Workshop: Ship born sampling in the fjord "Schlei" and the "Baltic Sea"

Sampling strategies

Studying the marine environment requires the application of different sampling strategies. This is particular important as the major processes running in the ecosystem take place on different time and spatial scale. Sampling from research vessels is still a classical one of the most often applied approaches. It is used both to characterize the abiotic features of the seawater such as salinity, temperatures, and currents but also to derive samples from living organisms (e.g. algae and bacteria) and from the seafloor sediments. Due to the fact that the Baltic Sea features horizontal and vertical gradients in salinity the characterization of salinity distribution has to be done at each sampling station. However, in addition scientists make also use of other methods to study the Baltic Sea. Take a look to the overview given below.

Worksheet 1: Introduction of methods used for investigating the Baltic Sea

Fig. 1: Algae bloom

Research vessels are still very important tools for investigation of marine ecosystems. They allow sampling of water, sediments and organisms. Research cruises in the Baltic Sea range from a few days up to a month. Applying the same methods in different areas allows to compare the studied processes e.g. along the salt gradient in the Baltic Sea.

Fig. 2: Passenger ferry

Also cargo or passenger vessels can be used for scientific purposes. Ship owners just need to provide small space to install automated sampling and measuring devises. This gives time series data along the route of the investigated parameter which allows to investigate how processes (e.g. algae blooms) develop over the seasons and along the route.

Fig. 3: Autonomous Monitoring station in the Arkona Basin

In the shallow western part of the Baltic the Institute for Baltic Sea research Warnemünde (IOW) operates 3 autonomous monitoring stations (http://www.io-warnemuende.de/marnet-en.html). The main purpose of these stations is to study the water exchange between North Sea and Baltic Sea and to study the anthropogenic import of nutrients and hazardous substances to the Baltic Sea.
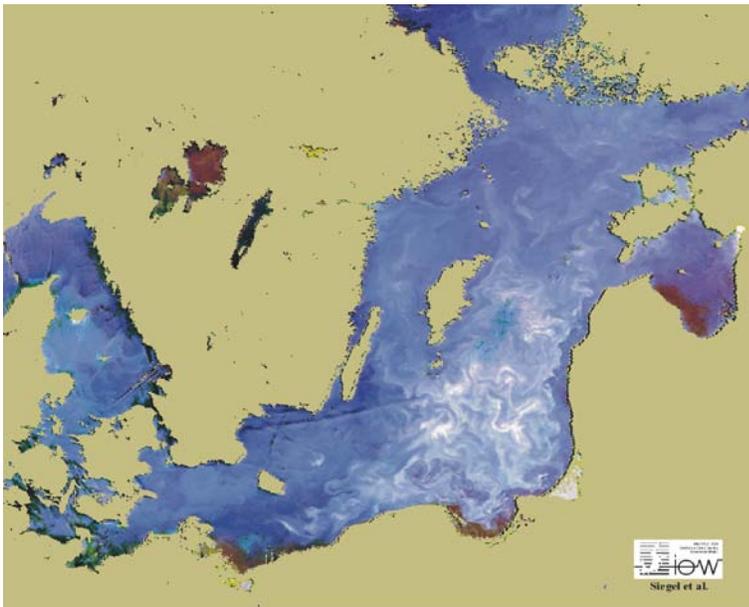

Fig. 4: Satelite picture of the Baltic Sea

To study processes like the development of algae blooms on a Baltic Sea wide scale, this requires the use of satellites. The research field which makes use of pictures derived of satellites is called "remote sensing". If there are no clouds affecting the view, pictures derived from satellites can be used to quantify the extend of cyanobacterial blooms in the Baltic Sea (see figure left hand).

Some instructions for sampling using the workboat "Klaashahn"

Safety instruction:
-        Always wear a life jacket! Only people which are able to swim can join!
-        Number of students is limited to 5 students plus two technicians
-        Follow the instruction of the skipper!

Fig: 5: Workboat KLAASHAHN ready for the Sciene Camp Kappeln.

Sampling area:
Your sampling will take place both in the fjord "Schlei" and in the "Baltic Sea".
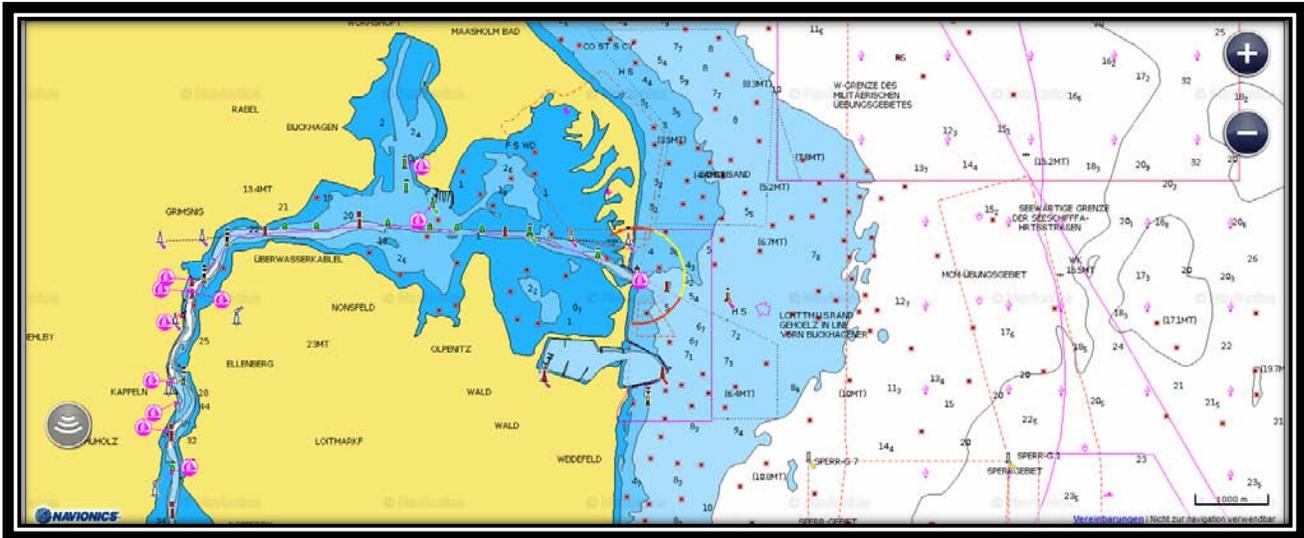
Fig. 6: Seachart from Schlei/Baltic Sea derived from www.navionics.com.

What kind of samples do we take?

1. Salinity (direct measurement)
2. Secchie depth
3. Water
4. Plankton
5. Benthic organisms

What instruments do we use?

Please find below some information on the applied sampling devises. The crew will teach you how to use those before heading out to the sampling stations.

For determination of salinity we use a salinometer. This device measures the conductivity in the water. Considering the temperature the unite calculates the salinity (sorry, some kind of black-box stuff).

Fig. 7: Salinometer.

A standard parameter for characterization of sampling station is water transparency. This is defined as the depth light penetrates in the surface waters. Measuring is done use a so call "Secchie Disk". The operator lowers the disk on a rope until it visually disappears. This is defined as secchie depth. Water transparency is controlled by the amount of e.g. algae and suspended particulate matter.

Fig. 8: Secchie Disk

Fig. 9: Water sampler

Water samplers are used to collect water samples in distinct depth levels. The sampler is first lowered down on a rope until it reaches the wanted depth; afterwards it is getting closed by using a weight which slides down on the rope to close the lids.

For the collection of plankton special nets can be used. The nets are first lowered to the wanted depth before they get retrieved to the surface. While be "running up" through the water column the organisms gets collected in the beaker attached to the bottom of the net. To get a sufficient amount of sample the sampling has to be repeated several times.
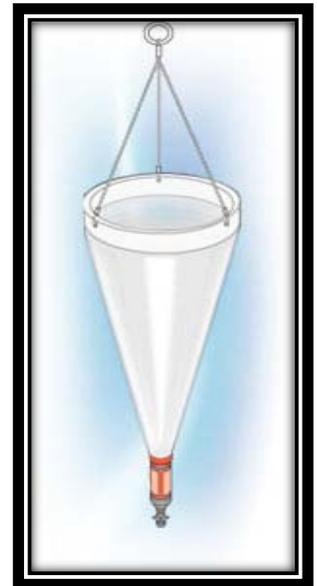
Fig. 10: Plankton net

To collect samples of organisms living on top and in the sediments (benthos) a so called dredge is applied. This devise consists of a solid metal frame onto which a net is attached. The dredge sampling takes place from a slowly driving boat (1-2 km/h). The metal frame slides over the seafloor. This makes the bottom dwelling organisms trying to escape which gets finally caught in the net.

Fig. 11: Dredge for collecting benthic organisms

What needs to be documented while sampling?

Besides taking care of the derived samples also some metadata needs to be documented. Those include:
- Date of sampling
- Sampling gear
- Position auf sampling position
- Depth from where the sediment was taken

All these information have to be carefully documented on the sample and/or in the sampling protocol. Please use permanent markers when labeling sample containers and a pencil when making note in paper protocols (those stay even if it gets wet).

Tasks for sampling cruise onboard workboat "Klaashahn"

The main goal for sampling cruise is to take samples (water, plankton, benthos) along a gradient from fjord schlei to the Baltic Sea. Please proceed as described below:

Divide the group of students into:
one being responsible for writing the the sampling protocol and determination of secchie depth
    being responsible for salinity measurements
    taking water samples
    taking plankton samples
    taking dredge samples

1. Study the seachart and select together with the technicians 2 sampling locations in the Schlei (at minimum 3 m water depth) and one in the Baltic Sea. If weather doesn´t allow sailing to the Baltic Sea, take a 3rd station in the Schlei.
2. At each station conduct the following work including make notes in the protocol:
   - Measure the secchie depth at each station
   - Measure the salinity both on the surface and close to the bottom
   - Take water samples from the surface and from water layer close to the seafloor using water sampler.
   - Take 3x plankton samples using the plankton net (put all in one container).
   - Take 2x dredge samples, each time 5 min trolling. Put the samples into different containers.

Please note: Water, plankton and benthos samples will be also used for other workshops.