

WADDEN SEA



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Dredging and Dumping - Impacts on Macrozoobenthos

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INTRODUCTION

In October 1995, the German Federal Institute of Hydrology (BfG) in Koblenz, with its branch office in Berlin held a workshop aimed at gaining a general overview on the impacts of dredging and dredged material dumping on the aquatic fauna with special reference to the German coastal waters. Invitations to this discussion went to scientists and experts in pertinent authorities, private consultants, as well as researchers at institutes and universities. The pooling of such a wide diversity of topics, views, approaches, and findings seemed to us the best method of "scoping this field", which also meant the combination of aspects

of the Wadden Sea/Estuaries with those of the Baltic. A detailed documentation on this workshop has recently been published in the series MITTEILUNG DER BUNDESANSTALT FÜR GEWÄSSERKUNDE, 1996, No. 11, 111 p., and can be obtained from the BfG. In the following, abstracts of these papers are presented.

WADDEN SEA / ESTUARIES

HAGENDORFF ET AL.: Literature Study - Mussels and Suspended Matter, p. 7-11.

A great portion of the literature about the topic of this workshop exists only in form of reports or expert opinions and is, thus, not

generally available. In order to collect the expertise of these studies and make it widely accessible, the BfG commissioned a literature study. This paper presents one aspect covered in this literature search, namely the impacts of increased suspended matter concentrations on mussels. In general, one can state that unless the increase of suspended matter concentrations does not exceed certain thresholds, or if it occurs only temporarily, the organisms do not suffer damages, sometimes they may even benefit from improved food supply.

ESSINK: Dutch studies - An Overview, p. 12-17.

An overview of the studies made in The Netherlands shows that - concerning macrozoobenthos - the most severe direct impacts of dredging and dumping of dredged material are those of the dredging operation itself, the increased sedimentation at the dumping site and in its vicinity, as well as the increased concentration of suspended solids. Beyond this, continual dredging operations in estuaries may trigger large-scale changes in the suspended matter regime and in the geomorphology of channels and tidal flats. These changes may, in turn, cause gradual modifications in the structure of benthic communities of the estuary and its carrying capacity for avifauna.

VAN BERNEM: The Europe Development Project in the East Frisian Wadden Sea, p. 18-29.

First study results on the macrofauna in the context of the Europe Development Project (gas pipeline off Langeoog) show that the number of species to be found in the sublittoral has significantly decreased, not only in the areas directly affected by dredging operations, but also in the adjacent zones in the west and south. Irrespective of direct damages of dredging, local sediment accumulations were found where the blanketing rates were critical for numerous macrofauna organisms. The high portion of fluid mud

found in some net catches in the eulittoral, as it was observed only during the construction activity, is an indication for possibly severely changed quality of the near-bottom particle load.

HÜBNER ET AL.: East Frisian Wadden Sea - Individual Management of Dumping Sites, p. 30-44.

The maintenance of tidal harbors and their approach channels requires regular dredging. Concerning the first results of a pilot study in the East Frisian Wadden Sea (sediments, turbidity, macrozoobenthos), possibilities of an individual management of dumping sites are discussed. Such a management concept is based, on the one hand, on knowledge of the area and material-specific impacts of dredged material dumping (contamination potential) and, on the other hand, on information about the admissible effects in the impact area (tolerance potential). With these two inputs, an assessment scheme can be developed for which a structure is proposed.

GOSSELCK ET AL.: Recolonization of Dumping Sites for Dredged Material in the Weser Estuary, p. 45-52.

On the Outer Weser River, dredging operations are going on for maintenance and new construction projects. In this context, studies on the recolonization of former dumping sites by macrozoobenthos have been made since 1991. Findings collected so far, suggest, that in the mesohaline part of the study area, the disturbed areas are fully recolonized within one year. The full benthos recolonization in the polyhaline parts, including the increase in long-living, stenotopic species, takes, in general, two years at maximum.

NEHRING AND LEUCHS: HABAK Pilot Projects in the Estuaries of Ems and Elbe - An Overview, p. 60-64.

International conventions for the protection of the seas pursue, inter alia, the aim and purpose to provide the signatory states with

unified guidelines for the analysis, assessment, and management of dredged material. In this sense, the BfG developed the "Manual for the Application of the Guidelines on Dredged Material of the OSLO and HELSINKI Conventions in the Federal Waterways and Shipping Administration of Germany" (in German short "HABAK" for **H**andlungsanweisung **B**aggergut **K**üste) that was then enacted by the German Federal Ministry of Transport. In order to test the full implementation of this guideline, two HABAK pilot projects were initiated (Ems-Dukegat and Ems-Brunsbüttel). Both pilot projects showed clearly that dredged material dumping can have lasting impacts on macrozoobenthos populations. A modification of the bottom sediments, however, could not be proven, although short-term (one hour) and local increases in turbidity were observed.

LEUCHS ET AL.: Permanent Dumping Site Brunsbüttel in the Elbe Estuary, p. 53-59.

An in-depth presentation of the results of the HABAK pilot project on macrozoobenthos at the permanent dumping site Brunsbüttel revealed that the macrofauna community occurring there is strongly deficient in species which possibly results from the strong increase of the fluid mud layer through the permanent dumping operations.

NEHRING AND LEUCHS: In Situ Documentation of the Fluid Mud Layer, p. 65-68.

For some years, image processing techniques have gained increasing significance in documenting the state of the environment in conjunction with conventional study methods. They allow to integrate point observations over wider areas. The application of a RETMOS sediment profile camera at the permanent dumping site Brunsbüttel could demonstrate that dredged material dumping intensifies turbidity and that dumped material settles here, although this was not proven in previous morphological studies.

BALTIC SEA

KROST: Study on the Dredged Material Concept of the Government of Schleswig-Holstein, p. 69-72.

Between 1992 and 1995, a study was devoted to the concept of the Government of Schleswig-Holstein for the handling of dredged material. It was found that dredged material disposal disturbs the benthos through spillage and increased water turbidity, but that these interferences were local and transient. At the scheduled disposal sites on the Baltic coast of Schleswig-Holstein, the benthos is pre-adapted to mechanical interferences, so that these sites are acceptable for the dumping of uncontaminated material. However, the lateral drift of the turbidity plume is crucial, as it hinders the orientation of animals, clogs filter organs, and impairs photosynthesis.

RUMOHR: A Succession Model for the Baltic Sea, p. 73-76.

Species communities have a general tendency towards higher complexity, diversity, and biomass, i.e. a higher "degree of maturity". In the Baltic Sea, however, frequent disturbances (such as pollution, fishery, sand mining) often set them back to a less "mature" level and they have to restart repeatedly at the pioneer stage to establish new communities. A succession model for the specific conditions of the Baltic Sea is discussed which describes various succession stages under deteriorating environmental conditions and which might serve as a classification tool for Baltic Sea benthos similar to the saprobic system in watercourses.

SCHLUNGBAUM & BAUDLER: Concepts for Minimizing Dredging, p. 77-90.

With the example of the siltation of coastal lagoons ("Bodden" and "Haffe") on the Baltic coast of Mecklenburg/Western-Pomerania, potential sanitation concepts are presented to minimize dredging requirements. One possibility for the restoration of these

lagoons, with special reference to the negative impacts of sediments and silt, is the trapping and collection of easily suspendable and biochemically highly active muds in artificial sedimentation basins. This first stage of the sanitation process should be combined with an acceleration of the microbial sediment decomposition by application of immobilizing bacteria to these sedimentation basins. Thus, the removal of sediments by dredging might become unnecessary.

GOSSELCK: Dumping Sites for Dredged Material - Selection Criteria for Suitability, p. 91-98.

So far, there have been no concrete criteria for assessing and evaluating the sensitivity of marine species and habitats. Thus, it became necessary to develop precise criteria for the suitability of marine habitats for dredged material dumping on the seafloor. On the basis of a large-scale division of the Baltic Sea benthos off Mecklenburg/ Western-Pomerania, and the assessment of the vulnerability against the dumping of dredged material, zones were defined where dumping is inadmissible, and potential dumping sites were identified. The latter comprise the gravel and sand areas without macrophyte growth in a depth between 6 and 15 meters and the oxygen-deficient mud zones in the Lübeck Bay and some regions in the Bay of Pomerania.

KÖHN: Population Studies for Risk Assessment, p. 99-106.

Studies on population ecology of macrozoobenthos communities can support the assessment of the risks associated with interventions through dredging and dredged material dumping. However, it was shown that in the western part of the Baltic Sea, merely about one fifth of the species is suitable for such studies. Moreover, comparative studies from impacted areas are required. Recolonization may be enhanced if population studies allow to give detailed

recommendations for the dimensions of the dredging and disposal sites and the times when these activities should be stopped.

OVERVIEW - OUTLOOK

ANLAUF ET AL.: Issues, Discussions and Suggestions of the Workshop, p. 107-111.

An essential and recurring topic of the discussion, was about methodological aspects (sampling technique, frequency and depth of sampling, statistical evaluation, quality assurance), although no final recommendations were developed. Regarding the site selection for dredged material dumping, it was agreed that an orientation at biological criteria is a meaningful approach. As to the assessment of the impacts of dumping, it was noted that information about the dredged material to be dumped is often not available, although it should be included in the holistic consideration and prediction of impacts. Because of the diversity of these issues, future workshops were announced by the organizers to be held in (bi)yearly intervals, each with a focus on a specific topic (such as assessment frames, significance of the types of plausibility, development of sensitivity grids). In January 1998, the BfG will held the 2th workshop in Hamburg on "Methods in macrozoobenthos investigations".

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