10 cells

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11th Webinar

bbe 10cells

New Measuring Instrument for the Indicative Investigation of Ballast Water

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Webinar

Part 1	Measuring Principle and Handling	10 min
Part 2	Independent Studies	10 min
Part 3	Interview	10 min

Feedback
Follow up

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Welcome

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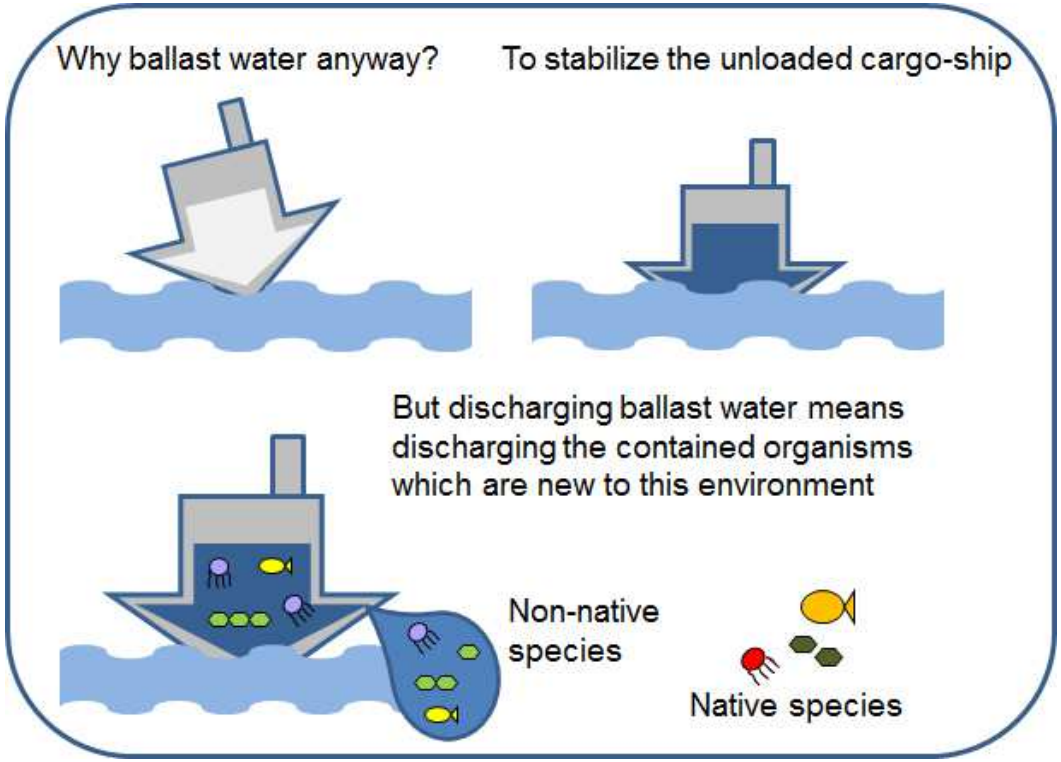
Ylva Tischler

bbe Team

The Need of Ballast Water



European Union The European Regional Development Fund

Regulatory Background

INTERNATIONAL MARITIME ORGANIZATION

International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004

Date of adoption	13 February 2004, London
Status	ratified on 8th September 2016

Regulatory Background

IMO INTERNATIONAL MARITIME ORGANIZATION

The main requirement of the IMO convention:

- Ballast water may only contain less than 10 living cells per ml in the size range of 10-50µm.

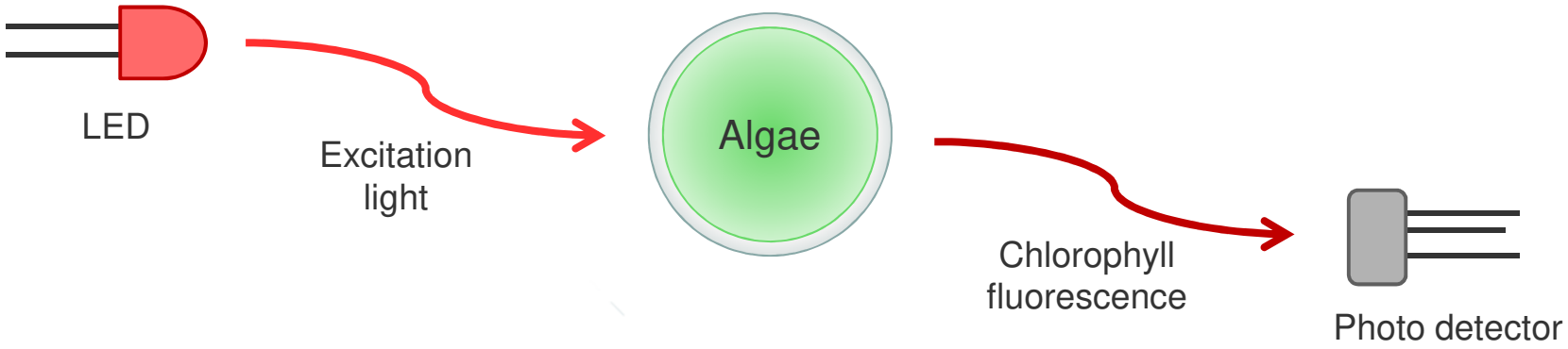
Advantages of the bbe 10cells

- Very sensitive:
  - Detection limit: 1 living cell/ml
  - 10 times more sensitive than required by IMO
- Measuring time less than 1 minute
- Mobile use, easy handling and robust design
- Without chemical pre-treatment
- Sampling equipment: syringe, bbe filter kit
- No maintenance, no cuvette to clean

bbe 10cells - Measuring Principle

- The measuring principle based on chlorophyll fluorescence of microalgae cells in the size range of 10 to 50 µm.

- Microalgae were chosen as indicative Organisms, because:
  - A great amount of biomass in ballast water consists of algae and
  - Algae can be measured optically and quickly in an easy way.



bbe 10cells - Handling

- Very sensitive field instrument to measure living algae cells in ballast water in a size range of 10 - 50 µm (IMO D2 compliance).

- Handling:
  - 50 µm pre-filtration
  - 10 µm filtration
  - Measurement

Expected Customers

- Producer of ballast water treatment systems
  - ➢ To check the own system during development
- Ship owners
  - ➢ Fast test to check the ballast water
  - ➢ To be able to take steps to reduce ship lay time
- Port authorities
  - ➢ Fast tool to control ships' ballast water

Part 2:
Independent Studies with the 10cells

Independent Studies of the Royal Netherlands Institute for Sea Research *(NIOZ)* about the Performance of the bbe 10cells

NIOZ performed a number of tests with the bbe 10cells including:

- Culture dilutions
- Field studies

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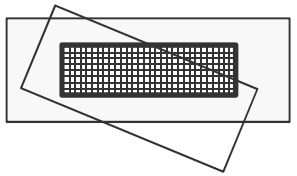
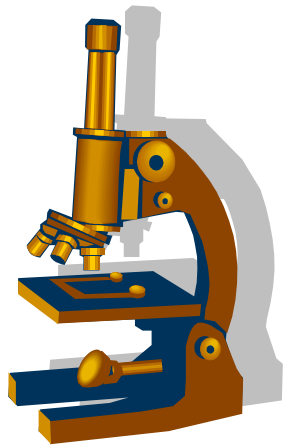
Comparison of Microscope Counting and Living Cell Measurements with the bbe 10cells

- Comparison of dilutions of *Thalassiosira weissflogii* cultures (diatom).
- Reference method: microscope counting:
  - The cells were treated with a dye (FDA) which only colors living cells.
  - The amount of living cells (size range of 10-50 µm) was determined using a counting chamber (SR) and an epifluorescence microscope.





SR: Sedgewick-Rafter; FDA: Fluorescein diacetate

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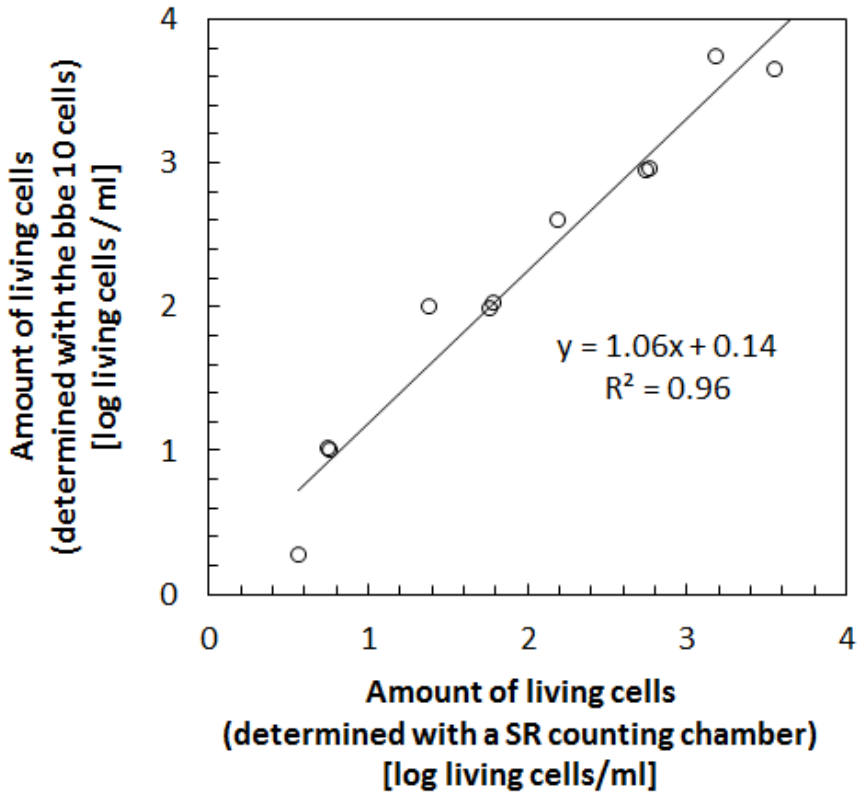
Comparison of Microscope Counting and Living Cell Measurements with the bbe 10cells

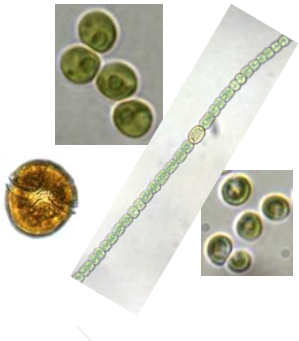


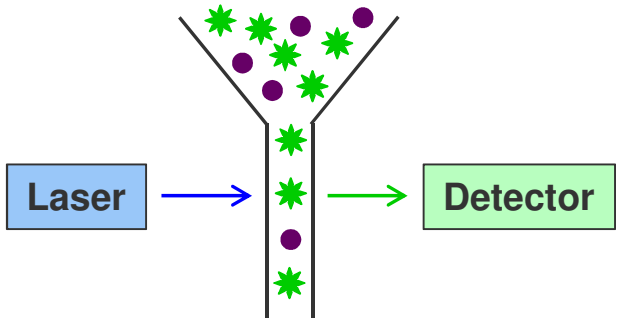
The measuring results of the bbe 10cells correlate high-grade with those of the microscope cell counting.

SR: Sedgewick-Rafter;
FDA: Fluorescein diacetate

Evaluation of the bbe 10cells using Natural Water Samples (Marine and Fresh Water)

- Comparison of living cell measurements with the bbe 10cells and the FC-CMFDA method.
- Reference method: FC-CMFDA:
  - The cells were treated with a dye (CMFDA) which only colors living cells.
  - The amount of living cells (size range of 10-50 µm) was determined using flow cytometry.





FC-CMFDA: Flow Cytometry with the dye Chloromethylfluorescein diacetate

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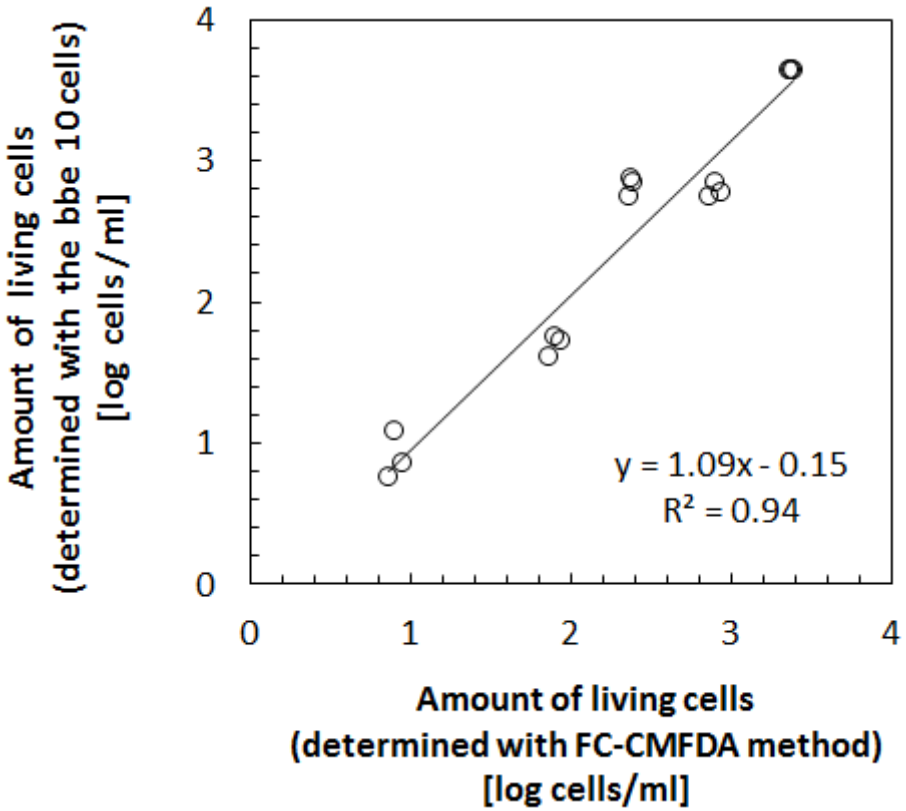
Evaluation of the bbe 10cells using Natural Water Samples (Marine and Fresh Water)

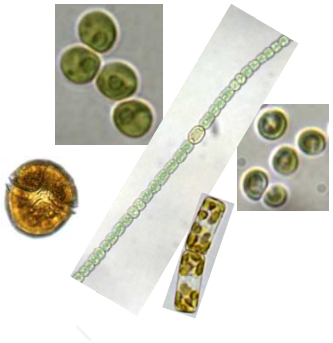


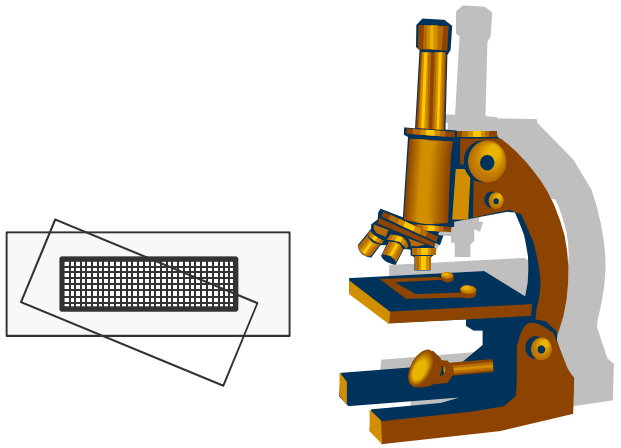
The measuring results of the bbe 10cells correlate high-grade with those of the flow cytometry cell counting.

FC-CMFDA: Flow Cytometry with the dye Chloromethylfluorescein diacetate

Independent Study during the BALMAS Project about the Performance of the bbe 10cells

- Test water samples from the Adriatic Sea near Piran, Slovenia.
- Reference method: microscope counting:
  - The cells were treated with a dye (FDA) which only colors living cells.
  - The amount of living cells (size range of 10-50 µm) was determined using a counting chamber (SR) and an epifluorescence microscope.





SR: Sedgewick-Rafter; FDA: Fluorescein diacetate

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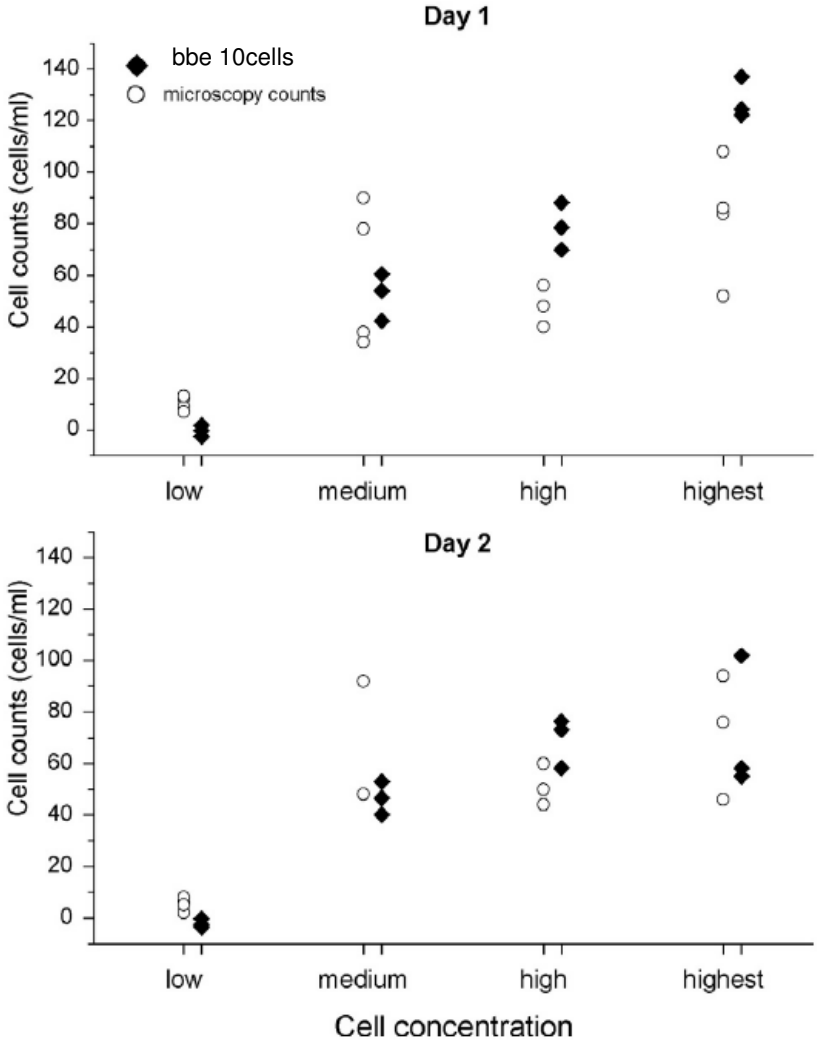


Independent Study during the BALMAS Project about the Performance of the bbe 10cells

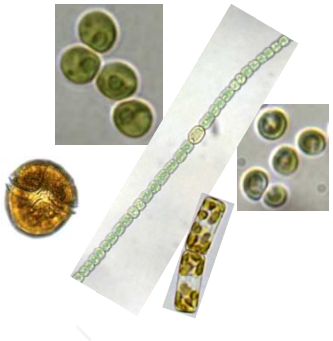
medium: natural algae concentration

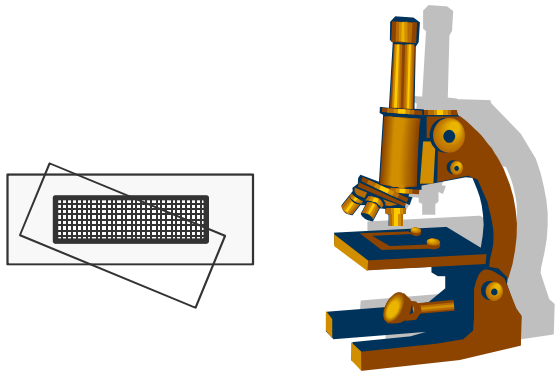
low: 10-fold dilution
high: 1:2 concentration via filtration
highest: 1:4 concentration via filtration

Source: Gollasch, S., et al., Quantifying indicatively living phytoplankton cells in ballast water samples - recommendations for Port State Control, Marine Pollution Bulletien (2015), http://dx.doi.org/10.1016/j.marpolbul.2015.09.037

Independent Study of the German Federal Maritime and Hydrographic Agency about the Performance of the bbe 10cells

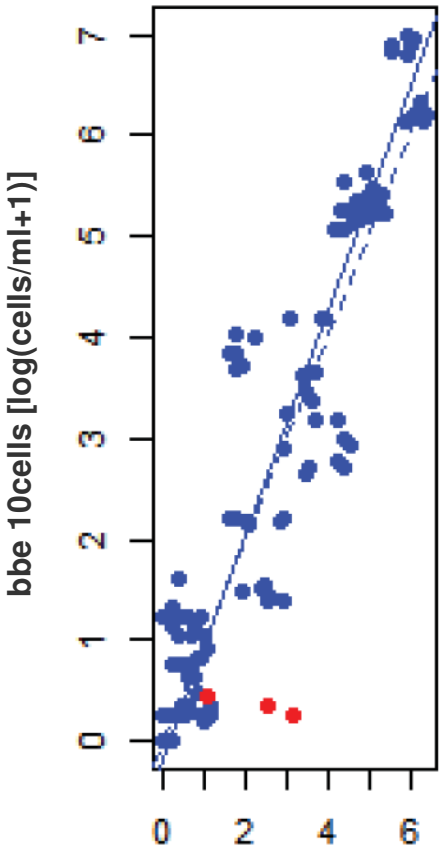
- Natural seawater (North Atlantic Ocean) and treated ballast water samples were tested.
- Reference method: microscope counting:
  - The cells were treated with a dye (FDA) which only colors living cells.
  - The amount of living cells (size range of 10-50 µm) was determined using a counting chamber (SR) and an epifluorescence microscope.





SR: Sedgewick-Rafter; FDA: Fluorescein diacetate

cor = 0.92



Independent Study of the German Federal Maritime and Hydrographic Agency about the Performance of the bbe 10cells

Red points: Samples that were treated with the ballast water treatment system

Solid line: line of the best fit found using Deming regression

Dashed line: line with the slope of 1

Source: Bradie, J. 2016. METEOR Voyage M116/2: Report on performance of ballast water collection and analysis devices. Prepared for BSH (German Federal Maritime and Hydrographic Agency) 130 pages.

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Features

- Very sensitive
- Easy handling
- Complete measurement below 1 minute
- Mobile use
- Robust

Conclusion

- Independent studies revealed the suitability of bbe 10cells for ballast water check.

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Many thanks
for your attention