	1500	1333	45	2125	2250	2125	2167	45
37473	26095	12896	25488	442	2206	2317	2703	2409	442	4166	3476	4248	3963	44
43480	30960	29560	34667		680	2040	1800	1507		2160	2960	2640	2587	2
30080	31760	35680	32507	61	2040	1640	1200	1627	61	2520	1480	2040	2013	61
8240	5720	4880	6280	69	2000	1920	2440	2120	69	2640	2440	2920	2667	69
16400	1600	4960	7653	15	1200	1200	2040	1480	15	2520	2520	2560	2533	15
31720	28640	25840	28733	12	760	1040	1480	1093	12	3200	2600	1880	2560	12
34400	19800	22720	25640	88	4480	2160	2560	3067	88	2560	2600	2200	2453	88
24560	25360	27480	25800	21	1360	1560	1280	1400	21	2760	1560	1800	2040	21
22360	26620	32700	27227	91	1880	1780	2140	1933	91	2720	2480	2800	2667	91
23250	57200	24600	35017	42	3567	1722	3936	3075	4287	2214	2829	2214	2419	42
33757	34595	32438	33597	87	2014	2516	2083	2204		2275	2849	2306	2477	87
9600	15600	13280	12827	11	840	360	960	720	11	1400	1840	2000	1747	11
22240	26160	26000	24800	74	1440	1120	640	1067	74	1440	2480	1920	1947	74
44920	58080	40560	47853	41	1400	1440	1080	1307	41	2840	2400	2160	2467	41
33200	44850	26700	34917	16	2300	1550	2400	2083	1662	2950	1900	3200	2683	16
9200	2480	5200	5627	62	1800	1200	1120	1373		3040	2080	2560	2560	62
24240	23440	25520	24400	64	920	1240	1360	1173	64	3080	2720	2440	2747	64
27880	16120	22320	22107	84	2840	2960	2240	2680	84	3520	2720	2440	2893	84
640	680	600	640	5	not id	not id	not id	not id	5	not id	not id	not id	not id	5
39800	39600	37100	38833	30	2800	400	1500	1567	30	2300	2500	2000	2267	30
not id	not id	not id	not id	13	1440	1120	1200	1253	13	1000	1200	1800	1333	13
18800	34400	34100	29100	48	800	500	1200	833	48	1700	2100	2200	2000	48
38320	33080	34840	35413	4	800	600	1120	840	4	2280	2600	1920	2267	4
24960	20080	28240	24427	39	not id	not id	not id	not id	39	2320	2240	2000	2187	2640	39
8280	31200	1440	13640	56	520	840	1440	933	56		2200	2360	2400	56

ANNEX VIII: Analysts results

39920	35920	34120	36653	37	1160	1080	1520	1253	37 38	3000	2920	2680	2867	37
35600	19280	7200	20693	38	1200	1720	1480	1467		1320	1080	1160	1187	38
30800	29200	26000	28667	7	1480	2440	1840	1920	7	2720	2880	2320	2640	7
40440	30840	33000	34760	49	2760	2480	2840	2693	49	1280	1560	2240	1693	49
16200	18240	14920	16453	78	1040	1240	1120	1133	78	2200	1320	2040	1853	78
27920	24320	40200	30813	14	0	320	560	293	14	1440	1360	1560	1453	14
31480	39440	25560	32160	22	1320	1320	1680	1440	22	3200	2760	1800	2587	22
37638	18819	39474	31977	96 20	800	560	880	747	96 20	1960	1680	1560	1733	96
4840	4560	5200	4867		1480	2040	2600	2040		2840	2680	2360	2627	20
25560	25160	27200	25973	83	440	640	1360	813	83	2320	2040	2600	2320	83
5840	5480	26720	12680	9	not id	not id	not id	not id		9	960	1360	1400	1240	9
39600	33800	35900	36433	71	1100	1800	1800	1567	71	2600	3600	2900	3033	71
28880	33080	25880	29280	28	760	360	640	587	28	2280	2320	2280	2293	28
31300	32500	30500	31433	46	1300	2300	2800	2133	46	3000	3100	2100	2733	46
33080	27080	38520	32893	93	1560	1200	1160	1307	93 36	2000	2680	2040	2240	93
17600	37360	11040	22000	36	1360	1040	760	1053		1360	640	1760	1253	36
39168	39138	40954	39753	17	998	1776	1523	1432	17	2688	3410	3540	3213	17
30840	24200	8240	21093	92	240	520	600	453	92	1440	2280	2440	2053	92
38697	40219	46219	41712	95	1739	1522	1739	1667	95	3304	2870	3218	3131	95
31760	30800	36160	32907	18	2840	800	1000.	1547	18	2000	2400	2320.	2240	18
34183	25637	22788	27536	50	2106	2808	2106.	2340	50	1404	1404	2808	1872	50
33731	38506	44641	38960	79	1642	2462	2834.	2313	79	2127	2637	7440	4068	79
16400	18280	19440	18040	43	2080	2680	2920.	2560	43	1120	1320	1880	1440	43
32100	40800	39700	37533	57	2100	1400	900.	1467	57 70	3100	3400	2600	3033	57
45300	41500	36000	40933	70	1500	2700	3200	2467		3200	3500	3200	3300	70
37654	39262	41610	39509	63 66	1870	1130	1391.	1464	63 66	2957	2783	3696	3145	63
1000	17100	800	6300		1300	800	1100.	1067		1800	1400	1400	1533	66

31600	35320	30920	32613	65	2040	2320	2800	2387	65	1240	1560	1720	1507	65
not id	not id	not id	not id	59	1050	1300	1650.	1333	59	2700	2250	2800	2583	59
7200	4800	9300	7100	80	600	1500	1200.	1100	80	700	2000	2600	1767	80
6000	1400	2000	3133	3	200	300	200.	233	3	900	900	1100 .	967	3

ANNEX VIII: Analysts results

Chaetoceros curvisetus (cells/L)				Analyst Code	Prorocentrum mexicanum (cells/L)				Analyst Code	Scrippsiella trochoidea (cells/L)				Analyst Code
sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average	
29680	31740	33240	31553	85	2480	1460	1340	1760	85	2380	2260	1960	2200	85
29600	21040	24640	25093	32	1040	880	640	853	32	1360	1360	1840	1520	32
26520	27744	21216	25160	31	3264	1632	1836	2244	31	2040	3060	2448	2516	31
11160	960	3840	5320	54	360	1520	1520	1133	54	1080	1720	1720	1507	54
27709	19465	19923	22366	47	1080	1560	1920	1520	47	2280	2520	2560	2453	47
30680	38000	32600	33760	25	840	800	480.	707	25	2440	3120	2320	2627	25
26200	29640	38240	31360	55	2440	3040	1440.	2307	55	2480	3440	2200	2707	55
32480	36680	37320	35493	51	560	1560	880	1000	51	2000	2480	2320	2267	51
31490	33460	16730	27227	76	2214	4182	2460.	2952	76	3690	2460	2460	2870	76
17440	26000	28440	23960	86	1480	600	1160.	1080	86	3000	2120	3400	2840	86
21240	15280	15920	17480	35	1160	840	440	813	35	1360	960	1680	1333	35
32560	32560	35200	33440	99	1360	1640	720.	1240	99	1760	1800	1560.	1707	99
1120	3200	9960	4760	98	1640	2760	1480.	1960	98	2000	2200	1840	2013	98
13360	18840	14600	15600	27	2320	2720	2600	2547	27	3040	2480	3160	2893	27
2360	2560	2880	2600	24	1280	1160	1120.	1187	24	1040	920	1080.	1013	24
25440	25720	19760	23640	89	1040	1160	1480.	1227	89	1920	2520	2760	2400	89
27360	29440	13920	23573	60	1400	1240	1680	1440	60	2480	2840	2720	2680	60
30600	28840	40240	33227	73	3200	1800	1880.	2293	73	2200	1320	2080.	1867	73
23240	9720	20840	17933	90	1720	2040	1280.	1680	90	1080	1440	1400	1307	90
36692	49077	57770	47847	34	1500	1192	1745.	1479	34	2692	1962	2967	2540	34
36334	45138	22677	34716	29	2998	2488	703.	2063	29	2293	2310	2460.	2354	29
29680	25840	33120	29547	52	2120	1680	1160.	1653	52	2200	2600	2440	2413	52
27720	34960	32600	31760	97	1600	1320	1680.	1533	97	2520	2560	1800	2293	97
32800	29720	36400	32973	67	520	960	440	640	67	2080	2520	2080	2227	67
12000	0	2000	4667	58	0	3000	2000	1667	58	0	2000	1000	1000	58
24720	16080	3120	14640	75	1520	1640	1960	1707	75	2160	3000	2160	2440	75
26320	22920	18200	22480	10	1800	1840	3800	2480	10	2120	1520	2480	2040	10
29404	28305	29004	28904	53	1199	866	1299	1121	53	2997	3363	2864	3075	53
20080	19440	20000	19840	77	1160	1200	1120	1160	77	1560	1680	1640	1627	77
24494	46028	33796	34773	1	1739	3293	532.5	1855	1	1702	4292	1633	2542	1
33640	36280	41760	37227	6	2040	1960	2000.	2000	6	2840	2920	2760	2840	6
15080	120	9400	8200	19	1920	2360	1200.	1827	19	2440	2040	2080	2187	19
25680	24360	30720	26920	8	1040	1440	1480	1320	8	2160	2880	2320	2453	8
29104	37536	40256	35632	94	1632	1632	816.	1360	94	4624	2720	1904.	3083	94

Chaetoceros curvisetus (cells/L)				Analyst Code	Prorocentrum mexicanum (cells/L)				Analyst Code	Scrippsiella trochoidea (cells/L)				Analyst Code
sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average		sample 1	sample 2	sample 3	Average	
	Chaetoceros curvisetus			53		Prorocentrum lima			49		Scrippsiella trochoidea			43
	Chaetoceros (Hyalochates)			28		Prorocentrum mexicanum			16		Scrippsiella sp.			38
	Not identified			3		Prorocentrum aporum			11		Pentapharsodinium dalei			4

	Chaetoceros lorenzianus	3		Prorocentrum maculosum	6		Pentapharsodinium sp.	3
	Chaetoceros brevis	1		Not identified	3		Scrippsiella minuta	2
	Chaetoceros lauderii	1		Prorocentrum cordatum	2		Not identified	1
	Chaetoceros teres/cersatoporus	1		Prorocentrum emarginatum	2		Total	91
	Chaetoceros teres/brevis	1		Prorocentrum concavum	1			
	Total	91		Prorocentrum triestinum	1			
				Total	91			

Annex IX: Robust mean and Standard deviation calculation according to algorithm A annex C ISO13528 *Trieres sinensis* iteration

Homogeneity and stability test IPI2017								
T. sinensis	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	4400	3720	4060	680	462400
		20/07/2017	water3	3560	2520	3040	1040	1081600
		20/07/2017	water3	2200	3000	2600	800	640000
		20/07/2017	water3	3640	3000	3320	640	409600
		20/07/2017	water3	3240	3360	3300	120	14400
		20/07/2017	water3	3040	3360	3200	320	102400
		20/07/2017	water3	2920	3280	3100	360	129600
		20/07/2017	water3	2600	3320	2960	720	518400
		20/07/2017	water3	3880	2440	3160	1440	2073600
		20/07/2017	water3	2520	3360	2940	840	705600

					Average:	3168 377	Sum	6137600
					SD		P=	10
				SD within samples:		554		
				SD between samples:		108		
		Date	Sample number	Test portion 1	Test portion 2	sample average	test portion range	*2
		20/07/2017	water3	3120	2480	2800	640	409600
	CELLS / L	20/07/2017	water3	2640	3160	2900	520	270400
		20/07/2017	water3	3120	2520	2820	600	360000
					Average:	2840	Sum	1040000
					SD	53	P=	3
				SD within samples:		416		
				SD between samples:		290		

Analysts results for *T.sinensis*

Analyst Code	Average		X-X*	it1	it2						
[redacted]	[redacted]		1253				19	3240	27	3240	3240
									53		
									67		
									80		
[redacted]	[redacted]		1147						87		
13	1960		947	2679	2679		46	3267	91	3267	3267
			893						93		
			773				43	3280	93	3280	3280
			760				74	3293	93	3293	3293
5	2067		760	2679	2679						
80	2267		726	2679	2679		59	3300	120	3300	3300
			640						120		
			627						120		
11	2320		573	2679	2679		95	3304	160	3304	3304
			560						167		
									200		
41	2440		520	2679	2679		62	3307	200	3307	3307
			493						209		
			440						213		
14	2453		433	2679	2679		20	3307	227	3307	3307
			427						240		
			347						253		
10	2453		333	2679	2679		73	3307	287	3307	3307
			307						297		
									307		
34	2487		267	2679	2679		8	3307	347	3307	3307
			253						347		
			240						361		
51	2573		240	2679	2679		2	3333	370	3333	3333
			240						400		
21	2587		227	2679	2679		57	3333	413	3333	3333
			227				99	3333	420	3333	3333
			213						440		

78	2640	200 200 187 187 160	2679	2679
22	2653	147 147 141 133 133	2679	2679
31	2693	120 120 107 107	2693	2693
65	2720	88 67 53	2720	2720
25	2773	0 13	2773	2773
85	2780	27 27	2780	2780
4	2787		2787	2787
55	2867		2867	2867
38	2880		2880	2880
77	2907		2907	2907
12	2947		2947	2947
87	2961		2961	2961
42	2973		2973	2973
96	2973		2973	2973
83	2973		2973	2973
60	2987		2987	2987
97	2987		2987	2987
58	3000		3000	3000
84	3013		3013	3013
98	3013		3013	3013
36	3027		3027	3027
24	3027		3027	3027
56	3053		3053	3053
28	3067		3067	3067

		470 493 516		
54	3373	520 553 600 787	3380	3380
91	3380	787 1649	3413	3413
90	3413		3413	3413
67	3413		3422	3422
79	3422		3427	3427
93	3427		3440	3440
52	3440		3453	3453
61	3453		3467	3467
64	3467		3500	3500
70	3500		3510	3510
50	3510		3520	3520
37	3520		3560	3560
32	3560		3560	3560
6	3560		3574	3574
29	3574		3583	3583
16	3583		3613	3613
88	3613		3627	3627
44	3627		3633	3633
66	3633		3653	3653
92	3653		3684	3684
17	3684		3707	3707
39	3707		3730	3730
53	3730		3733	3733
71	3733		3747	3747
30	3767		3747	3747

3	3067		3067	3067	18	3813	3747	3747
63	3073		3073	3073	48	4000	3747	3747
49	3080		3080	3080	89	4000	3747	3747
86	3080		3080	3080	1	4863	3747	3747
9	3093		3093	3093	Average X	3172	3193	3193
47	3093		3093	3093	SD S	447	338	338
					robust average X*	3213 new X*	3193	3193
7	3107		3107	3107				
					robust stdev S*	356 new S*	383	383
76	3107		3107	3107				
					δ= 1.5S*	534	574	574
45	3125		3125	3125				
					X*- δ	2679	2619	2619
27	3147		3147	3147	X*+ δ	3747	3768	3768
94	3160		3160	3160	no of analysts P	91	91	91
75	3213		3213	3213				
69	3227		3227	3227	Between Samples SD	108		
15	3240		3240	3240				
35	3240		3240	3240	new stdev for TSIN	398		

Annex IX: Robust mean and Standard deviation calculation according to algorithm A annex C ISO13528 *Akashiwo sanguinea* iteration

Homogeneity and stability test IPI2017					

A. sanguinea	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	1360	1320	1340	40	1600
		20/07/2017	water3	1080	1000	1040	80	6400
		20/07/2017	water3	1160	1560	1360	400	160000
		20/07/2017	water3	1200	1080	1140	120	14400
		20/07/2017	water3	1480	1440	1460	40	1600
		20/07/2017	water3	2600	2560	2580	40	1600
		20/07/2017	water3	1200	1480	1340	280	78400
		20/07/2017	water3	2880	2680	2780	200	40000
		20/07/2017	water3	2280	1640	1960	640	409600
		20/07/2017	water3	1520	1720	1620	200	40000
					Average:	1662	Sum	753600
					SD	595	P=	10
				SD within samples:		194		
				SD between samples:		579		
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2
		20/07/2017	water3	2640	1760	2200	880	774400
	CELLS / L	20/07/2017	water3	1360	1560	1460	200	40000
		20/07/2017	water3	1600	1200	1400	400	160000
					Average:	1687	Sum	974400
					SD	446	P=	3
				SD within samples:		403		

				SD between samples:	343		

Analysts results for *A.sanguinea*

Analyst Code	Average	X-X*	it1	it2	87	137	17	137	137
[redacted]	[redacted]	107							
[redacted]	[redacted]	93							
67	13	93	13	14	2	147		147	147
		93							
		87							
		80			90	147		147	147
		80							
		80			21	160		160	160
		80							
37	27	80	27	27					
93	27	67	27	27	78	160		160	160
		67							
		67							
92	27	62	27	27	31	160		160	160
		53							
		53							
3	33	53	33	33	99	160		160	160
64	40		40	40	98	160		160	160
		53							
		53							
4	40	53	40	40	45	167		167	167
		53							
		53							
28	40	42	40	40	70	167		167	167
		40							
		40							
36	40	40	40	40	59	167		167	167
		40							
		40							
35	40	34	40	40	34	167		167	167
		27					27		
38	53	27	53	53	7	173	27	173	173
		27					40		
		27					40		
83	53	27	53	53	22	173	40	173	173
		13					40		
		13					40		
27	53	13	53	53	47	173	47	173	173
		13					47		
		4					47		
95	58	0	58	58	16	183	47	183	183
		0					53		
		0					53		
12	67	0	67	67	91	193	53	193	193
		0					63		
		0					73		
48	67	0	67	67	80	200	80	200	200
		13					93		
20	67	13	67	67	44	213	93	213	213
		13					93		
							107		
					43	213	107	213	213
							113		
							113		
					60	213	118	213	213
							120		
							120		
					18	227	120	227	227
66	67		67	67			133		
54	67		67	67	77	227	142	227	227
							173		
							180		
					30	233	187	233	233
							213		
							213		
55	67		67	67			227		
							254		
							257		

					71	233		233	233
75	67		67	67					
					50	238		238	238
94	67		67	67					
					84	240		239	239
17	78		78	78					
					39	240		239	239
42	80		80	80					
					73	240		239	239
13	80		80	80					
					89	253		239	239
56	80		80	80					
					79	262		239	239
96	80		80	80					
					49	293		239	239
51	80		80	80					
					46	300		239	239
1	86		86	86					
					5	307		239	239
69	93		93	93					
					57	333		239	239
15	93		93	93	58	333		239	239
65	93		93	93	6	347		239	239
25	93		93	93	29	374		239	239
52	93		93	93	53	377		239	239
61	107		107	107	62	not id	not id	not id	not id
88	107		107	107	24	not id	not id	not id	not id
85	107		107	107	19	not id	not id	not id	not id
76	107		107	107	Average X	143		134	134

63	116		116	116	SD S	88		70	70
11	120		120	120	robust average X*	120	new X*	134	134
74	120		120	120	robust stdev S*	79	new S*	80	80
41	120		120	120	δ= 1.5S*	119		120	120
14	120		120	120	X*- δ	1		14	14
9	120		120	120	X*+ δ	239		254	254
86	120		120	120	no of analysts P	88		88	88
8	120		120	120					
32	133		133	133	Between Samples SD	579			
97	133		133	133					
10	133		133	133	new stdev for ASANG	584			

Annex IX: Robust mean and Standard deviation calculation according to algorithm A annex C ISO13528 *Azadinium spinosum* iteration

Homogeneity and stability test IPI2017								
A. spinosum	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	3520	4160	3840	640	409600
		20/07/2017	water3	2080	2040	2060	40	1600
		20/07/2017	water3	3240	3200	3220	40	1600
		20/07/2017	water3	4600	5400	5000	800	640000
		20/07/2017	water3	6400	6640	6520	240	57600
		20/07/2017	water3	3240	2720	2980	520	270400
		20/07/2017	water3	2440	2000	2220	440	193600
		20/07/2017	water3	4600	4800	4700	200	40000
		20/07/2017	water3	6320	4880	5600	1440	2073600
		20/07/2017	water3	5640	5880	5760	240	57600
					Average:	4190	Sum	3745600
					SD	1554	P=	10
				SD within samples:		433		
				SD between samples:		1524		
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2
		20/07/2017	water3	6800	6240	6520	560	313600
	CELLS / L	20/07/2017	water3	6200	5240	5720	960	921600

		20/07/2017	water3	2720	3000	2860	280	78400
					Average:	5033	Sum	1313600
					SD	1924	P=	3
				SD within samples:		468		
				SD between samples:		1896		

Analysts results for *A.spinosum*

Analyst Code	Average	X-X*	it1	it2	it3	it4	it5	it6	it7	it8
9	240	2080	240	276	310	325	331	334	335	335
		1820								
		1693								
		1653								
3	500	1653	500	500	500	500	500	500	500	500
73	627	1587	627	627	627	627	627	627	627	627
66	667	1427	667	667	667	667	667	667	667	667
32	667	1427	667	667	667	667	667	667	667	667
11	733	1387	733	733	733	733	733	733	733	733
49	893	1360	893	893	893	893	893	893	893	893
77	893	1360	893	893	893	893	893	893	893	893
36	933	1347	933	933	933	933	933	933	933	933
51	960	1320	960	960	960	960	960	960	960	960
19	960	1227	960	960	960	960	960	960	960	960
38	973	1227	973	973	973	973	973	973	973	973
45	1000	1213	1000	1000	1000	1000	1000	1000	1000	1000
93	1093		1093	1093	1093	1093	1093	1093	1093	1093
24	1093		1093	1093	1093	1093	1093	1093	1093	1093
65	1107	1187	1107	1107	1107	1107	1107	1107	1107	1107
54	1107	1173	1107	1107	1107	1107	1107	1107	1107	1107
		1120								
		1107								
		1080								
97	1133	1000	1133	1133	1133	1133	1133	1133	1133	1133
90	1147	987	1147	1147	1147	1147	1147	1147	1147	1147
		987								
		813								
		800								
48	1200	800	1200	1200	1200	1200	1200	1200	1200	1200
		787								
		680								
		587								
		533								
88	1213	448	1213	1213	1213	1213	1213	1213	1213	1213
		380								
		307								
		240								
		180								
15	1240	160	1240	1240	1240	1240	1240	1240	1240	1240
		147								
		144								
		133								
		107								
43	1320	13	1320	1320	1320	1320	1320	1320	1320	1320
		0								
		0								
		13								

16	2467	147	2467	2467	2467	2467	2467	2467	2467	2467
74	2520	200	2520	2520	2520	2520	2520	2520	2520	2520
		208								
		313								
87	2528	427	2528	2528	2528	2528	2528	2528	2528	2528
1	2633	520	2633	2633	2633	2633	2633	2633	2633	2633
		533								
18	2747	560	2747	2747	2747	2747	2747	2747	2747	2747
52	2840	587	2840	2840	2840	2840	2840	2840	2840	2840
61	2853	591	2853	2853	2853	2853	2853	2853	2853	2853
35	2880	600	2880	2880	2880	2880	2880	2880	2880	2880
69	2907	600	2907	2907	2907	2907	2907	2907	2907	2907
42	2911	720	2911	2911	2911	2911	2911	2911	2911	2911
27	2920	787	2920	2920	2920	2920	2920	2920	2920	2920
89	2920	796	2920	2920	2920	2920	2920	2920	2920	2920
22	3040	813	3040	3040	3040	3040	3040	3040	3040	3040
64	3107	1120	3107	3107	3107	3107	3107	3107	3107	3107
76	3116	1133	3116	3116	3116	3116	3116	3116	3116	3116
7	3133	1160	3133	3133	3133	3133	3133	3133	3133	3133
75	3440	1160	3440	3440	3440	3440	3440	3440	3440	3440
84	3453	1200	3453	3453	3453	3453	3453	3453	3453	3453
37	3480	1247	3480	3480	3480	3480	3480	3480	3480	3480
25	3480	1407	3480	3480	3480	3480	3480	3480	3480	3480
2	3520	1444	3520	3520	3520	3520	3520	3520	3520	3520
46	3567	1498	3567	3567	3567	3567	3567	3567	3567	3567
91	3727	1613	3727	3727	3727	3727	3727	3727	3727	3727
29	3764	1880	3764	3764	3764	3764	3764	3764	3764	3764
		1880								
		1883								
		2047								
		2559								
		2825								
		2840								
53	3818	2840	3818	3818	3818	3818	3818	3818	3818	3818
		2880								
		3341								
		3922								
		4580								
10	3933	5330	3933	3933	3933	3933	3933	3933	3933	3933
30	4200		4200	4200	4200	4200	4200	4200	4200	4200
59	4200		4200	4200	4200	4200	4200	4200	4200	4200

Annex IX: Robust mean and Standard deviation calculation according

92	1333	31 60 133	1333	1333	1333	1333	1333	1333	1333	1333											
98	1333		1333	1333	1333	1333	1333	1333	1333	1333	95	4203		4203	4203	4203	4203	4203	4203	4203	4203
78	1507		1507	1507	1507	1507	1507	1507	1507	1507	71	4367		4367	4367	4367	4367	4367	4367	4367	4367
62	1520		1520	1520	1520	1520	1520	1520	1520	1520	44	4879		4752	4598	4533	4506	4495	4490	4488	4487
39	1520		1520	1520	1520	1520	1520	1520	1520	1520	63	5145		4752	4598	4533	4506	4495	4490	4488	4487
60	1533		1533	1533	1533	1533	1533	1533	1533	1533	86	5160		4752	4598	4533	4506	4495	4490	4488	4487
28	1640		1640	1640	1640	1640	1640	1640	1640	1640	67	5160		4752	4598	4533	4506	4495	4490	4488	4487
6	1733		1733	1733	1733	1733	1733	1733	1733	1733	57	5200		4752	4598	4533	4506	4495	4490	4488	4487
55	1787		1787	1787	1787	1787	1787	1787	1787	1787	96	5661		4752	4598	4533	4506	4495	4490	4488	4487
50	1872		1872	1872	1872	1872	1872	1872	1872	1872	17	6242		4752	4598	4533	4506	4495	4490	4488	4487
85	1940		1940	1940	1940	1940	1940	1940	1940	1940	70	6900		4752	4598	4533	4506	4495	4490	4488	4487
99	2013		2013	2013	2013	2013	2013	2013	2013	2013	47	7650		4752	4598	4533	4506	4495	4490	4488	4487
14	2080		2080	2080	2080	2080	2080	2080	2080	2080	5	not id	not id	not id	not id	not id	not id	not id	not id	not id	not id
34	2140		2140	2140	2140	2140	2140	2140	2140	2140	13	not id	not id	not id	not id	not id	not id	not id	not id	not id	not id
20	2160		2160	2160	2160	2160	2160	2160	2160	2160	80	not id	not id	not id	not id	not id	not id	not id	not id	not id	not id
12	2173		2173	2173	2173	2173	2173	2173	2173	2173	Average X	2542		2437	2422	2416	2413	2412	2411	2411	2411
94	2176		2176	2176	2176	2176	2176	2176	2176	2176	SD S	1512		1271	1241	1229	1224	1222	1221	1220	1220
3	2187		2187	2187	2187	2187	2187	2187	2187	2187	robust average X*	2320	new X*	2437	2422	2416	2413	2412	2411	2411	2411
56	2213		2213	2213	2213	2213	2213	2213	2213	2213	robust stdev S*	1621	new S*	1441	1408	1394	1388	1386	1384	1384	1384
83	2307		2307	2307	2307	2307	2307	2307	2307	2307	δ= 1.5S*	2432		2161	2111	2090	2082	2078	2077	2076	2076
41	2320		2320	2320	2320	2320	2320	2320	2320	2320	X*- δ	-112		276	310	325	331	334	335	335	335
4	2320		2320	2320	2320	2320	2320	2320	2320	2320	X*+ δ	4752		4598	4533	4506	4495	4490	4488	4487	4487
58	2333		2333	2333	2333	2333	2333	2333	2333	2333	no of analysts P	88		88	88	88	88	88	88	88	88
79	2351		2351	2351	2351	2351	2351	2351	2351	2351											
31	2380		2380	2380	2380	2380	2380	2380	2380	2380	Between Samples SD	1524									

21	2453		2453	2453	2453	2453	2453	2453	2453	2453	new stdev for ASPIN	2058									

to algorithm A annex C ISO13528 *Chaetoceros danicus* iteration

Homogeneity and stability test IPI2017								
C. danicus	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	11760	8800	10280	2960	8761600
		20/07/2017	water3	9160	4600	6880	4560	20793600
		20/07/2017	water3	9560	10640	10100	1080	1166400
		20/07/2017	water3	11760	11360	11560	400	160000
		20/07/2017	water3	9360	10600	9980	1240	1537600
		20/07/2017	water3	9760	8440	9100	1320	1742400
		20/07/2017	water3	11120	9040	10080	2080	4326400
		20/07/2017	water3	9600	9520	9560	80	6400
		20/07/2017	water3	10640	11000	10820	360	129600
		20/07/2017	water3	9920	9360	9640	560	313600
					Average:	9800	Sum	38937600
					SD	1232	P=	10
				SD within samples:		1395		
				SD between samples:		738		

Annex IX: Robust mean and Standard deviation calculation according

		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2
		20/07/2017	water3	9520	9480	9500	40	1600
	CELLS / L	20/07/2017	water3	8600	11480	10040	2880	8294400
		20/07/2017	water3	10240	10360	10300	120	14400
					Average:	9947	Sum	8310400
					SD	408	P=	3
				SD within samples:		1177		
				SD between samples:		725		

Analysts results for *Chaetoceros danicus*

Analyst Code	Average														
	[redacted]	X-X*	it1	it2	it3	it4									
		7500													
	[redacted]	7107										827			
80	233	7067	2632	2632	2632	2632	25	8560	877	8560	8560	8560	8560		
		6827							980						
		6720							1133						
		6600					76	8611	1293	8611	8611	8611	8611		
		6358							1307						
		6213							1493						
		5787					53	8714	1507	8714	8714	8714	8714		
43	627	5467	2632	2632	2632	2632			1533						
58	667	4907	2632	2632	2632	2632	37	8867	1692	8867	8867	8867	8867		
		4453							1762						
		4187							1767						
24	907	4113	2632	2632	2632	2632	83	9027	2080	9027	9027	9027	9027		
		4000							2440						
		3973							2667						
11	1013	3840	2632	2632	2632	2632	52	9040	2687	9040	9040	9040	9040		
									2818						
									3000						
19	1133	3747	2632	2632	2632	2632	18	9227	3313	9227	9227	9227	9227		
		3627							3480						
45	1375	3187	2632	2632	2632	2632	51	9240	3589	9240	9240	9240	9240		
		2987							3637						
		2947							3691						
54	1520	2573	2632	2632	2632	2632	8	9267	3693	9267	9267	9267	9267		
		2293							3855						
		2267							3913						
78	1947	2267	2632	2632	2632	2632	87	9425	4167	9425	9425	9425	9425		
		2161							4533						
									39900						

48	2267	2040	2632	2632	2632	2632	50	9495		9495	9495	9495	9495
		1749											
		1533											
98	2827	1280	2827	2827	2827	2827	16	9500		9500	9500	9500	9500
		867											
		800											
36	3280	773	3280	3280	3280	3280	49	9813		9813	9813	9813	9813
		667											
15	3547	493	3547	3547	3547	3547	4	10173		10173	10173	10173	10173
		427											
		280											
85	3620	80	3620	3620	3620	3620	71	10400		10400	10400	10400	10400
		0											
		227											
32	3733	240	3733	3733	3733	3733	63	10421		10421	10421	10421	10421
		307											
		313											
9	3760	343	3760	3760	3760	3760	95	10551		10551	10551	10551	10551
		373											
		400											
10	3893	413	3893	3893	3893	3893	57	10733		10733	10733	10733	10733
		613											
							1	11046		11046	11046	11046	11046
							99	11213		11213	11213	11213	11213
							96	11322		11322	11322	11322	11322
62	3987		3987	3987	3987	3987							
89	4107		4107	4107	4107	4107	17	11370		11370	11370	11370	11370
							34	11424		11424	11424	11424	11424
60	4547		4547	4547	4547	4547							
							67	11427		11427	11427	11427	11427
75	4747		4747	4747	4747	4747							
							79	11588		11588	11588	11588	11588
90	4787		4787	4787	4787	4787							
							42	11647		11647	11647	11647	11647
74	5160		5160	5160	5160	5160							
							70	11900		11900	11900	11900	11900
94	5440		5440	5440	5440	5440							
							30	12267		12267	12267	12267	12267
22	5467		5467	5467	5467	5467							
							59	47633		12835	12304	12276	12275

Annex IX: Robust mean and Standard deviation calculation according

73	5467		5467	5467	5467	5467							
							69	not id	not id	not id	not id	not id	not id
47	5572		5572	5572	5572	5572							
							84	not id	not id	not id	not id	not id	not id
38	5693		5693	5693	5693	5693							
							5	not id	not id	not id	not id	not id	not id
31	5984		5984	5984	5984	5984							
							13	not id	not id	not id	not id	not id	not id
97	6200		6200	6200	6200	6200							
							56	not id	not id	not id	not id	not id	not id
92	6453		6453	6453	6453	6453	20	not id	not id	not id	not id	not id	not id
64	6867		6867	6867	6867	6867	66	not id	not id	not id	not id	not id	not id
21	6933		6933	6933	6933	6933	3	not id	not id	not id	not id	not id	not id
28	6960		6960	6960	6960	6960	35	not id	not id	not id	not id	not id	not id
88	7067		7067	7067	7067	7067	27	not id	not id	not id	not id	not id	not id
12	7240		7240	7240	7240	7240	77	not id	not id	not id	not id	not id	not id
39	7307		7307	7307	7307	7307	6	not id	not id	not id	not id	not id	not id
41	7453		7453	7453	7453	7453	Average X	7474		7218	7212	7211	7211
7	7653		7653	7653	7653	7653	SD S	5608		2990	2977	2977	2977
86	7733		7733	7733	7733	7733	robust average X*	7733	new X*	7218	7212	7211	7211
55	7960		7960	7960	7960	7960	robust stdev S*	3401	new S*	3390	3376	3376	3376
14	7973		7973	7973	7973	7973	δ= 1.5S*	5102		5085	5064	5063	5063
44	8041		8041	8041	8041	8041	X*- δ	2632		2133	2147	2148	2148
91	8047		8047	8047	8047	8047	X*+ δ	12835		12304	12276	12275	12275
29	8077		8077	8077	8077	8077	no of analysts P	79		79	79	79	79
93	8107		8107	8107	8107	8107							

46	8133		8133	8133	8133	8133	Between Samples SD	738					
2	8147		8147	8147	8147	8147							
65	8347		8347	8347	8347	8347	new stdev for CDAN	3455					

to algorithm A annex C ISO13528 *Pseudo-nitzschia pungens* iteration

Homogeneity and stability test IPI2017								
P. pungens	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	33600	26640	30120	6960	48441600
		20/07/2017	water3	27440	26120	26780	1320	1742400
		20/07/2017	water3	27680	32600	30140	4920	24206400
		20/07/2017	water3	37320	30400	33860	6920	47886400
		20/07/2017	water3	29080	27640	28360	1440	2073600
		20/07/2017	water3	29640	24400	27020	5240	27457600
		20/07/2017	water3	25600	30160	27880	4560	20793600
		20/07/2017	water3	21800	24520	23160	2720	7398400
		20/07/2017	water3	33240	28800	31020	4440	19713600
		20/07/2017	water3	28000	29000	28500	1000	1000000
					Average:	28684	Sum	200713600
					SD	2870	P=	10

Annex IX: Robust mean and Standard deviation calculation according

				SD within samples:		3168		
				SD between samples:		1794		
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2
		20/07/2017	water3	34160	27960	31060	6200	38440000
	CELLS / L	20/07/2017	water3	26280	28280	27280	2000	4000000
		20/07/2017	water3	27600	30200	28900	2600	6760000
					Average:	29080	Sum	49200000
					SD	1896	P=	3
				SD within samples:		2864		
				SD between samples:		710		

Analysts results for *Pseudo-nitzschia pungens*

Analyst Code	Average								
[redacted]	[redacted]	x-x*	it1	it2					
		18773							
		14840							
80	6800	13653	18544	18544	86	26760		26760	26760
		13407							
		11493							
		11300			93	26773		26773	26773
3	10733	10555 9240	18544	18544	16	27000		27000	27000
		8467							
5	11920	8307	18544	18544	89	27173		27173	27173
		7387							
66	12167	6987	18544	18544	67	27267		27267	27267
		6907							
		6347							
84	14080	6107	18544	18544	30	27400		27400	27400
		5853							
		5727							
50	14273		18544	18544	63	27407		27407	27407
		4560							
53	15018	4320	18544	18544	4	27427		27427	27427
		4267							

						71	26700	1127	26700	26700
								1187		
								1200		
								1427		
								1600		
								1693		
								1827		
								1834		
								1853		
								1893		
								2040		
								2113		
								2133		
								2160		
								2213		
								2280		
								2453		
								2693		
								2947		
								3127		
								3160		
								3387		
								3747		
								3803		

56	16333	4067 3493 3407 3213 2480 2373 2253 2200 1907 1587 1427 1335 1320 1320 1173 918 907 667 653 520 473 400 400 360 93 0 120 193 227	18544	18544	7	27467	3863 3907 3920 4080 4095 4426 4440 4533 5213 5507 6147 6547 6907 6935 7094 8480 13442 14231	27467	27467
13	17107		18544	18544	74	27613		27613	27613
27	17267		18544	18544	87	27686		27686	27686
69	18187		18544	18544	49	27707		27707	27707
78	18587		18587	18587	60	27733		27733	27733
58	18667		18667	18667	41	27787		27787	27787
19	19227		19227	19227	28	27853		27853	27853
77	19467		19467	19467	99	28027		28027	28027
11	19720		19720	19720	59	28267		28267	28267
91	19847		19847	19847	54	28520		28520	28520
					57	28700		28700	28700
					90	28733		28733	28733
35	21013		21013	21013	32	28960		28960	28960
14	21253		21253	21253	88	29320		29320	29320
					31	29376		29376	29376
39	21307		21307	21307					
					76	29437		29437	29437
94	21507		21507	21507					
					42	29480		29480	29480
83	22080		22080	22080					
					38	29493		29493	29493
45	22167		22167	22167					
					43	29653		29653	29653
9	22360		22360	22360					
					95	29668		29668	29668
51	23093		23093	23093					
					34	29999		29999	29999
85	23200		23200	23200					

Annex IX: Robust mean and Standard deviation calculation according

					55	30013		30013	30013
10	23320		23320	23320					
					75	30107		30107	30107
97	23373		23373	23373					
					2	30787		30787	30787
20	23667		23667	23667					
					22	31080		31080	31080
18	23987		23987	23987					
					64	31720		31720	31720
98	24147		24147	24147	61	32120		32120	32120
17	24238		24238	24238	44	32480		32480	32480
37	24253		24253	24253	1	32508		32508	32508
25	24253		24253	24253	29	32668		32603	32603
92	24400		24400	24400	73	34053		32603	32603
47	24656		24656	24656	96	39015		32603	32603
36	24667		24667	24667	79	39804		32603	32603
65	24907		24907	24907	Average X	25032		25417	25417
52	24920		24920	24920	SD S	5741		4264	4264
24	25053		25053	25053	robust average X*	25573	new X*	25417	25417
70	25100		25100	25100	robust stdev S*	4686	new S*	4835	4835
6	25173		25173	25173	δ= 1.5S*	7029		7253	7253
8	25173		25173	25173	X*- δ	18544		18164	18164
12	25213		25213	25213	X*+ δ	32603		32669	32669
62	25480		25480	25480	no of analysts P	91		91	91
21	25573		25573	25573					
15	25693		25693	25693	Between Samples SD	1794			

46	25767		25767	25767					
48	25800		25800	25800	new stdev for PPUN	5157			

to algorithm A annex C ISO13528 *Ceratoneis closterium* iteration

Homogeneity and stability test IPI2017								
C. closterium	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	2560	1760	2160	800	640000
		20/07/2017	water3	2400	2240	2320	160	25600
		20/07/2017	water3	4480	4040	4260	440	193600
		20/07/2017	water3	3040	2920	2980	120	14400
		20/07/2017	water3	2440	2720	2580	280	78400
		20/07/2017	water3	5160	4280	4720	880	774400
		20/07/2017	water3	3760	3520	3640	240	57600
		20/07/2017	water3	4640	4560	4600	80	6400
		20/07/2017	water3	4160	5680	4920	1520	2310400
		20/07/2017	water3	4120	2680	3400	1440	2073600
					Average:	3558	Sum	6174400
					SD	1032	P=	10
				SD within samples:		556		

Annex IX: Robust mean and Standard deviation calculation according

				SD between samples:		955		
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2
		20/07/2017	water3	4440	3600	4020	840	705600
	CELLS / L	20/07/2017	water3	4200	5560	4880	1360	1849600
		20/07/2017	water3	3840	3480	3660	360	129600
					Average:	4187	Sum	2684800
					SD	627	P=	3
				SD within samples:		669		
				SD between samples:		411		

Analysts results for *Ceratoneis closterium*

Analyst Code	[redacted]	Average	[redacted]	X-X*	it1	it2	it3	it4	it5								
				2347						35	2720	93	2720	2720	2720	2720	2720
	43	280		2227	461	612	641	649	652			142					
				2193								184					
				2060						29	2769	187	2769	2769	2769	2769	2769
				2053								200					
				1960								387					
				1933						94	2811	407	2811	2811	2811	2811	2811
				1920								423					
				1880						49	2813	740	2813	2813	2813	2813	2813
	80	400		1827	461	612	641	649	652			747					
		433		1480	461	612	641	649	652	21	2827	867	2827	2827	2827	2827	2827
				1427								933					
				1320								933					
	66	567		1293	567	612	641	649	652	18	3013	973	3013	3013	3013	3013	3013
				1120								1040					
				1093								1099					
	73	573		1080	573	612	641	649	652	46	3033	1107	3033	3033	3033	3033	3033
												1127					
												1172					
	96	667			667	667	667	667	667	1	3050	1213	3050	3050	3050	3050	3050
				1053								1240					
				1027								1273					
	19	693		920	693	693	693	693	693	91	3367	1307	3367	3367	3367	3367	3367
				880								1412					
				835								1413					
	47	707		791	707	707	707	707	707	67	3373	1600	3373	3373	3373	3373	3373
				733								1613					
				707								1627					
	11	747		627	747	747	747	747	747	64	3493	1649	3493	3493	3493	3493	3493
				533								1657					
												1774					

	54	800	467 427 373	800	800	800	800	800		2	3560	1807 1907 1965	3560	3560	3560	3560	3560
	78	1147	347 340 280	1147	1147	1147	1147	1147		12	3560	2373 2627 2634	3560	3560	3560	3560	3560
	36	1200	273 187 173	1200	1200	1200	1200	1200		57	3600	2953	3600	3600	3600	3600	3600
	90	1307	167 147 107	1307	1307	1307	1307	1307		69	3667		3667	3667	3667	3667	3667
	48	1333	67 40 40	1333	1333	1333	1333	1333		79	3726		3726	3726	3726	3726	3726
	98	1507	27 0 27	1507	1507	1507	1507	1507		8	3733		3733	3733	3733	3733	3733
	10	1533	27 80 80	1533	1533	1533	1533	1533		34	3753		3753	3753	3753	3753	3753
	9	1547	93	1547	1547	1547	1547	1547		50	3798		3798	3798	3798	3798	3798
										4	3840		3840	3840	3840	3840	3840
										86	3867		3867	3867	3867	3867	3867
										71	3900		3900	3900	3900	3900	3900
	32	1573		1573	1573	1573	1573	1573		52	3933		3933	3933	3933	3933	3933
	5	1600		1600	1600	1600	1600	1600		87	4039		4039	4039	4039	4039	4039
	24	1707		1707	1707	1707	1707	1707		55	4040		4040	4040	4040	4040	4040
	89	1747		1747	1747	1747	1747	1747		25	4227		4227	4227	4227	4227	4227
	45	1792		1792	1792	1792	1792	1792		37	4240		4240	4240	4240	4240	4240
	31	1836		1836	1836	1836	1836	1836		83	4253		4253	4253	4253	4253	4253
	20	1893		1893	1893	1893	1893	1893		44	4275		4275	4275	4275	4275	4275
	39	1920		1920	1920	1920	1920	1920		16	4283		4283	4283	4283	4283	4283
	58	2000		2000	2000	2000	2000	2000									

Annex IX: Robust mean and Standard deviation calculation according

										17	4401		4401	4401	4401	4401	4401
	77	2093	2093	2093	2093	2093	2093										
										30	4433		4433	4433	4433	4433	4433
	84	2160	2160	2160	2160	2160	2160										
										59	4533		4533	4533	4533	4533	4533
	14	2200	2200	2200	2200	2200	2200										
										42	4592		4592	4592	4592	4592	4592
	7	2253	2253	2253	2253	2253	2253										
										70	5000		4792	4749	4728	4721	4719
	99	2280	2280	2280	2280	2280	2280			27	5253		4792	4749	4728	4721	4719
	53	2286	2286	2286	2286	2286	2286			95	5261		4792	4749	4728	4721	4719
	38	2347	2347	2347	2347	2347	2347			63	5580		4792	4749	4728	4721	4719
	85	2353	2353	2353	2353	2353	2353			74	not id	not id	not id	not id	not id	not id	not id
	93	2440	2440	2440	2440	2440	2440			5	not id	not id	not id	not id	not id	not id	not id
	41	2453	2453	2453	2453	2453	2453			13	not id	not id	not id	not id	not id	not id	not id
	76	2460	2460	2460	2460	2460	2460			51	not id	not id	not id	not id	not id	not id	not id
	75	2480	2480	2480	2480	2480	2480			Average X	2699		2680	2685	2685	2685	2686
	65	2520	2520	2520	2520	2520	2520			SD S	1265		1216	1202	1197	1196	1195
	56	2560	2560	2560	2560	2560	2560			robust average X*	2627	new X*	2680	2685	2685	2685	2686
	15	2587	2587	2587	2587	2587	2587			robust stdev S*	1443	new S*	1379	1363	1357	1356	1355
	60	2587	2587	2587	2587	2587	2587			δ= 1.5S*	2165		2069	2044	2036	2034	2033
	92	2600	2600	2600	2600	2600	2600			X*- δ	461		612	641	649	652	652
	61	2627	2627	2627	2627	2627	2627			X*+ δ	4792		4749	4728	4721	4719	4719
	88	2653	2653	2653	2653	2653	2653			no of analysts P	87		87	87	87	87	87
	22	2653	2653	2653	2653	2653	2653										
	28	2707	2707	2707	2707	2707	2707			Between Samples SD	955						

	97	270		2707	2707	2707	2707	2707									
	62	272		2720	2720	2720	2720	2720	new stdev for CCLOS	1658							

to algorithm A annex C ISO13528 *Chaetoceros curvisetus* iteration

Homogeneity and stability test IPI2017								
C. curvisetus	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	40640	32160	36400	8480	71910400
		20/07/2017	water3	35440	35920	35680	480	230400
		20/07/2017	water3	37720	37520	37620	200	40000
		20/07/2017	water3	35120	37760	36440	2640	6969600
		20/07/2017	water3	32960	36880	34920	3920	15366400
		20/07/2017	water3	37160	31600	34380	5560	30913600
		20/07/2017	water3	44800	37000	40900	7800	60840000
		20/07/2017	water3	30840	31560	31200	720	518400
		20/07/2017	water3	34240	36840	35540	2600	6760000
		20/07/2017	water3	30240	25960	28100	4280	18318400
					Average:	35118	Sum	211867200
					SD	3476	P=	10
				SD within samples:		3255		

Annex IX: Robust mean and Standard deviation calculation according

				SD between samples:		2605		
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2
		20/07/2017	water3	30560	30440	30500	120	14400
	CELLS / L	20/07/2017	water3	26920	30080	28500	3160	9985600
		20/07/2017	water3	38080	31840	34960	6240	38937600
					Average:	31320	Sum	48937600
					SD	3307	P=	3
				SD within samples:		2856		
				SD between samples:		2619		

Analysts results for *Chaetoceros curvisetus*

Analyst Code	[redacted]	Average	[redacted]	X-X*	it1	it2	it3	it4	it5									
				26587							48	29100	1873	29100	29100	29100	29100	29100
	5	640		24627	10795	10795	10795	10795	10795				2053					
				24352									2320					
				24093							28	29280	3587	29280	29280	29280	29280	29280
				22560									4133					
				22467									4207					
				22360							52	29547	4327	29547	29547	29547	29547	29547
				21907									4533					
				21600									4750					
	24	2600		20947	10795	10795	10795	10795	10795		14	30813	4933	30813	30813	30813	30813	30813
	45	2875		20927	10795	10795	10795	10795	10795				5280					
				20127									5387					
				19573							55	31360	5667	31360	31360	31360	31360	31360
	3	3133		19027	10795	10795	10795	10795	10795				5680					
				14547									5747					
				14400							46	31433	6000	31433	31433	31433	31433	31433
	58	4667		13587	10795	10795	10795	10795	10795				6213					
											85	31553	6370	31553	31553	31553	31553	31553
	98	4760			10795	10795	10795	10795	10795				6533					
				12587							97	31760	7440	31760	31760	31760	31760	31760
	20	4867		11627	10795	10795	10795	10795	10795				7490					
				10773							96	31977	7533	31977	31977	31977	31977	31977
				9747									7546					
				9293									7690					
	54	5320		9187	10795	10795	10795	10795	10795		22	32160	7790	32160	32160	32160	32160	32160
				7387									8187					
													8267					
													8405					

	62	562	6533 6133 5227	10795	10795	10795	10795	10795		61	32507	9207 9427 10000	32507	32507	32507	32507	32507
	69	628(	5120 4861 4747	10795	10795	10795	10795	10795		65	32613	10307 11607 11733	32613	32613	32613	32613	32613
	66	630(	3653 3587 3267	10795	10795	10795	10795	10795		93	32893	12282 12527 13707	32893	32893	32893	32893	32893
	80	710(	2827 2800 2427	10795	10795	10795	10795	10795		18	32907	14485 20620 20627	32907	32907	32907	32907	32907
	15	765	2133 2067 1739	10795	10795	10795	10795	10795		67	32973		32973	32973	32973	32973	32973
	19	820(	1587 1427 1253	10795	10795	10795	10795	10795		73	33227		33227	33227	33227	33227	33227
		12680	307 0	12680	12680	12680	12680	12680		99	33440		33440	33440	33440	33440	33440
	11	1282	0 309 1440	12827	12827	12827	12827	12827		87	33597		33597	33597	33597	33597	33597
	56	1364(	1507 1678	13640	13640	13640	13640	13640		25	33760		33760	33760	33760	33760	33760
										2	34667		34667	34667	34667	34667	34667
										29	34716		34716	34716	34716	34716	34716
										49	34760		34760	34760	34760	34760	34760
	75	1464(		14640	14640	14640	14640	14640									
										1	34773		34773	34773	34773	34773	34773
	27	1560(		15600	15600	15600	15600	15600									
	78	1645		16453	16453	16453	16453	16453		16	34917		34917	34917	34917	34917	34917
										42	35017		35017	35017	35017	35017	35017
	35	1748(		17480	17480	17480	17480	17480									
										4	35413		35413	35413	35413	35413	35413
	90	1793		17933	17933	17933	17933	17933									
										51	35493		35493	35493	35493	35493	35493
	43	1804(		18040	18040	18040	18040	18040									
										94	35632		35632	35632	35632	35632	35632
	77	1984(		19840	19840	19840	19840	19840									
										71	36433		36433	36433	36433	36433	36433
	38	2069		20693	20693	20693	20693	20693									
										37	36653		36653	36653	36653	36653	36653

Annex IX: Robust mean and Standard deviation calculation according

	92	2109	21093	21093	21093	21093	21093											
									6	37227		37227	37227	37227	37227	37227		
	36	2200	22000	22000	22000	22000	22000											
									57	37533		37533	37533	37533	37533	37533		
	84	2210	22107	22107	22107	22107	22107											
									30	38833		38833	38833	38833	38833	38833		
	47	2236	22366	22366	22366	22366	22366											
									79	38960		38960	38960	38960	38960	38960		
	10	2248	22480	22480	22480	22480	22480											
									63	39509		39509	39509	39509	39509	39509		
	60	2357	23573	23573	23573	23573	23573		17	39753		39753	39753	39753	39753	39753		
	89	2364	23640	23640	23640	23640	23640		70	40933		40933	40933	40933	40933	40933		
	86	2396	23960	23960	23960	23960	23960		95	41712		41712	41712	41712	41712	41712		
	64	2440	24400	24400	24400	24400	24400		34	47847		43658	42605	42510	42501	42500		
	39	2442	24427	24427	24427	24427	24427		41	47853		43658	42605	42510	42501	42500		
	74	2480	24800	24800	24800	24800	24800		13	not id	not id	not id	not id	not id	not id	not id		
	32	2509	25093	25093	25093	25093	25093		59	not id	not id	not id	not id	not id	not id	not id		
	31	2516	25160	25160	25160	25160	25160		Average X	25377		26195	26171	26169	26169	26169		
	44	2548	25488	25488	25488	25488	25488		SD S	11424		9647	9605	9602	9601	9601		
	88	2564	25640	25640	25640	25640	25640		robust average X*	27227	new X*	26195	26171	26169	26169	26169		
	21	2580	25800	25800	25800	25800	25800		robust stdev S*	10954	new S*	10940	10892	10888	10888	10888		
	83	2597	25973	25973	25973	25973	25973		δ= 1.5S*	16432		16410	16339	16332	16332	16332		
		26920	26920	26920	26920	26920	26920		X*- δ	10795		9784	9832	9837	9837	9837		
	91	2722	27227	27227	27227	27227	27227		X*+ δ	43658		42605	42510	42501	42500	42500		
	76	2722	27227	27227	27227	27227	27227		no of analysts P	89		89	89	89	89	89		

	50	2753		27536	27536	27536	27536	27536										
		28667		28667	28667	28667	28667	28667		Between Samples SD	2605							
	12	2873		28733	28733	28733	28733	28733										
	53	2890		28904	28904	28904	28904	28904		new stdev for CCURV	11195							

to algorithm A annex C ISO13528 *Prorocentrum mexicanum* iteration

Homogeneity and stability test IPI2017								
P. mexicanum	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	5800	5320	5560	480	230400
		20/07/2017	water3	4080	5440	4760	1360	1849600
		20/07/2017	water3	5200	5520	5360	320	102400
		20/07/2017	water3	4960	5600	5280	640	409600
		20/07/2017	water3	5320	5240	5280	80	6400
		20/07/2017	water3	5000	5320	5160	320	102400
		20/07/2017	water3	3120	3200	3160	80	6400
		20/07/2017	water3	5280	4520	4900	760	577600
		20/07/2017	water3	4800	5720	5260	920	846400
		20/07/2017	water3	5520	5400	5460	120	14400
					Average:		Sum	4145600

Annex IX: Robust mean and Standard deviation calculation according

					SD	5018 696	P=	10
				SD within samples:		455		
				SD between samples:		617		
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2
		20/07/2017	water3	5880	4640	5260	1240	1537600
	CELLS / L	20/07/2017	water3	5640	6080	5860	440	193600
		20/07/2017	water3	3920	4680	4300	760	577600
					Average:	5140	Sum	2308800
					SD	787	P=	3
				SD within samples:		620		
				SD between samples:		653		

Analysts results for *Prorocentrum mexicanum*

Analyst Code	Average		X-X*	it1	it2	it3	it4		97	1533	67	1533	1533	1533	1533
	[redacted]		1233								80				
3	233	[redacted]	1173 1013 880 827	590	607	610	611		18	1547	100 160 187	1547	1547	1547	1547
14	293		760 747 720 653 653	590	607	610	611		30 71	1567 1567	200 213 240 293	1567 1567	1567 1567	1567 1567	1567 1567
92	453		633 627 613	590	607	610	611		61	1627	360 388 453	1627	1627	1627	1627
28	587		533 467 413	590	607	610	611		52	1653	467 493 533	1653	1653	1653	1653
67	640			640	640	640	640		58	1667	573 596 617 653	1667	1667	1667	1667

25	707	400	707	707	707	707	95	1667	667	1667	1667	1667	1667
									738				
									777				
11	720	400	720	720	720	720	90	1680	827	1680	1680	1680	1680
		387							840				
96	747	373	747	747	747	747	75	1707	846	1707	1707	1707	1707
		367							873				
		345							920				
83	813	333	813	813	813	813	85	1760	942	1760	1760	1760	1760
		333							1000				
		307							1013				
35	813	293	813	813	813	813	19	1827	1080	1827	1827	1827	1827
		280							1093				
		240							1213				
48	833	227	833	833	833	833	1	1855	1227	1855	1855	1855	1855
		213							1485				
		213							1600				
4	840	160	840	840	840	840	7	1920	1608	1920	1920	1920	1920
		160											
32	853	147	853	853	853	853	91	1933		1933	1933	1933	1933
		133											
		133											
56	933	107	933	933	933	933	98	1960		1960	1960	1960	1960
		93											
		67											
51	1000	34	1000	1000	1000	1000	6	2000		2000	2000	2000	2000
		27											
		27											
36	1053	3	1053	1053	1053	1053	20	2040		2040	2040	2040	2040
		0											
		0											
74	1067	13	1067	1067	1067	1067	29	2063		2063	2063	2063	2063
		13											
		40					16	2083		2083	2083	2083	2083
		53											
							69	2120		2120	2120	2120	2120
							46	2133		2133	2133	2133	2133
66	1067		1067	1067	1067	1067							
86	1080		1080	1080	1080	1080	87	2204		2204	2204	2204	2204
							31	2244		2244	2244	2244	2244
12	1093		1093	1093	1093	1093							
							73	2293		2293	2293	2293	2293
80	1100		1100	1100	1100	1100							
							55	2307		2307	2307	2307	2307
53	1121		1121	1121	1121	1121							
							79	2313		2313	2313	2313	2313
78	1133		1133	1133	1133	1133							
							50	2340		2340	2340	2340	2340

Annex IX: Robust mean and Standard deviation calculation according

54	1133		1133	1133	1133	1133											
77	1160		1160	1160	1160	1160		65	2387		2343	2343	2343	2343			
64	1173		1173	1173	1173	1173		44	2409		2343	2343	2343	2343			
24	1187		1187	1187	1187	1187		70	2467		2343	2343	2343	2343			
89	1227		1227	1227	1227	1227		10	2480		2343	2343	2343	2343			
99	1240		1240	1240	1240	1240		27	2547		2343	2343	2343	2343			
13	1253		1253	1253	1253	1253		43	2560		2343	2343	2343	2343			
37	1253		1253	1253	1253	1253		84	2680		2343	2343	2343	2343			
41	1307		1307	1307	1307	1307		49	2693		2343	2343	2343	2343			
93	1307		1307	1307	1307	1307		76	2952		2343	2343	2343	2343			
8	1320		1320	1320	1320	1320		88	3067		2343	2343	2343	2343			
45	1333		1333	1333	1333	1333		42	3075		2343	2343	2343	2343			
59	1333		1333	1333	1333	1333		5	not id	not id	not id	not id	not id	not id			
94	1360		1360	1360	1360	1360		39	not id	not id	not id	not id	not id	not id			
62	1373		1373	1373	1373	1373		9	not id	not id	not id	not id	not id	not id			
21	1400		1400	1400	1400	1400		Average X		1559		1527	1528	1528	1528		
17	1432		1432	1432	1432	1432		SD S		631		541	540	539	539		
22	1440		1440	1440	1440	1440		robust average X*		1467	new X*	1527	1528	1528	1528		
60	1440		1440	1440	1440	1440		robust stdev S*		584	new S*	613	612	612	612		
								δ= 1.5S*		877		920	918	917	917		

63	1464		1464	1464	1464	1464	X*- δ	590		607	610	611	611
38	1467		1467	1467	1467	1467	X*+ δ	2343		2448	2446	2446	2446
57	1467		1467	1467	1467	1467	no of analysts P	88		88	88	88	88
34	1479		1479	1479	1479	1479							
15	1480		1480	1480	1480	1480	Between Samples SD	617					
2	1507		1507	1507	1507	1507							
47	1520		1520	1520	1520	1520	new stdev for PMEX	868					

to algorithm A annex C ISO13528 *Scrippsiella trochoidea* iteration

Homogeneity and stability test IPI2017								
S. trochoidea	CELLS / L							
		Date	Sample	M1	M2	sample average		*2
		20/07/2017	water3	2560	2520	2540	40	1600
		20/07/2017	water3	2520	2560	2540	40	1600
		20/07/2017	water3	2720	2760	2740	40	1600
		20/07/2017	water3	1960	2440	2200	480	230400
		20/07/2017	water3	2440	2480	2460	40	1600
		20/07/2017	water3	2040	2320	2180	280	78400
		20/07/2017	water3	1680	2640	2160	960	921600
		20/07/2017	water3	2760	2960	2860	200	40000
		20/07/2017	water3	3760	3600	3680	160	25600

Annex IX: Robust mean and Standard deviation calculation according

		20/07/2017	water3	3120	2560	2840	560	313600
					Average:	2620 455	Sum	1616000
					SD		P=	10
				SD within samples:		284		
				SD between samples:		408		
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2
		20/07/2017	water3	4240	3280	3760	960	921600
	CELLS / L	20/07/2017	water3	3040	3760	3400	720	518400
		20/07/2017	water3	3600	4240	3920	640	409600
					Average:	3693	Sum	1849600
					SD	266	P=	3
				SD within samples:		555		
				SD between samples:		288		

Analysts results for *Scrippsiella trochoidea*

[redacted]	[redacted]	X-X*	it1	it2	it3								
		1411						76					
								76					
[redacted]	[redacted]	1377						76					
3	967	1364	1576	1576	1576	88	2453	89	2453	2453	2453		
		1191						99					
		1137						139					
		1124				47	2453	156	2453	2453	2453		
		1071						163					
		1044						165					
		1044				8	2453	183	2453	2453	2453		
58	1000	937	1576	1576	1576			183					
24	1013	924	1576	1576	1576	41	2467	206	2467	2467	2467		
		871						209					
		871						209					

38	1187	857 844 751 684 671 644 631 611 524 511 505 431 377 364 364 337 337 324 211 191 191 177 151 137 137 111 111 111 84 84 57 23 23 23 36 42	1576	1576	1576
9	1240		1576	1576	1576
36	1253		1576	1576	1576
90	1307		1576	1576	1576
13	1333		1576	1576	1576
35	1333		1576	1576	1576
43	1440		1576	1576	1576
14	1453		1576	1576	1576
65	1507		1576	1576	1576
54	1507		1576	1576	1576
32	1520		1576	1576	1576
66	1533		1576	1576	1576
77	1627		1627	1627	1627
49	1693		1693	1693	1693
99	1707		1707	1707	1707
96	1733		1733	1733	1733
11	1747		1747	1747	1747
80	1767		1767	1767	1767
78	1853		1853	1853	1853

87	2477	249 249 263 289 289 303 306 329 356 369 463 463 489 493 516 516 656 656 697 705 753 768 835 923 1586 1691	2477	2477	2477
31	2516		2516	2516	2516
15	2533		2533	2533	2533
34	2540		2540	2540	2540
1	2542		2542	2542	2542
12	2560		2560	2560	2560
62	2560		2560	2560	2560
59	2583		2583	2583	2583
2	2587		2587	2587	2587
22	2587		2587	2587	2587
20	2627		2627	2627	2627
25	2627		2627	2627	2627
7	2640		2640	2640	2640
69	2667		2667	2667	2667
91	2667		2667	2667	2667
60	2680		2680	2680	2680
16	2683		2683	2683	2683
55	2707		2707	2707	2707
46	2733		2733	2733	2733
64	2747		2747	2747	2747
86	2840		2840	2840	2840
6	2840		2840	2840	2840

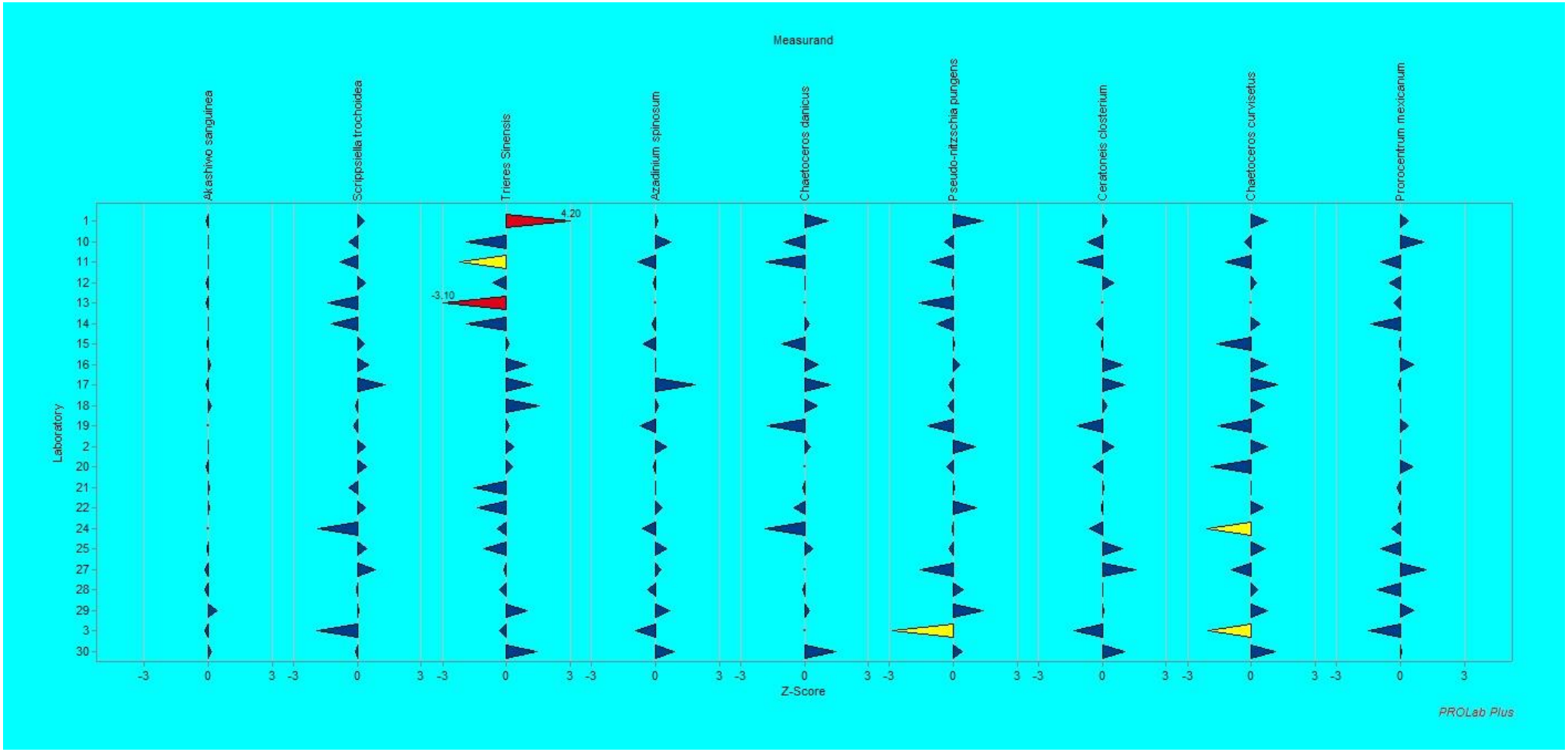
Annex IX: Robust mean and Standard deviation calculation according

73	1867		1867	1867	1867						
						37	2867		2867	2867	2867
50	1872		1872	1872	1872						
						76	2870		2870	2870	2870
74	1947		1947	1947	1947						
						84	2893		2893	2893	2893
48	2000		2000	2000	2000						
						27	2893		2893	2893	2893
61	2013		2013	2013	2013						
						71	3033		3033	3033	3033
98	2013		2013	2013	2013						
						57	3033		3033	3033	3033
21	2040		2040	2040	2040						
						53	3075		3075	3075	3075
10	2040		2040	2040	2040						
						94	3083		3083	3083	3083
92	2053		2053	2053	2053	95	3131		3131	3131	3131
45	2167		2167	2167	2167	63	3145		3145	3145	3145
39	2187		2187	2187	2187	17	3213		3178	3155	3151
19	2187		2187	2187	2187	70	3300		3178	3155	3151
85	2200		2200	2200	2200	44	3963		3178	3155	3151
67	2227		2227	2227	2227	79	4068		3178	3155	3151
93	2240		2240	2240	2240	5	not id	not id	not id	not id	not id
18	2240		2240	2240	2240	Average X	2283		2308	2307	2307
30	2267		2267	2267	2267	SD S	620		498	497	496
4	2267		2267	2267	2267	robust average X*	2377	new X*	2308	2307	2307

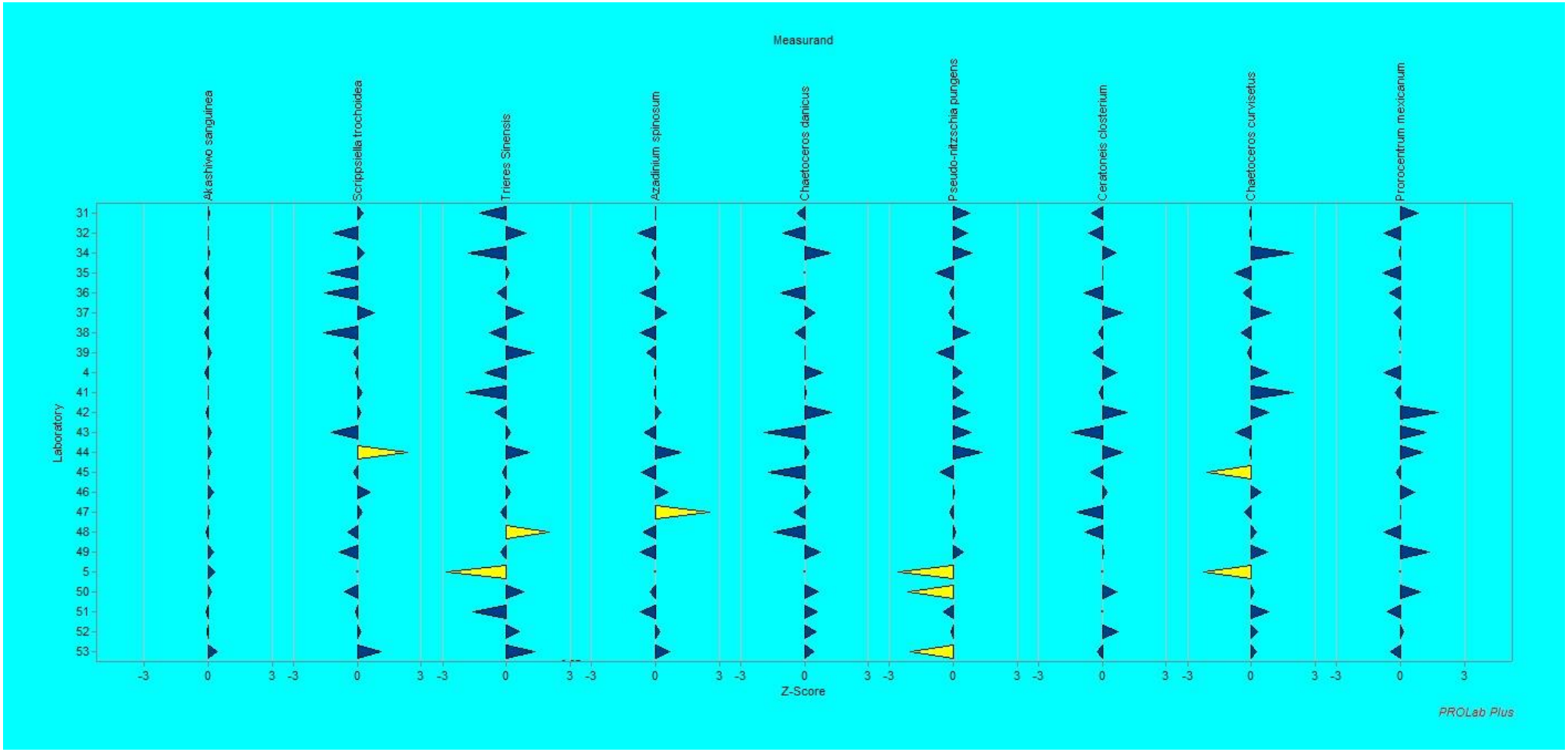
51	2267		2267	2267	2267	robust stdev S*	534	new S*	565	563	563
28	2293		2293	2293	2293	δ= 1.5S*	801		848	845	844
97	2293		2293	2293	2293	X*- δ	1576		1460	1462	1462
83	2320		2320	2320	2320	X*+ δ	3178		3155	3151	3151
29	2354		2354	2354	2354	no of analysts P	90		90	90	90
56	2400		2400	2400	2400						
89	2400		2400	2400	2400	Between Samples SD	408				
52	2413		2413	2413	2413						
42	2419		2419	2419	2419	new stdev for STROC	695				
Analyst Code	Average						75	2440	63	2440	2440	2440

Annex IX: Robust mean and Standard deviation calculation according

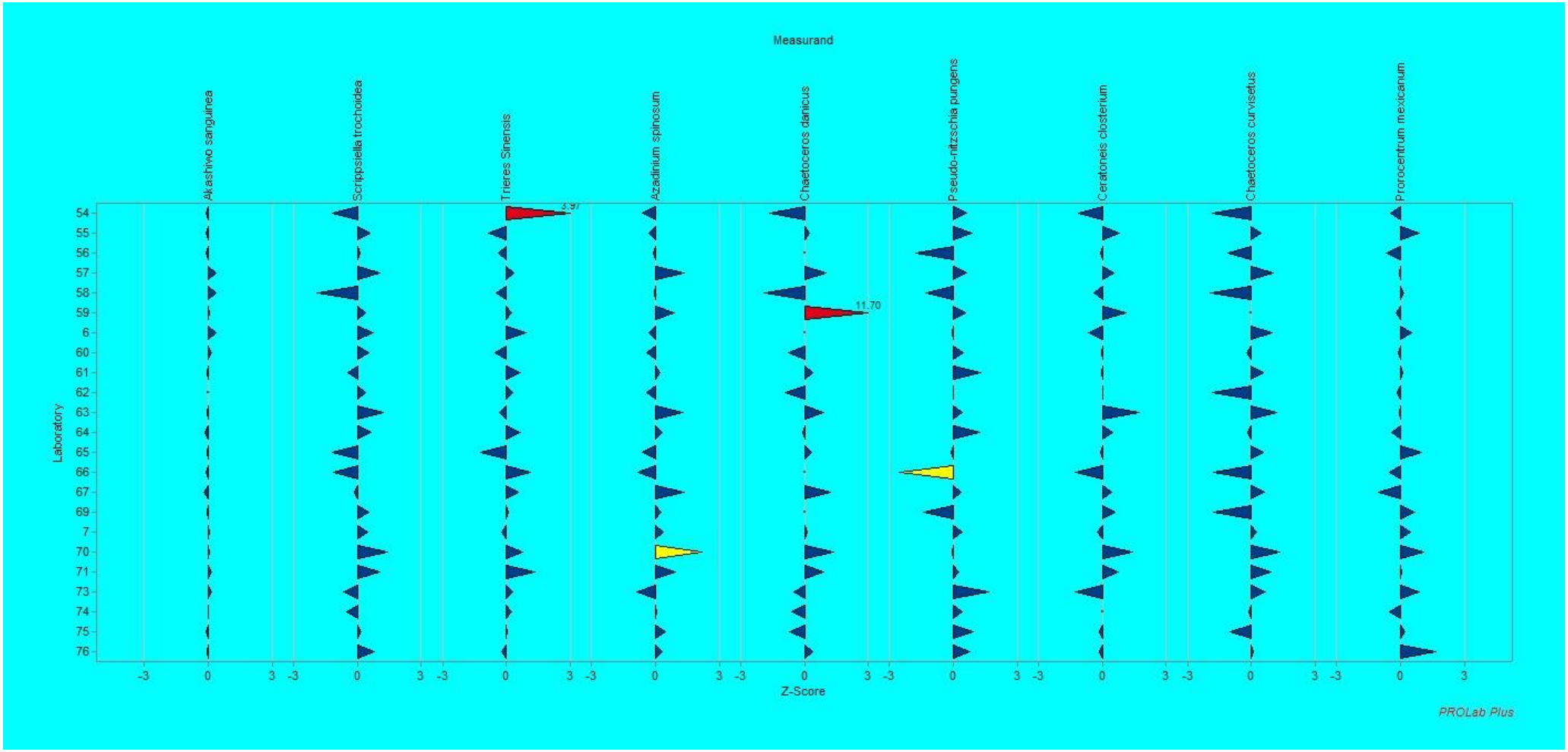
ANNEX X: Summary of Z-scores IPI2017 for all measurands pg1



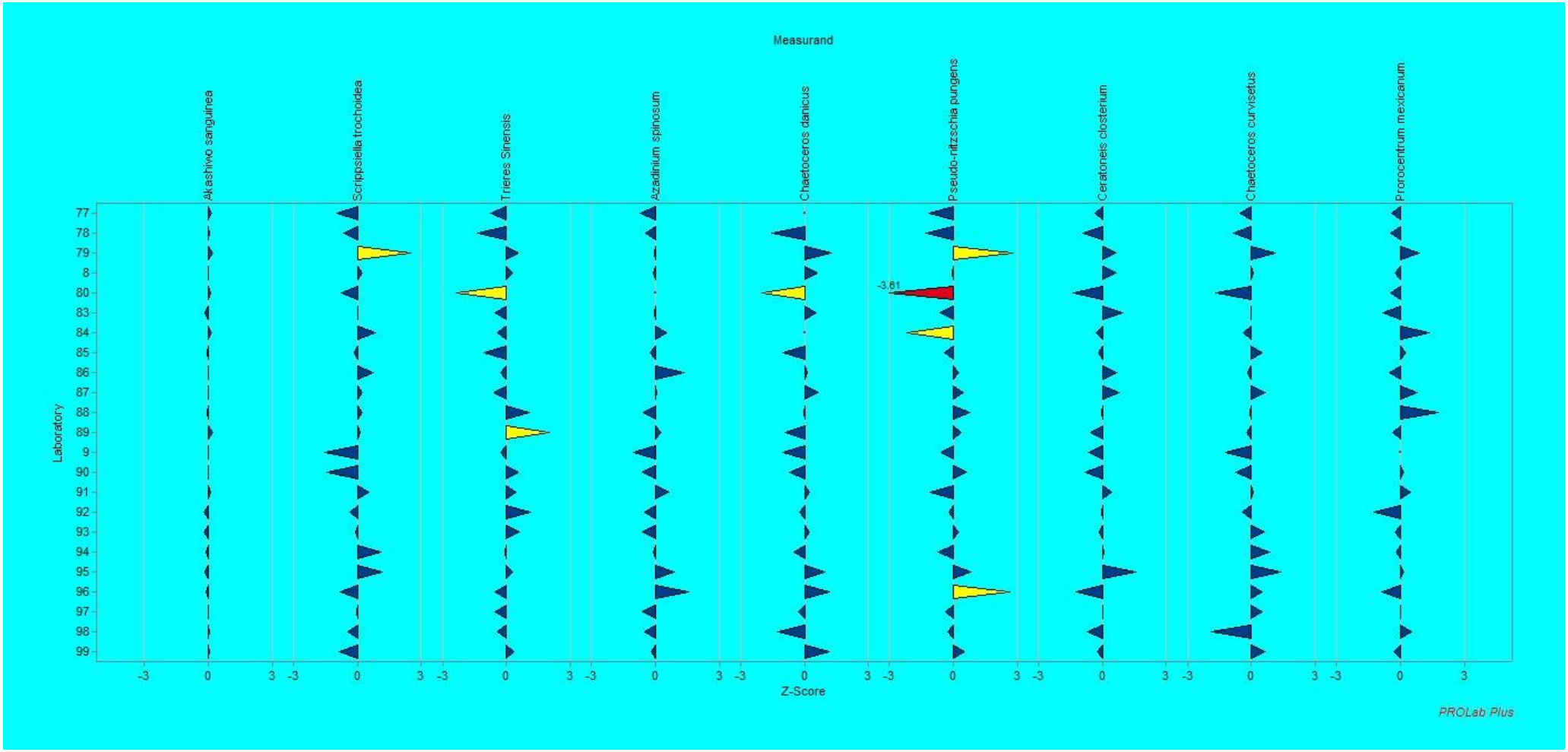
ANNEX X: Summary of Z-scores for all measurands pg2



ANNEX X: Summary of Z-scores for all measurands pg3



ANNEX X: Summary of Z-scores for all measurands pg4



ANNEX XI: Performance statistics for the test IPI2017

Analyst code	Number	Within tolerance	%	Successful	Analyst code	Number	Within tolerance	%	Successful	Analyst code	Number	Within tolerance	%	Successful
87	9	9	100	Yes	93	9	9	100	Yes	48	9	8	88.89	Yes
29	9	9	100	Yes	18	9	9	100	Yes	9	9	8	88.89	Yes
34	9	9	100	Yes	99	9	9	100	Yes	45	9	8	88.89	Yes
38	9	9	100	Yes	15	9	9	100	Yes	11	9	8	88.89	Yes
83	9	9	100	Yes	31	9	9	100	Yes	20	9	8	88.89	Yes
86	9	9	100	Yes	94	9	9	100	Yes	35	9	8	88.89	Yes
25	9	9	100	Yes	52	9	9	100	Yes	27	9	8	88.89	Yes
55	9	9	100	Yes	28	9	9	100	Yes	69	9	8	88.89	Yes
67	9	9	100	Yes	92	9	9	100	Yes	62	9	8	88.89	Yes
12	9	9	100	Yes	60	9	9	100	Yes	54	9	8	88.89	Yes
8	9	9	100	Yes	91	9	9	100	Yes	19	9	8	88.89	Yes
2	9	9	100	Yes	7	9	9	100	Yes	96	9	8	88.89	Yes
61	9	9	100	Yes	78	9	9	100	Yes	47	9	8	88.89	Yes
4	9	9	100	Yes	10	9	9	100	Yes	39	9	8	88.89	Yes
22	9	9	100	Yes	88	9	9	100	Yes	89	9	8	88.89	Yes
17	9	9	100	Yes	49	9	9	100	Yes	6	9	8	88.89	Yes
95	9	9	100	Yes	43	9	9	100	Yes	53	9	8	88.89	Yes
63	9	9	100	Yes	65	9	9	100	Yes	74	9	8	88.89	Yes
98	9	9	100	Yes	73	9	9	100	Yes	51	9	8	88.89	Yes
30	9	9	100	Yes	58	9	9	100	Yes	50	9	8	88.89	Yes
46	9	9	100	Yes	36	9	9	100	Yes	44	9	8	88.89	Yes
57	9	9	100	Yes	32	9	9	100	Yes	56	9	8	88.89	Yes
41	9	9	100	Yes	75	9	9	100	Yes	79	9	7	77.78	No
16	9	9	100	Yes	97	9	9	100	Yes	24	9	7	77.78	No
21	9	9	100	Yes	85	9	9	100	Yes	66	9	7	77.78	No
64	9	9	100	Yes	42	9	9	100	Yes	84	9	7	77.78	No

37	9	9	100	Yes	76	9	9	100	Yes	59	9	7	77.78	No
71	9	9	100	Yes	1	9	8	88.89	Yes	3	9	6	66.67	No
90	9	9	100	Yes	77	9	8	88.89	Yes	80	9	5	55.56	No
14	9	9	100	Yes	70	9	8	88.89	Yes	13	9	4	44.44	No
										5	9	1	11.11	No

ANNEX XII: Summary of laboratory means

Analyst code	Akashiwo sanguinea		Scrippsiela trochoidea		Trieres sinensis		Azadinium spinosum		Chaetoceros danicus		Pseudo-nitzschia pungens		Ceratoneis closterium		Chaetoceros curvisetus		Prorocentrum mexicanum	
	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score
1	86	-0.08	2542	0.34	4863	4.2	2633	0.11	11046	1.11	32508	1.38	3050	0.22	34773	0.77	1855	0.38
2	147	0.02	2587	0.4	3333	0.35	3520	0.54	8147	0.27	30787	1.04	3560	0.53	34667	0.76	1507	-0.02
3	33	-0.17	967	-1.93	3067	-0.32	500	-0.93	not id	not id	10733	-2.85	433	-1.36	3133	-2.06	233	-1.49
4	40	-0.16	2267	-0.06	2787	-1.02	2320	-0.04	10173	0.86	27427	0.39	3840	0.7	35413	0.83	840	-0.79
5	307	0.3	not id	not id	2067	-2.83	not id	not id	not id	not id	11920	-2.62	not id	not id	640	-2.28	not id	not id
6	347	0.36	2840	0.77	3560	0.92	1733	-0.33	not id	not id	25173	-0.05	1600	-0.66	37227	0.99	2000	0.54
7	173	0.07	2640	0.48	3107	-0.22	3133	0.35	7653	0.13	27467	0.4	2253	-0.26	28667	0.22	1920	0.45
8	120	-0.02	2453	0.21	3307	0.29	2187	-0.11	9267	0.59	25173	-0.05	3733	0.63	26920	0.07	1320	-0.24
9	120	-0.02	1240	-1.54	3093	-0.25	240	-1.05	3760	-1	22360	-0.59	1547	-0.69	12680	-1.2	not id	not id
10	133	0	2040	-0.38	2453	-1.86	3933	0.74	3893	-0.96	23320	-0.41	1533	-0.7	22480	-0.33	2480	1.1
11	120	-0.02	1747	-0.81	2320	-2.19	733	-0.82	1013	-1.79	19720	-1.1	747	-1.17	12827	-1.19	720	-0.93
12	67	-0.12	2560	0.36	2947	-0.62	2173	-0.12	7240	0.01	25213	-0.04	3560	0.53	28733	0.23	1093	-0.5
13	80	-0.09	1333	-1.4	1960	-3.1	not id	not id	not id	not id	17107	-1.61	not id	not id	not id	not id	1253	-0.32
14	120	-0.02	1453	-1.23	2453	-1.86	2080	-0.16	7973	0.22	21253	-0.81	2200	-0.29	30813	0.41	293	1.42
15	93	-0.07	2533	0.33	3240	0.12	1240	-0.57	3547	-1.06	25693	0.05	2587	-0.06	7653	-1.65	1480	-0.06
16	183	0.08	2683	0.54	3583	0.98	2467	0.03	9500	0.66	27000	0.31	4283	0.96	34917	0.78	2083	0.64
17	78	-0.1	3213	1.3	3684	1.23	6242	1.86	11370	1.2	24238	-0.23	4401	1.03	39753	1.21	1432	-0.11
18	227	0.16	2240	-0.1	3813	1.56	2747	0.16	9227	0.58	23987	-0.28	3013	0.2	32907	0.6	1547	0.02
19	not id	not id	2187	-0.17	3240	0.12	960	-0.71	1133	-1.76	19227	-1.2	693	-1.2	8200	-1.61	1827	0.34
20	67	-0.12	2627	0.46	3307	0.29	2160	-0.12	not id	not id	23667	-0.34	1893	-0.48	4867	-1.9	2040	0.59
21	160	0.04	2040	-0.38	2587	-1.52	2453	0.02	6933	-0.08	25573	0.03	2827	0.08	25800	-0.03	1400	-0.15
22	173	0.07	2587	0.4	2653	-1.36	3040	0.31	5467	-0.5	31080	1.1	2653	-0.02	32160	0.54	1440	-0.1
24	not id	not id	1013	-1.86	3027	-0.42	1093	-0.64	907	-1.82	25053	-0.07	1707	-0.59	2600	-2.11	1187	-0.39
25	93	-0.07	2627	0.46	2773	-1.05	3480	0.52	8560	0.39	24253	-0.23	4227	0.93	33760	0.68	707	-0.95
27	53	-0.14	2893	0.84	3147	-0.12	2920	0.25	not id	not id	17267	-1.58	5253	1.55	15600	-0.94	2547	1.17
28	40	-0.16	2293	-0.02	3067	-0.32	1640	-0.37	6960	-0.07	27853	0.47	2707	0.01	29280	0.28	587	-1.08
29	374	0.41	2354	0.07	3574	0.96	3764	0.66	8077	0.25	32667	1.41	2769	0.05	34716	0.76	2063	0.62
30	233	0.17	2267	-0.06	3767	1.44	4200	0.87	12267	1.46	27400	0.38	4433	1.05	38833	1.13	1567	0.04
31	160	0.04	2516	0.3	2693	-1.26	2380	-0.02	5984	-0.36	29376	0.77	1836	-0.51	25160	-0.09	2244	0.82
32	133	0	1520	-1.13	3560	0.92	667	-0.85	3733	-1.01	28960	0.69	1573	-0.67	25093	-0.1	853	-0.78
34	167	0.06	2540	0.34	2487	-1.77	2140	-0.13	11425	1.22	29999	0.89	3753	0.64	47846	1.94	1479	-0.06
35	40	-0.16	1333	-1.4	3240	0.12	2880	0.23	not id	not id	21013	-0.85	2720	0.02	17480	-0.78	813	-0.82
36	40	-0.16	1253	-1.52	3027	-0.42	933	-0.72	3280	-1.14	24667	-0.15	1200	-0.9	22000	-0.37	1053	-0.55
37	27	-0.18	2867	0.81	3520	0.82	3480	0.52	8867	0.48	24253	-0.23	4240	0.94	36653	0.94	1253	-0.32
38	53	-0.14	1187	-1.61	2880	-0.79	973	-0.7	5693	-0.44	29493	0.79	2347	-0.2	20693	-0.49	1467	-0.07
39	240	0.18	2187	-0.17	3707	1.29	1520	-0.43	7307	0.03	21307	-0.8	1920	-0.46	24427	-0.16	not id	not id
41	120	-0.02	2467	0.23	2440	-1.89	2320	-0.04	7453	0.07	27787	0.46	2453	-0.14	47853	1.94	1307	-0.25
42	80	-0.09	2419	0.16	2973	-0.55	2911	0.24	11647	1.28	29480	0.79	4592	1.15	35017	0.79	3075	1.78

ANNEX XII: Summary of laboratory means

43	213	0.14	1440	-1.25	3280	0.22	1320	-0.53	627	-1.91	29653	0.82	280	-1.45	18040	-0.73	2560	1.19
44	213	0.14	3963	2.38	3627	1.09	4879	1.2	8041	0.24	32480	1.37	4275	0.96	25488	-0.06	2409	1.01
45	167	0.06	2167	-0.2	3125	-0.17	1000	-0.69	1375	-1.69	22167	-0.63	1792	-0.54	2875	-2.08	1333	-0.22
46	300	0.28	2733	0.61	3267	0.19	3567	0.56	8133	0.27	25767	0.07	3033	0.21	31433	0.47	2133	0.7
47	173	0.07	2453	0.21	3093	-0.25	7650	2.55	5572	-0.47	24656	-0.15	707	-1.19	22366	-0.34	1520	-0.01
48	67	-0.12	2000	-0.44	4000	2.03	1200	-0.59	2267	-1.43	25800	0.07	1333	-0.82	29100	0.26	833	-0.8

Analyst code	Akashiwo sanguinea		Scrippsiela trochoidea		Trieres sinensis		Azadinium spinosum		Chaetoceros danicus		Pseudo-nitzschia pungens		Ceratoneis closterium		Chaetoceros curvisetus		Prorocentrum mexicanum	
	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score
49	293	0.27	1693	-0.88	3080	-0.28	893	-0.74	9813	0.75	27707	0.44	2813	0.08	34760	0.77	2693	1.34
50	238	0.18	1872	-0.63	3510	0.8	1872	-0.26	9495	0.66	14273	-2.16	3798	0.67	27536	0.12	2340	0.94
51	80	-0.09	2267	-0.06	2573	-1.56	960	-0.71	9240	0.59	23093	-0.45	not id	not id	35493	0.83	1000	-0.61
52	93	-0.07	2413	0.15	3440	0.62	2840	0.21	9040	0.53	24920	-0.1	3933	0.75	29547	0.3	1653	0.14
53	377	0.42	3075	1.1	3730	1.35	3818	0.68	8714	0.43	15018	-2.02	2286	-0.24	28904	0.24	1121	-0.47
54	67	-0.12	1507	-1.15	4773	3.97	1107	-0.63	1520	-1.65	28520	0.6	800	-1.14	5320	-1.86	1133	-0.45
55	67	-0.12	2707	0.58	2867	-0.82	1787	-0.3	7960	0.22	30013	0.89	4040	0.82	31360	0.46	2307	0.9
56	80	-0.09	2400	0.13	3053	-0.35	2213	-0.1	not id	not id	16333	-1.76	2560	-0.08	13640	-1.12	933	-0.69
57	333	0.34	3033	1.05	3333	0.35	5200	1.36	10733	1.02	28700	0.64	3600	0.55	37533	1.02	1467	-0.07
58	333	0.34	1000	-1.88	3000	-0.48	2333	-0.04	667	-1.89	18667	-1.31	2000	-0.41	4667	-1.92	1667	0.16
59	167	0.06	2583	0.4	3300	0.27	4200	0.87	47633	11	28267	0.55	4533	1.11	not id	not id	1333	-0.22
60	213	0.14	2680	0.54	2987	-0.52	1533	-0.43	4547	-0.77	27733	0.45	2587	-0.06	23573	-0.23	1440	-0.1
61	107	-0.05	2013	-0.42	3453	0.65	2853	0.21	8520	0.38	32120	1.3	2627	-0.04	32507	0.57	1627	0.11
62	not id	not id	2560	0.36	3307	0.29	1520	-0.43	3987	-0.93	25480	0.01	2720	0.02	5627	-1.83	1373	-0.18
63	116	-0.03	3145	1.21	3073	-0.3	5145	1.33	10421	0.93	27407	0.39	5580	1.75	39509	1.19	1464	-0.07
64	40	-0.16	2747	0.63	3467	0.69	3107	0.34	6867	-0.1	31720	1.22	3493	0.49	24400	-0.16	1173	-0.41
65	93	-0.07	1507	-1.15	2720	-1.19	1107	-0.63	8347	0.33	24907	-0.1	2520	-0.1	32613	0.58	2387	0.99
66	67	-0.12	1533	-1.11	3633	1.11	667	-0.85	not id	not id	12167	-2.57	567	-1.28	6300	-1.77	1067	-0.53
67	13	-0.21	2227	-0.12	3413	0.55	5160	1.34	11427	1.22	27267	0.36	3373	0.41	32973	0.61	640	-1.02
69	93	-0.07	2667	0.52	3227	0.08	2907	0.24	not id	not id	18187	-1.4	3667	0.59	6280	-1.78	2120	0.68
70	167	0.06	3300	1.43	3500	0.77	6900	2.18	11900	1.36	25100	-0.06	5000	1.4	40933	1.32	2467	1.08
71	233	0.17	3033	1.05	3733	1.36	4367	0.95	10400	0.92	26700	0.25	3900	0.73	36433	0.92	1567	0.04
73	240	0.18	1867	-0.63	3307	0.29	627	-0.87	5467	-0.5	34053	1.67	573	-1.27	33227	0.63	2293	0.88
74	120	-0.02	1947	-0.52	3293	0.25	2520	0.05	5160	-0.59	27613	0.43	not id	not id	24800	-0.12	1067	-0.53
75	67	-0.12	2440	0.19	3213	0.05	3440	0.5	4747	-0.71	30107	0.91	2480	-0.12	14640	-1.03	1707	0.21
76	107	-0.05	2870	0.81	3107	-0.22	3116	0.34	8611	0.41	29437	0.78	2460	-0.14	27227	0.09	2952	1.64
77	227	0.16	1627	-0.98	2907	-0.72	893	-0.74	not id	not id	19467	-1.15	2093	-0.36	19840	-0.57	1160	-0.42
78	160	0.04	1853	-0.65	2640	-1.39	1507	-0.44	1947	-1.52	18587	-1.32	1147	-0.93	16453	-0.87	1133	-0.45

ANNEX XII: Summary of laboratory means

79	262	0.22	4068	2.53	3422	0.58	2351	-0.03	11588	1.27	39804	2.79	3726	0.63	38959	1.14	2313	0.9
80	200	0.11	1767	-0.78	2267	-2.33	not id	not id	233	-2.02	6800	-3.61	400	-1.38	7100	-1.7	1100	-0.49
83	53	-0.14	2320	0.02	2973	-0.55	2307	-0.05	9027	0.53	22080	-0.65	4253	0.95	25973	-0.02	813	-0.82
84	240	0.18	2893	0.84	3013	-0.45	3453	0.51	not id	not id	14080	-2.2	2160	-0.32	22107	-0.36	2680	1.33
85	107	-0.05	2200	-0.15	2780	-1.04	1940	-0.23	3620	-1.04	23200	-0.43	2353	-0.2	31553	0.48	1760	0.27
86	120	-0.02	2840	0.77	3080	-0.28	5160	1.34	7733	0.15	26760	0.26	3867	0.71	23960	-0.2	1080	-0.52
87	137	0	2477	0.24	2961	-0.58	2528	0.06	9425	0.64	27686	0.44	4039	0.82	33597	0.66	2204	0.78
88	107	-0.05	2453	0.21	3613	1.06	1213	-0.58	7067	-0.04	29320	0.76	2653	-0.02	25640	-0.05	3067	1.77
89	253	0.2	2400	0.13	4000	2.03	2920	0.25	4107	-0.9	27173	0.34	1747	-0.57	23640	-0.23	1227	-0.35
90	147	0.02	1307	-1.44	3413	0.55	1147	-0.61	4787	-0.7	28733	0.64	1307	-0.83	17933	-0.74	1680	0.18
91	193	0.1	2667	0.52	3380	0.47	3727	0.64	8047	0.24	19847	-1.08	3367	0.41	27227	0.09	1933	0.47
92	27	-0.18	2053	-0.36	3653	1.16	1333	-0.52	6453	-0.22	24400	-0.2	2600	-0.05	21093	-0.45	453	-1.24
93	27	-0.18	2240	-0.1	3427	0.59	1093	-0.64	8107	0.26	26773	0.26	2440	-0.15	32893	0.6	1307	-0.25
94	67	-0.12	3083	1.12	3160	-0.08	2176	-0.11	5440	-0.51	21507	-0.76	2811	0.08	35632	0.85	1360	-0.19
95	58	-0.13	3131	1.19	3305	0.28	4203	0.87	10551	0.97	29668	0.82	5261	1.55	41712	1.39	1667	0.16
96	80	-0.09	1733	-0.83	2973	-0.55	5661	1.58	11322	1.19	39015	2.64	667	-1.22	31977	0.52	747	-0.9
97	133	0	2293	-0.02	2987	-0.52	1133	-0.62	6200	-0.29	23373	-0.4	2707	0.01	31760	0.5	1533	0.01
98	160	0.04	2013	-0.42	3013	-0.45	1333	-0.52	2827	-1.27	24147	-0.25	1507	-0.71	4760	-1.91	1960	0.5
99	160	0.04	1707	-0.86	3333	0.35	2013	-0.19	11213	1.16	28027	0.51	2280	-0.24	33440	0.65	1240	-0.33

Analyst code	Akashiwo sanguinea		Scrippsiela trochoidea		Trieres sinensis		Azadinium spinosum		Chaetoceros danicus		Pseudo-nitzschia pungens		Ceratoneis closterium		Chaetoceros curvisetus		Prorocentrum mexicanum	
	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score	Mean(cells/L)	Z score
Statistical method	Q/Hampel		Q/Hampel		Q/Hamp		Q/Hampel		Q/Hampel		Q/Hampel		Q/Hampel		Q/Hampel		Q/Hampel	
Assessment	|Z|<=2.00		|Z|<=2.00		|Z|<=2.0		|Z|<=2.00		|Z|<=2.00		|Z|<=2.00		|Z|<=2.00		|Z|<=2.00		|Z|<=2.00	
No of Labs that submitted results	88		90		91		88		79		91		87		89		88	
No. of participants	91		91		91		91		91		91		91		91		91	
No of labs with quantitative values	88		90		91		88		79		91		87		89		88	
Minimal value	0		0		1520		200		0		4200		100		0		0	
Maximal value	1000		7440		8400		8680		49150		59211		6044		58080		4480	

ANNEX XII: Summary of laboratory means

Range	1000		7440		6880		8480		49150		55011		5944		58080		4480	
Median measurement repetitions	3		3		3		3		3		3		3		3		3	
95% range of UCM of the mean	±13		±127		±110		±300		±794		±1121		±293		±2362		±136	
95% range of relative UCM of the mean	9.70 %		5.60 %		3.45 %		12.43 %		11.31 %		4.45 %		10.91 %		9.18 %		8.75 %	
Arithmetical mean	131		2257		3125		2436		7398		25009		2678		24908		1545	
Median	120		2315		3160		2120		7640		25400		2520		26620		1470	
Assigned value	134		2307		3193		2411		7211		25417		2686		26169		1528	
Mean	137		2277		3177		2417		7018		25193		2685		25747		1549	
Reference value	134		2307		3193		2411		7211		25417		2686		26169		1528	
Target s.d.	584		695		398		2058		3455		5157		1658		11195		868	
Reproducibility SD	87		687		666		1483		3674		6439		1440		11867		728	
Repeatability s.d.	74		399		505		570		1251		4390		560		4997		433	
Reprod. SD/Repeatability SD ratio	1.17		1.72		1.32		2.6		2.94		1.47		2.57		2.37		1.68	
Rel. SDPA	435.82 %		30.13 %		12.46 %		85.36 %		47.91 %		20.29 %		61.73 %		42.78 %		56.81 %	
Rel. reproducibility s.d.	65.00 %		29.76 %		20.86 %		61.53 %		50.95 %		25.33 %		53.62 %		45.35 %		47.61 %	
Rel. repeatability SD	55.60 %		17.30 %		15.80 %		23.64 %		17.35 %		17.27 %		20.84 %		19.10 %		28.36 %	
Reference s.d.	584		695		398		2058		3455		5157		1658		11195		868	

ANNEX XII: Summary of laboratory means

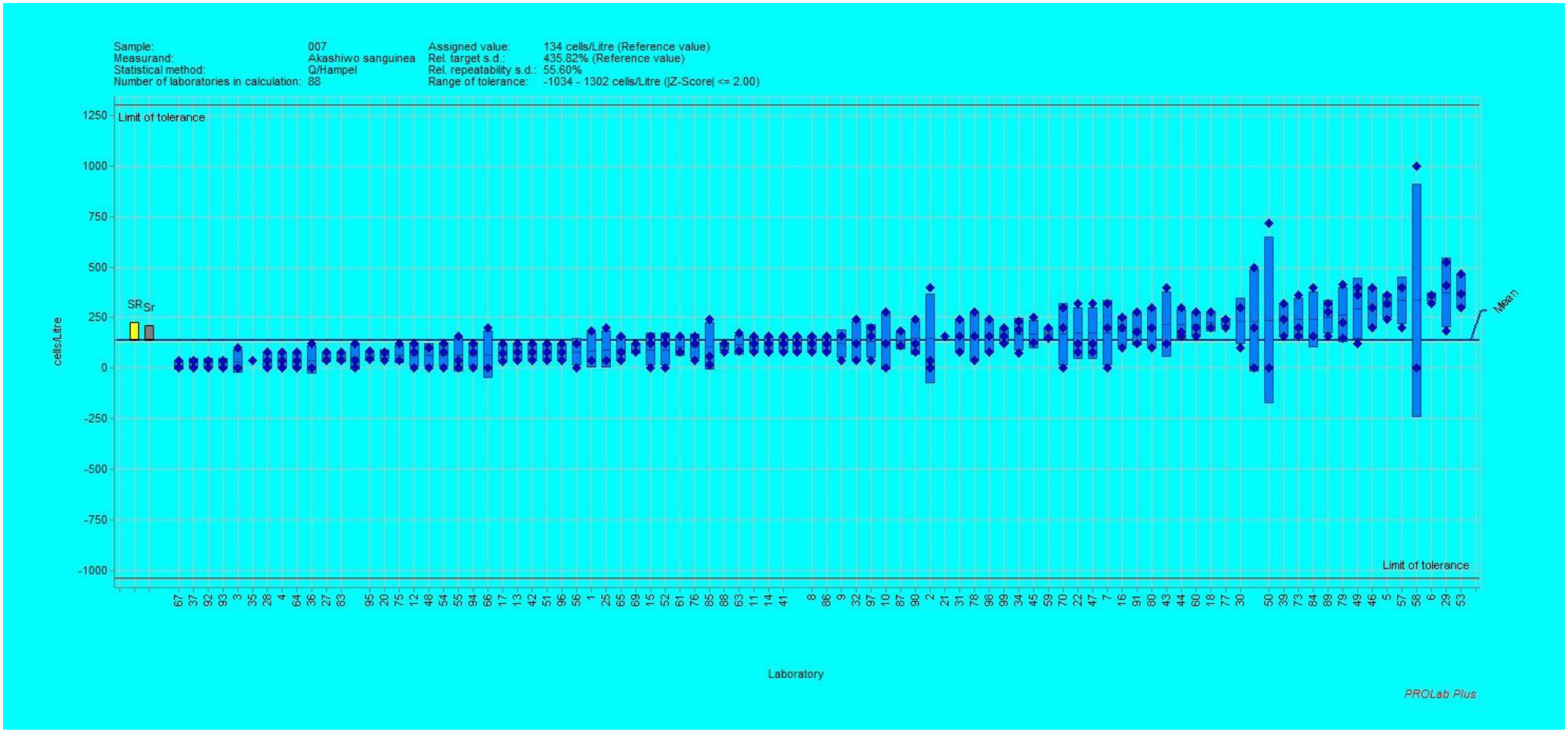
Limit of reproducibility, R (3.00 X sR)	261		2060		1998		4450		11021		19317		4321		35601		2183	
Limit of repeatability, r (3.00 X sr)	223		1197		1514		1710		3753		13169		1679		14992		1300	
Rel. limit of reproducibility	195.00 %		89.29 %		62.57 %		184.58 %		152.84 %		76.00 %		160.87 %		136.04 %		142.84 %	
Rel. limit of repeatability	166.79 %		51.89 %		47.41 %		70.93 %		52.05 %		51.81 %		62.51 %		57.29 %		85.09 %	
Limit of reference value (3.00 X Ref. s.d.)	1752		2085		1194		6174		10365		15471		4974		33585		2604	
LOQ rate	0.00 %		0.00 %		0.00 %		0.00 %		0.00 %		0.00 %		0.00 %		0.00 %		0.00 %	
Shapiro-Wilk test	0		0.121		0.007		0		0		0.008		0.226		0.001		0.187	
Measurand name	ASANG		STROC		TSIN		ASPIN		CDAN		PPUN		CCLOS		CCURV		PMEX	
HORRAT	455.4		48.31		20.99		137.79		91.21		46.69		101.28		98.87		85.62	
Absolute classical Horwitz s.d.	1		14		19		15		38		110		16		113		10	
Relative classical Horwitz s.d.	0.96 %		0.62 %		0.59 %		0.62 %		0.53 %		0.43 %		0.61 %		0.43 %		0.66 %	
Lower limit of tolerance	-1034		917		2397		-1705		301		15103		-630		3779		-208	
Upper limit of tolerance	1302		3697		3989		6527		14121		35731		6002		48559		3264	
Standard error	7		64		55		150		397		561		146		1181		68	
Rel. standard error	4.96 %		2.76 %		1.72 %		6.23 %		5.51 %		2.21 %		5.45 %		4.51 %		4.43 %	
Lower mean	137		2277		3177		2417		7018		25193		2685		25747		1549	
Upper mean	137		2277		3177		2417		7018		25193		2685		25747		1549	

ANNEX XII: Summary of laboratory means

No. of measurement values outside of tolerance limits			10		62		9		9		35		1		26		6	
No. of laboratories after elimination of outliers type A-L except E (without laboratories that only gave states but no measured values)	88		90		91		88		79		91		87		89		88	
Number of laboratories with replicates outside of tolerance limits			8		46		5		6		26		1		16		5	
Number of laboratories with mean outside of tolerance limits			2		8		2		2		9				4			
No. of measurement values and states	91		91		91		91		91		91		91		91		91	
No. of measurement values	264		270		273		264		237		273		261		267		264	
No. of measurement values without outliers	264		270		273		264		237		273		261		267		264	
Explanation of outlier types A: Single outlier (Grubbs) B: Differing laboratory mean (Grubbs) C: Excessive laboratory s.d. (Cochran) D: Excluded manually E: mean outside tolerance limits F: |Z-Score|>3.5 L: Differing (Grubbs)laboratory mean (Grubbs II)																		

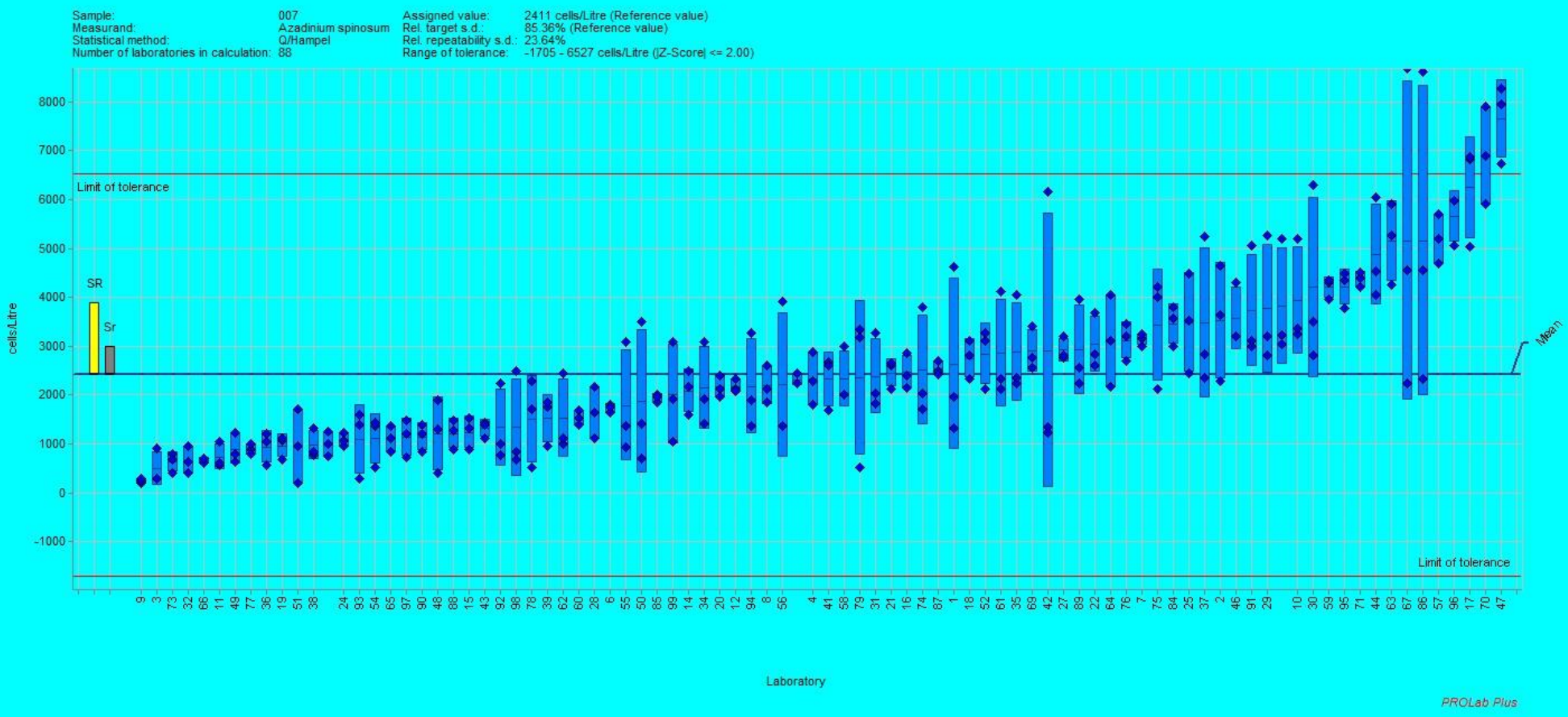
ANNEX XIII: Graphical summary of results by analyst

Akashiwo sanguinea



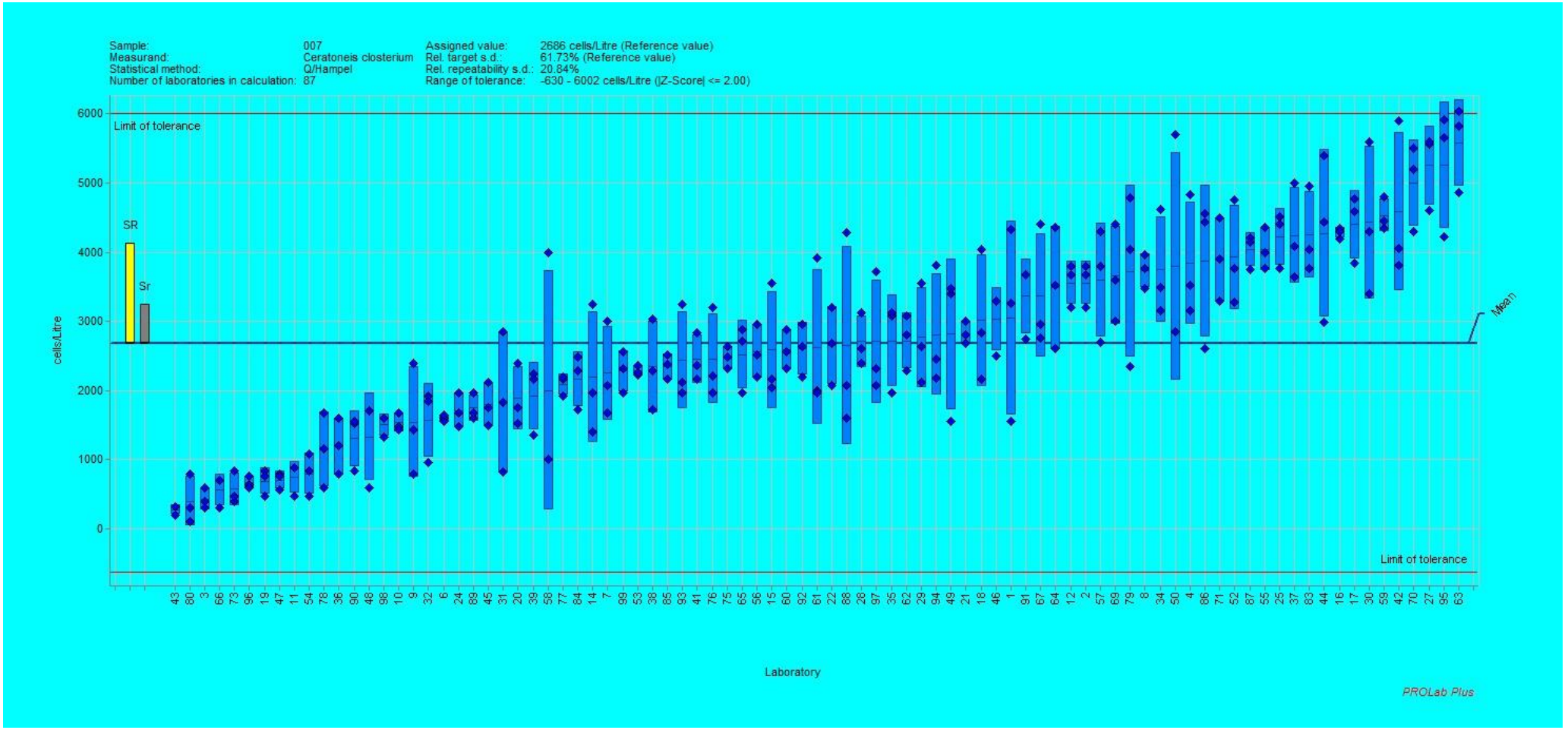
Azadinium spinosum

ANNEX XIII: Graphical summary of results by analyst

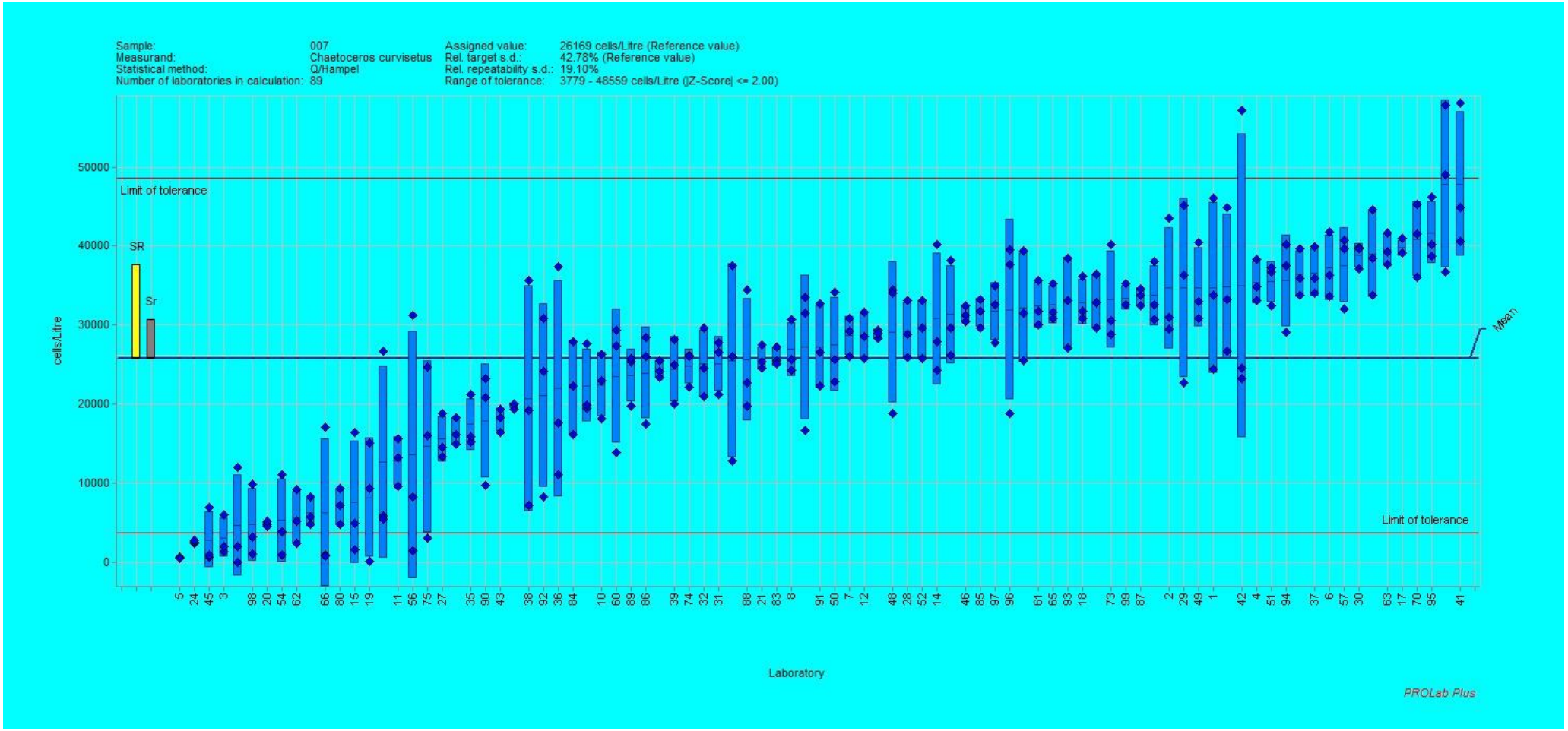


Ceratoneis closterium

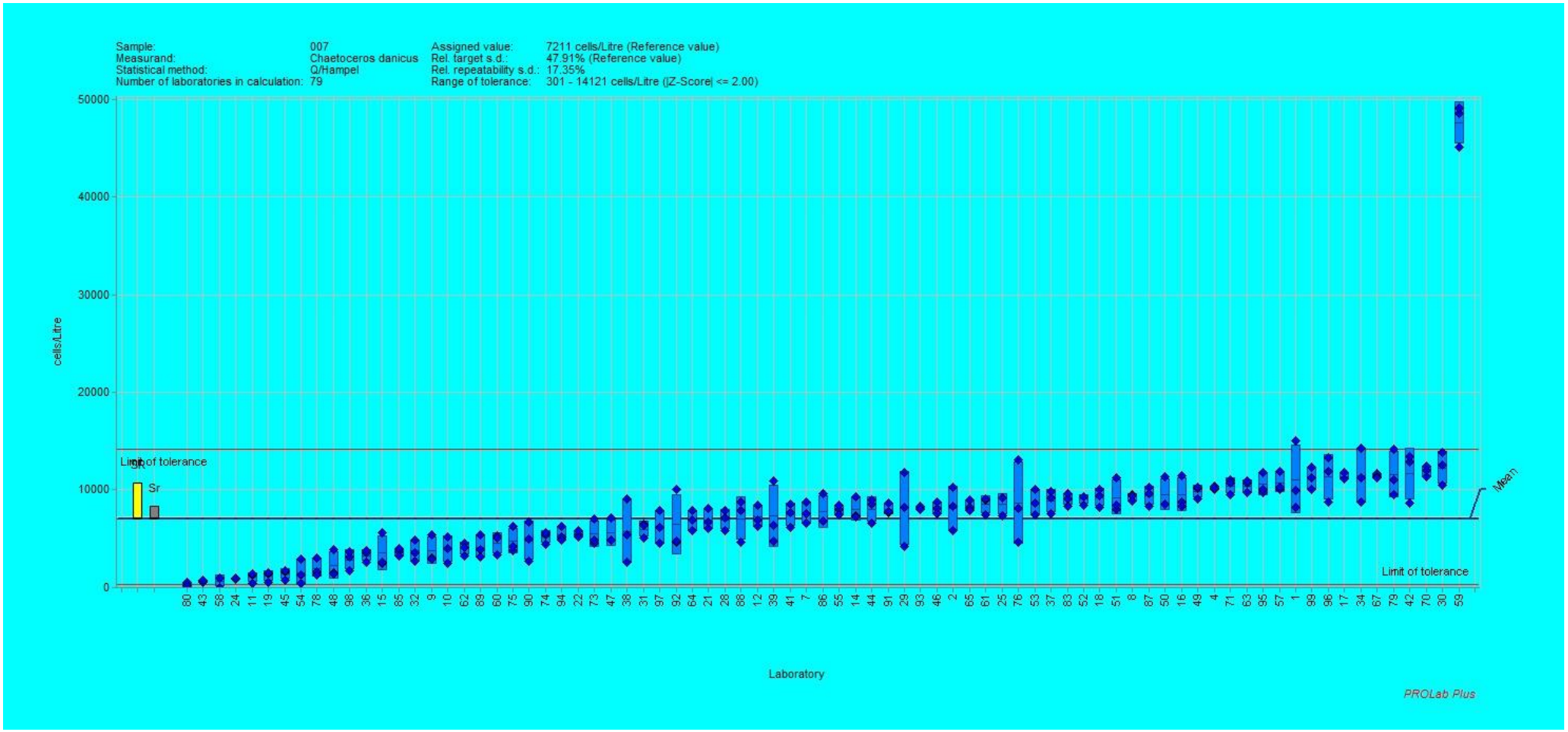
ANNEX XIII: Graphical summary of results by analyst



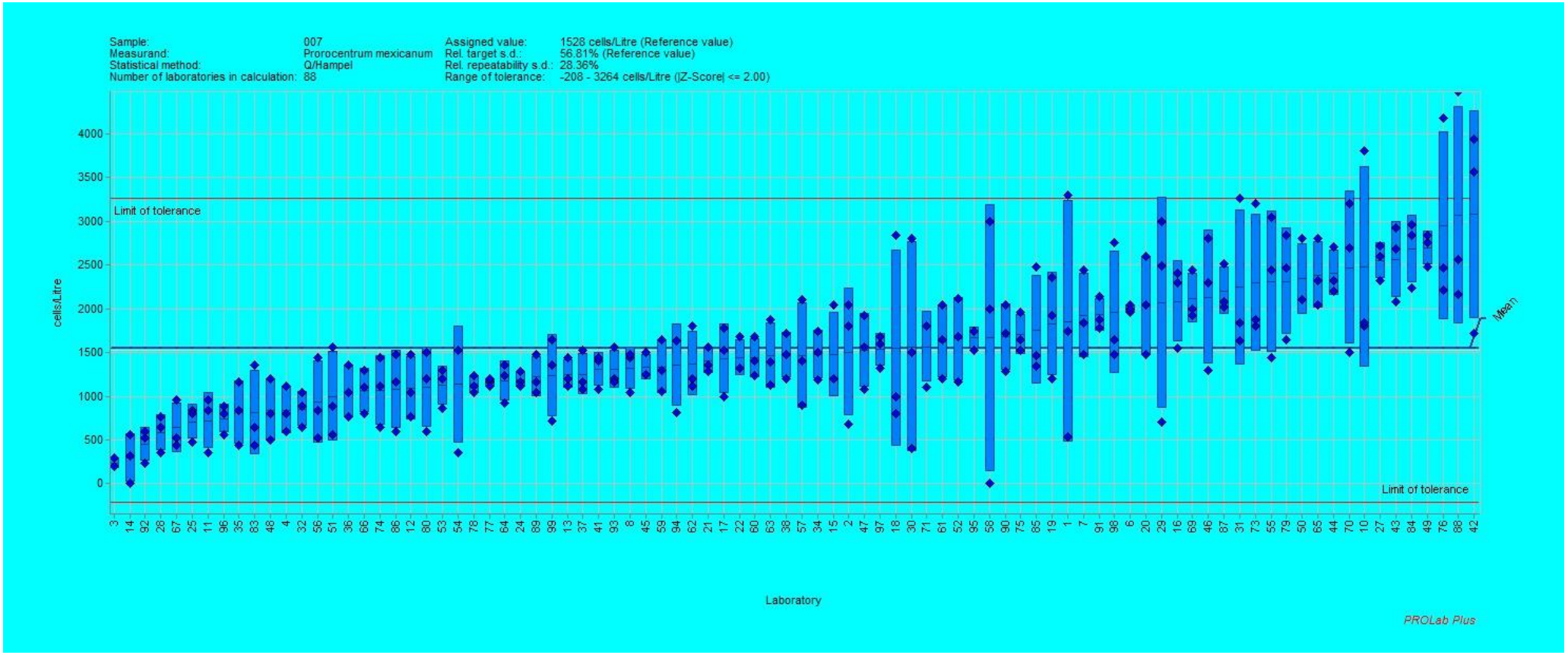
ANNEX XIII: Graphical summary of Chaetoceros curvisetus results by analyst



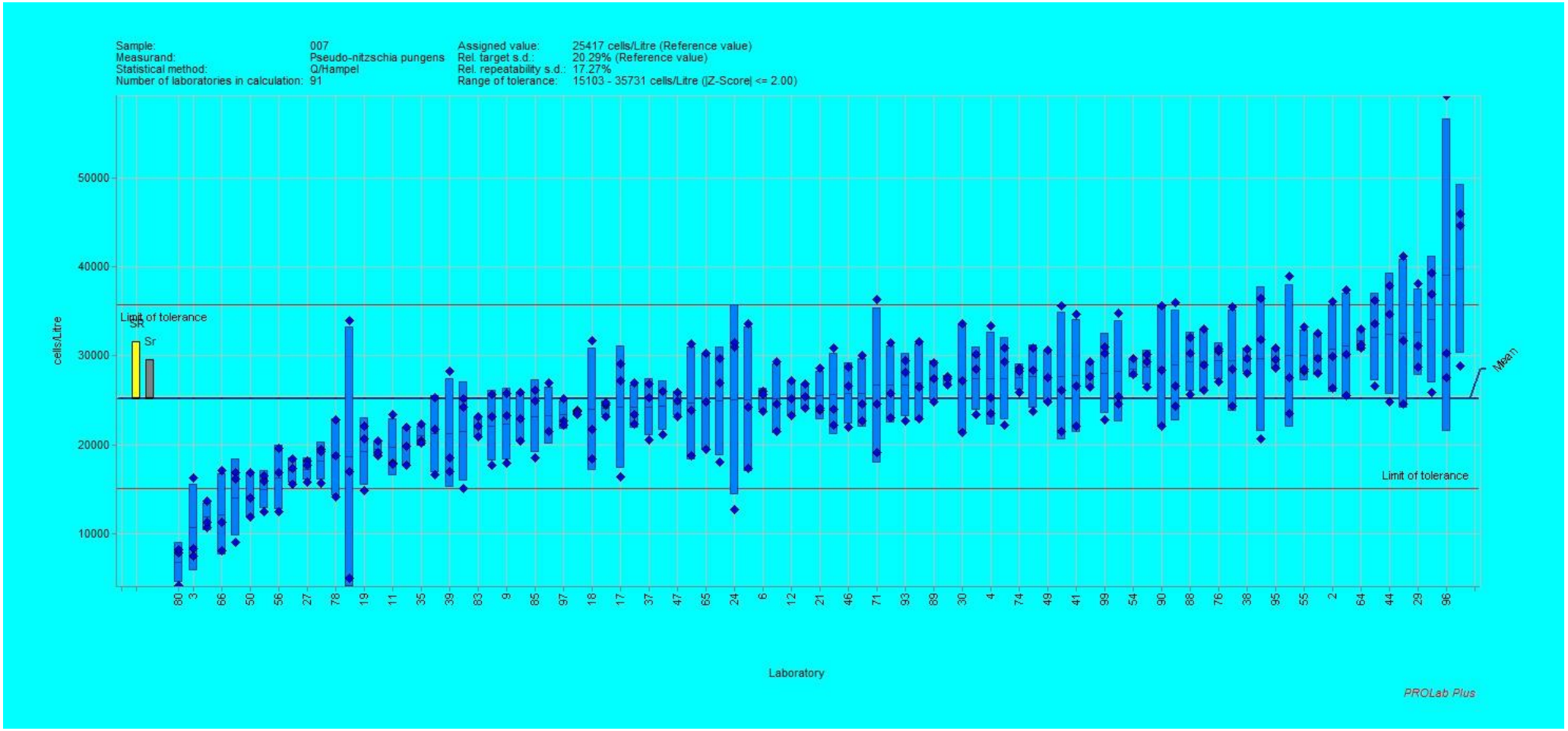
ANNEX XIII: Graphical summary of Chaetoceros danicus results by analyst



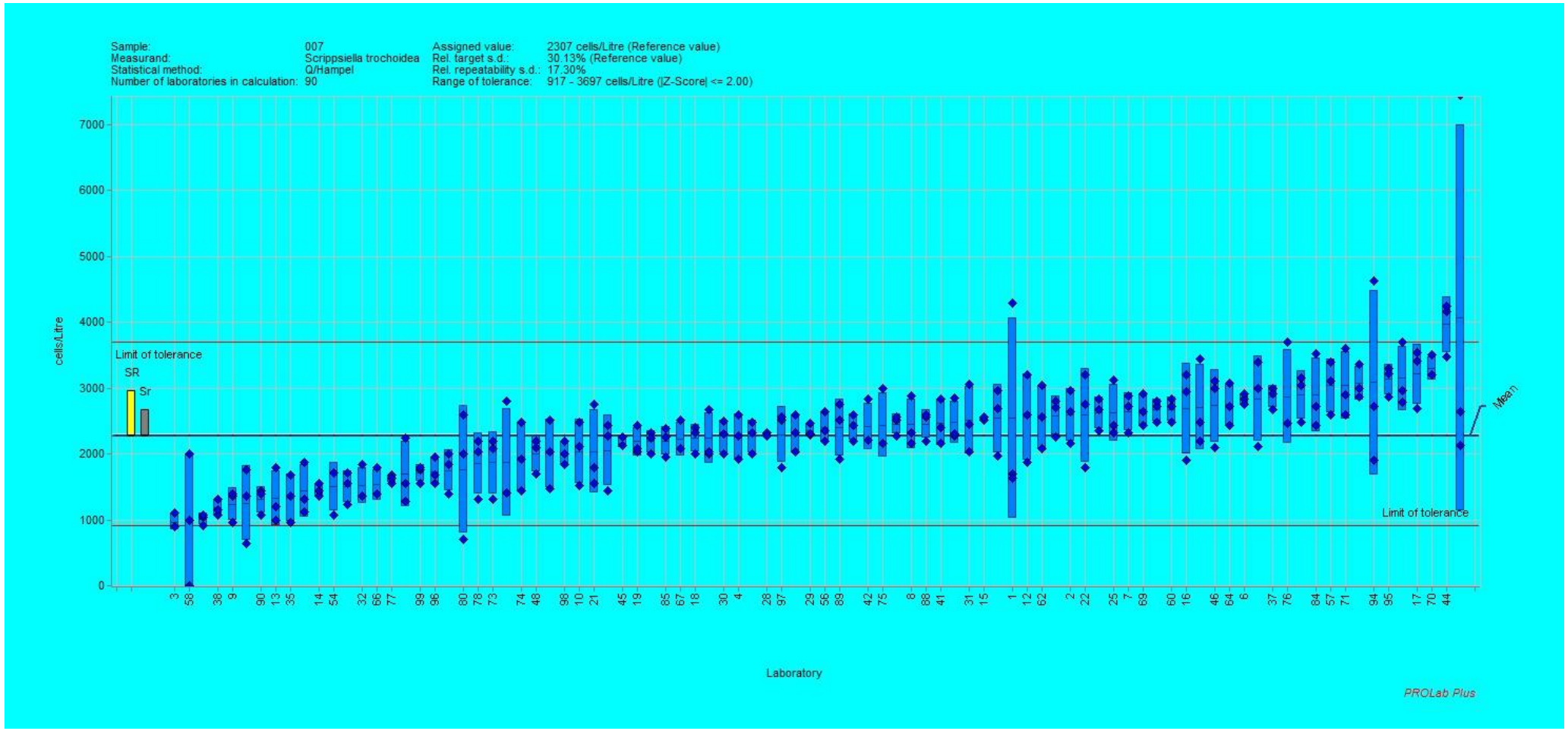
ANNEX XIII: Graphical summary of Prorocentrum mexicanum results by analyst



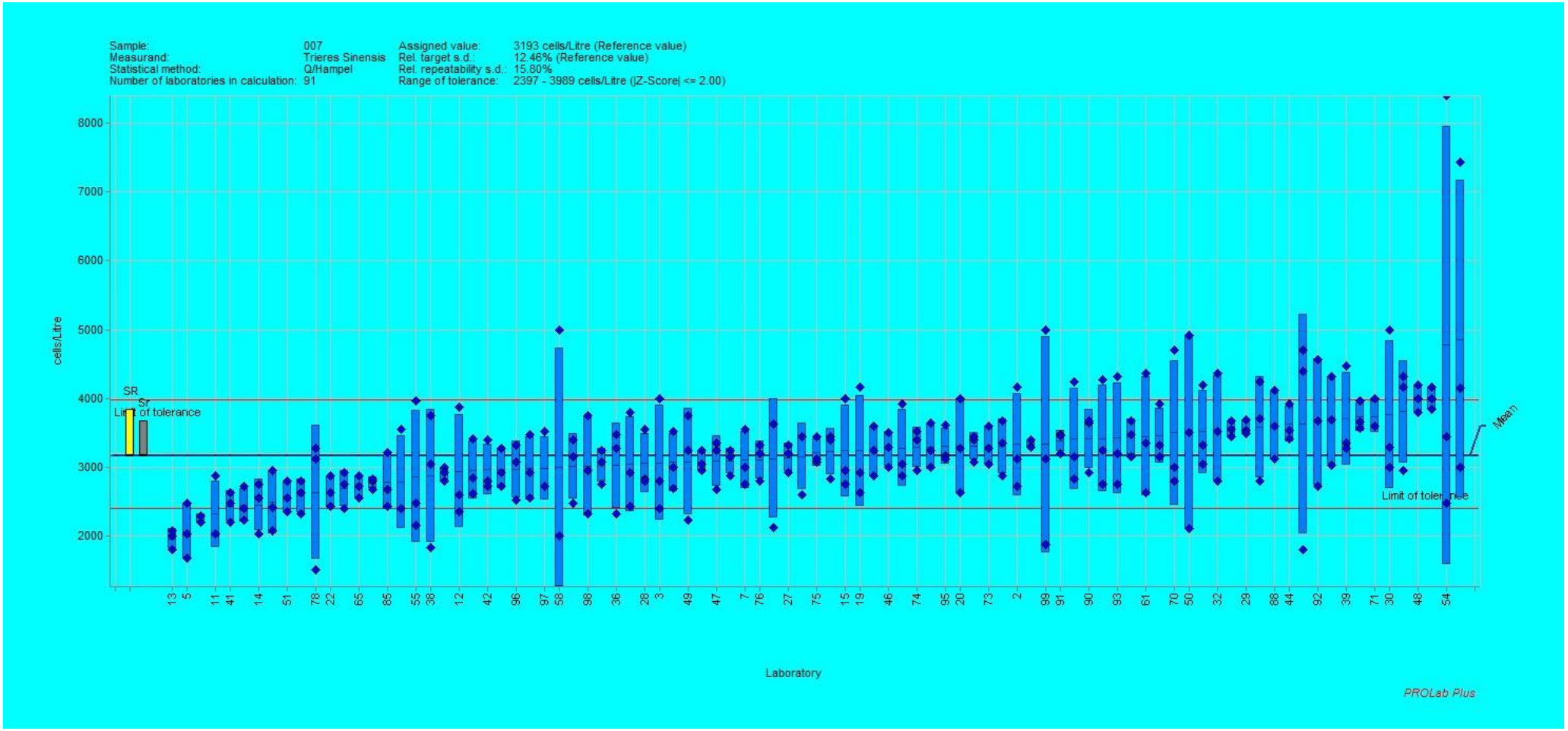
ANNEX XIII: Graphical summary of Pseudo-nitzschia pungens results by analyst



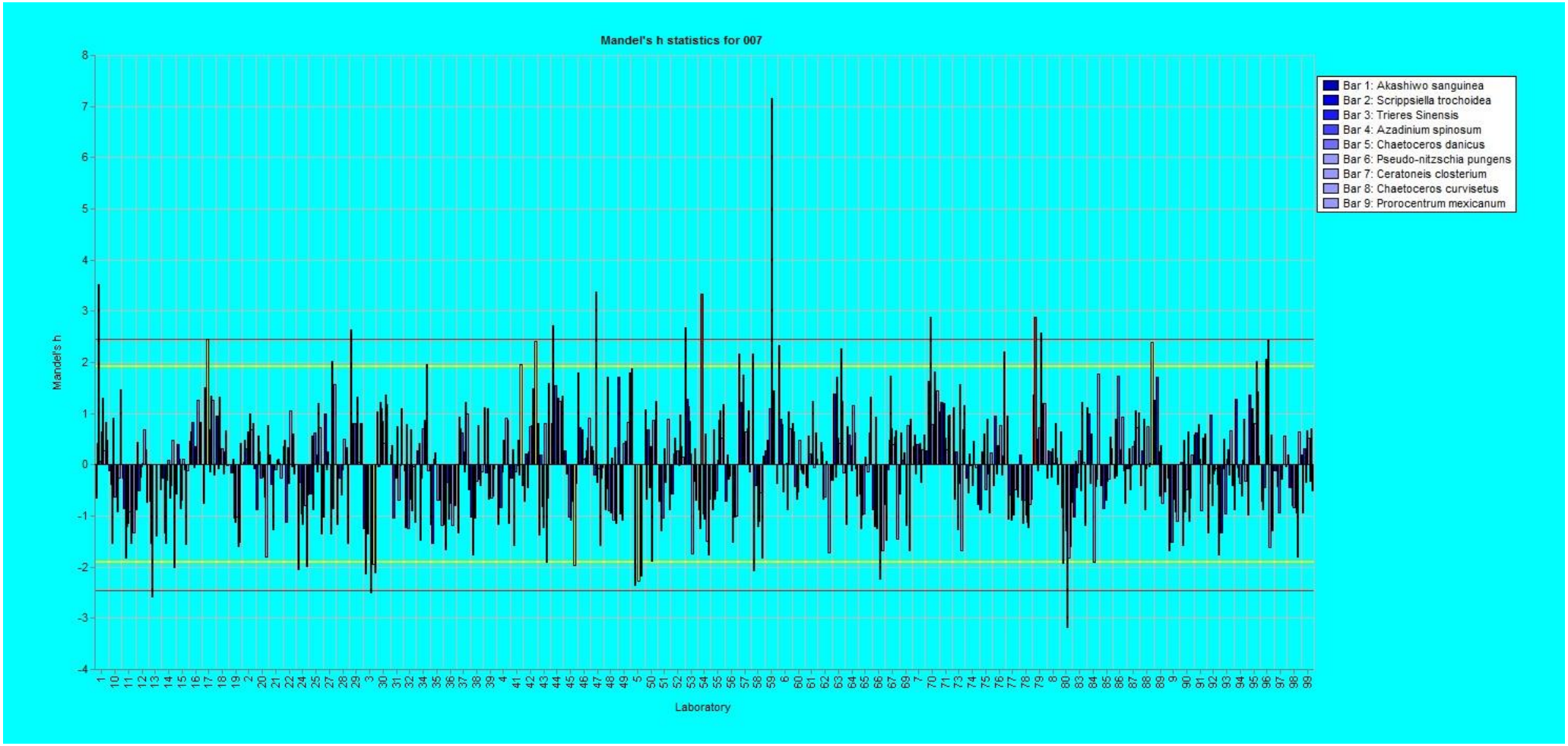
ANNEX XIII: Graphical summary of Scrippsiella trochoidea results by analyst



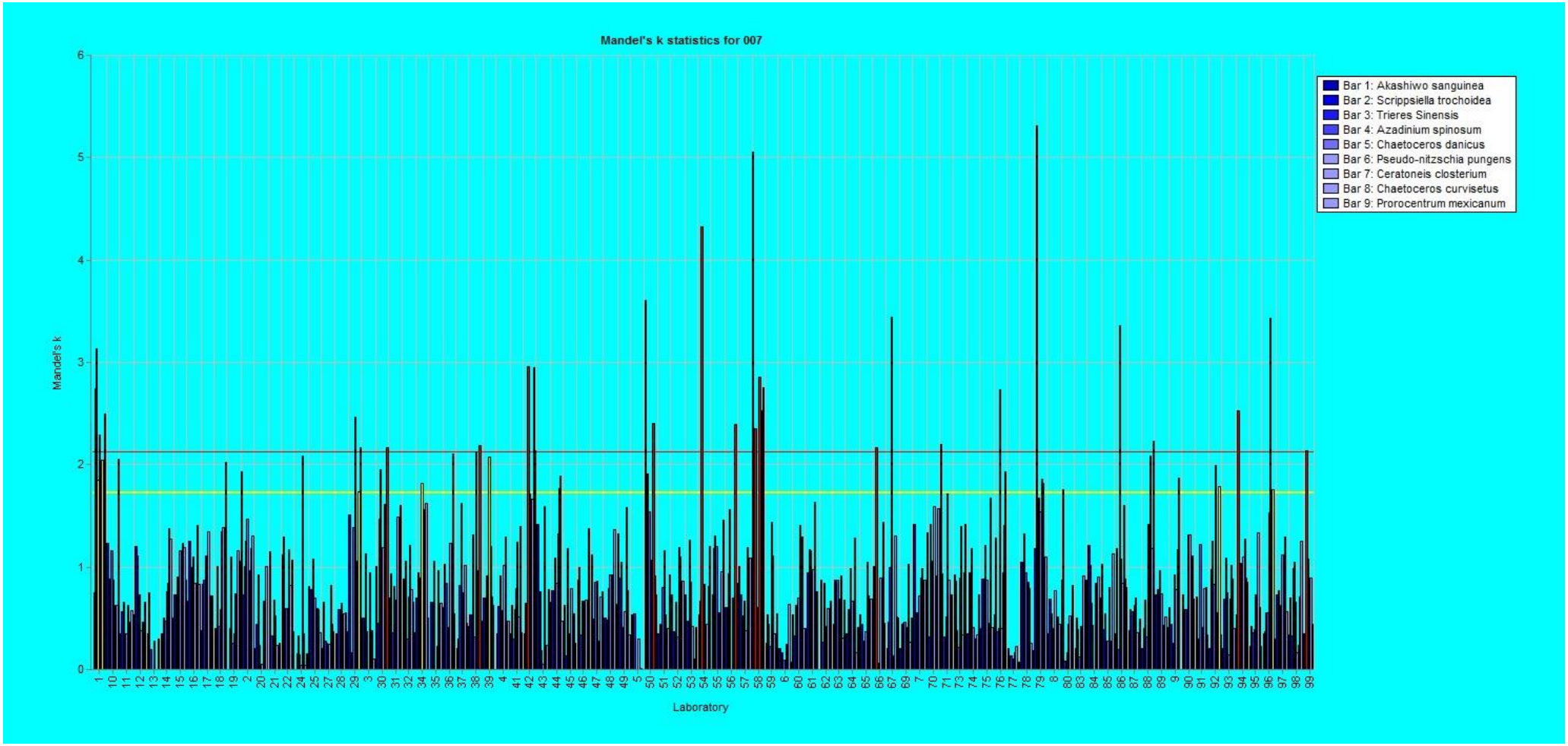
ANNEX XIII: Graphical summary of Trieres sinensis results by analyst



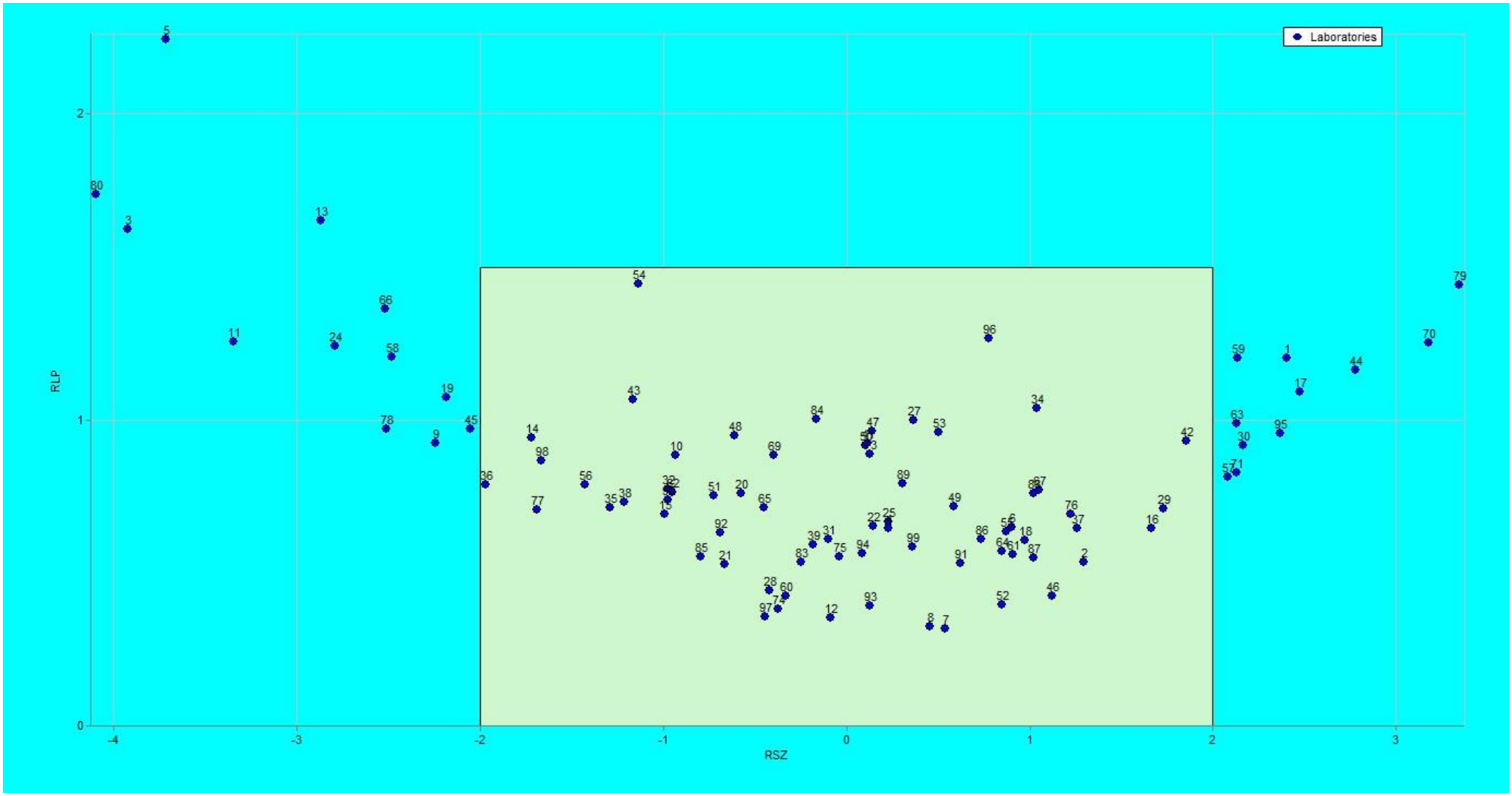
ANNEX XIV: Mandel's h statistics



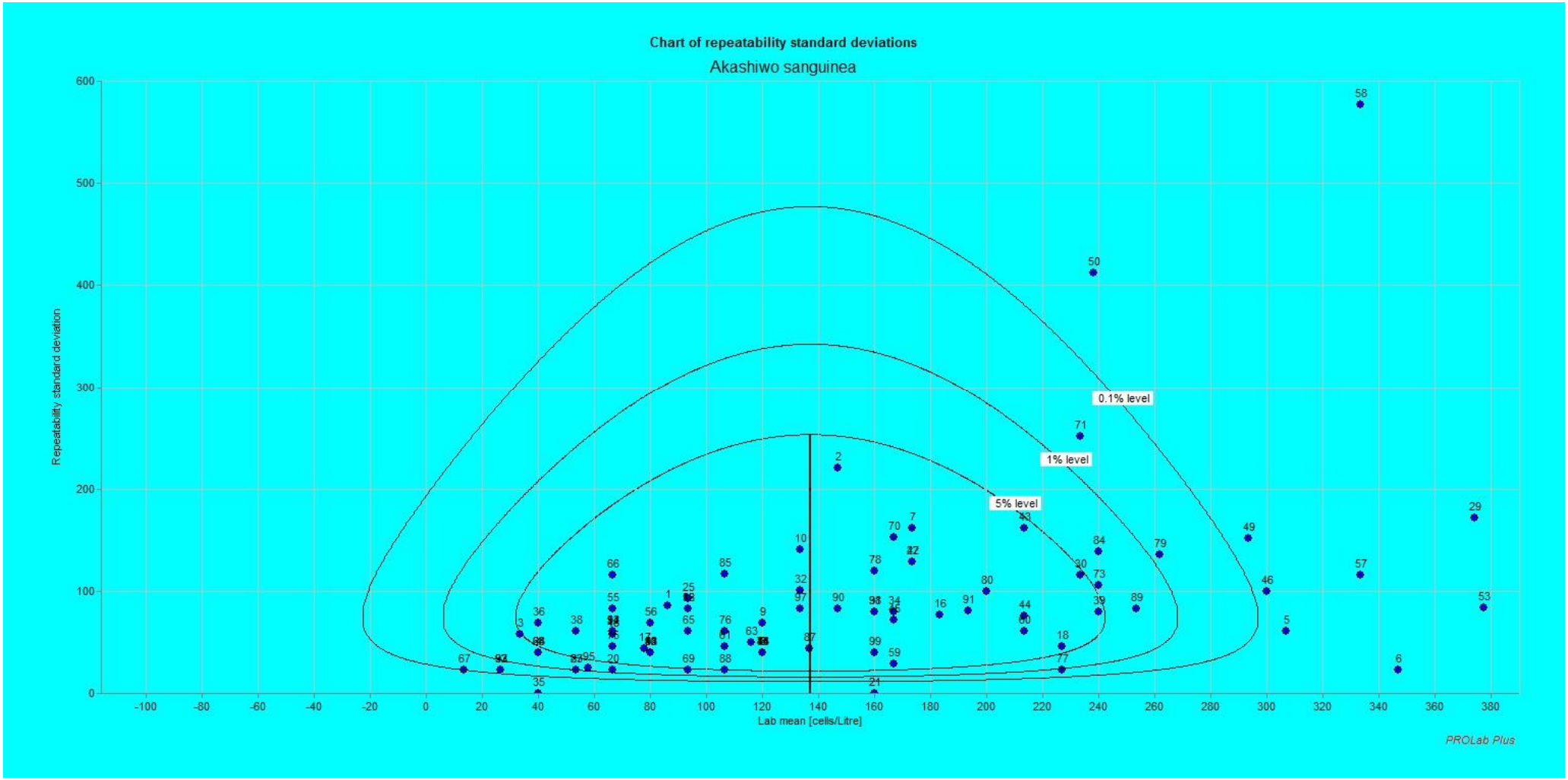
ANNEX XIV Mandel’s k statistics



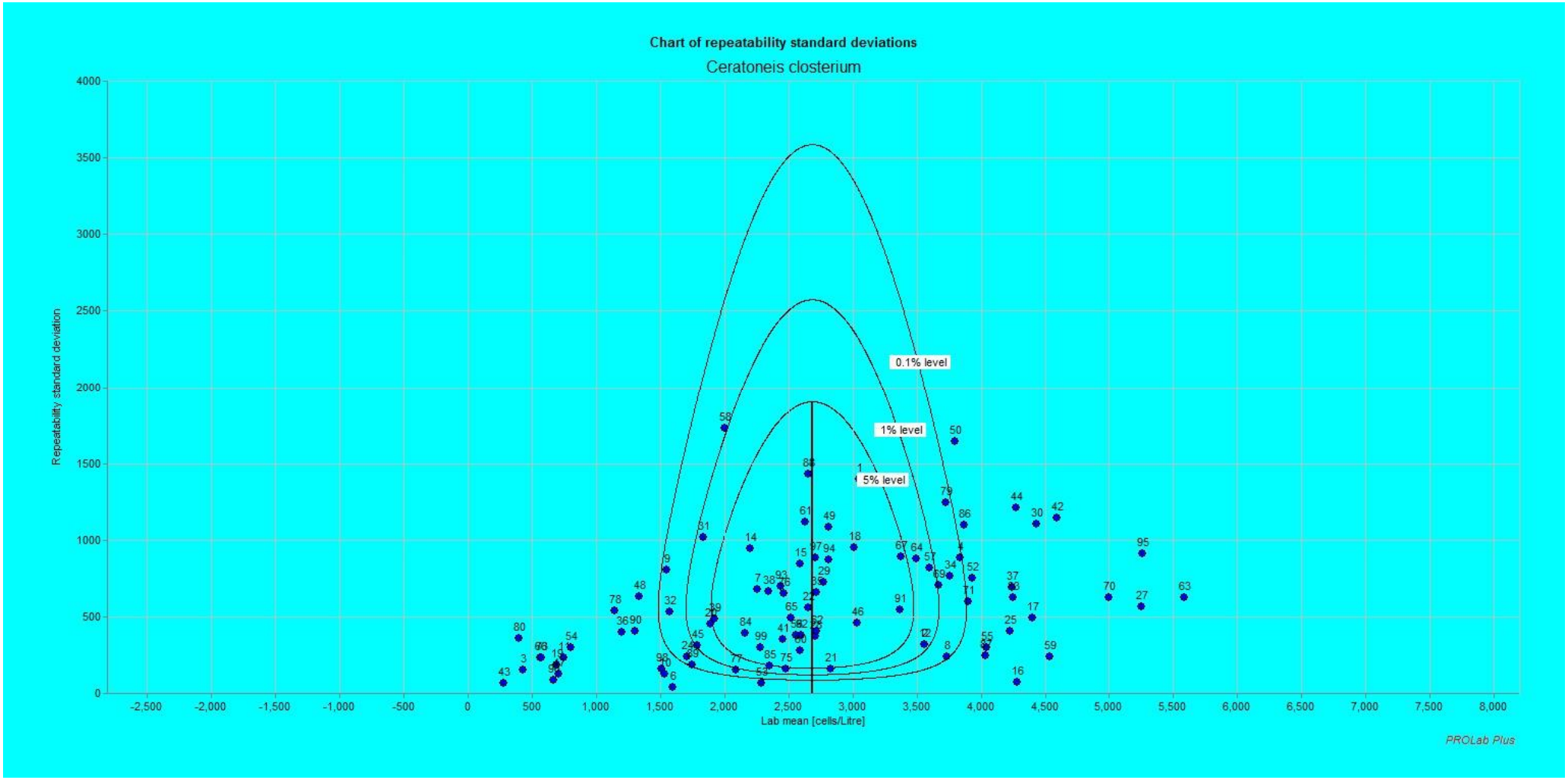
ANNEX XV: RLP and RSZ for all measurands IPI2017



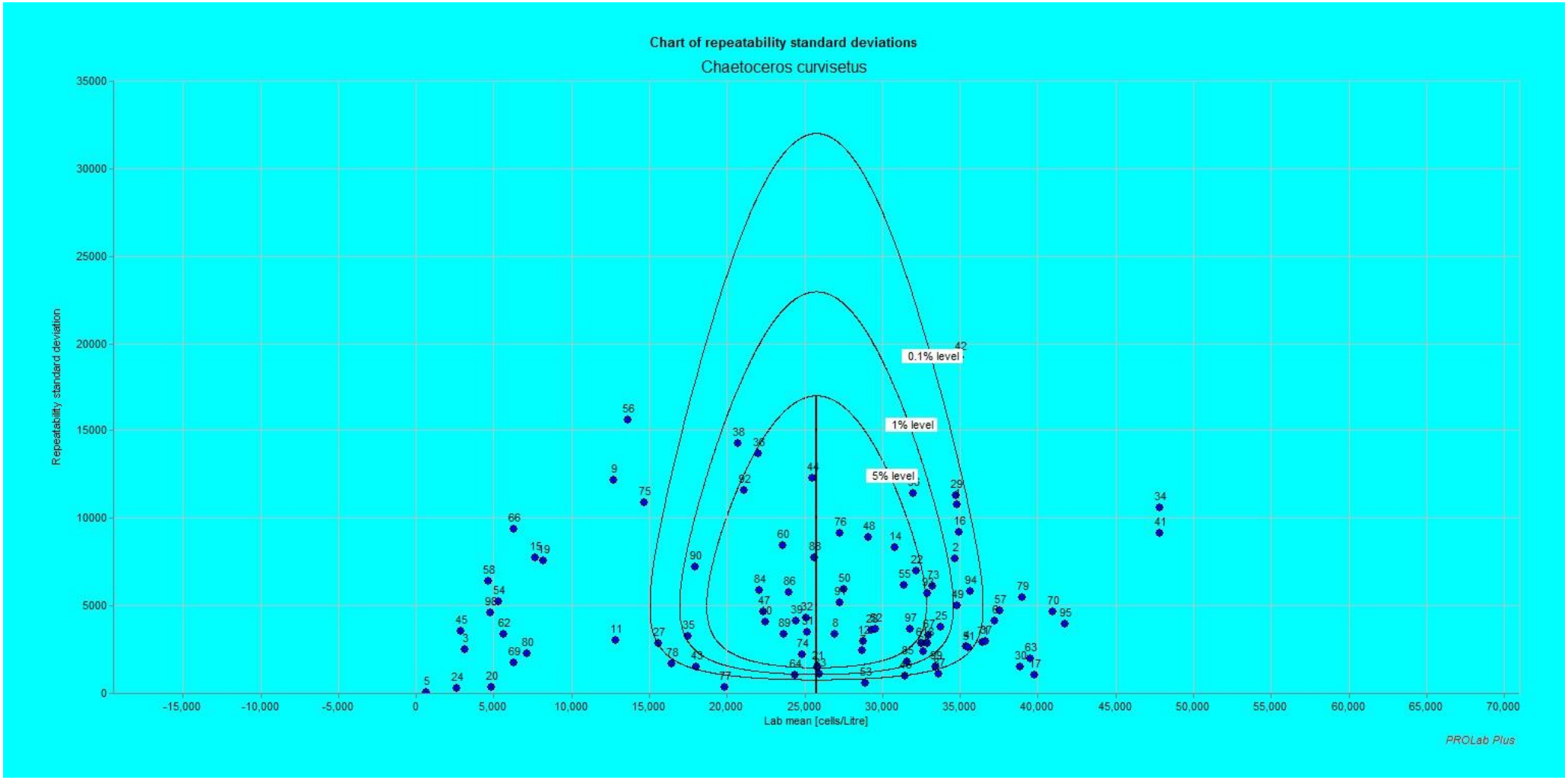
ANNEX XVI: Chart of repeatability standard deviations



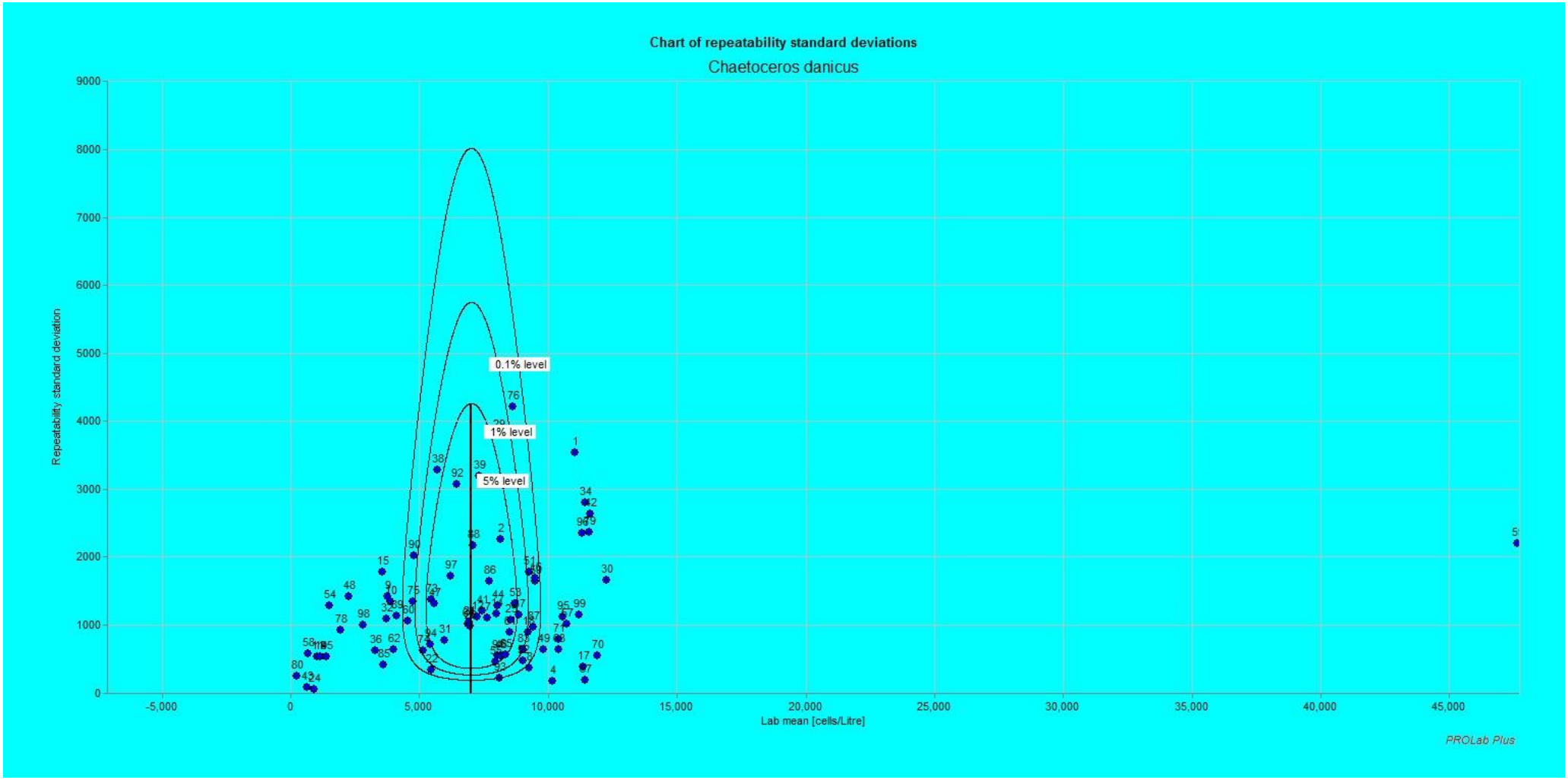
ANNEX XVI: Chart of repeatability standard deviations



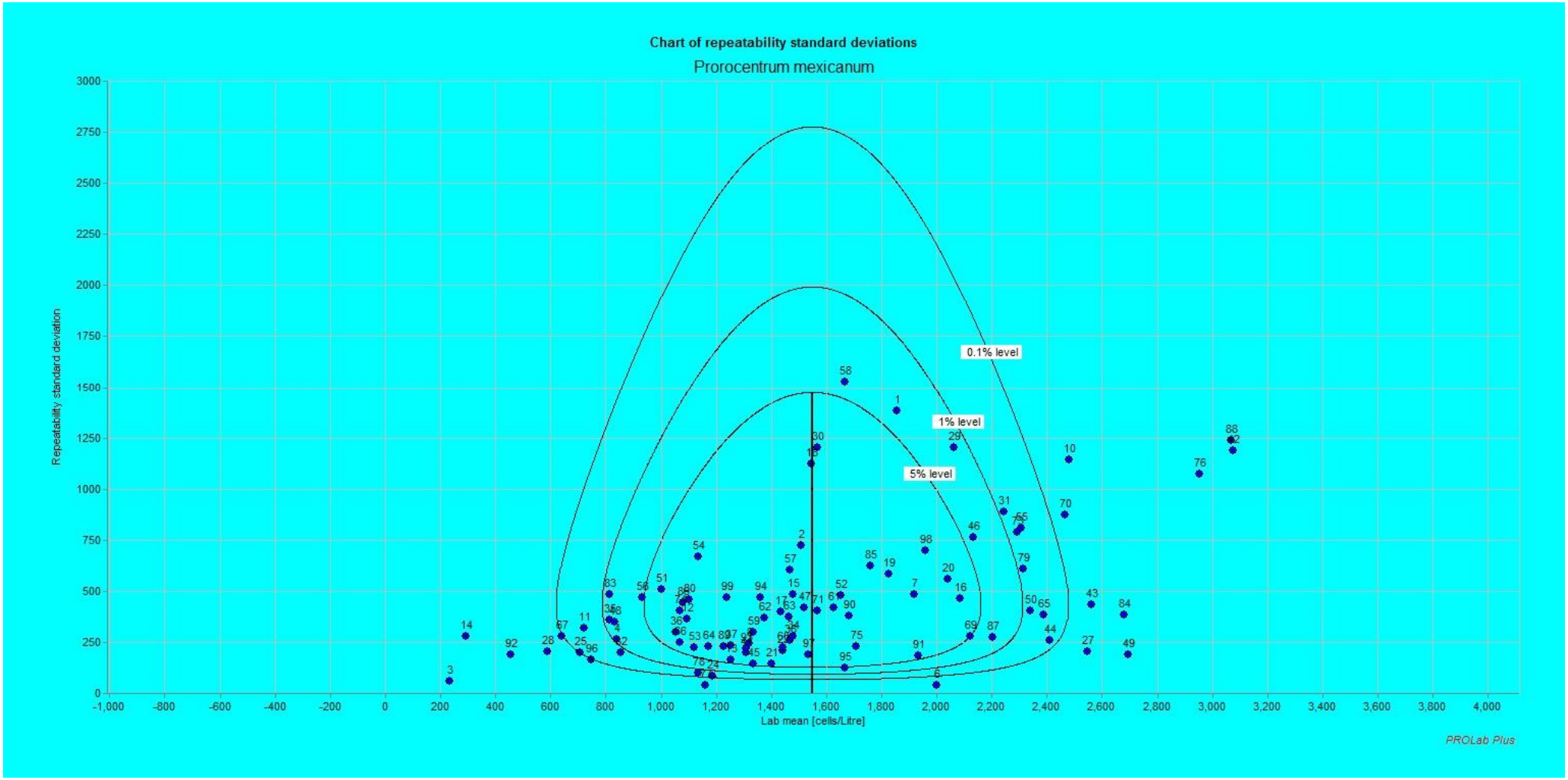
ANNEX XVI: Chart of repeatability standard deviations



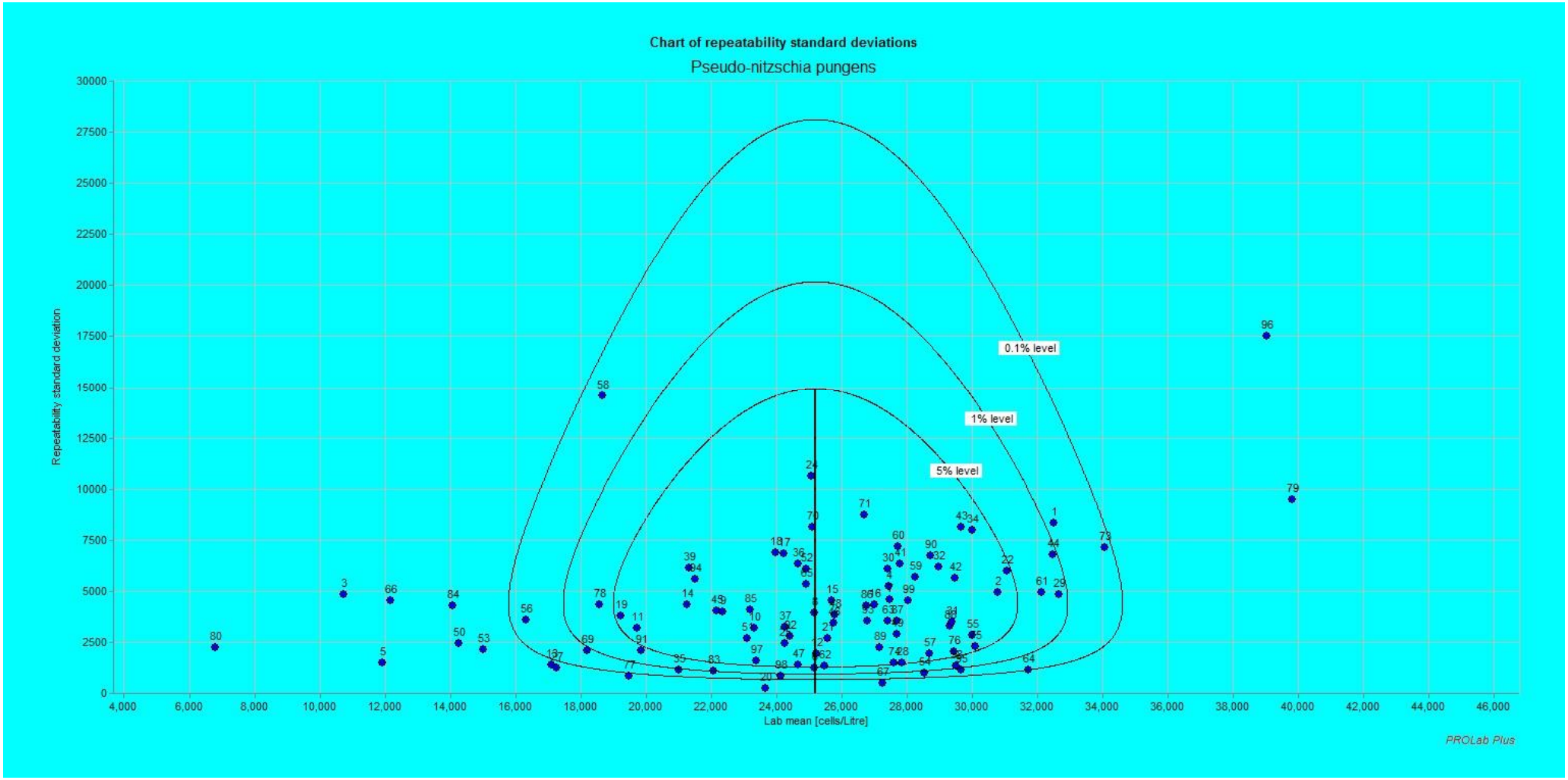
ANNEX XVI: Chart of repeatability standard deviations



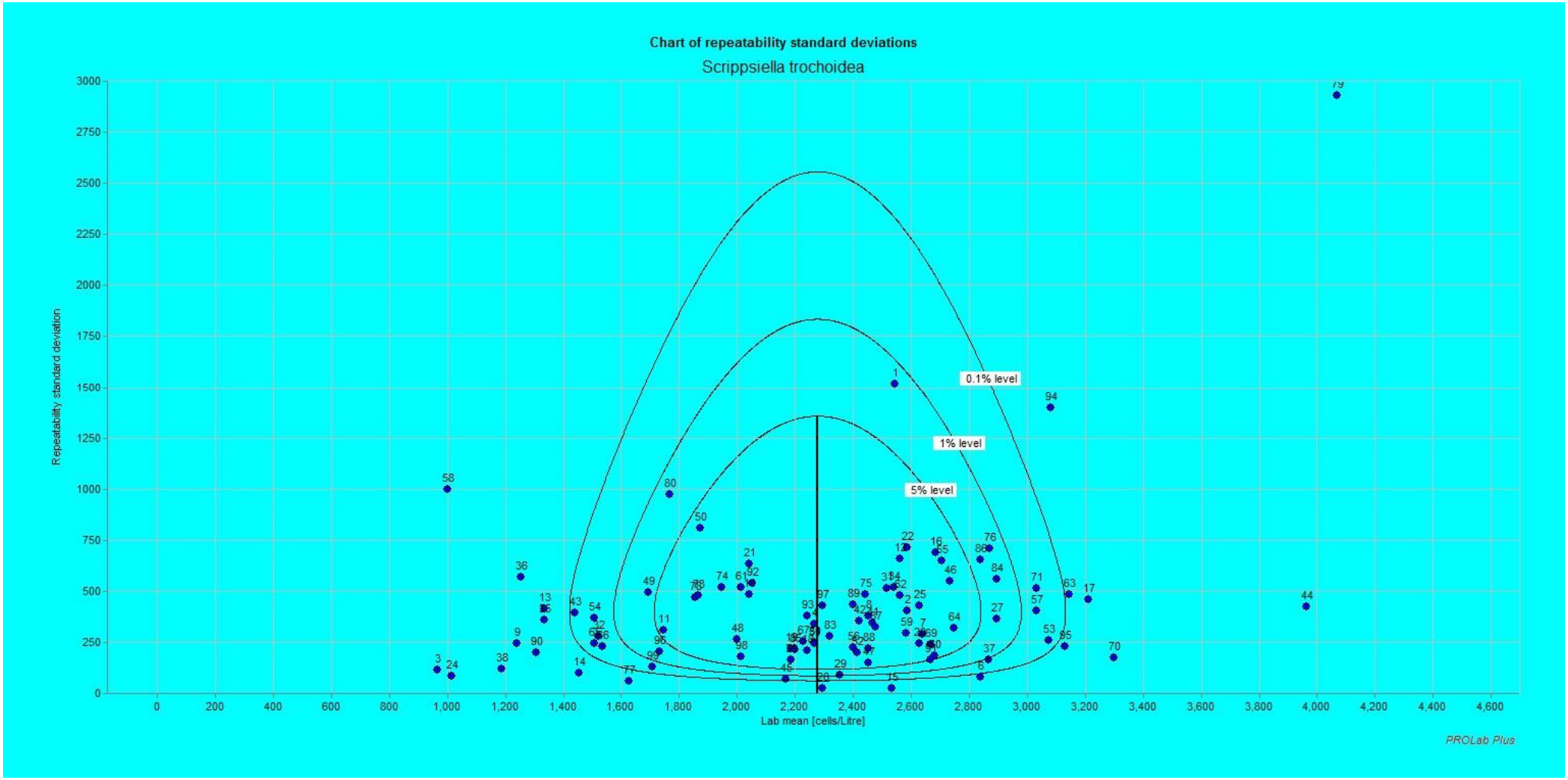
ANNEX XVI: Chart of repeatability standard deviations



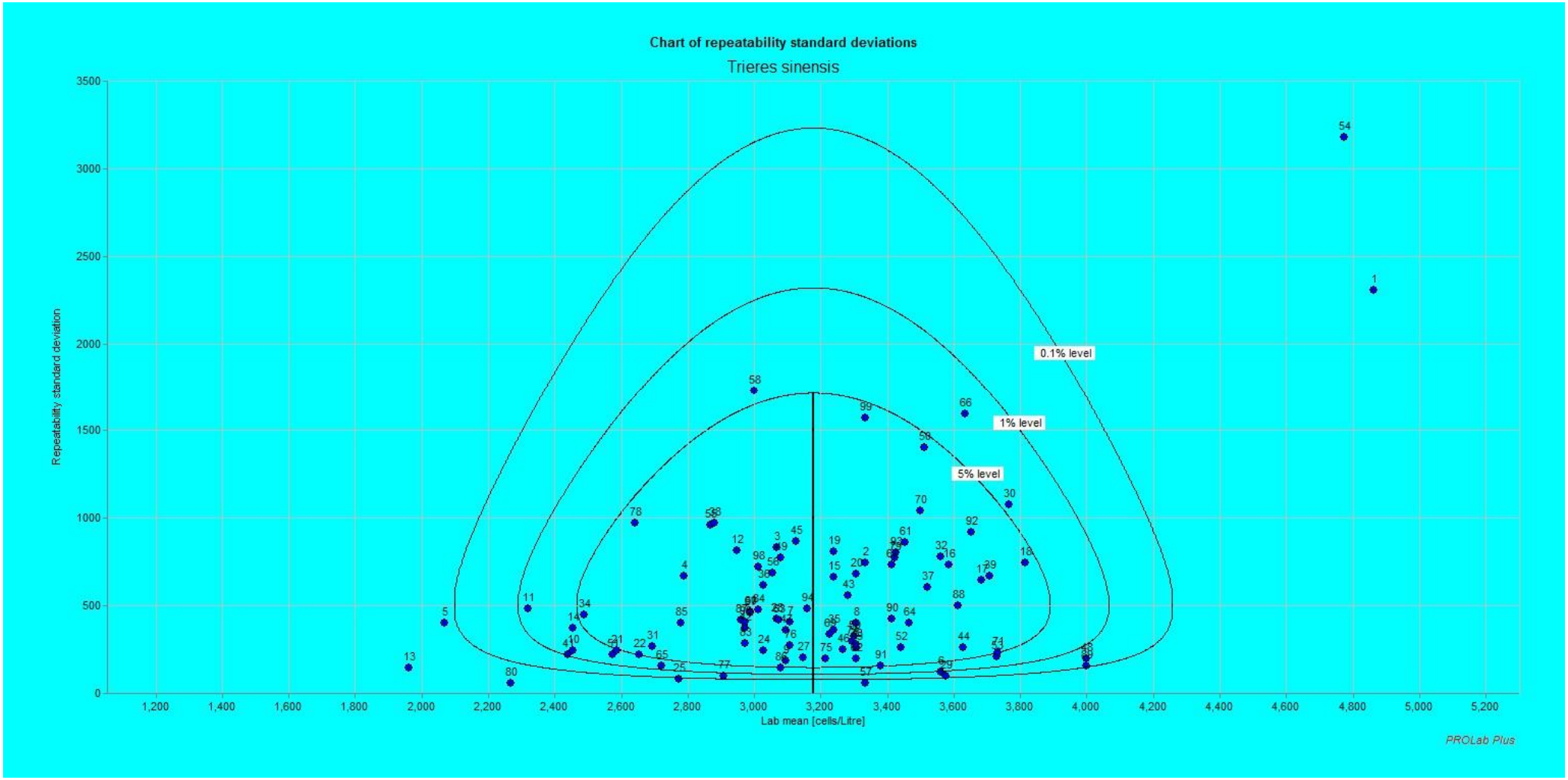
ANNEX XVI: Chart of repeatability standard deviations



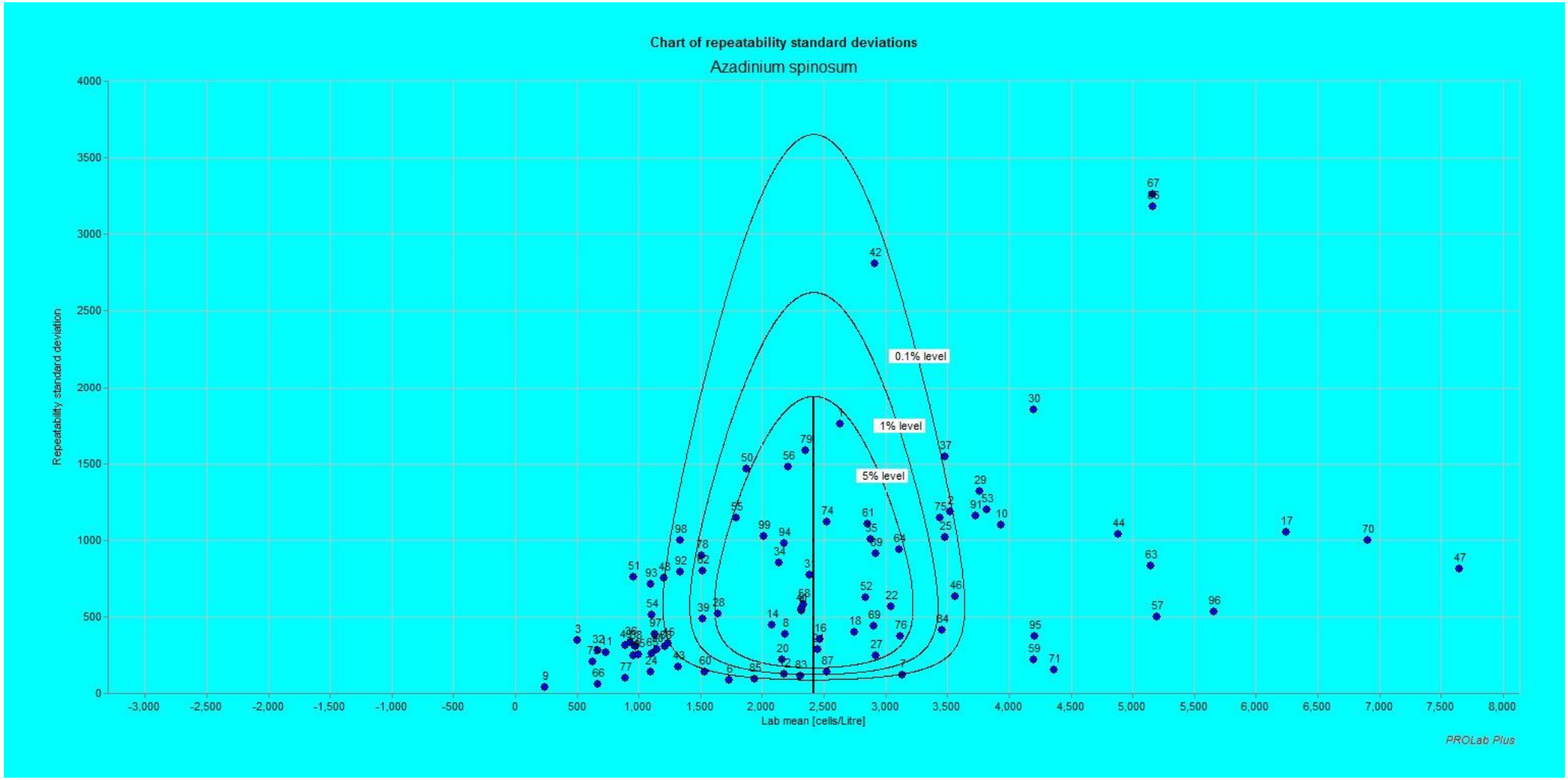
ANNEX XVI: Chart of repeatability standard deviations



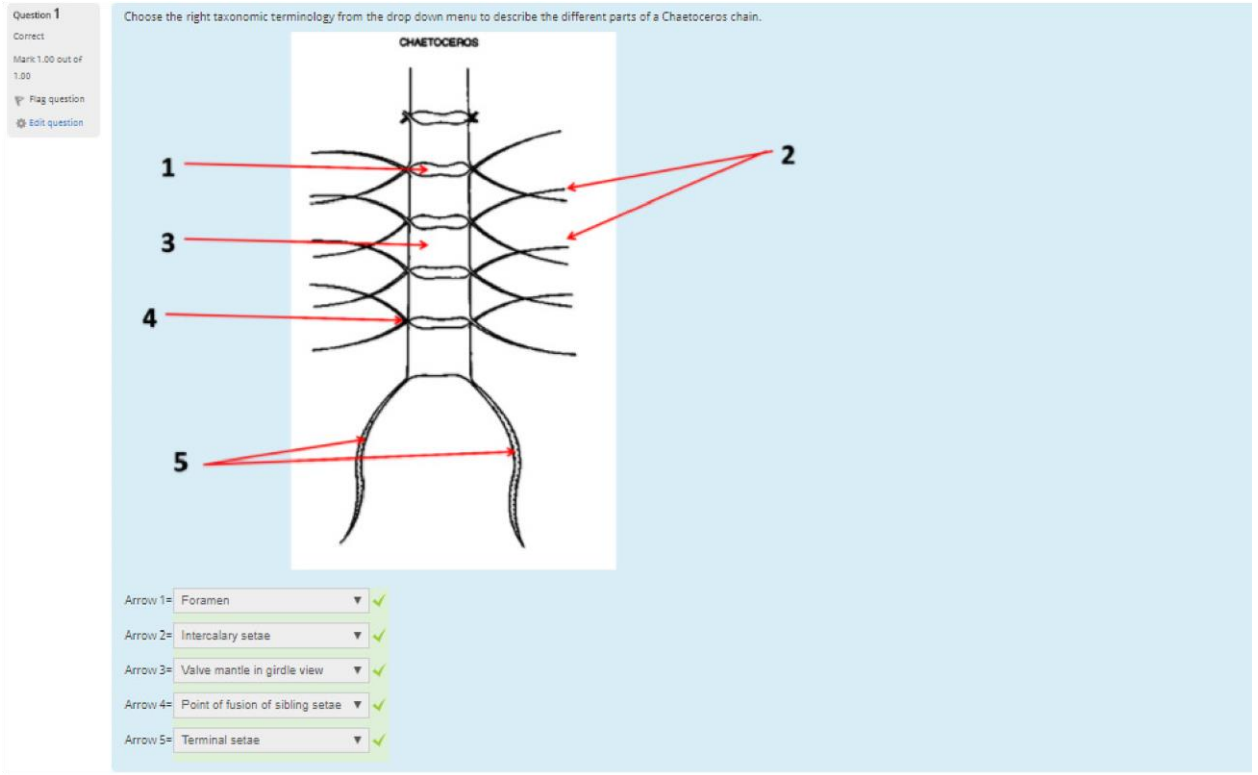
ANNEX XVI: Chart of repeatability standard deviations



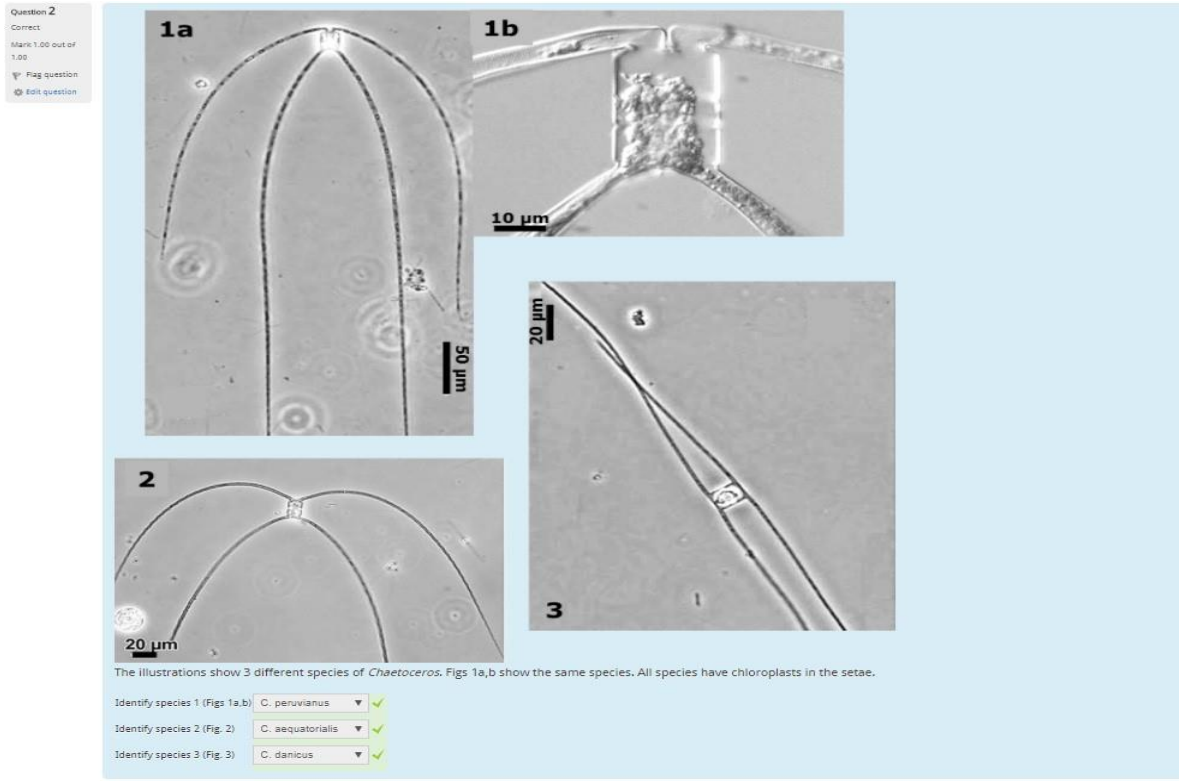
ANNEX XVI: Chart of repeatability standard deviations



ANNEX XVII: Ocean Teacher HAB Quiz IPI2017
ANNEX XVII: Ocean Teacher HAB Quiz IPI2017

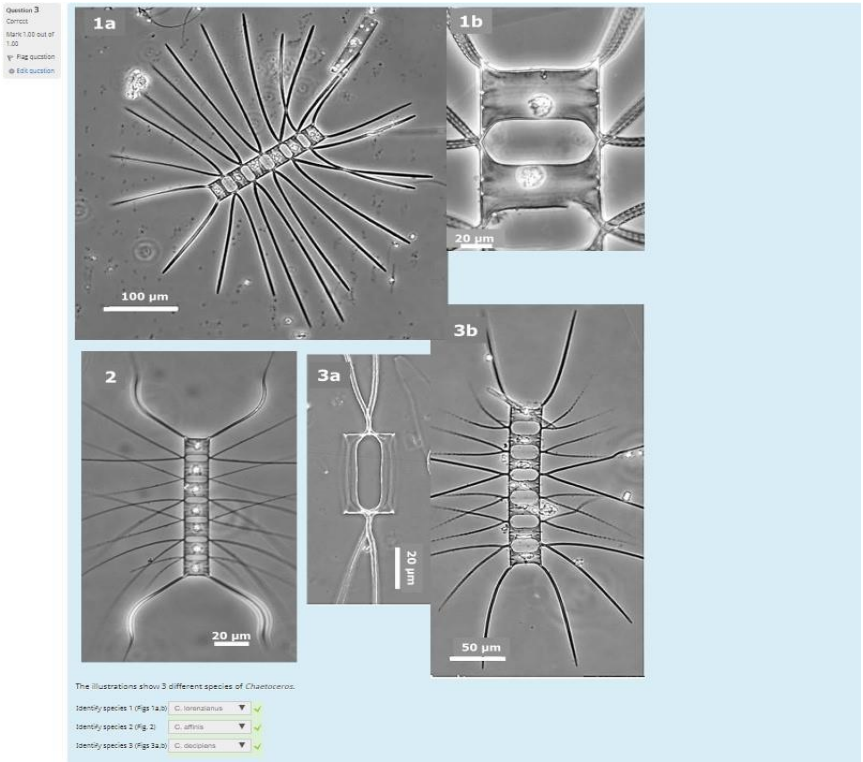


Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Arrow 1= : Foramen	Foramen	20.00%	65	74.71%
	Arrow 1= : Apical setae	Apical setae	0.00%	1	1.15%
	Arrow 1= : Opening	Opening	0.00%	21	24.14%
2	Arrow 2= : Intercalary setae	Intercalary setae	20.00%	84	96.55%
	Arrow 2= : Apical setae	Apical setae	0.00%	3	3.45%
3	Arrow 3= : Valve mantle in girdle view	Valve mantle in girdle view	20.00%	79	90.80%
	Arrow 3= : Central process	Central process	0.00%	3	3.45%
	Arrow 3= : Valve view	Valve view	0.00%	2	2.30%
	Arrow 3= : Opening	Opening	0.00%	1	1.15%
	Arrow 3= : Valvar plane	Valvar plane	0.00%	2	2.30%
4	Arrow 4= : Point of fusion of sibling setae	Point of fusion of sibling setae	20.00%	87	100.00%
5	Arrow 5= : Terminal setae	Terminal setae	20.00%	86	98.85%
	Arrow 5= : Apical setae	Apical setae	0.00%	1	1.15%



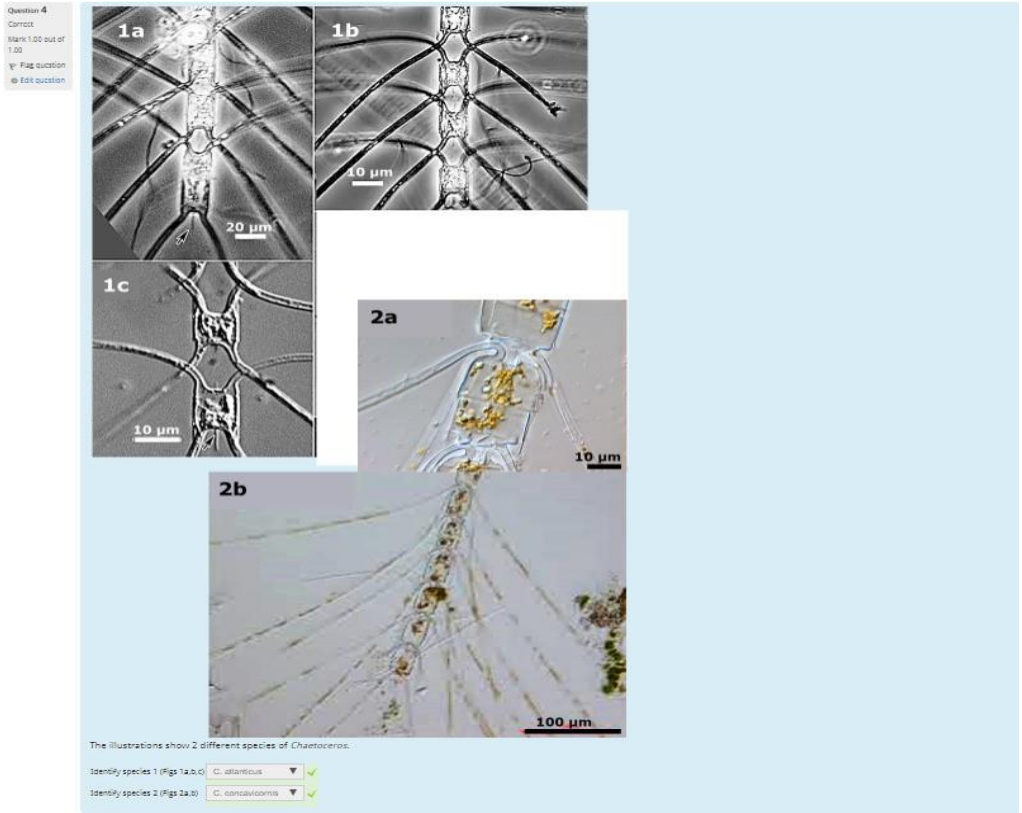
Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Identify species 1 (Figs 1a,b) : C. peruvianus	C. peruvianus	33.33%	86	98.85%
	Identify species 1 (Figs 1a,b) : C. concavicornis	C. concavicornis	0.00%	1	1.15%
2	Identify species 2 (Fig. 2) : C. peruvianus	C. peruvianus	0.00%	1	1.15%
	Identify species 2 (Fig. 2) : C. aequatorialis	C. aequatorialis	33.33%	84	96.55%
	Identify species 2 (Fig. 2) : C. atlanticus	C. atlanticus	0.00%	1	1.15%
	Identify species 2 (Fig. 2) : C. concavicornis	C. concavicornis	0.00%	1	1.15%

3	Identify species 3 (Fig. 3) : C. danicus	C. danicus	33.33%	87	100.00%

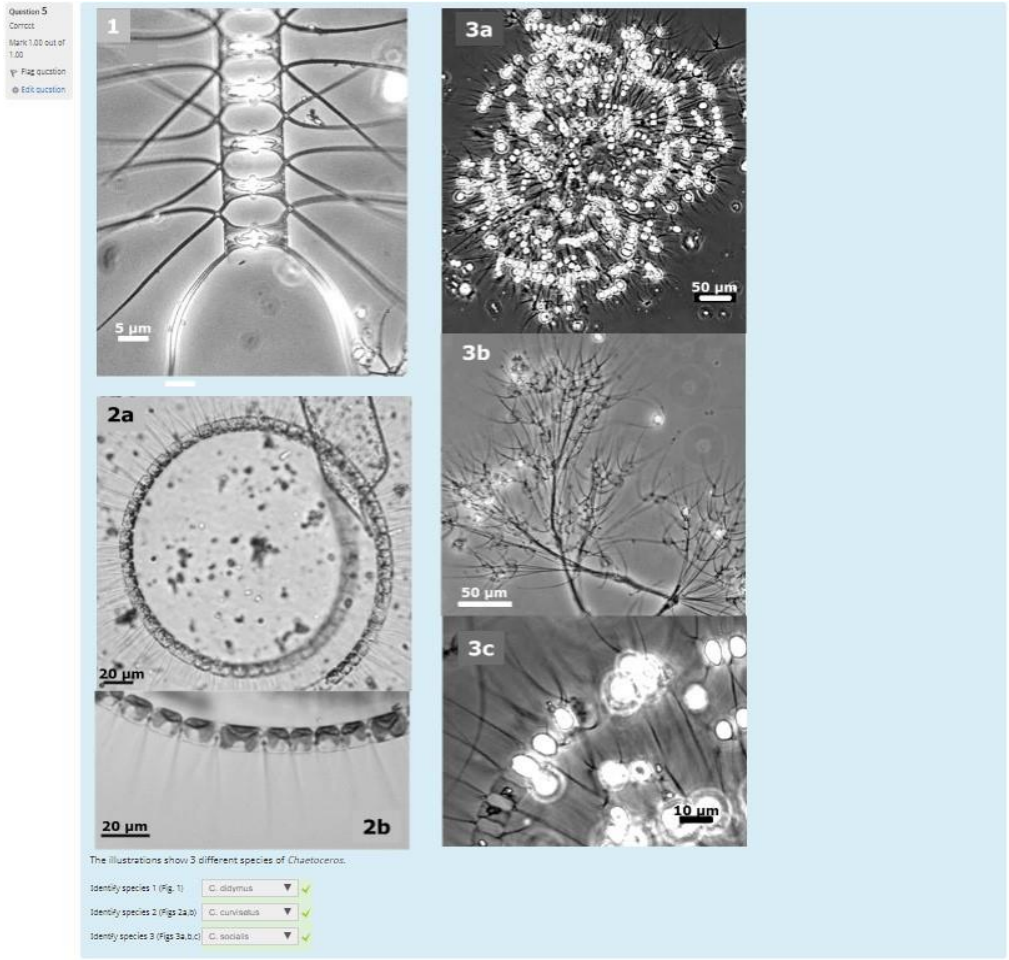


Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Identify species 1 (Figs 1a,b) : C. lorenzianus	C. lorenzianus	33.33%	80	91.95%
	Identify species 1 (Figs 1a,b) : C. decipiens	C. decipiens	0.00%	5	5.75%
	Identify species 1 (Figs 1a,b) : C. brevis	C. brevis	0.00%	1	1.15%
	Identify species 1 (Figs 1a,b) : C. atlanticus	C. atlanticus	0.00%	1	1.15%
2	Identify species 2 (Fig. 2) : C. affinis	C. affinis	33.33%	83	95.40%

	Identify species 2 (Fig. 2) : C. decipiens	C. decipiens	0.00%	3	3.45%
	Identify species 2 (Fig. 2) : C. brevis	C. brevis	0.00%	1	1.15%
3	Identify species 3 (Figs 3a,b) : C. lorenzianus	C. lorenzianus	0.00%	5	5.75%
	Identify species 3 (Figs 3a,b) : C. affinis	C. affinis	0.00%	1	1.15%
	Identify species 3 (Figs 3a,b) : C. decipiens	C. decipiens	33.33%	80	91.95%
	Identify species 3 (Figs 3a,b) : C. compressus	C. compressus	0.00%	1	1.15%



Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Identify species 1 (Figs 1a,b,c) : C. atlanticus	C. atlanticus	50.00%	85	97.70%
	Identify species 1 (Figs 1a,b,c) : C. lorenzianus	C. lorenzianus	0.00%	1	1.15%
	Identify species 1 (Figs 1a,b,c) : C. didymus	C. didymus	0.00%	1	1.15%
2	Identify species 2 (Figs 2a,b) : C. concavicornis	C. concavicornis	50.00%	87	100.00%

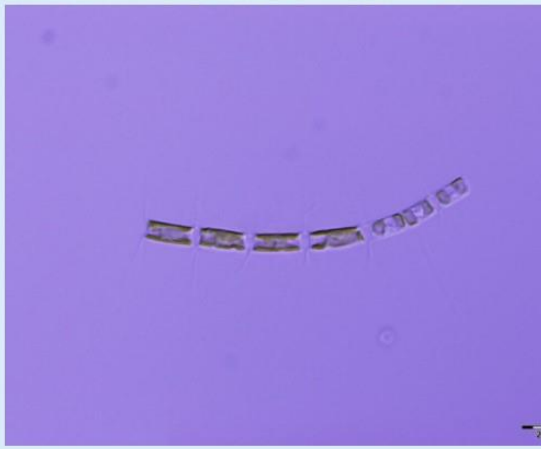


Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Identify species 1 (Fig. 1) : C. didymus	C. didymus	33.33%	87	100.00%
2	Identify species 2 (Figs 2a,b) : C. curvisetus	C. curvisetus	33.33%	83	95.40%
	Identify species 2 (Figs 2a,b) : C. debilis	C. debilis	0.00%	4	4.60%
3	Identfy species 3 (Figs 3a,b,c) : C. socialis	C. socialis	33.33%	86	98.85%

	Identfy species 3 (Figs 3a,b,c) : C. lorenzianus	C. lorenzianus	0.00%	1	1.15%

Question 6
Correct
Mark 1.00 out of 1.00
Flag question
Edit question

Enumerate the phytoplankton cells in the following image (numeric answers, 1,2,3 etc.)



Answer: 7

Question 7
Correct
Mark 1.00 out of 1.00
Flag question
Edit question

How many cells of Thalassosira are shown (numeric answers, 1,2,3 etc.)

Answer: 9

Model response	Actual response	Partial credit	Count	Frequency
7 (5.9999999999999..8.0000000000001)	7	100.00%	43	49.43%
	6	100.00%	8	9.20%
[Did not match any answer]	4	0.00%	36	41.38%

Model response	Actual response	Partial credit	Count	Frequency
9 (7.9999999999999..10)	9	100.00%	66	75.86%
	8	100.00%	13	14.94%
	10	100.00%	1	1.15%
[Did not match any answer]	13	0.00%	6	6.90%
	14	0.00%	1	1.15%

Model response	Actual response	Partial credit	Count	Frequency
26 (25..27)	26	100.00%	84	96.55%
	25	100.00%	2	2.30%
	27	100.00%	1	1.15%

Question 8

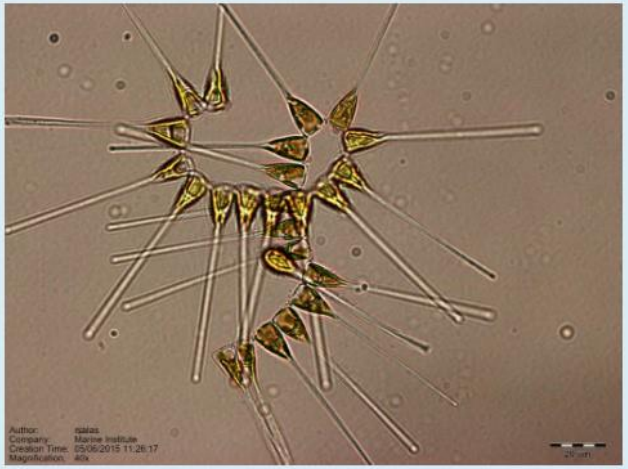
Correct

Mark 1.00 out of 1.00

Flag question

Edit question

Count all visable cells, even partial cells (numeric answers 1,2,3 etc.)



Answer: 26

Question 9

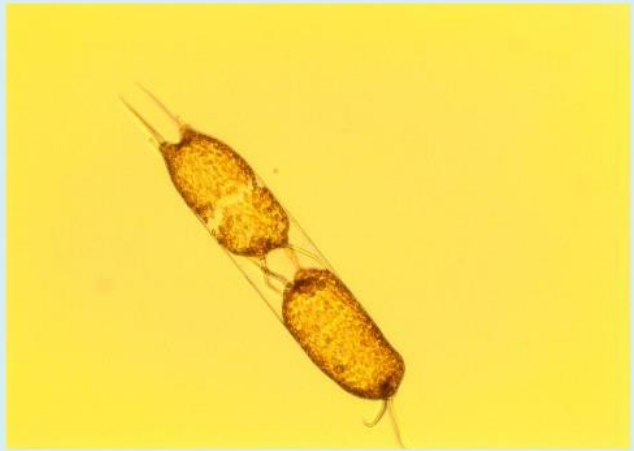
Correct

Mark 1.00 out of 1.00

Flag question

Edit question

Enumerate the phytoplankton in the following image (numeric answers 1,2,3 etc.



Answer: 2

Model response	Actual response	Partial credit	Count	Frequency
2 (2..2)	2	100.00%	86	98.85%
[Did not match any answer]	1	0.00%	1	1.15%

Part of question	Model response	Partial credit	Count	Frequency
1	1 apical plate	16.67%	85	97.70%
	[No response]	0.00%	2	2.30%
2	ventral pore	16.67%	82	94.25%
	[No response]	0.00%	5	5.75%
3	Apical pore complex	16.67%	85	97.70%
	[No response]	0.00%	2	2.30%
4	Posterior sulcal plate	16.67%	75	86.21%
	[No response]	0.00%	12	13.79%
5	6 pre cingular plate	16.67%	73	83.91%

	[No response]	0.00%	14	16.09%
6	1 postcingular plate	16.67%	44	50.57%
	[No response]	0.00%	43	49.43%

Question 10

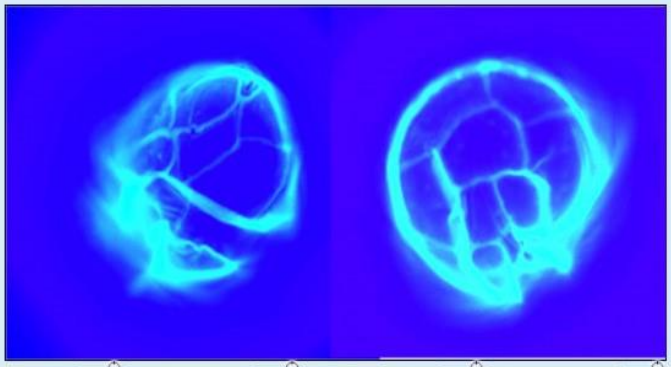
Not yet answered

Marked out of 1.00

Flag question

Edit question

These epi-fluorescence microscopy images depict the thecal plates under calcofluor staining of the armoured dinoflagellate *Alexandrium sp.* **Drag and Drop** the taxonomic markers in the correct areas



ventral pore | 1 apical plate | 6 pre cingular plate | Apical pore complex | 1 postcingular plate | Posterior sulcal plate

Question 10

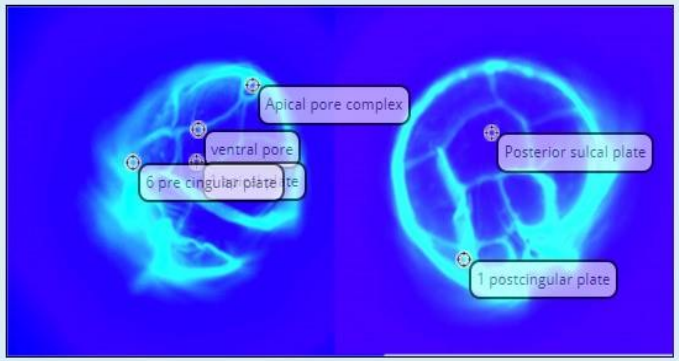
Correct

Mark 1.00 out of 1.00

Flag question

Edit question

These epi-fluorescence microscopy images depict the thecal plates under calcofluor staining of the armoured dinoflagellate *Alexandrium sp.* **Drag and Drop** the taxonomic markers in the correct areas



ANNEX XVII: Ocean Teacher HAB Quiz IPI2017

Part of question	Model response	Partial credit	Count	Frequency
1	1. Peridiniales antapical view	100.00%	82	94.25%
	4. Gonyaulacales Sulcal view	0.00%	1	1.15%
	5. Peridiniales sulcal view	0.00%	1	1.15%
	6. Peridiniales apical view	0.00%	2	2.30%
	9. Gonyaulacales antapical view	0.00%	1	1.15%
2	2. Gonyaulacales ventral view	100.00%	83	95.40%
	10. Peridiniales ventral view	0.00%	4	4.60%
3	1. Peridiniales antapical view	0.00%	1	1.15%
	3. Peridiniales dorsal view	100.00%	85	97.70%
	7. Gonyaulacales dorsal view	0.00%	1	1.15%
4	4. Gonyaulacales Sulcal view	100.00%	80	91.95%
	5. Peridiniales sulcal view	0.00%	5	5.75%
	7. Gonyaulacales dorsal view	0.00%	1	1.15%
	9. Gonyaulacales antapical view	0.00%	1	1.15%
5	1. Peridiniales antapical view	0.00%	1	1.15%
	3. Peridiniales dorsal view	0.00%	1	1.15%
	4. Gonyaulacales Sulcal view	0.00%	5	5.75%
	5. Peridiniales sulcal view	100.00%	80	91.95%
6	1. Peridiniales antapical view	0.00%	2	2.30%
	6. Peridiniales apical view	100.00%	81	93.10%

Question 11

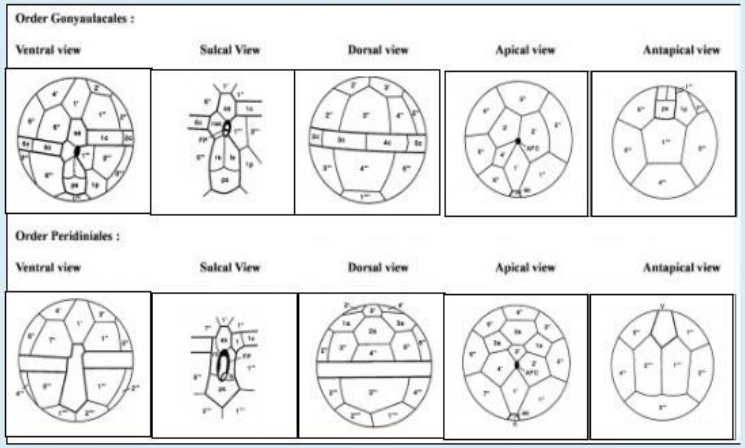
Correct

Mark 1.00 out of 1.00

Flag question

Edit question

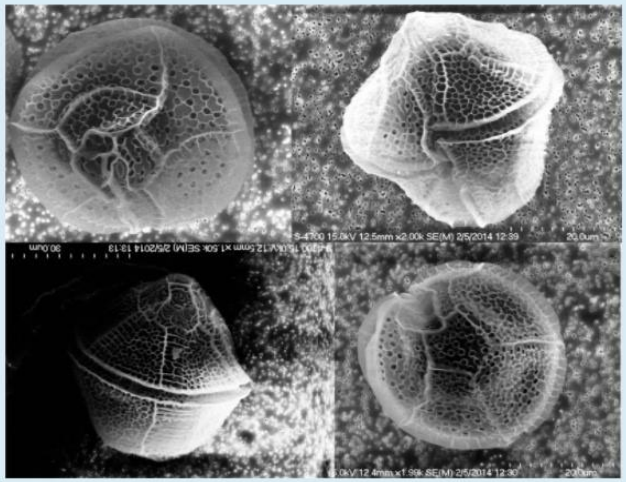
The following diagrams belong to either the order Gonyaulacales or Peridiniales. Drag and Drop the correct diagram view to the right place on the board.



	8. Gonyaulacales apical view	0.00%	4	4.60%
7	3. Peridiniales dorsal view	0.00%	1	1.15%
	7. Gonyaulacales dorsal view	100.00%	85	97.70%
	9. Gonyaulacales antapical view	0.00%	1	1.15%
8	6. Peridiniales apical view	0.00%	4	4.60%
	8. Gonyaulacales apical view	100.00%	82	94.25%
	9. Gonyaulacales antapical view	0.00%	1	1.15%
9	1. Peridiniales antapical view	0.00%	1	1.15%
	4. Gonyaulacales Sulcal view	0.00%	1	1.15%
	5. Peridiniales sulcal view	0.00%	1	1.15%
	8. Gonyaulacales apical view	0.00%	1	1.15%
	9. Gonyaulacales antapical view	100.00%	83	95.40%
10	2. Gonyaulacales ventral view	0.00%	4	4.60%
	10. Peridiniales ventral view	100.00%	83	95.40%

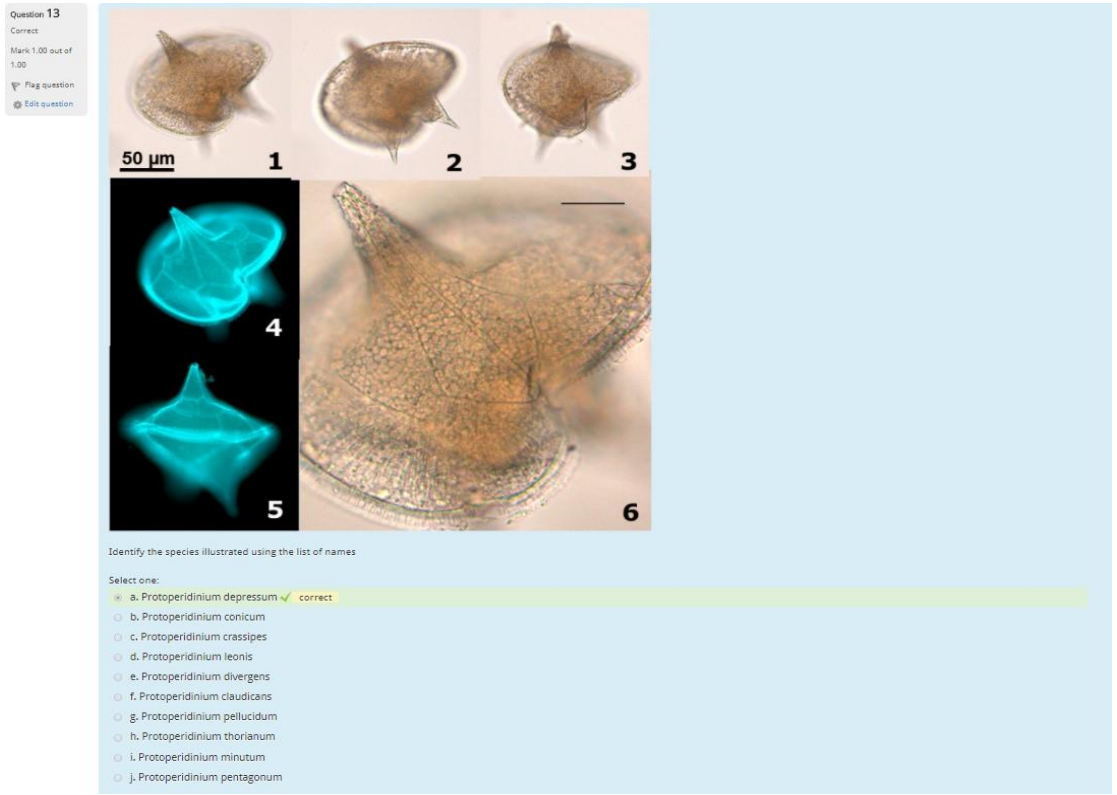
Question 12
Correct
Mark 1.00 out of 1.00
Flag question
Edit question

Identify the armoured dinoflagellate depicted in these images



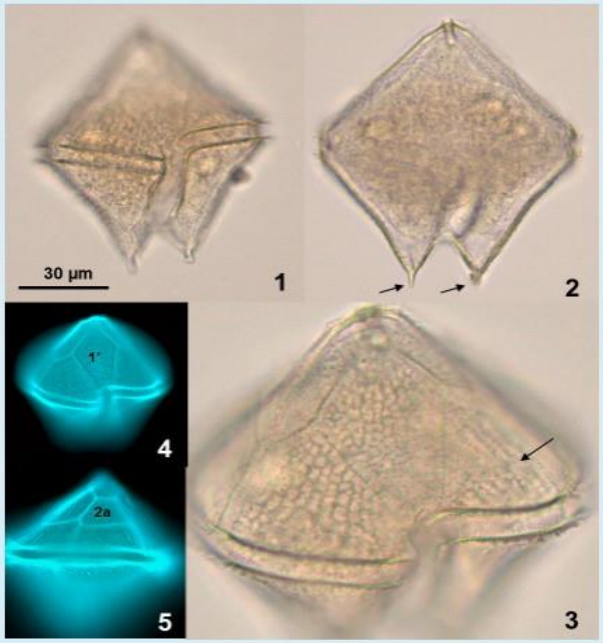
Select one:
- a. Alexandrium minutum
- b. Protoceratium reticulatum
- c. Gonyaulax spinifera
- d. Lingulodinium polyedrum ✓
- e. Fragilidium subglobosum
- f. Gonyaulax digitale
- g. Amphidoma nucula
- h. Heterocapsa rotundata

Model response	Partial credit	Count	Frequency
Protoceratium reticulatum	0.00%	9	10.34%
Gonyaulax spinifera	0.00%	1	1.15%
Lingulodinium polyedrum	100.00%	77	88.51%



Model response	Partial credit	Count	Frequency
Protoperidinium depressum	100.00%	86	98.85%
Protoperidinium pentagonum	0.00%	1	1.15%

Question 14
Correct
Mark 1.00 out of 1.00
Flag question
Edit question



Identify the species illustrated using the list of names

Select one:

- a. Protoperidinium pentagonum
- b. Protoperidinium divergens
- c. Protoperidinium crassipes
- d. Protoperidinium pellucidum
- e. Protoperidinium depressum
- f. Protoperidinium conicum
- g. Protoperidinium thorianum
- h. Protoperidinium minutum
- i. Protoperidinium claudicans
- j. Protoperidinium leonis ✓ correct

ANNEX XVII: Ocean Teacher HAB Quiz IPI2017

Model response	Partial credit	Count	Frequency
Protoperidinium depressum	100.00%	86	98.85%
Protoperidinium pentagonum	0.00%	1	1.15%

ANNEX XVIII: HABs Oceanteacher quiz results

Analyst code	Overall grade	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
8	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
10	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
25	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
28	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
29	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
31	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
50	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
55	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
57	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
62	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
63	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
70	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
75	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
83	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
85	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
86	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
87	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
95	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
97	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
16	98.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
24	98.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
27	98.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
37	98.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
53	98.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
56	98.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
92	98.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
98	98.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
45	98.60	80.28	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
4	97.60	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	67.61	100.00	100.00	100.00	100.00
66	97.60	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	67.61	100.00	100.00	100.00	100.00

76	96.20	80.28	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	67.61	100.00	100.00	100.00	100.00
42	95.20	100.00	100.00	100.00	100.00	67.61	100.00	100.00	100.00	100.00	67.61	100.00	100.00	100.00	100.00
69	94.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	67.61	60.56	100.00	100.00	100.00
7	92.90	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00
11	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
12	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
15	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
34	92.90	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00
35	92.90	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00
41	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
46	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
48	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

ANNEX XVIII: HABs Oceanteacher quiz results

Analyst code	Overall grade	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
51	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
67	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
71	92.90	100.00	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
79	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
94	92.90	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2	91.70	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	0.00	100.00	100.00
6	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
18	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
19	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
38	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
44	91.70	100.00	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
47	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
52	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
54	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
80	91.70	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	100.00	0.00	100.00	100.00
84	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
93	91.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
91	90.50	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	67.61	100.00	100.00	100.00	100.00
96	90.50	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	67.61	100.00	100.00	100.00	100.00

13	89.80	80.28	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	16.90	60.56	100.00	100.00	100.00
5	89.30	100.00	100.00	100.00	100.00	67.61	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
14	88.80	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	84.51	60.56	100.00	100.00	0.00
64	88.10	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	33.80	100.00	100.00	100.00	100.00
1	87.40	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	40.85	100.00	100.00	100.00
39	86.20	80.28	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	67.61	60.56	100.00	100.00	0.00
3	85.70	100.00	100.00	100.00	100.00	100.00	0.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
60	85.70	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00
88	85.70	100.00	100.00	33.80	100.00	100.00	100.00	100.00	100.00	100.00	67.61	100.00	100.00	100.00	0.00
30	85.20	60.56	100.00	67.61	100.00	100.00	100.00	100.00	100.00	100.00	67.61	100.00	0.00	100.00	100.00
73	85.20	80.28	100.00	67.61	100.00	100.00	0.00	100.00	100.00	100.00	67.61	80.28	100.00	100.00	100.00
77	84.50	100.00	100.00	33.80	100.00	67.61	0.00	100.00	100.00	100.00	84.51	100.00	100.00	100.00	100.00
78	84.30	80.28	100.00	67.61	100.00	67.61	100.00	100.00	100.00	0.00	67.61	100.00	100.00	100.00	100.00
58	83.10	100.00	67.61	67.61	100.00	100.00	100.00	100.00	100.00	100.00	50.70	80.28	0.00	100.00	100.00
21	81.70	100.00	100.00	100.00	100.00	100.00	0.00	0.00	100.00	100.00	84.51	60.56	100.00	100.00	100.00
74	81.40	80.28	100.00	33.80	100.00	100.00	0.00	100.00	100.00	100.00	67.61	60.56	100.00	100.00	100.00
65	81.00	100.00	100.00	33.80	100.00	100.00	0.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
22	79.50	80.28	67.61	100.00	100.00	100.00	100.00	100.00	100.00	100.00	67.61	100.00	0.00	0.00	100.00
90	79.30	80.28	100.00	0.00	50.70	100.00	0.00	100.00	100.00	100.00	100.00	80.28	100.00	100.00	100.00
61	77.40	100.00	100.00	0.00	100.00	100.00	0.00	100.00	100.00	100.00	84.51	100.00	0.00	100.00	100.00
89	77.40	100.00	100.00	100.00	100.00	100.00	0.00	0.00	100.00	100.00	84.51	100.00	0.00	100.00	100.00
17	75.00	100.00	100.00	100.00	100.00	67.61	0.00	0.00	100.00	100.00	84.51	100.00	100.00	100.00	0.00
99	69.30	80.28	33.80	100.00	50.70	100.00	0.00	100.00	100.00	100.00	67.61	40.85	0.00	100.00	100.00