Reducing the impact of blue mussel (Mytilus edulis) dredging on the ecosystem in shallow water soft bottom areas

Dredging blue mussels (Mytilus edulis) and thus removing structural elements, inducing resuspension of sediment as well as reducing filtration capacity, will inevitably affect the ecosystem. The study demonstrates that the impacts of fishing can be reduced through gear developments. A new light dredge was tested on commercial vessels using two different experimental setups. First, a twin haul experiment tested the standard gear (i.e., a Dutch dredge) against the light dredge by fishing the two gears side by side onboard the same vessel. Second, a single dredge experiment tested the absolute performance of the two gears by fishing in areas with a known blue mussel density. Results from the twin haul experiment demonstrate that the weight of sediment retained in the gear per square metre fished is 49% less in the light dredge compared with the Dutch dredge which will reduce resuspension of sediment at the surface. Also, the drag resistance of the light dredge was significantly less (177.1 vs. 202.7kgm-1). In the twin haul experiment no significant difference was found in the catch per unit effort (CPUE) of the two gears. The single dredge experiment, on the other hand, demonstrated a significant increase in CPUE exceeding 200% when using the light dredge. Seafloor tracks made by the two dredges could not be distinguished by use of side-scan sonar and the tracks were still detectable 2 months after fishing. It was concluded that replacement of the Dutch dredge with the light dredge would reduce the impact of the fishery on the ecosystem by (i) reducing resuspension of sediment, (ii) reducing fuel consumption, and (iii) potentially reducing energy transfer to the sediment through a reduced gear drag resistance. A potential increase in catch efficiency may reduce the area affected. Fishing with the light dredge is discussed in relation to management of Natura 2000 sites.
Fiskeriets påvirkning af naturtypen 'Rev' (1170) i Natura 2000 området i Lillebælt

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Authors: Christoffersen, M. O. (Intern), Dinesen, G. E. (Intern), Geitner, K. (Intern), Stenberg, C. (Intern), Lisbjerg, D. (Intern), Dolmer, P. (Intern)
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Kulturbankeprojekt med udlægning af blåmuslinger produceret på langline

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Organisations: National Institute of Aquatic Resources, Danish Shellfish Centre, Section for Ecosystem based Marine Management, Research Secretariat, Section for Marine Living Resources, DHI Denmark, Danish Shellfish Centre, University of Copenhagen
Authors: Dolmer, P. (Intern), Christensen, H. T. (Intern), Christoffersen, M. O. (Intern), Hansen, F. T. (Ekstern), Møhlenberg, F. (Ekstern), Lisbjerg, D. (Intern), Stage, B. (Intern), Landes, A. (Intern), Nielsen, P. (Intern), Tørring, D. (Ekstern)
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Design of integrated survey systems to provide high quality, low-cost data for marine management.

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Organisations: Section for Vessels, National Institute of Aquatic Resources, Section for Management Systems
Authors: Stage, B. (Intern), Lundgren, B. (Intern), Lisbjerg, D. (Intern)
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High-resolution geo-coded mapping of shallow-water benthic ecosystems using a towed video-array: A pilot experiment

General information
Habitat mapping as part of an ecosystem-based approach to management of coastal waters

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State: Published
Organisations: Research Secretariat, National Institute of Aquatic Resources, Section for Fisheries- and Monitoring Technology
Authors: Lisbjerg, D. (Intern), Pham, A. H. (Intern), Stæhr, K. (Intern), Stage, B. (Intern), Lundgren, B. (Intern)
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Biologiske effekter af råstofindvinding

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Authors: Lisbjerg, D. (Intern), Petersen, J. K. (Intern), Dahl, K. (Ekstern)
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Feeding activity, retention efficiency, and effects of temperature and particle concentration on clearance rate in the marine bryozoan Electra crustulenta

Various factors influencing clearance rate were elucidated on the bryozoan Electra crustulenta (Pallas). Measurements of clearance rates were performed using the algae Rhodomonas sp. (6 μm in diameter). Clearance rates were related to the area of the active zooids within the colonies in order to obtain area-specific clearance rates. Specific area was 42% of the total colony area. Several replicates were performed with each colony to obtain maximum clearance rate (F-max). F-max increased with temperature from 90 ml h(-1) cm(-2) at 6 degreesC to 229 ml h(-1) cm(-2) at 22 degreesC. Clearance rate decreased at increasing algal cell concentration from 1600 to 19 000 cells ml(-1). The decrease in clearance corresponded to a maximum ingestion rate at particle concentrations > 8500 Rhodomonas sp. cells ml(-1). E. crustulenta zooids are capable of retaining and ingesting particles in the range from ca 5 to ca 30 pm in diameter. Smaller particles are less efficiently retained due to the structure of the feeding apparatus, the lophophore and larger particles due to the size of the mouth (30 pm in diameter). Feeding activity was observed on single zooids and it was found that zooids have periodical retraction of the lophophore. At low particle concentrations (ca 1500 cells of Rhodomonas sp, ml(-1)) the lophophore is retracted 5 x h(-1) for periods of 38 s. Zooidal activity measured as the time of protruded lophophore thus leads to an activity of 95% of the total time. At high algae concentrations, zooidal feeding activity decreased to 70% as the lophophore was retracted more frequently (10 x h(-1)) and for longer periods of time (107 s). Despite the decreased activity at high algae concentration, this could only account for 50% of the decrease in clearance rate. Thus, regulatory mechanisms of the clearance rate other than retraction of the lophophore must be considered in bryozoans.

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Clearance capacity of Electra bellula (Bryozoa) in seagrass meadows of Western Australia

Filtration rates were measured as the clearance of algal cells (Rhodomonas sp.) in the laboratory for the bryozoan Electra bellula (Hincks). The colony clearance rates were related to both total and specific (active) area of the colony, and a closer correlation was obtained when relating clearance to specific area. All results were therefore related to specific colony area. On average 49% of total colony area had active zooids. Clearance rates were measured at temperatures ranging from 16 to 24 degrees C. Maximum specific clearance rates (F-max) were from the 2-3 replicates with the highest specific clearance rates out of 3-8 experiments performed with each colony. F-max varied from 69 ml h(-1) cm(-2) at 16 degrees C to 107 ml h(-1) cm(-2) at 24 degrees C. Highest F-max of 115 ml h(-1) cm(-2) was measured at 20 degrees C. Dry weight (DW) related to total area by W-DW = 5.15 mg cm(-2) and ash-free dry weight (AFDW) by W-AFDW = 1.15 mg cm(-2). F-max = 9.5 1h(-1) g(-1) DW and 43 1h(-1) g(-1) AFDW at 22 degrees C. The clearance capacity of bryozoan communities in seagrass meadows of Western Australia is estimated by use of these results. (C) 2000 Elsevier Science B.V. All rights reserved.

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Projects:

Fisheries management in NATURE 2000 areas (38797)
Approximately 17 % of the Danish sea territory is appointed as Nature 2000 areas. Many of these areas are also very important for fishery. To allow fishery to continue in Nature 2000 sites, it must be demonstrated that the fishery does not negatively impact the basis for appointment for the site. The project aims to establish the science base for development of a concept for Environmental Impact Assessments (EIA) for fishery and aquaculture in Nature 2000 areas, as well as establish interactions between the mussel fishery and the basis for appointment of Nature 2000 areas. The results generated will provide input to the EIA conducted by DTU Aqua and to other advisory issues related to mussel fishery, and to improve the environment in Nature 2000 areas. The approach is a combination of field experiments, model development and theoretical work. Through the project, knowledge will be generated on eelgrass, macrophyte and blue mussel ecology and abundance and interactions with mussel fishery. Development of the oyster fishery in the Wadden Sea will be developed with focus on the Nature 2000 site N89. Seabed mapping of the stone reefs in the Little Belt Sea will include an analysis of the impact of blue mussel fishery on these habitats. Finally the project will establish knowledge base for interactions between aquaculture and Nature 2000 areas.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Danish Shellfish Centre
Period: 01/01/2010 → 30/09/2012
Number of participants: 7
Research areas: Ecosystem Based Marine Management & Observation Technology
Project participant:
Dinesen, Grete E. (Intern)
Stage, Bjarne (Intern)
Lisbjerg, Dennis (Intern)
Rasmussen, Richard Skott (Intern)
Project Manager, academic:
Dolmer, Per (Intern)
Christoffersen, Mads (Intern)
Poulsen, Louise K. (Intern)

Towards an integrated marine and maritime science community (MARCOM+) (38881)
The Aberdeen plus interest group joined forces with the Venice Platform group to take further steps in integrating the marine, maritime and coastal research sectors in Europe. The goal is to establish a sustainable and long-lasting partnership forum (European Marine and Maritime Science and Technology Forum), based on shared interests and shared leadership, and to test it on regional seas and pan-European basis. The process will contribute to developing interactions between partners (the research community, industry, regional authorities, civil society and other stakeholders) starting from regional scales to broader issues shared with EU-neighboring countries.

In the project DTU Aqua is representing the European Fisheries and Aquaculture Organization (EFARO).
The project is coordinated by International Council for the Exploration of the Sea (ICES).

National Institute of Aquatic Resources

Research Secretariat

International Council for the Exploration of the Sea

Coastal and Marine Union

European Council for Maritime Applied R&D Association (representing the Waterborne Technology Platform)

Marine Board – European Science Foundation

European Aquaculture Technology and Innovation Platform

Hellenic Centre for Marine Research

Royal Netherlands Academy of Arts and Sciences (representing the European Network of Marine Research Institutes and Stations MARS)

Community of European Shipyards Associations

Mediterranean Science Commission

Period: 01/01/2010 → 15/04/2012

Number of participants: 2

Research area: Ecosystem Based Marine Management

Project participant:

Köster, Fritz (Intern)

Lisbjerg, Dennis (Intern)

Project