ECOREGION	North Sea
SUBJECT	Proposed fisheries measures for the Dogger Bank Special Area of Conservation

Advice summary[1]

ICES considers that the diversity, and ambition, of the national conservation objectives makes development of a single management approach complicated and difficult. Reaching the stated conservation objectives is complicated in that there may be changes, both anthropogenic and natural, already imposed on the area that are irreversible. The response of the five different benthic communities to changes in fishing pressures will differ. Achieving the conservation objectives for some of the very long-lived species will, if possible, take decades. Recovery of benthic species will depend on the availability of source populations, some of which may only occur outside the closed areas. Recruitment in the entire North Sea will be affected by influences such as changes in fish community composition and climate change effects. The establishment of a monitoring programme and selection of indicators will require further work to ensure that the selected indicators are responsive to changes in pressures from mobile bottom-contacting fishing gears and that they can measure trajectories towards the stated conservation objectives. It will be necessary to establish the spatial and temporal variance and patchiness of the characteristics being measured by the indicators. ICES advises that this work be carried out in a coordinated manner across the entire Dogger Bank, drawing on, and having reference to, developments in monitoring under the Marine Strategy Framework Directive. A comparison of incremental improvement after a full six-year monitoring and assessment period could improve understanding of the implication of scale and provide better scientific guidance for the appropriate location and size of areas needed to achieve the conservation objectives.

ICES considers that the effect of seine fishing gear on the Dogger Bank sandbank habitat may not significantly impede the achievement of the conservation objectives. It is unlikely that, under the current proposal, displacement will be a significant problem but there may be increased fishing efforts along the open/closed boundaries. A mechanism to allow experimental trials with low impact gear in part of the closed area, verifying results that indicate no likely impacts on the conservation objectives, should be established. Short-term access to the closed areas at specific times may be possible without compromising the conservation objectives, but should first be thoroughly evaluated.

Request

Germany, the Netherlands, and the UK have sent the following request to ICES.

ICES is requested to advise on the degree to which the implementation of the proposed fisheries measures[2] in the Presentation Paper will contribute to the achievement of the established conservation objectives, taking into account the wish of the Dogger Bank states to consider the Dogger Bank as one ecosystem.

The three Member States have taken note of the ICES advice from 2008 on protection of the German Natura 2000 site on the Dogger Bank (EMPAS Advice). As the advice requested in this procedure affects the German sector, ICES is asked to provide a rationale for any deviation from the 2008 advice.

In preparing its response ICES is required to advise on the changes that can be attributed solely or primarily to the implementation of the proposed fisheries measures. Specifically, if the proposed fisheries measures described in the three proposals (closed areas to certain gear types) are implemented, ICES should describe:

  i)   The likely progress over a six year period towards achieving the conservation objectives that will occur as a result of implementation of the proposed measures in the closed areas and in the habitat type 1110 in the Dogger Bank SAC;

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[1] This ICES advice is in response to specific questions on fisheries measures proposed by relevant authorities of Member States. Unless specifically stated, it is not an opinion from ICES on the designation of Natura 2000 sites or the Conservation Objectives set by the Member States for those sites. ICES facilitated input and advice in the Dogger Bank process by identifying an expert who advised the process. This expert was not involved in any of the ICES review, drafting or advice approving processes. An ACOM Vice-Chair was assigned the task of following and observing the process. Expert reviewers and advice drafters were selected from independent countries as per ACOM procedures. The ICES advice drafting process was managed by the ACOM Vice-Chair; the scientific advice is the work of the independent reviewers and advice drafters.

2 The proposal from Germany, the Netherlands, and the UK is shown in Annex 1.

ii)   *The likely long term progress towards achieving the conservation objectives that will occur beyond the six year period as a result of implementation of the proposed measures in these areas;*

iii)   *How progress towards achieving the conservation objectives could be measured and when such changes can be expected to be measurable;*

iv)   *The key aspects that should be contained in an appropriate, cost effective, joint monitoring programme to measure progress towards achieving the conservation objectives;*

v)   *The likely impacts of seines including fly-shooting on attaining the conservation objectives for the Dogger Bank habitat type 1110 and an assessment of the likely additional benefits for the achievements of the conservation objectives from the prohibition of these gears in the managed /closed zones and – if available data are not sufficient for a concluding analysis – identification of missing data and how to obtain such data;*

vi)   *The effort displacement within the SAC attributable to the proposed measures and, the expected effects of such displacement on the achievement of the conservation objectives for habitat type 1110 in the SAC area, together with any possible measures to mitigate any effects. When considering effort displacement other relevant factors causing changes in fishing patterns in the Dogger Bank (e.g. TAC/quotas, fuel cost, other spatial claims etc.) should be taken into account;*

vii) *Any shortcomings in the proposed measures and how these might be overcome;*

viii) *Summarise under points i) to iii) in a comparative analysis the difference to the improvements to the conservation status between the implementation of the proposed measures of the DBSG, the NGO and the fishing sector proposals. The two latter proposals are described in the NSRAC Position Paper of April 2012. In this comparative analysis ICES should comment on the relationship between the size and location of the closed areas and the progress towards achieving the conservation objectives;*

ix)   *Any other information on fishing impacts ICES considers relevant to the achievement of conservation objectives in the SAC area for habitat type 1110.*

ICES advice

Dogger Bank conservation objectives

In the documentation submitted to ICES with the request it is stated that

> *The purpose of fisheries measures is to reduce the pressure on the benthic habitat from bottom contacting fishing gear with a view to contributing to the achievement of the conservation objectives. The conservation status is currently assessed as unfavourable.*

In order to put the request and ICES response into context, additional information on the conservation objectives is available in Annex 2.

ICES considers that the diversity of the national conservation objectives makes development of a single management approach complicated and difficult. The different objectives (improve/restore/recover) have different outcomes and all depend on agreement on what constitutes a favourable status for habitat type 1110 with respect to stated indicators that are yet to be defined (as noted by the UK). The "improve" objective further requires knowledge of the recovery trajectories of selected indicators, which will not be linear, so that status can be evaluated along the path towards the objective state. This assumes that full recovery is possible even if some of the changes (due to both anthropogenic and natural factors) already imposed on the area may be irreversible.

More specific restoration objectives commonly agreed to by UK, Germany, and the Netherlands are listed as:

1)   For abiotic and biotic factors in the area to achieve a state which enables benthic communities to reach and maintain a good state of preservation.

2)   Benthic communities should be shaped by characteristic, in particular long-lived, species. Of these species individuals should be present of all typically occurring species and in natural proportions of size and age.

3)   Characteristic fish species should be present in characteristic population structures and of all typical species in natural proportions of size and age.

ICES notes that these conservation and restoration objectives are very demanding. However, if their achievement is couched in terms of natural recovery following removal of fishing pressure then any change in status could be considered as achieving some degree of restoration. ICES also cautions that if the indicators that were used to assess the original determination of unfavourable status were not based on the restoration objectives noted above, then it will be important to re-evaluate current status against an agreed set of indicators so that change can be effectively tracked.

Response to *Question i) The likely progress over a six year period...*

Given the caveats noted above for framing change in status within an envelope of baseline and target conditions, in responding to this question ICES has asssumed that recovery is possible and that any changes that have occured are not irreversible. Further, ICES can only respond to this question in abstract terms given that full information on the size/age composition for most of the "typical" species (excepting lesser sandeel and plaice) is unknown.

ICES considers it likely that changes in status of the typical species in the five different benthic communities will differ due to differences in species composition, population dynamics, depth, and sensitivity to fishing impacts.

Within the list of typical species for the area, lifespans range from several years or less (e.g., *Spisula subtruncata*, *Acrocnida brachiata*, *Lanice conchilega*) to centuries (*Arctic islandica*) , although there are few species with very long lifespans. Given that the current population structure of the longest-lived species, *Arctic islandica*, appears to be altered from baseline conditions with fewer large animals found on the bank than formerly, and that restoration objective 2 noted above requires this species to be present in natural proportions of sizes and ages, it is clear that the conservation objectives will not be met in a six-year time frame.

Selecting and closing areas of the Dogger Bank particularly appropriate for supporting some now uncommon or rare benthic species will result in more progress being made in six years towards restoration of healthy populations of species characteristic of the Dogger Bank. The more areas included, the more progress made, although the relationship between the amount of area closed to fishing and the six-year progress towards restoring populations of all characteristic species is not simple and linear.

For species with lifespans of less than six years, recovery is possible provided that recruitment occurs within the area. Many short-lived species are subject to fluctuations in recruitment due to environmental conditions and detecting change in their abundance will require an appropriately designed monitoring programme. This also applies to the biogenic reefs formed by aggregations of *Lanice conchilega* tubes which appear to have good recovery potential over this time frame.

ICES notes that pelagic larval duration is an important consideration, and that the source/sink dynamics for most of the typical species are unknown; consequently source populations may occur in areas outside of the proposed closed area. For some fish populations whose effective breeding populations extend well beyond the Dogger Bank no measures applied solely on the Dogger Bank will allow recovery of the historical age and size compositions of these populations, as long as fishing, even at sustainable levels, is allowed outside the Dogger Bank. In such cases, if the source populations are impacted by ongoing fishing then no or slow rates of change may occur in the proposed closed area. Furthermore, if displaced effort increases the impact on those source populations outside the closed area, then recruitment to the closed area could be further retarded.

Response to *Question ii) The likely long term progress...*

All of the issues raised in the response to the previous question have relevance here, given the lifespan and recruitment dynamics of the typical species. The connectivity of populations on the Dogger Bank has implications for direct colonization and recovery of impacted areas. Additionally, over longer time periods (>6 years), changes in fish community composition occurring at large spatial scales throughout the North Sea could influence progress towards achieving the stated conservation objectives in the Dogger Bank. This is because many fish species prey on benthic species at some point in their life cycle and changes to the predation pressure may influence recovery trajectories of the benthos. Environmental changes such as those resulting from climate are also expected to be expressed over these longer time periods and will affect conservation objectives in unknown ways (new species moving in, changes in water chemistry and pelagic production, etc.). Environmental change will influence rates of changes as well as changes in state. In relatively high-energy environments, characteristic species and communities are all adapted to some frequency of natural disturbance. Hence, for time periods longer than six years there will continue to be an increase in the number of species that re-establish self-sustaining populations, but there will be diminishing gains over longer time periods. However, that is not cause to suspend restrictive management after six years. In general, the fisheries management measures suggested will reduce the pressure on the benthic habitats from bottom-contacting fishing gears, although the scale of this effect and consequences to the status of the habitats are not possible to predict.

Response to *Question iii) How progress could be measured and changes can be expected to be measurable*

As noted above, it is imperative that an operational framework be built around the stated conservation objectives. This will entail establishment of appropriate indicators which will allow for target setting and evaluation followed by an appropriate monitoring programme (see below). Ongoing work by ICES has outlined a prioritized list of eighteen criteria that should be considered when selecting indicators (ICES, 2012a). Evaluation of indicators against these criteria considers *inter alia* the quality of the available data, responsiveness of the indicator to the pressure of interest,

and links to conceptual and/or theoretical underpinnings. Not all of these criteria are expected to be met by any one indicator and not all may be relevant to the present application. Table 6.3.3.9.1 provides an overview of a preliminary list of generic criteria for indicators along with an evaluation of their priority for any monitoring programme. Indicator redundancy, i.e. groups of metrics or indicators that co-vary significantly, providing duplicate copies of a single signal rather than reflecting different independent signals, should be avoided.

Table 6.3.3.9.1   Preliminary list of priority for criteria by which to assess the suitability of indicators (ICES, 2012a).

Number	Criterion/Characteristic	Priority
1	Methodological approach to defining the target should be consolidated	Essential
2	Existing reference conditions	Essential
3	Relevant spatial domain	Desirable
4	Environmental fluctuations and climate	Desirable
5	Related to change in specific pressures	Essential
6	Uncertainty	Desirable
7	Relevant to management objectives	Essential
8	Relevant to management measures	Essential
9	Comprehensible	Desirable
10	Established target	Desirable
11	Pragmatic	Desirable
12	Theoretically sound	Essential
13	Early warning	?
14	Target suites	Desirable
15	Compatibility	Desirable
16	State, impact, pressure, and operational targets	Essential
17	Relevance to MSFD ecosystem components	Essential
18	Cross-application	?

ICES anticipates that different indicators will be required for each or some of the five different benthic communities identified for the Dogger Bank due to differences in species composition and response to changes in pressure. Further, more than one indicator will be required for each area, given the three conservation targets. Consideration of the relative importance of the indicators in each area when assessing overall status may be required and will relate back to relative importance of the conservation objectives.

Response to *Question iv) An appropriate, cost effective, joint monitoring programme...*

It is a priority to establish a comprehensive baseline study and this should be informed by previous work on the Dogger Bank. This is a prerequisite to designing a monitoring programme to measure progress or otherwise towards the conservation objectives. Suitable control areas, outside of the closed area where normal fishing operations are conducted, should be selected for each of the five benthic communities. The spatial and temporal variance and patchiness of the species or ecological elements to be monitored needs to be understood and addressed in the design of a monitoring programme. Standard power curve analyses can be used to determine the precision needed to detect a difference of a given size (say a 25% increase in abundance of a population) with a specified (usually high) probability. To determine the sampling effort needed to achieve the necessary level of precision, it is then necessary to know how variance in the population estimate increases with sampling effort. For the overall objectives of improved environmental status for the communities on the sand banks, improvements in the more common species will contribute most to healthy functioning of ecosystem processes. Such improvements are usually best measured with a representative, spatially stratified random survey design. However, for objectives related to specifically improving the status of rarer species, particularly ones with specialized ecological requirements, targeted sampling will be more efficient. For rarer species, having accurate estimates of likelihood of encounter and total range of occurrence are properties that are possible to quantify with sufficient precision to allow evaluation of trends over time.

ICES highly recommends that a common and coordinated monitoring programme for the entire Dogger Bank should be established and used by each country. Use of established protocols for related subjects (e.g. wind farm EIA (environmental impact assessment), or oil-spill monitoring) should be considered. Standards such as EN 16260:2012 (CEN, 2012) on visual seabed surveys and ISO 16665:2005 (ISO, 2005) on sampling marine soft-bottom macrofauna could inform this process.

The monitoring requirements of the Marine Strategy Framework Directive and developments within OSPAR will also provide an opportunity for coordination. Currently, the ridged structure and focus on fish stock assessment of Data Collection Framework (DCF) surveys means that they could provide only limited data and information for the likely

monitoring requirements on the Dogger Bank. With minimal adjustments, DCF surveys could provide useful data on commercial species such as plaice, sandeel, and possibly other elements. Current developments aiming at closer cooperation between the DCF and environmental monitoring will bring efficiencies in the coming years.

It will be appropriate to target monitoring effort in areas that are judged to be controversial and/or sensitive, for example, areas where moderate to high fishing effort has occurred prior to the closure, across the interface between open and closed areas and the transition between the different benthic communities. Cooperation with the fishing industry could bring efficiencies and provide cost-effective access to the sites.

A variety of sampling and data collection methods are available, such as high-frequency eccograms combined with sidescan sonar, underwater video, bait-camera systems, grab sampling and dredge sampling, and it is likely that a combination of these and other methods will be required.

Response to *Question v) The likely impacts of seines including fly-shooting and the likely additional benefits from the prohibition of these gears...*

Seine gear is moved while in contact with the bottom and can theoretically impact the biota and disturb the seabed. Little is known on the impacts of the various types of seine fishing gear on the benthic communities. Impacts will depend on the target species and associated substrate type, but effects on plain sand bottom are likely to be low. Given the lack of information on the impact of seining in its different forms a risk analysis such as Ecological Risk Assessment for the Effects of Fishing (ERAEF) (WGECO; ICES, 2012a) is a useful first step. This would provide an extended gear matrix to supplement the one carried out by FIMPAS. For example, comparisons with beam trawls in a relative framework, taking into account the efficiency of the fishery, the swept area, and the costs associated with gear change could be evaluated. Such a study could provide a semi-quantitative approach to evaluating the pressures on the benthic communities of different types of seine gear such as fly-shooters (Scottish seiners) and anchor seiners. However, based on current knowledge ICES considers that the effect of seine fishing gear on the Dogger Bank sandbank habitat may not significantly impede the achievement of the conservation objectives.

Response to *Question vi) The effort displacement within the SAC...*

The data appears to be available to quantify effort displacement magnitudes and costs, not only for areas within the Dogger Bank but anywhere in the southern North Sea, and ICES advises that these quantifications be undertaken.

The sandeel fishery is a specific localized activity primarily at the edges of the Dogger Bank. Closures are not proposed for the most important sandeel fishing areas. The proposal to close areas in the central part of the Dogger Bank will affect the less important sandeel fisheries thus having only a minor displacement effect on the sandeel fishing effort.

There is an important beam trawl fishery for flatfishes on the Dogger Bank. The proposed closure of areas where this beam trawl fisheries occurs will result in some displacement of this fishing effort.

In the current DBSG proposal there is no restriction on the use of seine fishing gear. The shallower areas proposed for closure to beam and otter trawling are important seine fishing grounds. ICES advises that if these shallower areas were to be closed to seine fishing it will result in substantial displacement of this fishing effort while achieving minimal reduction of the pressure on these areas.

Response to *Question vii) Any shortcomings in the proposed measures*

In the documentation supplied to ICES with the request it is stated that the fisheries management proposal for the Dogger Bank SAC shall be designed so that overall, approximately the same proportion of each benthic communities' area is protected. Given that the areas of the different communities vary widely, closing equal proportions of these areas assumes that ecological processes are scale independent. There does not seem to be scientific evidence in the supporting material for this assumption. Some minimum size may be essential for each type of benthic community, but it may not be the same for each. Furthermore, the proposal does not seem to have been developed with a focus on adaptive management relevant to both meeting conservation objectives and climate change. A comparison of incremental improvement after a full six-year monitoring and assessment could improve understanding of the implication of scale and provide better scientific guidance for the appropriate location and size of the areas needed to achieve conservation objectives.

Response to *Question viii) Summarise the difference to the improvements to the conservation status between the DBSG, the NGO and the fishing sector proposals...*

It is not possible to predict how, or over what time period, the Dogger Bank will respond to reduced pressures from fisheries or for that matter respond to wider environmental pressures such as climate change or acidification. In terms of

size of the areas to be closed, there is no "best percent". The nature of the ecosystems, the nature of the potential threats, and the nature of the management outside the protected areas combine to make the optimum area to protect a case-specific consideration. From an ecological perspective there is no need to protect all of any benthic community type or sedentary species range; as long as the areas that are protected are large enough to sustain viable populations, the current proposal seems to achieve that. As mentioned above there are some mobile fish populations whose effective breeding populations extend well beyond the Dogger Bank and no measures applied solely to the Dogger Bank will allow recovery to the historical age and size compositions of these populations, as long as fishing, even at sustainable levels, is allowed outside the Dogger Bank. Based on information provided with the request, the areas proposed by the industry may not be sufficient and the areas proposed by the NGOs may be excessive. The current proposal for fisheries measures, if implemented, will provide an opportunity to monitor and assess the response of the ecosystem to the reduced pressure from bottom-contacting fishing gear. This information is needed before it will be possible to carry out a scientific comparative analysis.

Response to *Question ix) Any other information on fishing impacts...*

Fisheries management measures will directly affect at least two different trophic levels; however, food chain effects are not evaluated with regard to achieving favourable conservation status. For mobile species (most fishes) closures will only have effects proportional to the population distribution. For more sessile species (sandeels to some degree and many invertebrates to a high degree) populations may be able to build up biomasses that may have spill-over effects which could have positive influences on commercial species yield outside the closed areas. This could result in increased fishing efforts along the open/closed boundaries and could have an adverse effect on local recruitment. Increased biomass may also attract commercial fish which prey on benthic communities and thereby reduce availability to the fishery in the open area.

Developments in low impact gear should continue and when proven not to have adverse affects on the benthic communities of the closed areas their use in these areas should be permitted. This may require experimental trials within a closed area but should only be permitted at the very late stages of a research programme and only to verify results indicating no likely impacts on the conservation objectives. ICES advises that a decision-making process should be established to consider such access.

In addition, economic mitigation measures within the closed areas that consider the spatial and temporal distribution of fishing should be considered. There may be times when, due to seasonal or tidal influences, gear/species interaction is reduced to an extent that the use of banned gear would not compromise the attainment of the conservation objectives. In these situations, the short-term pulse disturbances of such access could be tolerated. This should be evaluated and, if considered viable, a mechanism established for permitting such short-term access.

Sources

CEN. 2012. Water quality – Visual seabed surveys using remotely operated and/or towed observation gear for collection of environmental data. BS EN 16260:2012.

ICES. 2009. Report of the EMPAS project (Environmentally Sound Fisheries Management in Protected Areas), 2006–2008, an ICES–BfN project. 123 pp.

ICES. 2012a. Report of the Working Group on the Ecosystem Effects of Fishing Activities (WGECO), 11–18 April 2012; Copenhagen, Denmark. ICES CM 2012/ACOM:26. 192 pp.

ICES. 2012b. Material provided to ICES for advice on proposed fisheries measures for the Dogger Bank Special Area of Conservation. Dogger Bank Steering Group, September 2012. ICES CM 2012/ACOM:77.

ISO. 2005. Water quality – Guidelines for quantitative sampling and sample processing of marine soft-bottom macrofauna. ISO 16665:2005.

Annex 1 Extract from the document '*20120904 Dogger Bank Presentation paper final*', submitted to ICES with the request**.**

Gears with bottom-contact and which are expected to have a significant effect on the habitats are banned in the closed zone. This includes beam trawls and otter board trawls and dredges. However, other bottom contacting gears are used in the Dogger Bank site which may present a risk to the achievement of the conservation objectives, i.e. seines including flyshooting as indicated by the ICES 2008 EMPAS advice. There was no consensus whether the prohibition of other bottom contacting gears, in particular seines including flyshooting, should apply to the proposed closed areas. In so far as seines including flyshooting are concerned, the DBSG considered that there was insufficient information on the adverse effects of these gears on the conservation status of the whole of the SAC. However, the DBSG recognised that the management of "all mobile bottom contacting gear" had been proposed as a part of the EMPAS advice (advice relating to the conservation of the German sector), when this was assessed in isolation in 2008. Therefore DBSG has asked ICES to advise on the potential impacts of these gears on the habitat and on additional beneficial effects that may accrue if these gears were prohibited from the overall proposed closed area;
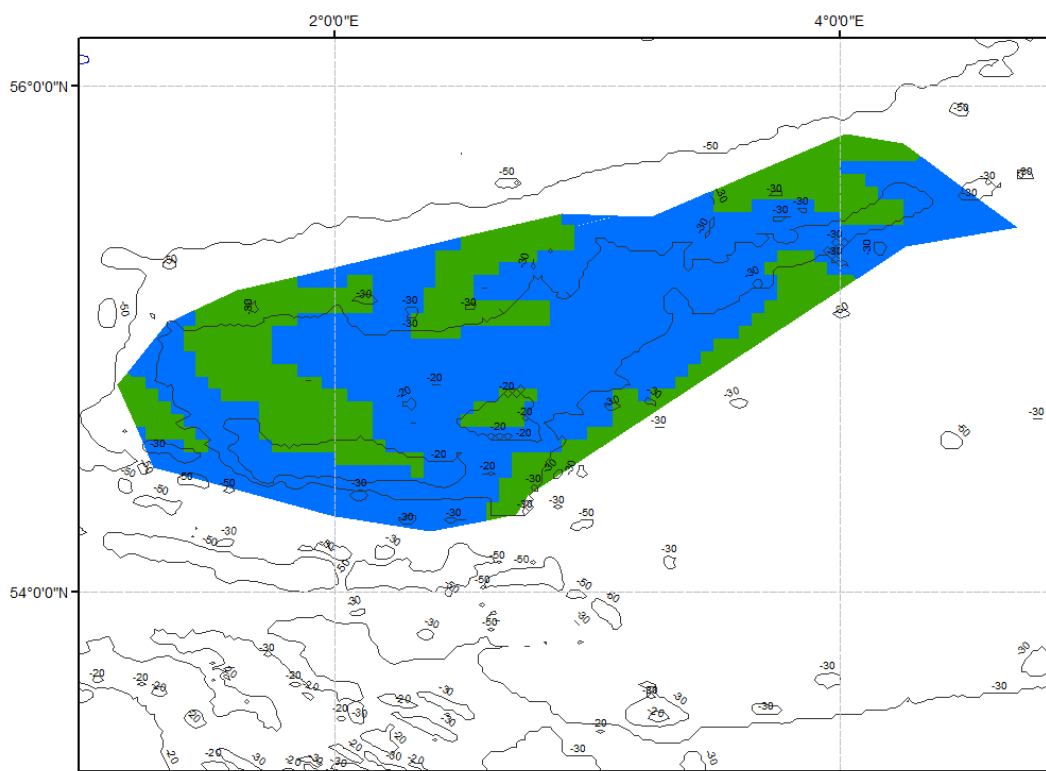

Figure 6.3.3.9.1 Proposal for closed areas including depth contours. Green: areas closed to beam and otter board trawls and dredges.

Annex 2   Extract from document '*20120904 Conservation objectives final*', submitted to ICES with the request.

- *The conservation status is currently assessed as unfavourable, due mainly to the quality of the habitat and considerations of disturbances of the biological community which result from impacts to sediments;*
- *This assessment mentions significant habitat disturbance as a result of (bottom-contacting) fishing, and that fishing has distorted the species composition – towards smaller and short-lived species;*
- *Therefore the Member States want to decrease human pressure from the habitat as a result of bottom-contacting fishing gear, with the aim to: improve the quality of the habitat (NL); restore the habitat to favourable condition (UK); conservation and restoration of a favourable conservation status of the habitattype (1110) including its characteristic and threatened communities and species (GER);*
- *In doing so, they want to establish a more natural situation in which*
    - *physical structure (the shape, form and composition of the habitat and its substrata),*
    - *diversity (the number of different biological communities or number of species within a given community),*
    - *community structure (e.g. age classes, sex ratios, distribution of species, abundance, biomass, reproductive capacity, recruitment, range and mobility), and*
    - *typical species are improved/are restored/are recovered;*