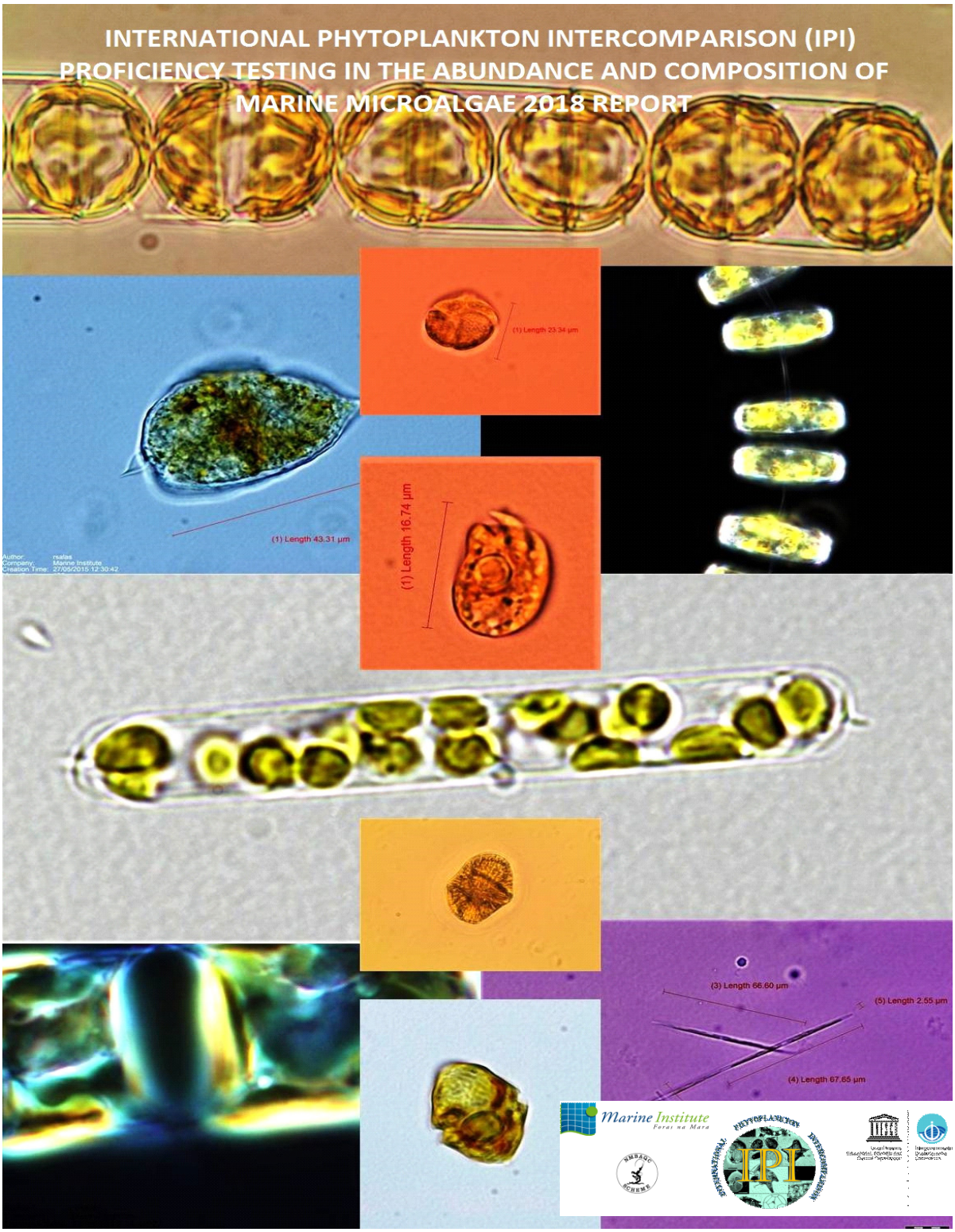
INTERNATIONAL PHYTOPLANKTON INTERCOMPARISON (IPI) PROFICIENCY TESTING IN THE ABUNDANCE AND COMPOSITION OF MARINE MICROALGAE 2018 REPORT



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1. Summary of results

- This year, 99 analysts from 47 laboratories took part in this intercomparison exercise. 96 analysts returned sample results and 86 completed the online HAB quiz. 77% of participants come from European countries, 10% from South America, 7% from African countries, 5% from Australia and New Zealand and 1% from the Middle East

- Ten species were used in this test. These were the dinoflagellates *Heterocapsa triquetra* (Ehrenberg) Stein, 1883, *Amphidinium carterae* Hulburt, 1957, *Prorocentrum micans* Ehrenberg, 1834, *Levanderina fissa* (Levander) Ø.Moestrup, P.Hakanen, G.Hansen, N.Daugbjerg & M.Ellegaard, 2014, *Karenia mikimotoi* (Miyake & Kominami ex Oda) Gert Hansen & Ø.Moestrup, 2000 and the diatoms *Pseudo-nitzschia delicatissima complex* (Cleve) Heiden, 1928, *Dactyliosolen fragilissimus* (Bergon) Hasle, 1996, *Thalassiosira rotula/ gravida* Meunier, 1910/ Cleve, 1896, *Chaetoceros lorenzianus* Grunow, 1863 and *Melosira nummuloides* C.Agardh, 1824.

- The average and confidence limit for each test item was calculated using the robust algorithm in annex C of ISO13528:2015 which takes into account the heterogeneity of the samples and the between samples standard deviation from the homogeneity and stability test. ISO 13528:2015 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 and the stability test according to ISO13528:2015.

- There were a very small number of warning and action signals across the measurands. 13 Red flags (1.36%), 31 (3.26%) yellow flags and 22 (2.3%) non-id flags from 950 scores is evidence of good performance overall. Seven analysts did not pass the test with a score below 80%.

- There were no major problems identifying the composition of samples in this exercise and the number of non-identifications (2.1%) and mis-identifications (5.9%) were relatively small. An array of commonly found diatoms and dinoflagellates were used.

- Overall, from 960 possible correct identifications, there were a total of 883 correct answers at genus level that is 91.9% correct, 20 (2.1%) non identifications and 57 (5.9%) incorrect answers mainly on one species. This indicates a high level of taxonomic proficiency amongst participants.

- Q1 on diatom taxonomic terminology was found to be the most difficult question in this test. The average grade was 70% and there was confusion with some of the terminology used. However, there were no problems with Q2 (93.5%), Q11 (96%) and Q12 (92%), also on diatoms.

- The numerical questions Q3-Q5 did not cause major problems for analysts. However, the percentage of correct answers was different for Q3 (88%) to Q4 (97%) and Q5 (98%), which were mostly perfect. Q3 showed a chain of the diatom *Melosira nummuloides* showing cells in the chain at different stages of division which could have caused difficulty in interpreting the cell count.

- The 2018 Ocean teacher online HAB taxonomic assessment results show a high rate of proficiency. 76% of analysts achieved a score over 90% (Proficient). 21% of analysts above 80%, 3 % need improvement.

2. Introduction

The Proficiency testing scheme IPI has been designed to test the ability of analysts to identify and enumerate correctly marine phytoplankton species in lugol's preserved water samples using the Utermöhl method. As in previous years, samples have been produced using laboratory cultures.

Ten species were used in this test. These were the dinoflagellates *Heterocapsa triquetra* (Ehrenberg) Stein, 1883, *Amphidinium carterae* Hulburt, 1957, *Prorocentrum micans* Ehrenberg, 1834, *Levanderina fissa* (Levander) Ø.Moestrup, P.Hakanen, G.Hansen, N.Daugbjerg & M.Ellegaard, 2014, *Karenia mikimotoi* (Miyake & Kominami ex Oda) Gert Hansen & Ø.Moestrup, 2000 and the diatoms *Pseudo-nitzschia delicatissima complex* (Cleve) Heiden, 1928, *Dactyliosolen fragilissimus* (Bergon) Hasle, 1996, *Thalassiosira rotula/ gravida* Meunier, 1910/ Cleve, 1896, *Chaetoceros lorenzianus* Grunow, 1863 and *Melosira nummuloides* C.Agardh, 1824.

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 is a 3 full day training workshop which is held in Hillerød, Denmark in rooms equipped with microscopes and using live cultures, preserved samples from participants (See Workshop agenda: Annex IV). At least 2 days are dedicated to lectures on algal groups, this workshop has become an important forum for taxonomists working on phytoplankton monitoring programmes to convene and discuss taxonomical matters, new advances and finds, nomenclatural changes, samples from different locations and listen to relevant stories from other laboratories about harmful algal events in their regions of relevant ecological importance.

This year, 99 analysts from 47 laboratories took part in this intercomparison exercise. 96 analysts returned sample results and 86 completed the online HAB quiz. 77% of participants come from European countries, 10% from South America, 7% from African countries, 5% from Australia and New Zealand and 1% from the Middle East (Figure 1).

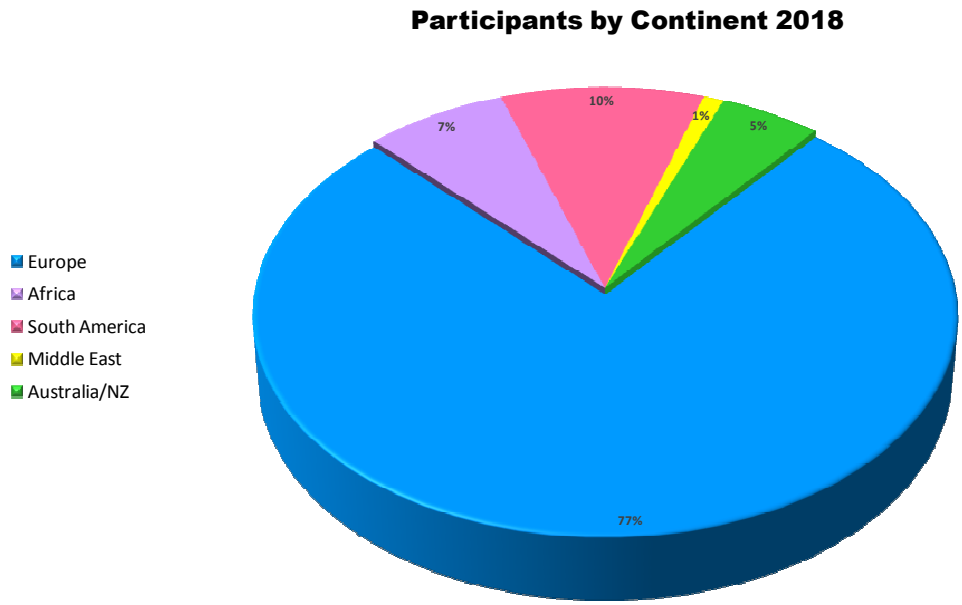

Figure 1: Participants by continent IPI2018

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.

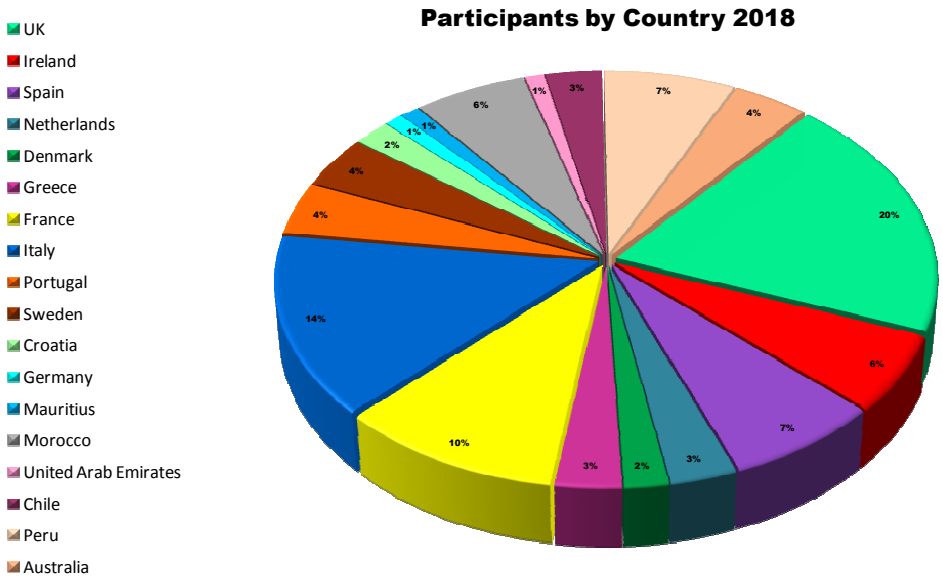

Figure 2: Participants by country IPI 2018

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-18-MI1. PHY standing for phytoplankton, ICN for intercomparison, 18 refers to the year 2018, 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 2018.

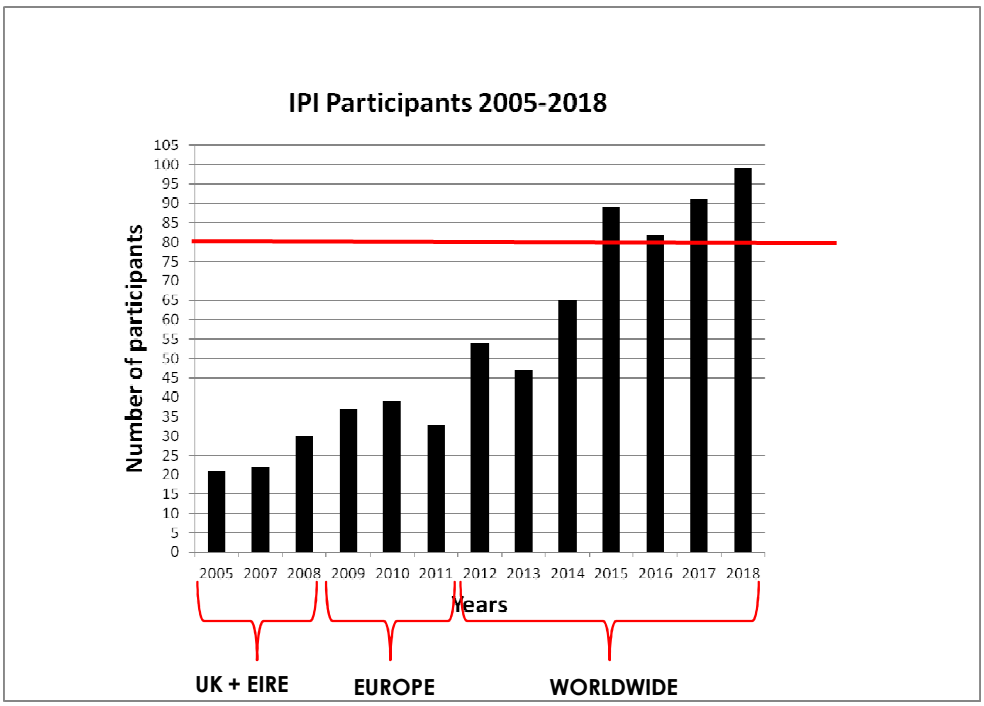

Figure 3: IPI participation in the last 10 years

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 many regions across the globe. This year we reached the highest number of analysts (99) and while the majority of laboratories come from European countries (77%), an increasing number of laboratories 23 % (up 8% from last year) are made up from South America, Africa, Oceania and Middle East.

This year, we have introduced a new way to register your laboratory to the IPI exercise. We have developed the website www.iphy.org to provide a structured and user-friendly single point source of information relating to the IPI. Here, laboratories can find information about the IPI scheme, find the schedule for the year and register their analysts. As part of the registration process, we asked laboratories if bio-volume measurements were to be introduced as part of the test, whether they would be interested in taking part in this new section. 57 analysts responded that they would, that is 58% of all participants for 2018. This compares to only 32% when asked the same question the previous year.

Another change introduced as part of the intercomparison exercise in 2018 is the manner in which we produce our materials. The main change is the production of materials preserved in lugol's iodine in 5 ml brown glass ampoules under nitrogen gas and homogenized using the 'inversina', a machine that can automatically homogenize materials at different speeds using the Paul-Schatz rotary method. Materials produced in this way are very stable. This is discussed at length in the materials and methods section of this report.

3. Materials and Methods

3.1 Sample preparation, homogenization and inoculation

The seawater used in this study was 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 materials were produced from a number of culture strains. A stock solution for each of the species was prepared using 50ml glass screw top bottles (Duran®, Mainz, Germany). Then, a working stock to the required cell concentration was prepared using a measured aliquot from each stock solution into a 2l Schott glass bottle. The stock solution containing all the species was homogenized and sub-divided into five replicate working stocks containing 400 ml each. These working stocks were homogenized using the 2L Inversina (Bioengineering AG, Wald, Switzerland), which is able to homogenize materials automatically and

uses the Paul-Schatz rotation method. The working stocks were homogenized for 3 minutes at speed setting number 4.

5 ml amber glass ampoules (Wheaton, New Jersey, USA) were used to store the inoculum. 3ml aliquots of the homogenized materials were inoculated into each ampoule containing 100µl of neutral lugol's iodine. This was carried out using an automatic eppendorf multipipette Xstream (0-10ml) (Eppendorf, Hamburg, Germany), set to dispense accurately 3 ml per sample. Once all the samples were inoculated, ampoules were purged with nitrogen gas to stop oxidation and sealed using a flame torch. The ampoules were submerged into a water bath to test for their impermeability.

Each ampoule was labeled with a sequential number and each box of ampoules was also labeled to differentiate sample sets produced from different working stocks (IPI2018-1 to IPI2018-5) and store in the fridge (2-5 °C) in the dark until further transport to the participating laboratories.

Samples were couriered using different companies depending on where the parcels go on a one day delivery across the world, in order for all the laboratories to have approximately the same arrival time.

Before the samples could be analysed, participants had to carry out an extra preparation step in the laboratory. Analysts had to accurately pipette or dispense 47 ml of seawater + lugol's iodine (if necessary) into the sterilin tubes, break the ampoule by its neck and pipette out its contents including a rinsing step into the sterilin tube. Once the sterilin tube was inoculated with the 3ml ampoule, the tube was ready for homogenization and analysis.

3.2 Culture material, treatments and replicates.

Most of the laboratory cultures used in this study have been collected in Galway bay and Bantry bay during the months of February and May 2018 except for *Karenia mikimotoi* and *Amphidinium carterae* which were donated by the Cawthron Institute culture collection in New Zealand. 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 delicatissima* which was confirmed to species level using qPCR (Roche Lightcycler) species specific gene probes.

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Ø.Moestrup, P.Hakanen, G.Hansen, N.Daugbjerg & M.Ellegaard, 2014, *Karenia mikimotoi* (Miyake & Kominami ex Oda) Gert Hansen & Ø.Moestrup, 2000 and the diatoms *Pseudo-nitzschia delicatissima complex* (Cleve) Heiden, 1928, *Dactyliosolen fragilissimus* (Bergon) Hasle, 1996, *Thalassiosira rotula/gravida* Meunier, 1910/ Cleve, 1896, *Chaetoceros lorenzianus* Grunow, 1863 and *Melosira nummuloides* C.Agardh, 1824.

A total of 700 samples were produced for the enumeration and identification study. Each participant was sent a set of four samples, three for analysis and including an extra one as spare. 99 analysts were sent a total of 396 ampoules in 47 laboratories.

Each sample set per analyst consisted of a padded brown envelope, labeled with the analyst code for the test which contained 4 ampoules, 4 x 50 ml sterilin tubes, 4 plastic droppers and one 1.5 ml eppendorf centrifuge tube containing 1 ml of lugol's iodine.

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 were necessary for the homogeneity test and a minimum of 3 samples for the stability test.

A time delay between the homogeneity test and the stability test is required. ISO 13528:2015 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 the same.

3.3 Cell concentrations

Preliminary cell counts from individual stock solutions were carried out using a 1 ml glass Sedgewick-Rafter cell counting chamber (Pyser-SGI, Kent, UK) to establish the approximate cell concentration of each species. These approximate cell concentrations were used to decide the volume of the aliquot and the final concentration required for the working stock. Further analysis of the working stock is done to make sure that all the species involved are well preserved and in the concentrations required before proceeding with the inoculation process.

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

The instructions and forms required for this test were sent via e-mail to all registered participants in order to complete the exercise including their unique identifiable laboratory and analyst code. Also, a short video was uploaded to youtube which gave step by step guidance on how to prepare the samples using the ampoules and how to mix the inoculum into the sterilin tubes, before homogenization and analysis took place.

Form 1 (Annex I) was sent to confirm the receipt of materials; number and condition of samples and correct sample code. Form 2 (Annex II) was sent 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 2018.6.19.0, dedicated software for the statistical analysis of intercalibration and proficiency testing exercises from Quodata, Minitab® Statistical Software Vr16.0 and Microsoft office Excel 2016.

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, how to treat 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 given permission by the site administrator to access the test. The test opened on the 13th July 2018 and closed on the 2nd of November 2018, that is over 3 months to complete this assignment. 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 2018 HAB quiz content from here.

The test itself consisted of 13 questions (see Annex XVII). Question types used in the quiz were; 'matching type' (Q 1,2,8,9,10), matching questions have dropdown menus including an array of answers which analysts must choose from, 'numerical type' (Q3-Q5), numerical questions must be answered using a numeral, 'drag and drop' type (Q7), the participant must move the answer (drag) with the mouse cursor into its correct location and 'multiple choice' (Q 6,11-13), the participant must fill in the right choices from those given. All questions had equal value and the quiz had a maximum grade of 100% for a perfect score. This year we introduced penalties for wrong answers in multiple choice questions, where an incorrect choice incur a percentage deduction in marks.Q6, Q11, Q12 and Q13 carried penalties of 5, 10, 10 and 20 % respectively.

The online quiz could only be submitted once. After submission, no changes could be made. However, analysts could login and out as many times as they wished throughout the allocated period and changes to the quiz could be saved and accessed at a later stage, so the quiz did not 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 2018.6.19.0 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. All measurands passed the expanded criterion for homogeneity according to ISO13528:2015 and the stability test according to ISO13528:2015 (Table 1).

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 the 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 according to the expanded criterion can be identified, although the heterogeneity standard deviation is greater than 30 % of the standard deviation for proficiency assessment. Hence, the proficiency test items cannot be considered fully homogeneous.

ISO13528	Cochran outliers	F-test	ISO 13528:2015	ISO 13528:2015 - expanded criterion	Stability test ISO 13528:2015	Stability test - expanded criterion
Amphidinium carterae	no outliers found	Not OK	Ok	Ok	Ok	Ok
Chaetoceros lorenzianus	no outliers found	Not OK	Ok	Ok	Ok	Ok
Dactyliosolen fragilissimus	outliers found	Ok	Not OK	Ok	Ok	Ok
Gymnodinium Gyrodinium sp.	no outliers found	Not OK	Ok	Ok	Ok	Ok
Heterocapsa triquetra	no outliers found	Not OK	Ok	Ok	Ok	Ok
Karenia mikimotoi	no outliers found	Not OK	Ok	Ok	Ok	Ok
Melosira nummuloides	no outliers found	Ok	Ok	Ok	Ok	Ok
Pseudo-nitzschia delicatissima group	no outliers found	Ok	Not OK	Ok	Ok	Ok
Prorocentrum micans	no outliers found	Not OK	Ok	Ok	Ok	Ok
Thalassiosira gravida/rotula	no outliers found	Ok	Not OK	Ok	Ok	Not OK

Table 1: 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 table of participants' results can be found in Annex VIII at the end of this report. The average count for each measurand was used to calculate the robust averages and standard deviations by iteration. These values were then 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. The calculations are generated by iteration and can be found for each measurand in this report in annex IX.

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

(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

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;

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

B)

Where;

u_x= Standard uncertainty of the assigned value,

s^*= robust standard deviation for the test

p= number of analysts

	Heterocapsa triquetra	Prorocentrum micans	Amphidinium carterae	Karenia mikimotoi	Gymnodinium Gyrodinium	Dactyliosen fragillisimus	Thalassiosira gravida/rotula	Chaetoceros lorenzianus	Pseudo-nitzschia delicatissima group	Melosira nummuloides
Robust mean x*	16020	2057	10057	2949	1164	20481	4636	2575	2412	2183
Robust Stdev s*	5725	869	5939	1791	473	7087	838	1164	1041	701
Standard Ux	734	111	766	236	62	904	107	151	138	90
n=	95	96	94	90	90	96	96	93	89	95
if Ux ? 0.3xSTdev	1718	261	1782	537	142	2126	251	349	312	210
then Ux is negligible	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg
The equation is satisfied in all cases										

Table 2: 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 2).

4.4 Calculation of performance statistics

The performance statistics for the exercise have been calculated using ProLab Plus. 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.

4.4.1 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 non-identifications. If the analyst failed to identify one or various species in the samples, no triangle will appear for that score. All qualitative scores are included for the final evaluation of analysts.

There were a very small number of warning and action signals across measurands. 13 Red flags (1.36%), 31 (3.26%) yellow flags and 22 (2.3%) non-identification flags from 950 scores is evidence of good performance overall. Six analysts failed the test (see annex XI). Analysts 88/89/93 (70%) just below the requirement failed three test items which require improvement and analysts 66 (30%), 92/46 (40%) and 99 (50%) failed >3 items and need substantial improvement next round.

4.5 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.

4.5.1 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 colored 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.

4.5.2 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.

4.6 Qualitative data

The performance of analysts on the correct identification of species was generally very good (Table 3). There were a small number of mis-identifications and non-identifications across the measurands. The most non identified measurands were *Gymnodinium/Gyrodinium* (6), *Karenia mikimotoi* (5) and *Pseudo-nitzschia delicatissima* complex (5) and the most mis-identified species were *Gymnodinium/Gyrodinium* which was mistaken with *Akashiwo sanguinea* by 38 analysts followed by *Dactyliosolen fragilissimus* mistaken by 15 analysts for another similar diatom *Guinardia delicatula* (10) and others (5).

H.triquetra and *prorocentrum micans* were the easiest to identify of the dinoflagellates. The other diatoms were identified correctly to genus level but a decision at species level for *Chaetoceros* divided analysts between *C.lorenzianus* and *C.decipiens.*

The majority of identifications were straightforward and no major difficulties were found with any of the measurands. The dinoflagellate *Levanderina fussa* was identified mostly as *Gymnodinium* or *Gyrodinium* or a mixture of both *Gymnodinium /Gyrodinium*, also as *G.instriatum* which was considered a synonym of

Levanderina fussa. All were given as correct identifications. The identification as *Akashiwo sanguinea* however was given as incorrect.

Also, for the diatom *Pseudo-nitzschia delicatissima complex* we expected analysts to identify correctly to group level, that is either *seriata* group or *delicatissima* group, therefore, the identifications of the *seriata* group were also given as incorrect in this test.

Species	number	%
Melosira nummuloides	71	73.96
Melosira sp.	20	20.83
Melosira varians	1	1.04
Melosira moniliformis	2	2.08
Corethron criophylum	1	1.04
not identified	1	1.04
Total	96	100

Species	number	%
Chaetoceros lorenzianus	18	18.75
Chaetoceros decipiens	18	18.75
Chaetoceros (hyalochates)	51	53.13
Chaetoceros (phaeoceros)	4	4.17
Chaetoceros diadema	2	2.08
Chaetoceros brevis	1	1.04
Not identified	2	2.08
Total	96	100

Species	number	%
Dactyliosolen fragilissimus	65	67.71
Dactyliosolen sp.	16	16.67
Guinardia delicatula	10	10.42
Detonula confarvacea	2	2.08
Detonula sp.	1	1.04
Rhizosolenia delicatula	1	1.04
Cerataulina pelagica	1	1.04
Total	96	100

Species	number	%
Thalassiosira gravida/rotula	40	41.67
Thalassiosira sp.	52	54.17
Thalassiosira anguste-lineata	3	3.13
Thalassiosira angulata	1	1.04
Total	96	100

Species	number	%
P.micans	95	98.96
P.mexicanum	1	1.04
Total	96	100

Species	number	%
H.triquetra	83	86.46
Heterocapsa sp.	10	10.42
Aza/heterocapsa	2	2.08
Scrippsiella sp.	1	1.04
Total	96	100

Species	number	%
Karenia mikimotoi	75	78.13
Karenia selliformis	12	12.50
Karenia digitata	3	3.13
Gymnodinium sp.	1	1.04
not identified	5	5.21
Total	96	100

Species	number	%
Amphidinium carterae	83	86.46
Amphidinium sp.	11	11.46
Heterosigma akashiwo	1	1.04
not identified	1	1.04
Total	96	100

Species	number	%
Gymno/Gyro sp.	23	23.96
Gymno sp.	10	10.42
Gyro sp.	6	6.25
Gyrodinium instriatum	13	13.54
Akashiwo sanguinea	38	39.58
not identified	6	6.25
Total	96	100

Species	number	%
P.delicatissima complex	79	82.29
P.delicatissima	6	6.25
P.seriata complex	5	5.21
P.australis	1	1.04
Not identified	5	5.21
Total	96	100

Table 3: Qualitative data by measurand.

The majority of the identifications clearly show a consensus towards certain species names (Table 3). The easiest to identify to species level was *P.micans* (98.9%), *A.carterae* (86.5%), *H.triquetra* (86.5%), *P.delicatissima* complex (82.3%), *Karenia mikimotoi* (78.1%) followed by the diatoms *M.nummuloides* (73.9%), and *D.fragilissimus* (67.7%).

4.7 Ocean Teacher online HAB quiz

The online HAB quiz consisted of 13 questions; annex XVII shows the questions and correct answers for the online HAB quiz and annex XVIII show the final grades. 86 analysts completed and submitted the quiz. There were a variety of question types in this assessment, matching (Q 1, 2, 8, 9, 10), numerical (Q 3-5), drag and drop (Q 7) and multiple choices (Q 6, 11-13).

Questions 1 and 2 tested analysts' taxonomic knowledge on the terminology of diatoms using *Melosira nummuloides* as an example in Q1 and a series of images in girdle and valve view in Q2. In Q1, different shapes were used to highlight a feature of taxonomic interest and a variety of answers were introduced as possible answers. The main confusion here arose between the following answers; Corona (67%)/Carina (18%) Corona is the right answer to arrow 3 which is a ring of spines found at the valve apex, whereas Carina is the collar on the outer side of the valve. Girdle band (66%)/Copulae (20%) Copulae is considered as a synonym of girdle band in some reference books, so it was decided to give this answer also as correct. Cingula (58%)/intercalary bands (22%) the correct answer for arrow 2 was Cingula which describes a number of girdle bands uniting a pair of cells in chains of *Melosira.* Intercalary bands are growth zones in armoured dinoflagellates.

In Q2, a variety of diatom species were displayed and analysts were asked whether they were in 'valve' or 'girdle' view. Over 90% of analysts answered correctly, with exception to the first image (species 1), an error in the quiz design was later rectified and the test scores recalculated. The right answer for species 1 was 'valve view'.

Questions 3-5 were counting exercises. Q3 depicting a chain of *melosira* caused some problems, cells of *Melosira* can appear as pairs or triplets connected by their Cingula in chains, each individual cell inside the Cingula must be counted but only as long as they are fully developed and divided.

In Q4, the image shows a chain of *Thalassiosira* with well defined cells and there were no issues counting them. In Q5, there were two short chains of *Chaetoceros* depicted. Some of the cells appeared larger than others but well defined by pairs of setae between cells.

Q6 asked a number of questions about a dinoflagellate shown in the image. The dinoflagellate belonged to the Suessiaceae family, which is characterised by the presence of Elongated Apical vesicles (pointed by the arrow). The EAV surrounded narrow Amphiesmal vesicles, the smallest of which at the ventral end is known as the x-plate circled here in red. This family is characterised by their latitudinal plate series. The percentage of correct answers was around 90%.

For Q7 we used a 'drag and drop' type question. Most analysts answered the question correctly although some had problems with the placement of the tiles in the correct position. The crosshairs on the marker tiles had to be placed directly on the number for the answer to be given as correct. Several analysts placed the markers correctly but slightly out of the target area and their answers were given as incorrect. This has now been amended as it was a technical error rather than a taxonomic one. This question has an inherent bias in that if you place one marker in the wrong place, then two answers will be wrong rather than just one. However, the scores were good for most analysts with correct answers for all parts in the 85-95% range.

Q 8 to 11 was mostly concerned with the order *Dinophysiales*. Q9 focused on the genus *Dinophysis*, Q10 on *Phalacroma* and Q11 on toxic species of these genera. Almost all analysts correctly answered Q8 being able to distinguish between the six common genera of *Histioneis*, *Dinophysis*, *Phalacroma*, *Amphisolenia*, *Oxyphysis* and *Ornithocercus*. Picture 1 featured *Ornithocercus*, distinguishable by extensive cingular and sulcal lists. Picture 2 showed *Oxyphysis* with a tower shaped epitheca. Pictures 3a and b were *Amphisolenia* with large elongated cells, around 1mm in length and fusiform. Picture 4 was *Phalacroma*, characterised by a horizontal cingular list and epitheca usually visible above it. Picture 5 detailed *Dinophysis* with a large anterior cingular list, funnel shaped epitheca, flat not protruding above the cingular list. Picture 6, *Histioneis* is a more kidney shaped cell, which possess a distinctive chamber between the epitheca and the cingular lists.
Q9-11 had near perfect scores for most analysts.

Q12-13 focused on the order Thalassiosirales. In Q12 analysts had to choose the right statements about the order Thalassiosirales. There were three right statements: a, c and h. However, statement 'e' was not true but it was built into the exercise as a correct answer by mistake. To be correct, instead of 'labiate' processes it should read 'strutted' processes. As a result we have re-evaluated all the scores and not taking statement 'e' into consideration. Scores are mainly correct above 95% for all the statements. In Q13, analysts were asked to choose which images depicted members of the order Thalassiosirales. The right answers were *Thalassiosira* (2, 3), *Skeletonema* (5) and *Detonula* (8). High scores (98%) for all answers in Q13.

5. Discussion

A number of improvements/changes have taken place since last year. The materials had been prepared in a slightly different manner to previous years. An inversina instrument was purchased in 2018 with the idea of improving the homogenization, stability and long term storage of our biological materials.

This is explained in detail in the materials and methods section but it is summarized here. The inversina is an instrument that can homogenize up to 2 L of liquid materials using the Paul-Schatz rotation method in a consistent way by controlling the speed and time of homogenization. The homogenized materials since 2018 are stored in brown glass ampoules, which have been previously purged using Nitrogen gas, sealed and stored at 2-5 °C. This has improved enormously the quality of the materials and it allows us time to prepare the materials in advance of the test, knowing that the stability is very good over a long period of time. In 2017, materials were produced using this methodology and brought to two consecutive workshops in 2017 and 2018, over a 2 year period to check their stability. The results of these checks were quite promising and it bides well for the future production of reference materials.

Because the way we prepared the samples have changed, also analysis preparation had to change too. Analysts were asked to sub-sample and dilute the ampoules before analysis, which was a methodology deviation from previous years. The Z-scores achieved this year suggest that this methodology deviation has not influenced negatively laboratories or their results from previous years and that the improvements are important enough to continue producing them in this manner.

Homogeneity is still a pending subject and many issues to be resolved around this. The type of materials we are working with, the variety of shapes and sizes, chain forming or individual cells, makes this task the more complex to tackle.

Statistically speaking, we are following the statistical methods laid out in ISO13528:2015 as in the last number of years to calculate the performance statistics for the test. The results of the exercise have been processed using the consensus values of all the analysts to form the basis for their final Z-scores. Since 2014, we are using the statistical software programme ProLab Plus to calculate the descriptive statistics for the test and the performance characteristics including the graphical representation of all the results. The preferred statistical method since 2017 is the Q/Hampel uncorrected Z-score algorithm and before that we used the Q/Huber algorithm.

Homogeneity and stability test

A homogeneity and stability test is carried out each year since 2013 with a set of samples by an expert laboratory and 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 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 heterogeneous. However, this year using the new Inversina homogenizer instrument according to Table 1 most of our materials satisfy at least some of the ISO13528:2015 requirements for homogeneity and stability. All the materials passed the test for significant heterogeneity which allows the standard deviation to be greater than 30% of that of the test. Also, all materials passed the stability assessment according to the expanded criterion.

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, we have added the 'between sample standard deviation' from the homogeneity test for all the measurands (see table 2) to the consensus values as a precaution. In any case, the practical effect of adding the 'between sample SD' from the homogeneity test is to widen slightly the confidence limits for each test item.

Calculation of performance statistics

The consensus values from the participants + the 'between samples standard deviation' from the homogeneity test (Annex VIII) were used to calculate the performance statistics for the test. These values are derived by 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 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 was good for most analysts with perfect scores in all measurands. In this exercise, 13 Red flags (1.36%), 31 (3.26%) yellow flags and 22 (2.3%) non-id flags from 950 scores were evidence of good performance overall. Seven analysts did not pass the test with a score below 80%.

Combined performance scores

It is common in any rounds of a 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 are 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 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.

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 don't 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 colored 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 some kind of 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 doesn't have the shape of a circle anymore. 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

There were no major problems identifying the composition of samples in this exercise and the number of non-identifications (2.1%) and mis-identifications (5.9%) were relatively small. An array of commonly found diatoms and dinoflagellates were used.

The most difficult identification was that of *Levanderina fussa* a naked dinoflagellate. These are known for the difficulty in identifying them beyond genus level and sometimes even to genus level. Therefore, we accepted the genus names *Gymnodinium* or *Gyrodinium* or both as correct responses for the species. What we did not expect was that many analysts reported the species as *A.sanguinea.* 38 analysts or 40% chose this instead. This was considered incorrect, even though *A.sanguinea* is also a naked dinoflagellate. The reason is that we believe that *A.sanguinea* is a distinctive enough species to be considered separately.

Other problems included the misidentification of *D.fragilissimus* for *G.delicatula.* Both species are very similar in shape and size however *D.fragilissimus* can be differentiated by the external process position and shape as it is slightly curved in *D.fragilissimus* and straight in *G.delicatula.*

The diatom *Chaetoceros lorenzianus* was also discussed at length and there was no real consensus as whether it was *C.decipiens* (19%) or *C.lorenzianus* (19%). The majority however, opted for *Chaetoceros* (hyalochates) sp. which was also correct.

Overall, from 960 possible correct identifications, there were a total of 883 correct answers at genus level that is 91.9% correct, 20 (2.1%) non identifications and 57 (5.9%) incorrect answers mainly on one species. This indicates a high level of taxonomic proficiency amongst participants.

Online taxonomic assessment or HAB quiz

The online taxonomic assessment is produced from scratch in the web platform Oceanteacher and designed to entice participants to study the taxonomic literature. The level of taxonomic proficiency required to perform well is high. The online quiz allows us to assess participants' taxonomic skills and compare those skills across laboratories. The technical expertise should be universal but teaching tools, resources and references may be different from one place to another. The consensus is generally quite good between participants and the scores suggest a high level of proficiency among them.

There were a few issues raised about morphological nomenclature of diatoms in Q1. These are extremely technical in nature and the literature is not always consistent in the use of a particular term. This was the case for Copulae and Girdle band used to describe item 4 in Q1. The literature uses both terms to describe the same thing, so the expert group decision was to give both answers as correct.

There were several numerical questions (Q3 to Q5) in this test and these in principle should have been very easy to answer. The analyst must count the number of cells in the image provided. Q3 depicted a chain of the diatom *Melosira nummuloides* which was also one of the measurands in the samples and 10 analysts failed to count correctly the number of cells in the chain. Counts varied from 9 to 20 cells, while the correct number was 21 (also the consensus), which suggests that some analysts are counting doublets in the chain as one cell rather than two, as they are encased within the same Cingula.

This suggests that a small number of analysts have a different strategy at counting cells in diatom chains and that this is significantly different to most analysts. There are no rules regarding counting other than each cell must be counted (excluding colonial forms or large filaments), however what describes 'one cell' possibly needs debating in exceptional cases (for example a dividing dinoflagellate or dividing cells within a diatom chain), so that all analysts enumerate according to certain rules or guidelines. We provide a counting guide with our instructions to provide certainty in this respect to make sure we are all counting within certain agreed parameters.

65 (76%) analysts above 90% mark for the test suggest that the level of proficiency is very high among analysts and across laboratories.

ANNEX I: Form 1 return slip and checklist

IPI PHY-ICN-18-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
Envelope containing 4 x ampoules, droppers, lugols iodine and 4 x 50ml sterilin tubes		YES	NO
Enumeration and identification result log sheet (Form 2)		YES	NO

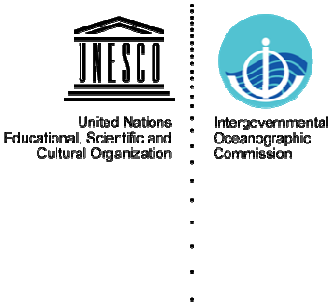
I confirm that I have received the items as detailed above and that the materials were received in good working conditions.

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

SIGNED: _____

DATE: _____

ANNEX II: Form 2 Enumeration and identification results log sheet



IPI 2018 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!
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										#DIV/0!
										#DIV/0!
										#DIV/0!

Comments:

Form 2: Results logsheet

IPI Phytoplankton Proficiency Test PHY-ICN-18-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 IPI2018**
9. **Online HABs taxonomic assessment in Oceanteacher**

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 BEQUALM-NMBAQC 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.

In 2018, we have developed a website www.iphyi.org as a point source of information about the IPI scheme. Information about the exercise can be obtained in this website under the heading 'Programme' and register your laboratory under 'Registration'. The site is under development and improvement and we are hoping to be able to provide all documentation through the website in the future. Also, you can find information about the scheme through our partners, the IOC (http://hab.ioc-unesco.org under the heading 'activities and training courses') and associates 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. Phytoplankton analysts should participate annually in an external and independent proficiency testing scheme to test their ongoing competency on the abundance and composition of 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 2019. All our work is carried out following the technical and managerial requirements for PT schemes (ISO17043:2010) and the data is statistically analysed using the statistical methods as laid out in ISO13528:2015 '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.

In 2018 for the first time, we have changed the way we prepare the samples for this intercomparison. These changes will have implications in the way participants must prepare their samples for analysis, so read carefully the following notes.

In previous years, we have prepared a '**master mix'** by mixing manually using the Paul-Schatz rotation (figure of eight movement) a Schott glass bottle containing the species of interest. Then, a 5ml aliquot from this manually homogenised '**master mix'** was pipette into each pre-prepared sterilin tube containing an accurate volume of sterile seawater + lugol's iodine (45ml).

This year for the first time we have moved towards an automated homogenizer. We are using an Inversina 2L tumbler mixer by Bioengineering to homogenize the Master mix (see video https://youtu.be/LTQ_mzolXlU). This, we are hoping will be an improvement towards a better homogenization of the samples.

We have also changed to an automated multi-pippetor (Xstream, eppendorf) to deliver the aliquots with accuracy and we are using for the first time brown glass ampoules to store our samples.

These changes mean that a bit of preparation will be necessary by the participants prior to analysis. The advantages are many, samples are really stable over long periods of time and the organisms preserve better and they look even better under these conditions. Samples can be sent at different times to laboratories so there is no need for a huge courier dispatch across the world and also the deadlines don't have to be so tight for laboratories to analyse the samples.

Degradation of the samples is practically zero over 12 months. We don't have enough data after this as yet, but the batch we prepared last year in May doesn't show signs of deterioration.

Figure 1: Sample set per participant including sealed vials, lugol's iodine, plastic droppers and 50ml sterilin 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) and according to figure 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: IPI18 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 have until the **28th September 2018** to return the results to the scheme co-ordinator at rafael.salas@marine.ie or 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, September 28th 2018**.

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: IPI18 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 2). Three sedimentation chambers are required.

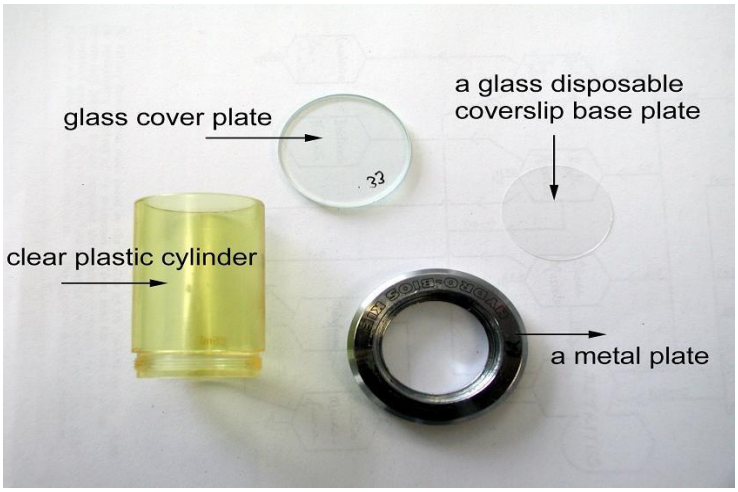


Fig 2: Sedimentation counting chamber

5.1 **Storage of ampoules:** 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:** Vials must be adapted to room temperature before aliquoting and 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 ampoule.

5.5 **Preparation of samples for analysis from ampoules:**

5.5.1 In 2018, as explained in the introduction, the production of the materials has been modified from previous tests. This year we have used 10ml amber glass

ampoules containing 100µl of lugols iodine and 3ml aliquots of the Master mix, gas purged, sealed and stored at 2-5 degree Celsius in the dark.

5.5.2 In order to prepare the ampoules for analysis, analysts must aliquot the contents into the 50ml sterilin tubes, using the plastic droppers included in the sample kit.

5.5.3 Please follow the link here to watch a video on how to prepare your sample for analysis from an ampoule. https://youtu.be/UXhgbtlsp3w

5.5.4 The sterilin tubes should be prepared in advance of opening the ampoule.

5.5.5 Measure accurately 47ml of sterile seawater containing a few drops of lugol's iodine. The ampoules are already preserved in lugols, but when the sample is aliquot into the tube, it is going to be diluted and pale in colour, so if you wish your sample to have a slightly darker coloration you can add a few drops of lugols iodine to the sterile seawater before you pipette the amount.

5.5.6 The volume can be measured in different ways, using an accurate pipette is one way to do it. However, you can use a gravimetric method also by weighing the amount using a balance. If you use a gravimetric method, remember that the density of Seawater at 33-35ppt is roughly 1.025g, so that 47ml = 48.175g in weight.

5.5.7 The seawater used should be of a salinity of 33-35ppt

5.5.8 Once your tubes contain the 47ml seawater and are ready, then you can start working with the ampoules.

5.5.9 First adapt the ampoule and test tube temperature to room temperature, before aliquoting.

5.5.10 Make sure the ampoule contents are at the bottom of the ampoule. If some contents are trapped on the top, flick the ampoule using your fingers to dislodge any liquid.

5.5.11 Break the ampoule by the neck pre-marked break line using gloves and a wad of paper to avoid cuts and grazes. Avoid losing any sample content. If you think some content is lost, you have an extra sample to work with and if this fails, ask for another set.

5.5.12 Use one dropper per sample, do not mix or use the same dropper. Using the dropper, aspirate the contents from the ampoule into the tube.

5.5.13 Once all the sample has been aliquoted into the tube, using the same dropper, take a 3ml sample from the tube itself and rinse the ampoule with it once, collect the liquid again back into the tube.

5.5.14 Close the lid of the tube, invert the sample 50 times minimum and pour into a sedimentation chamber of your choice.

5.5.15 Once the sample has been taken out of the ampoule into the tube, the sample should be sedimented and analysed. **Do not keep the sample in the tube for several days as this will invalidate your analysis.**

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.

The Master mix, 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 in a 2L brown schott glass bottle with the target species at the required concentrations, this mixture has been homogenised using an automated tumbler mixer (Inversina 2L) that uses the Paul-Schatz movement for 4 minutes at 60 rpm approximately and divided in 4 x 500ml batches. These in turn have been homogenised again at the same speed and time. 3mls of the Master mix have been inoculated using an automated multi-pipette eppendorf into a batch of 600 10ml brown glass ampoules, containing 100µl of lugols iodine.

The ampoules have been purged using nitrogen gas and sealed using a torch and tongs. The ampoules have been checked for leaks by submerging on a water bath and then stored at 2-5°C in the dark. The ampoules have been assigned a number randomly.

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

8. Counting guide IPI2018

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. Figures 3 to 5 show a series of images of chain forming diatoms to demonstrate how they should be counted.

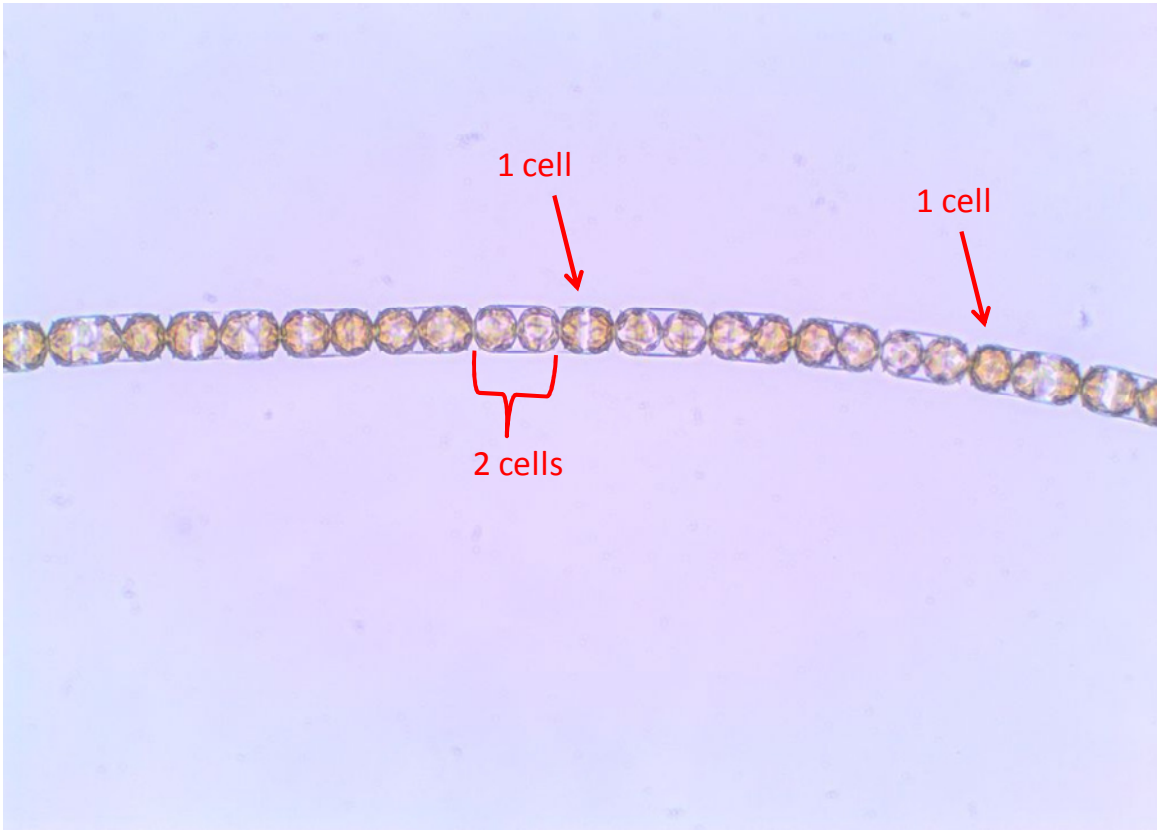


Fig.3 Chain forming diatom showing couplets united by their cingula and also single cells. Count as in the image.

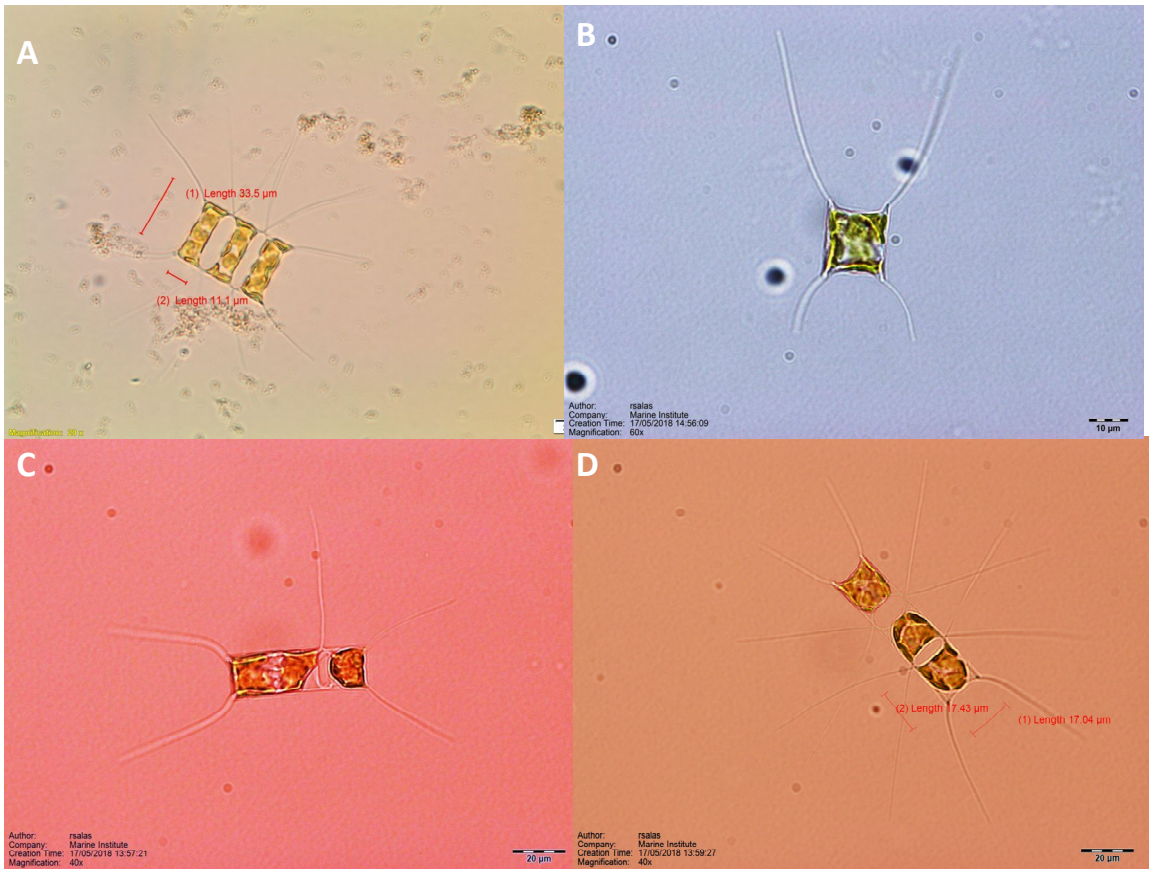


Fig.4 Chain forming diatom images (A-D). Different cell size (A). Single cells (B). Cells dividing (C) (count 2 cells). Normal cell chain (D). If you see different size chains (as in A), do not count as a different species. We cannot ascertain fully whether image A belongs to a different species (contaminant in the culture) or is actually the same species, for the purpose of this test, please count them all as if they were the same species if you see them in your samples. Identify to species level if possible using (B-D) as the type species.

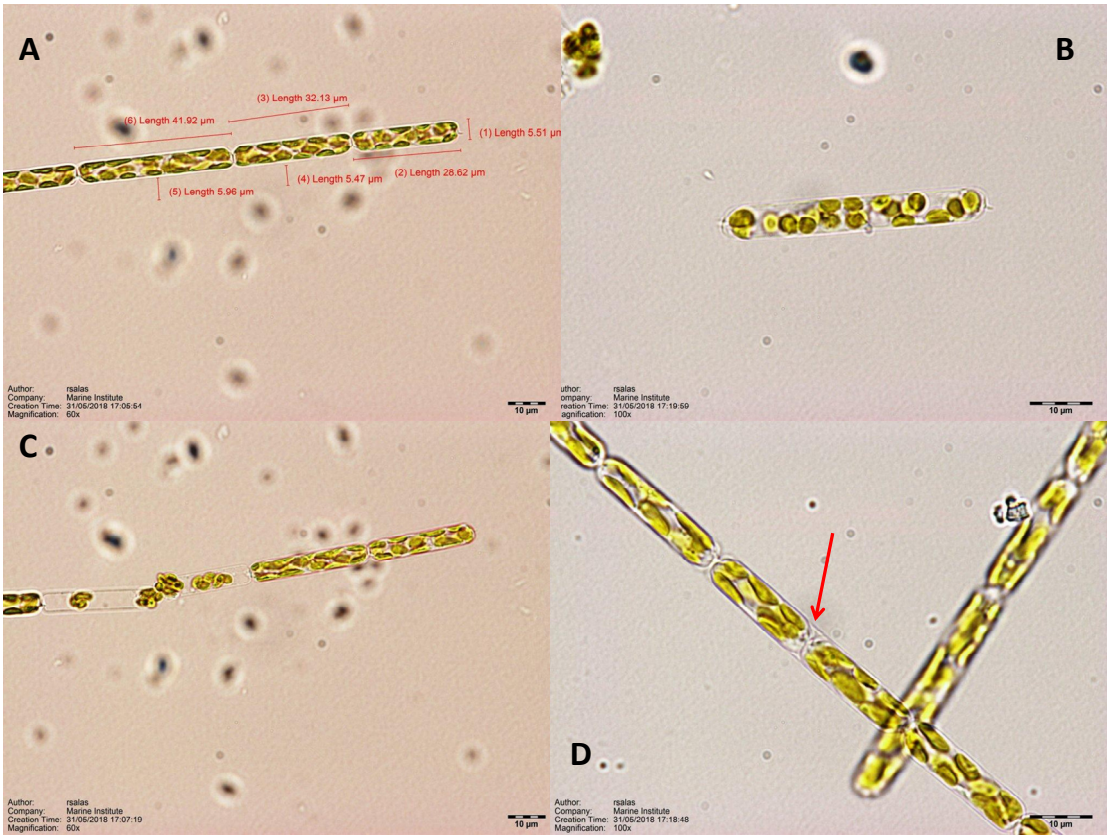


Fig.5 Another chain forming diatom. Please be aware that cells may have different lengths (A), there are single cells (B), broken cells do not count as in C and be careful with divided cells (see arrow in image D) where cells are divided but within the cingula (count 2 cells in this case).

c. How to count dinoflagellates?

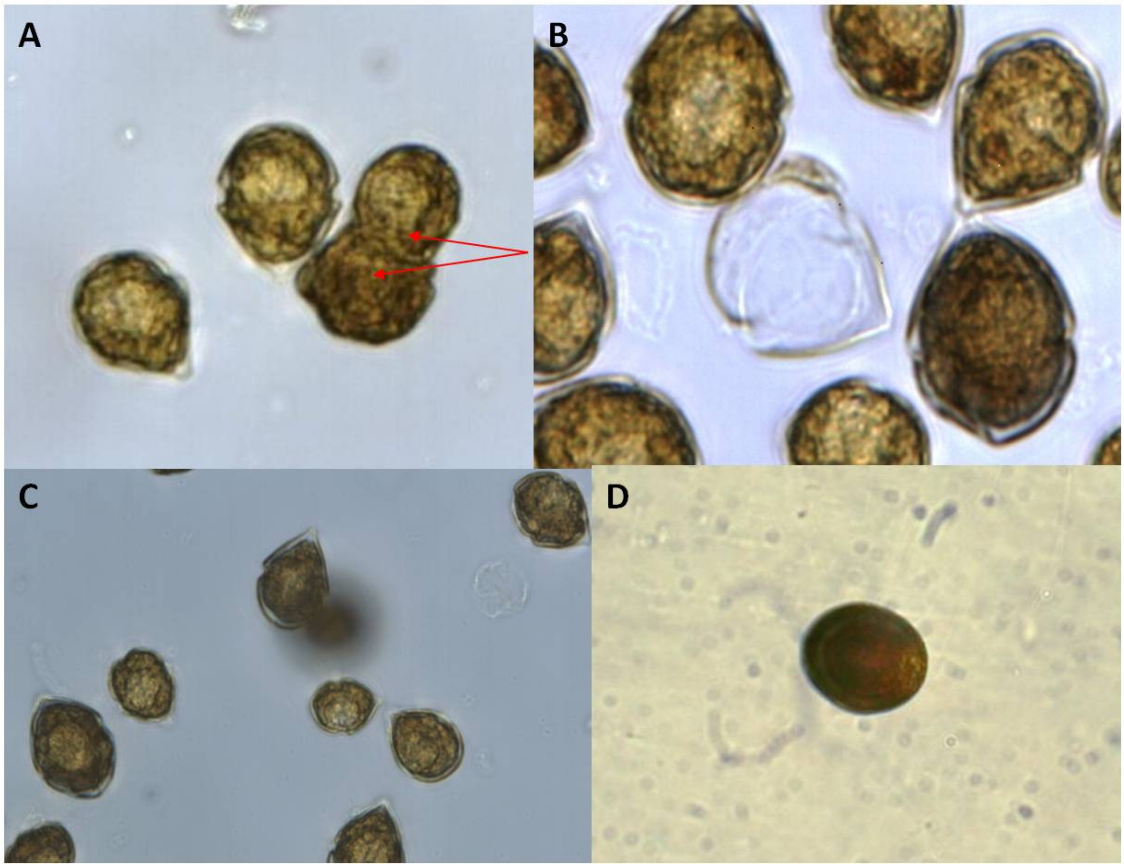


Fig.6 Image A shows two cells fusing or dividing, count only one cell. B: Dinoflagellates empty theca should not be counted. C: Cells may also vary in size, some cells will appear smaller than others, this is normal in culture conditions. Count all cells big or small. D: Sometimes Plasmolysis may occur 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 taxonomic assessment in Oceanteacher

A HAB taxonomic assessment has been developed in the web platform 'Ocean teacher' and it should be ready by the **13th of July 2018.** All participants will need access to the internet to complete this part of the exercise.
This year, we are going to manually enroll the participants to the test using the e-mails you have provided us from the registration process, so there is no need for any of you to register. Once we have you all registered, we will give you access to the test.
The test will be open from the **13th of July 2018** until the **19th October 2018**, giving you ample time to complete the exercise.

Once we have you enrolled, an e-mail will be sent to you with instructions on how to access the test. In order to access the exercise you need to go to the webpage http://classroom.oceanteacher.org/ and login.

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 use your username and password to access the course, if you forgot your password press the forgotten password link. Once you are logged in, in the main page go to my courses and in the drop down menu choose the IPI 2018 course and start your test. Please note that you can login and out as many times as you want from the exercise as long as you don't submit the exercise, So do not press submit until you are sure you are finished.

Analysts will have only one attempt to the exercise and once the exercise is submitted analysts won't be able to access it again to make any changes. 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. 03-05 December 2018

	Morning, 9.00-12.00	**Afternoon, 13.30-17.00**
Sunday, 2 Dec		Arrival to the venue, arr. time 16.00 Danhostel, Lejrskolevej 4, 3400 Hilleroed, Sandwich is served in the evening
Monday, 3 Dec	Results and discussion of the inter-calibration and taxonomic quiz, Rafael, Debbie	Presentations by the participants
Tuesday, 4 Dec	Lecture and microscope demonstration: *Prorocentrum*, pelagic species, Jacob	Microscopy of own samples, mixed samples from different areas, Jacob
Wednesday, 5 Dec	Lecture and microscope demonstration: *Tripos* (*Ceratium*), Jacob Microscopy of own samples, mixed samples from different areas, Jacob	News from recent publications, conferences etc. Rafael & Jacob
Thursday, 6 Dec	Breakfast, check-out at 10.00	

ANNEX V: Participating Laboratories

Company Name	Company Name	Company Name
Marine Institute	Fondazione Centro Ricerche Marine	Istituto Zooprofilattico Sperimentale della Sardegn
Microalgal Services	Dalcon Environmental	Marine Biological Association (ex SAHFOS)
Orbicon A/S	Cawthron Institute	Alfred-Wegener-Institute
Agri Food and Biosciences Institute (AFBI)	ARPAL	Rijkswaterstaat
ARPA FVG	ARPAE	IRTA
SAMS Research Services Ltd (SRSL)	IFREMER	Agenzia Regionale Protezione Ambientale Campani
SANIPES	ARPA Puglia	LIttoral ENvironnement et Sociétés (LIENSs) - UMR 7266 CNRS
Wageningen Marine Research	MEA-nl	SMHI / Swedish Meteorological and Hydrological Institute
Istituto Zooprofilattico Sperimentale delle Venezie	Environmental Protection Agency	Rudjer Boskovic Institute
Institut za oceanografiju i ribarstvo (IOR) (Institute of Oceanography and Fisheries)	PLANCTON ANDINO SPA	IPMA (Portuguese Institute for Sea and Atmosphere)
Bureau Waardenburg bv	Universidad Austral de Chile	Marine Scotland Marine Laboratory
Certificaciones del Perú S.A	Aristotle University of Thessaloniki	Ministry of Ocean Economy, Marine Resources, Fisheries and Shippin
Cefas	Istituto Zooprofilattico Sperimentale Abruzzo Molise	SGS of Perú
Medins Havs och Vattenkonsulter	APEM Limited	AGAPA
Northern Ireland Environment Agency (NIEA)	Sydney Water	Inspectorate Services Perú S.A.C.

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 2018

Participant details:
Name of organisation:
Country:
Participant:
Year of joining:
Years of participation:

Statement Issued:	XX/XX/2018
Statement Number:	MI-IPI-18-001

Summary of results:

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 laboratory participated. See over for details.

Notes:

Details certified by:

Debbie Walsh
Laboratory technician

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 IPI 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

Amphidinium carterae homogeneity test

IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Amphidinium**

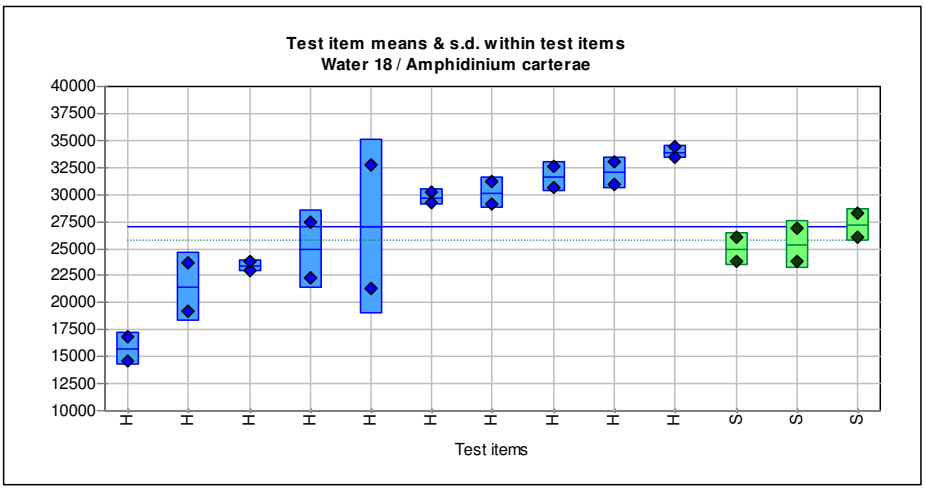
Mean of homogeneity:	26990
Mean of stability:	25800
Uncertainty of mean for homogeneity measurement:	1789
Uncertainty of mean for stability measurement:	733
Standard deviation for proficiency assessment:	7779 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Amphidinium carterae has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 26990, the mean value across all proficiency test items of the stability analysis equals 25800.
Therefore, the mean value of the stability analysis lies 4.4 % 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.
Therefore, given the standard deviation for proficiency assessment of 7779, 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.



IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Amphidinium**

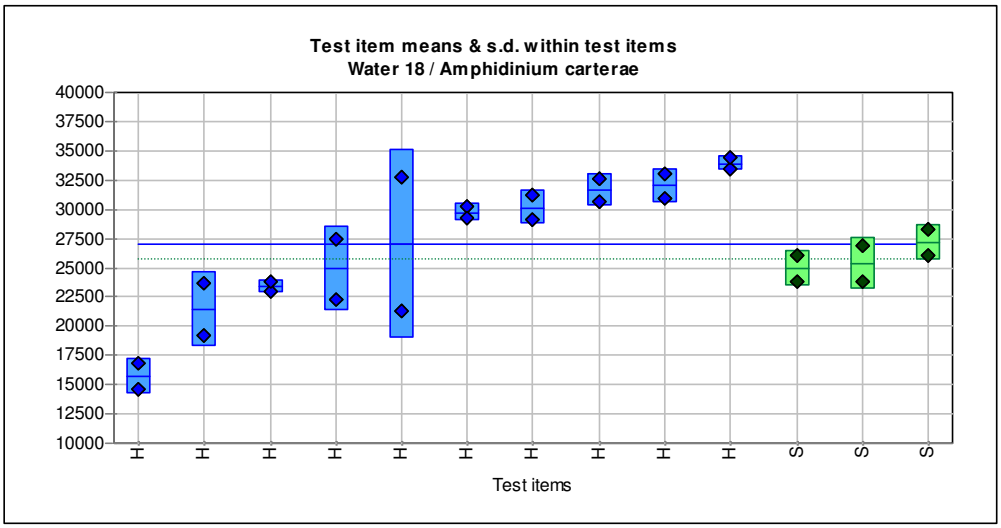
Mean of homogeneity:	26990
Mean of stability:	25800
Uncertainty of mean for homogeneity measurement:	1789
Uncertainty of mean for stability measurement:	733
Standard deviation for proficiency assessment:	7779 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Amphidinium carterae has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 26990, the mean value across all proficiency test items of the stability analysis equals 25800.
Therefore, the mean value of the stability analysis lies 4.4 % below 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.
Therefore, given the standard deviation for proficiency assessment of 7779, the proficiency test items may be considered as adequately stable.

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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Chaetoceros**

Mean:	3674
Analytical standard deviation:	672
Heterogeneity standard deviation s(samples):	695
Standard deviation for proficiency assessment:	1355 (Manual)

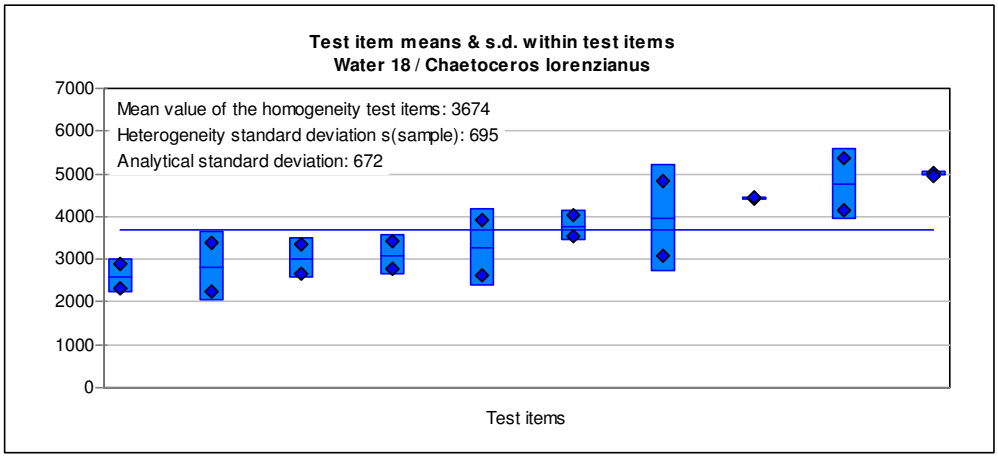
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Chaetoceros lorenzianus was analyzed 2 times. The mean across all 10 proficiency test items is 3674. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 672 , and the standard deviation between proficiency test items s(sample) is 695 .

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) between 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 (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.



ANNEX VII: *Chaetoceros lorenzianus* stability test

IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Chaetoceros**

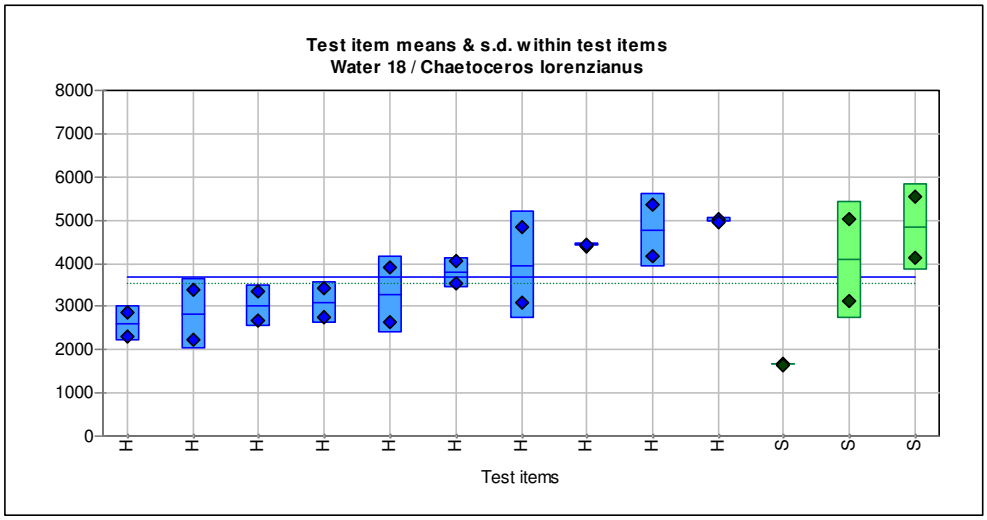
Mean of homogeneity:	3674
Mean of stability:	3527
Uncertainty of mean for homogeneity measurement:	266
Uncertainty of mean for stability measurement:	959
Standard deviation for proficiency assessment:	1355 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Chaetoceros lorenzianus has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 3674, the mean value across all proficiency test items of the stability analysis equals 3527.
Therefore, the mean value of the stability analysis lies 4.0 % 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.
Therefore, given the standard deviation for proficiency assessment of 1355, 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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Dactyliossen**

Mean:	27452
Analytical standard deviation:	4144
Heterogeneity standard deviation s(samples):	3187
Standard deviation for proficiency assessment:	7955 (Manual)

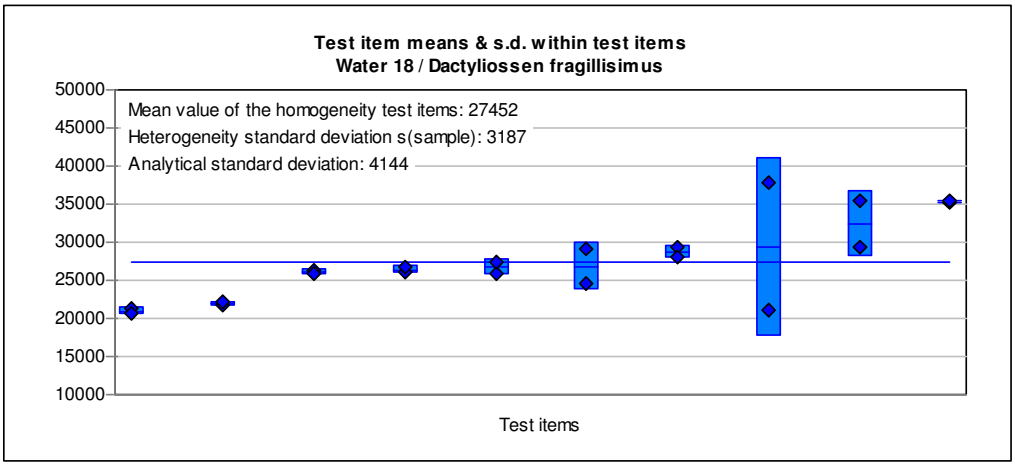
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Dactyliossen fragillisimus was analyzed 2 times. The mean across all 10 proficiency test items is 27452. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 4144 , and the standard deviation between proficiency test items s(sample) is 3187 .

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) between 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 7955 (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.



ANNEX VII: *Dactyliosolen fragillisimus* stability test

IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Dactyliossen**

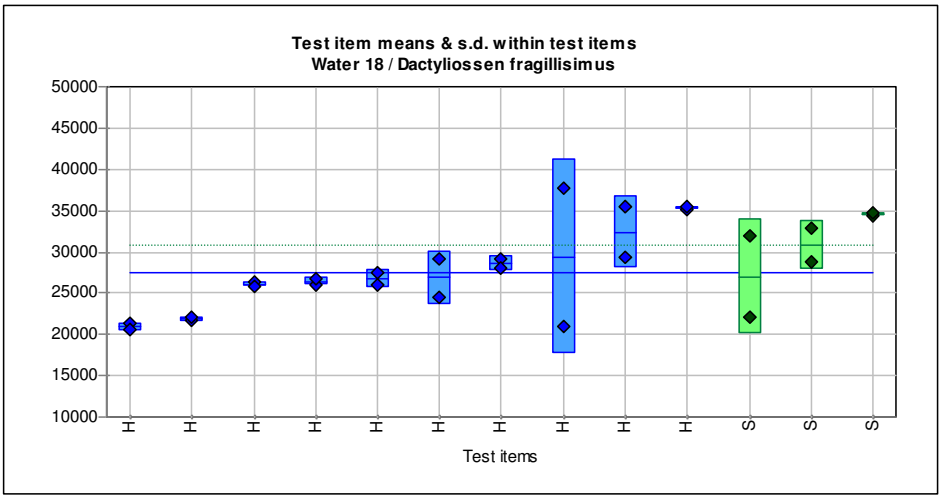
Mean of homogeneity:	27452
Mean of stability:	30800
Uncertainty of mean for homogeneity measurement:	1369
Uncertainty of mean for stability measurement:	2183
Standard deviation for proficiency assessment:	7955 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Dactyliossen fragillisimus has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 27452, the mean value across all proficiency test items of the stability analysis equals 30800.
Therefore, the mean value of the stability analysis lies 12.2 % 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 7955, 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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Gymnodinium**

Mean:	1816
Analytical standard deviation:	308
Heterogeneity standard deviation s(samples):	608
Standard deviation for proficiency assessment:	780 (Manual)

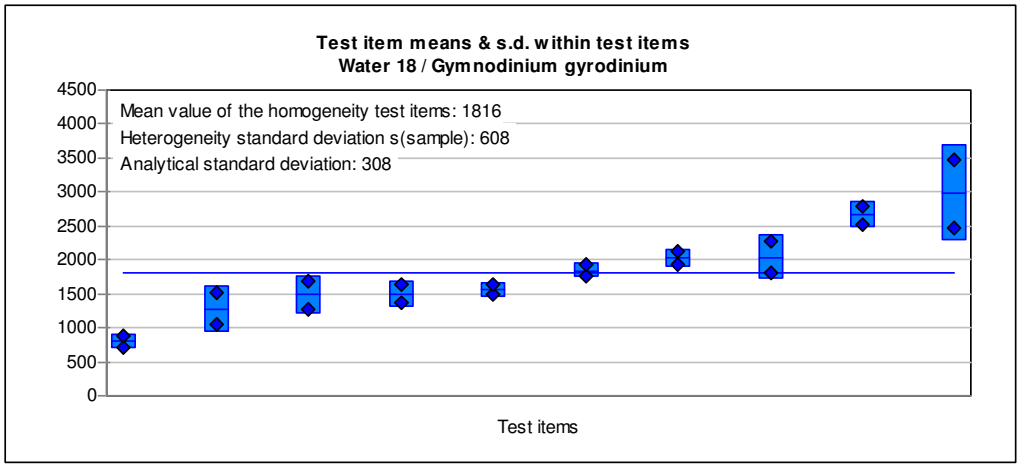
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Gymnodinium gyrodinium was analyzed 2 times. The mean across all 10 proficiency test items is 1816. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 308 , and the standard deviation between proficiency test items s(sample) is 608 .

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) between 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 780 (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 780 (Manual). The heterogeneity standard deviation s(sample) equals 608 and is significantly too high.



IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Gymnodinium**

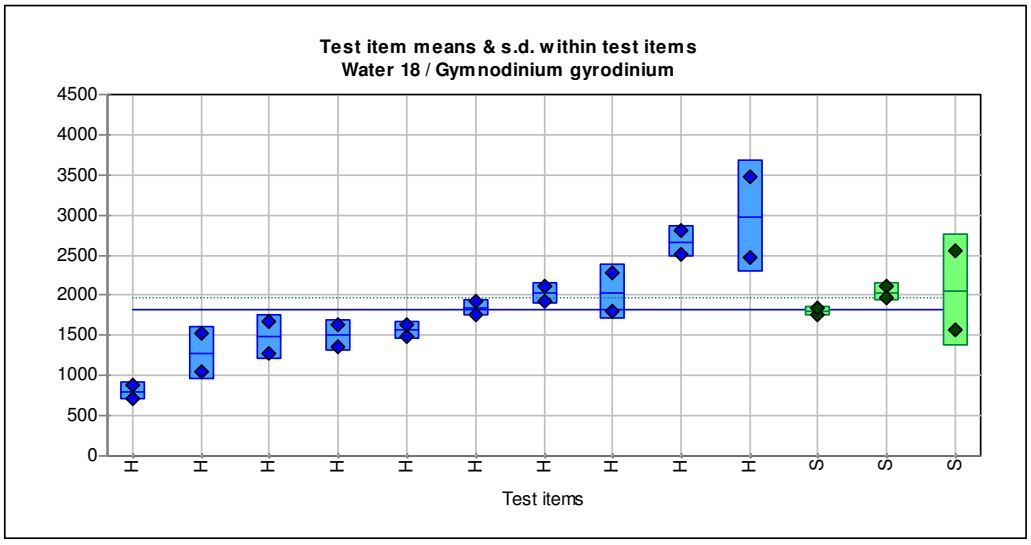
Mean of homogeneity:	1816
Mean of stability:	1967
Uncertainty of mean for homogeneity measurement:	204
Uncertainty of mean for stability measurement:	169
Standard deviation for proficiency assessment:	780 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Gymnodinium gyrodinium has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 1816, the mean value across all proficiency test items of the stability analysis equals 1967.
Therefore, the mean value of the stability analysis lies 8.3 % 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.
Therefore, given the standard deviation for proficiency assessment of 780, the proficiency test items may be considered as adequately stable.

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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Heterocapsa**

Mean:	22922
Analytical standard deviation:	956
Heterogeneity standard deviation s(samples):	3452
Standard deviation for proficiency assessment:	6718 (Manual)

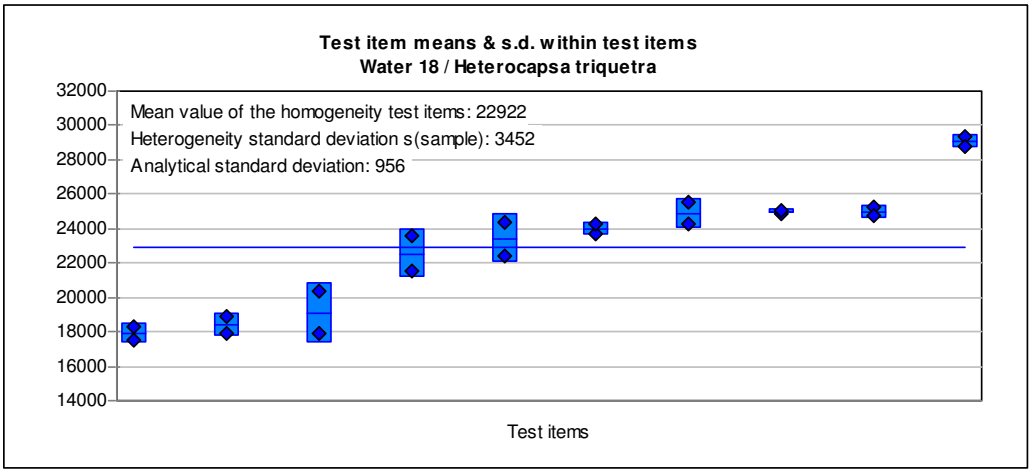
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Heterocapsa triquetra was analyzed 2 times. The mean across all 10 proficiency test items is 22922. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 956 , and the standard deviation between proficiency test items s(sample) is 3452 .

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) between 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 6718 (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 6718 (Manual). The heterogeneity standard deviation s(sample) equals 3452 and is significantly too high.



IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Heterocapsa**

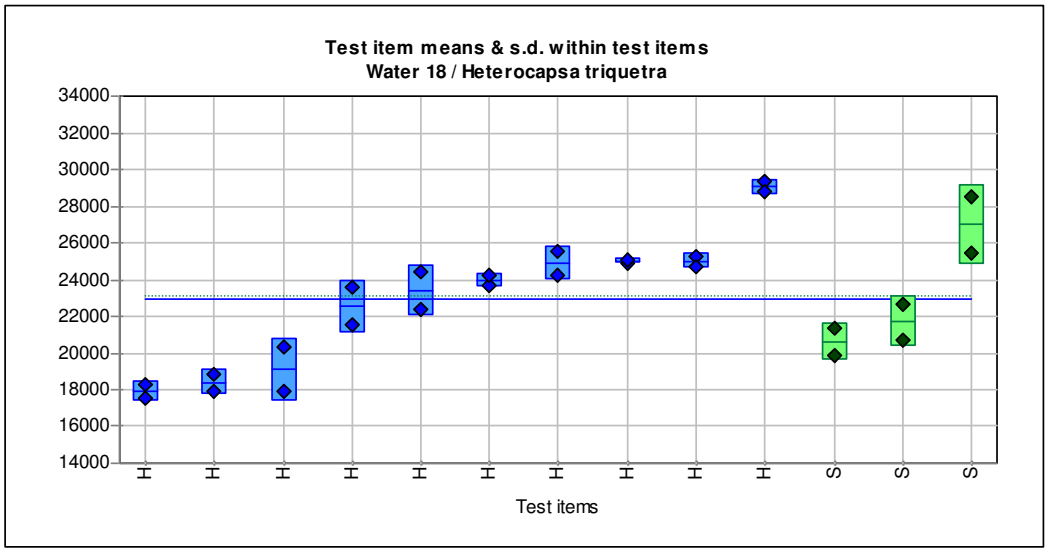
Mean of homogeneity:	22922
Mean of stability:	23093
Uncertainty of mean for homogeneity measurement:	1112
Uncertainty of mean for stability measurement:	1969
Standard deviation for proficiency assessment:	6718 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Heterocapsa triquetra has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 22922, the mean value across all proficiency test items of the stability analysis equals 23093.
Therefore, the mean value of the stability analysis lies 0.7 % 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.
Therefore, given the standard deviation for proficiency assessment of 6718, the proficiency test items may be considered as adequately stable.

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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Karenia**

Mean:	11576
Analytical standard deviation:	1154
Heterogeneity standard deviation s(samples):	2413
Standard deviation for proficiency assessment:	3009 (Manual)

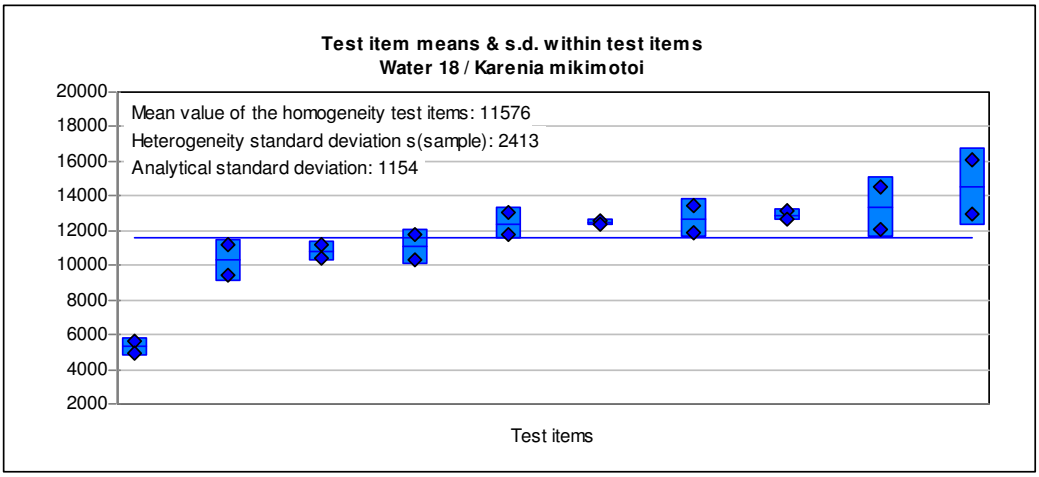
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Karenia mikimotoi was analyzed 2 times. The mean across all 10 proficiency test items is 11576. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 1154 , and the standard deviation between proficiency test items s(sample) is 2413 .

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) between 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 3009 (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 3009 (Manual). The heterogeneity standard deviation s(sample) equals 2413 and is significantly too high.



IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Karenia**

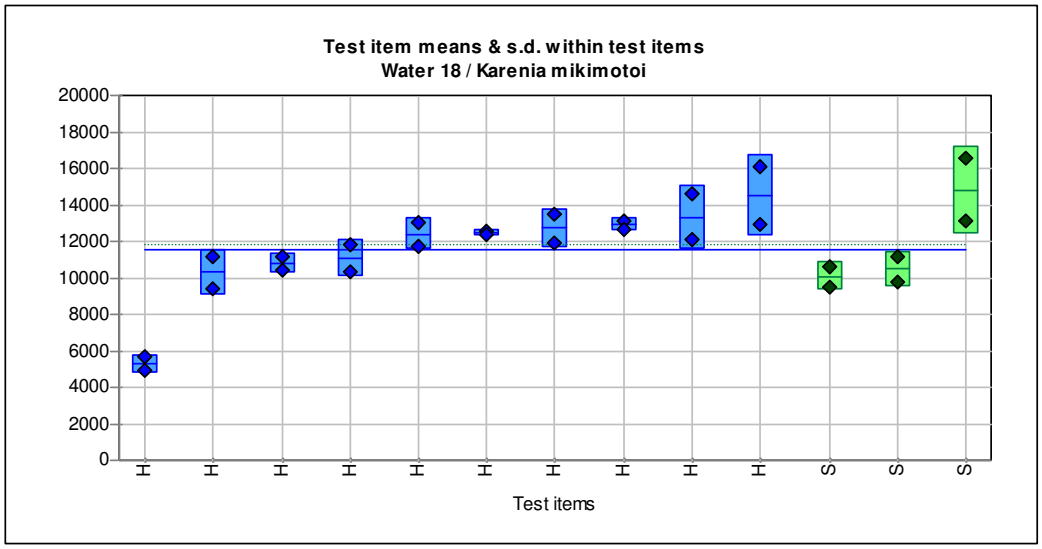
Mean of homogeneity:	11576
Mean of stability:	11787
Uncertainty of mean for homogeneity measurement:	805
Uncertainty of mean for stability measurement:	1511
Standard deviation for proficiency assessment:	3009 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Karenia mikimotoi has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 11576, the mean value across all proficiency test items of the stability analysis equals 11787.
Therefore, the mean value of the stability analysis lies 1.8 % 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.
Therefore, given the standard deviation for proficiency assessment of 3009, the proficiency test items may be considered as adequately stable.

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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Melosira**

Mean:	2930
Analytical standard deviation:	1512
Heterogeneity standard deviation s(samples):	885
Standard deviation for proficiency assessment:	1128 (Manual)

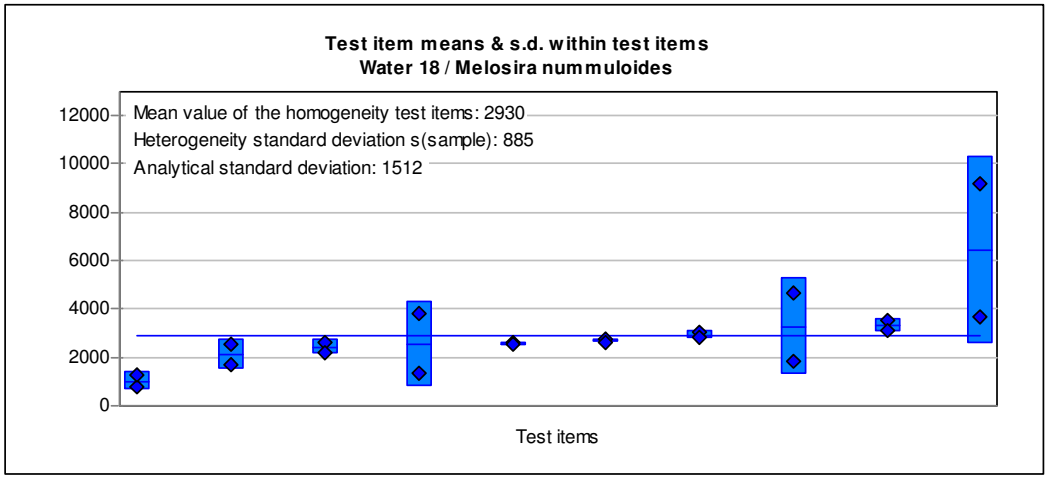
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Melosira nummuloides was analyzed 2 times. The mean across all 10 proficiency test items is 2930. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 1512 , and the standard deviation between proficiency test items s(sample) is 885 .

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) between 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 1128 (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.



IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Melosira**

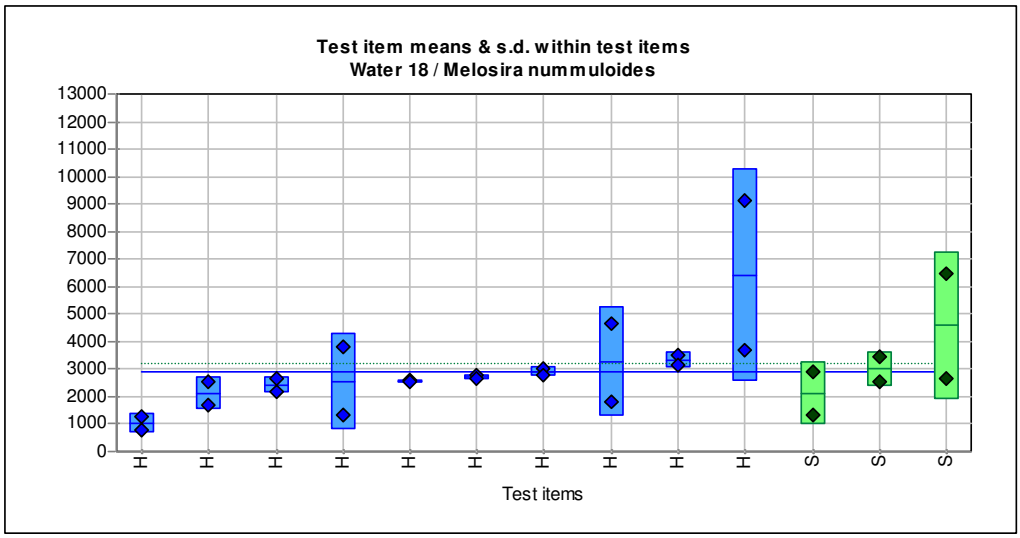
Mean of homogeneity:	2930
Mean of stability:	3233
Uncertainty of mean for homogeneity measurement:	439
Uncertainty of mean for stability measurement:	720
Standard deviation for proficiency assessment:	1128 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Melosira nummuloides has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 2930, the mean value across all proficiency test items of the stability analysis equals 3233.
Therefore, the mean value of the stability analysis lies 10.4 % 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 1128, 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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Pseudo-**

Mean:	3918
Analytical standard deviation:	882
Heterogeneity standard deviation s(samples):	516
Standard deviation for proficiency assessment:	1174 (Manual)

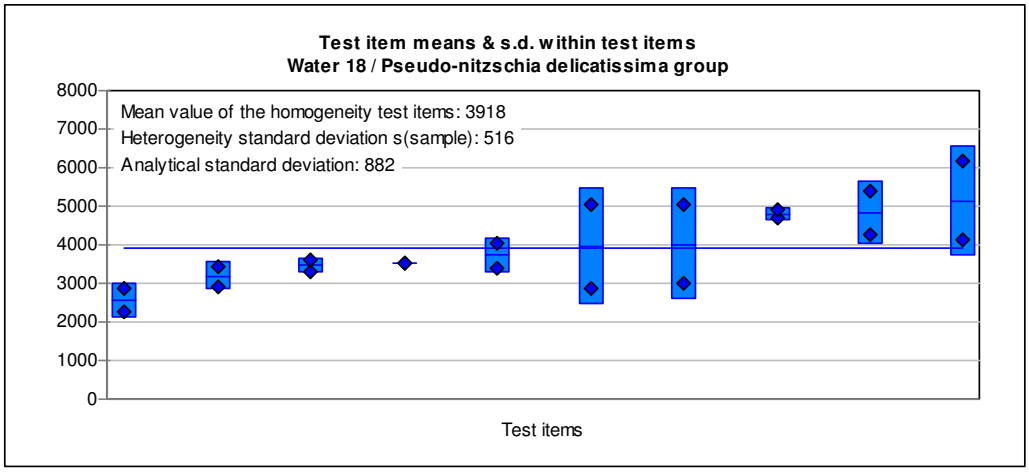
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Pseudo-nitzschia delicatissima group was analyzed 2 times. The mean across all 10 proficiency test items is 3918. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 882 , and the standard deviation between proficiency test items s(sample) is 516 .

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) between 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 1174 (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.



IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Pseudo-**

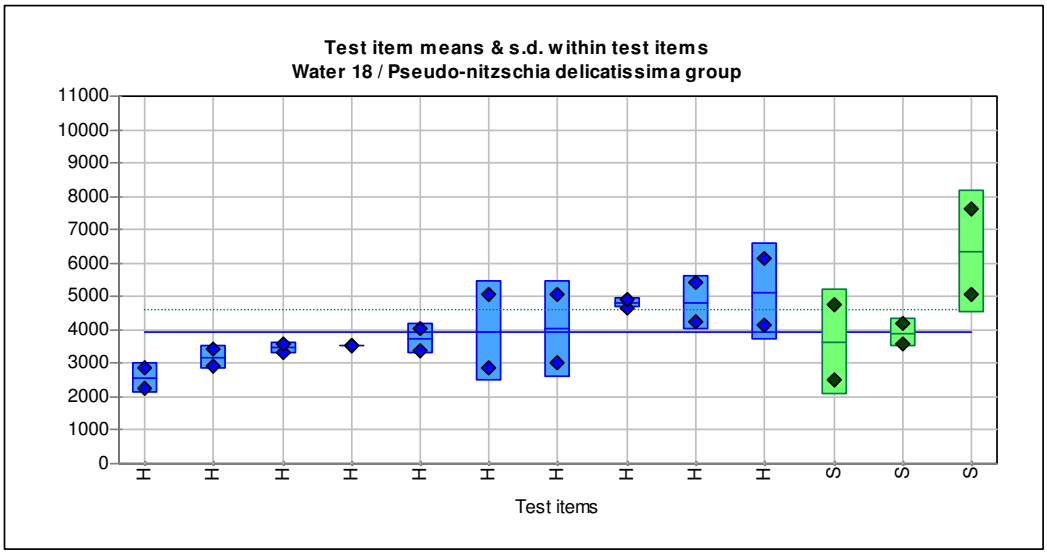
Mean of homogeneity:	3918
Mean of stability:	4627
Uncertainty of mean for homogeneity measurement:	256
Uncertainty of mean for stability measurement:	860
Standard deviation for proficiency assessment:	1174 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Pseudo-nitzschia delicatissima group has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 3918, the mean value across all proficiency test items of the stability analysis equals 4627.
Therefore, the mean value of the stability analysis lies 18.1 % 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 1174, 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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Prorocentrum**

Mean:	3022
Analytical standard deviation:	244
Heterogeneity standard deviation s(samples):	525
Standard deviation for proficiency assessment:	1022 (Manual)

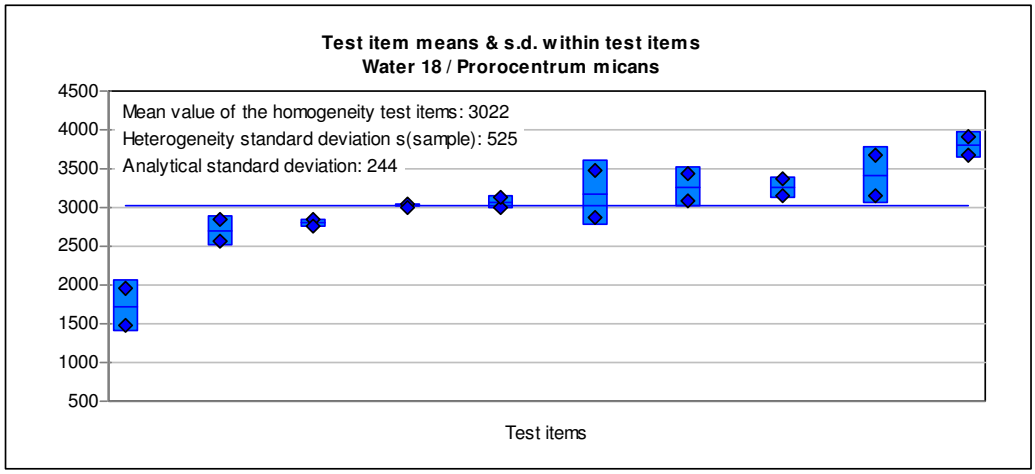
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Prorocentrum micans was analyzed 2 times. The mean across all 10 proficiency test items is 3022. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 244 , and the standard deviation between proficiency test items s(sample) is 525 .

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) between 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 1022 (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 1022 (Manual). The heterogeneity standard deviation s(sample) equals 525 and is significantly too high.



IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Prorocentrum**

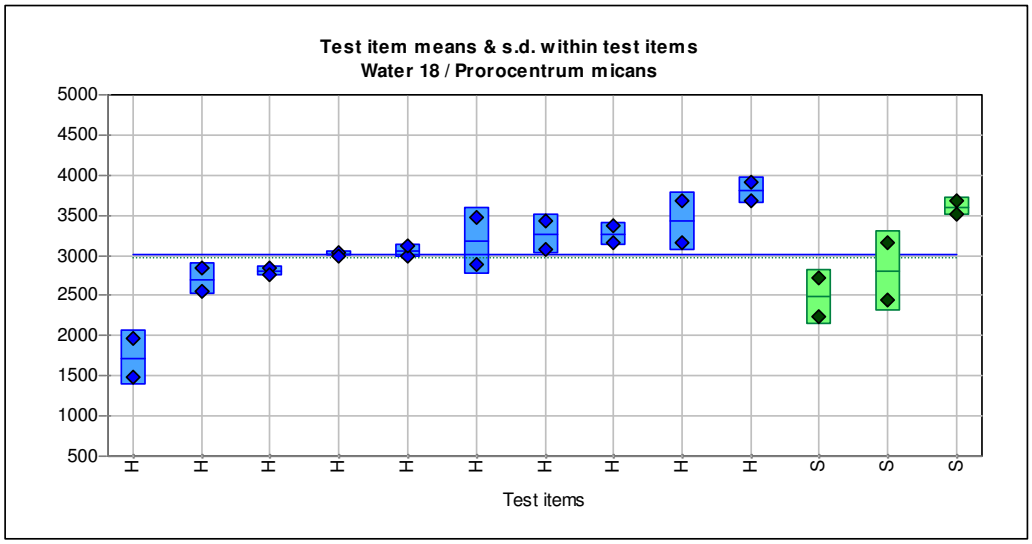
Mean of homogeneity:	3022
Mean of stability:	2960
Uncertainty of mean for homogeneity measurement:	175
Uncertainty of mean for stability measurement:	333
Standard deviation for proficiency assessment:	1022 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Prorocentrum micans has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 3022, the mean value across all proficiency test items of the stability analysis equals 2960.
Therefore, the mean value of the stability analysis lies 2.1 % below 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.
Therefore, given the standard deviation for proficiency assessment of 1022, the proficiency test items may be considered as adequately stable.

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.



IPI2018

Survey of homogeneity test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Thalassiosira**

Mean:	5712
Analytical standard deviation:	977
Heterogeneity standard deviation s(samples):	919
Standard deviation for proficiency assessment:	1250 (Manual)

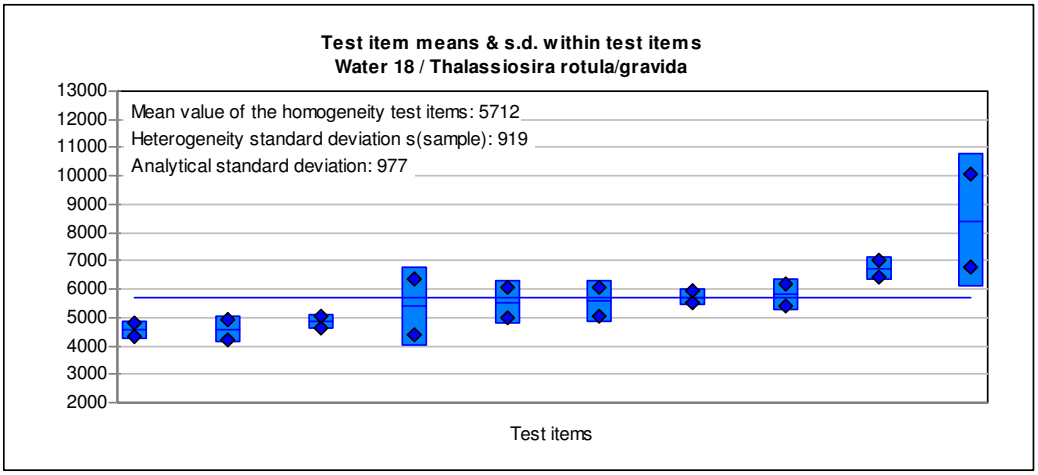
Results of homogeneity analysis (with statistical background)

For the homogeneity test, 10 of the prepared proficiency test items of sample Water 18 were randomly selected, and the measurand Thalassiosira rotula/gravida was analyzed 2 times. The mean across all 10 proficiency test items is 5712. The standard deviation within proficiency test items s(analytical) (=analytical precision) is 977 , and the standard deviation between proficiency test items s(sample) is 919 .

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) between 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 1250 (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.



IPI2018

Survey of stability test results

Sample: **Water 18** Date: 21/01/2019
Measurand: **Thalassiosira**

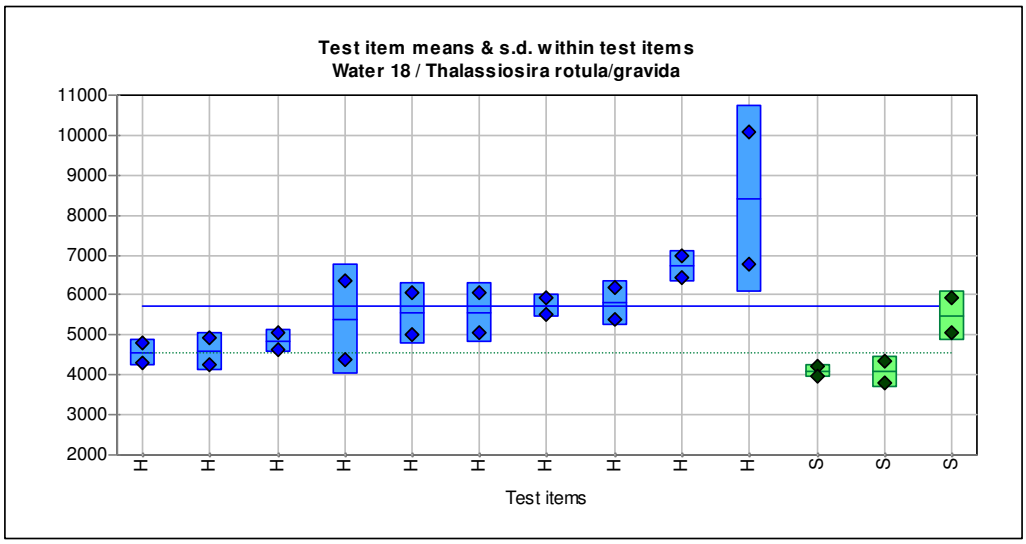
Mean of homogeneity:	5712
Mean of stability:	4547
Uncertainty of mean for homogeneity measurement:	363
Uncertainty of mean for stability measurement:	467
Standard deviation for proficiency assessment:	1250 (Manual)

Results of Stability Test

For the test for stability, 3 of the proficiency test items of sample Water 18 have been selected randomly and the measurand Thalassiosira rotula/gravida has been analyzed 2 times.
The mean value across all proficiency test items of the homogeneity analysis equals 5712, the mean value across all proficiency test items of the stability analysis equals 4547.
Therefore, the mean value of the stability analysis lies 20.4 % below 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 1250, 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 %).
There is a statistically significant difference between the mean values. Therefore the proficiency test items cannot be considered stable according to the t test.



ANNEX VIII: Analysts results 1-55 *Heterocapsa triquetra* + *Prorocentrum micans*

Analyst Code	Heterocapsa triquetra (cells/L)			Average	ID	Analyst Code	Prorocentrum micans (cells/L)			Average	ID
1	13300	11400	7600	10767		1	2100	1200	600	1300	
2	21633	8469	7653	12585		2	5510	816	1633	2653	
3	18720	21520	14280	18173		3	1760	2400	1760	1973	
4	14880	15600	16760	15747		4	1760	1760	1920	1813	
5	13000	13600	15200	13933		5	1960	1960	2840	2253	
6	22088	22523	25001	23204		6	2870	2131	2913	2638	
7	13660	12640	15080	13793		7	820	1040	1380	1080	
8	20800	24240	15880	20307		8	2880	3520	2160	2853	
9	22400	19240	17560	19733		9	2800	2280	1960	2347	
10	12247	12802	11655	12235		10	740	888	1750	1126	
11	12640	12800	12040	12493	sp.	11	2320	2680	2640	2547	
12	17720	9680	10400	12600		12	2520	840	1600	1653	
13	7840	7520	10240	8533		13	1040	840	1360	1080	
15	27000	25760	29240	27333	sp.	15	3040	3000	4400	3480	
16	10440	6960	8840	8747		16	1280	760	1080	1040	
17	9269	10692	2615	7526		17	1308	1692	615	1205	
18	14400	13880	16946	15075		18	2280	1840	1840	1987	
19	17400	22080	21240	20240	sp.	19	2480	1880	2320	2227	
20	18840	18120	14680	17213	sp.	20	2680	2280	1680	2213	
21	6120	11016	6426	7854		21	1520	1040	1400	1320	
22	15840	13680	16360	15293		22	1520	1520	1840	1627	
23	13040	18040	10360	13813	sp.	23	1800	1720	3400	2307	
24	10160	8240	8280	8893		24	800	520	320	547	
25	20200	18320	20680	19733	Scrippsiella sp.	25	2320	1560	2280	2053	P. mex
27	14120	14360	17840	15440		27	1280	1240	2560	1693	
28	25730	23678	21942	23783		28	2380	3260	2900	2847	
29	18760	23280	21760	21267		29	2540	2480	3040	2687	
30	13720	8320	7200	9747		30	1720	1160	840	1240	
31	10400	12560	13840	12267		31	720	1440	2080	1413	
32	15080	20440	24400	19973	sp.	32	1240	1880	3600	2240	
33	19400	14640	24880	19640		33	3880	1680	2440	2667	
34	9420	14800	14040	12753	sp.	34	960	1320	2220	1500	
35	9920	11120	3680	8240		35	2080	2200	2320	2200	
36	5600	4840	6120	5520		36	2360	2120	2040	2173	
37	13992	16091	21688	17257	sp.	37	2099	1399	2099	1866	
38	9520	9240	13080	10613		38	1440	1360	1520	1440	
39	15040	16440	16240	15907		39	1640	1640	1640	1640	
40	21140	23840	19480	21487		40	2500	2800	2400	2567	
41	13360	12240	15720	13773		41	1400	1080	1080	1187	
43	18720	19880	17840	18813		43	2280	2480	2560	2440	
44	11040	15200	17480	14573		44	640	1720	1640	1333	
45	9814	8862	19623	12766		45	1375	818	1933	1375	
46	1040	1320	1400	1253	sp.	46	400	280	360	347	
47	23840	23480	24600	23973		47	2920	2440	3480	2947	
48	19548	12217	3840	11868		48	1500	1269	808	1192	
49	17700	16400	21900	18667		49	1000	1700	2500	1733	
50	14400	12800	16280	14493		50	1720	2160	2120	2000	
51	27160	12640	19800	19867		51	3160	520	1600	1760	
52	16830	8874	14382	13362		52	1320	760	1480	1187	
53	19000	14000	15000	16000		53	1800	1200	2100	1700	
54	10880	14400	14720	13333		54	1560	2440	1960	1987	
55	29760	26440	21600	25933		55	2920	3960	3400	3427	

ANNEX VIII: Analysts results 56-99 *Heterocapsa triquetra* + *Prorocentrum micans*

Analyst Code	Heterocapsa triquetra (cells/L)			Average	ID	Analyst Code	Prorocentrum micans (cells/L)			Average	ID
56	16840	15320	20320	17493		56	1720	1800	3160	2227	
57	11960	11160	15160	12760		57	1540	940	1940	1473	
58	20450	22800	30700	24650		58	1900	3500	4550	3317	
59	27360	27510	28200	27690		59	2910	3360	3210	3160	
60	23880	24120	25800	24600		60	3800	2320	2560	2893	
61	10500	18000	8200	12233		61	1300	1000	600	967	
62	12520	15280	15320	14373		62	2600	2680	2520	2600	
63	11600	15960	17840	15133		63	1920	1960	4080	2653	
64	11960	11240	15120	12773		64	2200	1560	2560	2107	
65	13593	17790	15511	15631		65	2037	4345	1889	2757	
66	260	1800	2000	1353	Aza/Hetero	66	60	800	500	453	
67	15920	15520	14760	15400		67	1960	2440	1360	1920	
68	14040	3720	16120	11293		68	1720	840	2720	1760	
69	16125	11625	12125	13292		69	1125	1375	500	1000	
70	15400	18800	16400	16867		70	2800	3520	5120	3813	
71	14040	15880	15120	15013		71	2560	1920	1840	2107	
72	16080	20880	21200	19387		72	3600	5400	2240	3747	
73	21280	21520	22080	21627		73	3440	2480	3440	3120	
74	10920	10440	13040	11467		74	1640	1120	1720	1493	
75	23640	22600	22840	23027		75	4080	3560	3600	3747	
76	12400	13640	17200	14413	Aza/Hetero	76	2120	2320	3160	2533	
77	15120	11160	9520	11933		77	1600	800	1120	1173	
78	10160	12640	14760	12520		78	800	1560	1320	1227	
79	19584	24208	24208	22667		79	2440	2520	2320	2427	
80	13135	16650	14874	14886		80	999	2479	1443	1640	
81	19040	17880	19200	18707		81	2040	2560	2640	2413	
82	9040	10560	8400	9333		82	720	1320	1120	1053	
83	17240	18320	18360	17973	sp.	83	2360	2560	2480	2467	
84	17640	18720	16520	17627		84	2400	2440	2400	2413	
85	6160	8536	8624	7773		85	880	1496	1232	1203	
86	15400	22040	21360	19600		86	1540	3700	2840	2693	
87	17160	15240	18440	16947		87	1600	2320	2280	2067	
88	24392	25349	24740	24827		88	2304	2783	2870	2652	
89	27305	26131	25479	26305		89	3739	3696	3044	3493	
90	20480	22160	20800	21147		90	3840	3800	3720	3787	
91	18447	18560	21760	19589		91	2262	2240	2640	2381	
92	21840	20840	32320	25000		92	4560	4440	7600	5533	
93	26000	31200	25700	27633		93	3500	8200	2700	4800	
94	6080	3120	3480	4227		94	720	680	520	640	
95	13560	5840	15240	11547		95	1200	560	1800	1187	
96	23560	25280	23680	24173		96	3000	3080	2560	2880	
97	15400	19880	17720	17667		97	1800	1600	1720	1707	
98	20400	20560	18680	19880		98	3000	2640	2880	2840	
99	not id	not id	not id	not id		99	800	1100	1500	1133	

ANNEX VIII: Analysts results 1-55 *Amphidinium carterae* + *Karenia mikimotoi*

Analyst Code	Amphidinium carteare (cells/L)			Average	ID	Analyst Code	Karenia mikimotoi (cells/L)			Average	ID
1	6800	12500	4200	7833		1	2300	5300	600	2733	
2	5306	3163	3265	3911		2	5204	2245	1939	3129	
3	10520	14080	7760	10787	sp.	3	7080	6920	3800	5933	
4	7960	8120	8040	8040		4	2280	2120	2440	2280	
5	9320	9760	9680	9587		5	2840	1120	1880	1947	
6	21392	27871	26349	25204		6	4348	7566	6739	6218	
7	9620	8420	8560	8867		7	2340	2420	3460	2740	selliformis
8	13360	13280	4960	10533		8	5760	3760	1720	3747	
9	7800	7520	6640	7320		9	2240	1920	1800	1987	
10	9102	9472	7525	8700	sp.	10	1850	2035	1925	1937	K.digitata
11	9320	7160	8600	8360		11	3560	2600	2760	2973	
12	12920	4280	4240	7147		12	3240	1360	2080	2227	
13	4480	2080	6400	4320		13	480	400	1040	640	
15	28200	26440	29720	28120		15	6200	6920	7440	6853	
16	4240	4160	5640	4680		16	1160	1000	1160	1107	
17	3808	4154	654	2872		17	1231	1462	731	1141	
18	11560	10880	10534	10991		18	3680	5400	6641	5240	
19	6440	7520	6640	6867	sp.	19	1960	1360	3120	2147	
20	6960	3520	3880	4787	sp.	20	3200	2040	1080	2107	
21	2754	4590	2142	3162		21	760	1040	680	827	
22	9160	7520	8320	8333		22	1880	3720	2120	2573	
23	3360	3680	4200	3747	sp.	23	1920	840	2040	1600	
24	12040	8800	7200	9347		24	2560	1240	880	1560	
25	18600	8520	19960	15693		25	Not id.	Not id.	Not id.	Not id.	Not id
27	13480	11200	15960	13547		27	Not id.	Not id.	Not id.	Not id.	Not id
28	22099	26204	28098	25467		28	1380	1540	1040	1320	
29	16800	25140	19440	20460		29	2100	6200	2980	3760	
30	11320	4200	5120	6880		30	1360	600	680	880	
31	4280	5240	7440	5653		31	1200	1640	920	1253	selliformis
32	3800	5560	18920	9427	sp.	32	1000	1360	3680	2013	
33	18120	7520	10680	12107		33	7200	5600	4800	5867	
34	5940	8700	10760	8467	H.akashiwo	34	1000	1720	2960	1893	
35	4550	1320	3680	3183	sp.	35	1480	1000	680	1053	
36	8800	9400	7960	8720		36	5040	4080	4400	4507	
37	700	700	2099	1166		37	2798	2099	2798	2565	
38	5880	5440	3840	5053		38	1680	2200	680	1520	
39	5440	5280	7640	6120		39	1760	1760	2720	2080	
40	17140	18280	14040	16487		40	6260	5200	3520	4993	selliformis
41	12000	8640	13200	11280		41	Not id.	Not id.	Not id.	Not id.	Not id
43	14160	15960	12800	14307		43	Not id.	Not id.	Not id.	Not id.	Not id
44	8080	13160	16480	12573		44	2360	3480	4600	3480	
45	18287	5697	9706	11230		45	3309	818	4387	2838	
46	80	120	120	107		46	240	200	200	213	K.digitata
47	28000	26160	29400	27853		47	6440	13400	7560	9133	
48	15708	16057	1396	11054		48	4887	4887	698	3491	
49	3100	5000	7800	5300		49	800	1700	1600	1367	
50	18000	4400	15800	12733		50	1600	3600	4520	3240	selliformis
51	33760	7640	15840	19080		51	7600	1560	3160	4107	
52	9792	7650	13158	10200		52	2280	840	3160	2093	
53	2700	1500	3300	2500		53	780	1200	960	980	selliformis
54	9360	5120	5760	6747		54	Not id.	Not id.	Not id.	Not id.	Not id
55	34720	28880	22480	28693		55	6280	6520	5000	5933	

ANNEX VIII: Analysts results 56-99 *Amphidinium carterae* + *Karenia mikimotoi*

Analyst Code	Amphidinium carteare (cells/L)			Average	ID	Analyst Code	Karenia mikimotoi (cells/L)			Average	ID
56	7720	6160	18960	10947		56	3080	2880	5240	3733	
57	13280	8960	14160	12133		57	2460	1980	2600	2347	
58	11850	10350	15850	12683		58	4650	3300	6000	4650	
59	14700	9480	18420	14200		59	6600	3960	7200	5920	
60	31200	22600	30200	28000		60	6760	5240	8480	6827	
61	15500	15600	2600	11233		61	1500	1900	1200	1533	
62	3080	9480	6280	6280		62	2520	4840	2600	3320	selliformis
63	4920	6160	8720	6600		63	1960	2960	3000	2640	
64	7800	5040	7920	6920		64	2320	2760	2960	2680	
65	5111	8502	9779	7797		65	1333	4682	5407	3807	
66	0	200	0	67	sp.	66	20	200	0	73	selliformis
67	7400	7960	9640	8333		67	2240	3080	1160	2160	
68	5040	1440	7720	4733	sp.	68	5240	1400	5960	4200	selliformis
69	14625	10000	8000	10875		69	1750	875	1750	1458	
70	13680	16400	21600	17227		70	8880	4320	4560	5920	
71	7400	13000	9800	10067		71	2480	2320	2280	2360	
72	17000	17120	20000	18040		72	4080	9600	3760	5813	
73	25440	24560	27440	25813		73	8240	6720	5440	6800	
74	5920	5440	4120	5160		74	2240	1320	1600	1720	
75	18120	19960	19760	19280		75	1040	720	1240	1000	
76	5640	4800	7640	6027		76	3800	5040	4760	4533	selliformis
77	16240	8840	6720	10600		77	3360	1360	1640	2120	
78	4640	5520	4720	4960		78	1240	1560	1480	1427	selliformis
79	17952	19312	7344	14869		79	4720	3840	1640	3400	
80	11803	11877	6475	10052		80	2775	5106	2220	3367	K.digitata
81	18560	9720	14440	14240		81	9320	6560	5520	7133	
82	3600	3800	2160	3187		82	880	1520	1200	1200	
83	5960	8520	6520	7000	sp.	83	1560	1760	1600	1640	
84	7320	6280	6800	6800		84	2600	2320	2360	2427	
85	2024	2024	1936	1995		85	1408	1496	1584	1496	
86	10100	11840	17740	13227		86	3960	5420	7280	5553	
87	7720	6040	7400	7053		87	2360	1400	1720	1827	
88	27914	28045	25914	27291		88	8261	8000	9174	8479	
89	35741	25262	23392	28132		89	9957	6087	5435	7160	
90	26800	26480	25240	26173		90	6240	6720	5440	6133	
91	8658	9000	8726	8795		91	2652	2400	3120	2724	selliformis
92	9960	13000	17840	13600		92	4960	7240	17480	9893	
93	15300	29900	22900	22700	sp.	93	5300	11800	7000	8033	Gymno sp.
94	2160	440	880	1160		94	720	160	400	427	
95	not id.	not id.	not id.	not id.	not id	95	1880	560	3440	1960	
96	23720	30240	22960	25640		96	11160	12600	13160	12307	
97	2120	4960	5400	4160		97	600	1120	1800	1173	
98	20160	17520	17000	18227		98	3360	6000	4720	4693	selliformis
99	not id	not id	not id	not id		99	Not id.	Not id.	Not id.	Not id.	

ANNEX VIII: Analysts results 1-55 *Gymno/Gyro* sp. + *Dactyliosolen fragilissimus*

Analyst Code	Gymnodinium/Gyrodinium sp. (cells/L)			Average	ID
1	not id.	not id.	not id.	not id.	not identified
2	7245	714	510	2823	A.sanguinea
3	1680	1520	520	1240	A.sanguinea
4	1520	800	1520	1280	Gym/Gyr sp.
5	1040	1240	1680	1320	Gym/Gyr sp.
6	1609	1478	2044	1710	A.sanguinea
7	680	800	800	760	A.sanguinea
8	1520	1920	920	1453	A.sanguinea
9	1320	1520	960	1267	Gyrodinium sp.
10	not id.	not id.	not id.	not id.	not identified
11	1000	1000	960	987	A.sanguinea
12	920	440	1200	853	Gymnodinium sp.
13	560	480	1400	813	Gym/Gyr sp.
15	1840	1760	2040	1880	A.sanguinea
16	400	160	920	493	Gymnodinium sp.
17	1308	808	500	872	A.sanguinea
18	800	520	720	680	Gym/Gyr sp.
19	1400	1040	1560	1333	Gyrodinium sp.
20	1120	960	1200	1093	Gyrodinium sp.
21	840	720	680	747	Gym/Gyr sp.
22	200	120	520	280	Gymnodinium sp.
23	880	1000	1280	1053	Gyrodinium sp.
24	360	320	720	467	Gym/Gyr sp.
25	960	800	1520	1093	A.sanguinea
27	3360	3920	4840	4040	Gyrodinium instriatum
28	5998	11050	3946	6998	Gymnodinium sp.
29	960	1300	1340	1200	A.sanguinea
30	880	840	360	693	Gym/Gyr sp.
31	920	960	1200	1027	Gym/Gyr sp.
32	800	1320	1920	1347	Gyrodinium sp.
33	1600	1160	1440	1400	Gyrodinium instriatum
34	300	660	1400	787	A.sanguinea
35	650	0	440	363	Gym/Gyr sp.
36	1200	1520	1680	1467	A.sanguinea
37	700	700	1399	933	A.sanguinea
38	1040	760	920	907	Gymnodinium sp.
39	640	680	1360	893	Gym/Gyr sp.
40	800	1160	920	960	Gyrodinium instriatum
41	2840	1880	4360	3027	Gyrodinium instriatum
43	3560	3840	4840	4080	Gyrodinium instriatum
44	840	680	720	747	Gyrodinium instriatum
45	1115	149	446	570	A.sanguinea
46	not id.	not id.	not id.	not id.	not identified
47	1760	2040	2160	1987	Gym/Gyr sp.
48	349.1	461.5	192.3	334	A.sanguinea
49	1400	1400	1700	1500	Gymnodinium sp.
50	1200	1000	1440	1213	Gym/Gyr sp.
51	1920	360	680	987	Gym/Gyr sp.
52	640	200	1320	720	Gym/Gyr sp.
53	780	960	960	900	Gymnodinium sp.
54	6440	6120	4840	5800	Gymnodinium sp.
55	1920	2160	1120	1733	Gymnodinium sp.

Analyst Code	Dactyliosolen fragilissimus (cells/L)			Average	ID
1	17000	18400	14500	16633	
2	29898	18776	15612	21429	
3	23680	25440	19320	22813	D. confervacea
4	19480	21480	20920	20627	
5	27760	33960	32040	31253	
6	30827	41349	41089	37755	sp.
7	21680	25440	19960	22360	
8	14040	26400	16520	18987	
9	19440	14080	16600	16707	sp.
10	13801	18278	20475	17518	
11	9760	8640	8560	8987	sp.
12	17680	17280	17360	17440	
13	26560	12720	17600	18960	R. delicatula
15	30360	28320	32600	30427	
16	17960	16120	26960	20347	sp.
17	18654	19923	13192	17256	
18	11800	7360	9160	9440	G.delicatula
19	23200	21840	16640	20560	sp.
20	21040	18720	20680	20147	sp.
21	37944	23868	27234	29682	G.delicatula
22	17880	10480	17560	15307	
23	15640	15160	18120	16307	sp.
24	19520	25400	22240	22387	
25	32520	33720	36000	34080	C. pelagica
27	27480	19360	29840	25560	
28	41673	26519	31886	33360	
29	23400	32200	25760	27120	
30	22440	18040	14040	18173	
31	14520	23120	13760	17133	
32	20360	18840	23240	20813	sp.
33	22760	19360	15040	19053	
34	21040	21180	23060	21760	
35	5040	6320	10960	7440	R. delicatula
36	10400	11400	13480	11760	G.delicatula
37	16790	16091	16091	16324	sp.
38	18240	18160	19880	18760	
39	11200	15880	19040	15373	
40	23260	23200	25640	24033	
41	29440	25000	19360	24600	
43	27920	27680	24920	26840	
44	23120	20040	11200	18120	
45	15056	22999	23843	20632	
46	80	320	240	213	G.delicatula
47	23440	28520	25200	25720	
48	18500	31416	4887	18268	
49	15200	17800	13400	15467	
50	1800	7480	16240	8507	
51	27320	19680	24880	23960	
52	29682	27540	29376	28866	G.delicatula
53	21000	12000	17000	16667	
54	24880	17440	19120	20480	
55	36160	23200	16360	25240	sp.

ANNEX VIII: Analysts results 56-99 *Gymno/Gyro* sp. + *Dactyliosolen fragilissimus*

Analyst Code	Gymnodinium/Gyrodinium sp. (cells/L)			Average	ID	Analyst Code	Dactyliosolen fragilissimus (cells/L)			Average	ID
56	1480	560	1480	1173	Gyrodinium instriatum	56	31320	20120	30680	27373	
57	500	620	980	700	A.sanguinea	57	20320	17740	18180	18747	
58	900	950	2000	1283	Gym/Gyr sp.	58	25800	19150	22300	22417	
59	1320	1800	1680	1600	Gyrodinium instriatum	59	31410	27750	26820	28660	
60	2600	1640	2040	2093	Gym/Gyr sp.	60	41240	19640	25200	28693	
61	1400	1800	600	1267	Gym/Gyr sp.	61	33800	34600	26600	31667	
62	960	1640	1760	1453	Gym/Gyr sp.	62	18720	25480	19040	21080	
63	1120	1400	1120	1213	A.sanguinea	63	18760	21280	25160	21733	
64	560	920	1360	947	A.sanguinea	64	17480	23680	20800	20653	
65	1704	8764	1148	3872	A.sanguinea	65	19333	11124	16407	15621	
66	not id.	not id.	not id.	not id.	not identified	66	0	0	100	33	
67	1280	1120	1280	1227	Gyrodinium instriatum	67	27840	25400	23320	25520	
68	760	280	1600	880	A.sanguinea	68	14600	3760	20440	12933	sp.
69	1875	1125	1000	1333	A.sanguinea	69	22500	24125	26750	24458	G.delicatula
70	1680	1840	1680	1733	A.sanguinea	70	4400	4480	4800	4560	G.delicatula
71	1200	1240	1080	1173	Gym/Gyr sp.	71	22280	25920	23360	23853	
72	1360	1040	1440	1280	A.sanguinea	72	3600	3720	4160	3827	G.delicatula
73	800	960	1440	1067	A.sanguinea	73	21360	26000	25840	24400	
74	560	1440	1560	1187	A.sanguinea	74	19600	13280	12560	15147	
75	7160	9240	9320	8573	Gymnodinium sp.	75	26960	26520	27200	26893	
76	2080	640	1080	1267	A.sanguinea	76	8320	4320	6120	6253	
77	920	480	480	627	Gyrodinium instriatum	77	30240	28360	22600	27067	
78	840	1000	600	813	Gym/Gyr sp.	78	21760	14680	17680	18040	
79	1160	1400	1400	1320	Gym/Gyr sp.	79	28016	30192	31824	30011	G.delicatula
80	not id.	not id.	not id.	not id.	not identified	80	19832	23014	25308	22718	
81	1120	840	1200	1053	A.sanguinea	81	18560	22280	18720	19853	D. confervacea
82	240	360	800	467	Gym/Gyr sp.	82	8560	8200	10640	9133	
83	1360	1360	1440	1387	Gyrodinium sp.	83	21800	22720	16800	20440	sp.
84	1280	1240	1400	1307	Gym/Gyr sp.	84	19200	20800	18480	19493	
85	440	176	176	264	A.sanguinea	85	13288	15224	10384	12965	
86	1060	1260	1200	1173	Gyrodinium instriatum	86	14840	21920	27780	21513	
87	720	400	680	600	A.sanguinea	87	21800	19360	17640	19600	
88	1435	1783	1826	1681	A.sanguinea	88	38002	42697	37001	39233	sp.
89	2739	1957	1696	2131	A.sanguinea	89	42654	33262	39697	38538	sp.
90	1600	1440	1560	1533	A.sanguinea	90	27360	26360	26880	26867	sp.
91	1092	1440	1440	1324	Gym/Gyr sp.	91	26949	23160	19880	23330	
92	not id.	not id.	not id.	not id.	not identified	92	17560	21040	25000	21200	Detonula sp.
93	1900	12200	1500	5200	Gyrodinium instriatum	93	31200	31300	26800	29767	
94	480	440	320	413	Gyrodinium instriatum	94	4960	1280	960	2400	
95	1080	480	1160	907	A.sanguinea	95	4800	1560	4080	3480	
96	1040	1480	1760	1427	A.sanguinea	96	26080	26320	35480	29293	
97	600	1120	1040	920	A.sanguinea	97	8751	7520	16680	10984	sp.
98	960	920	1400	1093	A.sanguinea	98	9320	16640	19120	15027	
99	500	200	400	367	A.sanguinea	99	1000	900	1200	1033	G.delicatula

ANNEX VIII: Analysts results 1-55 *Thalassiosira rotula/gravida.* + *Chaetoceros lorenzianus*

Analyst Code	Thalassiosira rotula/gravida (cells/L)			Average	ID
1	9500	27900	10600	16000	sp.
2	1735	5000	3878	3538	sp.
3	3880	4640	3800	4107	sp.
4	3840	4400	4320	4187	
5	4880	5360	5720	5320	
6	5565	5261	5305	5377	sp.
7	5200	5180	3540	4640	T.angulata
8	5200	6080	4920	5400	
9	5080	5560	4280	4973	sp.
10	4033	4033	4305	4124	sp.
11	3440	4000	3360	3600	sp.
12	4600	4400	5200	4733	sp.
13	4080	4240	3520	3947	
15	6040	6520	6560	6373	
16	5000	3880	5600	4827	sp.
17	3077	5038	3269	3795	
18	5400	4680	3910	4663	
19	4880	4120	5760	4920	sp.
20	4440	5360	4760	4853	sp.
21	2560	2360	3360	2760	sp.
22	5880	3600	4000	4493	sp.
23	5040	4560	4280	4627	sp.
24	4280	3960	4720	4320	
25	5720	5160	5720	5533	sp.
27	5680	4160	4520	4787	
28	6472	4893	5683	5683	sp.
29	5160	5860	5120	5380	sp.
30	4280	4280	4640	4400	sp.
31	4400	5200	4480	4693	
32	3760	5320	5080	4720	sp.
33	5000	5680	4400	5027	
34	4040	4320	4180	4180	
35	5080	4400	3200	4227	
36	4600	3920	4000	4173	T.ang-lin
37	4897	4198	3499	4198	sp.
38	4840	4760	4920	4840	sp.
39	4840	4880	6080	5267	
40	5260	6440	6920	6207	
41	4880	3720	4200	4267	
43	4800	4520	5200	4840	
44	4600	4360	4080	4347	sp.
45	4312	4796	4312	4473	
46	200	120	360	227	sp.
47	5120	5200	5480	5267	sp.
48	3846	4692	2038	3526	
49	4900	4100	5100	4700	sp.
50	3600	4040	3360	3667	
51	5640	5040	4760	5147	sp.
52	4160	3240	4080	3827	
53	6200	5000	4100	5100	
54	4720	5480	5200	5133	
55	5880	5520	3320	4907	sp.

Analyst Code	Chaetoceros lorenzianus (cells/L)			Average	ID
1	2300	1000	1100	1467	Hyalochates
2	3061	2041	1939	2347	
3	2120	3000	2200	2440	Hyalochates
4	2000	2120	2160	2093	Hyalochates
5	2560	3120	3120	2933	Hyalochates
6	3565	4826	4174	4189	Hyalochates
7	2600	2120	2640	2453	
8	4280	3600	3280	3720	
9	3040	2760	2520	2773	Hyalochates
10	2553	3256	2625	2811	Hyalochates
11	1520	1320	1400	1413	C.decipiens
12	3600	2680	3480	3253	C.diadema
13	640	1040	1840	1173	Hyalochates
15	3200	3320	4400	3640	
16	3000	2000	2200	2400	Hyalochates
17	1423	1308	692	1141	Hyalochates
18	2600	2280	960	1947	Hyalochates
19	1840	2040	1560	1813	Hyalochates
20	2240	2680	2360	2427	Hyalochates
21	1040	1080	600	907	Hyalochates
22	3120	3400	3240	3253	C.decipiens
23	1800	3160	3160	2707	Hyalochates
24	2560	1640	1400	1867	C.decipiens
25	3800	2040	4520	3453	C.decipiens
27	2880	3040	2360	2760	C.decipiens
28	6314	4104	4104	4841	
29	3460	4040	4560	4020	
30	2880	1280	1760	1973	C.decipiens
31	1440	1800	2480	1907	Hyalochates
32	1360	2040	1960	1787	Hyalochates
33	2800	1680	1000	1827	C.decipiens
34	1660	1460	1340	1487	Hyalochates
35	280	280	360	307	Hyalochates
36	2520	2080	3120	2573	
37	1399	2099	1399	1632	C.brevis
38	3320	2920	3320	3187	Hyalochates
39	1920	1840	1400	1720	C.decipiens
40	2420	3800	4120	3447	
41	2680	3040	3040	2920	C.decipiens
43	2640	3200	2360	2733	C.decipiens
44	2240	2920	2840	2667	Hyalochates
45	2751	2532	4220	3168	
46	not id.	not id.	not id.	not id.	not identified
47	3880	3480	3600	3653	Hyalochates
48	2038	1885	1231	1718	Hyalochates
49	2600	3000	2800	2800	Hyalochates
50	800	1080	1520	1133	Hyalochates
51	4280	3160	2800	3413	
52	1200	1560	2200	1653	Hyalochates
53	not id.	not id.	not id.	not id.	
54	2440	2160	2960	2520	C.decipiens
55	3880	4920	3880	4227	Hyalochates

ANNEX VIII: Analysts results 56-99 *Thalassiosira rotula/gravida.* + *Chaetoceros lorenzianus*

Analyst Code	Thalassiosira rotula/gravida (cells/L)			Average	ID	Analyst Code	Chaetoceros lorenzianus (cells/L)			Average	ID
56	5400	5480	4920	5267		56	3560	3680	4040	3760	Hyalochates
57	2820	3440	4260	3507		57	1640	1160	1520	1440	Hyalochates
58	5150	5450	5550	5383	sp.	58	3400	3350	4950	3900	
59	5640	5760	6030	5810	sp.	59	6000	5190	5100	5430	Hyalochates
60	5800	5000	4560	5120	sp.	60	4640	3600	3480	3907	Hyalochates
61	6400	5500	5800	5900		61	2700	4900	2600	3400	Hyalochates
62	5240	5040	5760	5347		62	1520	2040	920	1493	Hyalochates
63	4240	8070	5840	6050		63	2600	2400	3440	2813	Hyalochates
64	4320	5120	5480	4973	sp.	64	2600	2800	3800	3067	Hyalochates
65	3444	3071	4704	3740		65	2741	3258	2481	2827	Hyalochates
66	60	200	0	87	T.ang-lin	66	not id.	not id.	not id.	not id.	not identified
67	4880	4800	5520	5067		67	1720	2040	2520	2093	C.decipiens
68	2040	680	6040	2920	sp.	68	800	360	1360	840	Hyalochates
69	5625	6875	5625	6042		69	4125	3000	2750	3292	C.diadema
70	3080	3920	1520	2840	sp.	70	2400	3000	3320	2907	Phaeoceros
71	5240	6080	4400	5240	sp.	71	2040	3160	3600	2933	C.decipiens
72	2880	2080	4200	3053	sp.	72	3400	3600	3200	3400	Phaeoceros
73	4960	4160	4800	4640	sp.	73	2320	3600	3120	3013	
74	4480	4880	4760	4707		74	2680	1600	2920	2400	
75	4560	4200	5920	4893		75	2680	4160	4080	3640	C.decipiens
76	3280	3080	4160	3507	sp.	76	1040	1120	1200	1120	Hyalochates
77	3880	4440	3080	3800	sp.	77	2880	3360	2600	2947	Hyalochates
78	4280	5160	3840	4427		78	2720	2040	2480	2413	Hyalochates
79	3120	3440	3480	3347		79	1400	1800	1400	1533	Hyalochates
80	3885	5106	4403	4465	sp.	80	2775	3367	3663	3268	C.decipiens
81	4840	4400	4240	4493		81	2280	1640	2280	2067	Hyalochates
82	3320	4000	4800	4040	sp.	82	1920	2200	2680	2267	Hyalochates
83	5120	4720	4880	4907	sp.	83	1840	1960	2120	1973	Hyalochates
84	4680	5120	4520	4773	sp.	84	2120	2200	2440	2253	Hyalochates
85	4840	3608	3080	3843		85	968	1584	880	1144	
86	2260	3840	4520	3540		86	1580	1540	1740	1620	
87	3880	3720	3480	3693	T.ang-lin	87	680	840	1080	867	Phaeoceros
88	4826	5044	5826	5232	sp.	88	3957	5261	4348	4522	Hyalochates
89	5696	4565	4565	4942	sp.	89	3783	4565	4348	4232	Hyalochates
90	4920	4440	5400	4920	sp.	90	3200	3000	3160	3120	Phaeoceros
91	5304	4240	3680	4408	sp.	91	2652	1520	2280	2151	Hyalochates
92	7000	5560	11040	7867	sp.	92	4080	3600	10480	6053	Hyalochates
93	5400	5600	5000	5333	sp.	93	4400	4700	6700	5267	C.decipiens
94	3320	1360	2320	2333		94	680	240	480	467	C.decipiens
95	4240	5600	5280	5040	sp.	95	1760	960	2280	1667	Hyalochates
96	6360	6080	4800	5747	sp.	96	4840	5360	3520	4573	Hyalochates
97	3880	4640	5800	4773	sp.	97	840	1560	1080	1160	Phaeoceros
98	4280	6840	5600	5573		98	4320	4720	4440	4493	C.decipiens
99	2600	2100	2600	2433	sp.	99	300	500	200	333	

ANNEX VIII: Analysts results 1-55 *P.delicatissima* group + *Melosira nummuloides*

Analyst Code	Pseudo-nitzschia delicatissima complex (cells/L)			Average	ID
1	900	2000	200	1033	
2	3571	2959	3061	3197	
3	1120	3040	1560	1907	
4	2120	2280	1920	2107	
5	4000	3680	3680	3787	
6	4696	3957	5261	4638	
7	2440	3060	2480	2660	
8	840	2960	720	1507	
9	2840	3080	2480	2800	
10	1591	2997	1820	2136	P.delicatissima
11	320	400	240	320	P.seriata complex
12	3200	1160	2320	2227	
13	Not id.	Not id.	Not id.	Not id.	Not identified
15	2840	4320	3600	3587	
16	760	1600	1520	1293	
17	2538	1962	1000	1833	
18	1640	2000	1840	1827	
19	2360	3680	2560	2867	
20	3640	2120	1880	2547	
21	1080	880	1080	1013	
22	2360	1400	2040	1933	
23	2280	1800	2280	2120	
24	3280	3720	1440	2813	
25	3080	2880	3600	3187	P.australis
27	3080	2160	2880	2707	P.delicatissima
28	4262	3157	2999	3473	
29	2360	4820	3480	3553	
30	1520	1160	1040	1240	
31	2360	2640	2120	2373	
32	2880	2360	4080	3107	
33	2120	920	2360	1800	
34	1320	1680	2060	1687	
35	Not id.	Not id.	Not id.	Not id.	Not identified
36	Not id.	Not id.	Not id.	Not id.	Not identified
37	1399	1399	2099	1632	
38	960	880	1040	960	
39	1920	2880	2960	2587	
40	2520	3200	3280	3000	
41	3400	2480	2960	2947	P.delicatissima
43	3200	3120	2880	3067	P.delicatissima
44	3200	2320	1800	2440	P.seriata complex
45	1970	2532	1688	2063	
46	Not id.	Not id.	Not id.	Not id.	Not identified
47	3880	4040	4560	4160	
48	3142	3142	349	2211	
49	1600	2100	1500	1733	
50	2240	3200	3040	2827	
51	5160	3360	3200	3907	
52	920	1200	1320	1147	
53	4300	2300	2500	3033	
54	2160	1800	1560	1840	
55	3080	4320	2640	3347	

Analyst Code	Melosira nummuloides (cells/L)			Average	ID
1	2500	1900	1300	1900	M.moniliformis
2	3367	1837	2653	2619	
3	800	4760	1840	2467	sp.
4	1280	1680	2560	1840	
5	2920	2440	680	2013	
6	3565	2348	2261	2725	sp.
7	1940	800	2200	1647	
8	1320	1600	1800	1573	
9	2320	2640	2200	2387	sp.
10	777	1110	3465	1784	
11	2520	3040	2680	2747	
12	2960	1240	2040	2080	sp.
13	2320	880	3920	2373	
15	2760	3280	3160	3067	
16	1880	1920	1600	1800	sp.
17	2577	1269	1846	1897	
18	2160	1920	1840	1973	
19	1760	3440	1960	2387	sp.
20	3200	2640	2920	2920	sp.
21	1560	800	1400	1253	
22	1480	1600	1960	1680	
23	3640	1800	3640	3027	sp.
24	880	600	1120	867	
25	2160	2520	1720	2133	
27	2000	2360	2840	2400	
28	1960	1960	1960	1960	
29	1980	2400	2120	2167	
30	1280	1000	400	893	
31	560	2840	1360	1587	
32	1120	3320	2360	2267	sp.
33	3120	1000	640	1587	
34	1080	1140	820	1013	
35	2120	3320	1160	2200	sp.
36	2680	3280	2520	2827	
37	2798	4198	1399	2798	sp.
38	640	3400	2880	2307	sp.
39	1320	1960	2520	1933	
40	2620	2760	2720	2700	
41	880	2040	2000	1640	
43	2000	2840	2280	2373	
44	880	2200	2000	1693	sp.
45	781	1561	1970	1437	
46	400	400	560	453	sp.
47	2720	2920	3520	3053	
48	1615	923	577	1038	
49	900	4400	1600	2300	
50	2400	2600	2280	2427	
51	3800	2320	2040	2720	
52	1080	1160	2400	1547	
53	2300	2100	1200	1867	
54	1200	2320	1680	1733	
55	2920	1960	3000	2627	sp.

ANNEX VIII: Analysts results *56*-99 *P.delicatissima* group + *Melosira nummuloides*

Analyst Code	Pseudo-nitzschia delicatissima complex (cells/L)			Average	ID
56	3480	3520	3440	3480	
57	2240	2080	2140	2153	
58	3150	3500	3400	3350	
59	4860	4020	3690	4190	
60	5000	3960	3800	4253	
61	3700	3700	2800	3400	
62	1960	2680	1960	2200	
63	840	1800	2480	1707	
64	1760	2320	1960	2013	
65	2074	1910	2222	2069	
66	0	200	0	67	P.delicatissima
67	2720	3440	2240	2800	
68	480	480	1960	973	
69	3125	3000	2500	2875	
70	600	600	720	640	P.delicatissima
71	2760	2720	2880	2787	
72	Not id.	Not id.	Not id.	Not id.	Not identified
73	3360	3520	2080	2987	
74	800	1400	1480	1227	
75	2560	2440	2280	2427	
76	1600	960	840	1133	
77	1800	2920	2080	2267	
78	2440	3160	2760	2787	
79	1360	1120	1000	1160	
80	2664	3478	2442	2861	
81	3560	1720	2880	2720	
82	440	1120	520	693	
83	2080	2880	3040	2667	
84	2120	2320	2240	2227	
85	176	792	352	440	
86	1580	3080	2780	2480	
87	1640	240	1240	1040	P.seriata complex
88	5565	6479	6087	6044	
89	5957	4826	4913	5232	
90	4120	4280	4000	4133	P.seriata complex
91	2736	2052	2233	2340	
92	1400	2880	3720	2667	
93	4400	6700	3600	4900	
94	160	160	120	147	
95	760	440	680	627	
96	3400	4680	3320	3800	seriata complex
97	Not id.	Not id.	Not id.	Not id.	
98	2840	2360	2720	2640	
99	Not id.	Not id.	Not id.	Not id.	

Analyst Code	Melosira nummuloides (cells/L)			Average	ID
56	1480	2480	1560	1840	
57	2940	1260	1320	1840	
58	1800	4200	1800	2600	
59	1920	2670	2880	2490	
60	2840	2240	5480	3520	
61	200	1400	1500	1033	
62	4160	2600	1680	2813	
63	2240	1840	2560	2213	
64	1800	1440	1400	1547	Corethron criophylum
65	1926	2509	1519	1985	
66	not id.	not id.	not id.	not id.	not identified
67	2160	2920	800	1960	
68	1000	1400	3520	1973	sp.
69	3500	1375	3125	2667	
70	3600	2760	3200	3187	
71	2160	2160	840	1720	
72	3400	3000	2800	3067	
73	2560	3040	3120	2907	
74	2040	1640	3200	2293	
75	2760	2040	2080	2293	
76	1840	3160	3640	2880	
77	1560	2200	600	1453	
78	3200	3680	1640	2840	
79	2320	2640	1880	2280	
80	1258	1369	1628	1418	
81	3160	2760	2680	2867	
82	960	1200	1400	1187	
83	2520	2480	2360	2453	sp.
84	2640	1680	2160	2160	M.moniliformis
85	2552	1320	2992	2288	
86	940	1360	2140	1480	
87	3080	3240	1680	2667	
88	4131	3478	3913	3841	sp.
89	3304	1826	2696	2609	sp.
90	3440	3520	3320	3427	
91	1716	2640	1080	1812	
92	3240	2120	9080	4813	Melosira varians
93	2200	5300	4800	4100	
94	640	360	800	600	
95	1720	520	2240	1493	sp.
96	2640	3520	1320	2493	
97	2240	2960	1960	2387	
98	3480	3440	3760	3560	
99	1500	900	1200	1200	

Annex IX: Robust mean and Standard deviation calculation according to algorithm A annex C ISO13528 *H.triquetra* iteration

Homogeneity and stability test IPI2018									
Heterocapsa triquetra	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	23680	24240	23960	560	313600	
		20/08/2018	water3	23560	21520	22540	2040	4161600	
		20/08/2018	water3	25280	24720	25000	560	313600	
		20/08/2018	water3	24880	25080	24980	200	40000	
		20/08/2018	water3	29320	28760	29040	560	313600	
		20/08/2018	water3	18320	17520	17920	800	640000	
		20/08/2018	water3	24240	25520	24880	1280	1638400	
		20/08/2018	water3	24400	22400	23400	2000	4000000	
		20/08/2018	water3	17920	18880	18400	960	921600	
		20/08/2018	water3	20320	17880	19100	2440	5953600	
					Average:	22922	Sum	18296000	
					SD	3517	P=	10	
				SD within samples:		956			
				SD between samples:		3452			
		Date	Sample number	Test portion 1	Test portion 2	sample average	test portion range	*2	
		03/10/2017	water3	25440	28520	26980	3080	9486400	
	CELLS / L	03/10/2017	water3	22680	20720	21700	1960	3841600	
		03/10/2017	water3	21320	19880	20600	1440	2073600	
					Average:	23093	Sum	15401600	
					SD	3411	P=	3	
				SD within samples:		1602			
				SD between samples:		3217			
	homogeneity criteria			3452	1055				
	stability check criteria			22922	23093	171	0		

Analysts results for *H.triquetra*

Analyst Code	Average	x-x*	it1	it2	it3	it4	it5
46	1253	14147	6828	7331	7416	7430	7433
66	1353	14047	6828	7331	7416	7430	7433
94	4227	11173	6828	7331	7416	7430	7433
36	5520	9880	6828	7331	7416	7430	7433
17	7526	7874	7526	7526	7526	7526	7526
85	7773	7627	7773	7773	7773	7773	7773
21	7854	7546	7854	7854	7854	7854	7854
35	8240	7160	8240	8240	8240	8240	8240
13	8533	6867	8533	8533	8533	8533	8533
16	8747	6653	8747	8747	8747	8747	8747
24	8893	6507	8893	8893	8893	8893	8893
82	9333	6067	9333	9333	9333	9333	9333
30	9747	5653	9747	9747	9747	9747	9747
38	10613	4787	10613	10613	10613	10613	10613
1	10767	4633	10767	10767	10767	10767	10767
68	11293	4107	11293	11293	11293	11293	11293
74	11467	3933	11467	11467	11467	11467	11467
95	11547	3853	11547	11547	11547	11547	11547
48	11868	3532	11868	11868	11868	11868	11868
77	11933	3467	11933	11933	11933	11933	11933
61	12233	3167	12233	12233	12233	12233	12233
10	12235	3165	12235	12235	12235	12235	12235
31	12267	3133	12267	12267	12267	12267	12267
11	12493	2907	12493	12493	12493	12493	12493
78	12520	2880	12520	12520	12520	12520	12520
2	12585	2815	12585	12585	12585	12585	12585
12	12600	2800	12600	12600	12600	12600	12600
34	12753	2647	12753	12753	12753	12753	12753
57	12760	2640	12760	12760	12760	12760	12760
45	12766	2634	12766	12766	12766	12766	12766
64	12773	2627	12773	12773	12773	12773	12773
69	13292	2108	13292	13292	13292	13292	13292
54	13333	2067	13333	13333	13333	13333	13333
52	13362	2038	13362	13362	13362	13362	13362
41	13773	1627	13773	13773	13773	13773	13773
7	13793	1607	13793	13793	13793	13793	13793
23	13813	1587	13813	13813	13813	13813	13813
5	13933	1467	13933	13933	13933	13933	13933
62	14373	1027	14373	14373	14373	14373	14373
76	14413	987	14413	14413	14413	14413	14413
50	14493	907	14493	14493	14493	14493	14493
44	14573	827	14573	14573	14573	14573	14573
80	14886	514	14886	14886	14886	14886	14886
71	15013	387	15013	15013	15013	15013	15013
18	15075	325	15075	15075	15075	15075	15075
63	15133	267	15133	15133	15133	15133	15133
22	15293	107	15293	15293	15293	15293	15293
67	15400	0	15400	15400	15400	15400	15400
27	15440	40	15440	15440	15440	15440	15440
65	15631	231	15631	15631	15631	15631	15631
4	15747	347	15747	15747	15747	15747	15747
39	15907	507	15907	15907	15907	15907	15907
53	16000	600	16000	16000	16000	16000	16000
70	16867	1467	16867	16867	16867	16867	16867
87	16947	1547	16947	16947	16947	16947	16947
20	17213	1813	17213	17213	17213	17213	17213
37	17257	1857	17257	17257	17257	17257	17257
56	17493	2093	17493	17493	17493	17493	17493

Analysts results for *H.triquetra*

84	17627	2227	17627	17627	17627	17627	17627
97	17667	2267	17667	17667	17667	17667	17667
83	17973	2573	17973	17973	17973	17973	17973
3	18173	2773	18173	18173	18173	18173	18173
49	18667	3267	18667	18667	18667	18667	18667
81	18707	3307	18707	18707	18707	18707	18707
43	18813	3413	18813	18813	18813	18813	18813
72	19387	3987	19387	19387	19387	19387	19387
91	19589	4189	19589	19589	19589	19589	19589
86	19600	4200	19600	19600	19600	19600	19600
33	19640	4240	19640	19640	19640	19640	19640
9	19733	4333	19733	19733	19733	19733	19733
25	19733	4333	19733	19733	19733	19733	19733
51	19867	4467	19867	19867	19867	19867	19867
98	19880	4480	19880	19880	19880	19880	19880
32	19973	4573	19973	19973	19973	19973	19973
19	20240	4840	20240	20240	20240	20240	20240
8	20307	4907	20307	20307	20307	20307	20307
90	21147	5747	21147	21147	21147	21147	21147
29	21267	5867	21267	21267	21267	21267	21267
40	21487	6087	21487	21487	21487	21487	21487
73	21627	6227	22667	22667	22667	22667	22667
79	22667	7267	23027	23027	23027	23027	23027
75	23027	7627	23204	23204	23204	23204	23204
6	23204	7804	23783	23783	23783	23783	23783
28	23783	8383	23787	23787	23787	23787	23787
47	23973	8573	23972	23972	23972	23972	23972
96	24173	8773	23972	23972	23972	23972	23972
60	24600	9200	23972	23972	23972	23972	23972
58	24650	9250	23972	23972	23972	23972	23972
88	24827	9427	23972	23972	23972	23972	23972
92	25000	9600	23972	23972	23972	23972	23972
55	25933	10533	23972	23972	23972	23972	23972
89	26305	10905	23972	23972	23972	23972	23972
15	27333	11933	23972	23972	23972	23972	23972
93	27633	12233	23972	23972	23972	23972	23972
59	27690	12290	23972	23972	23972	23972	23972
99	not id	not id	not id	not id	not id	not id	not id
Average X	16009		15995	16016	16020	16020	16020
SD S	5741		5094	5056	5050	5049	5048
robust average X*	15400	new *X**	15995	16016	16020	16020	16020
robust stdev S*	5714	new *S**	5776	5733	5726	5725	5725
δ= 1.5S*	8572		8664	8600	8590	8588	8587
X*- δ	6828		7331	7416	7430	7433	7433
X*+ δ	23972		24659	24616	24609	24608	24608
no of analysts P	95		95	95	95	95	95

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

Homogeneity and stability test IPI2018									
Prorocentrum micans	CELLS / L	Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	2560	2840	2700	280	78400	
		20/08/2018	water3	3000	3120	3060	120	14400	
		20/08/2018	water3	3080	3440	3260	360	129600	
		20/08/2018	water3	3480	2880	3180	600	360000	
		20/08/2018	water3	3920	3680	3800	240	57600	
		20/08/2018	water3	1960	1480	1720	480	230400	
		20/08/2018	water3	3040	3000	3020	40	1600	
		20/08/2018	water3	3160	3360	3260	200	40000	
		20/08/2018	water3	3160	3680	3420	520	270400	
		20/08/2018	water3	2840	2760	2800	80	6400	
					Average:	3022	Sum	1188800	
					SD	553	P=	10	
				SD within samples:		244			
				SD between samples:		525			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	3680	3520	3600	160	25600	
	CELLS / L	03/10/2017	water3	2720	2240	2480	480	230400	
		03/10/2017	water3	3160	2440	2800	720	518400	
					Average:	2960	Sum	774400	
					SD	577	P=	3	
				SD within samples:		359			
				SD between samples:		518			
	homogeneity criteria			525	166				
	stability check criteria			3022	2960	62			

Analysts results for *Prorocentrum micans*

Analyst Code	Average	x-x*	it1	it2	it3	it4	it5	it6	it7	it8
46	347	1713	696	731	743	748	751	752	752	753
66	453	1607	696	731	743	748	751	752	752	753
24	547	1513	696	731	743	748	751	752	752	753
94	640	1420	696	731	743	748	751	752	752	753
61	967	1093	967	967	967	967	967	967	967	967
69	1000	1060	1000	1000	1000	1000	1000	1000	1000	1000
16	1040	1020	1040	1040	1040	1040	1040	1040	1040	1040
82	1053	1007	1053	1053	1053	1053	1053	1053	1053	1053
7	1080	980	1080	1080	1080	1080	1080	1080	1080	1080
13	1080	980	1080	1080	1080	1080	1080	1080	1080	1080
10	1126	934	1126	1126	1126	1126	1126	1126	1126	1126
99	1133	927	1133	1133	1133	1133	1133	1133	1133	1133
77	1173	887	1173	1173	1173	1173	1173	1173	1173	1173
41	1187	873	1187	1187	1187	1187	1187	1187	1187	1187
52	1187	873	1187	1187	1187	1187	1187	1187	1187	1187
95	1187	873	1187	1187	1187	1187	1187	1187	1187	1187
48	1192	868	1192	1192	1192	1192	1192	1192	1192	1192
85	1203	857	1203	1203	1203	1203	1203	1203	1203	1203
17	1205	855	1205	1205	1205	1205	1205	1205	1205	1205
78	1227	833	1227	1227	1227	1227	1227	1227	1227	1227
30	1240	820	1240	1240	1240	1240	1240	1240	1240	1240
1	1300	760	1300	1300	1300	1300	1300	1300	1300	1300
21	1320	740	1320	1320	1320	1320	1320	1320	1320	1320
44	1333	727	1333	1333	1333	1333	1333	1333	1333	1333
45	1375	685	1375	1375	1375	1375	1375	1375	1375	1375
31	1413	647	1413	1413	1413	1413	1413	1413	1413	1413
38	1440	620	1440	1440	1440	1440	1440	1440	1440	1440
57	1473	587	1473	1473	1473	1473	1473	1473	1473	1473
74	1493	567	1493	1493	1493	1493	1493	1493	1493	1493
34	1500	560	1500	1500	1500	1500	1500	1500	1500	1500
22	1627	433	1627	1627	1627	1627	1627	1627	1627	1627
39	1640	420	1640	1640	1640	1640	1640	1640	1640	1640
80	1640	420	1640	1640	1640	1640	1640	1640	1640	1640
12	1653	407	1653	1653	1653	1653	1653	1653	1653	1653
27	1693	367	1693	1693	1693	1693	1693	1693	1693	1693
53	1700	360	1700	1700	1700	1700	1700	1700	1700	1700
97	1707	353	1707	1707	1707	1707	1707	1707	1707	1707
49	1733	327	1733	1733	1733	1733	1733	1733	1733	1733
51	1760	300	1760	1760	1760	1760	1760	1760	1760	1760
68	1760	300	1760	1760	1760	1760	1760	1760	1760	1760
4	1813	247	1813	1813	1813	1813	1813	1813	1813	1813
37	1866	194	1866	1866	1866	1866	1866	1866	1866	1866
67	1920	140	1920	1920	1920	1920	1920	1920	1920	1920
3	1973	87	1973	1973	1973	1973	1973	1973	1973	1973
18	1987	73	1987	1987	1987	1987	1987	1987	1987	1987
54	1987	73	1987	1987	1987	1987	1987	1987	1987	1987
50	2000	60	2000	2000	2000	2000	2000	2000	2000	2000
25	2053	7	2053	2053	2053	2053	2053	2053	2053	2053
87	2067	7	2067	2067	2067	2067	2067	2067	2067	2067
64	2107	47	2107	2107	2107	2107	2107	2107	2107	2107
71	2107	47	2107	2107	2107	2107	2107	2107	2107	2107

Analysts results for *Prorocentrum micans*

36	2173	113	2173	2173	2173	2173	2173	2173	2173	2173
35	2200	140	2200	2200	2200	2200	2200	2200	2200	2200
20	2213	153	2213	2213	2213	2213	2213	2213	2213	2213
19	2227	167	2227	2227	2227	2227	2227	2227	2227	2227
56	2227	167	2227	2227	2227	2227	2227	2227	2227	2227
32	2240	180	2240	2240	2240	2240	2240	2240	2240	2240
5	2253	193	2253	2253	2253	2253	2253	2253	2253	2253
23	2307	247	2307	2307	2307	2307	2307	2307	2307	2307
9	2347	287	2347	2347	2347	2347	2347	2347	2347	2347
91	2381	321	2381	2381	2381	2381	2381	2381	2381	2381
81	2413	353	2413	2413	2413	2413	2413	2413	2413	2413
84	2413	353	2413	2413	2413	2413	2413	2413	2413	2413
79	2427	367	2427	2427	2427	2427	2427	2427	2427	2427
43	2440	380	2440	2440	2440	2440	2440	2440	2440	2440
83	2467	407	2467	2467	2467	2467	2467	2467	2467	2467
76	2533	473	2533	2533	2533	2533	2533	2533	2533	2533
11	2547	487	2547	2547	2547	2547	2547	2547	2547	2547
40	2567	507	2567	2567	2567	2567	2567	2567	2567	2567
62	2600	540	2600	2600	2600	2600	2600	2600	2600	2600
6	2638	578	2638	2638	2638	2638	2638	2638	2638	2638
88	2652	592	2652	2652	2652	2652	2652	2652	2652	2652
2	2653	593	2653	2653	2653	2653	2653	2653	2653	2653
63	2653	593	2653	2653	2653	2653	2653	2653	2653	2653
33	2667	607	2667	2667	2667	2667	2667	2667	2667	2667
29	2687	627	2687	2687	2687	2687	2687	2687	2687	2687
86	2693	633	2693	2693	2693	2693	2693	2693	2693	2693
65	2757	697	2757	2757	2757	2757	2757	2757	2757	2757
98	2840	780	2840	2840	2840	2840	2840	2840	2840	2840
28	2847	787	2847	2847	2847	2847	2847	2847	2847	2847
8	2853	793	2853	2853	2853	2853	2853	2853	2853	2853
96	2880	820	2880	2880	2880	2880	2880	2880	2880	2880
60	2893	833	2893	2893	2893	2893	2893	2893	2893	2893
47	2947	887	2947	2947	2947	2947	2947	2947	2947	2947
73	3120	1060	3160	3160	3160	3160	3160	3160	3160	3160
59	3160	1100	3317	3317	3317	3317	3317	3317	3317	3317
58	3317	1257	3413	3391	3375	3367	3364	3362	3361	3361
55	3427	1367	3424	3391	3375	3367	3364	3362	3361	3361
15	3480	1420	3424	3391	3375	3367	3364	3362	3361	3361
89	3493	1433	3424	3391	3375	3367	3364	3362	3361	3361
72	3747	1687	3424	3391	3375	3367	3364	3362	3361	3361
75	3747	1687	3424	3391	3375	3367	3364	3362	3361	3361
90	3787	1727	3424	3391	3375	3367	3364	3362	3361	3361
70	3813	1753	3424	3391	3375	3367	3364	3362	3361	3361
93	4800	2740	3424	3391	3375	3367	3364	3362	3361	3361
92	5533	3473	3424	3391	3375	3367	3364	3362	3361	3361
Average X	2102		2061	2059	2058	2057	2057	2057	2057	2057
SD S	918		782	774	770	768	767	767	767	767
robust average X*	2060	new *X**	2061	2059	2058	2057	2057	2057	2057	2057
robust stdev S*	910	new *S**	887	877	873	871	870	870	869	869
δ= 1.5S*	1364		1330	1316	1310	1307	1305	1304	1304	1304
X*- δ	696		731	743	748	751	752	752	753	753
X*+ δ	3424		3391	3375	3367	3364	3362	3361	3361	3361
no of analysts P	96		96	96	96	96	96	96	96	96

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

Homogeneity and stability test IPI2018									
Amphidinium carteare	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	22960	23760	23360	800	640000	
		20/08/2018	water3	23720	19200	21460	4520	20430400	
		20/08/2018	water3	30240	29200	29720	1040	1081600	
		20/08/2018	water3	33480	34360	33920	880	774400	
		20/08/2018	water3	29120	31200	30160	2080	4326400	
		20/08/2018	water3	14600	16800	15700	2200	4840000	
		20/08/2018	water3	32600	30680	31640	1920	3686400	
		20/08/2018	water3	32800	21320	27060	11480	131790400	
		20/08/2018	water3	22320	27440	24880	5120	26214400	
		20/08/2018	water3	30960	33040	32000	2080	4326400	
					Average:	26990	Sum	198110400	
					SD	5656	P=	10	
				SD within samples:		3147			
				SD between samples:		5200			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	23800	26040	24920	2240	5017600	
	CELLS / L	03/10/2017	water3	26040	28240	27140	2200	4840000	
		03/10/2017	water3	23800	26880	25340	3080	9486400	
					Average:	25800	Sum	19344000	
					SD	1179	P=	3	
				SD within samples:		1796			
				SD between samples:		470			
	homogeneity criteria			5200	1697				
	stability check criteria			26990	25800	1190			

Analysts results for *Amphidinium carterae*

Analyst Code	Average	x-x*	it1	it2	it3	it4	it5
66	67	9320	570	1089	1141	1147	1148
46	107	9280	570	1089	1141	1147	1148
94	1160	8227	1160	1160	1160	1160	1160
37	1166	8220	1166	1352	1400	1408	1410
85	1995	7392	1995	1995	1995	1995	1995
53	2500	6887	2500	2500	2500	2500	2500
17	2872	6515	2872	2872	2872	2872	2872
21	3162	6225	3162	3162	3162	3162	3162
35	3183	6203	3183	3183	3183	3183	3183
82	3187	6200	3187	3187	3187	3187	3187
23	3747	5640	3747	3747	3747	3747	3747
2	3911	5475	3911	3911	3911	3911	3911
97	4160	5227	4160	4160	4160	4160	4160
13	4320	5067	4320	4320	4320	4320	4320
16	4680	4707	4680	4680	4680	4680	4680
68	4733	4653	4733	4733	4733	4733	4733
20	4787	4600	4787	4787	4787	4787	4787
78	4960	4427	4960	4960	4960	4960	4960
38	5053	4333	5053	5053	5053	5053	5053
74	5160	4227	5160	5160	5160	5160	5160
49	5300	4087	5300	5300	5300	5300	5300
31	5653	3733	5653	5653	5653	5653	5653
76	6027	3360	6027	6027	6027	6027	6027
39	6120	3267	6120	6120	6120	6120	6120
62	6280	3107	6280	6280	6280	6280	6280
63	6600	2787	6600	6600	6600	6600	6600
54	6747	2640	6747	6747	6747	6747	6747
84	6800	2587	6800	6800	6800	6800	6800
19	6867	2520	6867	6867	6867	6867	6867
30	6880	2507	6880	6880	6880	6880	6880
64	6920	2467	6920	6920	6920	6920	6920
83	7000	2387	7000	7000	7000	7000	7000
87	7053	2333	7053	7053	7053	7053	7053
12	7147	2240	7147	7147	7147	7147	7147
9	7320	2067	7320	7320	7320	7320	7320
65	7797	1589	7797	7797	7797	7797	7797
1	7833	1553	7833	7833	7833	7833	7833
4	8040	1347	8040	8040	8040	8040	8040
22	8333	1053	8333	8333	8333	8333	8333
67	8333	1053	8333	8333	8333	8333	8333
11	8360	1027	8360	8360	8360	8360	8360
34	8467	920	8467	8467	8467	8467	8467
10	8700	687	8700	8700	8700	8700	8700
36	8720	667	8720	8720	8720	8720	8720
91	8795	592	8795	8795	8795	8795	8795
7	8867	520	8867	8867	8867	8867	8867
24	9347	40	9347	9347	9347	9347	9347
32	9427	40	9427	9427	9427	9427	9427
5	9587	200	9587	9587	9587	9587	9587
80	10052	665	10052	10052	10052	10052	10052
71	10067	680	10067	10067	10067	10067	10067
52	10200	813	10200	10200	10200	10200	10200
8	10533	1147	10533	10533	10533	10533	10533
77	10600	1213	10600	10600	10600	10600	10600
3	10787	1400	10787	10787	10787	10787	10787
69	10875	1488	10875	10875	10875	10875	10875
56	10947	1560	10947	10947	10947	10947	10947

Analysts results for *Amphidinium carterae*

18	10991	1605	10991	10991	10991	10991	10991
48	11054	1667	11054	11054	11054	11054	11054
45	11230	1843	11230	11230	11230	11230	11230
61	11233	1847	11233	11233	11233	11233	11233
41	11280	1893	11280	11280	11280	11280	11280
33	12107	2720	12107	12107	12107	12107	12107
57	12133	2747	12133	12133	12133	12133	12133
44	12573	3187	12573	12573	12573	12573	12573
58	12683	3297	12683	12683	12683	12683	12683
50	12733	3347	12733	12733	12733	12733	12733
86	13227	3840	13227	13227	13227	13227	13227
27	13547	4160	13547	13547	13547	13547	13547
92	13600	4213	13600	13600	13600	13600	13600
59	14200	4813	14200	14200	14200	14200	14200
81	14240	4853	14240	14240	14240	14240	14240
43	14307	4920	14307	14307	14307	14307	14307
79	14869	5483	14869	14869	14869	14869	14869
25	15693	6307	15693	15693	15693	15693	15693
40	16487	7100	16487	16487	16487	16487	16487
70	17227	7840	17227	17227	17227	17227	17227
72	18040	8653	18040	18040	18040	18040	18040
98	18227	8840	18203	18203	18203	18203	18203
51	19080	9693	18203	18203	18203	18203	18203
75	19280	9893	18203	18203	18203	18203	18203
29	20460	11073	18203	18203	18203	18203	18203
93	22700	13313	18203	18203	18203	18203	18203
6	25204	15817	18203	18203	18203	18203	18203
28	25467	16080	18203	18203	18203	18203	18203
96	25640	16253	18203	18203	18203	18203	18203
73	25813	16426	18203	18203	18203	18203	18203
90	26173	16787	18203	18203	18203	18203	18203
88	27291	17904	18203	18203	18203	18203	18203
47	27853	18467	18203	18203	18203	18203	18203
60	28000	18613	18203	18203	18203	18203	18203
15	28120	18733	18203	18203	18203	18203	18203
89	28132	18745	18203	18203	18203	18203	18203
55	28693	19307	18203	18203	18203	18203	18203
99	not id	not id	not id	not id	not id	not id	not id
95	not id.	not id.	not id.	not id.	not id.	not id.	not id.
Average X	11148		10042	10055	10057	10057	10057
SD S	7389		5264	5241	5238	5238	5237
robust average X*	9387	new *X**	10042	10055	10057	10057	10057
robust stdev S*	5878	new *S**	5969	5943	5940	5939	5939
δ= 1.5S*	8816		8953	8914	8910	8909	8909
X*- δ	570		1089	1141	1147	1148	1148
X*+ δ	18203		18995	18969	18966	18966	18966
no of analysts P	94		94	94	94	94	94
Between Samples SD	5200						
new stdev for ACARTER	7894						

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

Homogeneity and stability test IPI2018									
Karenia mikimotoi	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	13160	12640	12900	520	270400	
		20/08/2018	water3	11160	9400	10280	1760	3097600	
		20/08/2018	water3	12600	12360	12480	240	57600	
		20/08/2018	water3	12960	16080	14520	3120	9734400	
		20/08/2018	water3	12080	14560	13320	2480	6150400	
		20/08/2018	water3	5640	4920	5280	720	518400	
		20/08/2018	water3	11920	13480	12700	1560	2433600	
		20/08/2018	water3	11800	10360	11080	1440	2073600	
		20/08/2018	water3	11200	10400	10800	800	640000	
		20/08/2018	water3	11760	13040	12400	1280	1638400	
					Average:	11576	Sum	26614400	
					SD	2547	P=	10	
				SD within samples:		1154			
				SD between samples:		2413			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	13080	16520	14800	3440	11833600	
	CELLS / L	03/10/2017	water3	9800	11160	10480	1360	1849600	
		03/10/2017	water3	10640	9520	10080	1120	1254400	
					Average:	11787	Sum	14937600	
					SD	2617	P=	3	
				SD within samples:		1578			
				SD between samples:		2368			
	homogeneity criteria			2413	764				
	stability check criteria			11576	11787	211	0		

Analysts results for *Karenia mikimotoi*

Analyst Code	Average	x-x*	it1	it2	it3	it4
66	73	2533	73	252	262	263
46	213	2393	213	252	262	263
94	427	2180	427	427	427	427
13	640	1967	640	640	640	640
21	827	1780	827	827	827	827
30	880	1727	880	880	880	880
53	980	1627	980	980	980	980
75	1000	1607	1000	1000	1000	1000
35	1053	1553	1053	1053	1053	1053
16	1107	1500	1107	1107	1107	1107
17	1141	1466	1141	1141	1141	1141
97	1173	1433	1173	1173	1173	1173
82	1200	1407	1200	1200	1200	1200
31	1253	1353	1253	1253	1253	1253
28	1320	1287	1320	1320	1320	1320
49	1367	1240	1367	1367	1367	1367
78	1427	1180	1427	1427	1427	1427
69	1458	1148	1458	1458	1458	1458
85	1496	1111	1496	1496	1496	1496
38	1520	1087	1520	1520	1520	1520
61	1533	1073	1533	1533	1533	1533
24	1560	1047	1560	1560	1560	1560
23	1600	1007	1600	1600	1600	1600
83	1640	967	1640	1640	1640	1640
74	1720	887	1720	1720	1720	1720
87	1827	780	1827	1827	1827	1827
34	1893	713	1893	1893	1893	1893
10	1937	670	1937	1937	1937	1937
5	1947	660	1947	1947	1947	1947
95	1960	647	1960	1960	1960	1960
9	1987	620	1987	1987	1987	1987
32	2013	593	2013	2013	2013	2013
39	2080	527	2080	2080	2080	2080
52	2093	513	2093	2093	2093	2093
20	2107	500	2107	2107	2107	2107
77	2120	487	2120	2120	2120	2120
19	2147	460	2147	2147	2147	2147
67	2160	447	2160	2160	2160	2160
12	2227	380	2227	2227	2227	2227
4	2280	327	2280	2280	2280	2280
57	2347	260	2347	2347	2347	2347
71	2360	247	2360	2360	2360	2360
84	2427	180	2427	2427	2427	2427
37	2565	42	2565	2565	2565	2565
22	2573	33	2573	2573	2573	2573
63	2640	33	2640	2640	2640	2640
64	2680	73	2680	2680	2680	2680
91	2724	117	2724	2724	2724	2724
1	2733	127	2733	2733	2733	2733
7	2740	133	2740	2740	2740	2740

Analysts results for *Karenia mikimotoi*

45	2838	231	2838	2838	2838	2838
11	2973	367	2973	2973	2973	2973
2	3129	523	3129	3129	3129	3129
50	3240	633	3240	3240	3240	3240
62	3320	713	3320	3320	3320	3320
80	3367	760	3367	3367	3367	3367
79	3400	793	3400	3400	3400	3400
44	3480	873	3480	3480	3480	3480
48	3491	884	3491	3491	3491	3491
56	3733	1127	3733	3733	3733	3733
8	3747	1140	3747	3747	3747	3747
29	3760	1153	3760	3760	3760	3760
65	3807	1201	3807	3807	3807	3807
51	4107	1500	4107	4107	4107	4107
68	4200	1593	4200	4200	4200	4200
36	4507	1900	4507	4507	4507	4507
76	4533	1927	4533	4533	4533	4533
58	4650	2043	4650	4650	4650	4650
98	4693	2087	4693	4693	4693	4693
40	4993	2387	4993	4993	4993	4993
18	5240	2634	5202	5202	5202	5202
86	5553	2947	5202	5202	5202	5202
72	5813	3207	5202	5202	5202	5202
33	5867	3260	5202	5202	5202	5202
59	5920	3313	5202	5202	5202	5202
70	5920	3313	5202	5202	5202	5202
3	5933	3327	5202	5202	5202	5202
55	5933	3327	5202	5202	5202	5202
90	6133	3527	5202	5202	5202	5202
6	6218	3611	5202	5202	5202	5202
73	6800	4193	5202	5202	5202	5202
60	6827	4220	5202	5202	5202	5202
15	6853	4247	5202	5202	5202	5202
81	7133	4527	5202	5202	5202	5202
89	7160	4553	5202	5202	5202	5202
93	8033	5427	5202	5202	5202	5202
88	8479	5872	5202	5202	5202	5202
47	9133	6527	5202	5202	5202	5202
92	9893	7287	5202	5202	5202	5202
96	12307	9700	5202	5202	5202	5202
25	Not id.	Not id.	Not id.	Not id.	Not id.	Not id.
27	Not id.	Not id.	Not id.	Not id.	Not id.	Not id.
41	Not id.	Not id.	Not id.	Not id.	Not id.	Not id.
43	Not id.	Not id.	Not id.	Not id.	Not id.	Not id.
54	Not id.	Not id.	Not id.	Not id.	Not id.	Not id.
99	Not id.	Not id.	Not id.	Not id.	Not id.	Not id.
Average X	3359		2946	2949	2949	2949
SD S	2376		1584	1580	1579	1579
robust average X*	2607	new *X**	2946	2949	2949	2949
robust stdev S*	1730	new *S**	1796	1791	1791	1791
δ= 1.5S*	2595		2694	2687	2686	2686
X*- δ	11		252	262	263	263
X*+ δ	5202		5641	5636	5636	5636
no of analysts P	90		90	90	90	90
Between Samples SD	2413					
new stdev for KMIKIMO	3005					

Annex IX: Robust mean and Standard deviation calculation according to algorithm A annex C ISO13528 *Gymnodinium/Gyrodinium* sp. iteration

Homogeneity and stability test IPI2018									
Gymnodinium/Gyrodinium sp.	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	1760	1920	1840	160	25600	
		20/08/2018	water3	1040	1520	1280	480	230400	
		20/08/2018	water3	1480	1640	1560	160	25600	
		20/08/2018	water3	3480	2480	2980	1000	1000000	
		20/08/2018	water3	1920	2120	2020	200	40000	
		20/08/2018	water3	880	720	800	160	25600	
		20/08/2018	water3	1640	1360	1500	280	78400	
		20/08/2018	water3	2520	2800	2660	280	78400	
		20/08/2018	water3	1680	1280	1480	400	160000	
		20/08/2018	water3	2280	1800	2040	480	230400	
					Average:	1816	Sum	1894400	
					SD	646	P=	10	
				SD within samples:		308			
				SD between samples:		608			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	2120	1960	2040	160	25600	
	CELLS / L	03/10/2017	water3	2560	1560	2060	1000	1000000	
		03/10/2017	water3	1760	1840	1800	80	6400	
					Average:	1967	Sum	1032000	
					SD	145	P=	3	
				SD within samples:		415			
				SD between samples:		255			
	homogeneity criteria			608	194				
	stability check criteria			1816	1967	151	146		

Analysts results for *Gymnodinium/Gyrodinium* sp

Analyst Code	Average	x-x*	it1	it2
85	264	916	527	527
22	280	900	527	527
48	334	846	527	527
35	363	817	527	527
99	367	813	527	527
94	413	767	527	527
24	467	713	527	527
82	467	713	527	527
16	493	687	527	527
45	570	610	570	570
87	600	580	600	600
77	627	553	627	627
18	680	500	680	680
30	693	487	693	693
57	700	480	700	700
52	720	460	720	720
21	747	433	747	747
44	747	433	747	747
7	760	420	760	760
34	787	393	787	787
13	813	367	813	813
78	813	367	813	813
12	853	327	853	853
17	872	308	872	872
68	880	300	880	880
39	893	287	893	893
53	900	280	900	900
38	907	273	907	907
95	907	273	907	907
97	920	260	907	907
37	933	247	920	920
64	947	233	933	933
40	960	220	947	947
11	987	193	960	960
51	987	193	987	987
31	1027	153	987	987
23	1053	127	1027	1027
81	1053	127	1053	1053
73	1067	113	1053	1053
20	1093	87	1093	1093
25	1093	87	1093	1093
98	1093	87	1093	1093
56	1173	7	1173	1173
71	1173	7	1173	1173
86	1173	7	1173	1173
74	1187	7	1173	1173
29	1200	20	1187	1187
50	1213	33	1200	1200
63	1213	33	1213	1213
67	1227	47	1213	1213
3	1240	60	1227	1227
9	1267	87	1240	1240

Analysts results for *Gymnodinium/Gyrodinium* sp

61	1267	87	1267	1267
76	1267	87	1267	1267
4	1280	100	1267	1267
72	1280	100	1280	1280
58	1283	103	1283	1283
84	1307	127	1307	1307
5	1320	140	1320	1320
79	1320	140	1320	1320
91	1324	144	1324	1324
19	1333	153	1333	1333
69	1333	153	1333	1333
32	1347	167	1347	1347
83	1387	207	1387	1387
33	1400	220	1400	1400
96	1427	247	1427	1427
8	1453	273	1453	1453
62	1453	273	1453	1453
36	1467	287	1467	1467
49	1500	320	1500	1500
90	1533	353	1533	1533
59	1600	420	1600	1600
88	1681	501	1681	1681
6	1710	530	1710	1710
55	1733	553	1733	1733
70	1733	553	1733	1733
15	1880	700	1833	1833
47	1987	807	1833	1833
60	2093	913	1833	1833
89	2131	951	1833	1833
2	2823	1643	1833	1833
41	3027	1847	1833	1833
65	3872	2692	1833	1833
27	4040	2860	1833	1833
43	4080	2900	1833	1833
93	5200	4020	1833	1833
54	5800	4620	1833	1833
28	6998	5818	1833	1833
75	8573	7393	1833	1833
1	not id.	not id.	not id.	not id.
10	not id.	not id.	not id.	not id.
46	not id.	not id.	not id.	not id.
66	not id.	not id.	not id.	not id.
80	not id.	not id.	not id.	not id.
92	not id.	not id.	not id.	not id.
Average X	1472		1164	1164
SD S	1353		417	417
robust average X*	1180	new *X**	1164	1164
robust stdev S*	435	new *S**	473	473
δ= 1.5S*	653		709	709
X*- δ	527		455	455
X*+ δ	1833		1874	1874
no of analysts P	90		90	90
Between Samples SD	608			
new stdev for GYMNOGYR	771			

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

Homogeneity and stability test IPI2018									
Dactyliosolen fragilissimus	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	35480	29320	32400	6160	37945600	
		20/08/2018	water3	26080	26720	26400	640	409600	
		20/08/2018	water3	26320	25840	26080	480	230400	
		20/08/2018	water3	35200	35400	35300	200	40000	
		20/08/2018	water3	25960	27480	26720	1520	2310400	
		20/08/2018	water3	21680	22080	21880	400	160000	
		20/08/2018	water3	29240	28000	28620	1240	1537600	
		20/08/2018	water3	37720	21000	29360	16720	279558400	
		20/08/2018	water3	21280	20560	20920	720	518400	
		20/08/2018	water3	29120	24560	26840	4560	20793600	
					Average:	27452	Sum	343504000	
					SD	4329	P=	10	
				SD within samples:		4144			
				SD between samples:		3187			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	34360	34720	34540	360	129600	
	CELLS / L	03/10/2017	water3	31920	22040	26980	9880	97614400	
		03/10/2017	water3	28800	32960	30880	4160	17305600	
					Average:	30800	Sum	115049600	
					SD	3781	P=	3	
				SD within samples:		4379			
				SD between samples:		2169			
	homogeneity criteria			3187	1299				
	stability check criteria			27452	30800	3348			

Analysts results for *Dactyliosolen fragilissimus*

Analyst Code	Average	x-x*	it1	it2
66	33	20487	10584	10584
46	213	20307	10584	10584
99	1033	19487	10584	10584
94	2400	18120	10584	10584
95	3480	17040	10584	10584
72	3827	16693	10584	10584
70	4560	15960	10584	10584
76	6253	14267	10584	10584
35	7440	13080	10584	10584
50	8507	12013	10584	10584
11	8987	11533	10584	10584
82	9133	11387	10584	10584
18	9440	11080	10584	10584
97	10984	9536	10984	10984
36	11760	8760	11760	11760
68	12933	7587	12933	12933
85	12965	7555	12965	12965
98	15027	5493	15027	15027
74	15147	5373	15147	15147
22	15307	5213	15307	15307
39	15373	5147	15373	15373
49	15467	5053	15467	15467
65	15621	4899	15621	15621
23	16307	4213	16307	16307
37	16324	4196	16324	16324
1	16633	3887	16633	16633
53	16667	3853	16667	16667
9	16707	3813	16707	16707
31	17133	3387	17133	17133
17	17256	3264	17256	17256
12	17440	3080	17440	17440
10	17518	3002	17518	17518
78	18040	2480	18040	18040
44	18120	2400	18120	18120
30	18173	2347	18173	18173
48	18268	2252	18268	18268
57	18747	1773	18747	18747
38	18760	1760	18760	18760
13	18960	1560	18960	18960
8	18987	1533	18987	18987
33	19053	1467	19053	19053
84	19493	1027	19493	19493
87	19600	920	19600	19600
81	19853	667	19853	19853
20	20147	373	20147	20147
16	20347	173	20347	20347
83	20440	80	20440	20440
54	20480	40	20480	20480
19	20560	40	20560	20560
4	20627	107	20627	20627
45	20632	112	20632	20632
64	20653	133	20653	20653
32	20813	293	20813	20813
62	21080	560	21080	21080

Analysts results for *Dactyliosolen fragilissimus*

92	21200	680	21200	21200
2	21429	909	21429	21429
86	21513	993	21513	21513
63	21733	1213	21733	21733
34	21760	1240	21760	21760
7	22360	1840	22360	22360
24	22387	1867	22387	22387
58	22417	1897	22417	22417
80	22718	2198	22718	22718
3	22813	2293	22813	22813
91	23330	2810	23330	23330
71	23853	3333	23853	23853
51	23960	3440	23960	23960
40	24033	3513	24033	24033
73	24400	3880	24458	24458
69	24458	3938	24600	24600
41	24600	4080	25240	25240
55	25240	4720	25520	25520
67	25520	5000	25560	25560
27	25560	5040	25720	25720
47	25720	5200	26827	26827
43	26840	6320	26840	26840
90	26867	6347	26867	26867
75	26893	6373	26893	26893
77	27067	6547	27067	27067
29	27120	6600	27120	27120
56	27373	6853	27373	27373
59	28660	8140	28660	28660
60	28693	8173	28693	28693
52	28866	8346	28866	28866
96	29293	8773	29293	29293
21	29682	9162	29682	29682
93	29767	9247	29767	29767
79	30011	9491	30011	30011
15	30427	9907	30427	30427
5	31253	10733	30456	30456
61	31667	11147	30456	30456
28	33360	12840	30456	30456
25	34080	13560	30456	30456
6	37755	17235	30456	30456
89	38538	18018	30456	30456
88	39233	18713	30456	30456
Average X	20043		20481	20481
SD S	8283		6249	6249
robust average X*	20520	new *X**	20481	20481
robust stdev S*	6624	new *S**	7087	7087
δ= 1.5S*	9936		10630	10630
X*- δ	10584		9851	9851
X*+ δ	30456		31111	31111
no of analysts P	96		96	96
Between Samples SD	3187			
new stdev for DFRAGILL	7770			

Annex IX: Robust mean and Standard deviation calculation according to algorithm A annex C ISO13528 *Thalassiosira rotula/Gravida* iteration

Homogeneity and stability test IPI2018									
Thalassiosira rotula/gravida	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	4800	4320	4560	480	230400	
		20/08/2018	water3	6360	4400	5380	1960	3841600	
		20/08/2018	water3	6080	5000	5540	1080	1166400	
		20/08/2018	water3	5520	5920	5720	400	160000	
		20/08/2018	water3	6200	5400	5800	800	640000	
		20/08/2018	water3	5040	6080	5560	1040	1081600	
		20/08/2018	water3	4240	4920	4580	680	462400	
		20/08/2018	water3	6760	10080	8420	3320	11022400	
		20/08/2018	water3	7000	6440	6720	560	313600	
		20/08/2018	water3	5040	4640	4840	400	160000	
					Average:	5712	Sum	19078400	
					SD	1149	P=	10	
				SD within samples:		977			
				SD between samples:		919			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	5920	5040	5480	880	774400	
	CELLS / L	03/10/2017	water3	4200	3960	4080	240	57600	
		03/10/2017	water3	3800	4360	4080	560	313600	
					Average:	4547	Sum	1145600	
					SD	808	P=	3	
				SD within samples:		437			
				SD between samples:		747			
	homogeneity criteria			919	345				
	stability check criteria			5712	4547	1165	0		

Analysts results for *Thalassiosira rotula/Gravida*

Analyst Code	Average	x-x*	it1	it2	it3	it4	it5
66	87	4627	3497	3497	3497	3497	3497
46	227	4487	3497	3497	3497	3497	3497
94	2333	2380	3497	3497	3497	3497	3497
99	2433	2280	3497	3497	3497	3497	3497
21	2760	1953	3497	3497	3497	3497	3497
70	2840	1873	3497	3497	3497	3497	3497
68	2920	1793	3497	3497	3497	3497	3497
72	3053	1660	3497	3497	3497	3497	3497
79	3347	1367	3497	3497	3497	3497	3497
57	3507	1207	3507	3507	3507	3507	3507
76	3507	1207	3507	3507	3507	3507	3507
48	3526	1188	3526	3526	3526	3526	3526
2	3538	1176	3538	3538	3538	3538	3538
86	3540	1173	3540	3540	3540	3540	3540
11	3600	1113	3600	3600	3600	3600	3600
50	3667	1047	3667	3667	3667	3667	3667
87	3693	1020	3693	3693	3693	3693	3693
65	3740	974	3740	3740	3740	3740	3740
17	3795	918	3795	3795	3795	3795	3795
77	3800	913	3800	3800	3800	3800	3800
52	3827	887	3827	3827	3827	3827	3827
85	3843	871	3843	3843	3843	3843	3843
13	3947	767	3947	3947	3947	3947	3947
82	4040	673	4040	4040	4040	4040	4040
3	4107	607	4107	4107	4107	4107	4107
10	4124	590	4124	4124	4124	4124	4124
36	4173	540	4173	4173	4173	4173	4173
34	4180	533	4180	4180	4180	4180	4180
4	4187	527	4187	4187	4187	4187	4187
37	4198	515	4198	4198	4198	4198	4198
35	4227	487	4227	4227	4227	4227	4227
41	4267	447	4267	4267	4267	4267	4267
24	4320	393	4320	4320	4320	4320	4320
44	4347	367	4347	4347	4347	4347	4347
30	4400	313	4400	4400	4400	4400	4400
91	4408	305	4408	4408	4408	4408	4408
78	4427	287	4427	4427	4427	4427	4427
80	4465	249	4465	4465	4465	4465	4465
45	4473	240	4473	4473	4473	4473	4473
22	4493	220	4493	4493	4493	4493	4493
81	4493	220	4493	4493	4493	4493	4493
23	4627	87	4627	4627	4627	4627	4627
7	4640	73	4640	4640	4640	4640	4640
73	4640	73	4663	4663	4663	4663	4663
18	4663	50	4693	4693	4693	4693	4693
31	4693	20	4700	4700	4700	4700	4700
49	4700	13	4707	4707	4707	4707	4707
74	4707	7	4720	4720	4720	4720	4720
32	4720	7	4733	4733	4733	4733	4733
12	4733	20	4773	4773	4773	4773	4773
84	4773	60	4773	4773	4773	4773	4773
97	4773	60	4787	4787	4787	4787	4787
27	4787	73	4827	4827	4827	4827	4827
16	4827	113	4840	4840	4840	4840	4840
38	4840	127	4840	4840	4840	4840	4840

Analysts results for *Thalassiosira rotula/Gravida*

43	4840	127	4853	4853	4853	4853	4853
20	4853	140	4893	4893	4893	4893	4893
75	4893	180	4907	4907	4907	4907	4907
55	4907	193	4907	4907	4907	4907	4907
83	4907	193	4920	4920	4920	4920	4920
19	4920	207	4920	4920	4920	4920	4920
90	4920	207	4942	4942	4942	4942	4942
89	4942	229	4973	4973	4973	4973	4973
9	4973	260	4973	4973	4973	4973	4973
64	4973	260	5027	5027	5027	5027	5027
33	5027	313	5040	5040	5040	5040	5040
95	5040	327	5067	5067	5067	5067	5067
67	5067	353	5093	5093	5093	5093	5093
53	5100	387	5100	5100	5100	5100	5100
60	5120	407	5120	5120	5120	5120	5120
54	5133	420	5133	5133	5133	5133	5133
51	5147	433	5147	5147	5147	5147	5147
88	5232	519	5232	5232	5232	5232	5232
71	5240	527	5240	5240	5240	5240	5240
39	5267	553	5267	5267	5267	5267	5267
47	5267	553	5267	5267	5267	5267	5267
56	5267	553	5267	5267	5267	5267	5267
5	5320	607	5320	5320	5320	5320	5320
93	5333	620	5333	5333	5333	5333	5333
62	5347	633	5347	5347	5347	5347	5347
6	5377	664	5377	5377	5377	5377	5377
29	5380	667	5380	5380	5380	5380	5380
58	5383	670	5383	5383	5383	5383	5383
8	5400	687	5400	5400	5400	5400	5400
25	5533	820	5533	5533	5533	5533	5533
98	5573	860	5573	5573	5573	5573	5573
28	5683	969	5683	5683	5683	5683	5683
96	5747	1033	5747	5747	5747	5747	5747
59	5810	1097	5810	5810	5810	5810	5810
61	5900	1187	5900	5900	5896	5894	5893
69	6042	1328	5929	5902	5896	5894	5893
63	6050	1337	5929	5902	5896	5894	5893
40	6207	1493	5929	5902	5896	5894	5893
15	6373	1660	5929	5902	5896	5894	5893
92	7867	3153	5929	5902	5896	5894	5893
1	16000	11287	5929	5902	5896	5894	5893
Average X	4649		4639	4637	4636	4636	4636
SD S	1602		743	740	739	739	739
robust average X*	4713	new *X**	4639	4637	4636	4636	4636
robust stdev S*	811	new *S**	843	839	838	838	838
δ= 1.5S*	1216		1264	1259	1258	1257	1257
X*- δ	3497		3375	3378	3379	3379	3379
X*+ δ	5929		5902	5896	5894	5893	5893
no of analysts P	96		96	96	96	96	96
Between Samples SD	919						
new stdev for TGRAVROT	1243						

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

Homogeneity and stability test IPI2018									
Chaetoceros lorenzianus	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	3520	4040	3780	520	270400	
		20/08/2018	water3	4840	3080	3960	1760	3097600	
		20/08/2018	water3	5360	4160	4760	1200	1440000	
		20/08/2018	water3	3440	2760	3100	680	462400	
		20/08/2018	water3	4400	4440	4420	40	1600	
		20/08/2018	water3	2640	3920	3280	1280	1638400	
		20/08/2018	water3	5040	4960	5000	80	6400	
		20/08/2018	water3	3400	2240	2820	1160	1345600	
		20/08/2018	water3	2320	2880	2600	560	313600	
		20/08/2018	water3	3360	2680	3020	680	462400	
					Average:	3674	Sum	9038400	
					SD	842	P=	10	
				SD within samples:		672			
				SD between samples:		695			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	4120	5560	4840	1440	2073600	
	CELLS / L	03/10/2017	water3	1680	1640	1660	40	1600	
		03/10/2017	water3	5040	3120	4080	1920	3686400	
					Average:	3527	Sum	5761600	
					SD	1661	P=	3	
				SD within samples:		980			
				SD between samples:		1509			
	homogeneity criteria			695	253				
	stability check criteria			3674	3527	147			

Analysts results for *Chaetoceros lorenzianus*

Analyst Code	Average	x-x*	it1	it2	it3	it4	it5	it6
35	307	2267	734	803	821	826	828	829
99	333	2240	734	803	821	826	828	829
94	467	2107	734	803	821	826	828	829
68	840	1733	840	840	840	840	840	840
87	867	1707	867	867	867	867	867	867
21	907	1667	907	907	907	907	907	907
76	1120	1453	1120	1120	1120	1120	1120	1120
50	1133	1440	1133	1133	1133	1133	1133	1133
17	1141	1432	1141	1141	1141	1141	1141	1141
85	1144	1429	1144	1144	1144	1144	1144	1144
97	1160	1413	1160	1160	1160	1160	1160	1160
13	1173	1400	1173	1173	1173	1173	1173	1173
11	1413	1160	1413	1413	1413	1413	1413	1413
57	1440	1133	1440	1440	1440	1440	1440	1440
1	1467	1107	1467	1467	1467	1467	1467	1467
34	1487	1087	1487	1487	1487	1487	1487	1487
62	1493	1080	1493	1493	1493	1493	1493	1493
79	1533	1040	1533	1533	1533	1533	1533	1533
86	1620	953	1620	1620	1620	1620	1620	1620
37	1632	941	1632	1632	1632	1632	1632	1632
52	1653	920	1653	1653	1653	1653	1653	1653
95	1667	907	1667	1667	1667	1667	1667	1667
48	1718	855	1718	1718	1718	1718	1718	1718
39	1720	853	1720	1720	1720	1720	1720	1720
32	1787	787	1787	1787	1787	1787	1787	1787
19	1813	760	1813	1813	1813	1813	1813	1813
33	1827	747	1827	1827	1827	1827	1827	1827
24	1867	707	1867	1867	1867	1867	1867	1867
31	1907	667	1907	1907	1907	1907	1907	1907
18	1947	627	1947	1947	1947	1947	1947	1947
30	1973	600	1973	1973	1973	1973	1973	1973
83	1973	600	1973	1973	1973	1973	1973	1973
81	2067	507	2067	2067	2067	2067	2067	2067
4	2093	480	2093	2093	2093	2093	2093	2093
67	2093	480	2093	2093	2093	2093	2093	2093
91	2151	423	2151	2151	2151	2151	2151	2151
84	2253	320	2253	2253	2253	2253	2253	2253
82	2267	307	2267	2267	2267	2267	2267	2267
2	2347	226	2347	2347	2347	2347	2347	2347
16	2400	173	2400	2400	2400	2400	2400	2400
74	2400	173	2400	2400	2400	2400	2400	2400
78	2413	160	2413	2413	2413	2413	2413	2413
20	2427	147	2427	2427	2427	2427	2427	2427
3	2440	133	2440	2440	2440	2440	2440	2440
7	2453	120	2453	2453	2453	2453	2453	2453
54	2520	53	2520	2520	2520	2520	2520	2520
36	2573	0	2573	2573	2573	2573	2573	2573
44	2667	93	2667	2667	2667	2667	2667	2667
23	2707	133	2707	2707	2707	2707	2707	2707
43	2733	160	2733	2733	2733	2733	2733	2733
27	2760	187	2760	2760	2760	2760	2760	2760
9	2773	200	2773	2773	2773	2773	2773	2773
49	2800	227	2800	2800	2800	2800	2800	2800
10	2811	238	2811	2811	2811	2811	2811	2811
63	2813	240	2813	2813	2813	2813	2813	2813

Analysts results for *Chaetoceros lorenzianus*

65	2827	254	2827	2827	2827	2827	2827	2827
70	2907	333	2907	2907	2907	2907	2907	2907
41	2920	347	2920	2920	2920	2920	2920	2920
5	2933	360	2933	2933	2933	2933	2933	2933
71	2933	360	2933	2933	2933	2933	2933	2933
77	2947	373	2947	2947	2947	2947	2947	2947
73	3013	440	3067	3067	3067	3067	3067	3067
64	3067	493	3120	3120	3120	3120	3120	3120
90	3120	547	3168	3168	3168	3168	3168	3168
45	3168	594	3187	3187	3187	3187	3187	3187
38	3187	613	3253	3253	3253	3253	3253	3253
12	3253	680	3253	3253	3253	3253	3253	3253
22	3253	680	3268	3268	3268	3268	3268	3268
80	3268	695	3292	3292	3292	3292	3292	3292
69	3292	718	3307	3307	3307	3307	3307	3307
61	3400	827	3400	3400	3400	3400	3400	3400
72	3400	827	3400	3400	3400	3400	3400	3400
51	3413	840	3413	3413	3413	3413	3413	3413
40	3447	873	3447	3447	3447	3447	3447	3447
25	3453	880	3453	3453	3453	3453	3453	3453
15	3640	1067	3640	3640	3640	3640	3640	3640
75	3640	1067	3640	3640	3640	3640	3640	3640
47	3653	1080	3653	3653	3653	3653	3653	3653
8	3720	1147	3720	3720	3720	3720	3720	3720
56	3760	1187	3760	3760	3760	3760	3760	3760
58	3900	1327	3900	3900	3900	3900	3900	3900
60	3907	1333	3907	3907	3907	3907	3907	3907
29	4020	1447	4020	4020	4020	4020	4020	4020
6	4189	1615	4189	4189	4189	4189	4189	4189
55	4227	1653	4227	4227	4227	4227	4227	4227
89	4232	1659	4232	4232	4232	4232	4232	4232
98	4493	1920	4412	4355	4333	4326	4323	4322
88	4522	1949	4412	4355	4333	4326	4323	4322
96	4573	2000	4412	4355	4333	4326	4323	4322
28	4841	2267	4412	4355	4333	4326	4323	4322
93	5267	2693	4412	4355	4333	4326	4323	4322
59	5430	2857	4412	4355	4333	4326	4323	4322
92	6053	3480	4412	4355	4333	4326	4323	4322
53	not id.	not id.	not id.	not id.	not id.	not id.	not id.	not id.
46	not id.	not id.	not id.	not id.	not id.	not id.	not id.	not id.
66	not id.	not id.	not id.	not id.	not id.	not id.	not id.	not id.
Average X	2610		2579	2577	2576	2576	2575	2575
SD S	1164		1044	1032	1029	1027	1027	1027
robust average X*	2573	new *X**	2579	2577	2576	2576	2575	2575
robust stdev S*	1226	new *S**	1184	1171	1166	1165	1165	1164
δ= 1.5S*	1839		1776	1756	1750	1748	1747	1746
X*- δ	734		803	821	826	828	829	829
X*+ δ	4412		4355	4333	4326	4323	4322	4322
no of analysts P	93		93	93	93	93	93	93
Between Samples SD	695							
new stdev for CLORENZI	1356							

Annex IX: Robust mean and Standard deviation calculation according to algorithm A annex C ISO13528 *Pseudo-nitzschia delicatissima complex* iteration

Homogeneity and stability test IPI2018									
Pseudo-nitzschia delicatissima complex	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	3320	3600	3460	280	78400	
		20/08/2018	water3	3400	4040	3720	640	409600	
		20/08/2018	water3	4680	4920	4800	240	57600	
		20/08/2018	water3	2880	5040	3960	2160	4665600	
		20/08/2018	water3	4240	5400	4820	1160	1345600	
		20/08/2018	water3	2920	3440	3180	520	270400	
		20/08/2018	water3	3520	3520	3520	0	0	
		20/08/2018	water3	2880	2240	2560	640	409600	
		20/08/2018	water3	3000	5040	4020	2040	4161600	
		20/08/2018	water3	6160	4120	5140	2040	4161600	
					Average:	3918	Sum	15560000	
					SD	809	P=	10	
				SD within samples:		882			
				SD between samples:		516			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	5040	7640	6340	2600	6760000	
	CELLS / L	03/10/2017	water3	4200	3600	3900	600	360000	
		03/10/2017	water3	4760	2520	3640	2240	5017600	
					Average:	4627	Sum	12137600	
					SD	1489	P=	3	
				SD within samples:		1422			
				SD between samples:		1099			
	homogeneity criteria			516	243				
	stability check criteria			3918	4627	709			

Analysts results for *Pseudo-nitzschia delicatissima complex*

Analyst Code	Average	x-x*	it1	it2
66	67	2373	1016	1016
94	147	2293	1016	1016
11	320	2120	1016	1016
85	440	2000	1016	1016
95	627	1813	1016	1016
70	640	1800	1016	1016
82	693	1747	1016	1016
38	960	1480	1016	1016
68	973	1467	1016	1016
21	1013	1427	1016	1016
1	1033	1407	1033	1033
87	1040	1400	1040	1040
76	1133	1307	1133	1133
52	1147	1293	1147	1147
79	1160	1280	1160	1160
74	1227	1213	1227	1227
30	1240	1200	1240	1240
16	1293	1147	1293	1293
8	1507	933	1507	1507
37	1632	808	1632	1632
34	1687	753	1687	1687
63	1707	733	1707	1707
49	1733	707	1733	1733
33	1800	640	1800	1800
18	1827	613	1827	1827
17	1833	607	1833	1833
54	1840	600	1840	1840
3	1907	533	1907	1907
22	1933	507	1933	1933
64	2013	427	2013	2013
45	2063	377	2063	2063
65	2069	371	2069	2069
4	2107	333	2107	2107
23	2120	320	2120	2120
10	2136	304	2136	2136
57	2153	287	2153	2153
62	2200	240	2200	2200
48	2211	229	2211	2211
12	2227	213	2227	2227
84	2227	213	2227	2227
77	2267	173	2267	2267
91	2340	100	2340	2340
31	2373	67	2373	2373
75	2427	13	2427	2427
44	2440	0	2440	2440
86	2480	40	2480	2480
20	2547	107	2547	2547
39	2587	147	2587	2587
98	2640	200	2640	2640
7	2660	220	2660	2660
83	2667	227	2667	2667
92	2667	227	2667	2667
27	2707	267	2707	2707
81	2720	280	2720	2720
71	2787	347	2787	2787

78	2787	347	2787	2787
9	2800	360	2800	2800
67	2800	360	2800	2800
24	2813	373	2813	2813
50	2827	387	2827	2827
80	2861	421	2861	2861
19	2867	427	2867	2867
69	2875	435	2875	2875
41	2947	507	2947	2947
73	2987	547	3000	3000
40	3000	560	3067	3067
53	3033	593	3033	3033
43	3067	627	3107	3107
32	3107	667	3187	3187
25	3187	747	3197	3197
2	3197	757	3280	3280
55	3347	907	3347	3347
58	3350	910	3350	3350
61	3400	960	3400	3400
28	3473	1033	3473	3473
56	3480	1040	3480	3480
29	3553	1113	3553	3553
15	3587	1147	3587	3587
5	3787	1347	3787	3787
96	3800	1360	3800	3800
51	3907	1467	3864	3864
90	4133	1693	3864	3864
47	4160	1720	3864	3864
59	4190	1750	3864	3864
60	4253	1813	3864	3864
6	4638	2198	3864	3864
93	4900	2460	3864	3864
89	5232	2792	3864	3864
88	6044	3604	3864	3864
13	Not id.	Not id.	Not id.	Not id.
35	Not id.	Not id.	Not id.	Not id.
36	Not id.	Not id.	Not id.	Not id.
46	Not id.	Not id.	Not id.	Not id.
72	Not id.	Not id.	Not id.	Not id.
97	Not id.	Not id.	Not id.	Not id.
99	Not id.	Not id.	Not id.	Not id.
Average X	2436		2412	2412
SD S	1151		918	918
robust average X*	2440	new *X**	2412	2412
robust stdev S*	949	new *S**	1041	1041
δ= 1.5S*	1424		1562	1562
X*- δ	1016		850	850
X*+ δ	3864		3974	3974
no of analysts P	89		89	89
Between Samples SD	516			
new stdev for STROC	1162			

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

Homogeneity and stability test IPI2018									
Melosira nummuloides	CELLS / L								
		Date	Sample	M1	M2	sample average		*2	
		20/08/2018	water3	1320	3800	2560	2480	6150400	
		20/08/2018	water3	2640	2200	2420	440	193600	
		20/08/2018	water3	3520	3120	3320	400	160000	
		20/08/2018	water3	3680	9160	6420	5480	30030400	
		20/08/2018	water3	1840	4680	3260	2840	8065600	
		20/08/2018	water3	760	1280	1020	520	270400	
		20/08/2018	water3	3040	2800	2920	240	57600	
		20/08/2018	water3	2600	2520	2560	80	6400	
		20/08/2018	water3	2760	2640	2700	120	14400	
		20/08/2018	water3	1680	2560	2120	880	774400	
					Average:	2930	Sum	45723200	
					SD	1388	P=	10	
				SD within samples:		1512			
				SD between samples:		885			
		Date	Sample number	Test portion 1	Test portion 2	sample average	Between test portion range	*2	
		03/10/2017	water3	2680	6480	4580	3800	14440000	
	CELLS / L	03/10/2017	water3	2920	1320	2120	1600	2560000	
		03/10/2017	water3	3440	2560	3000	880	774400	
					Average:	3233	Sum	17774400	
					SD	1246	P=	3	
				SD within samples:		1721			
				SD between samples:		269			
	homogeneity criteria			885	416				
	stability check criteria			2930	3233	303			

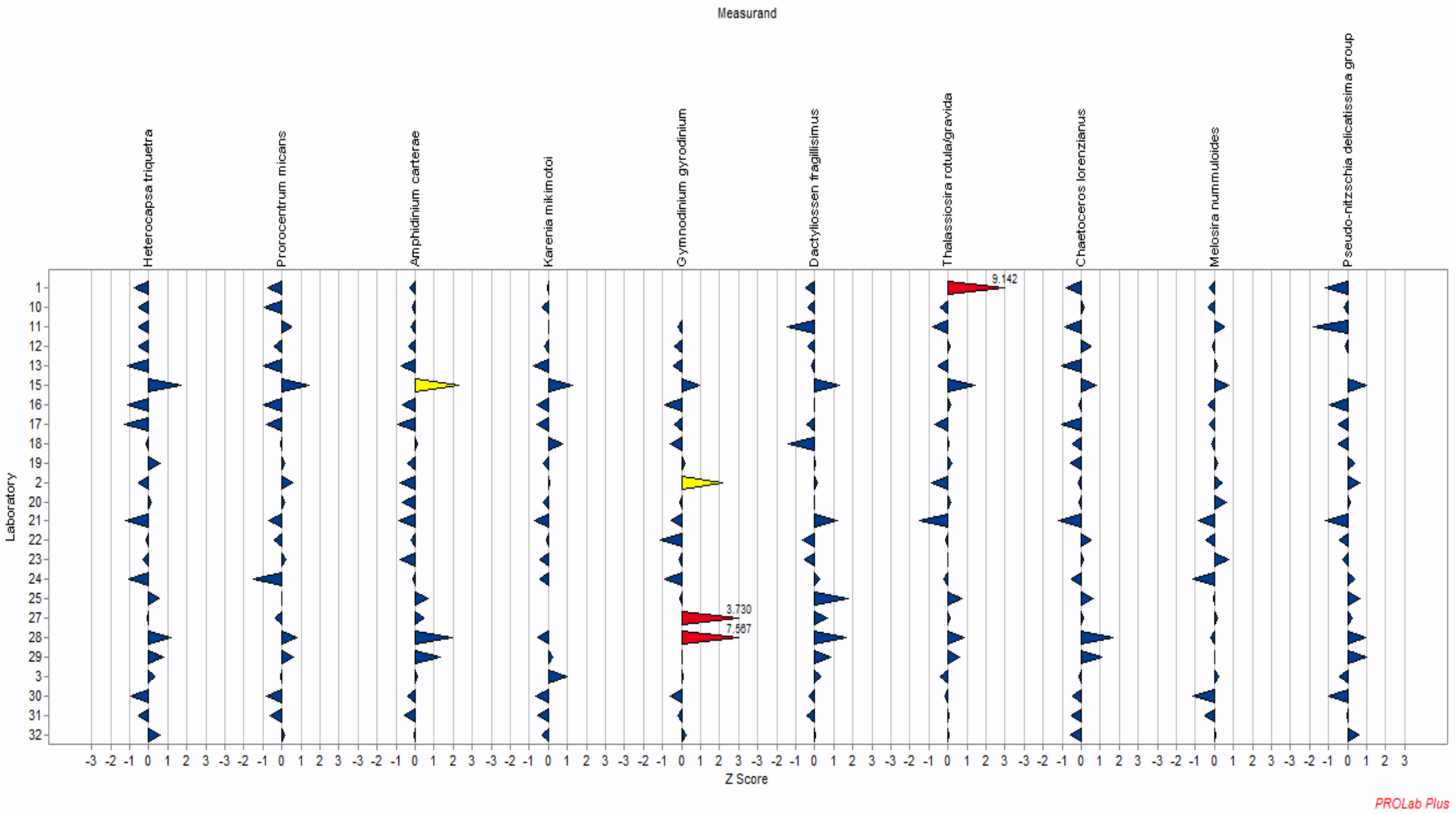
Analysts results for *Melosira nummuloides*

Analyst Code	Average	X-X*	it1	it2	it3	it4	it5
46	453	1760	1131	1131	1131	1132	1132
94	600	1613	1131	1131	1131	1132	1132
24	867	1347	1131	1131	1131	1132	1132
30	893	1320	1131	1131	1131	1132	1132
34	1013	1200	1131	1131	1131	1132	1132
61	1033	1180	1131	1131	1131	1132	1132
48	1038	1175	1131	1131	1131	1132	1132
82	1187	1027	1187	1187	1187	1187	1187
99	1200	1013	1200	1200	1200	1200	1200
21	1253	960	1253	1253	1253	1253	1253
80	1418	795	1418	1418	1418	1418	1418
45	1437	776	1437	1437	1437	1437	1437
77	1453	760	1453	1453	1453	1453	1453
86	1480	733	1480	1480	1480	1480	1480
95	1493	720	1493	1493	1493	1493	1493
52	1547	667	1547	1547	1547	1547	1547
64	1547	667	1547	1547	1547	1547	1547
8	1573	640	1573	1573	1573	1573	1573
31	1587	627	1587	1587	1587	1587	1587
33	1587	627	1587	1587	1587	1587	1587
41	1640	573	1640	1640	1640	1640	1640
7	1647	567	1647	1647	1647	1647	1647
22	1680	533	1680	1680	1680	1680	1680
44	1693	520	1693	1693	1693	1693	1693
71	1720	493	1720	1720	1720	1720	1720
54	1733	480	1733	1733	1733	1733	1733
10	1784	429	1784	1784	1784	1784	1784
16	1800	413	1800	1800	1800	1800	1800
91	1812	401	1812	1812	1812	1812	1812
4	1840	373	1840	1840	1840	1840	1840
56	1840	373	1840	1840	1840	1840	1840
57	1840	373	1840	1840	1840	1840	1840
53	1867	346	1867	1867	1867	1867	1867
17	1897	316	1897	1897	1897	1897	1897
1	1900	313	1900	1900	1900	1900	1900
39	1933	280	1933	1933	1933	1933	1933
28	1960	253	1960	1960	1960	1960	1960
67	1960	253	1960	1960	1960	1960	1960
18	1973	240	1973	1973	1973	1973	1973
68	1973	240	1973	1973	1973	1973	1973
65	1985	229	1985	1985	1985	1985	1985
5	2013	200	2013	2013	2013	2013	2013
12	2080	133	2080	2080	2080	2080	2080
25	2133	80	2133	2133	2133	2133	2133
84	2160	53	2160	2160	2160	2160	2160
29	2167	47	2167	2167	2167	2167	2167
35	2200	13	2200	2200	2200	2200	2200
63	2213	0	2213	2213	2213	2213	2213
32	2267	53	2267	2267	2267	2267	2267
79	2280	67	2280	2280	2280	2280	2280
85	2288	75	2288	2288	2288	2288	2288
74	2293	80	2293	2293	2293	2293	2293
75	2293	80	2293	2293	2293	2293	2293
49	2300	87	2300	2300	2300	2300	2300
38	2307	93	2307	2307	2307	2307	2307

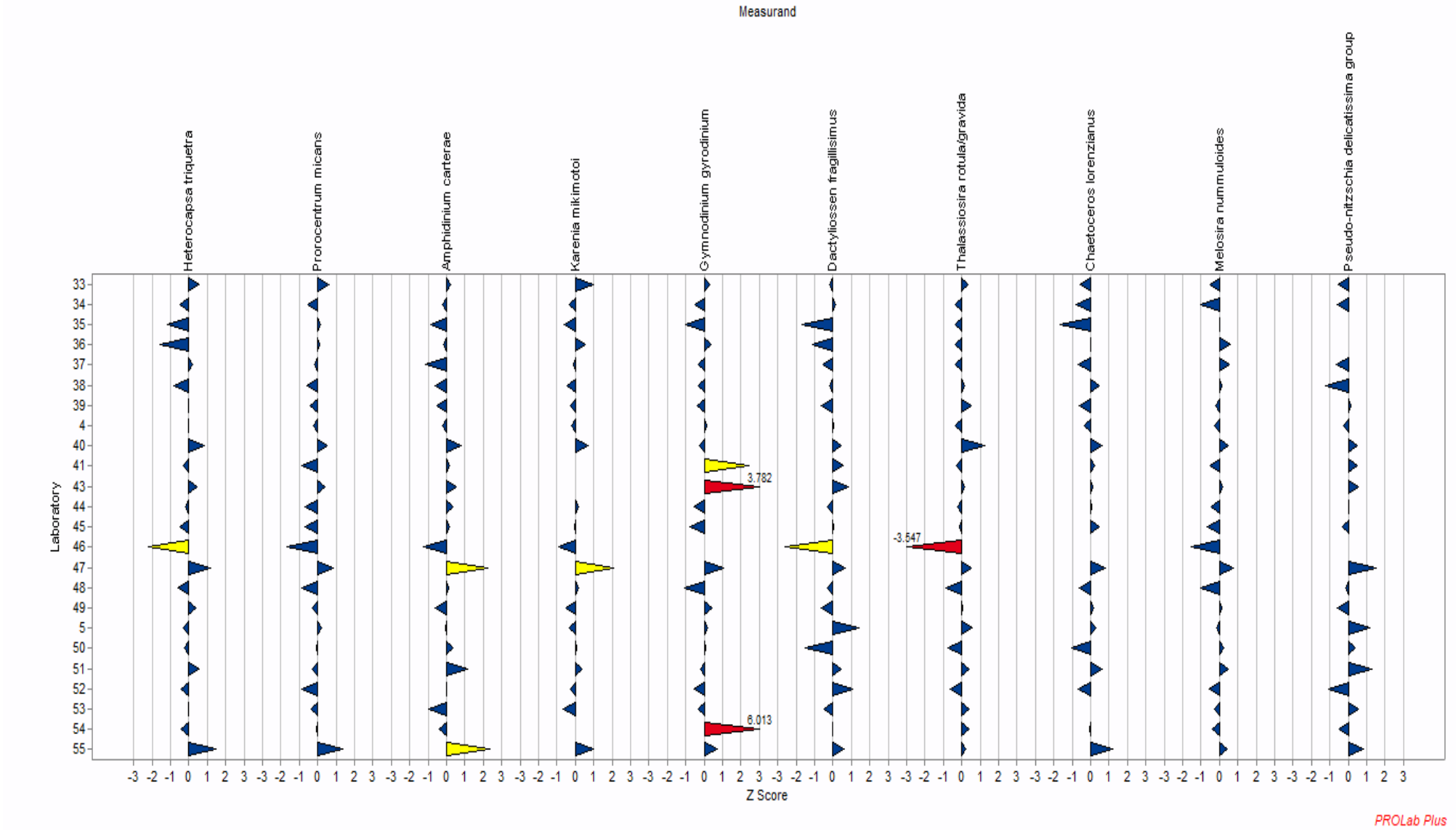
Analysts results for *Melosira nummuloides*

13	2373	160	2373	2373	2373	2373	2373
43	2373	160	2373	2373	2373	2373	2373
9	2387	173	2387	2387	2387	2387	2387
19	2387	173	2387	2387	2387	2387	2387
97	2387	173	2387	2387	2387	2387	2387
27	2400	187	2400	2400	2400	2400	2400
50	2427	213	2427	2427	2427	2427	2427
83	2453	240	2453	2453	2453	2453	2453
3	2467	253	2467	2467	2467	2467	2467
59	2490	277	2490	2490	2490	2490	2490
96	2493	280	2493	2493	2493	2493	2493
58	2600	387	2600	2600	2600	2600	2600
89	2609	395	2609	2609	2609	2609	2609
2	2619	406	2619	2619	2619	2619	2619
55	2627	413	2627	2627	2627	2627	2627
69	2667	453	2667	2667	2667	2667	2667
87	2667	453	2667	2667	2667	2667	2667
40	2700	487	2700	2700	2700	2700	2700
51	2720	507	2720	2720	2720	2720	2720
6	2725	511	2725	2725	2725	2725	2725
11	2747	533	2747	2747	2747	2747	2747
37	2798	585	2798	2798	2798	2798	2798
62	2813	600	2813	2813	2813	2813	2813
36	2827	613	2827	2827	2827	2827	2827
78	2840	627	2840	2840	2840	2840	2840
81	2867	653	2867	2867	2867	2867	2867
76	2880	667	2880	2880	2880	2880	2880
73	2907	694	2920	2920	2920	2920	2920
20	2920	707	3027	3027	3027	3027	3027
23	3027	813	3053	3053	3053	3053	3053
47	3053	840	3067	3067	3067	3067	3067
15	3067	853	3067	3067	3067	3067	3067
72	3067	853	3187	3187	3187	3187	3187
70	3187	973	3187	3187	3187	3187	3187
90	3427	1213	3296	3250	3238	3235	3234
60	3520	1307	3296	3250	3238	3235	3234
98	3560	1347	3296	3250	3238	3235	3234
88	3841	1627	3296	3250	3238	3235	3234
93	4100	1887	3296	3250	3238	3235	3234
92	4813	2600	3296	3250	3238	3235	3234
66	not id.	Not id.	not id.	not id.	not id.	not id.	not id.
Average X	2200		2187	2184	2183	2183	2183
SD S	747		625	620	618	618	618
robust average X*	2213	new *X**	2187	2184	2183	2183	2183
robust stdev S*	722	new *S**	708	703	701	701	701
δ= 1.5S*	1083		1063	1054	1052	1051	1051
X*- δ	1131		1124	1130	1132	1132	1132
X*+ δ	3296		3250	3238	3235	3234	3234
no of analysts P	95		95	95	95	95	95
Between Samples SD	885						
new stdev for MNUMMUL	1128						

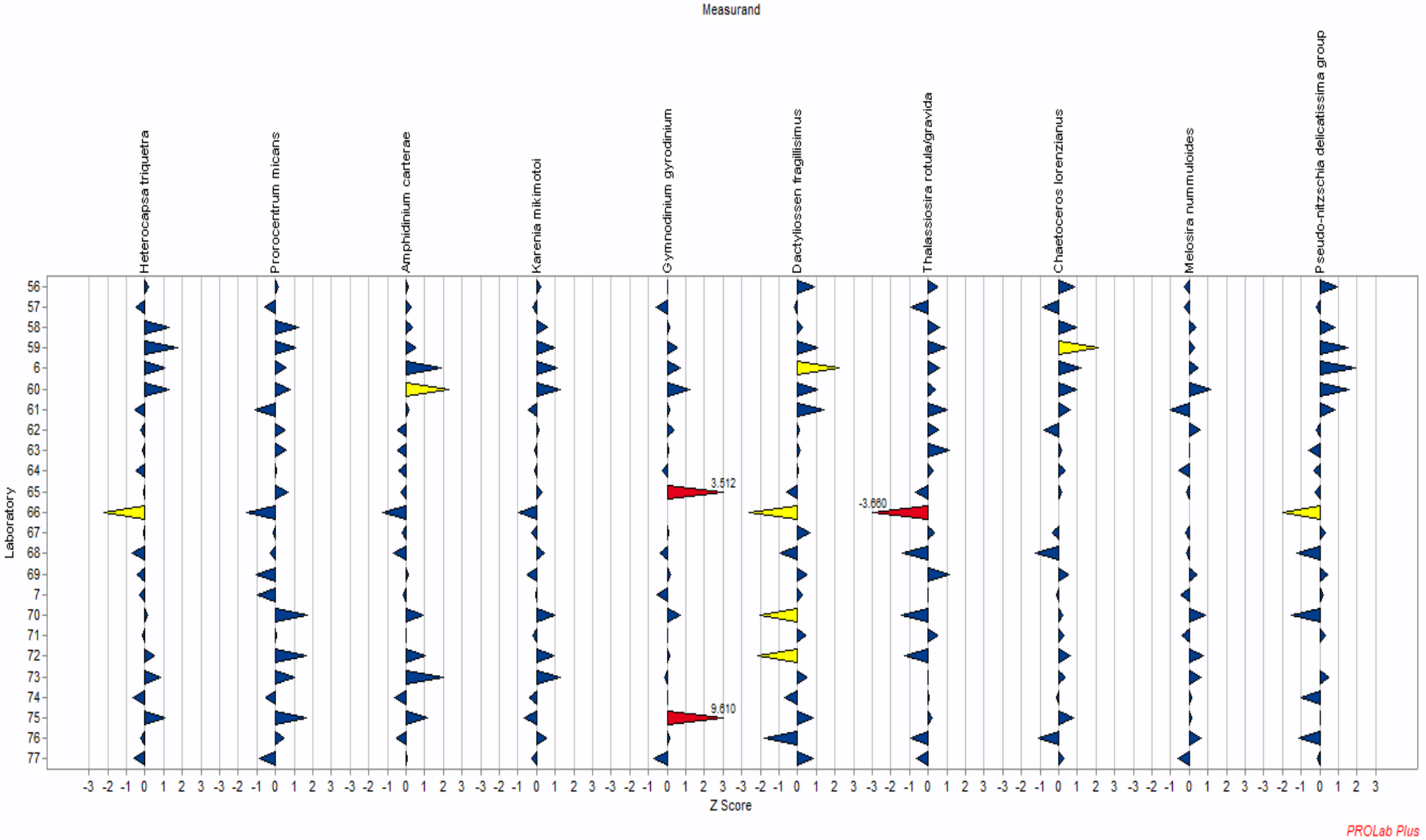
ANNEX X: Summary of Z-scores IPI2018 for all measurands pg1



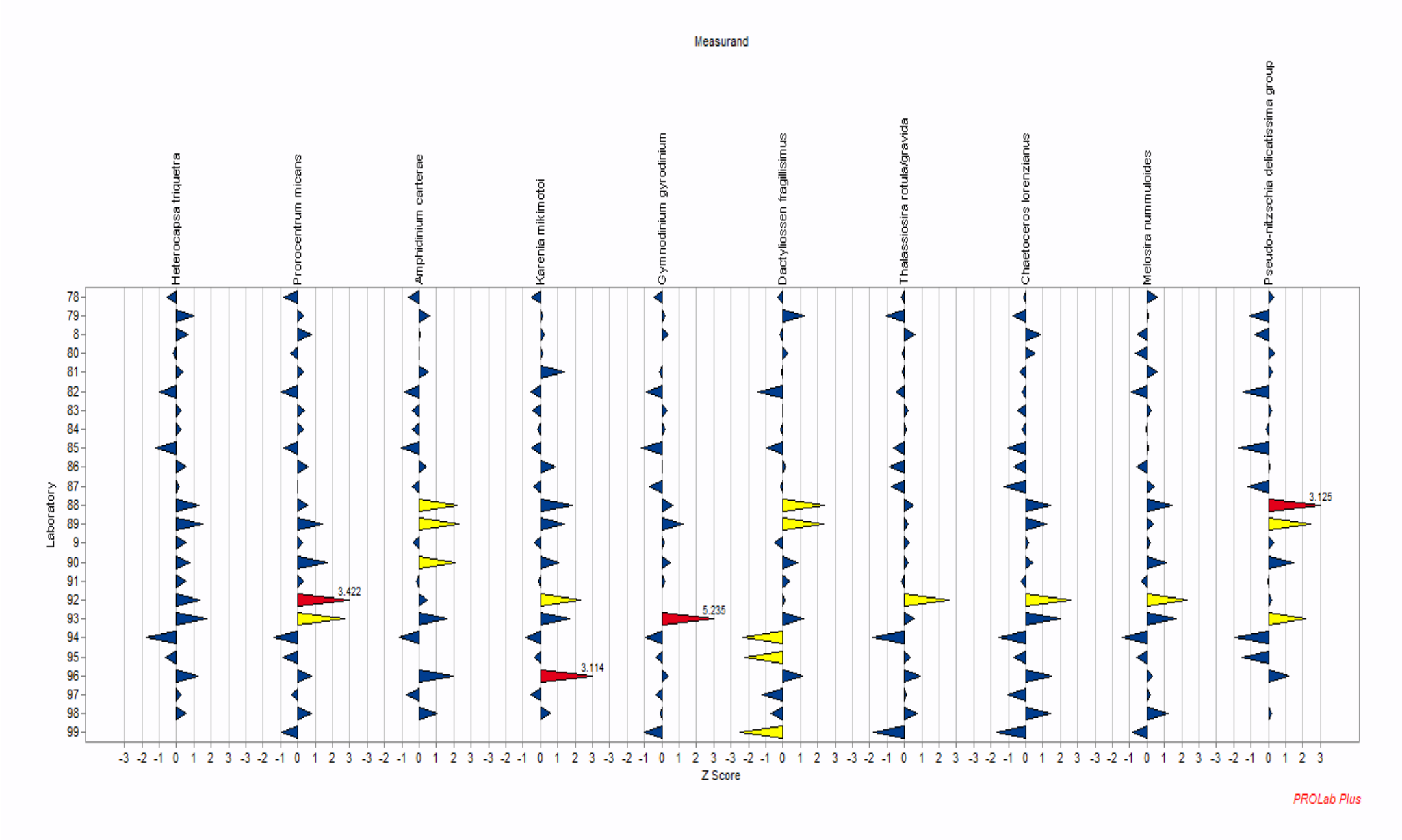
ANNEX X: Summary of Z-scores IPI2018 for all measurands pg2



ANNEX X: Summary of Z-scores IPI2018 for all measurands pg3



ANNEX X: Summary of Z-scores IPI2018 for all measurands pg4



ANNEX XI: Performance statistics for the test IPI2018

Analyst code	Total	Within tolerance limits	%	Successful	Analyst code	Total	Within tolerance limits	%	Successful	Analyst code	Total	Within tolerance limits	%
45	10	10	100 %	Yes	18	10	10	100 %	Yes	36	10	9	90 %
17	10	10	100 %	Yes	52	10	10	100 %	Yes	53	10	9	90 %
48	10	10	100 %	Yes	79	10	10	100 %	Yes	6	10	9	90 %
30	10	10	100 %	Yes	5	10	10	100 %	Yes	75	10	9	90 %
31	10	10	100 %	Yes	4	10	10	100 %	Yes	97	10	9	90 %
50	10	10	100 %	Yes	29	10	10	100 %	Yes	70	10	9	90 %
24	10	10	100 %	Yes	98	10	10	100 %	Yes	90	10	9	90 %
91	10	10	100 %	Yes	82	10	10	100 %	Yes	55	10	9	90 %
62	10	10	100 %	Yes	76	10	10	100 %	Yes	60	10	9	90 %
78	10	10	100 %	Yes	34	10	10	100 %	Yes	25	10	9	90 %
9	10	10	100 %	Yes	7	10	10	100 %	Yes	15	10	9	90 %
64	10	10	100 %	Yes	57	10	10	100 %	Yes	59	10	9	90 %
16	10	10	100 %	Yes	73	10	10	100 %	Yes	96	10	9	90 %
38	10	10	100 %	Yes	81	10	10	100 %	Yes	13	10	9	90 %
12	10	10	100 %	Yes	68	10	10	100 %	Yes	35	10	9	90 %
20	10	10	100 %	Yes	3	10	10	100 %	Yes	2	10	9	90 %
83	10	10	100 %	Yes	85	10	10	100 %	Yes	28	10	9	90 %
23	10	10	100 %	Yes	39	10	10	100 %	Yes	54	10	8	80 %
49	10	10	100 %	Yes	44	10	10	100 %	Yes	95	10	8	80 %
67	10	10	100 %	Yes	40	10	10	100 %	Yes	72	10	8	80 %
58	10	10	100 %	Yes	86	10	10	100 %	Yes	47	10	8	80 %
77	10	10	100 %	Yes	19	10	10	100 %	Yes	41	10	8	80 %
61	10	10	100 %	Yes	32	10	10	100 %	Yes	27	10	8	80 %
33	10	10	100 %	Yes	84	10	10	100 %	Yes	43	10	8	80 %
56	10	10	100 %	Yes	8	10	10	100 %	Yes	1	10	8	80 %
71	10	10	100 %	Yes	63	10	10	100 %	Yes	89	10	7	70 %
22	10	10	100 %	Yes	74	10	10	100 %	Yes	88	10	7	70 %
69	10	10	100 %	Yes	37	10	10	100 %	Yes	93	10	7	70 %
11	10	10	100 %	Yes	80	10	9	90 %	Yes	99	10	5	50 %
87	10	10	100 %	Yes	10	10	9	90 %	Yes	92	10	4	40 %
51	10	10	100 %	Yes	65	10	9	90 %	Yes	46	10	4	40 %
21	10	10	100 %	Yes	94	10	9	90 %	Yes	66	10	3	30 %

ANNEX XII: Summary of laboratory means

Analyst code	Heterocapsa triquetra	Z score	Prorocentrum micans	Z score	Amphidinium carterae	Z score	Karenia mikimotoi	Z score	Gymnodinium gyrodinium	Z score	Dactyliossen fragillisimus	Z score	Thalassiosira rotula/gravida	Z score	Chaetoceros lorenzianus	Z score	Melosira nummuloides	Z score	Pseudo-nitzschia delicatissima group	Z score
	cells/Litre		cells/Litre		cells/Litre		cells/Litre		cells/Litre		cells/Litre		cells/Litre		cells/Litre		cells/Litre		cells/Litre	
1	10767	-0.786	1300	-0.745	7833	-0.282	2733	-0.072			16633	-0.495	16000	9.142	1467	-0.817	1900	-0.251	1033	-1.186
2	12585	-0.514	2653	0.587	3911	-0.779	3129	0.060	2823	2.152	21429	0.122	3538	-0.884	2347	-0.168	2619	0.387	3197	0.676
3	18173	0.322	1973	-0.082	10787	0.092	5933	0.993	1240	0.099	22813	0.300	4107	-0.426	2440	-0.100	2467	0.251	1907	-0.435
4	15747	-0.041	1813	-0.240	8040	-0.256	2280	-0.223	1280	0.150	20627	0.019	4187	-0.361	2093	-0.355	1840	-0.304	2107	-0.263
5	13933	-0.312	2253	0.193	9587	-0.060	1947	-0.334	1320	0.202	31253	1.386	5320	0.550	2933	0.264	2013	-0.150	3787	1.183
6	23204	1.074	2638	0.572	25204	1.919	6218	1.088	1710	0.709	37755	2.223	5377	0.596	4188	1.190	2725	0.480	4638	1.916
7	13793	-0.333	1080	-0.962	8867	-0.151	2740	-0.070	760	-0.524	22360	0.242	4640	0.003	2453	-0.090	1647	-0.475	2660	0.213
8	20307	0.641	2853	0.784	10533	0.060	3747	0.265	1453	0.375	18987	-0.192	5400	0.615	3720	0.844	1573	-0.540	1507	-0.779
9	19733	0.555	2347	0.285	7320	-0.347	1987	-0.320	1267	0.133	16707	-0.486	4973	0.271	2773	0.146	2387	0.181	2800	0.334
10	12235	-0.566	1126	-0.916	8700	-0.172	1937	-0.337			17518	-0.381	4124	-0.412	2811	0.174	1784	-0.354	2136	-0.238
11	12493	-0.527	2547	0.482	8360	-0.215	2973	0.008	987	-0.230	8987	-1.479	3600	-0.833	1413	-0.857	2747	0.500	320	-1.800
12	12600	-0.512	1653	-0.397	7147	-0.369	2227	-0.240	853	-0.403	17440	-0.391	4733	0.078	3253	0.500	2080	-0.091	2227	-0.159
13	8533	-1.120	1080	-0.962	4320	-0.727	640	-0.768	813	-0.455	18960	-0.196	3947	-0.555	1173	-1.034	2373	0.169		
15	27333	1.692	3480	1.401	28120	2.288	6853	1.299	1880	0.929	30427	1.280	6373	1.398	3640	0.785	3067	0.783	3587	1.011
16	8747	-1.088	1040	-1.001	4680	-0.681	1107	-0.613	493	-0.870	20347	-0.017	4827	0.153	2400	-0.129	1800	-0.340	1293	-0.963
17	7525	-1.271	1205	-0.839	2872	-0.910	1141	-0.602	872	-0.379	17256	-0.415	3795	-0.677	1141	-1.058	1897	-0.253	1833	-0.498
18	15075	-0.141	1987	-0.069	10991	0.118	5240	0.763	680	-0.628	9440	-1.421	4663	0.022	1947	-0.463	1973	-0.186	1827	-0.504
19	20240	0.631	2227	0.167	6867	-0.404	2147	-0.267	1333	0.220	20560	0.010	4920	0.228	1813	-0.562	2387	0.181	2867	0.391
20	17213	0.178	2213	0.154	4787	-0.668	2107	-0.280	1093	-0.092	20147	-0.043	4853	0.175	2427	-0.109	2920	0.653	2547	0.116
21	7854	-1.221	1320	-0.725	3162	-0.873	827	-0.706	747	-0.541	29682	1.184	2760	-1.509	907	-1.230	1253	-0.824	1013	-1.204
22	15293	-0.109	1627	-0.424	8333	-0.218	2573	-0.125	280	-1.147	15307	-0.666	4493	-0.115	3253	0.500	1680	-0.446	1933	-0.412
23	13813	-0.330	2307	0.246	3747	-0.799	1600	-0.449	1053	-0.144	16307	-0.537	4627	-0.008	2707	0.097	3027	0.748	2120	-0.251
24	8893	-1.066	547	-1.487	9347	-0.090	1560	-0.462	467	-0.904	22387	0.245	4320	-0.254	1867	-0.522	867	-1.167	2813	0.345
25	19733	0.555	2053	-0.004	15693	0.714			1093	-0.092	34080	1.750	5533	0.722	3453	0.648	2133	-0.044	3187	0.667
27	15440	-0.087	1693	-0.358	13547	0.442			4040	3.730	25560	0.654	4787	0.121	2760	0.136	2400	0.192	2707	0.254
28	23783	1.161	2847	0.777	25467	1.952	1320	-0.542	6998	7.567	33359	1.657	5683	0.842	4841	1.671	1960	-0.198	3473	0.913
29	21267	0.785	2687	0.620	20460	1.318	3760	0.270	1200	0.047	27120	0.854	5380	0.599	4020	1.066	2167	-0.014	3553	0.982
30	9747	-0.938	1240	-0.804	6880	-0.402	880	-0.689	693	-0.610	18173	-0.297	4400	-0.190	1973	-0.444	893	-1.143	1240	-1.009
31	12267	-0.561	1413	-0.634	5653	-0.558	1253	-0.564	1027	-0.178	17133	-0.431	4693	0.046	1907	-0.493	1587	-0.529	2373	-0.033
32	19973	0.591	2240	0.180	9427	-0.080	2013	-0.311	1347	0.237	20813	0.043	4720	0.068	1787	-0.581	2267	0.074	3107	0.598
33	19640	0.541	2667	0.600	12107	0.260	5867	0.971	1400	0.306	19053	-0.184	5027	0.314	1827	-0.552	1587	-0.529	1800	-0.527
34	12753	-0.489	1500	-0.548	8467	-0.201	1893	-0.351	787	-0.489	21760	0.165	4180	-0.367	1487	-0.803	1013	-1.037	1687	-0.624
35	8240	-1.164	2200	0.141	3183	-0.871	1053	-0.631	363	-1.038	7440	-1.678	4227	-0.329	307	-1.673	2200	0.015		
36	5520	-1.570	2173	0.115	8720	-0.169	4507	0.518	1467	0.393	11760	-1.122	4173	-0.372	2573	-0.001	2827	0.571		
37	17257	0.185	1866	-0.188	1166	-1.126	2565	-0.128	933	-0.300	16324	-0.535	4198	-0.352	1632	-0.695	2798	0.546	1632	-0.671
38	10613	-0.809	1440	-0.607	5053	-0.634	1520	-0.476	907	-0.334	18760	-0.221	4840	0.164	3187	0.451	2307	0.110	960	-1.250
39	15907	-0.017	1640	-0.410	6120	-0.499	2080	-0.289	893	-0.351	15373	-0.657	5267	0.507	1720	-0.631	1933	-0.221	2587	0.150
40	21487	0.818	2567	0.502	16487	0.815	4993	0.680	960	-0.265	24033	0.457	6207	1.264	3447	0.643	2700	0.458	3000	0.506
41	13773	-0.336	1187	-0.857	11280	0.155			3027	2.416	24600	0.530	4267	-0.297	2920	0.254	1640	-0.481	2947	0.460
43	18813	0.418	2440	0.377	14307	0.538			4080	3.782	26840	0.818	4840	0.164	2733	0.117	2373	0.169	3067	0.563
44	14573	-0.216	1333	-0.712	12573	0.319	3480	0.177	747	-0.541	18120	-0.304	4347	-0.233	2667	0.068	1693	-0.434	2440	0.024

ANNEX XII: Summary of laboratory means

Analyst code	Heterocapsa triquetra	Z score	Prorocentrum micans	Z score	Amphidinium carterae	Z score	Karenia mikimotoi	Z score	Gymnodinium gyrodinium	Z score	Dactyliossen fragillisimus	Z score	Thalassiosira rotula/gravida	Z score	Chaetoceros lorenzianus	Z score	Melosira nummuloides	Z score	Pseudo-nitzschia delicatissima group	Z score
45	12766	-0.487	1375	-0.671	11230	0.149	2838	-0.037	570	-0.770	20633	0.020	4473	-0.131	3168	0.437	1437	-0.661	2063	-0.300
46	1253	-2.209	347	-1.683	107	-1.260	213	-0.910			213	-2.608	227	-3.547			453	-1.533		
47	23973	1.190	2947	0.876	27853	2.254	9133	2.058	1987	1.067	25720	0.674	5267	0.507	3653	0.795	3053	0.772	4160	1.504
48	11868	-0.621	1192	-0.851	11054	0.126	3491	0.180	334	-1.076	18268	-0.285	3525	-0.894	1718	-0.632	1038	-1.015	2211	-0.173
49	18667	0.396	1733	-0.319	5300	-0.603	1367	-0.527	1500	0.436	15467	-0.645	4700	0.051	2800	0.166	2300	0.104	1733	-0.584
50	14493	-0.228	2000	-0.056	12733	0.339	3240	0.097	1213	0.064	8507	-1.541	3667	-0.780	1133	-1.063	2427	0.216	2827	0.357
51	19867	0.575	1760	-0.292	19080	1.143	4107	0.385	987	-0.230	23960	0.448	5147	0.411	3413	0.618	2720	0.476	3907	1.286
52	13362	-0.398	1187	-0.857	10200	0.018	2093	-0.285	720	-0.576	28866	1.079	3827	-0.651	1653	-0.680	1547	-0.564	1147	-1.089
53	16000	-0.003	1700	-0.351	2500	-0.957	980	-0.655	900	-0.342	16667	-0.491	5100	0.373			1867	-0.280	3033	0.535
54	13333	-0.402	1987	-0.069	6747	-0.419			5800	6.013	20480	0.000	5133	0.400	2520	-0.041	1733	-0.399	1840	-0.492
55	25933	1.483	3427	1.348	28693	2.361	5933	0.993	1733	0.738	25240	0.612	4907	0.218	4227	1.218	2627	0.393	3347	0.804
56	17493	0.220	2227	0.167	10947	0.113	3733	0.261	1173	0.012	27373	0.887	5267	0.507	3760	0.874	1840	-0.304	3480	0.919
57	12760	-0.488	1473	-0.574	12133	0.263	2347	-0.200	700	-0.602	18747	-0.223	3507	-0.909	1440	-0.837	1840	-0.304	2153	-0.223
58	24650	1.291	3317	1.240	12683	0.333	4650	0.566	1283	0.155	22417	0.249	5383	0.601	3900	0.977	2600	0.370	3350	0.807
59	27690	1.745	3160	1.086	14200	0.525	5920	0.989	1600	0.565	28660	1.053	5810	0.944	5430	2.105	2490	0.272	4190	1.530
60	24600	1.283	2893	0.823	28000	2.273	6827	1.290	2093	1.205	28693	1.057	5120	0.389	3907	0.982	3520	1.185	4253	1.585
61	12233	-0.566	967	-1.073	11233	0.149	1533	-0.471	1267	0.133	31667	1.440	5900	1.017	3400	0.608	1033	-1.019	3400	0.850
62	14373	-0.246	2600	0.534	6280	-0.478	3320	0.123	1453	0.375	21080	0.077	5347	0.572	1493	-0.798	2813	0.559	2200	-0.182
63	15133	-0.133	2653	0.587	6600	-0.438	2640	-0.103	1213	0.064	21733	0.161	6050	1.138	2813	0.176	2213	0.027	1707	-0.607
64	12773	-0.486	2107	0.049	6920	-0.397	2680	-0.090	947	-0.282	20653	0.022	4973	0.271	3067	0.363	1547	-0.564	2013	-0.343
65	15631	-0.058	2757	0.689	7797	-0.286	3807	0.286	3872	3.512	15621	-0.625	3740	-0.721	2827	0.186	1985	-0.176	2069	-0.295
66	1353	-2.194	453	-1.578	67	-1.266	73	-0.957			33	-2.632	87	-3.660					67	-2.018
67	15400	-0.093	1920	-0.135	8333	-0.218	2160	-0.263	1227	0.081	25520	0.649	5067	0.346	2093	-0.355	1960	-0.198	2800	0.334
68	11293	-0.707	1760	-0.292	4733	-0.674	4200	0.416	880	-0.368	12933	-0.971	2920	-1.381	840	-1.279	1973	-0.186	973	-1.238
69	13292	-0.408	1000	-1.040	10875	0.104	1458	-0.496	1333	0.220	24458	0.512	6042	1.131	3292	0.529	2667	0.429	2875	0.398
70	16867	0.127	3813	1.729	17227	0.908	5920	0.989	1733	0.738	4560	-2.049	2840	-1.445	2907	0.245	3187	0.890	640	-1.525
71	15013	-0.151	2107	0.049	10067	0.001	2360	-0.196	1173	0.012	23853	0.434	5240	0.486	2933	0.264	1720	-0.410	2787	0.322
72	19387	0.504	3747	1.663	18040	1.011	5813	0.953	1280	0.150	3827	-2.143	3053	-1.273	3400	0.608	3067	0.783		
73	21627	0.839	3120	1.046	25813	1.996	6800	1.282	1067	-0.126	24400	0.504	4640	0.003	3013	0.323	2907	0.642	2987	0.495
74	11467	-0.681	1493	-0.555	5160	-0.620	1720	-0.409	1187	0.029	15147	-0.687	4707	0.057	2400	-0.129	2293	0.098	1227	-1.020
75	23027	1.048	3747	1.663	19280	1.168	1000	-0.649	8573	9.610	26893	0.825	4893	0.207	3640	0.785	2293	0.098	2427	0.013
76	14413	-0.240	2533	0.469	6027	-0.511	4533	0.527	1267	0.133	6253	-1.831	3507	-0.909	1120	-1.073	2880	0.618	1133	-1.100
77	11933	-0.611	1173	-0.870	10600	0.069	2120	-0.276	627	-0.697	27067	0.848	3800	-0.673	2947	0.274	1453	-0.647	2267	-0.125
78	12520	-0.523	1227	-0.817	4960	-0.646	1427	-0.507	813	-0.455	18040	-0.314	4427	-0.168	2413	-0.119	2840	0.582	2787	0.322
79	22667	0.994	2427	0.364	14869	0.610	3400	0.150	1320	0.202	30011	1.226	3347	-1.037	1533	-0.768	2280	0.086	1160	-1.077
80	14886	-0.170	1640	-0.410	10052	-0.001	3367	0.139			22718	0.288	4465	-0.138	3268	0.511	1418	-0.678	2861	0.387
81	18707	0.402	2413	0.351	14240	0.530	7133	1.392	1053	-0.144	19853	-0.081	4493	-0.115	2067	-0.375	2867	0.606	2720	0.265
82	9333	-1.000	1053	-0.988	3187	-0.870	1200	-0.582	467	-0.904	9133	-1.460	4040	-0.479	2267	-0.227	1187	-0.883	693	-1.479
83	17973	0.292	2467	0.403	7000	-0.387	1640	-0.436	1387	0.289	20440	-0.005	4907	0.218	1973	-0.444	2453	0.240	2667	0.219
84	17627	0.240	2413	0.351	6800	-0.413	2427	-0.174	1307	0.185	19493	-0.127	4773	0.110	2253	-0.237	2160	-0.020	2227	-0.159

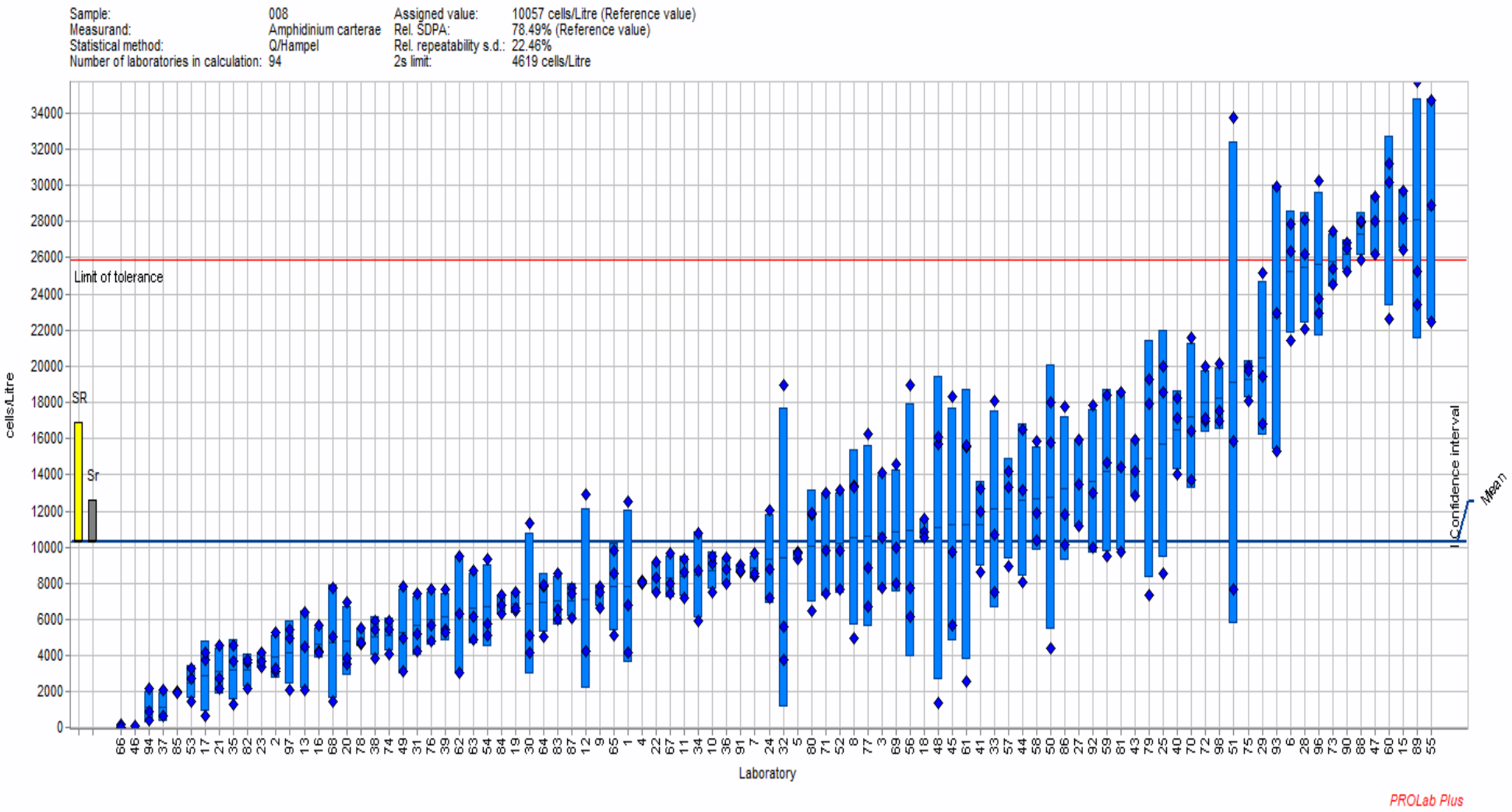
ANNEX XII: Summary of laboratory means

Analyst code	Heterocapsa triquetra	Z score	Prorocentrum micans	Z score	Amphidinium carterae	Z score	Karenia mikimotoi	Z score	Gymnodinium gyrodinium	Z score	Dactyliossen fragillisimus	Z score	Thalassiosira rotula/gravida	Z score	Chaetoceros lorenzianus	Z score	Melosira nummuloides	Z score	Pseudo-nitzschia delicatissima group	Z score
85	7773	-1.233	1203	-0.841	1995	-1.021	1496	-0.484	264	-1.167	12965	-0.967	3843	-0.638	1144	-1.055	2288	0.093	440	-1.697
86	19600	0.535	2693	0.626	13227	0.402	5553	0.867	1173	0.012	21513	0.133	3540	-0.882	1620	-0.704	1480	-0.623	2480	0.059
87	16947	0.139	2067	0.010	7053	-0.380	1827	-0.373	600	-0.732	19600	-0.113	3693	-0.758	867	-1.260	2667	0.429	1040	-1.181
88	24827	1.317	2652	0.586	27291	2.183	8478	1.840	1681	0.671	39233	2.413	5232	0.479	4522	1.436	3841	1.470	6044	3.125
89	26305	1.538	3493	1.413	28132	2.290	7160	1.401	2131	1.254	38538	2.324	4942	0.246	4232	1.222	2609	0.377	5232	2.427
90	21147	0.767	3787	1.702	26173	2.042	6133	1.060	1533	0.479	26867	0.822	4920	0.228	3120	0.402	3427	1.103	4133	1.481
91	19589	0.534	2381	0.319	8795	-0.160	2724	-0.075	1324	0.208	23330	0.367	4408	-0.183	2151	-0.313	1812	-0.329	2340	-0.062
92	25000	1.343	5533	3.422	13600	0.449	9893	2.311			21200	0.093	7867	2.599	6053	2.565	4813	2.332	2667	0.219
93	27633	1.737	4800	2.700	22700	1.602	8033	1.692	5200	5.235	29767	1.195	5333	0.561	5267	1.985	4100	1.699	4900	2.141
94	4227	-1.764	640	-1.395	1160	-1.127	427	-0.839	413	-0.974	2400	-2.327	2333	-1.853	467	-1.555	600	-1.403	147	-1.950
95	11547	-0.669	1187	-0.857	< 0		1960	-0.329	907	-0.334	3480	-2.188	5040	0.325	1667	-0.670	1493	-0.611	627	-1.536
96	24173	1.219	2880	0.810	25640	1.974	12307	3.114	1427	0.341	29293	1.134	5747	0.894	4573	1.474	2493	0.275	3800	1.194
97	17667	0.246	1707	-0.345	4160	-0.747	1173	-0.591	920	-0.316	10984	-1.222	4773	0.110	1160	-1.044	2387	0.181		
98	19880	0.577	2840	0.771	18227	1.035	4693	0.580	1093	-0.092	15027	-0.702	5573	0.754	4493	1.415	3560	1.221	2640	0.196
99			1133	-0.909	< 0				367	-1.034	1033	-2.503	2433	-1.772	333	-1.653	1200	-0.871		

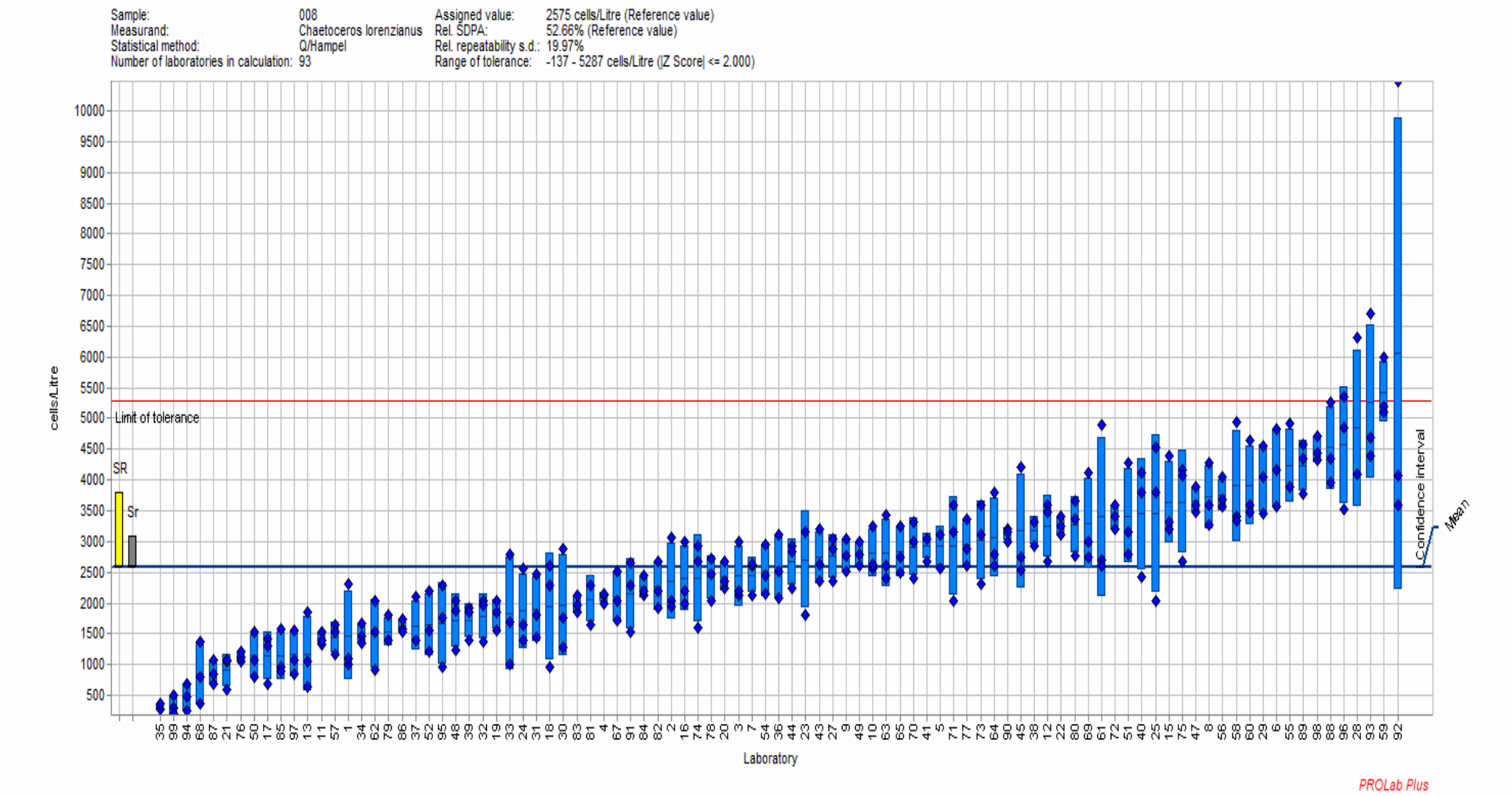
Explanation of outlier types

A: Single outlier	Grubbs
B: Differing laboratory mean	Grubbs
C: Excessive laboratory s.d.	Cochran
D: Excluded manually	
E: mean outside tolerance limits	
L: Differing laboratory mean (Grubbs II)	

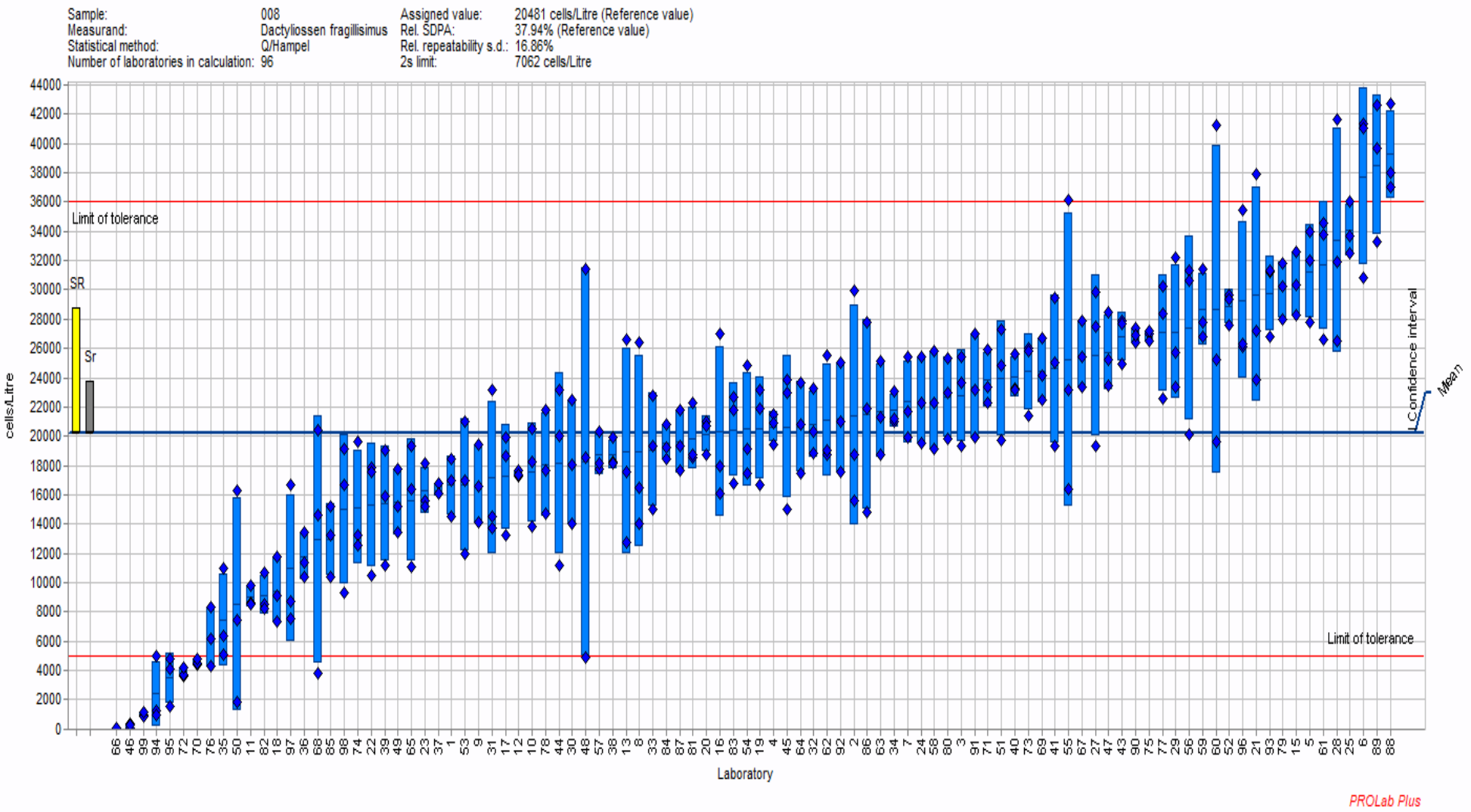
ANNEX XIII: Graphical summary of *Amphidinium carterae* results by analyst



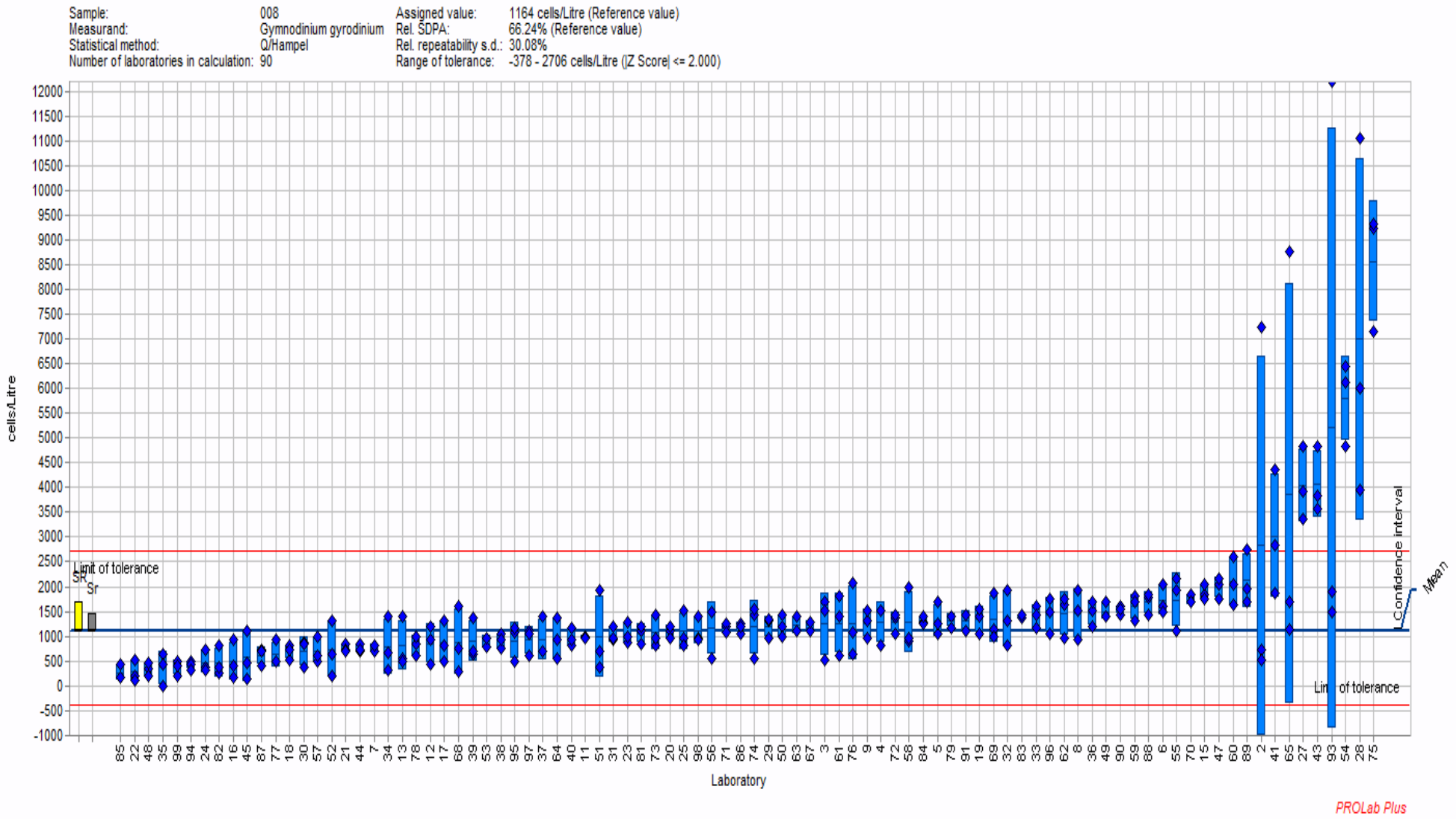
ANNEX XIII: Graphical summary of *Chaetoceros lorenzianus* results by analyst



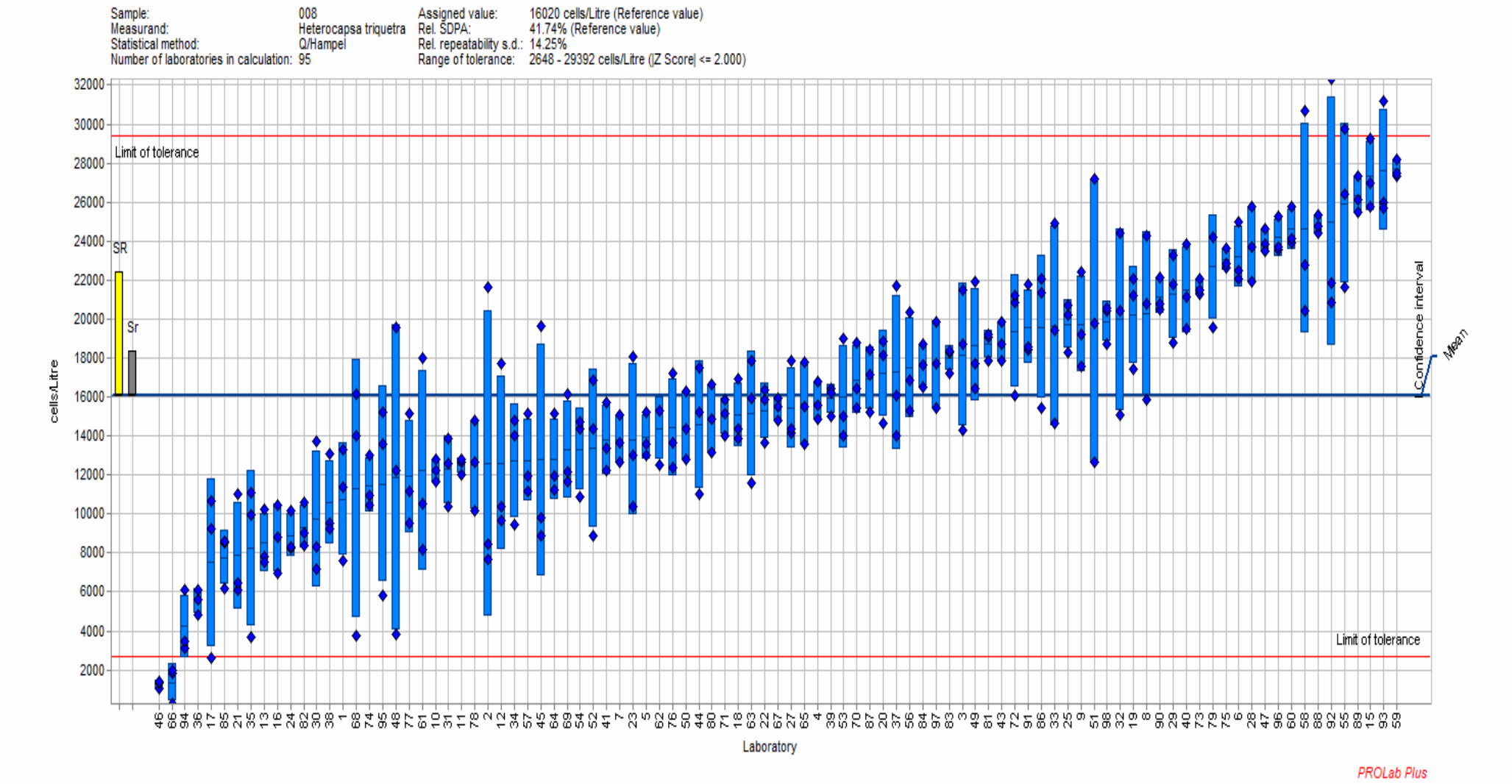
ANNEX XIII: Graphical summary of *Dactyliosolen fragilissimus* results by analyst



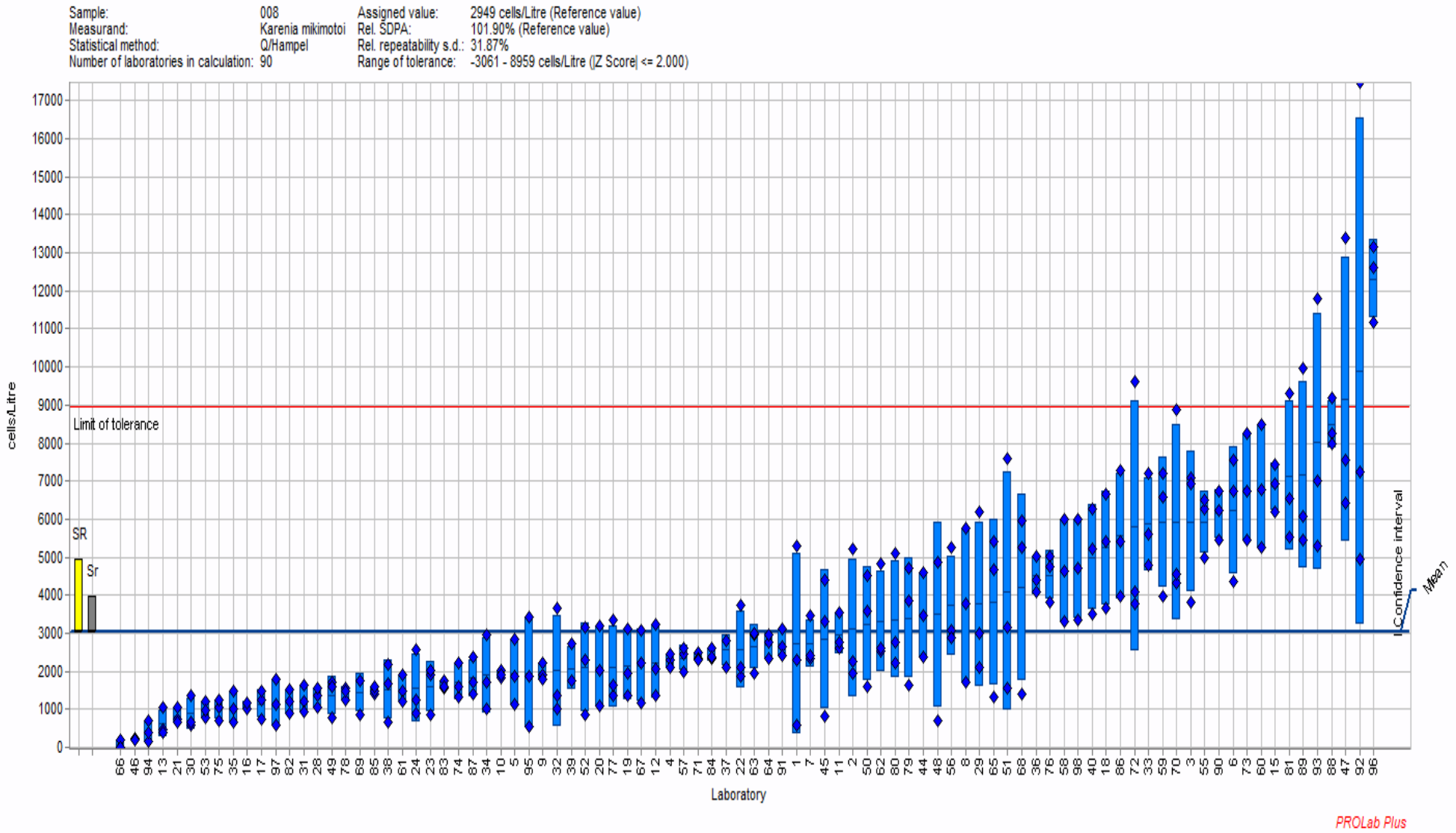
ANNEX XIII: Graphical summary of *Gymnodinium/Gyrodinium sp.* results by analyst



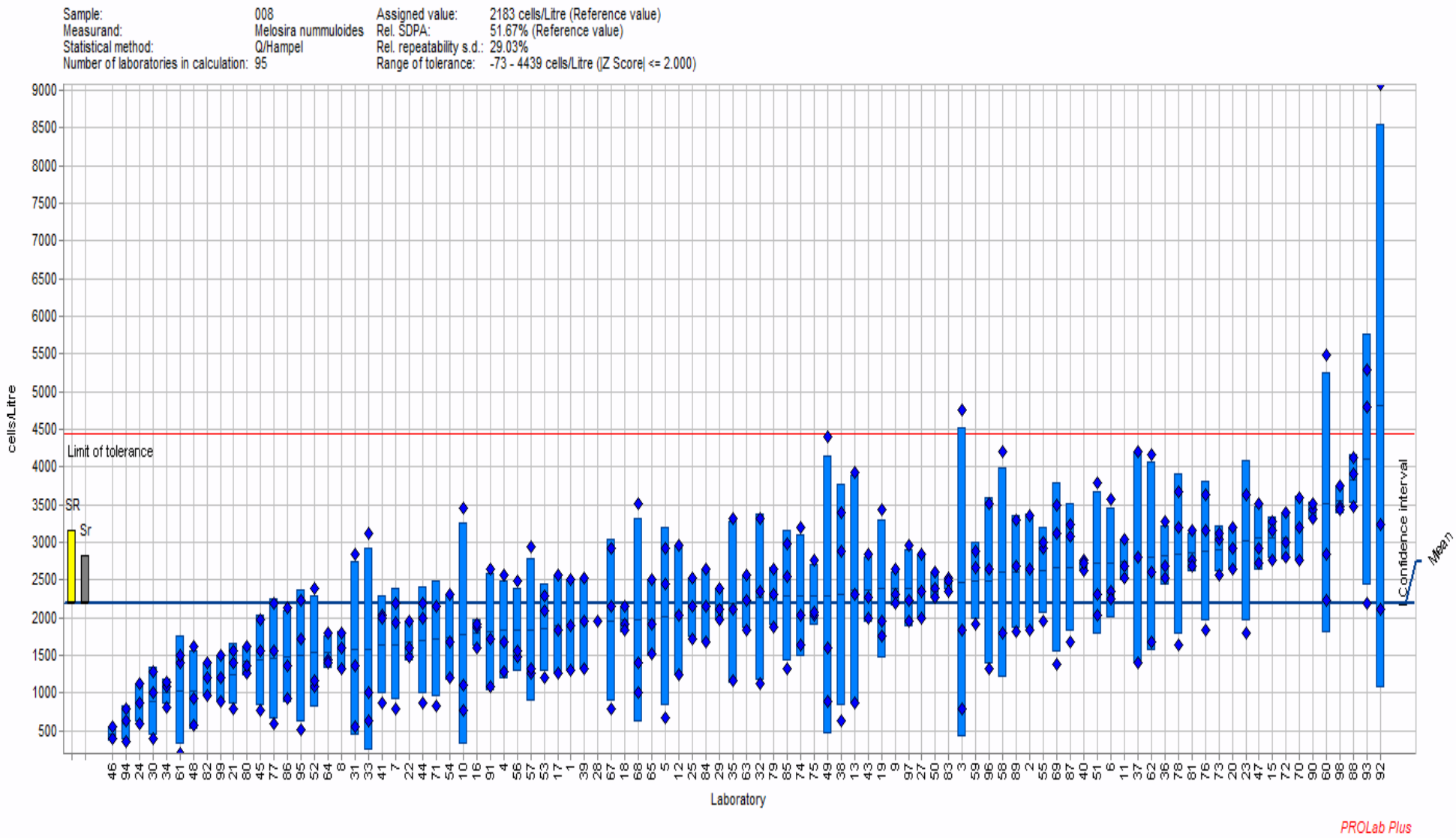
ANNEX XIII: Graphical summary of *Heterocapsa triquetra* results by analyst



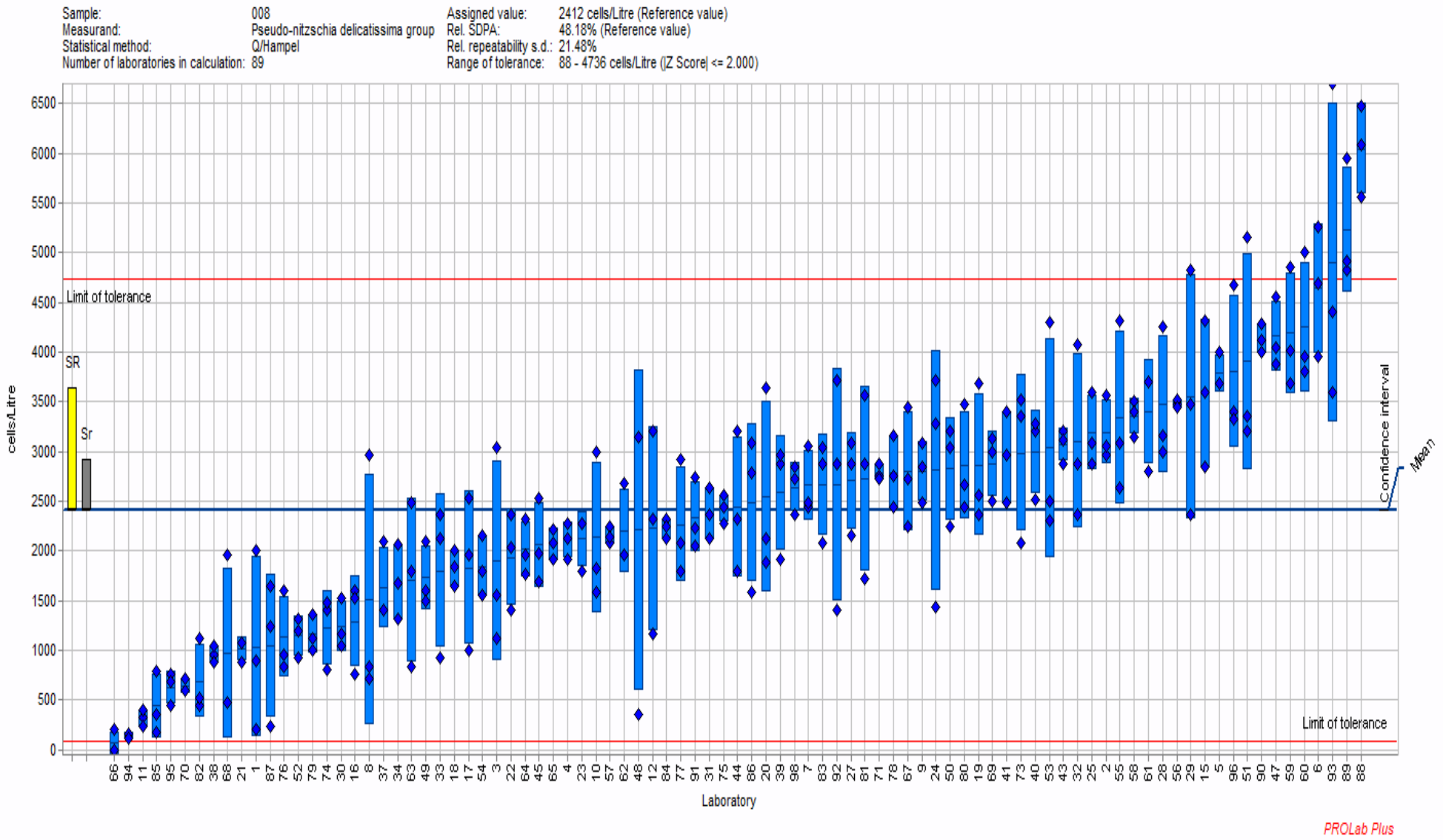
ANNEX XIII: Graphical summary of *Karenia mikimotoi* results by analyst



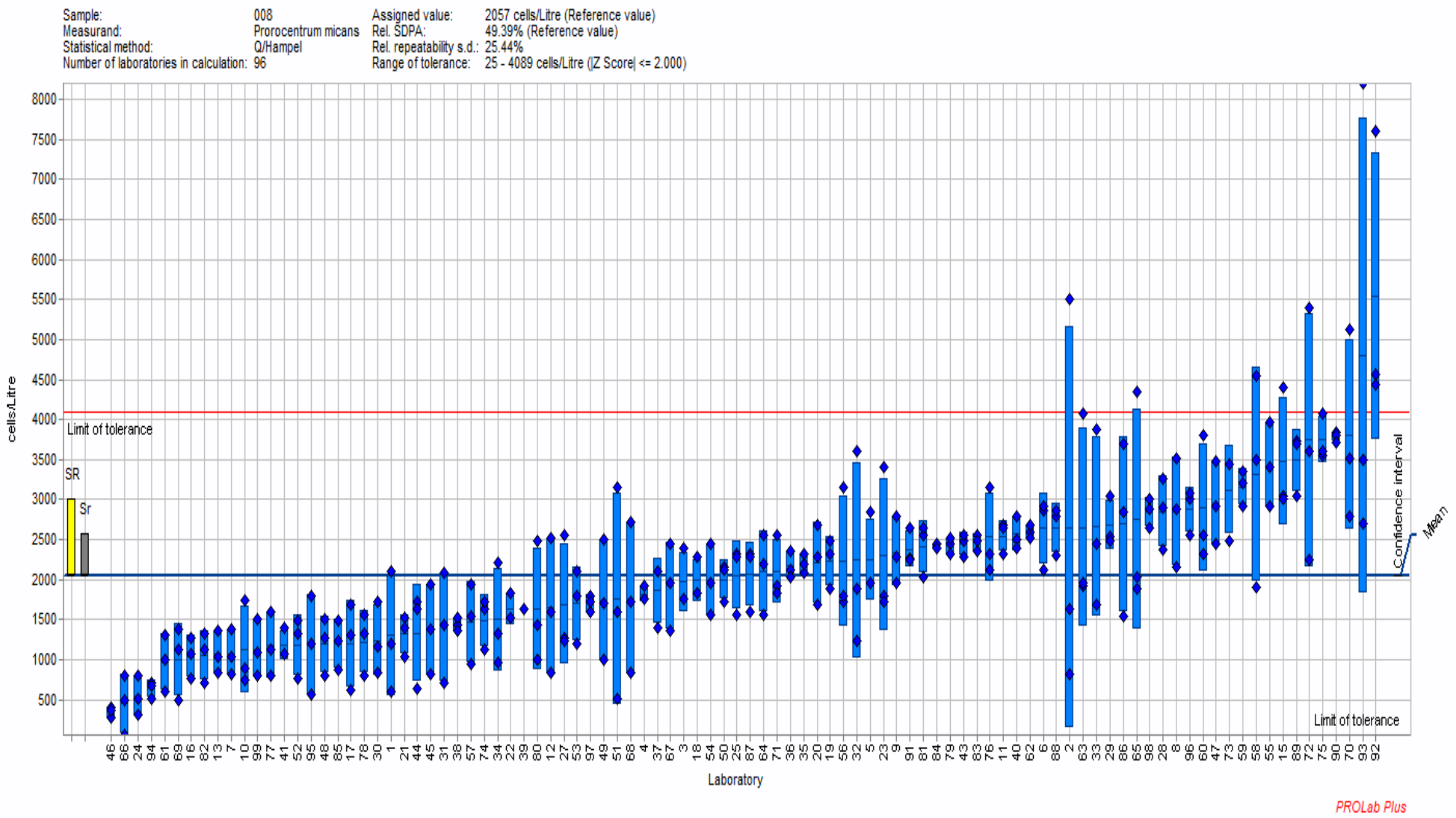
ANNEX XIII: Graphical summary of *Melosira nummuloides* results by analyst



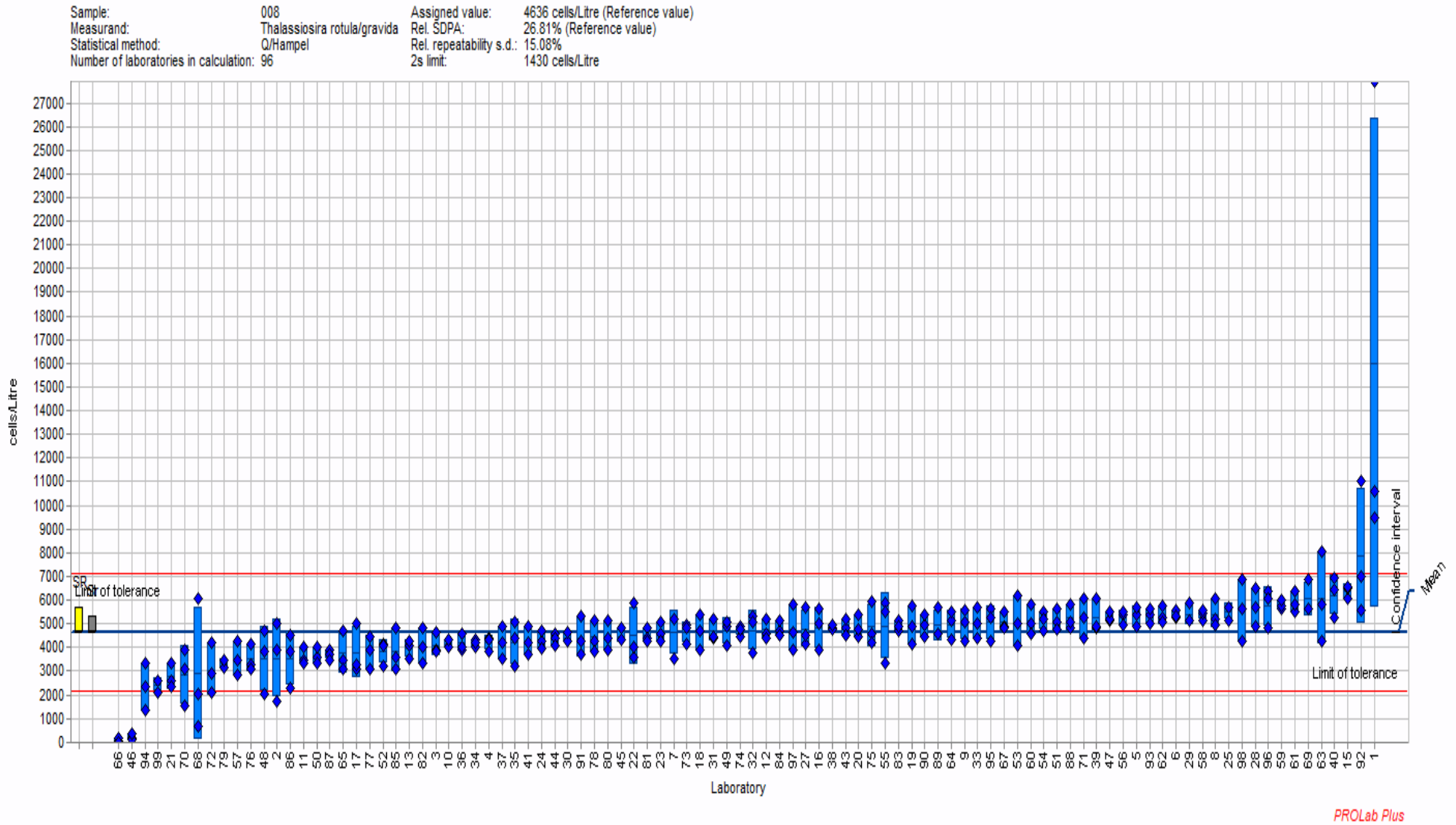
ANNEX XIII: Graphical summary of *Pseudo-nitzschia delicatissima group* results by analyst



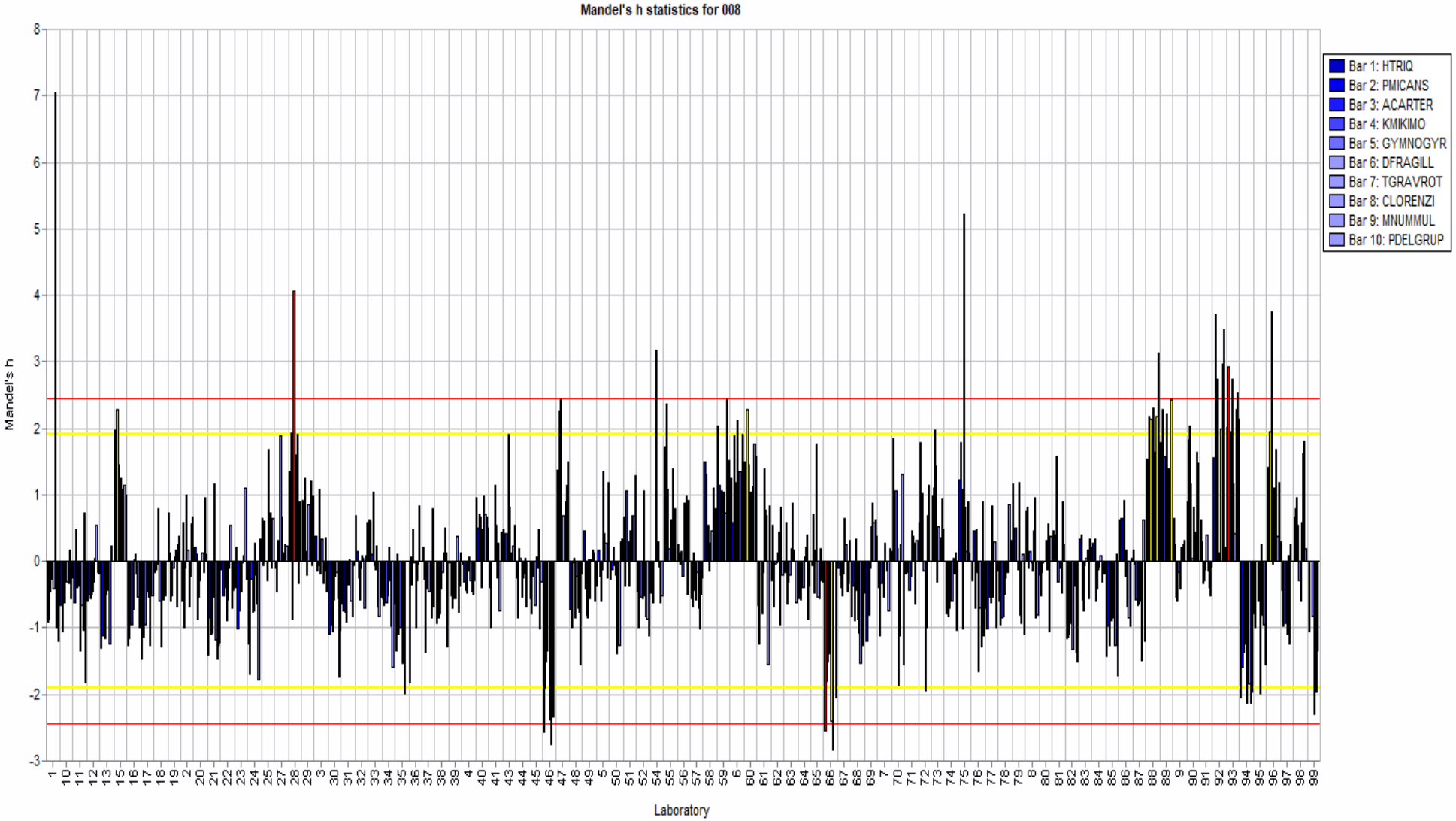
ANNEX XIII: Graphical summary of *Prorocentrum micans* results by analyst



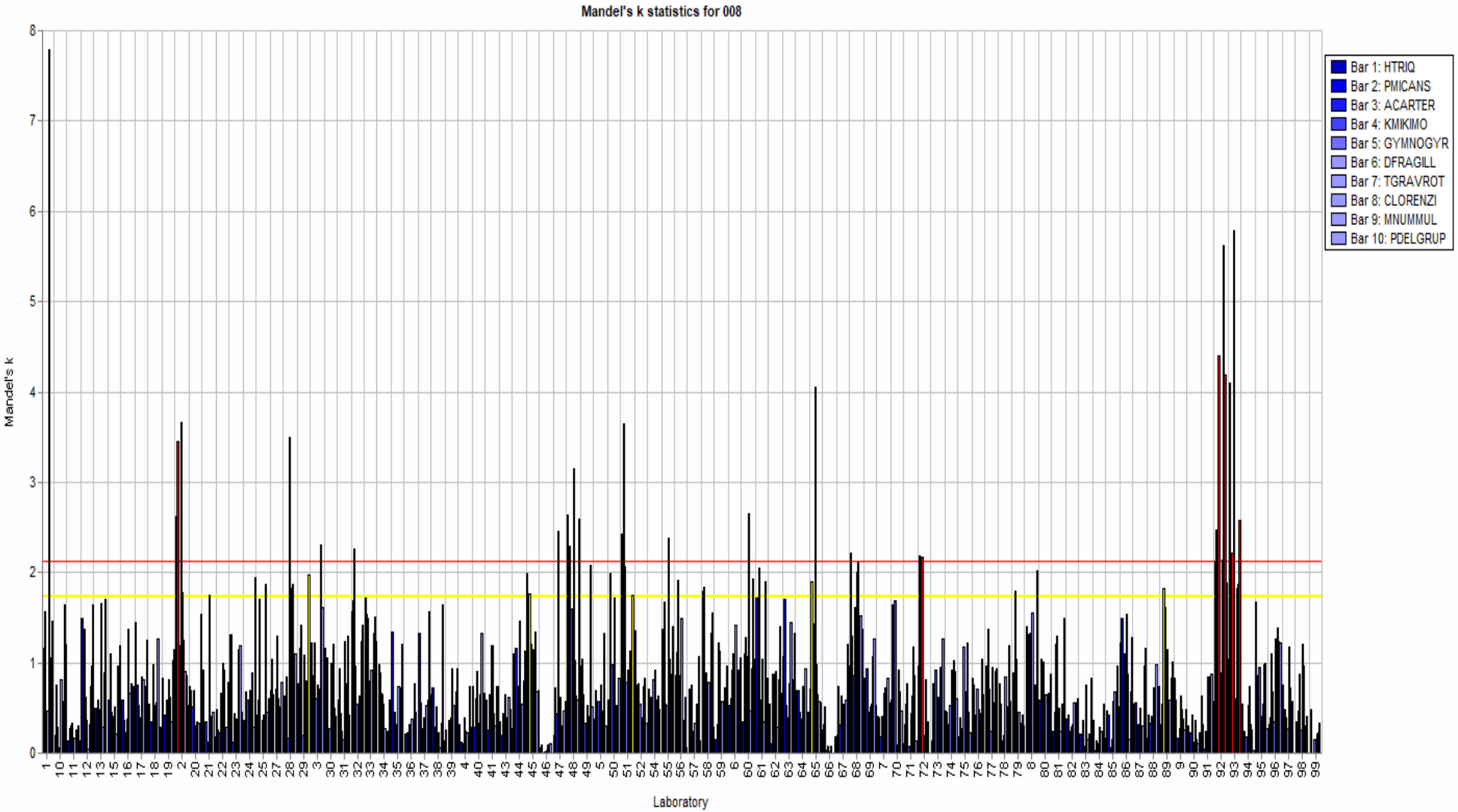
ANNEX XIII: Graphical summary of *Thalassiosira rotula/gravida* results by analyst



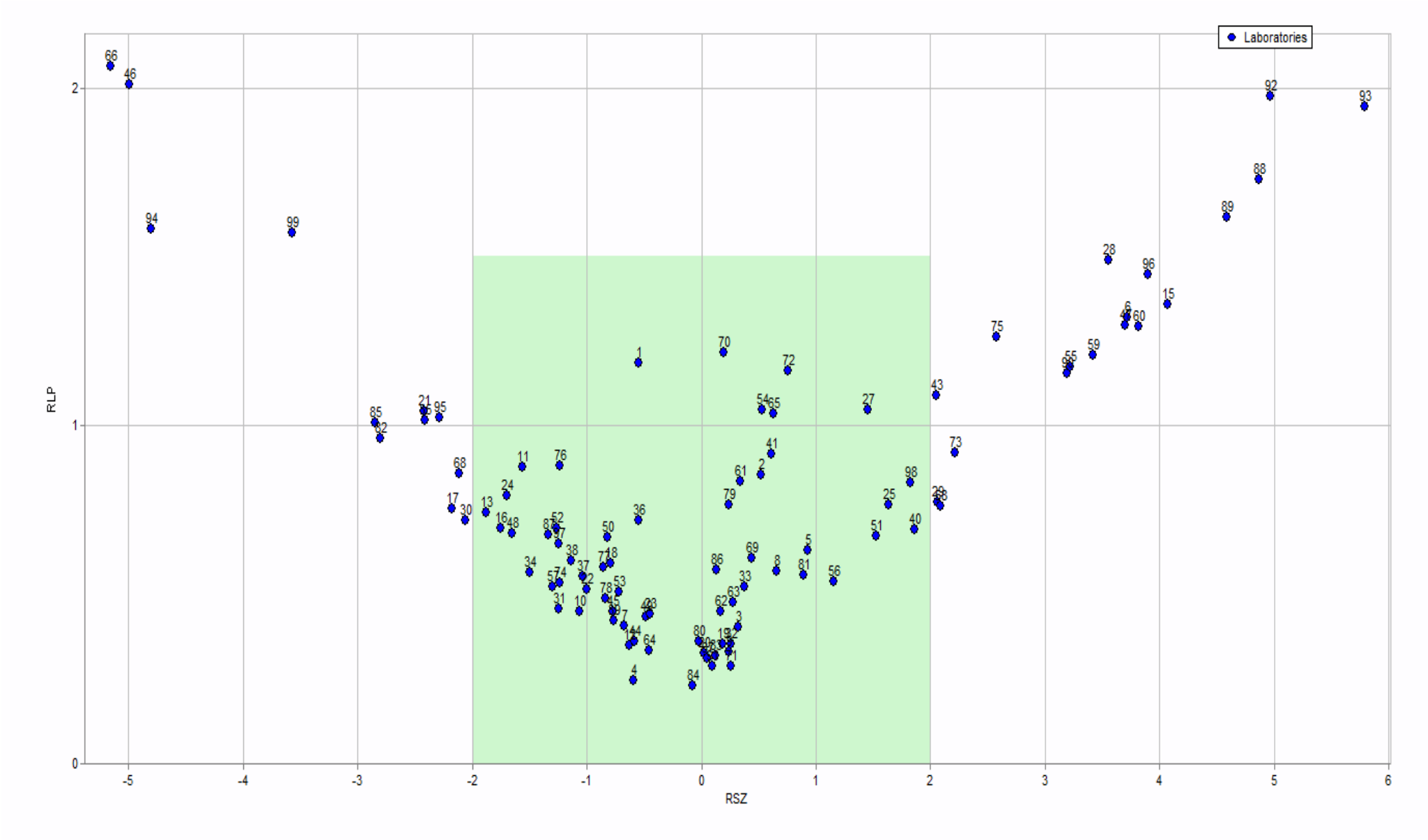
ANNEX XIV: Mandel's h statistics



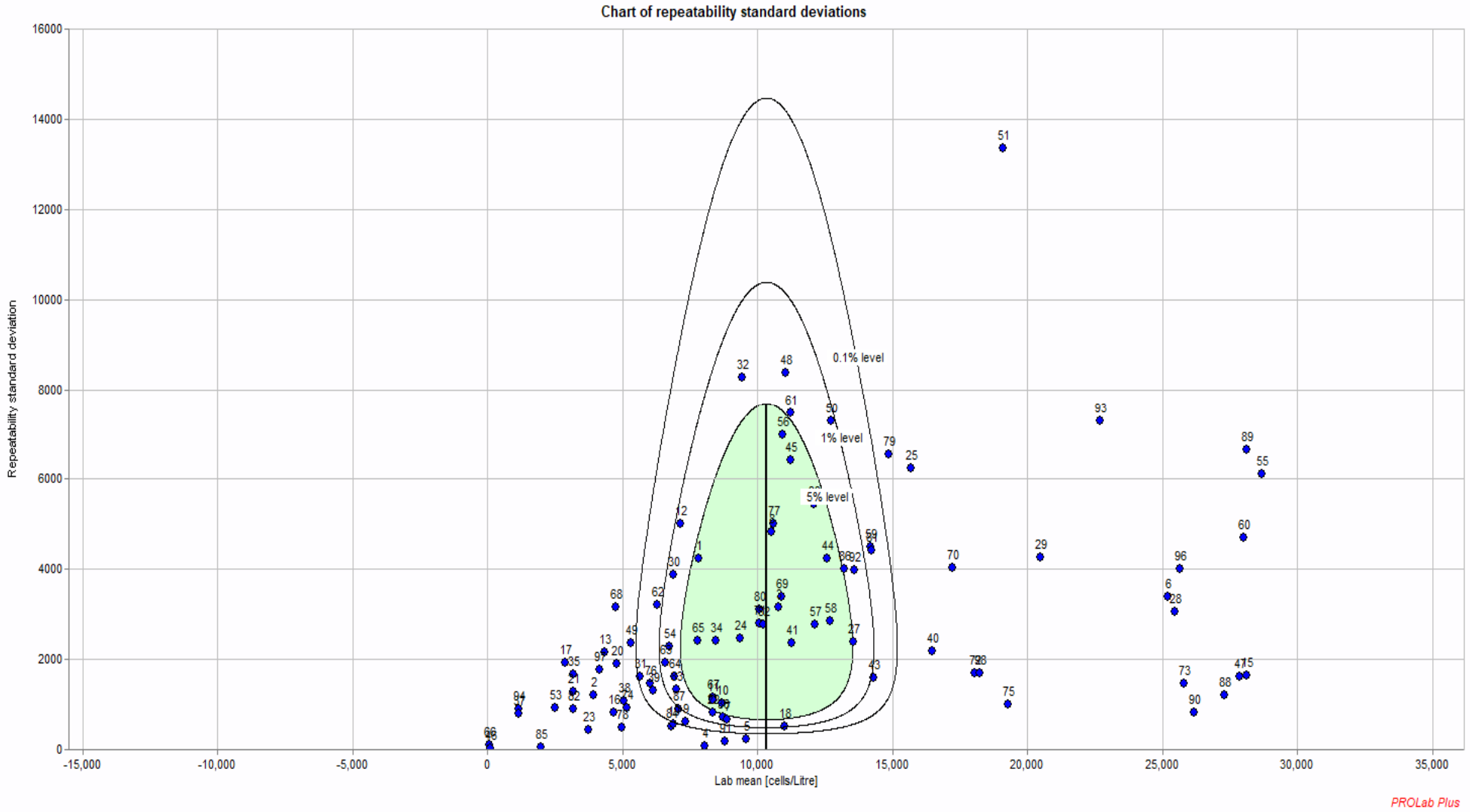
ANNEX XIV Mandel's k statistics



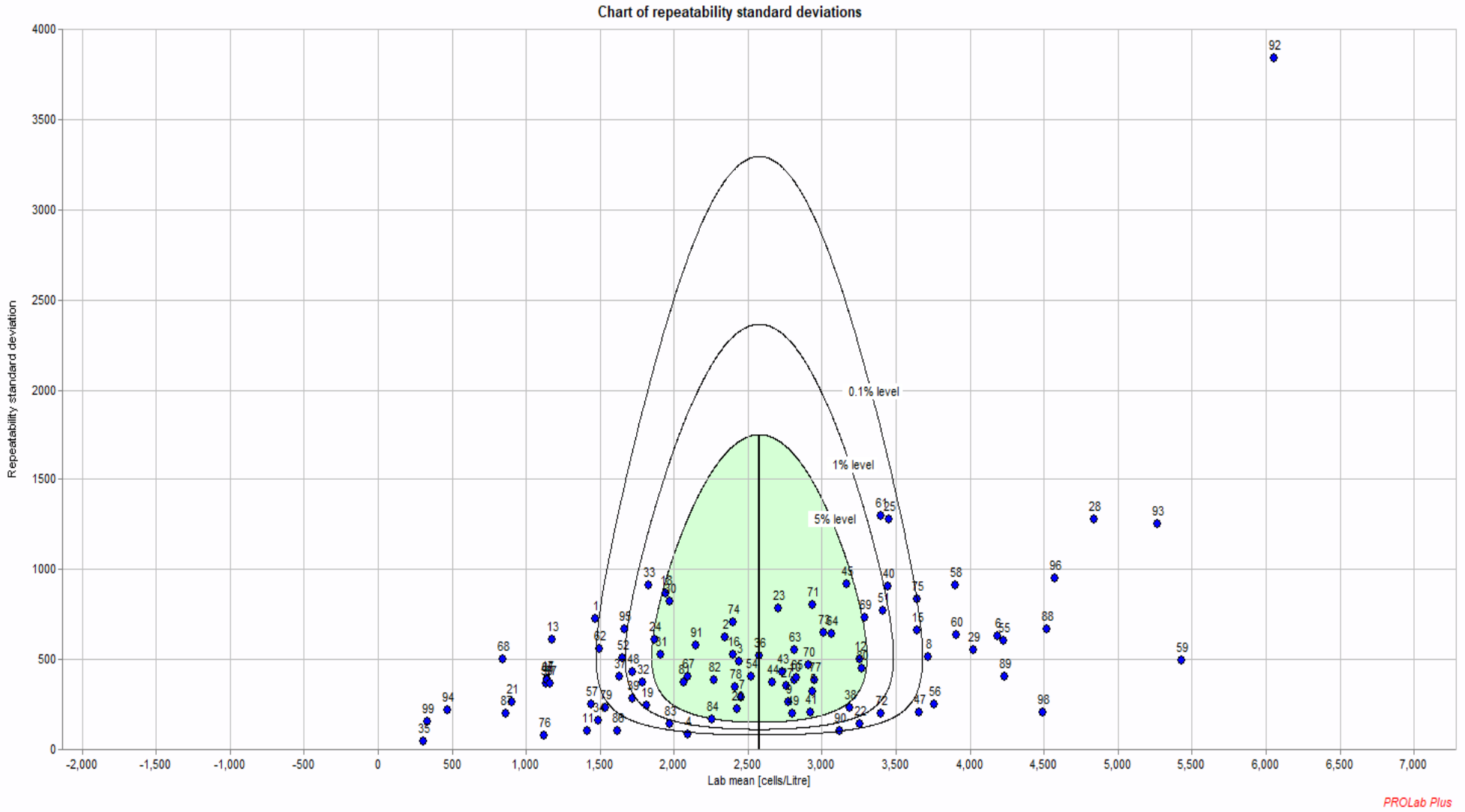
ANNEX XV: RLP and RSZ for all measurands IPI2018



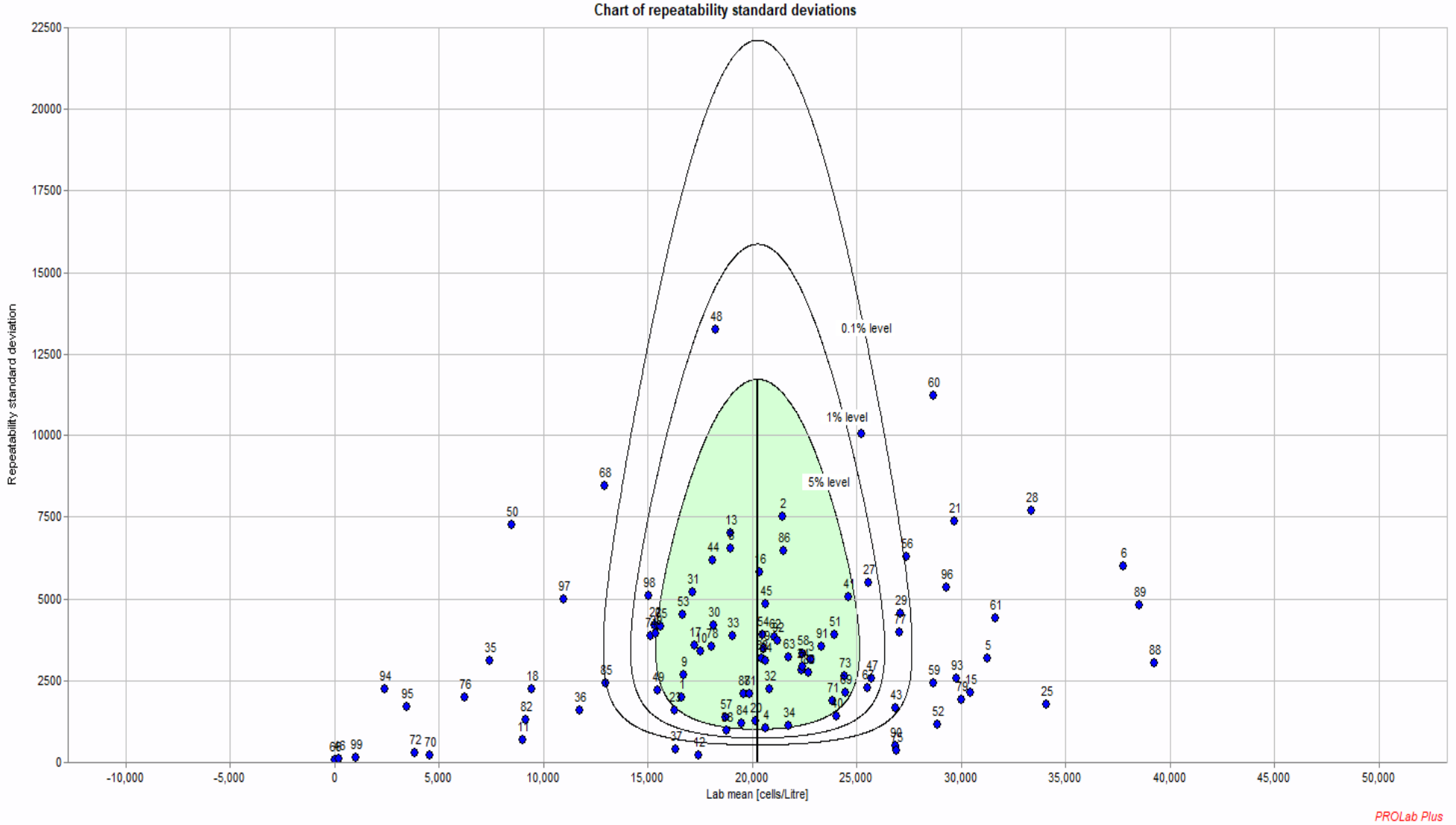
ANNEX XVI: Chart of repeatability standard deviations *Amphidinium carterae*



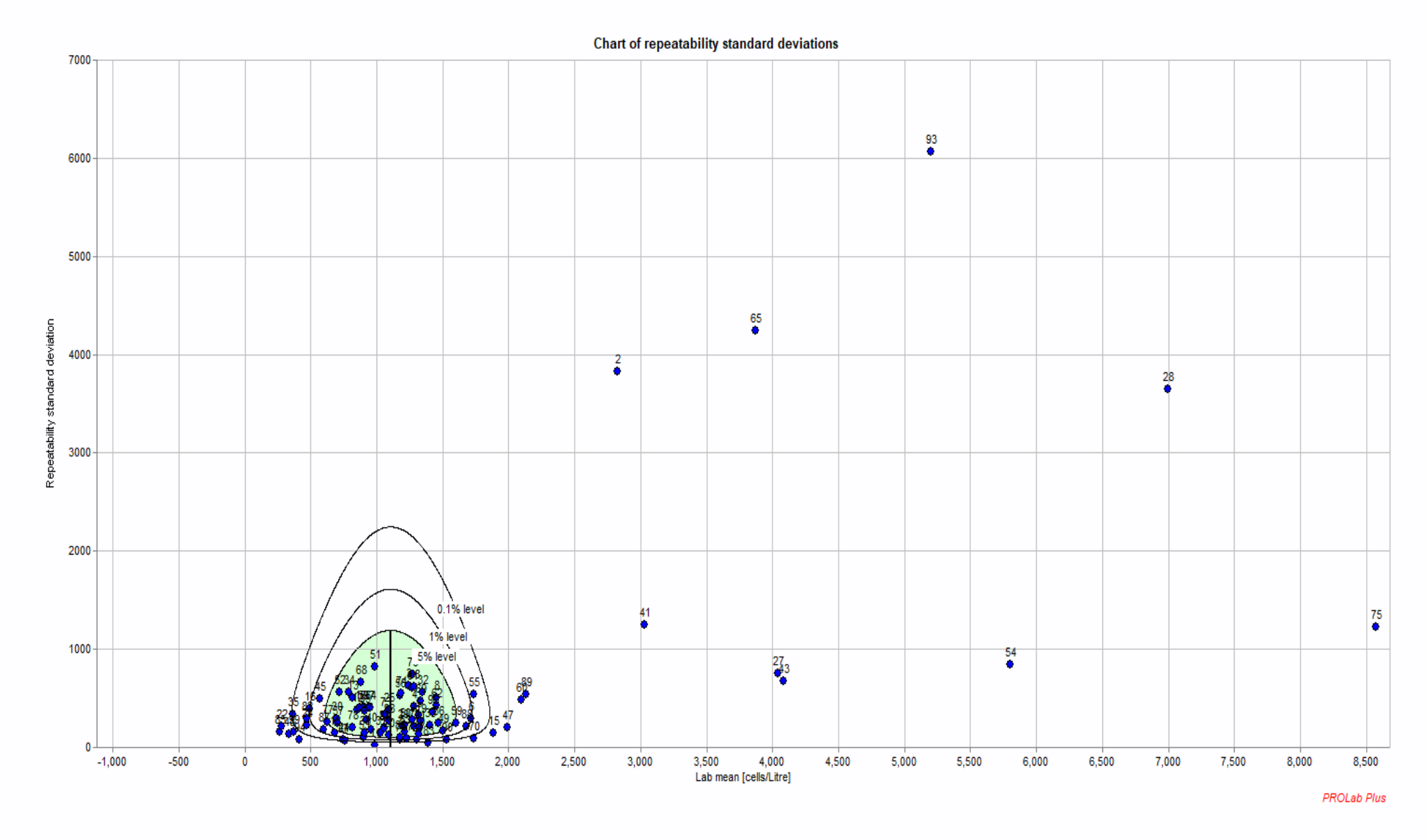
ANNEX XVI: Chart of repeatability standard deviations *Chaetoceros lorenzianus*



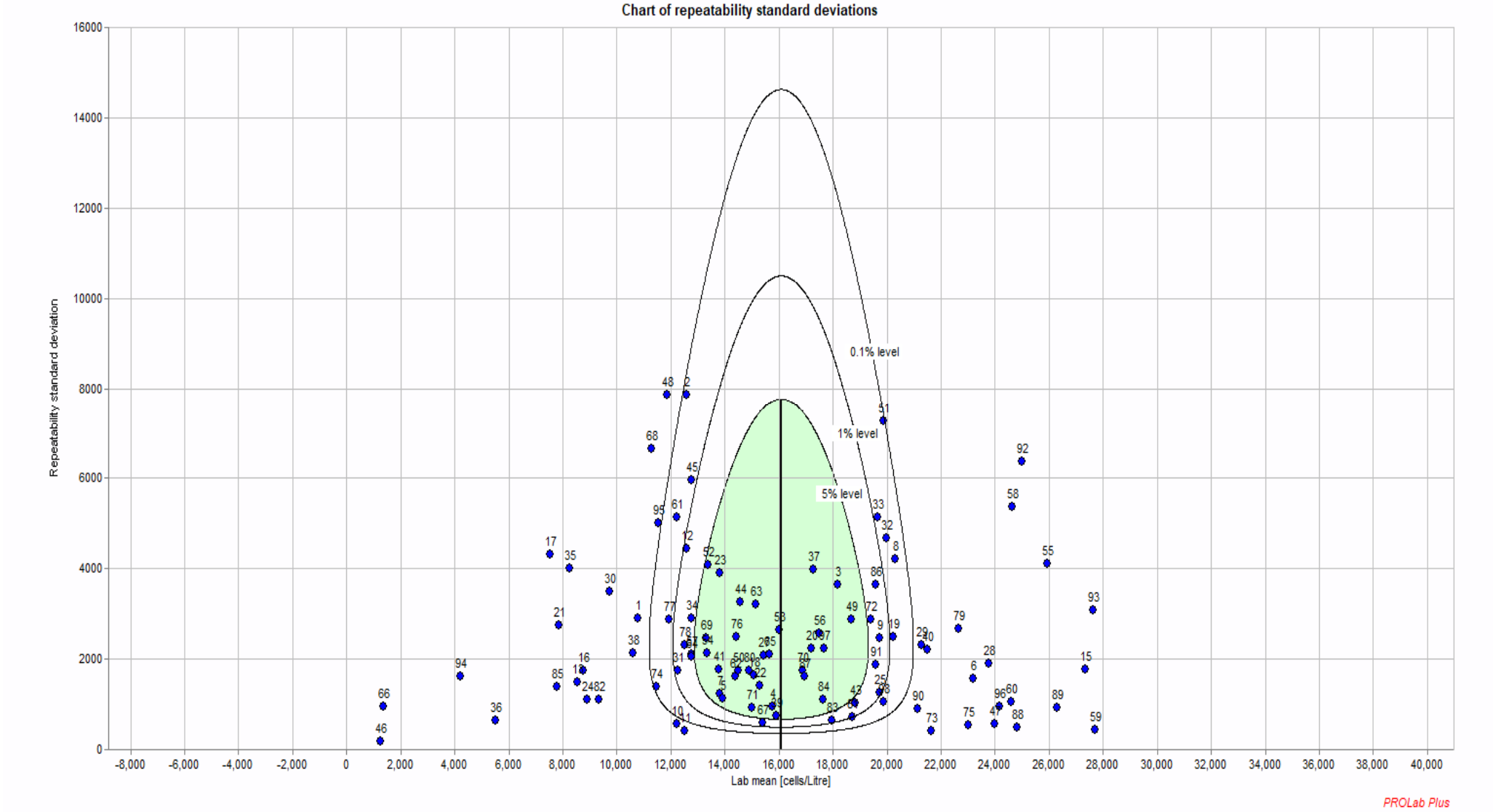
ANNEX XVI: Chart of repeatability standard deviations *Dactyliosolen fragilissimus*



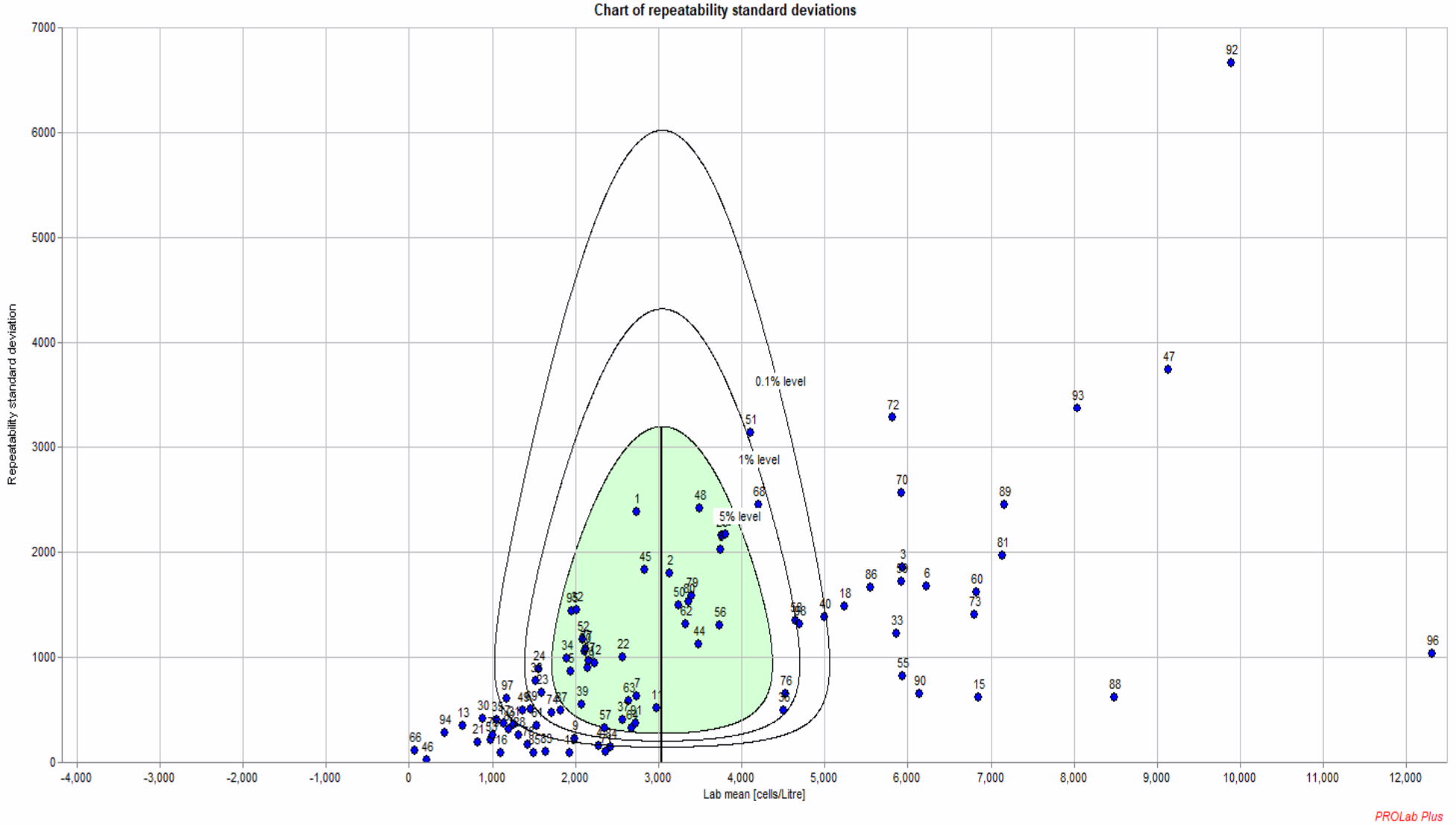
ANNEX XVI: Chart of repeatability standard deviations *Gymnodinium/Gyrodinium* sp.



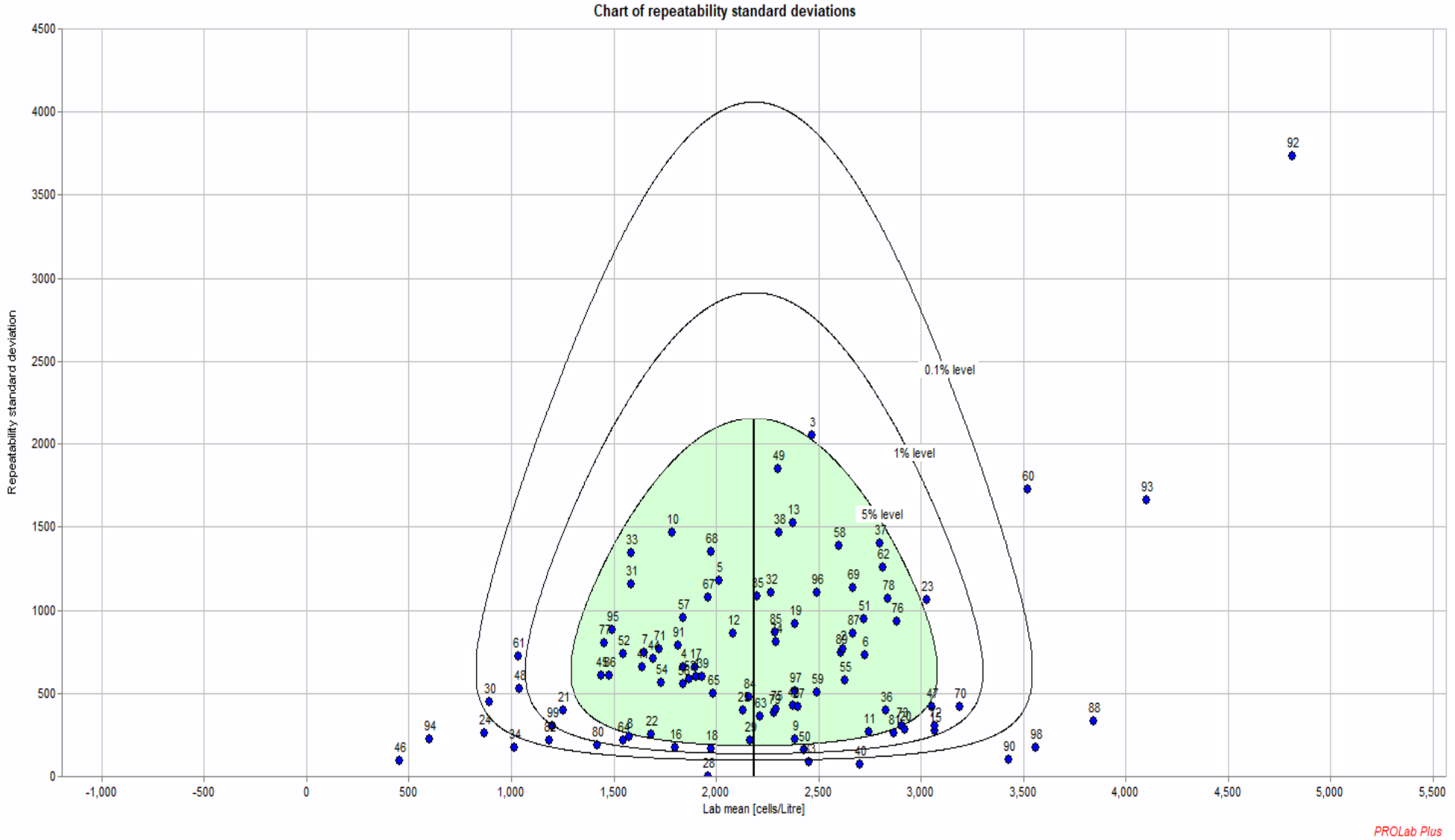
ANNEX XVI: Chart of repeatability standard deviations *Heterocapsa triquetra*



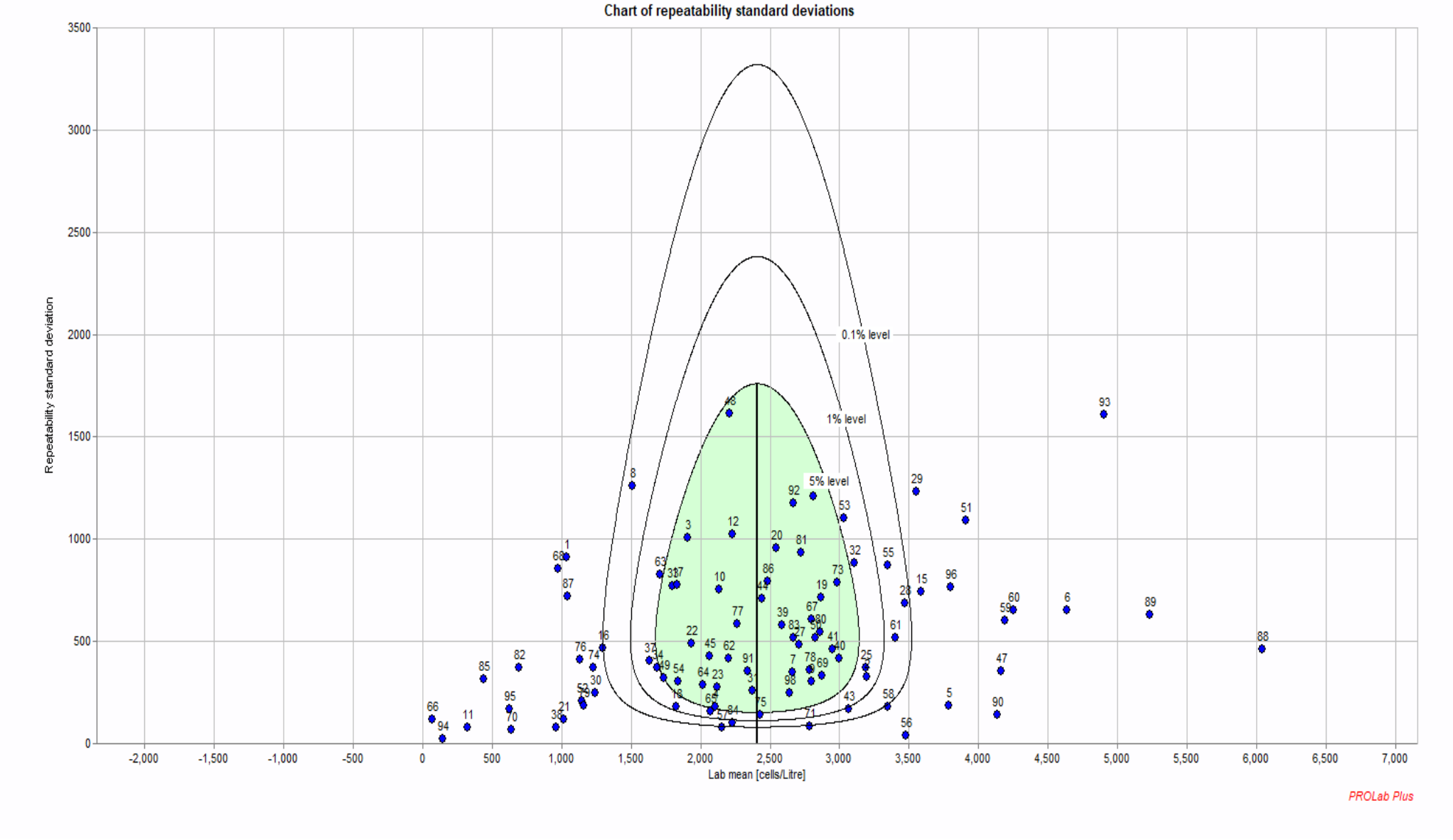
ANNEX XVI: Chart of repeatability standard deviations *Karenia mikimotoi*



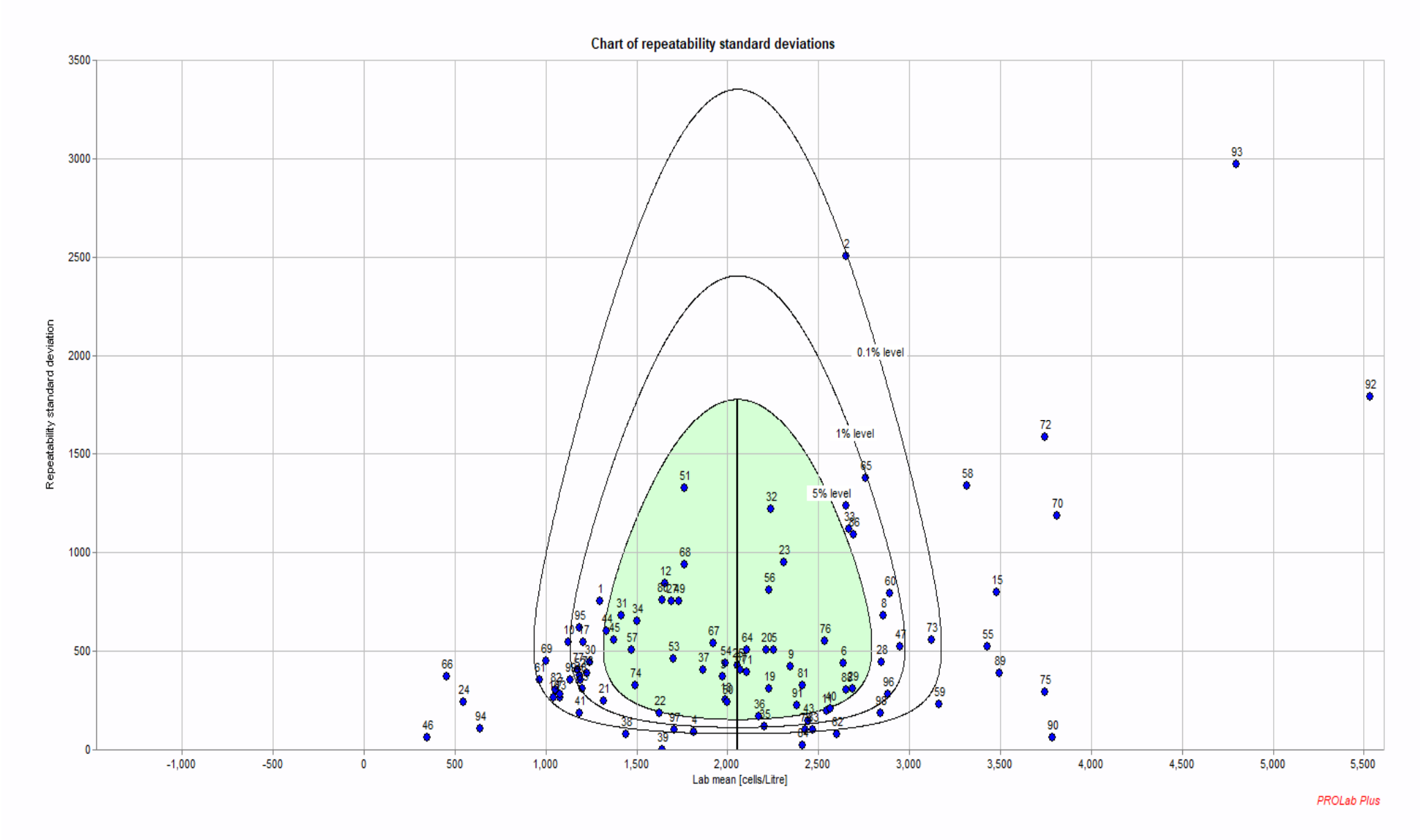
ANNEX XVI: Chart of repeatability standard deviations *Melosira nummuloides*



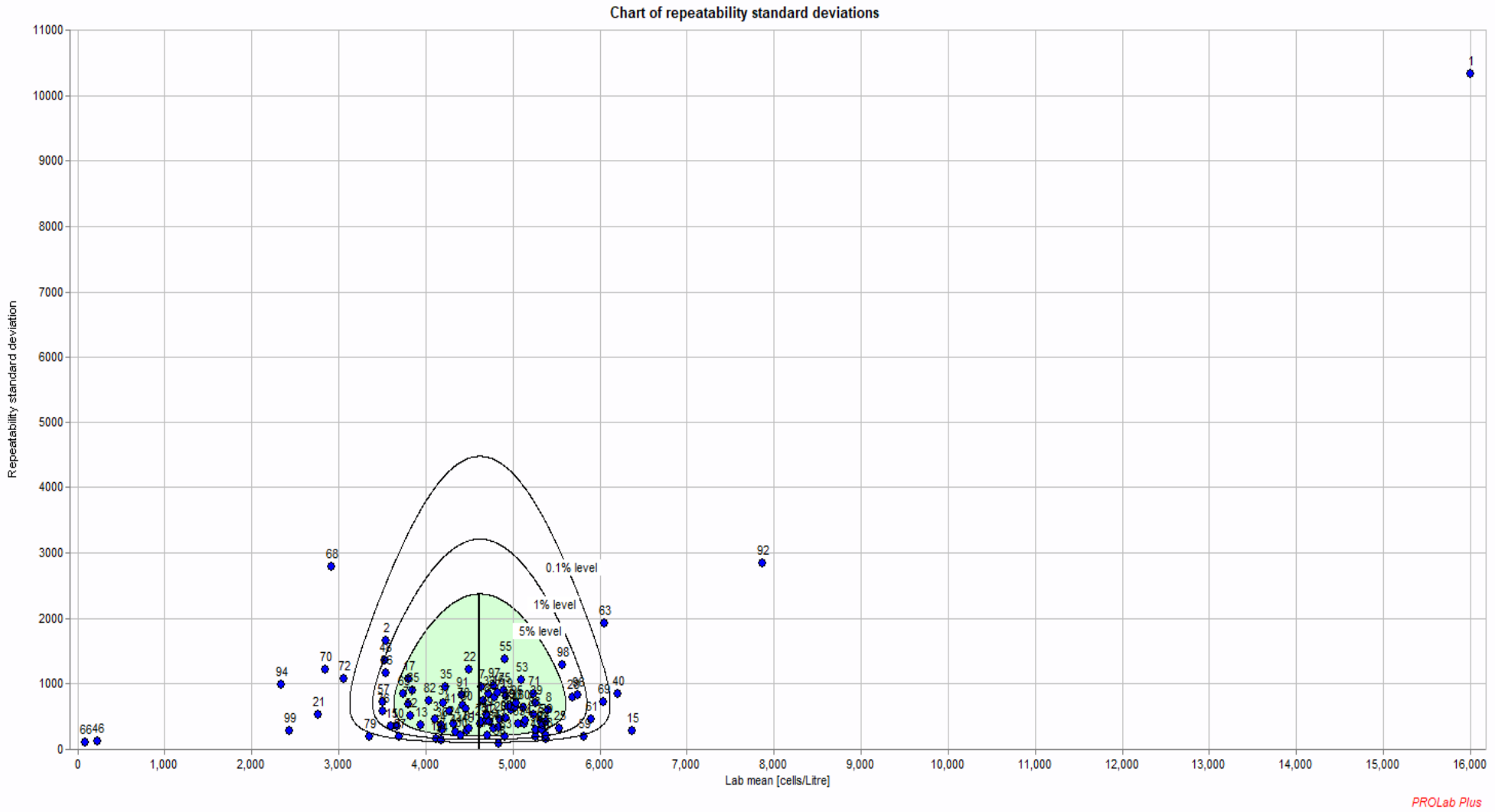
ANNEX XVI: Chart of repeatability standard deviations *Pseudo-nitzschia delicatissima* group



ANNEX XVI: Chart of repeatability standard deviations *Prorocentrum micans*



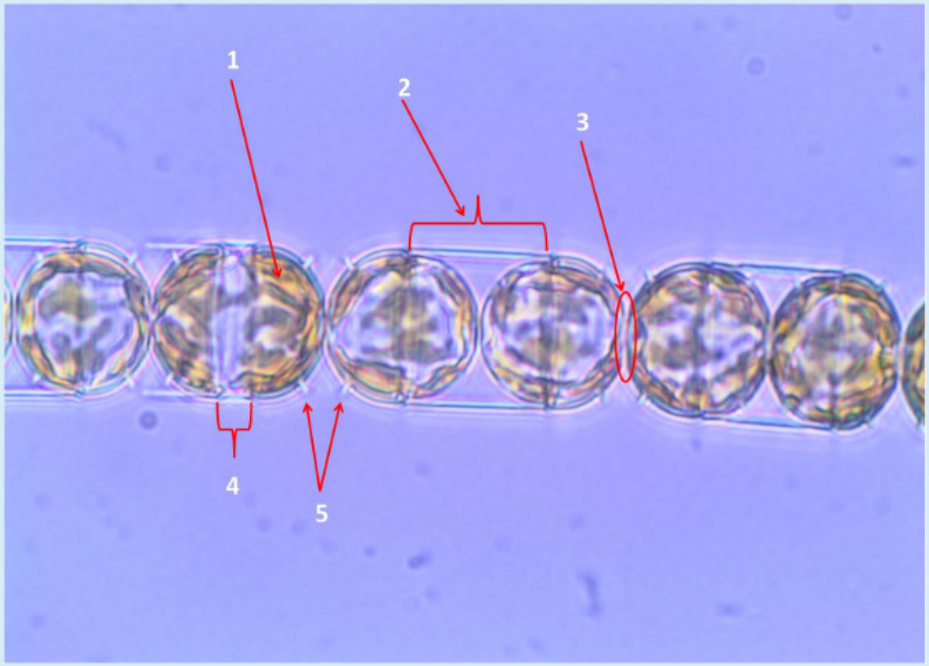
ANNEX XVI: Chart of repeatability standard deviations *Thalassiosira rotula/gravida*



ANNEX XVII: Ocean Teacher HAB Quiz IPI2018

Question 1
Correct
Mark 1.00 out of 1.00

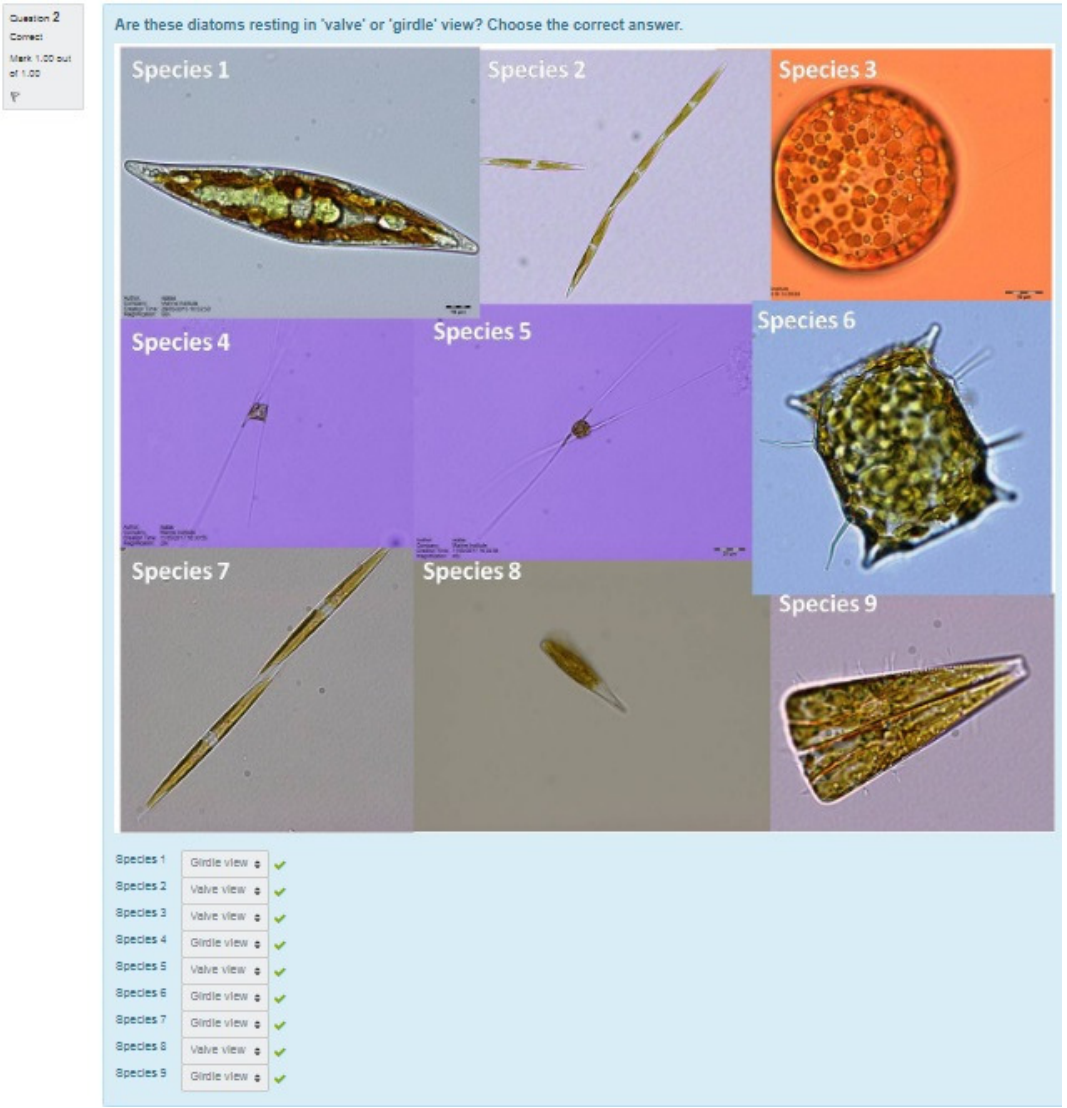
Choose the right taxonomic terminology from the drop down menu to describe the different parts of this *Melosira* chain.



Arrow 1= Chloroplasts
Arrow 2= Cingula
Arrow 3= Corona
Arrow 4= Girdle band
Arrow 5= Carina

Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Arrow 1= : Chloroplasts	Chloroplasts	20.00%	84	98.82%
	Arrow 1= : Corona	Corona	0.00%	1	1.18%
2	Arrow 2= : Cingula	Cingula	20.00%	49	57.65%
	Arrow 2= : Corona	Corona	0.00%	1	1.18%
	Arrow 2= : Girdle band	Girdle band	0.00%	11	12.94%
	Arrow 2= : pelvalvar axis	pelvalvar axis	0.00%	1	1.18%
	Arrow 2= : Copulae	Copulae	0.00%	4	4.71%
	Arrow 2= : Intercalary valves	Intercalary valves	0.00%	19	22.35%
3	Arrow 3= : Cingula	Cingula	0.00%	2	2.35%
	Arrow 3= : Corona	Corona	20.00%	57	67.06%
	Arrow 3= : Carina	Carina	0.00%	15	17.65%
	Arrow 3= : pelvalvar axis	pelvalvar axis	0.00%	2	2.35%
	Arrow 3= : Rimoportulae	Rimoportulae	0.00%	1	1.18%
	Arrow 3= : Copulae	Copulae	0.00%	2	2.35%
	Arrow 3= : Intercalary valves	Intercalary valves	0.00%	6	7.06%
4	Arrow 4= : Cingula	Cingula	0.00%	11	12.94%
	Arrow 4= : Girdle band	Girdle band	20.00%	56	65.88%
	Arrow 4= : Copulae	Copulae	0.00%	17	20.00%
	Arrow 4= : Intercalary valves	Intercalary valves	0.00%	1	1.18%
5	Arrow 5= : Corona	Corona	0.00%	8	9.41%
	Arrow 5= : Carina	Carina	20.00%	54	63.53%
	Arrow 5= : Labiate processes	Labiate processes	0.00%	5	5.88%
	Arrow 5= : marginal spines	marginal spines	0.00%	15	17.65%
	Arrow 5= : Rimoportulae	Rimoportulae	0.00%	3	3.53%

ANNEX XVII: Ocean Teacher HAB Quiz IPI2018



Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Species 1 : Girdle view	Girdle view	11.11%	16	18.82%
	Species 1 : Valve view	Valve view	0.00%	69	81.18%
2	Species 2 : Girdle view	Girdle view	0.00%	5	5.88%
	Species 2 : Valve view	Valve view	11.11%	80	94.12%
3	Species 3 : Girdle view	Girdle view	0.00%	1	1.18%
	Species 3 : Valve view	Valve view	11.11%	84	98.82%
4	Species 4 : Girdle view	Girdle view	11.11%	82	96.47%
	Species 4 : Valve view	Valve view	0.00%	3	3.53%
5	Species 5 : Girdle view	Girdle view	0.00%	8	9.41%
	Species 5 : Valve view	Valve view	11.11%	77	90.59%
6	Species 6 : Girdle view	Girdle view	11.11%	78	91.76%
	Species 6 : Valve view	Valve view	0.00%	7	8.24%
7	Species 7 : Girdle view	Girdle view	11.11%	82	96.47%
	Species 7 : Valve view	Valve view	0.00%	3	3.53%
8	Species 8 : Girdle view	Girdle view	0.00%	7	8.24%
	Species 8 : Valve view	Valve view	11.11%	78	91.76%
9	Species 9 : Girdle view	Girdle view	11.11%	84	98.82%
	Species 9 : Valve view	Valve view	0.00%	1	1.18%

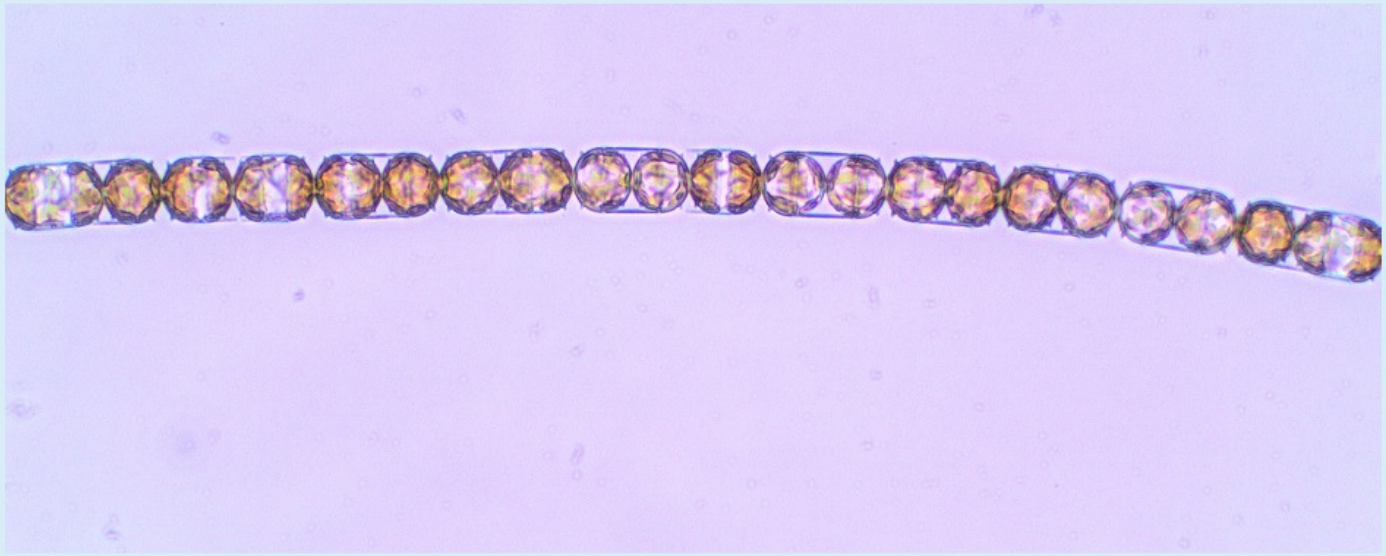
ANNEX XVII: Ocean Teacher HAB Quiz IPI2018

Question 3

Correct

Mark 1.00 out of 1.00

How many cells do you observe in the following image?? Answer using a numeral (for example: 5)



Answer: 21

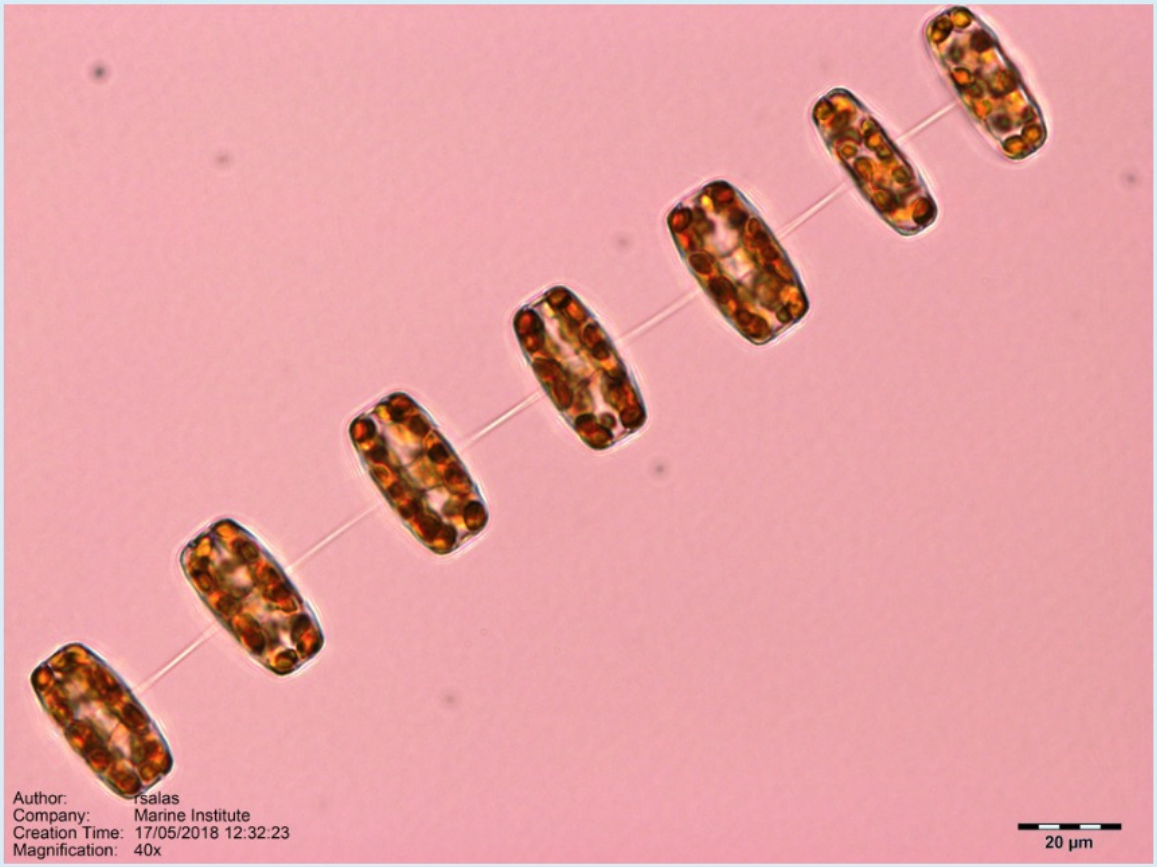
Model response	Actual response	Partial credit	Count	Frequency
21 (20..22)	21	100.00%	74	87.06%
	20	100.00%	1	1.18%
[Did not match any answer]	10	0.00%	1	1.18%
	19	0.00%	2	2.35%
	15	0.00%	2	2.35%
	13	0.00%	2	2.35%
	11	0.00%	1	1.18%
	16	0.00%	1	1.18%
	9	0.00%	1	1.18%

Question 4

Correct

Mark 1.00 out of 1.00

How many cells do you observe in the following image?? Answer using a numeral (for example: 5)



Answer: 7

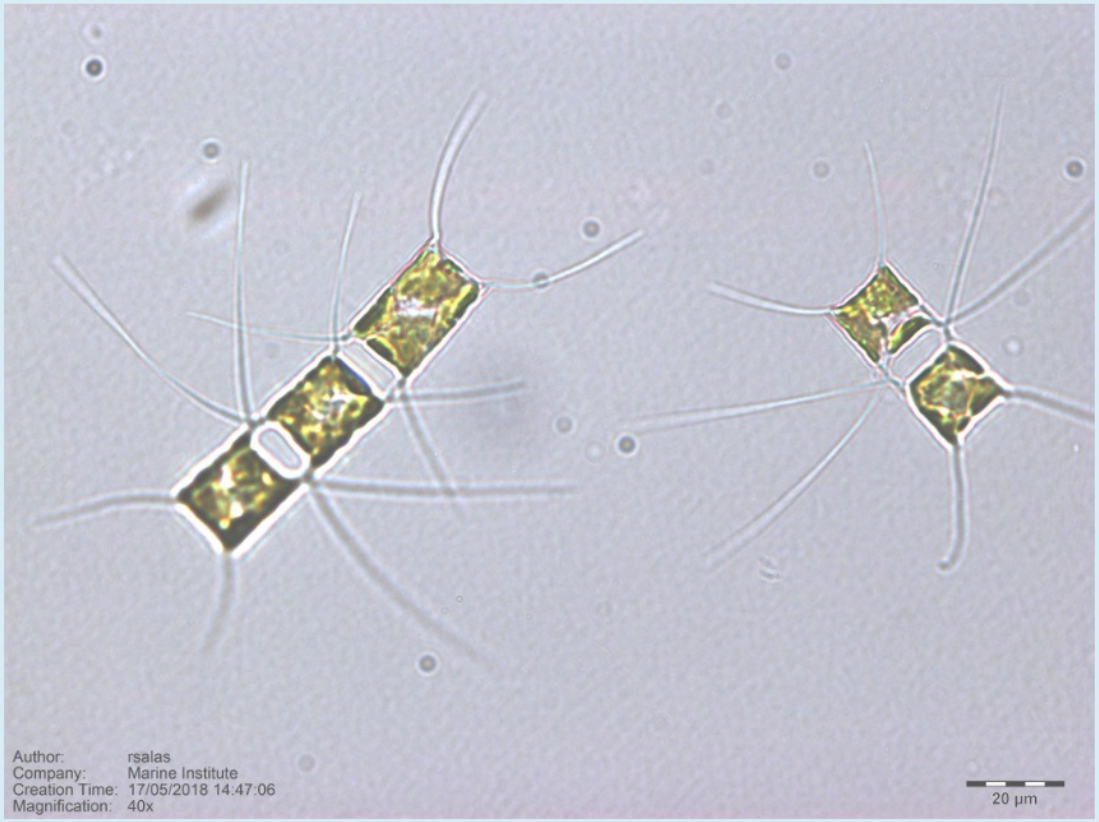
Model response	Actual response	Partial credit	Count	Frequency
7 (6.9999999999999..7.0000000000001)	7	100.00%	84	98.82%
[Did not match any answer]	6	0.00%	1	1.18%
[No response]		0.00%	0	0.00%

Question **5**

Correct

Mark 1.00 out of 1.00

How many cells do you observe in the following image?? Answer using a numeral (for example: 5)



Answer: 5

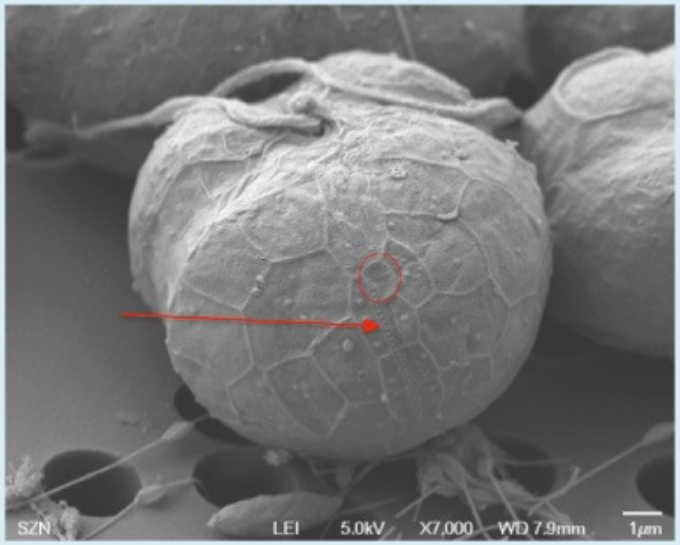
Model response	Actual response	Partial credit	Count	Frequency
5 (5..5)	5	100.00%	83	97.65%
[Did not match any answer]	8	0.00%	1	1.18%
	4	0.00%	1	1.18%
[No response]		0.00%	0	0.00%

Question 6
Correct
Mark 1.00 out of 1.00

Answer the following questions:

1. What family does this organism belongs to?
2. what characteristic feature is the arrow pointing at ?
3. What is the name of the plate in the circle? (1' apical, Intercalary, Po, etc....)
4. The plate series in this family of organisms are known as.....

Choose the correct answers from the list. There are 4 answers, each correct answer is a 25% of the total mark. Each incorrect answer will deduct 5% of your mark.



Select one or more:

- Amphiesmal vesicles
- Eyespot
- Elongated Apical vesicles ✔
- Thecal pores
- Apical groove
- Latitudinal series ✔
- Thecal series
- longitudinal series
- Suessiaceae ✔
- Gymnodiniaceae
- Kareniaceae
- x plate ✔
- 1' apical
- 1 cingular
- sulcal plates
- 3 antapical plate
- Peridiniaceae

Response	Partial credit	Count	Frequency
Amphiesmal vesicles	-5.00%	20	23.53%
Eyespot	-5.00%	0	0.00%
Elongated Apical vesicles	25.00%	76	89.41%
Thecal pores	-5.00%	0	0.00%
Apical groove	-5.00%	9	10.59%
Latitudinal series	25.00%	68	80.00%
Thecal series	-5.00%	1	1.18%
longitudinal series	-5.00%	6	7.06%
Suessiaceae	25.00%	79	92.94%
Gymnodiniaceae	-5.00%	3	3.53%
Kareniaceae	-5.00%	2	2.35%
x plate	25.00%	74	87.06%
1' apical	-5.00%	1	1.18%
1 cingular	-5.00%	0	0.00%
sulcal plates	-5.00%	0	0.00%
3 antapical plate	-5.00%	0	0.00%
Peridiniaceae	-5.00%	1	1.18%

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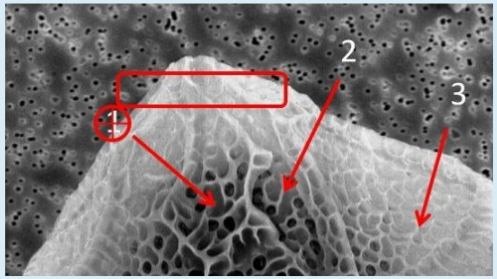
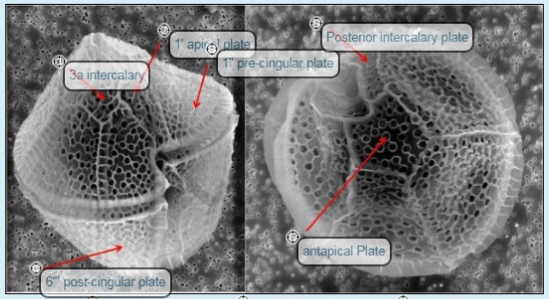
Question 7
Correct
Mark 1.00 out of 1.00

These SEM images of the armoured dinoflagellate *Lingulodinium polyedrum* show a number of arrows pointing at specific thecal plates. **Drag and Drop** the correct markers to the corresponding **drop zones** in the image. **The drop zones are the numbers 1 to 6. Drag the markers and place the crosshair cursor of the marker on top of the numbers as in the picture below used as example.**





Part of question	Model response	Partial credit	Count	Frequency
1	3a intercalary	16.67%	76	89.41%
	[No response]	0.00%	9	10.59%
2	1' apical plate	16.67%	76	89.41%
	[No response]	0.00%	9	10.59%
3	1" pre-cingular plate	16.67%	74	87.06%
	[No response]	0.00%	11	12.94%
4	6"' post-cingular plate	16.67%	77	90.59%
	[No response]	0.00%	8	9.41%
5	Posterior intercalary plate	16.67%	78	91.76%
	[No response]	0.00%	7	8.24%
6	antapical Plate	16.67%	81	95.29%
	[No response]	0.00%	4	4.71%

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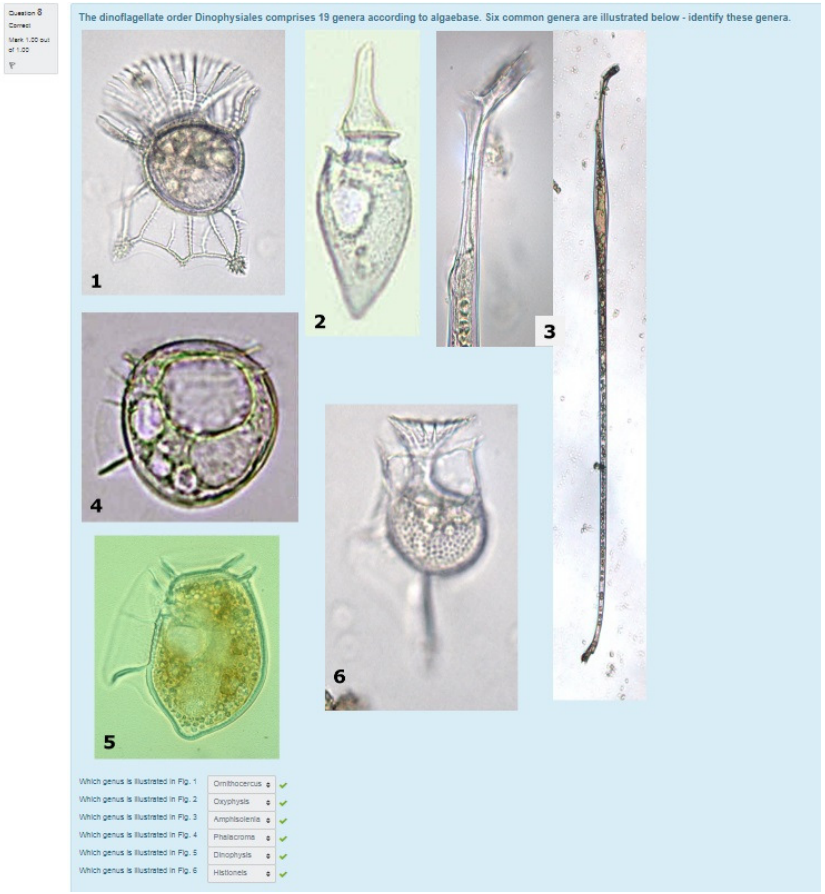
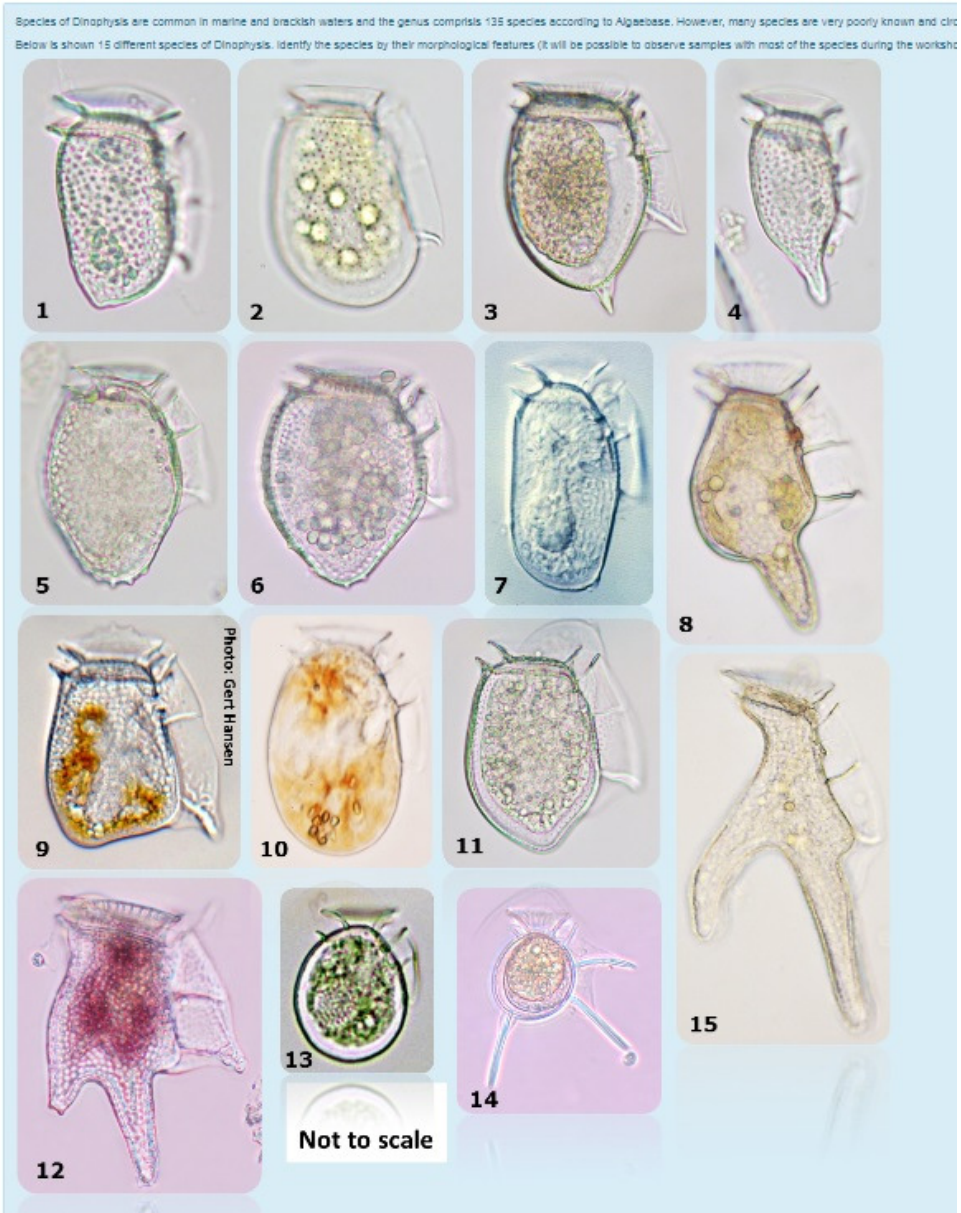


Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Which genus is illustrated in Fig. 1 : Ornithocercus	Ornithocercus	16.67%	85	100.00%
2	Which genus is illustrated in Fig. 2 : Oxyphysis	Oxyphysis	16.67%	82	96.47%
	Which genus is illustrated in Fig. 2 : Phalacroma	Phalacroma	0.00%	3	3.53%
3	Which genus is illustrated in Fig. 3 : Amphisolenia	Amphisolenia	16.67%	85	100.00%
4	Which genus is illustrated in Fig. 4 : Phalacroma	Phalacroma	16.67%	85	100.00%
5	Which genus is illustrated in Fig. 5 : Amphisolenia	Amphisolenia	0.00%	1	1.18%
	Which genus is illustrated in Fig. 5 : Dinophysis	Dinophysis	16.67%	84	98.82%
6	Which genus is illustrated in Fig. 6 : Histioneis	Histioneis	16.67%	85	100.00%

ANNEX XVII: Ocean Teacher HAB Quiz IPI2018

Question 9
Correct
Mark 1.00 out of 1.00

Species of Dinophysis are common in marine and brackish waters and the genus comprisis 135 species according to Algaebase. However, many species are very poorly known and circ
Below is shown 15 different species of Dinophysis. Identify the species by their morphological features (it will be possible to observe samples with most of the species during the worksho



Which species is shown in Fig. 1	Dinophysis dens
Which species is shown in Fig. 2	Dinophysis fortii
Which species is shown in Fig. 3	Dinophysis hastata
Which species is shown in Fig. 4	Dinophysis diegensis
Which species is shown in Fig. 5	Dinophysis acuminata
Which species is shown in Fig. 6	Dinophysis norvegica
Which species is shown in Fig. 7	Dinophysis sacculus
Which species is shown in Fig. 8	Dinophysis caudata
Which species is shown in Fig. 9	Dinophysis truncata
Which species is shown in Fig. 10	Dinophysis ovum
Which species is shown in Fig. 11	Dinophysis acuta
Which species is shown in Fig. 12	Dinophysis tripos
Which species is shown in Fig. 13	Dinophysis infundibulum
Which species is shown in Fig. 14	Dinophysis schuettii
Which speces is shown in Fig. 15	Dinophysis miles

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Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Which species is shown in Fig. 1 : Dinophysis dens	Dinophysis dens	6.67%	78	91.76%
	Which species is shown in Fig. 1 : Dinophysis hastata	Dinophysis hastata	0.00%	1	1.18%
	Which species is shown in Fig. 1 : Dinophysis acuminata	Dinophysis acuminata	0.00%	2	2.35%
	Which species is shown in Fig. 1 : Dinophysis sacculus	Dinophysis sacculus	0.00%	1	1.18%
	Which species is shown in Fig. 1 : Dinophysis acuta	Dinophysis acuta	0.00%	2	2.35%
	Which species is shown in Fig. 1 : Dinophysis schuettii	Dinophysis schuettii	0.00%	1	1.18%
2	Which species is shown in Fig. 2 : Dinophysis fortii	Dinophysis fortii	6.67%	85	100.00%
3	Which species is shown in Fig. 3 : Dinophysis hastata	Dinophysis hastata	6.67%	85	100.00%
4	Which species is shown in Fig. 4 : Dinophysis diegensis	Dinophysis diegensis	6.67%	84	98.82%
	Which species is shown in Fig. 4 : Dinophysis caudata	Dinophysis caudata	0.00%	1	1.18%
5	Which species is shown in Fig. 5 : Dinophysis dens	Dinophysis dens	0.00%	1	1.18%
	Which species is shown in Fig. 5 : Dinophysis acuminata	Dinophysis acuminata	6.67%	81	95.29%
	Which species is shown in Fig. 5 : Dinophysis sacculus	Dinophysis sacculus	0.00%	1	1.18%
	Which species is shown in Fig. 5 : Dinophysis truncata	Dinophysis truncata	0.00%	2	2.35%
6	Which species is shown in Fig. 6 : Dinophysis acuminata	Dinophysis acuminata	0.00%	2	2.35%
	Which species is shown in Fig. 6 : Dinophysis norvegica	Dinophysis norvegica	6.67%	79	92.94%
	Which species is shown in Fig. 6 : Dinophysis truncata	Dinophysis truncata	0.00%	1	1.18%
	Which species is shown in Fig. 6 : Dinophysis ovum	Dinophysis ovum	0.00%	1	1.18%
	Which species is shown in Fig. 6 : Dinophysis acuta	Dinophysis acuta	0.00%	2	2.35%
7	Which species is shown in Fig. 7 : Dinophysis dens	Dinophysis dens	0.00%	2	2.35%
	Which species is shown in Fig. 7 : Dinophysis sacculus	Dinophysis sacculus	6.67%	82	96.47%
	Which species is shown in Fig. 7 : Dinophysis truncata	Dinophysis truncata	0.00%	1	1.18%
8	Which species is shown in Fig. 8 : Dinophysis caudata	Dinophysis caudata	6.67%	85	100.00%
9	Which species is shown in Fig. 9 : Dinophysis dens	Dinophysis dens	0.00%	2	2.35%
	Which species is shown in Fig. 9 : Dinophysis diegensis	Dinophysis diegensis	0.00%	1	1.18%
	Which species is shown in Fig. 9 : Dinophysis truncata	Dinophysis truncata	6.67%	80	94.12%
	Which species is shown in Fig. 9 : Dinophysis ovum	Dinophysis ovum	0.00%	1	1.18%
	Which species is shown in Fig. 9 : Dinophysis acuta	Dinophysis acuta	0.00%	1	1.18%
10	Which species is shown in Fig. 10 : Dinophysis acuminata	Dinophysis acuminata	0.00%	1	1.18%
	Which species is shown in Fig. 10 : Dinophysis sacculus	Dinophysis sacculus	0.00%	1	1.18%
	Which species is shown in Fig. 10 : Dinophysis ovum	Dinophysis ovum	6.67%	82	96.47%
	Which species is shown in Fig. 10 : Dinophysis infundibulum	Dinophysis infundibulum	0.00%	1	1.18%
11	Which species is shown in Fig. 11 : Dinophysis norvegica	Dinophysis norvegica	0.00%	6	7.06%
	Which species is shown in Fig. 11 : Dinophysis acuta	Dinophysis acuta	6.67%	79	92.94%
12	Which species is shown in Fig. 12 : Dinophysis tripos	Dinophysis tripos	6.67%	85	100.00%
13	Which species is shown in Fig. 13 : Dinophysis ovum	Dinophysis ovum	0.00%	1	1.18%
	Which species is shown in Fig. 13 : Dinophysis infundibulum	Dinophysis infundibulum	6.67%	84	98.82%
14	Which species is shown in Fig. 14 : Dinophysis schuettii	Dinophysis schuettii	6.67%	85	100.00%
5	Which speces is shown in Fig. 15 : Dinophysis miles	Dinophysis miles	6.67%	85	100.00%

ANNEX XVII: Ocean Teacher HAB Quiz IPI2018

Question 10
Correct
Mark 1.00 out of 1.00

Species of Phalacroma are common in marine and brackish waters. The genus was until recently considered synonymous with Dinophysis by many authors. but Phala
Below is shown 6 different species of Phalacroma. Identfy the species by their morphological features (it will be possible to observe samples with all the illustrated spe

Not to scale

Which species is shown in Fig. 1	Phalacroma mitra
Which species is shown in Fig. 2	Phalacroma doryphorum
Which species is shown in Fig. 3	Phalacroma favus
Which species is shown in Fig. 4	Phalacroma rapa
Which species is shown in Fig. 5	Phalacroma rotundatum
Which species is shown in Fig. 6	Phalacroma cuneus

Part of question	Model response	Actual response	Partial credit	Count	Frequency
1	Which species is shown in Fig. 1 : Phalacroma mitra	Phalacroma mitra	16.67%	82	96.47%
	Which species is shown in Fig. 1 : Phalacroma rapa	Phalacroma rapa	0.00%	3	3.53%
2	Which species is shown in Fig. 2 : Phalacroma doryphorum	Phalacroma doryphorum	16.67%	83	97.65%
	Which species is shown in Fig. 2 : Phalacroma favus	Phalacroma favus	0.00%	1	1.18%
	Which species is shown in Fig. 2 : Phalacroma cuneus	Phalacroma cuneus	0.00%	1	1.18%
3	Which species is shown in Fig. 3 : Phalacroma mitra	Phalacroma mitra	0.00%	1	1.18%
	Which species is shown in Fig. 3 : Phalacroma favus	Phalacroma favus	16.67%	84	98.82%
4	Which species is shown in Fig. 4 : Phalacroma mitra	Phalacroma mitra	0.00%	2	2.35%
	Which species is shown in Fig. 4 : Phalacroma rapa	Phalacroma rapa	16.67%	82	96.47%
	Which species is shown in Fig. 4 : Phalacroma cuneus	Phalacroma cuneus	0.00%	1	1.18%
5	Which species is shown in Fig. 5 : Phalacroma rotundatum	Phalacroma rotundatum	16.67%	85	100.00%
6	Which species is shown in Fig. 6 : Phalacroma doryphorum	Phalacroma doryphorum	0.00%	2	2.35%
	Which species is shown in Fig. 6 : Phalacroma cuneus	Phalacroma cuneus	16.67%	83	97.65%

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Question 11

Correct

Mark 1.00 out of 1.00

Which of the following species of *Dinophysis/Phalacroma* are potentially toxic accord
Taxonomic Reference List of Harmful Microalgae. Each wrong answer will deduct 10%

Select one or more:

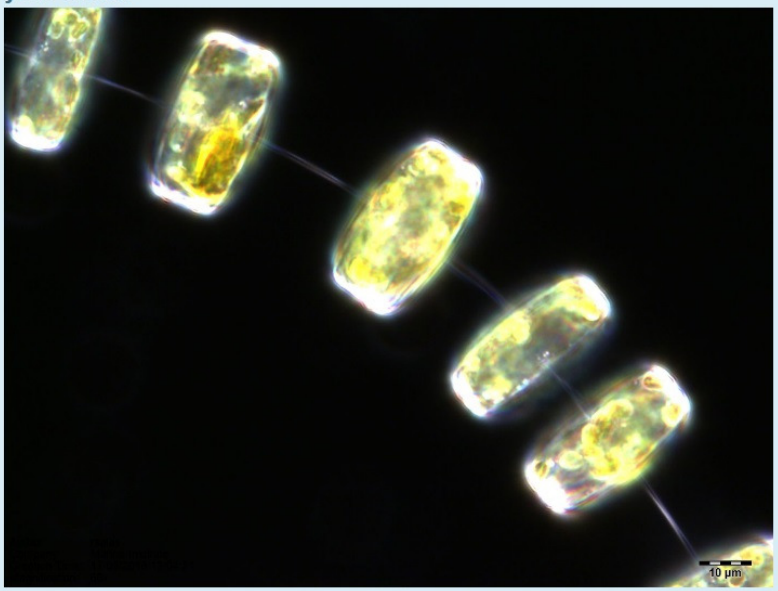
- a. Dinophysis acuta ✔
- b. Dinophysis norvegica ✔
- c. Dinophysis caudata ✔
- d. Phalacroma rapa
- e. Dinophysis sacculus ✔
- f. Dinophysis miles ✔
- g. Dinophysis hastata
- h. Phalacroma favus
- i. Dinophysis fortii ✔
- j. Phalacroma mitra ✔
- k. Phalacroma rotundatum ✔
- l. Dinophysis tripos ✔
- m. Phalacroma doryphorum
- n. Dinophysis acuminata ✔
- o. Dinophysis schuettii
- p. Dinophysis diegensis
- q. Dinophysis truncata
- r. Dinophysis dens
- s. Dinophysis ovum ✔
- t. Dinophysis infundibulum ✔
- u. Phalacroma cuneus

Response	Partial credit	Count	Frequency
Dinophysis acuta	5.00%	85	100.00%
Dinophysis norvegica	5.00%	84	98.82%
Dinophysis caudata	5.00%	85	100.00%
Phalacroma rapa	-10.00%	5	5.88%
Dinophysis sacculus	5.00%	84	98.82%
Dinophysis miles	10.00%	84	98.82%
Dinophysis hastata	-10.00%	3	3.53%
Phalacroma favus	-10.00%	0	0.00%
Dinophysis fortii	10.00%	85	100.00%
Phalacroma mitra	10.00%	83	97.65%
Phalacroma rotundatum	10.00%	84	98.82%
Dinophysis tripos	10.00%	85	100.00%
Phalacroma doryphorum	-10.00%	0	0.00%
Dinophysis acuminata	10.00%	84	98.82%
Dinophysis schuettii	-10.00%	2	2.35%
Dinophysis diegensis	-10.00%	2	2.35%
Dinophysis truncata	-10.00%	0	0.00%
Dinophysis dens	-10.00%	1	1.18%
Dinophysis ovum	10.00%	82	96.47%
Dinophysis infundibulum	10.00%	80	94.12%
Phalacroma cuneus	-10.00%	0	0.00%

ANNEX XVII: Ocean Teacher HAB Quiz IPI2018

Question 12
Correct
Mark 1.00 out of 1.00

Choose which statements are true about species belonging to the fan your mark.



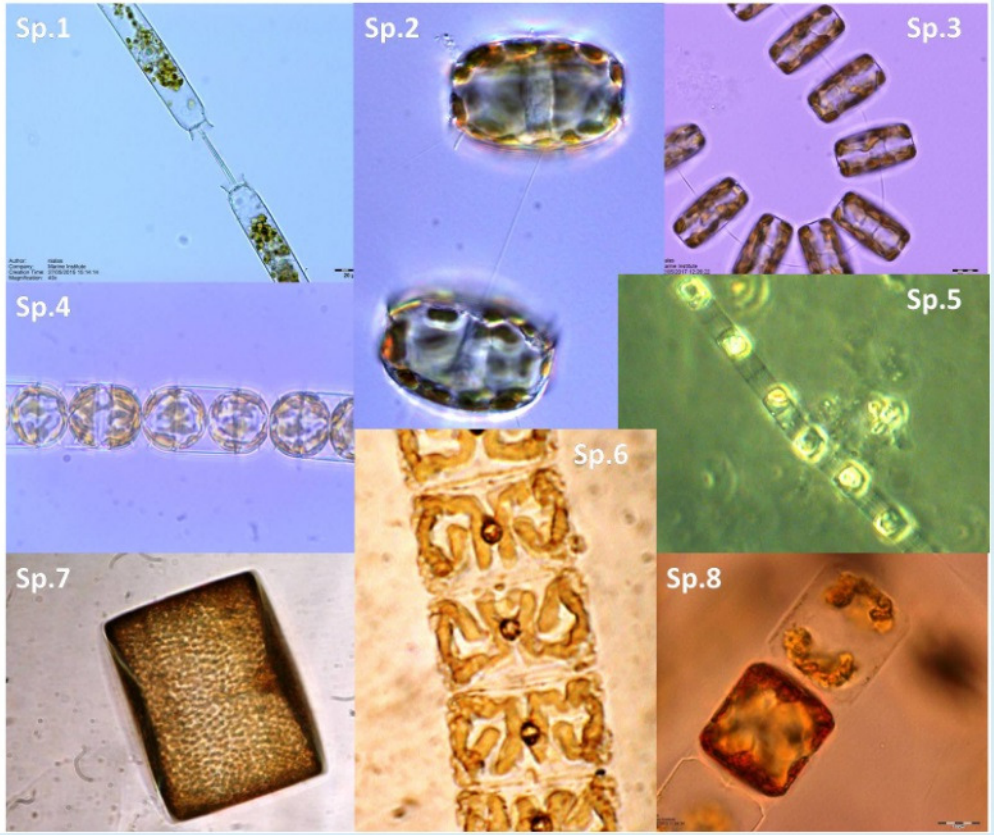
Select one or more:

- a. Cells are linked by threads of organic matter from strutted processes ✔
- b. They are unipolar centrics
- c. Their cell wall is known for having internal cribra and external foramina ✔
- d. They have no labiate processes
- e. Their cell wall have a marginal ring of smaller labiate processes ✔
- f. Their cell wall is known for having internal foramina and external cribra
- g. They have two larger marginal labiate processes
- h. They can have one or more labiate processes ✔

Response	Partial credit	Count	Frequency
Cells are linked by threads of organic matter from strutted processes	25.00%	84	98.82%
They are unipolar centrics	-20.00%	13	15.29%
Their cell wall is known for having internal cribra and external foramina	25.00%	79	92.94%
They have no labiate processes	-20.00%	0	0.00%
Their cell wall have a marginal ring of smaller labiate processes	25.00%	22	25.88%
Their cell wall is known for having internal foramina and external cribra	-20.00%	4	4.71%
They have two larger marginal labiate processes	-20.00%	2	2.35%
They can have one or more labiate processes	25.00%	83	97.65%

Question 13
Correct
Mark 1.00 out of 1.00

Choose which of these species belong to the order Thalassiosirales? Th
Skeletonemataceae, Lauderiaceae and Stephanodiscaceae. Each wrong



Select one or more:

- a. Species 1
- b. Species 2 ✔
- c. Species 3 ✔
- d. Species 4
- e. Species 5 ✔
- f. Species 6
- g. Species 7
- h. Species 8 ✔

Response	Partial credit	Count	Frequency
Species 1	-20.00%	0	0.00%
Species 2	25.00%	84	98.82%
Species 3	25.00%	85	100.00%
Species 4	-20.00%	0	0.00%
Species 5	25.00%	84	98.82%
Species 6	-20.00%	0	0.00%
Species 7	-20.00%	4	4.71%
Species 8	25.00%	84	98.82%

ANNEX XVIII: HABs Oceanteacher quiz results

Analyst Code IPI 2018	Grade	Q. 1	Q. 2	Q. 3	Q. 4	Q. 5	Q. 6	Q. 7	Q. 8	Q. 9	Q. 10	Q. 11	Q. 12	Q. 13
65	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
29	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
45	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
18	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
52	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
48	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
17	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
57	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
59	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
15	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
79	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
27	99.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5	100.0	100.0	100.0	100.0
19	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
20	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
43	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
88	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
83	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
32	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
50	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
84	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
62	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
78	99.1	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
80	98.7	100.0	100.0	100.0	100.0	100.0	100.0	83.1	100.0	100.0	100.0	100.0	100.0	100.0
89	98.5	80.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
69	98.5	80.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
16	98.5	80.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
53	98.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.5	100.0
86	98.5	80.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
41	97.8	100.0	88.3	100.0	100.0	100.0	100.0	83.1	100.0	100.0	100.0	100.0	100.0	100.0
5	97.7	100.0	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
74	97.7	100.0	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
9	97.6	100.0	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.5	100.0
82	97.0	80.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.5	100.0
40	96.9	59.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
73	96.9	59.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
7	96.9	59.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
68	96.8	100.0	88.3	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
91	96.8	100.0	88.3	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
30	95.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	46.8	100.0
58	95.4	40.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
39	95.4	100.0	100.0	100.0	100.0	100.0	40.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0
63	95.4	40.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

ANNEX XVIII: HABs Oceanteacher quiz results

Analyst Code IPI 2018	Grade	Q. 1	Q. 2	Q. 3	Q. 4	Q. 5	Q. 6	Q. 7	Q. 8	Q. 9	Q. 10	Q. 11	Q. 12	Q. 13
2	95.4	40.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
4	95.4	40.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
49	95.4	40.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
12	95.1	100.0	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	66.2	100.0
1	95.1	100.0	55.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.5
47	94.6	59.7	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
51	94.6	59.7	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
55	94.6	59.7	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
75	94.6	59.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.6	80.5	100.0
60	94.6	59.7	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
98	94.6	59.7	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
71	94.6	59.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.6	80.5	100.0
44	94.5	40.3	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
67	94.1	40.3	100.0	100.0	100.0	100.0	100.0	100.0	83.1	100.0	100.0	100.0	100.0	100.0
92	93.4	40.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5	100.0	100.0	80.5	100.0
31	92.5	19.5	100.0	100.0	100.0	100.0	100.0	83.1	100.0	100.0	100.0	100.0	100.0	100.0
85	92.3	40.3	100.0	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	89.6	100.0	100.0
21	92.2	59.7	88.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	70.1	100.0	80.5
11	91.6	19.5	88.3	100.0	100.0	100.0	100.0	83.1	100.0	100.0	100.0	100.0	100.0	100.0
64	90.9	40.3	88.3	100.0	100.0	100.0	100.0	66.2	100.0	87.0	100.0	100.0	100.0	100.0
23	90.6	19.5	88.3	100.0	100.0	100.0	100.0	100.0	83.1	87.0	100.0	100.0	100.0	100.0
94	89.3	40.3	100.0	100.0	100.0	100.0	70.1	100.0	83.1	87.0	100.0	100.0	80.5	100.0
37	88.7	59.7	100.0	100.0	100.0	100.0	40.3	66.2	100.0	87.0	100.0	100.0	100.0	100.0
77	88.3	19.5	77.9	100.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	80.5	100.0
81	88.1	59.7	88.3	100.0	100.0	100.0	70.1	100.0	100.0	87.0	100.0	59.7	80.5	100.0
36	87.8	40.3	88.3	100.0	100.0	100.0	100.0	100.0	100.0	66.2	66.2	100.0	80.5	100.0
24	87.5	40.3	100.0	100.0	100.0	100.0	70.1	100.0	100.0	80.5	66.2	100.0	80.5	100.0
34	87.0	80.5	100.0	0.0	100.0	100.0	70.1	100.0	100.0	100.0	100.0	100.0	80.5	100.0
87	86.4	40.3	100.0	100.0	100.0	100.0	10.4	100.0	100.0	72.7	100.0	100.0	100.0	100.0
95	86.1	19.5	100.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
28	85.5	100.0	88.3	0.0	100.0	100.0	40.3	83.1	100.0	100.0	100.0	100.0	100.0	100.0
10	85.0	40.3	77.9	100.0	100.0	100.0	40.3	100.0	100.0	100.0	100.0	100.0	46.8	100.0
90	83.9	19.5	100.0	100.0	100.0	100.0	10.4	100.0	100.0	100.0	100.0	80.5	100.0	80.5
22	83.1	19.5	77.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	16.9	100.0	66.2	100.0
38	82.8	40.3	55.8	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.5	100.0
33	82.8	80.5	88.3	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.5	27.3	100.0
72	82.1	19.5	67.5	100.0	100.0	100.0	10.4	100.0	100.0	100.0	100.0	70.1	100.0	100.0
54	82.1	40.3	100.0	0.0	100.0	100.0	40.3	100.0	100.0	87.0	100.0	100.0	100.0	100.0
8	81.1	59.7	88.3	0.0	100.0	100.0	40.3	100.0	100.0	100.0	100.0	100.0	66.2	100.0
76	71.7	80.5	88.3	0.0	0.0	0.0	100.0	100.0	83.1	100.0	100.0	100.0	80.5	100.0
66	59.5	59.7	67.5	0.0	100.0	0.0	40.3	100.0	100.0	53.2	66.2	64.9	46.8	75.3
46	56.3	19.5	67.5	0.0	100.0	100.0	0.0	66.2	100.0	80.5	100.0	35.1	33.8	29.9
Average	93.0	70.1	93.5	88.3	98.7	97.4	84.4	97.4	98.7	97.4	97.4	96.1	92.2	97.4