Harvesting geo-spatial data on coastal fish assemblages through coordinated citizen science

In response to repeated complaints from recreational and commercial coastal fishermen about declining fishing opportunities in inner Danish waters, focus was directed to inshore fish stocks. However, without data targeting inshore areas, it was not possible to investigate potential changes in fish distribution or abundances, or their causes. As a first step, a voluntary catch registration system was initiated in 2002, in collaboration with locally organized recreational fishermen. Using citizen science as a methodology, scientists and the fishermen developed a protocol for data collection, which the fishermen then implemented. The aim was to establish regular monitoring of fish catches from gill net and fyke net fisheries in coastal waters around Denmark in order to provide data that could inform management. After three years, during which time recreational fishermen could use their own gear and fish where they normally fished, the data was evaluated. As a result, the fishing method was switched in 2005 to fixed gears and fixed positions, to enable comparison between areas, years and season. The project has been very successful in recruiting highly motivated fishermen, who register their entire catch regularly. The time-series of data spans more than a decade and covers over 16,000 instances of fishing. The data from this project are now being used to create coastal fish indicators for managers to assess environmental status at a regional scale. Here we present an analysis of a subset of the data on one species, the European flounder (Platichthys flesus), to illustrate how the spatial and seasonal coverage can be utilized further for investigation of coastal ecosystems and to inform management.
Conflicts in the coastal zone: human impacts on commercially important fish species utilizing coastal habitat

Coastal ecosystems are ecologically, culturally, and economically important, and hence are under pressure from diverse human activities. We reviewed the literature for existing evidence of effects of human-induced habitat changes on exploited fish utilizing coastal habitats. We focused on fish species of the Northeast Atlantic for which fisheries advice is provided by International Council for the Exploration of the Sea (ICES) and which utilize coastal habitats for at least one life-history stage (LHS). We found that 92% of these species are impacted by human activity in at least one LHS while utilizing coastal habitat and 38% in multiple stages. Anthropogenic pressures most commonly shown to impact these fish species were toxicants and pollutants (75% of species). Eutrophication and anoxia, invasive species, and physical coastal development affected about half of the species (58, 54, and 42% of species, respectively), while indirect fishing impacts affected a minority (17% of species). Moreover, 71% of the ICES advice species that utilize coastal habitats face impacts from more than one pressure, implying cumulative effects. Given that three-fourths of the commercial landings come from fish species utilizing coastal habitats, there is an obvious need for a better understanding of the impacts that human activities cause in these habitats for the development of ecosystem-based fisheries management.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, University of Lisbon, Swedish University of Agricultural Sciences, Wageningen IMARES, Italian National Research Council, INRA Institut National de La Recherche Agronomique
Pages: 1203-1213
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Peer-reviewed: Yes

Publication information
Journal: ICES Marine Science Symposia
Volume: 75
Issue number: 4
ISSN (Print): 0906-060X
Ratings:
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Scopus rating (2017): CiteScore 2.98
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Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 2.63
Web of Science (2016): Impact factor 2.76
Web of Science (2016): Indexed yes
Scopus rating (2015): CiteScore 2.18
Web of Science (2015): Impact factor 2.626
Web of Science (2015): Indexed yes
Scopus rating (2014): CiteScore 2.62
Web of Science (2014): Impact factor 2.377
Web of Science (2014): Indexed yes
Scopus rating (2013): CiteScore 2.46
Web of Science (2013): Impact factor 2.525
Web of Science (2013): Indexed yes
Scopus rating (2012): CiteScore 2.35
Web of Science (2012): Impact factor 2.277
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
Scopus rating (2011): CiteScore 2.32
Web of Science (2011): Impact factor 2.007
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
Web of Science (2010): Impact factor 1.808
Web of Science (2010): Indexed yes
Essential coastal habitats for fish in the Baltic Sea

Many coastal and offshore fish species are highly dependent on specific habitat types for population maintenance. In the Baltic Sea, shallow productive habitats in the coastal zone such as wetlands, vegetated flads/lagoons and sheltered bays as well as more exposed rocky and sandy areas are utilized by fish across many life history stages including spawning, juvenile development, feeding and migration. Although there is general consensus about the critical importance of these essential fish habitats (EFH) for fish production along the coast, direct quantitative evidence for their specific roles in population growth and maintenance is still scarce. Nevertheless, for some coastal species, indirect evidence exists, and in many cases, sufficient data are also available to carry out further quantitative analyses. As coastal EFH in the Baltic Sea are often found in areas that are highly utilized and valued by humans, they are subjected to many different pressures. While cumulative pressures, such as eutrophication, coastal construction and development, climate change, invasive species and fisheries, impact fish in coastal areas, the conservation coverage for EFH in these areas remains poor. This is mainly due to the fact that historically, fisheries management and nature conservation are not integrated neither in research nor in management in Baltic Sea countries. Setting joint objectives for fisheries management and nature conservation would hence be pivotal for improved protection of EFH in the Baltic Sea. To properly inform management, improvements in the development of monitoring strategies and mapping methodology for EFH are also needed. Stronger international cooperation between Baltic Sea states will facilitate improved management outcomes across ecologically arbitrary boundaries. This is especially important for successful implementation of international agreements and legislative directives such as the Baltic Sea Action Plan, the Marine Strategy Framework Directive, the Habitats Directive, and the Maritime Spatial Planning Directive, but also for improving the communication of information related to coastal EFH among researchers, stakeholders, managers and decision makers. In this paper, efforts are made to characterize coastal EFH in the Baltic Sea, their importance and the threats/pressures they face, as well as their current conservation status, while highlighting knowledge gaps and outlining perspectives for future work in an ecosystem-based management framework.

General information

State: Published
Pages: 14-30
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Estuarine, Coastal and Shelf Science
Volume: 204
ISSN (Print): 0272-7714
Ratings:
BFI (2018): BFI-level 1
Kortlægning af fiskenes levesteder i den danske del af Øresund: Rapport til Miljø- og Fødevareministeriet

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, University of Copenhagen
Number of pages: 104
Publication date: 2016

Multidisciplinary mapping of fish habitats in the Sound, Denmark for maritime spatial planning

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data, Natural History Museum of Denmark
Number of pages: 2
Publication date: 2015
Peer-reviewed: No
Event: Abstract from ICES Annual Science Conference 2015, Copenhagen, Denmark.

Projects:

Stock assessment and management of sole fishery (39383)
The project is focused on improving the stock assessment and management of sole fishery in the Skagerrak, Kattegat, Belts and Western Baltic Sea. Input to the stock assessment and the scientific basis for counseling on the sole population in Danish waters is developed continuously. This project aims at collecting biological data and acquire new knowledge on sole distribution as well as including knowledge from the fishermen and give advice on efficiency of using different fishing gear. The project is coordinated by DTU Aqua and is funded by the European Maritime and Fisheries Fund (EMFF).

Edelvang, K., Project Manager, National Institute of Aquatic Resources, Section for Oceans and Arctic
Jørgensen, O. A., Project Participant, National Institute of Aquatic Resources
Støttrup, J. G., Project Participant, National Institute of Aquatic Resources
Brown, E. J., Project Participant, National Institute of Aquatic Resources  
Vinther, M., Project Participant, National Institute of Aquatic Resources  
Storr-Paulsen, M., Project Participant, National Institute of Aquatic Resources  
Boje, J., Project Participant, National Institute of Aquatic Resources  
Hüssy, K., Project Participant, National Institute of Aquatic Resources  
Jonasdottir, S., Project Participant, National Institute of Aquatic Resources  
Munk, P., Project Participant, National Institute of Aquatic Resources  
Krag, L. A., Project Participant, National Institute of Aquatic Resources  
Hansen, J. H., Project Participant, National Institute of Aquatic Resources  
Frandsen, R., Project Participant, National Institute of Aquatic Resources  
16/09/2016 → 31/12/2018  
Keywords: Research area: Fisheries Management  
Project: Research

Mapping of fish habitats with Øresund as a case study (FiskeHab) (39206)  
Mapping of fish habitats in the Danish part of Øresund, based on existing data on fish and habitats, interviews with gillnet fishermen, anglers and workshop participants. The project was commissioned as a response to widespread protest over sand extraction activity in several designated sites in the area. Øresund is a relatively data poor sea area that is fished primarily by fishermen with vessels below 12 meters, i.e. vessels without satellite location data. The project succeeded in creating maps indicating the distributions of 7 key commercial fish species within Øresund with direct association to benthic habitats. This project was coordinated by DTU Aqua. The project was commissioned directly by the Danish Ministry of Food, Agriculture and Fisheries.  
Sørensen, T. K., Project Coordinator, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management  
Egekvist, J., Project Participant, National Institute of Aquatic Resources  
Støttrup, J. G., Project Participant, National Institute of Aquatic Resources  
Brown, E. J., PhD Student, National Institute of Aquatic Resources  
Vinther, M., Project Participant, National Institute of Aquatic Resources  
Dinesen, G. E., Project Participant, National Institute of Aquatic Resources  
03/12/2014 → 31/08/2015  
Keywords: Research area: Ecosystem based Marine Management & Coastal Ecology  
Collaborators: University of Copenhagen  
Project: Research

FishHab-II (39345)  
The aim of the project is to map fish habitats to improve data and information for Maritime Spatial Planning. The project focuses on mapping the habitats for 9 commercially important fish species and one invertebrate species in the inner Danish waters. Within the project methods will be developed to map habitats in data-poor as well as data-rich areas. Data derived from different sources; surveys, fisheries, citizen science will be used and combined with information derived from fisher interviews. The mapping will include coastal habitats to provide the basis for advice on management of coastal fish nursery areas. This project is coordinated by DTU Aqua. The project is funded by the Ministry of Environment and Food of Denmark and the European Maritime and Fisheries Fund (EMFF).  
Støttrup, J. G., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management  
Brown, E. J., PhD Student, National Institute of Aquatic Resources  
Wisz, M., Project Participant, National Institute of Aquatic Resources  
Sørensen, T. K., Project Participant, National Institute of Aquatic Resources  
Vinther, M., Project Participant, National Institute of Aquatic Resources  
Egekvist, J., Project Participant, National Institute of Aquatic Resources  
Svendsen, J. C., Project Participant, National Institute of Aquatic Resources  
01/03/2016 → 28/02/2018  
Keywords: Research areas: Coastal Ecology & Ecosystem based Marine Management  
Collaborators: University of Copenhagen, Danish Fishermen's Association  
Project: Research

Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters  
Brown, E. J., PhD Student, National Institute of Aquatic Resources  
Støttrup, J. G., Main Supervisor, National Institute of Aquatic Resources  
Stenberg, C., Supervisor, National Institute of Aquatic Resources  
Offentlig finansiering  
01/12/2014 → 30/11/2018  
Award relations: Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters  
Project: PhD
Flatfish nursery grounds (38176)
The aim of the project is to determine what constitutes a good nursery area for specific flatfish in coastal soft bottom areas in the inner Danish waters using a combination of empirical and theoretical approaches. Field studies on juvenile flatfish feeding, growth and condition use both wild and released fish. One approach is to explore different statistical methods to determine potential nursery grounds for different flatfish based on physical parameters such as wave exposure, sediment type and abiotic variables such as temperature, salinity and depth. This research coupled with the development of tools to map different coastal habitats will provide the basis for advice on management of coastal fish nursery areas. Implementation of PIT-tag technology in coastal marine waters will be developed in order to build up expertise to sample released individuals in different habitats. The project was coordinated by DTU Aqua. The project is funded by the Danish Rod and Net Fishing License Funds.

Støttrup, J. G., Project Manager, National Institute of Aquatic Resources, Section for Ecosystem based Marine Management
Kristensen, L. D., Project Participant, National Institute of Aquatic Resources
Kristensen, K., Project Participant, National Institute of Aquatic Resources
Aarestrup, K., Project Participant, National Institute of Aquatic Resources
Brown, E. J., PhD Student, National Institute of Aquatic Resources

Keywords: Research areas: Coastal Ecology & Freshwater Fisheries and Ecology & Marine Living Resources
Collaborators: Aarhus University, Danish Organization for Amateur Fishermen
Project: Research

Activities:

The distribution of coastal gobies from the Inner Danish Waters.
Period: Feb 2018 → Jul 2018
Elliot John Brown (Supervisor)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Activity: Examinations and supervision › Supervisor activities

Differences in juvenile plaice and flounder otolith microchemistry from the Inner Danish Waters
Period: 11 Nov 2017 → 16 Nov 2017
Elliot John Brown (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related event
10th International Flatfish Symposium
11/11/2017 → 16/11/2017
Saint-Malo, France
Activity: Talks and presentations › Conference presentations

Coastal Fish Monitoring Through Citizen Science
Period: 16 Jul 2017 → 20 Jul 2017
Elliot John Brown (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related event
World Recreational Fishing Conference 2017
16/07/2017 → 20/07/2017
Victoria, Canada
Sampling juvenile fish habitats with engaged community members – Smáfisk2017
Period: 16 Jul 2017 → 20 Jul 2017
Elliot John Brown (Speaker)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related event
World Recreational Fishing Conference 2017
16/07/2017 → 20/07/2017
Victoria, Canada
Activity: Talks and presentations › Conference presentations

ICES - Workshop on Fish Distribution Shifts - WKFISHDISH (External organisation)
Elliot John Brown (Member)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International

Related external organisation
ICES - Workshop on Fish Distribution Shifts - WKFISHDISH
H. C. Andersens Boulevard 44-46, 1553, Copenhagen, Denmark
Activity: Membership › Membership of research networks or expert groups

The PhD Association of the Technical University of Denmark (External organisation)
Period: Nov 2016 → 2018
Elliot John Brown (Member)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: National

Related external organisation
The PhD Association of the Technical University of Denmark
c/o The Administration, The Technical University of Denmark, Building 101, Anker Engelunds Vej, 2800, Kongens Lyngby, Denmark
Activity: Membership › Board duties in companies, associations, or public organisations

Microplastic occurrence in marine coastal gobies and sticklebacks in the Inner Danish Coastal Waters
Period: Jun 2016 → Jun 2017
Elliot John Brown (Supervisor)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description
Identifying the spatial abundance of microplastics and the difference between benthic feeding and pelagic feeding non-commercial fish species in the Inner Danish Coastal Waters.
Activity: Examinations and supervision › Supervisor activities

The PhD Association of the Technical University of Denmark (External organisation)
Period: Mar 2015 → Nov 2016
Elliot John Brown (Chairman)
Section for Ecosystem based Marine Management
National Institute of Aquatic Resources
Degree of recognition: National

Related external organisation
The PhD Association of the Technical University of Denmark
c/o The Administration, The Technical University of Denmark, Building 101, Anker Engelunds Vej, 2800, Kongens Lyngby, Denmark
Activity: Membership › Board duties in companies, associations, or public organisations

Helsinki Commission - Baltic Marine Environment Protection Commission (External organisation)
Period: 2015 → 2018
Elliot John Brown (Member)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management

Description
HELCOM FISH-PRO II: Project for Baltic-wide assessment of coastal fish communities in support of an ecosystem-based management
Degree of recognition: International
Links:
http://www.helcom.fi/helcom-at-work/projects/fish-pro

Related external organisation
Helsinki Commission - Baltic Marine Environment Protection Commission
Finland
Activity: Membership › Membership of research networks or expert groups

ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES (External organisation)
Period: 2015 → 2018
Elliot John Brown (Participant)
National Institute of Aquatic Resources
Section for Ecosystem based Marine Management
Degree of recognition: International
Links:
http://ices.dk/community/groups/Pages/WGVHES.aspx

Related external organisation
ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

Press clippings:

Bønnerup og Grenaa: Små fisk – skal gerne blive større
Ole Henriksen, Elliot John Brown, Dennis Ulrik Andersen & Aurelia Pereira Gabellini
15/09/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Monitoring and Data

Media contribution (1)

Bønnerup og Grenaa: Små fisk – skal gerne blive større
15/09/2016
NYT OM Østjylland (Local), Denmark, Web
Ole Henriksen, Elliot John Brown, Dennis Ulrik Andersen & Aurelia Pereira Gabellini
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management, Section for Monitoring and Data

Relations
Projects:
Flatfish nursery grounds (38176)
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
FishHab-II (39345)

An Expedition covering covering the Danish Coast's from the 18th July - 22nd August, 2016
Elliot John Brown, Ole Henriksen, Aurelia Pereira Gabellini, Asbjørn Emil Wilken Andreasen & Alexandros Kokkalis
31/08/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Monitoring and Data

Media contribution (1)
An Expedition covering covering the Danish Coast's from the 18th July - 22nd August, 2016
31/08/2016
YouTube (International), Denmark, Web
Kasper Due Bække
05:35
https://www.youtube.com/watch?v=NaFccdjFuNs
Elliot John Brown, Ole Henriksen, Aurelia Pereira Gabellini, Asbjørn Emil Wilken Andreasen & Alexandros Kokkalis
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources, Section for Monitoring and Data

Relations
Projects:
Flatfish nursery grounds (38176)
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
FishHab-II (39345)

Condition report from the seabed
Ole Henriksen, Aurelia Pereira Gabellini & Elliot John Brown
07/08/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources

Media coverage (1)
Tilstandsrapport fra havbunden
07/08/2016
Nordjyske Stiftstidende (Regional), Denmark, Print
Bent Stenbakken og Jesper Thomasen
Ole Henriksen, Aurelia Pereira Gabellini & Elliot John Brown
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management

Relations
Research outputs:
Kortlægning af fiskenes levesteder i den danske del af Øresund
Multidisciplinary mapping of fish habitats in the Sound, Denmark for maritime spatial planning
Projects:
Flatfish nursery grounds (38176)
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
Activities:
ICES - Working Group on the value of Coastal Habitats for Exploited Species - WGVHES (External organisation)
Press/Media: Press / Media

Indslag i 24NORDJYSKE
Ole Henriksen & Elliot John Brown
07/08/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources

Media contribution (1)

Indslag i 24Nordjyske omkring Yngeltogt 2016
07/08/2016
24Nordjyske (Regional), Denmark, Television
Bent Stenbakken
02:20
Ole Henriksen & Elliot John Brown
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management

Relations
Projects:
Flatfish nursery grounds (38176)
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
FishHab-II (39345)
Press/Media: Press / Media

Forskere undersøger fisk langs kysten
Ole Henriksen & Elliot John Brown
26/07/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Living Resources

Media contribution (1)

Forskere undersøger fisk langs kysten
26/07/2016
TV ØST (Regional), Denmark, Television
Signe Alvang
02:57
https://www.tveast.dk/artikel/forskere-undersoeger-fisk-langs-kysten
Ole Henriksen & Elliot John Brown
National Institute of Aquatic Resources, Section for Marine Living Resources, Section for Ecosystem based Marine Management

Relations
Projects:
Flatfish nursery grounds (38176)
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
FishHab-II (39345)
Press/Media: Press / Media

Fintælling af bugtens fisk
Elliot John Brown & Ole Henriksen
22/07/2016
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography

Media coverage (1)

Fintælling af bugtens fisk
22/07/2016
DAGBLADET Køge (Local), Denmark, Print
Torben Thorsø
Elliot John Brown & Ole Henriksen
National Institute of Aquatic Resources, Section for Ecosystem based Marine Management, Section for Marine Ecology and Oceanography

Relations
Projects:
Flatfish nursery grounds (38176)
Habitat Suitability for Recreationally Important Finfish of the Inner Danish Waters
FishHab-II (39345)
Press/Media: Press / Media