

Effects on the seabed sediment from beam trawling in the North Sea.

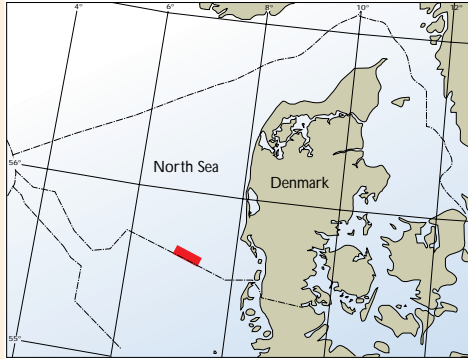


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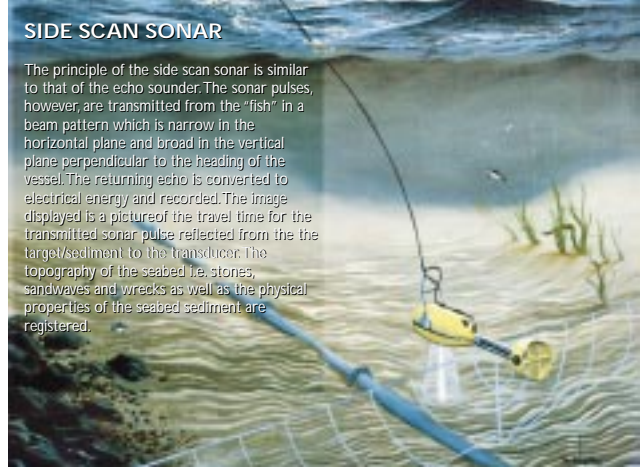


Several human activities in the marine environment i.e. dredging, fishery, building activities, discharge of nutrients etc. have been in the focus of the environmental administration for many years. Damage of the benthic fauna suffered by the passage of the trawler, the change of the physical property characteristics of the seabed sediment and the release of nutrients and heavy metals from the sediment by trawling have been studied in the North Sea by several authors. Most investigations, although, have focused on the damaging effects on the benthic fauna during the physical exploitation of the seabed. Half of the impacts from the use of trawling gear in the North Sea is caused by beam trawling. In the southern North Sea where beam trawling fishery is most intensive certain areas might be influenced on average 3-4 times per year. The present investigation area is located here, close to the Danish/German borderline. As a part of a regional geological mapping survey by the use of side scan sonar recordings tracks of beam trawling gear on these seabed sediments have been registered.



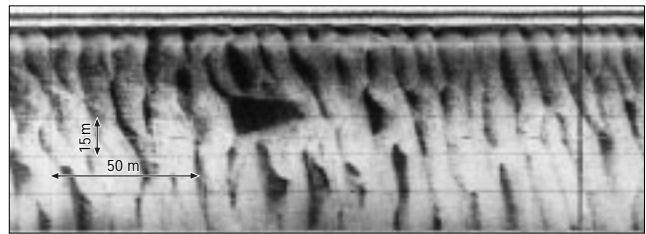
SIDE SCAN SONAR

The principle of the side scan sonar is similar to that of the echo sounder. The sonar pulses, however, are transmitted from the "fish" in a beam pattern which is narrow in the horizontal plane and broad in the vertical plane perpendicular to the heading of the vessel. The returning echo is converted to electrical energy and recorded. The image displayed is a picture of the travel time for the transmitted sonar pulse reflected from the target/sediment to the transducer; the topography of the seabed i.e. stones, sandwaves and wrecks as well as the physical properties of the seabed sediment are registered.



SEDIMENT TRANSPORT - BY NATURE

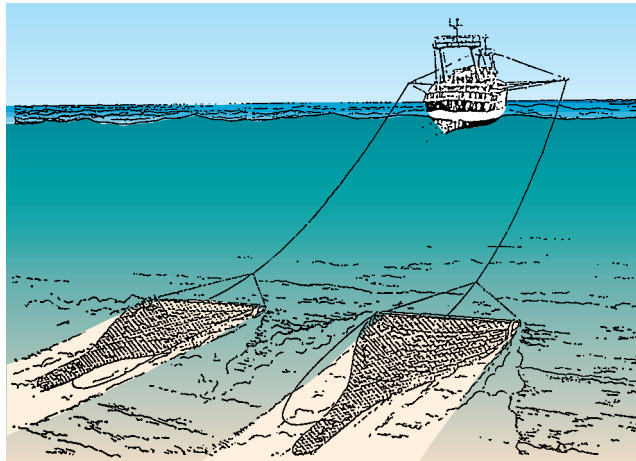
Dependant on the dynamic forces the uppermost part of the sediment by nature will migrate. Waves, currents and biological activity imply sorting, transport and/or sedimentation of the sediment. Sand migrates close to the seabed building up the characteristic ripples. By strong currents (> 30 cm/sec) the ripples increase in size to megaripples and sandwaves. Mud and organic detritus, on the other hand, is transported in suspension and during storms resuspended into the water column. Fine sand/coarse silt normally is part of the mobile sediment fraction in the wave- and current exposed south-eastern North Sea. Bottom roughness contributes further to the turbulence of the bottom boundary layer and may normally prevent the deposition of fine grained sediment in the area dealt with.



Side scan sonar record of sand wave field.

THE FUTURE PROTECTION POLICY

An assessment of the natural processes in relation to the human impacts of the seabed is needed to balance the natural resource management and protection policy and the exploitation of the sea. It is therefore strongly recommended to conduct repeated (yearly) sidescan sonar surveys and sediment sampling programmes in beam trawling areas for monitoring the extent of changes of the seabed sediment in order to implement this information in the future fishery policy. Using the longterm experience in geological surface sediment mapping would be an effectful way to point out the most sensitive areas to beam trawling.



LONG-TERM TRAWLING EFFECT ON THE SEABED SEDIMENT

In the region dealt with area poorly preserved trawl marks are widely distributed. An exception, however, was found in an area near the German borderline, where on coarse grained sediments numerous extremely well-preserved beam trawling marks are displayed. Due to beam trawling the substrate appears locally to have entirely altered from coarse grained sand and gravel to predominantly fine sand and/or coarse silt filling the trawl marks. Individual trawling marks have a maximum width of about 12 m. Various individual areas where the original coarse substrate has now entirely been covered by fine sand are larger than 50,000 m². Long-term effects (> year) on the seabed from hydraulic dredging of Cardium Edule has been demonstrated by Runte (1991) during investigations in the German tidal flat areas. Comparing the sediment filling of the dredging tracks with the sediment present outside these tracks the physical property characteristics of the sediment has changed. This may imply that beam trawling also has a long-term effect on the seabed, as has been demonstrated above. In some areas this may have resulted in a definitive change of the substrate with all possible implications for the benthic community.

Side scan sonar record from the SE North Sea (see map). Depth of water in the area is around 25 m. Light colours reflects fine sand/coarse silt deposited along the beam trawl tracks. Dark areas reflect the original substrate of coarse sand and gravel.

