Field clearance of an intertidal bivalve bed: relative significance of the co-occurring blue mussel Mytilus edulis and Pacific oyster Crassostrea gigas

At an approximately 12,000 m² sheltered intertidal bivalve bed in the western part of the Limfjord, Denmark, the Pacific oyster Crassostrea gigas co-occurs with the blue mussel Mytilus edulis. The relative significance of the impact of the 2 species on phytoplankton density during a tidal cycle was estimated by combining field measurements of clearance rates and modelling of the bivalve bed (topography, biomass distribution, temporal and spatial water coverage and depth). The average density of C. gigas and M. edulis was $35 \pm 36$ and $1001 \pm 685$ ind. m$^{-2}$, respectively. The water volume cleared during a tidal cycle was estimated at 45,838 m³, of which C. gigas and M. edulis contributed 9169 and 36,669 m³, respectively. Therefore, M. edulis contributed 4 times as much as C. gigas to the bivalve bed's clearance, and the 2 bivalves were estimated to clear the water volume 1.9 times during each tidal cycle. However, the estimated water column cleared during low tide is overestimated due to phytoplankton depletion. Hence, it is concluded that the bivalve bed clears the water close to 1 time each tidal cycle. This, together with a low dry weight of soft parts, indicates that the bivalve bed, in general, is food-limited.
Survival after transplantation of mussel seeds is crucial for the production output of blue mussels (Mytilus edulis L.) in bottom cultures. Hence, an understanding of the interactions between bed formation, habitat structure and performance of mussel seed of different origins can contribute to an optimization of the production. The effect of substrate composition and timing of formation of a mussel bed in relation to aggregation and attachment of mussels were investigated with mussel seeds obtained from two different sources: mussel seed dredged from a natural mussel bed and mussel seed collected from a suspended long line culture. The mussels were applied to experimental units of complex and smooth substrate on the sea bed. Data on aggregation (day 0, day 1 and day 2), attachment strength (day 2 and 30), loss (day 2 and 30) and growth (day 0–30) of mussels were collected during the experiment. The results showed that complex substrate indeed had a stabilizing effect on the mussel structure resulting in less aggregation and increased attachment strength. The 3D matrix forming a mussel bed was achieved faster on complex substrate, and led to reduced mortality of transplanted mussels. Despite significantly lower specific growth rates on the complex substrate, the total biomass of mussels was significantly higher on complex substrate compared to smooth substrate due to the higher survival of mussels. Furthermore, suspended mussels aggregated more and faster and had a stronger and more rapid attachment as compared to bottom mussels. Consequently, it was concluded that when transplanting mussels, seeding with substrate increases surface complexity on the seabed and increases survival of the mussels.
Establishment of blue mussel beds to enhance fish habitats

Human activity has impacted many coastal fjords causing degeneration of the structure and function of the fish habitats. In Nørrefjord, Denmark, local fishermen complained of declining fish catches which could be attributed to eutrophication and extraction of sediments over several decades. This study aimed to establish blue mussel beds (Mytilus edulis) to increase structural complexity and increase the abundance of fish and epifauna in Nørrefjord. It was expected that the mussels would improve water transparency and increase the depth range and coverage of eelgrass (Zostera marina). New methods for mussel production and -bed construction were investigated in collaboration with local volunteer fishermen. The effect of the artificial mussel beds was most evident on a small scale. Video observations directly at the beds (Impact area) demonstrated increased biodiversity and a three times higher abundance of mesopredator fish compared to the Control area. Water clarity and eelgrass coverage were unchanged. Two methods for establishing mussel beds were tested. A total of 44 tons of blue mussels were produced and established in beds over an area of 121,000 m². Production of blue mussels directly on hemp sacs hanging on long-lines was the most effective method. This new method is potentially a useful management tool to improve fish habitats.
Status of the Pacific Oyster Crassostrea gigas (Thunberg, 1793) in the western Limfjord, Denmark – Five years of population development

The Pacific oyster, Crassostrea gigas, was introduced into the Netherlands in 1964 for aquaculture purposes and has since spread extensively in Northern European waters. Eight locations in the western part of the Limfjord, Denmark, first sampled in 2006 were revisited in 2011, to determine how the population of C. gigas has changed. Densities were lower at all but two locations. No differences in average shell lengths or condition indices were detected. No changes in the number or distribution of shell size classes were observed. These similarities suggest there is a single population that has not expanded in terms of geographic distribution. While reproduction does occur, conditions for population growth appear to be suboptimal. The species has become established in western Limfjord but abundance is low and densities are much lower than those considered harmful to the ecosystem. At present, the C. gigas population is not a cause for concern in the Limfjord ecosystem.

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**Anvendelse af GIS i forbindelse med konsekvensvurderinger af fiskeri på skaldyr i Natura 2000-områder i Danmark**

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**Dannelse af bankestruktur hos blåmuslinger: effekt af substrat, tid og muslingernes oprindelse**

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**Genskabelse af biogene rev i Nørrefjord**

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Area-intensive bottom culture of blue mussels Mytilus edulis in a micro-tidal estuary

Dredge fishery for blue mussels Mytilus edulis (L.) impacts the benthic ecosystem, and substitution by area-intensive bottom culture production may reduce adverse effects on the ecosystem. Two different field studies in 2007 and 2009 tested the productivity of bottom culture of blue mussels, and whether a shift from dredging of full-grown blue mussels to production of blue mussels in bottom culture could reduce the area of impacted sea bottom. In the first study, the macrostructure of a commercial bottom culture was analysed by side scan mapping, and the growth of blue mussels was recorded on a transect from the edge to the central part of the bottom culture. In the second study, we analysed the effect of seeding density (1.5 and 3.5 kg m−2) on mussel production. The measured production was used to model the affected area when producing blue mussels in bottom culture. The macrostructure of the culture bed formed during the transplantation of mussel seed was not changed 1 yr after transplantation, indicating that transplantation supported the formation of a robust blue mussel bed. Shell growth showed no spatial variability from the edge to the central part of the commercial bottom culture, suggesting that growth was not reduced by density-dependent food limitation. The population production:biomass ratio (P/B) of the experimental bottom cultures was 1.0 and showed no significant effect of seeding density. Model simulations indicated that the impacted area was smaller when producing blue mussels in bottom culture than in a fishery of full-grown mussels if P/B was higher than 0.5

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Area-intensive bottom culture production of blue mussels, *Mytilus edulis* (L.)

The conflict between blue mussel, *Mytilus edulis* (Linnaeus, 1758), exploitation and other interest groups due to ecological effects of the fishery, was described ten years ago, and still exists today. To reduce the ecological effects and the conflicts between conservation and exploitation it is therefore necessary to focus on area-intensive production methods for mussel exploitation. For that purpose bottom culture production of blue mussels is relevant. Despite a long tradition for bottom culturing in Europe the method is still dependent on natural conditions, such as recruitment, food availability and predation. The major constraints for development of the production method is lack of recruitment to sustain the seed mussel source, and conflicts with nature conservation interests due to negative effects of dredging. The aim of the present PhD project was, therefore, to study how thorough insights in biological mechanisms can be used as a tool to develop and optimize bottom culture production methods. The study was addressed through the following questions: 1) How can the seed mussel source in bottom culturing be supported? 2) How can survival of mussels in bottom culturing be improved? And 3) How does bottom culture practice support an area-intensive exploitation of blue mussels? To answer the questions four experimental studies were conducted.

Results from a laboratory- and a manipulated field experiment showed that blue mussels collected on suspended long line cultures in the water column have the potential to become an alternative seed source for mussel production in bottom cultures. When compared to mussels collected from natural benthic mussel beds, suspended mussels had an active predator response by developing a significantly stronger attachment to the substrate and having a more pronounced aggregation behaviour. Bottom mussels exhibited a passive strategy by developing a thicker shell and larger relative size of the posterior adductor muscle. When comparing the performance of suspended and bottom seed mussels on complex and smooth substrates, respectively, originally suspended mussels aggregated significantly more than bottom originated mussels on smooth substrates. This indicated that suspended mussels are better in achieving the protection provided by group living compared to bottom mussels, since more aggregated mussels are more protected against predators. Thus, it is concluded that the use of suspended mussels in bottom culture production supplement, and possibly, secure the seed source in future blue mussel production in intensive bottom cultures.

From two manipulated field experiments it was concluded that substrate complexity stabilizes the structure of the mussel bed on micro-scale (<1 m) resulting in an achievement of protection faster than without aplying shell substrate to the seabed. On complex substrate, mussels have the protection from predators right after transplantation, due to more spatial refuges, in contrast to on smooth substrate where mussels need to aggregate to achieve the same protection. The stabilization is expressed by increased byssal strength and reduced aggregation activity within the mussels and is resulting in higher survival. However, the increased protection provided by the higher complexity also result in a trade-off between increased survival and reduced growth and lower condition index for the individual mussel. The production output
was generally higher on complex substrate than on smooth substrate and it was therefore concluded that an increased
substrate complexity has the potential to improve survival of mussels in bottom culture beds. Nevertheless, due to the
trade-off between survival and growth, the degree of complexity is important in the planning of culture beds to secure that
the reduction in growth and condition index do not eliminate the increased survival of the mussels.

To achieve a smaller impacted area, prerequisites concerning robust bed structures and seeding densities needs to be
fulfilled. In a case study it was concluded that production of blue mussels in bottom cultures support an area-intensive
exploitation, with off-set in Danish production practices. The robust structure and the seeding density of 3.5 kg m-2
support an area-intensive exploitation of blue mussels in the case area. On macro-scale (> 100 m) it can be documented
that macrostructure of the individual culture bed was similar to the original transplantation tracks established the year
before. This indicates that bottom cultures can form robust structures, not affected by wave- or current induced transport.
Seeding density of 1.5 and 3.5 kg m-2 and the position of the individual mussel in the culture bed apparently did not
adversely affect shell growth, suggesting that there was no detectable food limitation between transplantation
tracks. Production of blue mussels in bottom culture beds may impact a smaller area compared to fishery on full-grown
mussels from natural mussel beds, and can support an area-intensive production if the bio-

mass/production ratio is higher than 0.5

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Impact of an icy winter on the Pacific oyster (Crassostrea gigas Thunberg, 1793) populations in Scandinavia
The Pacific oyster (Crassostrea gigas) is an invasive species that has dispersed into Scandinavia during the last few
decades. The objective of this study was to evaluate the effects of extreme winter conditions on the mortality of the Pacific
oyster in Scandinavia. The study was done by compiling mortality data from independent surveys in Denmark, Sweden
and Norway. Winter mortality of the oysters increased with latitude, which can be explained by the colder climate
experienced at higher latitudes. Mortality was also found to be affected by site specific conditions such as water depth at
the sampling sites of oyster populations. Despite the severe winter conditions of 2009/2010 causing high
mortality, the Pacific oyster still exists in large numbers in Scandinavia. The present investigation indicates that extreme
winter conditions may result in a temporary reduction of the density of the Pacific oyster, but that the species can be
expected to continue its invasion of Scandinavian coastal areas

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, Holm-Hansen, T. H. (Ekstern), Hjelment, A. (Ekstern), Lindegarth, S. (Ekstern), Mortensen, S. (Ekstern), Moy, F. E.
(Ekstern), Nielsen, P. (Intern), Norling, P. (Ekstern), Nyberg, C. (Ekstern), Christensen, H. T. (Intern), Vismann, B.
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Comparative study of predatory responses in blue mussels (Mytilus edulis L.) produced in suspended long line cultures or collected from natural bottom mussel beds
Blue mussels (Mytilus edulis L.) are a valuable resource for commercial shellfish production and may also have uses as a tool in habitat improvement, because mussel beds can increase habitat diversity and complexity. A prerequisite for both commercial mussel production and habitat improvement is the availability of seed mussels collected with minimum impact on the benthic ecosystem. To examine whether mussels collected in suspended cultures can be used for bottom culture production and as tool in habitat improvement, the differences in predatory defence responses between suspended and...
bottom mussels exposed to the predatory shore crab (Carcinus maenas L.) were tested in laboratory experiments and in the field. Predatory defence responses (byssal attachment and aggregation) and morphological traits were tested in laboratory, while growth and mortality were examined in field experiments. Suspended mussels had an active response in relation to the predator by developing a significantly firmer attachment to the substrate and a closer aggregated structure. Bottom mussels had a passive strategy by having a thicker shell and larger relative size of the adductor muscle. In a field experiment mussels originated from suspended cultures had a higher length increment and lower mortality when compared to bottom mussels. It is concluded that suspended mussels potentially are an alternative resource to bottom culture and can be used in habitat improvement of mussel beds, but that the use of suspended mussels has to be tested further in large-scale field experiments

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Scopus rating (2004): SJR 0.67 SNIP 0.693
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Trade-off between increased survival and reduced growth for blue mussels living on Pacific oyster reefs

Pacific oysters Crassostrea gigas (Thunberg 1793) have been introduced into the Wadden Sea (North Sea, Germany) in the mid of the 1980s and have invaded native blue mussel Mytilus edulis (L.) beds. The latter turned into oyster reefs where mussels seem to be relegated to the bottom in between the much larger oysters. By combining field and laboratory experiments, we reveal how mussels react to cohabitation with the invasive oysters. Mussels subjected to direct contact with crabs Carcinus maenas migrate from top to bottom positions between oysters in both field and laboratory experiments within 22 days. Shell growth was significantly reduced for mussels placed on the bottom compared to mussels at the top of an oyster reef. Condition index was lower for mussels on the bottom of the reef irrespective of whether placed between dead or living oysters. We conclude that mussels experience a trade-off between survival and food supply and prefer to take refuge from predation even when this decreases growth and condition. This mechanism may have facilitated the take-over of C. gigas on M. edulis beds in the European Wadden Sea.
Massive settlements of the Pacific oyster, Crassostrea gigas, in Scandinavia: Invasion note

The Pacific oyster (Crassostrea gigas) is an important aquaculture species world-wide. Due to its wide environmental tolerance and high growth rate, it has also become a successful invader in many areas, leading to major ecosystem changes. Low water temperatures were previously believed to restrict the establishment of Pacific oysters in Scandinavia. However, recent surveys reveal that the Pacific oyster is now established in many areas in Scandinavia. The biomass of oysters in the Danish Wadden Sea has increased dramatically between 2005 and 2007, large numbers were observed along the Swedish west coast from settlement in 2006, and in Norway, populations are established along the southwest coast to 60°N.
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However, recent surveys reveal that the Pacific oyster is now established in many areas in Scandinavia. The biomass of
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along the Swedish west coast from settlement in 2006, and in Norway, populations are established along the southwest
coast to 60°N.

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Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, University of Gothenburg, Institute of
Marine Research
Authors: Wrange, A. (Ekstern), Valero, J. (Ekstern), Harkestad, L. S. (Ekstern), Strand, Ø. (Ekstern), Lindegarth, S.
(Ekstern), Christensen, H. T. (Intern), Dolmer, P. (Intern), Kristensen, P. S. (Intern), Mortensen, S. (Ekstern)
Pages: 1145-1152
Publication date: 2010
Main Research Area: Technical/natural sciences

Publication information
Journal: Biological Invasions
Volume: 12
Issue number: 5
ISSN (Print): 1387-3547
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.294 SNIP 1.193 CiteScore 2.71
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.444 SNIP 1.19 CiteScore 2.58
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.416 SNIP 1.402 CiteScore 2.78
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.553 SNIP 1.29 CiteScore 2.9
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.523 SNIP 1.335 CiteScore 2.79
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.652 SNIP 1.363 CiteScore 3
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.665 SNIP 1.526
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.865 SNIP 1.597
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.59 SNIP 1.478
Scopus rating (2007): SJR 1.481 SNIP 1.268
Scopus rating (2006): SJR 1.607 SNIP 1.445
Scopus rating (2005): SJR 1.035 SNIP 1.516
Scopus rating (2004): SJR 0.957 SNIP 1.199
Population control of the invasive Pacific oyster in microtidal areas: impact of an ice winter

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Dolmer, P. (Intern), Norling, P. (Ekstern), Holm, M. W. (Ekstern), Holm, T. (Ekstern), Davids, J. (Ekstern), Blanda, E. (Ekstern), Hansen, B. W. (Ekstern), Christensen, H. T. (Intern), Nielsen, P. (Ekstern), Lindegarth, S. (Ekstern), Strand, Å. (Ekstern), Nyberg, C. (Ekstern), Torjan, B. (Ekstern), Jensen, L. F. (Ekstern), Vismann, B. (Ekstern), Mortensen, S. (Ekstern), Harkestad, L. (Ekstern), Geitner, K. (Intern), Aabrink, M. (Intern), Ardehed, A. (Ekstern)
Publication date: 2010
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 251311
Publication: Research - peer-review › Journal article – Annual report year: 2010

Udbredelsen af stillehavsøsters, Crassostrea gigas, i Skandinavien

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Authors: Christensen, H. T. (Intern), Dolmer, P. (Intern), Wrange, A. (Ekstern), Hansen, B. W. (Ekstern), Harkestad, L. S. (Ekstern), Kristensen, P. S. (Intern), Lindegarth, S. (Ekstern), Mortensen, S. (Ekstern), Strand, Ø. (Ekstern), Valero, J. (Ekstern)
Publication date: 2010
Event: Poster session presented at Workshop om Invasive arter i praksis, København, 25. januar 2010,.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 269465
Publication: Research › Conference abstract for conference – Annual report year: 2010

Brug af GIS til konsekvensvurderinger af fiskeri på skaldyr i Natura 2000-områder i Danmark

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources
Authors: Geitner, K. (Intern), Christensen, H. T. (Intern)
Pages: 24-29
Publication date: 2009
Main Research Area: Technical/natural sciences

Publication information
Journal: Geoforum Perspektiv
Issue number: 16
ISSN (Print): 1601-8796
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
BFI (2015): BFI-level 1
Konsekvensvurdering af fiskeri på blåmuslinger i Løgstør Bredning 2008/2009

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources, Section for Management Systems, Section for Software and GIS development
Authors: Dolmer, P. (Intern), Christensen, H. T. (Intern), Kristensen, P. S. (Intern), Hoffmann, E. (Intern), Geitner, K. (Intern)
Number of pages: 32
Publication date: 2009

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Tekniske Universitet, Institut for Akvatiske Ressourcer - Dansk Skaldyrcenter
ISBN (Print): 978-87-7481-102-2
Original language: Danish
Series: DTU Aqua-rapport
Number: 210-09
ISSN: 1395-8216
Main Research Area: Technical/natural sciences
Electronic versions:
210-09_Konsekvensvurdering_af_fiskeri_af_blåmuslinger_i_Løgstør_Bredning_2008.pdf
Links:
http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter.aspx
Source: orbit
Source-ID: 225327
Publication: Research › Report – Annual report year: 2009

Konsekvensvurdering af fiskeri på blåmuslinger i Lovns Bredning 2008/2009

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources, Section for Management Systems, Section for Software and GIS development
Authors: Dolmer, P. (Intern), Christensen, H. T. (Intern), Kristensen, P. S. (Intern), Hoffmann, E. (Intern), Geitner, K. (Intern)
Number of pages: 33
Publication date: 2009

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Tekniske Universitet, Institut for Akvatiske Ressourcer - Dansk Skaldyrcenter
ISBN (Print): 978-87-7481-103-9
Original language: Danish
Konsekvensvurdering af fiskeri på europæisk østers i Nissum Bredning 2008

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources, Section for Management Systems
Authors: Dolmer, P. (Intern), Christensen, H. T. (Intern), Geitner, K. (Intern), Kristensen, P. S. (Intern), Hoffmann, E. (Intern)
Number of pages: 22
Publication date: 2009

Publication information
Place of publication: Charlottenlund
Publisher: Danmarks Tekniske Universitet, Institut for Akvatiske Ressourcer - Dansk Skaldyrcenter
Original language: Danish

Series: DTU Aqua-rapport
Number: 209-09
ISSN: 1395-8216
Main Research Area: Technical/natural sciences
Electronic versions:
209-09_Konsekvensvurdering_af_østersfiskeri_i_Nissum_Bredning_2008.pdf
Source: orbit
Source-ID: 253121
Publication: Commissioned › Report – Annual report year: 2009

Mangfoldigheden på spil

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources
Authors: Christensen, H. T. (Intern), Elmedal, I. (Ekstern), Hansen, B. W. (Ekstern), Jensen, T. (Ekstern)
Pages: 30-32
Publication date: 2009
Main Research Area: Technical/natural sciences

Publication information
Journal: Aktuel Naturvidenskab
Issue number: 5
ISSN (Print): 1399-2309
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 253223
Publication: Research › Journal article – Annual report year: 2009

Vurdering af mulighederne for linedyrkning af blåmuslinger i Nysted Havmøllepark

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources
Authors: Christensen, H. T. (Intern), Christoffersen, M. O. (Intern), Dolmer, P. (Intern), Stenberg, C. (Intern), Kristensen, P. S. (Intern)
Number of pages: 28
Publication date: 2009

Publication information
Original language: Danish
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 253079
Publication: Research › Report – Annual report year: 2009

Blåmuslingeprojekt fase 3 - Integration og optimering af produktionsformer

General information
State: Published
Organisations: Danish Shellfish Centre, Section for Coastal Ecology, National Institute of Aquatic Resources, Danish Shellfish Centre
Authors: Tørring, D. (Ekstern), Gramkow, M. (Ekstern), Nielsen, C. F. (Intern), Redeker, S. (Ekstern), Holtegaard, L. (Ekstern), Freudendahl, A. (Ekstern), Petersen, J. K. (Intern), Carlsson, M. (Ekstern), Dolmer, P. (Intern), Christensen, H. T. (Intern), Kristensen, P. S. (Intern)
Number of pages: 154
Publication date: 2008

Publication information
Place of publication: Nykøbing Mors
Publisher: Dansk Skaldyrcenter
Original language: Danish
Main Research Area: Technical/natural sciences
Electronic versions:

Publishers version
Publication: Research › Report – Annual report year: 2008

Erfaringsopsamling for muslingeopdræt i Danmark

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources
Authors: Christensen, H. T. (Intern), Dolmer, P. (Intern), Stewart, H. (Ekstern), Bangsholt, J. (Ekstern), Olesen, T. (Ekstern), Redeker, S. (Ekstern)
Number of pages: 113
Publication date: 2008

Publication information
Publisher: Institut for Akvatiske Ressourcer, Danmarks Tekniske Universitet
Original language: Danish
Series: DTU Aqua-rapport
Number: 185-08
Main Research Area: Technical/natural sciences
Electronic versions:

185_08_erfaringsopsamling_for_muslingeopdraet.pdf
Source: orbit
Source-ID: 225124
Publication: Research › Report – Annual report year: 2008

Stillehavsøsters - en invasiv ressource

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Coastal Ecology
Authors: Elmedal, I. (Intern), Christensen, H. T. (Intern)
Pages: 26-28
A northwards expansion of the Pacific oyster, Crassostrea gigas

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources
Authors: Mortensen, S. (Ekstern), Valero, J. (Ekstern), Wrange, A. (Ekstern), Harkestad, L. (Ekstern), Stene, R. (Ekstern), Christensen, H. T. (Intern), Dolmer, P. (Intern), Strand, Ø. (Ekstern)
Publication date: 2007
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 226689
Publication: Research › Poster – Annual report year: 2007

Den invasive Stillehavsøsters, Crassostrea gigas, i Limfjorden - inddragelse af borgere og interessenter i forslag til en forvaltningsplan

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources
Authors: Christensen, H. T. (Intern), Elmedal, I. (Intern)
Number of pages: 151
Publication date: 2007

Impact of dredging of Crassostrea gigas in the Danish Wadden Sea.

General information
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources
Authors: Christensen, H. T. (Intern), Dolmer, P. (Intern)
Publication date: 2007
Konsekvensvurdering af blåmuslingefiskeri i Vadehavet

**General information**
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources, Section for Monitoring
Authors: Christensen, H. T. (Intern), Dolmer, P. (Intern), Pihl, N. J. (Intern), Kristensen, P. S. (Intern)
Number of pages: 36
Publication date: 2007

**Publication information**
Publisher: [s.n.]
Original language: Danish
Main Research Area: Technical/natural sciences
Electronic versions:
konsekvensvurdering_blaamuslingefiskeri_vadehavet_2007.pdf
Source: orbit
Source-ID: 225125
Publication: Research › Poster – Annual report year: 2007

Konsekvensvurdering af effekten af forsøgsfiskeri på stillehavsøsters og blåmuslinger i Vadehavet

**General information**
State: Published
Organisations: Section for Shellfish, National Institute of Aquatic Resources
Authors: Christensen, H. T. (Intern), Dolmer, P. (Intern), Kristensen, P. S. (Intern)
Number of pages: 14
Publication date: 2007

**Publication information**
Original language: Danish
Main Research Area: Technical/natural sciences
Electronic versions:
konsekvensvurdering_blaamusling_stillehavsosters_vadehavet_2007.pdf
Source: orbit
Source-ID: 225126
Publication: Research › Report – Annual report year: 2007

**Projects:**

**Production performance of radial water-jet drilled wells: a modelling and laboratory study**
Department of Applied Mathematics and Computer Science
Period: 01/10/2016 → 30/09/2019
Number of participants: 4
Phd Student:
Medetbekova, Maiya (Intern)
Supervisor:
Christensen, Helle Torp (Intern)
Salimzadeh, Saeed (Intern)
Main Supervisor:
Nick, Hamid (Intern)

**Financing sources**
Stone reefs: Review of the biological and ecological knowledge on stone reefs and their function in temperate areas (Stenrev) (39038)
Boulder reefs have been the subject of extensive mining where a number of reefs have been wholly or partially removed from the marine areas, especially the shallow coastal waters less than 10 m depth. A review on the importance of cold temperate reefs was requested. The review summary highlighted the following. Reefs are known for their high species richness and are biologically very productive. They are home to many fish using reefs for refuge. In particular cavernous reefs with high complexity and many small niches (between and around stones) are characterized by high species diversity, high productivity and have an important function as a feeding area for many species of fish and marine mammals. There are no quantitative estimates of the impact and effects of reefs for fish stocks in Danish waters. However, the relationship between refuge options and survival was shown for goby, as well as for juvenile cod. Larger cod are attracted to reefs during autumn before they start their spawning migration. Results of the first reef restoration project in Danish waters showed a clear development of both macro-algae and benthic fauna and in fish abundance for fish normally associated with reefs. The many fish had probably attracted porpoises, which are now observed more frequently and for longer periods in the area. The European lobster occurs in salty water (> 25 parts per thousand) at 2-40 m depth around vegetated reefs or rocky ground, and therefore, this habitat is an important habitat for lobster. Of the sessile invertebrates highlighted, mussels were found in several different types of habitats, including reefs and is one of the species that are first to colonize new habitats - such as newly established reefs.

This project was coordinated by DTU Aqua.
The project was funded by the Danish Minestry of Food, Agriculture and Fisheries and the European Fisheries Fund (EFF).

Environmental impact assessment of mussel dredging (38691)
EU Habitats Directive Article 6 requires that if an activity in a habitat area or a nearby area can be expected to have an effect on habitat area, an environmental impact assessment (EIA) has to be conducted before permission is given. This Natura 2000 legislation was implemented in the Danish Fisheries Act at the last change which came into force on 1 July 2008. The Directorate of Fisheries, which is responsible for carrying out EIA’s, has requested DTU Aqua to conduct EIA’s of the fisheries.

The project aims to:
1) Develop a basic concept for use in future EIA’s of fishing activities in Natura 2000 areas
2) Prepare EIA’s of mussel fisheries in the Limfjord, Jutland's east coast, Isefjord and the Wadden Sea
3) Implement monitoring systems of mussel stocks in the Limfjord, Jutland's east coast, Isefjord and the Wadden Sea as input to EIS’s of mussel fishery.

The project is coordinated by DTU Aqua.
Marine invasive species impact on ecosystem structure and function (MARINVA) (38716)
The project aims to investigate the structural and environmental impacts of invasive benthic fauna and algae in Danish waters. Focus is on three species: a macrophyte from Asia, a group of polychaete species from North America/Arctic and an oyster species from Japan. All three species are more or less well established in Danish waters and co-existing in the western Limfjord. Knowledge on these species is sparse, including their physiological and habitat requirements. We will study how and to what extent these species influence the community they have become a part of with particular focus on ecosystem nutrient and energy turnover. The approach is a combination of field and laboratory experiments at different scales (individual to population). DTU Aqua focuses on coexistence of Pacific oyster and blue mussels in relation to competition for food and space, and research include lab and field experiments, and observation of small and large scale distribution.

The project is coordinated by University of Copenhagen.

National Institute of Aquatic Resources
Roskilde University
University of Copenhagen
University of Southern Denmark
Period: 01/01/2009 → 31/12/2011
Number of participants: 2
Research areas: Coastal Ecology & Ecosystem based Marine Management

Habitat structure of blue mussel, Mytilus edulis, beds in a bottom culture perspektive
National Institute of Aquatic Resources
Period: 01/10/2008 → 21/11/2012
Number of participants: 6
Phd Student:
Christensen, Helle Torp (Intern)
Supervisor:
Hansen, Benni Winding (Ekstern)
Main Supervisor:
Dolmer, Per (Intern)
Examiner:
Nielsen, Torkel Gissel (Ekstern)
Kamermans, Pauline (Ekstern)
Maar, Marie (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

ERFA-MUS (38815)
Within the last 8 years a number of mussel farms have been established. A significant growth and development in the seafood industry can be expected if the industry offers support in relation to research and development. The research is
primary focused on testing different farming methods in collaboration between a number of research institutions and aquaculture organizations. Also at the level of individual mussel farms, methods are developed to improve growth by adapting cultivation techniques to local environmental conditions and to improve harvest techniques. These developments which take place in individual farms promote diversification of methods. The aim of the project is to collect and compile this body of information, in order to disseminate the knowledge to other farmers. The farms will thus have the opportunity to evaluate and use the best possible production methods in relation to the production conditions their production area offers.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Association of Mussel Farmers
Danish Shellfish Centre
Period: 01/01/2006 → 31/12/2007
Number of participants: 3
Research area: Shellfish and Seaweed
Project participant:
Christensen, Helle Torp (Intern)
Geitner, Kerstin (Intern)
Project Manager, academic:
Dolmer, Per (Intern)