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# The *bbe* Benthofluor

## A portable fluorometer to analyse benthic algae

Various algal species have adapted their nutrient uptake systems enabling them to survive in shallow water close to the shoreline, where sunlight still penetrates to the sea bed. This habitat is home to benthic algae, ranging from the microscopic to the enormous (Giant Kelp). Such flora, attached to the seafloor sediments, play an essential role in primary production.

In December 2000, the European Water Framework Directive (EU-WFD) came into force. This directive stipulates that the ecological status of water masses must be assessed. In order to do so, several biological elements must be considered, including benthic algae. As a result, it has become obligatory to study the development and abundance of benthic communities. The collected data will satisfactorily contribute to the assessment of the water quality in aquatic ecosystems.

Whilst macroscopic algae can be easily observed due to their size, the occurrence of the microscopic benthic algae are difficult to record. The necessity for time-consuming microscopy has hindered effective analysis of benthic algal groups. Now, using the new *bbe* Benthofluor, it is possible to analyse benthic algae in-situ, by utilising the fluorometric characteristics of the

different algal pigments.

By measuring the amount of red light fluorescence, arising from illumination at different excitation wavelengths, a quantitative estimate of algal density and its distribution between the different classes is now possible. This technique has been well proven for pelagic phytoplankton, by extensive application of the *bbe* submersible FluoroProbe, and has now successfully been adapted to measure benthic algae.

The Benthofluor is housed in a water resistant, carbon-fibre reinforced case



Fiber optics with adaption disk



### **bbe Benthofluor in field research**

Foto by R. Dörffer, AWI Bremerhaven

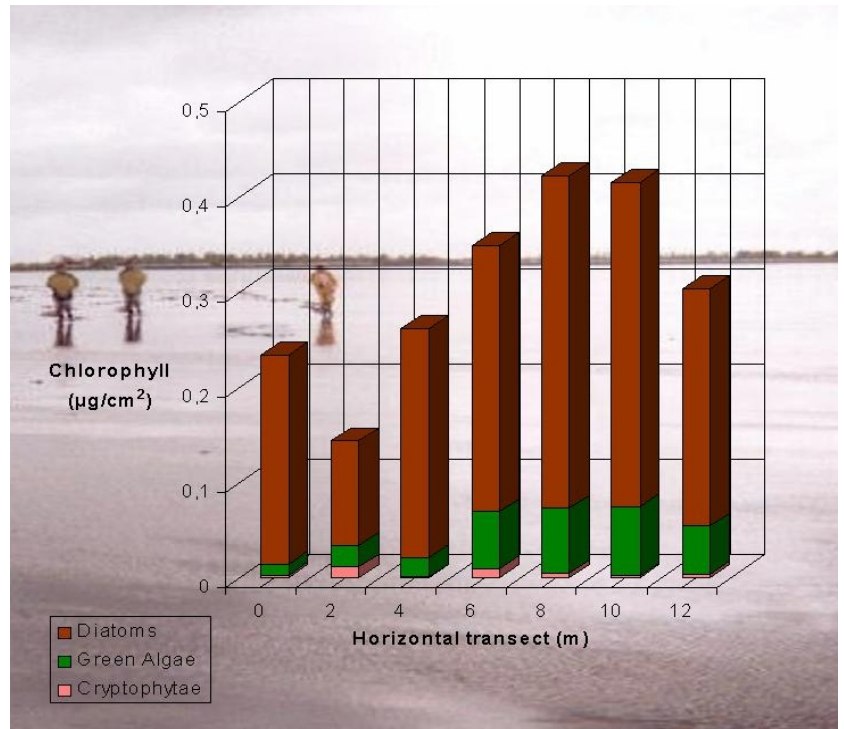
and during use, is transported in a backpack or placed inside a small boat. All the electronics, data processing and storage are confined in the unit, with the light irradiation and subsequent fluorescence being transmitted along a 1.5m fibre-optic cable to a submersible adaptor. This adaptor ensures a constant distance between the sediment and the fibre-optics, excludes ambient light enabling dark adaptation and prevents disturbance of the sediment layers. The unit is controlled by a laptop or small handheld PC (Archer PDA).



The chlorophyll-a content is displayed in real time in the measuring range up to  $3 \mu\text{g}/\text{cm}^2$ . Up to three algae classes are determined simultaneously. All data are recorded on the display or stored in the datalogger of the Benthofluor for further analysis. The ability to obtain and evaluate the results of the measurement on site makes the Benthofluor a valuable tool in benthic algae analysis.

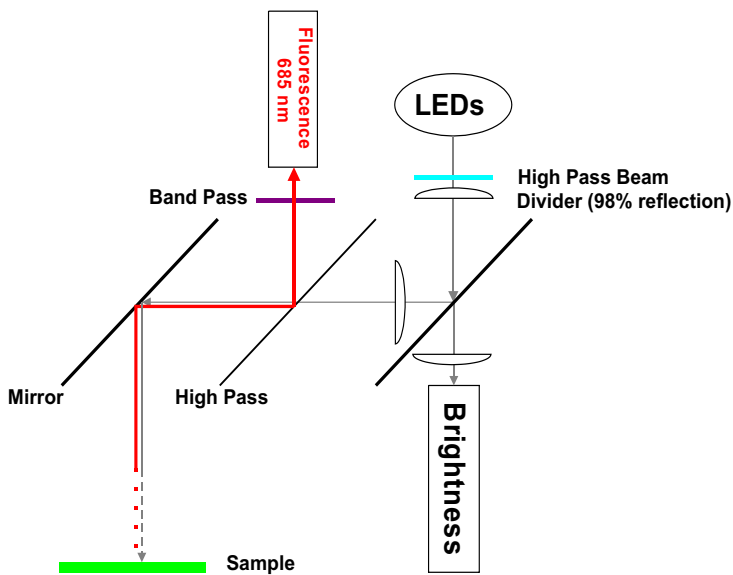
The Benthofluor comes with bbe software for use with Windows. The software uses spectral fingerprints of standardised algae from laboratory cultures but also allows the user to introduce his or her own type of algae as a special class.

The Benthofluor is a versatile instrument. Removal of the holder with fibre-optics quickly converts the Benthofluor into a submersible FluoroProbe. Installation of the parameter set for FluoroProbe operations requires only a PC and the standard bbe FluoroProbe software.



**Distribution of benthic algae: horizontal transect in the tidelands of North Sea near Westerhever**  
The graph shows the presence of diatoms.

### Principle of the Instrument



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### Technical Data

Measuring range	0 - $3 \mu\text{g chl-a}/\text{cm}^2$
Resolution	$0.1 \mu\text{g chl-a}/\text{cm}^2$
Algae classes	Up to 3
Weight	kg
Voltage	12V
Operation time / load	>10h
Data capacity	1800 data sets
Serial interface	RS232
Housing	IP 56

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