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Regulation of mariculture in Denmark: what of the legal and environmental space?

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Abstract

In line with EU policies, the Danish government sees great potentials in aquaculture and wishes to create better growth opportunities for the industry. How this objective can be met while also reducing the environmental impacts of aquaculture and meeting the legal requirements has been a highly debated topic in Denmark, particularly in relation to marine aquaculture *(mariculture)*. This industry has not managed to apply cleaner technologies at the same pace as land-based aquaculture has, and installations have typically been located in coastal areas often already in ecologically poor condition. Recently, the quasi-judicial Environmental Board of Appeal refused to grant an environmental permit for a new mariculture installation. This article reviews the comprehensive and mostly EU-based legal framework regulating Danish mariculture and its application through the decision of the Environmental Board of Appeal. It also touches on the discourse this situation has created and discusses regulatory approaches for reconciling industrial and environmental concerns. Further, it finds that there are limited possibilities of achieving the overall goal of a substantial increase in mariculture production under the current practice of siting mariculture installations near the coast. An obvious solution is to locate mariculture in more open sea areas with greater water flow and depth, and thereby less environmental impact. Locations should be decided on the basis of maritime spatial planning in accordance with the recently adopted EU Maritime Spatial Planning Directive.

1. Introduction

Denmark has been an international forerunner in developing new and cleaner technologies for the aquaculture industry. While land-based fish farming has the longest history, marine aquaculture or mariculture has existed in Denmark since the 1970s. In the face of growing worldwide demand for seafood that can no longer be met through sustainable catch fishery, Danish governments and the aquaculture industry have recognized the potential in aquaculture, and have been keen to promote and expand sustainable production – also because this industry can create employment opportunities in sparsely populated areas of Denmark.[2]

The environmental impacts of aquaculture against the demand for better growth conditions for the industry, and how to balance these conflicting concerns in the regulatory framework, have been much debated in Denmark.[3] Current-

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[2] Ministry of Environment and Ministry for Food, Agriculture and Fishery, 2014. *Strategi for bæredygtig udvikling af akvakultursektoren i Danmark 2014–2020* (Strategy for Sustainable Development of the Aquaculture Sector in Denmark 2014–2020).

[3] See for example the article by the Danish Society for Nature Conservation of 12 December 2015, 'Havet sletter ikke alle spor' ('The sea does not erase all traces'). The article criticizes the 2015 growth plan for mariculture because it would lead to a tripling of mariculture pollution at sea, 'despite the fact that we have not yet finished cleaning up after past environmental sins' (http://www.dn.dk/Default.aspx?ID=46495). Another illustration of

ly, the focus is mainly on mariculture: in contrast to freshwater aquaculture on land, mariculture is on the increase; moreover, it has not managed to apply cleaner technologies to reduce pollution at the same pace as freshwater aquaculture has.

The framework for regulation of mariculture in Denmark – building mainly on EU legislation – is comprehensive and complex, and is essentially based on environmental and locational considerations. A recent decision of the Danish Environmental Board of Appeal to refuse an environmental permit to a mariculture installation has given rise to serious questions about the growth potential of the industry. Conversely, a recent political proclamation from the Danish government on broadening the environmental space for aquaculture raises questions on conformity with the legal framework.[4]

This article reviews the legal framework regulating Danish mariculture at the international, EU and domestic levels and how it has been applied, as illustrated by the decision of the Danish Environmental Board of Appeal. Further, it reviews the discourse the decision has created, and discusses regulatory approaches for reconciling industry and environmental concerns.

2. Status of mariculture in Denmark

The Danish primary production of fish and shellfish amounted close to 44,000 tons in 2014, to a total value of around DKK 1 billion. Mariculture in 2014 had a yearly production of around 11,000 tons with a value of around DKK 0.25 billion. Production in aquaculture has remained fairly constant at that level over the past 10 years: while production in freshwater aquaculture has fallen, production in mariculture has increased commensurately.[5]

Some 90 % of Danish aquaculture production is exported. In freshwater aquaculture, the main product is small-sized fish, while larger (3–4 kg) fish and roe are the main products of mariculture.[6] As with freshwater fish farming, the fish species produced in mariculture is primarily North American rainbow trout *(Oncorhynchus mykiss)*. There are 18 mariculture installations in Denmark, and 13 applications for new installations are currently under consideration by the Danish Environmental Protection Agency (EPA).[7] Most existing installations are located near the coast in Denmark's inner marine areas.

3. Environmental impact of mariculture

In Denmark nutrient loading (eutrophication), nitrogen loading in particular, is considered to be the main source of environmental impact from aquaculture.[8] Discharges, primarily from waste feed and faeces, have been reduced significantly in freshwater fish farming due to the use of new and cleaner technology. Although the content of nitrogen and phosphorus in mariculture fish feed has declined, mariculture has not

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the debate is the call by Denmark's Enhedslisten (the Red–Green Alliance) for a moratorium on new mariculture in Danish waters (https://enhedslisten.dk/artikel/stop-havdambrug-i-danmark-73547).

[4] Danish Government, 2015. Aftale om Fødevare- og landbrugspakke (Agreement on a food and agriculture 'package'), 22 December 2015. (http://mfvm.dk/fileadmin/user_upload/FVM.dk/Dokumenter/Landbrug/Indsatser/Foedevare-_og_landbrugspakke/Aftale_om_foedevare-_og_landbrugspakken.pdf).

[5] Information provided by Dansk Akvakultur (Danish Aquaculture Association).

[6] Ibid.

[7] Danish EPA website: http://eng.mst.dk/topics/industry/aquaculture/

[8] Eutrophication is generally held to represent the most serious problem for the marine environment in Denmark, with agriculture as the main source. It has been a major concern in Danish environmental policy and legislation since the mid-1980s. See N.P. Nørring and E. Jørgensen, 2009. *Eutrophication and agriculture in Denmark: 20 years of experience and prospects for the future* published in Vol. 207 of the series Developments in Hydrobiology pp 65–70. (http://link.springer.com/chapter/10.1007%2F978-90-481-3385-7_7).

experienced the same significant reduction in the nutrient load because technology is not available for curbing the discharge of nutrients from marine fish farms. An indirect way of nutrient neutralization is currently being developed: this involves the breeding of mussels and/or seaweed to absorb the nutrients.[9] However, the effects of such breeding as a compensation measure for mariculture eutrophication are disputed, and are further discussed below.

On a smaller scale than eutrophication, there may be environmental impacts from residues of medicine, as well as disturbance generated by mariculture activities that affect marine mammals and birds. Antifouling of nets with copper may also have an environmental effect, but has been lessened through the use of thinner nets. Escape of farmed fish could have negative effects on wild stocks of trout and salmon. Other environmental effects from mariculture known to be serious problems elsewhere (not least in Norway), such as interbreeding with wild fish stocks and infection of stocks with lice, do not appear problematic in Danish waters.[10]

What happens to any type of waste released into the water column depends on the hydrographic conditions, bottom topography and geography of the area in question. The environmental impact of nutrients depends on the extent to which they are diluted before being assimilated by the pelagic ecosystem.[11]

4. Mariculture policies in the EU and Denmark

The aquaculture industry has grown rapidly elsewhere, but has been stagnant in the EU, especially in the countries around the Baltic Sea. Of the total supply of fish and shellfish in the EU, 25 % came from the EU's own fisheries and 10 % from aquaculture in the EU, while the remaining 65 % came from imports from outside the EU.[12] Therefore the EU would like its own aquaculture production to cover more of the demand within its borders. The 2013 EU Regulation on the Common Fisheries Policy has a strong focus on the promotion of an environmentally, socially and economically sustainable aquaculture, and requires member states to draw up national multi-year strategies to that effect.[13] The EU Commission has prepared a set of strategic guidelines for the sustainable development of aquaculture in the EU, with four priority areas: administrative procedures, coordinated planning, competitiveness, and equity.[14]

Both the previous Danish centre–left government and the current liberal/right government have formulated policies aimed at increasing aquaculture production without also increasing the environmental impacts: the former government even had a goal of reducing emissions of

[9] Danish EPA website.

[10] EPA, 2014. Note with EPA comments to the consultation process in the Endelave case. (http://mst.dk/media/mst/9186179/hjarn_-h_ringsnotat_med_bilag.pdf).

[11] P. Read, T. Fernandes, 2003. Management of environmental impacts of marine aquaculture in Europe. *Aquaculture* 226 (2003) 139–163.

[12] Ministry of Environment and Ministry for Food, Agriculture and Fishery, 2014.

[13] European Parliament and the Council of the EU, 2013. Regulation (EU) No 1380/2013 of the European Parliament and the Council of 11 December 2013 on the Common Fisheries Policy. (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:354:0022:0061:EN:PDF).

[14] European Commission, 2013. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Strategic Guidelines for the sustainable development of EU aquaculture. (http://ec.europa.eu/fisheries/cfp/aquaculture/official_documents/com_2013_229_en.pdf).

nitrogen per tonne fish by 20 % by 2020.[15] The current government, which came to power in June 2015, presented a food, agricultural and aquaculture policy 'package' in December that year, aimed mainly at promoting a 'paradigm shift' in environmental regulation to improve economic conditions for the food and agriculture industry. Rather than emplacing general one-size-fits-all requirements on farmers to prevent and reduce eutrophication, the government and its parliamentary majority want to apply a differentiated approach with tailored requirements based on site-specific environmental objectives. The government intends to abolish a range of general environmental requirements to agriculture and replace them with site-specific regulation and voluntary measures.[16]

These proclaimed changes to the regulation of nitrogen run-off from agriculture could have implications for the regulation of aquaculture as an additional contributor of nitrogen to the aquatic environment when assessing total nitrogen emissions against the River Basin Management Plans drawn up under the EU Water Framework Directive. The new policy document also covers the aquaculture industry as such. It reiterates the huge potential of aquaculture for growth and promises a 'growth strategy' for the industry. Identifying requirements on curbing nutrient discharges as the main barrier to growth, the policy document proclaims nitrogen quotas to be set for aquaculture. For mariculture, an environmental space is to be provided in the form of a total load of 800 tonnes of nitrogen for new mariculture production and an additional quota of 43 tonnes for existing production in coastal waters: in total this represents more than a doubling compared to today.

To lessen the administrative burdens for industry, the government has proclaimed not just a service check (as its predecessor), but an upfront general simplification of Danish environmental legislation related to food and agriculture, aimed at reducing the total number of legal acts by one third.[17]

5. Regulatory frameworks for mariculture at the international, EU and national levels

The degradation of the marine environment is of global concern, and perhaps the most far-reaching development of international environmental law has occurred in precisely this field. Many legal acts and soft-law instruments have been introduced at various geographical levels, aimed at the conservation and sustainable use of the marine ecosystems. Several of them are relevant to mariculture, as this is a growing industry with actual and potential adverse effects on the marine environment. The following offers an overview of the rather extensive set of legal frameworks relevant for mariculture, from the international to the national levels.[18]

5.1 International regulation

At the global level, some general rules and principles for protecting the marine environment are provided by the United Nations Convention on Law of the Sea (UNCLOS)[19] and the Convention

[15] Ministry of Environment and Ministry for Food, Agriculture and Fishery, 2014.

[16] Danish Government, 2015. *Aftale om Fødevare- og landbrugspakke* (Agreement on a food and agriculture 'package').

[17] Ibid.

[18] The overview is not intended to be exhaustive. In certain situations, other legal instruments than those mentioned here may also be of relevance.

[19] The United Nations Convention on Law of the Seas (UNCLOS). Entered into force in 1994 (http://www.un.org/depts/los/convention_agreements/texts/unclos/closindx.htm).

on Biological Diversity (CBD).[20] UNCLOS establishes an overall global framework in defining the rights and responsibilities of states with respect to their use of the world's oceans, including provisions to prevent, reduce and control pollution (Article 192). The CBD has broad provisions on conservation and sustainable use of biodiversity and its components, and has adopted the Ecosystem Approach as the primary framework for action under the Convention.[21] While the CBD contains no provisions specifically related to marine and costal biodiversity,[22] the issue has received extensive attention under the Convention in relation to its Programme of Work on Marine and Coastal Biodiversity, where mariculture is one of its five programme elements.[23]

COP 10 of the CBD in 2010 adopted the Strategic Plan for Biodiversity 2011–2020, including the 20 'Aichi Biodiversity Targets'. Target 7 reads: 'By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.'[24]

Danish marine waters are covered by two regional seas conventions that are partly overlapping in geographical scope:[25] the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)[26] and the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM)[27]. Both treaties enshrine the precautionary and the polluter pays principles as well as the principle of promoting best environmental practices and technologies. Moreover, HELCOM has adopted recommendations specifically aimed at preventing and mitigating environmental impacts from aquaculture.[28]

5.2 EU regulation

Regulation of mariculture in Denmark is based largely on legislation adopted by the EU pertaining to environmental protection, either generally or specifically concerning the protection of the marine environment. This EU legislation is consistent with the global and regional treaties presented above and the soft-law decisions and recommendations adopted by their governing bodies, while also being considerably more detailed as regards obligations for states. The legislation specifies obligations for states to achieve good environmental status and prevent deterioration of bodies of surface water. The following will present the EU legal acts most directly applicable to mariculture and their implementing legal acts in Denmark.

[20] The Convention on Biological Diversity. Entered into force in 1993.(https://www.cbd.int/).

[21] CBD COP 5 Decision V/6. The decision describes the approach as 'a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way'. Such an integrated approach has later been widely applied in legal instruments to protect the marine environment including the instruments described below. Sometimes the approach is formulated in less definite forms, such as 'an ecosystem-based approach'.

[22] Especially relevant provisions for mariculture are Articles 6(b) and 10(c) on mainstreaming of biodiversity concerns into sectoral and cross-sectoral activities and national decision-making.

[23] CBD COP 4 Decision IV/5.

[24] CBD COP 10 Decision X/II. COP 10 took place in Nagoya, Japan, and the Aichi Biodiversity Targets are named after the prefecture of Nagoya. The Plan aims at providing an overarching framework on biodiversity, not only for the CBD and other biodiversity-related conventions, but for the entire UN system and all other partners engaged in biodiversity management and policy development.

[25] Both conventions cover the Kattegat Sea area

[26] The OSPAR Convention, (http://www.ospar.org/). The acronym 'OSPAR' is used because the Convention unified and extended the former Oslo and Paris Conventions, which regulated emissions into waters from dumping and from land-based sources, respectively.

[27] HELCOM website (http://www.helcom.fi/about-us/convention/). HELCOM refers to its governing body, the Helsinki Commission.

[28] HELCOM Recommendations 2004, 25/4 and 37-2016, 4-10-Rev.1.

5.2.1 The Water Framework Directive (WFD)

The 2000 EU Water Framework Directive[29] and the implementing Danish legislation may have implications on the regulation of mariculture with regard to installations near the coast – as are most Danish mariculture installations today.

The WFD applies to rivers, lakes, groundwater and coastal waters.[30] It operates with an integrated approach to managing water quality on a river basin basis, with the designation of River Basin Districts (Article 3). For these, the WFD requires River Basin Management Plans; it specifies a structured approach to developing such plans, to be prepared and renewed in six-year cycles (Article 13). In the River Basin Plans, member states shall provide for various measures to be taken with the aim of achieving good surface-water status, which includes preventing and reducing pollution.[31]

Member states are required to prevent deterioration of surface-water bodies and to protect, enhance and restore them with the aim of achieving good status by the year 2015 (WFD Article 4). In a recent ruling (the *Weser* case) the Court of Justice of the European Union (CJEU) applied a strict interpretation of the non-deterioration obligation that may have implications for the establishment or extension of mariculture installations: The Court ruled that this obligation does not amount solely to basic, general obligations, but applies also to the authorization of individual projects. Accordingly, states are required – unless a derogation provided for by the WFD is granted – to refuse authorization for any project that cause a deterioration of the status of the water body in question. [32]

The Water Framework Directive is implemented in Denmark through the 2013 Water Planning Act in relation to future implementation.[33] Denmark has been divided into four River Basin Districts for which River Basin Plans have been developed according to earlier implementing legislation. Denmark issued its first River Basin plans in 2011, four years delayed. The next plans were to have been issued by December 2015. However, also these plans have been postponed by the government, probably with a view to applying its 'paradigm shift' in environmental regulation of the food and agriculture industry when drawing up the plans.

5.2.2 Marine Strategy Framework Directive (MSFD)

For mariculture established *beyond* coastal waters, the Marine Strategy Framework Directive may have implications.[34] Its geographical scope is 'all marine waters' (Article 2) covering both territorial waters and Exclusive Economic Zones.[35] For marine waters covered by the Water

[29] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000, establishing a framework for Community action in the field of water policy.

[30] Directive 2000/60/EC Art. 2.7 defines 'coastal waters' as follows: 'surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters'.

[31] Article 4. Annex VIII to the Directive includes an indicative list of the main pollutants, of which no. 11 concerns 'Substances which contribute to eutrophication (in particular, nitrates and phosphates)'– the main pollutant from mariculture in the Danish context

[32] CJEU Judgement of 1 July 2015. Case C-461/13 Bund für Umwelt und Naturschutz Deutschland eV v Bundesrepublik Deutschland (*Weser Case*) (http://curia.europa.eu/juris/liste.jsf?num=C-461/13).

[33] Lov nr 1606 af 26/12/2013 om vandplanlægning (Danish Water Planning Act).

[34] Directive 2008/56/EC of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).

[35] Article 3.1 defines 'marine waters' as:

(a) waters, the seabed and subsoil on the seaward side of the baseline from which the extent of territorial waters is measured extending to the outmost reach of the area where a Member State has and/or exer-

Framework Directive, the MSFD does not apply if specific aspects of the environmental status have already been dealt with under this directive or other Community legislation (Article 3.1.(b)).

The main objective of the MSFD is to achieve or maintain good environmental status in the marine environment by the year 2020. To that end, marine strategies are to be developed and implemented (Article 2). These strategies shall apply an ecosystem-based approach to the management of human activities which have an impact on the marine environment, integrating the concepts of environmental protection and sustainable use (Article 1.3). The MSFD includes rather detailed requirements for the preparation process and content of the marine strategies. (Article 5 and 8–16).

The Marine Strategy Framework Directive establishes European marine regions and subregions on the basis of geographical and environmental criteria within which states shall cooperate to develop coherent strategies (Articles 6 and 5.2). The marine regions are the Baltic Sea, the North-East Atlantic Ocean, the Mediterranean Sea and the Black Sea, all located within the geographical boundaries of existing Regional Sea Conventions under which regional and subregional cooperation is already taking place.[36]

To implement the MSFD, Denmark enacted the Marine Strategy Act in 2010.[37] It aims at establishing a framework for measures to achieve or maintain good environmental status of marine ecosystems, and to provide for the sustainable exploitation of marine resources through the development of marine strategies (Sec. 1).

Denmark issued its first marine strategy in 2010.[38] Although the socio-economic analysis includes a report on mariculture in Denmark explaining its environmental impact (mainly through eutrophication), none of the concrete targets of the strategy for achieving good environmental status refer specifically to aquaculture.

5.2.3 The Habitats Directive

The EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive)[39] is aimed at protecting species and habitats that are characteristic, endangered, vulnerable or rare in the EU. Together with the Directive on the Conservation of Wild Birds (the Birds Directive),[40] this is the EU's main regulatory contribution to the targeted protection of biodiversity in its member states. These two directives require the designation of core sites on

cises jurisdictional rights, in accordance with the UNCLOS, with the exception of waters adjacent to the countries and territories mentioned in Annex II to the Treaty and the French Overseas Departments and Collectivities; and

(b) coastal waters as defined by Directive 2000/60/EC, their seabed and their subsoil, in so far as particular aspects of the environmental status of the marine environment are not already addressed through that Directive or other Community legislation;

[36] The four European Regional Sea Conventions are:
- The 1992 Convention for the Protection of the Marine Environment in the North-East Atlantic (further to earlier versions of 1972 and 1974) – the OSPAR Convention (OSPAR)
- The 1992 Convention on the Protection of the Marine Environment in the Baltic Sea Area (further to the earlier version of 1974) – the Helsinki Convention (HELCOM) The 1995 Convention for the Protection of Marine Environment and the Coastal Region of the Mediterranean (further to the earlier version of 1976) – the Barcelona Convention (UNEP-MAP)
- The 1992 Convention for the Protection of the Black Sea – the Bucharest Convention.

[37] Lov nr. 522 af 26. maj 2010 om havstrategi (Marine Strategy Act).

[38] Miljøministeriet, Naturstyrelsen, 2010. *Danmarks havstrategi* (Marine Strategy of Denmark). (http://naturstyrelsen.dk/vandmiljoe/havet/havmiljoe/danmarks-havstrategi/).

[39] Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora.

[40] Directive 2009/147/EC of 30 November 2009 on the Conservation of Wild Birds

land and sea for species and habitat types listed in annexes to ensure that these are maintained, or restored, to a favourable conservation status in their natural range (Article 3 of the Habitats and 4 of the Birds Directive). Together, these designated sites form part of a coherent ecological network of nature areas, known as the European *Natura 2000 Network*. Denmark has designated 252 such Natura 2000 sites in total, with the marine sites covering 17.7 % of the Danish marine area.[41]

Article 6.1 requires states to establish the necessary conservation measures and Article 6.2 to avoid the deterioration of habitats as well as the disturbance of the species for which the areas have been designated. Article 6 .3 stipulates: 'Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.' The competent national authorities are not to agree to a plan or project until they have ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, until obtaining the opinion of the general public. This provision is modified in para. 4, allowing a plan or project to be carried out in spite of a negative assessment of the implications for the site and in the absence of alternative solutions 'for imperative reasons of overriding public interest, including those of a social or economic nature.' In such cases, member states shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected, and shall inform the EU Commission thereon.

Relying on the precautionary principle, the CJEU in several rulings – such as the *Waddenzee* (C-127/02), the *Sweetman v An Bord Pleanála (C-258/11) and the Commission v. Spain (C-404/09)* cases – has operated with a strict interpretation concerning whether an activity has the potential for adversely affecting a Natura 2000 site. This implies that an activity may be allowed only after it has been ascertained that there will be no harmful effects to the site. Hence, the Court has established that an assessment cannot be considered sufficient if there are deficiencies, such as absence of accurate findings and conclusions, to remove any reasonable scientific doubt about possible adverse effects.[42] The implication of this court practice on Danish regulation of mariculture will be further discussed below.

[41] Nature Agency website, http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-omraaderne/.

[42] Case C-127/02, *Waddensee case.*, Para 55–57: 'As regards the conditions under which a particular activity may be authorised, it lies with the competent national authorities, in the light of the conclusions of the assessment of the implications of a plan or project for the site concerned, to approve the plan or project only after having made sure that it will not adversely affect the integrity of that site. It is therefore apparent that the plan or project in question may be granted authorisation only on the condition that the competent national authorities are convinced that it will not adversely affect the integrity of the site concerned. Where doubt remains as to the absence of adverse effects on the integrity of the site linked to the plan or project being considered, the competent authority will have to refuse authorisation. In this respect, it is clear that the authorisation criterion laid down in the second sentence of Article 6(3) of the Habitats Directive integrates the precautionary principle. See also case (Case C-258/11 Peter Sweetman and Others v An Bord Pleanála, Para 40: 'Authorisation for a plan or project, as referred to in Article 6(3) of the Habitats Directive, may therefore be given only on condition that the competent authorities – once all aspects of the plan or project have been identified which can, by themselves or in combination with other plans or projects, affect the conservation objectives of the site concerned, and in the light of the best scientific knowledge in the field – are certain that the plan or project will not have lasting adverse effects on the integrity of that site. That is so where no reasonable scientific doubt remains as to the absence of such effects (see, to this effect, Case C-404/09 Commission v Spain, paragraph 99, and Solvay and Others, paragraph 67).'.

The CJEU has also ruled on whether a project that would negatively affect a Natura 2000 site may be allowed if measures are established that could offset the negative effects. As it will be shown below, this question is highly relevant for Danish mariculture. Also here, the Court holds a strict interpretation, rejecting such measures unless the conditions set out in Article 3. 4 are met. The *Briels and others* case (C-521/12) concerned the broadening of a Dutch motorway that would entail increased traffic and thereby a rise in airborne nitrogen depositions on a neighbouring nitrogen-sensitive Natura 2000 meadow where the conservation status was already unfavourable. The Court rejected the argument that the artificial creation of a new meadow in the area that would not be affected by the motorway could qualify as a 'mitigating measures' in the context of an appropriate assessment under the second sentence of Article 6.3 of the Habitats Directive. In the view of the Court, the assessment process must focus on the effects on the actual and existing habitat, and not extend to consideration of some future habitat that might be created by the developer.

The Habitats Directive has been implemented in Denmark through a statutory order on designating and managing international nature protection areas and protection of certain species. [43] For aquaculture projects within or affecting Natura 2000 sites, the order implies that the Natura 2000 appropriate assessment shall be part of and be taken into account in the permit issuance procedure according to the Environmental Protection Act and – when EIA is required – the EIA procedure, as discussed below.

5.2.4 Maritime Spatial Planning Directive (MSPD)

Another EU directive of particular relevance in this context is the 2014 Framework Directive for Maritime Planning[44] that 'establishes a framework for maritime spatial planning aimed at promoting the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources' (Article 1). Member states are required to establish and implement maritime spatial planning (Article. 4.1) to consider economic, social and environmental aspects to support sustainable development and growth in the maritime sector, applying an ecosystem-based approach, and to promote the coexistence of relevant activities and uses (Article. 5.1). Planning for mariculture is specifically referred to in this context, together with other maritime sectors (Articles 5.2 and 8.2).

Obligations under the MSPD are procedural. The Directive specifies that it shall not interfere with member states' competence to design and determine, within their marine waters, the extent and coverage of their maritime spatial plans (Article 2.3). It also establishes that it is without prejudice to the competence of member states to determine how the various objectives are reflected and weighted in their plans (Art 5.3.).

In June 2016, the Danish Parliament adopted a Maritime Spatial Planning Act to implement the EU MSPD.[45] The Ministry of Environment and Food has already started the process of designating areas for new mariculture installations.[46]

[43] Bekendtgørelse nr 408 af 01/05/2007 om udpegning og administration af internationale naturbeskyttelsesområder samt beskyttelse af visse arter, sections 7–10 (Order on designation and administration of Natura 2000 sites).

[44] Directive 2014/89/of 23 July 2014 establishing a framework for maritime spatial planning.

[45] Lov nr. 615 af 08/06/2016 om marin fysisk planlægning (Marine Spatial Planning Act). https://www.retsinformation.dk/Forms/R0710.aspx?id=180281.

[46] Information obtained from the Danish Aquaculture Association and the Danish Nature Agency.

5.2.5 The Environmental Impact Assessment (EIA) Directive

The last EU legal instrument of relevance in this context is also procedural: The Directive on the Assessment of the Effects of Certain Public and Private Projects on the Environment[47] makes it mandatory to undertake environmental impact assessments (EIA) of projects likely to have significant effects on the environment, prior to their authorization. The aim is to harmonize the principles of environmental assessment by introducing minimum requirements with regard to the type of projects subject to assessment, the main developer's obligations, the content of the assessment and the participation of the competent authorities and the public. This EIA Directive is intended to help policy-makers to reach well-informed decisions based on objective information and the results of consultation with the public/ stakeholders.

All projects listed in Annex I of the EIA Directive are subject to the EIA requirement (Article 4.1). For projects listed in Annex II, the national authorities are to decide whether an EIA is required (Art 4.2.). This includes 'intensive fish farming' (Annex 2, 1. (f)). Annex III specifies selection criteria for determining whether Annex II projects should be subject to EIA.

Thus far, implementation of the EIA Directive in Denmark as regards mariculture has been divided between two sets of legislation depending on the distance from the coast of the mariculture installation. However, a new Danish EIA act adopted in May 2016 has consolidated and made uniform the EIA provisions for aquaculture:[48] As with the EU EIA Directive, 'intensive fish farming' is listed in an annex under which EIA is not mandatory but subject to a prior decision by the competent authority as to whether it is required (Articles 15 and 21). For installations within one nautical mile of the coast the local council is the competent authority; the Ministry for Environment and Food is the authority for installations further out. (In accordance with Danish practice this competence is likely to be delegated to the Danish Environmental Protection Agency (EPA).)

5.3 National legislation pertaining to mariculture

Danish legal requirements for mariculture that do not involve implementation of EU legislation are the basic provisions for applying for permits to establish and operate marine fish farms and specifying the terms for this. Such permits are required under two regulatory frameworks, the Fisheries Act [49] and the Environment Protection Act. [50]

Concerning the latter, mariculture is included in an annex listing polluting enterprises which require a permit (Section 33), regardless of whether the installation has been deemed to require an EIA by the competent authority. Installations nearer to the shore than one nautical mile require approval from the local council, while the EPA has the authority to approve those further offshore. In awarding permits and setting terms for polluting enterprises, the competent authorities are to pay particular attention to the applica-

[47] Informal consolidated version of Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU.(http://ec.europa.eu/environment/eia/pdf/EIA_Directive_informal.pdf).

[48] Lov nr. 425 af 18/05/2016 om miljøvurdering af planer og programmer og af konkrete projekter (VVM) (Act on environmental impact assessment of plans, programmes and projects).

[49] Lovbekendtgørelse nr. 978 af 26/09/2008 om fiskeri og fiskeopdræt (fiskeriloven) (Act on Fisheries and Aquaculture, consolidated version).

[50] Miljøbeskyttelsesloven (Environmental Protection Act) (No. 879 of 2010) (this latest version of the Act is not available in English) and Statutory Order on Authorization of Listed Enterprises (No. 669 of 2014).

tion of the best available technology and the best location in terms of preventing pollution. This permit regime provides a tool for securing compliance with other relevant legislation, not least the EU-based legislation presented above. The competent authority shall oversee whether pollution from mariculture production can be kept within the set limits of the River Basin Management Plans or marine strategies and the designation basis for Natura 2000 sites that may be affected.

5.4 Appeal procedure

Decisions on mariculture taken under the Environmental Protection Act on an environmental permit and EIA may be appealed within 30 days after the decision to the Environmental Board of Appeal by the party to whom the decision is addressed, or by any party with an individual, significant interest in the outcome of the case, or by various civil society and trade organizations.[51] The Board is an independent administrative appeal board for rulings relating to planning, nature and the environment.

6. Regulation in practice: the Endelave mariculture case

Having provided an overview of the comprehensive regulatory framework regulating mariculture in Denmark, we now turn to the challenges and dilemmas confronting this framework. This will be done through a review of a recent illustrative appeal case brought before the quasi-judicial Environmental Board of Appeal.[52] The decision was keenly awaited by stakeholders, and the refusal to grant a permit sparked extensive debate on the environmental impacts of mariculture, and if the industry had any future in Denmark. The review here focuses on the most-contested aspects of the case.

In January 2013, the aquaculture company Hjarnø Havbrug applied for a permit to establish a mariculture installation in the Kattegat Sea 3.2 km south of the small island of Endelave, to produce up to 2105 tons of rainbow trout per year in 20 circular net cages. It was estimated that production would release 88 tons of nitrogen and 9.6 tons of phosphorus. The company emphasized that the high water flow on the location would lead to dilution and transportation of the nutrients away from coastal waters and to more open sea areas. In addition, the company would establish 'compensation breeding' in the form of mussel and seaweed breeding in coastal waters to 'neutralize' the nutrient loading. According to the company, this would lead to 100 % and 70 % removal of nitrogen and phosphorus, respectively.[53]

As the installation was to be established more than 1nm from the coast, the EPA was the competent authority concerning a permit pursuant to the Environmental Protection Act and an EIA permit, which the EPA had deemed necessary. These were granted in May 2014, on certain conditions.[54]

The installation was planned to be located 1.3 km from a Natura 2000 protected marine site. This designation was based on the presence of

[51] Environmental Protection Act, sections 91–100.

[52] Natur- og miljøklagenævnet (Environmental Board of Appeal) 2014. Afgørelse i sag om miljøgodkendelse af Endelave Havbrug og VVM-tilladelse til etablering af Endelave Havbrug (Decision of the Board, Endelave case). (http://nmkn.dk/media/129490/nmk-10-00807-og-nmk-34-00371.pdf).

[53] Undated note by Orbicon, the consulting firm employed by Hjarnø Havbrug, on Endelave Mariculture. (http://www.havbrug.dk/media/1012/endelave_p__4_sider_23-jan-2014.pdf).

[54] Miljøministeriet, Miljøstyrelsen, 2014. Miljøgodkendelse. Hjarnø Havbrug: Endelave. (http://mst.dk/media/mst/9193293/endelave_havbrug_milj_godkendelse-8_maj.pdf) and Miljøministeriet, Miljøstyrelsen, 2014. VVM tillladelse til etablering af havbrug ved Endelave. (http://mst.dk/media/mst/9193296/vvm_tilladelse_8maj_.pdf).

certain marine mammals, birds and marine habitat types listed in the EU Habitats Directive. This proximity meant that yet another assessment, a Natura 2000 Appropriate Assessment, had to be carried out subject to Article 6.3 of the Directive and its implementing Danish provision. Further, the EPA was obliged to ensure that the mariculture production would not violate the River Basin Management Plan that had been prepared in accordance with the EU Water Framework Directive. In both cases, the level of eutrophication was a critical factor. The EIA and the Natura 2000 assessments were prepared by the environmental consultancy company Orbicon, on behalf of Hjarnø Havbrug. It concluded that, with the planned environmental measures to compensate for the nutrient loading caused by mariculture production, the installation would be able to operate without significantly affecting the aquatic environment.[55]

On the basis of these assessments, the EPA justified granting a permit. The EPA also emphasized that the requirement under the Environmental Protection Act, that a potential polluter must apply the best available technology (BAT) to minimize environmental impact, would be fulfilled through the planned establishment of mussel and seaweed breeding and through not impregnating the cages with anti-fouling material containing copper.

The EPA decisions, however, were appealed to the Environmental Board of Appeal by the coastal local government, some national organizations with nature conservation, outdoor recreation and angling as their focus areas, and by a local interest group. Primarily, they challenged the premise that the installation would be able to operate without significantly affecting the nearby Natura 2000 site. The effect of the mussel and seaweed breeding as a compensation mechanism to absorb nitrogen and phosphorus was also questioned, and it was argued that this activity could not be regarded as BAT. Moreover, it was argued that the installation would pose a serious risk of release of fish that could damage wild populations of trout and salmon.

In its decision to deny a permit, the Environmental Board of Appeal emphasized that the main environmental threat to the nearby Natura 2000 site was nutrient loading, especially nitrogen; further, that, according to the River Basin Management Plan, the marine area in question was already considerably affected in that regard. Referring to the Habitat Directive Article 6.3, and the strict court practice of the CJEU, the Board stressed that the competent authority shall allow a plan or a project that may affect a Natura 2000 site only if the Natura 2000 Appropriate Assessment provides certainty beyond reasonable scientific doubt that this will not be the case. This reflection of the precautionary principle is also laid down in a set of guidelines issued by the Nature Agency on how to administer the Habitats Directive in Denmark.[56] Finding that the Natura 2000 Appropriate Assessment failed to provide such scientific certainty, the Board cited several examples of what it viewed as unclear or insufficient in that assessment.

On the breeding of mussels and seaweed, the Board considered whether this should be regarded a direct mitigation measure integrated in the proposed mariculture project. It had not been claimed that this should be considered a compensation measures pursuant to the Habitat Directive Article 6 (4) and equivalent provisions in Danish law. The distance between the location of the planned mariculture installation and

[55] Undated note, Orbicon.

[56] Vejledning til bekendtgørelse nr 408 af 1. maj 2007 om udpegning og administration af internationale naturbeskyttelsesområder af visse arter af 21. juni 2011 (Guidelines on designation and administration of Natura 2000 sites).

the planned mussel and seaweed breeding sites was 12 to 16 km. Under these circumstances, and since the latter would not even be located in the direction of the water flow from the mariculture installation, the Board found that the planned mussel and seaweed breeding could not have an effect on direct releases from the installation, and thus could not be taken into account in assessing whether the installation would affect the Natura 2000 site. Also for that reason, such mussel and seaweed breeding could not be regarded as a BAT measure. Here the Board also quoted a scientific body (Denmark's Technical University – Aqua) which held that mussel breeding could not be considered BAT as the technology was not yet fully developed (although this technology is in fact recommended in the mariculture guidelines issued by the Ministry of Environment in 2006).[57]

On the risk of escapes of fish from the installation, the Board did not object to the conditions set by the EPA decision to prevent such escapes.

In summary, the location of a marine Natura 2000 site sensitive to nutrient loading in the immediate vicinity of the planned location proved to be the decisive factor. The Appeal Board ruled that, in such cases, issuance of a permit cannot be based solely on an *assumption* that the installation will be able to operate without significantly affecting the site, as was the case for the EPA decision. The Habitat Directive and CJEU practice impose a burden of proof for the producer to document that the activity *will not* cause environmental damage: and the producer was not to do that. This ruling corresponds to earlier rulings of the Board on extension of existing mariculture installations near Natura 2000 sites.[58]

The Board also established that mussel and seaweed breeding facility intended to be established, at a considerable distance from the installation, to absorb nutrients – an important factor in the EPA decision to justify that the installation was 'nutrient-neutral' – could not be regarded as a mitigation measure for the release of nutrients from the installation even if this activity in fact would be able to hold back nitrogen and phosphorus from the marine environment. The ruling thereby leans towards the *Briels* ruling of the CJEU referred to above.

7 Discussion and conclusions

In light of the result of the Endelave case, the Danish aquaculture industry today does not see great opportunities for expansion, given current regulatory practices. The industry argues that mariculture is merely one of multiple other sources of loading of nitrogen and other nutrients. The main source is agriculture, which accounts for about 70 % of the total nitrogen discharge. Wastewater treatment installations, storm water outfalls and industry are responsible for approximately 10–12 %, while the contribution from other sources is between 18 % and 20%. Discharges come both from Denmark and from other countries bordering the waters. Areas with less water exchange with adjacent seas and coastal areas close to the sources will be relatively more affected by Danish discharges (up to 100 %) than the more open waters (down to 1 %).[59]

In contrast, proponents of strict environmental safeguards argue that the existing nutri-

[57] Guidance on Mariculture no. 9163 of 31 March 2006

[58] Miljøklagenævnets afgørelse af den 29. marts 2011 vedrørende Kongsnæs Havbrug (decision on Kongsnæs Havbrug), Natur- og miljøklagenævnets afgørelse af 9. januar 2013 vedrørende Langsand Laks (decision on Langsan Laks). Texts of the decisions can be found on the website of the Environmental Board of Appeal, http://nmkn.dk/afgoerelser/.

[59] Danish Aquaculture, 2015. Comments during a consultation process concerning Danish draft River Basin Management Plans, 23 June, 2015. (http://www.danskakvakultur.dk/media/13072/hoeringssvar-fra-Dansk-Akvakultur-til-Vandomraadeplaner_150623.pdf).

ent load of Danish marine areas is an argument for not allowing any increase from additional sources. Given the overall environmental impact and the vulnerability of Danish waters, they hold that the marine environment does not have the capacity to assimilate mariculture as well. In support of their appeal in the Endelave case they pointed out that the local government had invested large sums in waste-water treatment facilities from land sources. For that reason, a new source of 88 tonnes of nitrogen and 9.6 tonnes of phosphorus would, in their view, undermine these public investments.[60] This argument could be applied also in a national context, considering the investments made by various Danish governments over 30 years to reduce nutrient loading of the aquatic environment, not least from the biggest source, agriculture.[61]

Would it in fact be possible to achieve the official goals of a substantial increase in mariculture production, less bureaucracy for industry and less environmental impact? How could this be done in view of the environmental vulnerability of Denmark's coastal marine areas, the current regulatory framework and the legal precedent set by the Environmental Board of Appeal in the Endelave case?

Concerning the bureaucratic obstacles for the mariculture industry, this article has provided an admittedly non-exhaustive survey of the cumbersome administrative and regulatory system for mariculture in Denmark, which involves three separate agencies within the same ministry as well as local councils and numerous legal acts in the form of EU directives, laws and statutory orders, some with overlapping environmental objectives. According to the aquaculture industry, it typically takes one to two years from the applicant's first contact with the authorities to get a decision, sometimes even up to five years. Also the European Commission has identified red tape as a constraint for the aquaculture industry in the EU as a whole.[62] In order not to further discourage the development of mariculture, there are thus good reasons for simplifying and streamlining the unwieldy procedures for granting permits. Lessons may be learned from Norway, where there is a single piece of legislation that regulates mariculture: the Aquaculture Act. One of the aims of this Act, adopted in 2006, was precisely to simplify the application process. [63]

The Danish government intends not only to ease the procedural but also the environmental protection requirements for industry for existing and new mariculture. As yet, however, there have been no indications as to how this promise will be fulfilled in the face of the EU legal requirements and the legal precedent set by the Appeal Board and the CJEU. This applies in particular to expansion of the environmental space for existing installations. These are generally located near the coast, many of them in semi-closed marine areas that are already in an unfavourable ecological condition, according to Danish River Basin Management Plans.[64] Many marine Natura 2000 sites are located in the same coastal waters – a further obstacle to mariculture development, as seen in the Endelave case. The decision in this

[60] Environmental Protection Agency, 2014, note on the consultation process in the Endelave case.

[61] EPA website. Action Plan for the Aquatic Environment III 2005–2009 (http://eng.mst.dk/topics/agriculture/nitrates-directive/action-plan-for-the-aquatic-environment-iii/).

[62] European Commission, 2013.

[63] The Norwegian Ministry of Fisheries and Coastal Affairs, 2006, the Aquaculture Act (https://www.regjeringen.no/globalassets/upload/kilde/fkd/reg/2005/0001/ddd/pdfv/255327-l-0525_akvakulturloveneng.pdf).

[64] B. Riemann, S. Markager and M. Maar, 2015. Posting on the Danish web medium Altinget, 30 October 2015, on mariculture and potentially conflicting spatial interests at sea. The authors are marine environment researchers at Aarhus University. (http://www.altinget.dk/artikel/forskere-havbrug-kolliderer-med-miljoe-turisme-og-fiskeri.

case, together with CJEU court practice, shows that, when natural habitats already have an unfavourable conservation status, any additional impact could be deemed 'significant' in view of Article 6.3 of the Habitats Directive.[65] In addition to the rulings interpreting Article 6.3 of the Habitats Directive, the recent *Weser* case took a strong stance on the non-deterioration principle of the Water Framework Directive. The ruling here can be interpreted as binding the member states to refuse to authorize any project that might cause a deterioration of the status of a body of surface water – and this may include mariculture installations.

'Compensation breeding' of mussels and seaweed to remove nitrogen load from mariculture is part of the government's plan for growth in the aquaculture industry. Again, however, both the Danish Environmental Board of Appeal and the CJEU (through the *Briels* case) have set legal limits on the extent to which such measures can be viewed as integral elements in the mitigation of activities that negatively affect a marine Natura 2000 site.

All in all, there would appear to be limited possibilities for Denmark to achieve the overall political goal of a substantial increase in mariculture under the current practice of locating mariculture near the coast. The obvious solution would therefore be to locate mariculture *further away from the coast*, in open sea areas with greater water flow and depth, and thus with less nutrient load on the marine environment. And indeed, the Danish aquaculture industry appears willing to accept the resultant burden of longer sea transport of fish and of acquiring the technology necessary for dealing with the harsher physical conditions in the open sea.[66]

Such location should be subject to maritime spatial planning – and the recently adopted EU Maritime Spatial Planning Directive and the related implementing legislation in Denmark provide a welcome and timely opportunity for introducing this important tool. Danish marine areas are among the most intensively utilized in the world, and the competition for marine space also includes off-coast open sea areas of the type where mariculture would be best located. Competing uses include fishery, shipping, wind power, and oil and gas extraction. A spatial planning system can facilitate designation of the best suited mariculture locations both in terms of not interfering with other uses of the sea and of impacting the marine ecosystem as little as possible. As mentioned above, the process of designating areas for aquaculture is already underway.

[65] H. Schoukens, 2015. Atmospheric Nitrogen Deposition and the Habitats Directive: Tinkering with the Law in the Face of the Precautionary Principle? *Nordic Environmental Journal*, 2015:2.

[66] Interview with representatives of the aquaculture industry, 30 October 2015.