



DEEPFISHMAN

Management and Monitoring of Deep-sea Fisheries and Stocks

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1 Protocol for deep-sea fisheries management framework

Introduction

The management protocol described below is based upon the conclusions and recommendations reported in project deliverable D7.4, namely “Guidelines towards a prototype management and monitoring framework for deep-water fisheries/stocks in the NE Atlantic”.

Present day fisheries management has to take into account many issues, much more than simply evaluating the effects of fishing on the status of target stocks. Indeed, fisheries management has to take into account ecosystem considerations which encompass a full range of ecological, social and economic issues, along with an evaluation of trade-offs between different sectoral interests increasingly competing for the same spatial/temporal resources. Whilst, it is widely recognised that Ecosystem Approach to Fisheries Management (EAFM) has to be fully demonstrated at a practical level, there are nevertheless some important emerging aspects of EAFM which have a bearing on priority setting for fisheries management actions.

These aspects can broadly be divided into 3 categories; namely:

- i. the effects of the environment on the status of fish stocks, which includes aspects related to the assessment of ecological carrying capacity, productivity and the transfer of energy and nutrients in fishery targeted food-webs,
- ii. the effects of fisheries on the status of fish stocks, which includes the development and application of appropriate stock assessment methods, the development of appropriate harvest control rules with associated biological reference limits and targets, the development of multi-species production models to ensure that the combined yield of stocks does not exceed the capacity of the ecosystem, and finally
- iii. the effects of fisheries on the ecosystem, which includes the impacts of fishing on habitats and species, which in the case of the deep sea ecosystem is largely focussed on assessing Significant Adverse Impacts (SAI's) on deep sea benthic Vulnerable Marine Ecosystems (VME's).

These categories can best be visualised in relation to the development of the ecosystem approach to fisheries management as shown in Figure 1. It also highlights that potential priority or importance from a policy perspective, e.g. Issues related to impacts on fisheries on the ecosystem, specifically SAI's on VME's has as much importance as the assessment of fisheries impacts on stocks, whereas the effects of the environment on stocks has low priority. This is reflected in the proposed revision to the deep sea access regime (EC Proposal 2012/0179) which states as its primary objectives the need:

- a) to ensure the sustainable exploitation of deep-sea species while minimising the impact of deep-sea fishing activities on the marine environment;
- b) to improve the scientific knowledge on deep-sea species and their habitats for the purposes referred to in point a);
- c) to implement technical measures on fisheries management recommended by the North East Atlantic Fisheries Commission (NEAFC)

EAF in relation to deep-sea fisheries assessment & management

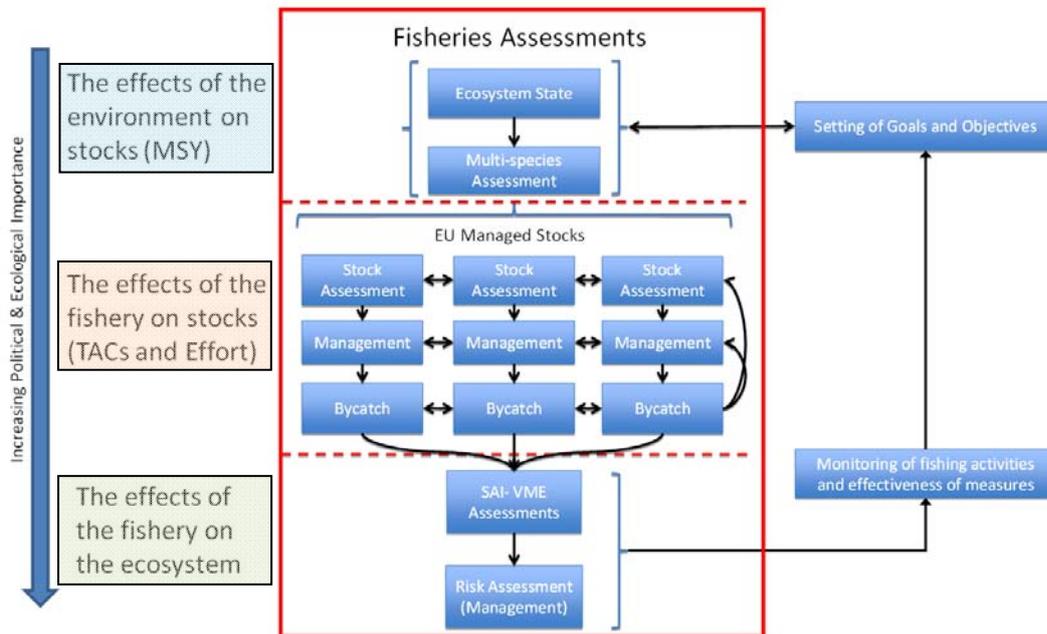


Figure 1. The essential elements for the practical implementation of an ecosystem approach to fisheries management with a special emphasis on deep-sea fisheries (redrawn from NAFO, 2012¹).

Whilst it is useful to understand how the policy advice relate to the EAFM (as outlined in Figure 1), there is also a need to categorise actions which should be implemented over the short term (e.g. within the next 2 years) and those which should be implemented over the longer-term (e.g. within the next 5 years). The policy advice derived from DEEPFISHMAN studies is therefore structured around the short-term and long-term needs and then further categorised in terms of their contribution to the EAFM (effects of the environment of stocks, effects of the fishery on stocks, effects of the fishery on the ecosystem).

¹ NAFO 2012. Report of the 4th Meeting of the NAFO Scientific Council Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM). Serial No. N6006, NAFO SCS Doc. 11/ 22, 126 pp.

Short-term considerations (within 2 years)

Effects of the environment on stocks

Conclusions of DEEPFISHMAN

- *The lack of an agreed definition of 'deep water' has contributed to a lack of a common definition of deep-water species across the various management bodies that manage deep-water fisheries and ecosystems around the world. This has resulted in advisory and management bodies having difficulty in defining deep-water species for management and monitoring purposes.*
- *Current licensing specifically applies to the 24 species listed in Annex I of the council regulation 2347/2002. Reporting of catch and effort information is also required for the further 22 species listed in Annex II of the same regulation (noting that these can be landed by non-licensed vessels). Many of the species listed in Annex II are bycatch, however several commercially important deep-water species are included. All species listed should be subject to the monitoring of catches (as well as landings) and biological sampling. A few species of the current annex II are not deep-water and the deep-sea fishing permit should not be required to exploit them (see below).*

Recommendations

- *In the NE Atlantic deep water be defined as waters where the depth is >200 m; this is consistent with the FAO definition applied globally in all of the world's oceans.*
- *In the NE Atlantic deep-water species be defined as those which spend a significant part of their life-cycle at depths >200 m. More practically, this can be defined by >50% of adult biomass located at depths >200 m, or by >50% of expected lifetime spent at depths >200 m. Information on the depth distribution of species biomass should, where possible, be sourced from available fisheries-independent survey data and, in the absence of these, time series abundance and landings data from commercial vessels and available information on the maximum and minimum depth range of species distribution. In areas of narrow shelf, this rule may need some adjustment.*
- *Where ICES rectangles straddle the 200 m depth contour, commercial CPUE, LPUE and catch data should be allocated as 'deep' where more than 50% of the area of the rectangle has a depth >200 m. More accurate effort allocation is easily feasible from Vessel Monitoring by Satellite (VMS). Effort estimation and match of landings and VMS data should be done wherever possible.*
- *For EU deep-sea licensing purposes the species listed in Annex I and II be combined, that conger eel and Norway redfish be deleted and Greenland halibut, tusk and beaked redfish be included. The list derived from annex I and II combined is in good agreement with the 200 m criterium as described above. Some further considerations may be needed. The reasons for *Lycodes esmarkii* to be included in annex II is unknown. There is no significant fishery for this species, which is only a small bycatch, usually discarded. The inclusion of bycatch species in the list of species to use for licensing purposes may be problematic. This may also apply to alepocephalids, which are discarded by most fisheries although some landings have been reported.*
- *Tusk and Greenland halibut continue to be included in species treated as deep-sea by NEAFC, that beaked redfish is added, and that ling, conger eel and Norway redfish be removed.*

Effects of the fishery on stocks

Conclusions of Deepfishman

- *From an economic point of view, the main objective of management policy should be to induce harvesters to change their level of effort to that corresponding to MEY, but given the commitment by the EU to harvest all fish stocks at fishing levels corresponding to MSY by 2015 (EC, 2006), this must be a primary aim of any proposed new management framework.*
- *Fishing licences, even when their issue is very restrictive, may not be sufficient to remedy the common property problem and the economic consequences of the race to fish.*
- *Sole ownership arrangements cannot be regarded as very practical, as this approach would meet stiff resistance from excluded potential owners.*
- *Territorial use rights (TURFs) have been found to be very effective when applied to species that do not move much such as certain types of shellfish.*
- *Individual transferable harvest quotas (ITQs) can be effective instruments for efficient fisheries management.*
- *The use of community fishing rights (CFRs) for macro-management of deep-water stocks and fisheries in the NE Atlantic is unlikely to be appropriate given the spatial extent of most stocks, therefore any allocated CFRs may have to be embedded in a broader-based management system.*
- *It is appropriate that species of the updated list (Annex I) be managed by EU TAC. However, not all these species are landed commercially and some are landed sporadically in quantities too small to make it feasible to set TACs.*
- *Some adjustment of management areas based upon DEEPFISHMAN reviews of stock identity is necessary (see annex II for details)*
- *Because of the difficulties in assessing quantitatively elasmobranch populations it is unlikely that some population dynamic modelling can be achieved in the absence of (i) fisheries landing data (that usually helps raising population models to the absolute population size), and (ii) age composition. Monitoring and management are required to assess whether sharks populations recover under the current fishing pressure, and to take management actions if not*
- *In relation to deep-water species, the metier approach and the new concurrent sampling scheme is a large improvement over the previous data collection regulation (DCR).*
- *Because deep-water fisheries are typically smaller than shelf fisheries, higher levels of sampling may be required, in particular, the proportion of fishing trips and fishing operations to make onboard observations needs to be higher.*
- *Stock assessments have been produced and improved in recent years with considerable input from DEEPFISHMAN*
- *The problem that some member states (MS) are not required to sample their small catches of deep-water species may not be of major importance, as in most cases there are 1 or 2 MS or other countries catching the bulk of the landings*
- *There is currently no internationally coordinated fishery-independent monitoring programme that follows stock trends and assesses potential recovery of depleted stocks*
- *Nationally funded surveys are carried out by Norway, Faeroes Islands, Iceland, Ireland, Scotland, Portugal and Spain. Target species are Greenland halibut and deep-water beaked redfish in the Faeroe Islands, Norway and Iceland, although data for other species are also collected. The main commercial targets of the Scottish and Irish surveys are roundnose grenadier and black*

scabbardfish, these surveys also provide indicators for deep-water sharks and the wider community.

- *The implementation of the ICES WGNEACS proposals for deep-water survey has the potential to produce stock indicators for several deep-water stocks. It is depending on DCF funding. These proposals include i) a fishery independent trawl survey in the Central European slope area and associated banks and seamounts stretching from the Faroese Plateau (ICES Division Vb) to the Goban Spur (ICES Subarea VII) and ii) A coordinated international longline survey covering ICES Subarea VIII and Division IXa. Existing survey programmes operating in these areas (mainly Scotland and Ireland) do not cover deep-water stocks and main fisheries distributions sufficiently.*
- *Where only age-aggregated catch data is available, Bayesian surplus production has been shown to be the most reliable of the methods tested and is flexible enough to be able to cope with sporadic missing years of data well. It is less robust to changes in CPUE variability than to missing data. As with all the assessment methods tested, it cannot reliably be used with as few as five years of CPUE*
- *Stock assessment advice has greatly improved for a number of data-poor deep-water stocks in recent years, with the result that many of the stocks following the setting of precautionary TACs are showing signs of recovery.*

Recommendations

- *EU vessels fishing for deep-water species (Annex 1) in EU waters and in international waters of the NEAFC RA continue to be managed by TACs and effort/licensing.*
- *TACs be evaluated using management strategy evaluation (MSE) where, possible. MSE developments made in DEEPFISHMAN provide a number of options for analytical (FLBEIA) spatially explicit (ISIS-Fish) and qualitative MSE*
- *Vessels of all nationalities fishing for deep-water species in international waters of the NEAFC RA should continue to be managed by TACs and effort control*
- *EU TACs for orange roughy be reviewed every five years.*
- *EU TACs for deep-water sharks be reviewed every five years.*
- *EU TACs for roundnose grenadier and beaked redfish be reviewed on a triennial basis.*
- *For all other existing and proposed deep-water species, DEEPFISHMAN recommends that EU TACs be reviewed biennially, except where long-term management plans are in place.*
- *If the range of deep-water species managed by TAC in the NEAFC RA is expanded, consideration should be given to reviewing these TACs with the same frequency as recommended above for EU TACs.*

Effects of the fishery on the ecosystem

Conclusions of Deepfishman

- *The FAO guidelines do not make strong prescriptions about how deep-water fishing effort should be defined, collected and managed. They clearly state, however, that effort should be properly monitored, which suggest the view that accurate effort data are essential to stock, fisheries and ecosystem assessment. The guidelines do make effort management mandatory, and they point out that spatial management of effort is an effective tool for VME protection.*
- *A relatively small proportion of the total fishable area is actually fished in the deep sea. Typically only 20% of fishable area at depths between 200 and 800m is actively fished whereas at depths >800m this figure is substantially reduced to 1%. By comparison results for shelf areas <200m in depth show that typically 40% of the fishable area is actively fished.*
- *Fishing effort at depths >800m has been in significant decline since 2006.*
- *Mobile PET species to consider for deep-sea fisheries are primarily deep-water sharks. There is no known significant impact of deep-sea fisheries in the North-East Atlantic to marine mammals, seabirds and marine turtles.*
- *Fixed species are to be addressed primarily in terms of VMEs and spatial management*
- *Total discards and sharks discards did not show strong spatial patterns that could be used for management purposes. However, the rate of discards (proportion of the total catch that is discarded) varied according to the target species. There may be more opportunity to manage the amount discarded by managing how species are targeted and which depth is fished than by using a spatial approach*
- *Not all types of MPAs have the same status in terms of protecting a habitat or biodiversity from human impacts (including fishing), with the result that biodiversity hotspots can be subject to multiple designations to ensure added levels of protection. Habitat and species MPAs are identified by evaluating candidate areas against a set of criteria including uniqueness, aggregation, fitness consequences, and naturalness. For fishery MPAs, there are three main types of closure: 'closed areas', 'no-take zones' and 'real-time closures'.*
- *VMS data enables vessel monitoring to be precisely undertaken, making it possible to effectively manage spatially the fishing footprint. Work on VMS data for mixed demersal fishing fleets has shown the spatial coherence of many fishing fleet activities*
- *The remoteness and scale of deep-sea fisheries make them difficult to monitor cost-effectively. Therefore, a change in the spatial management approach is required, away from an approach which relies entirely on identifying the known presence of VME indicator species to one which relies more on a risk based approach and defining the fishing footprint.*
- *Under the DCF module of "evaluation of the effects of the fishing sector on the marine ecosystem" the indicator VMS indicator of "areas not impacted by mobile bottom gear (in the preceding year)" may not be appropriate. For example, given the slow recovery time of some deep-water ecosystems, such as cold water corals, to the impact of bottom fishing, the period of 1 year for the evaluation of areas not affected by fishing is likely to be too short.*

Recommendations

- *Monitoring and management of deep-water sharks is carried out using population indicators derived from surveys and on-board observations. The most appropriate option could be to monitor abundance of sharks and manage fisheries at scale corresponding to the area of distribution of the main deep-water fisheries.*
- *Deep-water fishing effort is estimated from VMS data as this allows an accurate tracking on fishing effort and SAI's by depth. Effort management may not be required if an effective catch management is in place. In EU waters in recent years, the management of landings through TACs and quotas has been effective and allowed effort was not all used. However, even if it is not a management tool, an accurate monitoring of effort is essential, as accurate effort data are essential to both stock and ecosystem assessment.*
- *That guidelines should be developed which set out agreed procedures and protocols for the analysis of VMS data for the assessment of fishing activity and effort to facilitate the assessment of Significant Adverse Impacts on VMEs. Such guidelines are expected to be produced by the CoralFISH project.*
- *Priority should be given to fully quantitative and high resolution (spatial and temporal) assessments of both seabed habitat features and fishing pressure (effort), and research should be allocated to increasing our knowledge to fulfil an analysis of the following key elements essential for undertaking an appropriate seabed spatial risk assessment:*
 - *Mapping of actual and predicted VME habitat and VME indicator species distributions and densities*
 - *Mapping of actual fishing effort distribution and intensity in order to define the fishing footprint. VMS data are readily available for the deep-water where mostly large vessels operate, so it is a matter of all flag countries to be obliged to provide data in order that maps of fishing intensity can be produced and the high intensity areas then spatially defined and frozen*
 - *Assessment of actual and predicted sensitivity/vulnerability of habitats and species to fishing pressure to determine risk*
 - *Assigning the calculated risk to a defined risk category*
 - *An evaluation of uncertainty in the risk*

Long-term considerations (within 5 years)

Effects of the fishery on stocks

Conclusions of Deepfishman

- *TAC and quota regulation would improve clarity and transparency but may require some harmonisation with ICES regarding the frequency of ICES advice*
- *Under an ITQ scheme distributed by Member States, the concessions would grant their owner an entitlement to a share of the national fishing opportunity for each year. Operators would be able to lease or trade their shares. This would give the fishing industry a long-term perspective, more flexibility and greater accountability, while at the same time reducing over-capacity. In making this recommendation the Consortium assumes that ITQs would be tradable between fishers in different Member States, subject to the principle of overall relative stability.*
- *At the spatial scale of current management units, TACs of orange roughy would not prevent sequential depletion of local aggregations. These local aggregations do not represent genetic populations, but their sequential depletion implies a risk to the overall population. A secure way to manage orange roughy fisheries would be to assess the biomass of every aggregation and allow a sustainable catch from it. There is no known appropriate method to assess reliably the biomass of the small aggregations that occur in the NE Atlantic. In the current technological context, the small aggregations of orange roughy that occur in the NE Atlantic cannot be managed sustainably.*
- *Concerning deep-water, the segmentation for the DCF transversal variables occurs at a higher desegregation level than the economic variables. The level of aggregation should correspond to the most disaggregated level required. With this level of desegregation, effort evaluation as well as landings value and weight can be specifically assessed for deep-water métiers.*

Recommendations

- *Consistent with proposed CFP reforms (EC COM, 2011), DEEPFISHMAN recommends the introduction of a system of transferable fishing rights (preferably ITQs) for EU vessels having deep-water licences.*
- *DEEPFISHMAN recommends developing multi-annual harvest plans for targeted deep-water stocks.*

Effects of the fishery on the ecosystem

Conclusions of Deepfishman

- *Due to the paucity of available assessment data, the status of deep-water sharks stocks is unknown. This is unlikely to improve quickly and the population status of most demersal elasmobranchs is poorly known. Deep-water sharks remain a subject of concern and reducing their bycatch should be considered. However, some fishing activities targeting deep-sea sharks have been halted as a consequence of the ban of deep-sea sharks landings. Bycatch in other fisheries are reduced owing to the reduced fishing effort since 2003.*
- *Because of the difficulties in assessing quantitatively elasmobranch populations it is unlikely that some population dynamic modelling can be achieved in the absence of (i) fisheries landing data (that usually helps raising population models to the absolute population size), and (ii) age composition.*

Recommendations

- *Therefore DEEPFISHMAN recommends that monitoring and management are required to assess whether sharks populations recover under the current fishing pressure, and to take management actions if not.*

2 Summary of Priority Actions

In view of the large number of recommendations set out above, it is useful to consider which actions are likely to have the greatest impact in terms of achieving the goal of a sustainable deep-sea fishery, that is one which strikes an optimal balance between achieving MEY with an acceptable impact (both politically and ecologically) on the ecosystem. The following plan may also provide some useful contribution to the revision of the deep-sea access regime (EC Proposal 2012/0179).

Given the accepted priority for management reform towards the protection of seabed VME, the sustainable harvesting of targeted stocks and reduction of PET bycatch species, the conclusions and recommendations which fall under the categories of: **i.** the impacts of fisheries on stocks, and; **ii.** the impacts of fisheries on ecosystems, should take priority over other considerations. In addition the overall stock assessment and management of deep-sea has significantly improved over the last few years and this is likely to be an increasing trend in effective stock based management using the present measures of TAC and effort control. However, certain types of fishing can result in Significant Adverse Impacts on the ecosystem, particularly in respect of VME's and PET species bycatch. There are trade-offs between the management of target species and the impacts on VMEs and PETs species. Different fishing gears impact different ecosystem components, e.g. trawl impact VMEs and sharks are vulnerable to passive gears. In particular, the high catch of deep-water sharks was one reason for the ban of deep-water gillnetting. Longlines, to which sharks have also a high catchability, may further impact seabirds has largely reported in the scientific literature. There is then a need for an appropriate account of management tradeoffs.

Therefore an immediate plan of action should arguably prioritise recommendations related to the impacts of fisheries on ecosystems:

- *Deep-water fishing effort to be estimated from VMS data as this allows an accurate tracking on fishing effort and SAI's by depth. Effort management may not be required if an effective catch management is in place. In EU waters in recent years, the management of landings through TACs and quotas has probably been effective and allowed effort was not all used. However, even if it is not a management tool, an accurate monitoring of effort is essential, as accurate effort data are essential to both stock and ecosystem assessment*
- *Guidelines should be developed which set out agreed procedures and protocols for the analysis of VMS data for the assessment of fishing activity and effort to facilitate the assessment of Significant Adverse Impacts on VMEs.*
- *Priority should be given to fully quantitative and high resolution (spatial and temporal) assessments of both seabed habitat features and fishing pressure (effort), and research should be allocated to increasing our knowledge to fulfil an analysis of the following key elements essential for undertaking an appropriate seabed spatial risk assessment:*
 - *Mapping of VME habitat and VME indicator species distributions and densities*

- *Mapping of actual fishing effort distribution and intensity in order to define the fishing footprint. VMS data are readily available for the deep-water where mostly large vessels operate, so it is a matter of all flag countries to be obliged to provide data in order that maps of fishing intensity can be produced and the high intensity areas then spatially defined and frozen*
- *Assessment of actual and predicted sensitivity/vulnerability of habitats and species to fishing pressure to determine risk*
- *Assigning the calculated risk to a defined risk category (as outlined above)*
- *An evaluation of uncertainty in the risk*
- *For licensing purposes the list of species provided in annex I below is used.*

In this way EU deep sea fisheries in the short to medium term could remain open and viable from both an economic and ecosystem point of view, subject to agreed risk-based spatial management measures. Such measures would need to be established within the next 2 years and these would complement the existing tools which have been developed within DEEPFISHMAN for the appropriate assessment of data-poor fish stocks with its corresponding advice on TAC and effort control.

Annex 1. Proposed list of species to be used for licensing purposes in a revised EU Deep-sea Access Regime

Scientific name	Common name
<i>Aphanopus carbo</i>	Black scabbardfish
<i>Apristurus</i> spp.	Iceland catshark
<i>Argentina silus</i>	Greater silver smelt
<i>Beryx</i> spp.	Alfonsinos
<i>Centrophorus granulosus</i>	Gulper shark
<i>Centrophorus squamosus</i>	Leafscale gulper shark
<i>Centroscyllium fabricii</i>	Black dogfish
<i>Centroscymnus coelolepis</i>	Portuguese dogfish
<i>Coryphaenoides rupestris</i>	Roundnose grenadier
<i>Dalatias licha</i>	Kitefin shark
<i>Deania calcea</i>	Birdbeak dogfish
<i>Etmopterus princeps</i>	Great lanternshark
<i>Etmopterus spinax</i>	Velvet belly
<i>Galeus melastomus</i>	Blackmouth dogfish
<i>Galeus murinus</i>	Mouse catshark
<i>Hoplostethus atlanticus</i>	Orange roughy
<i>Molva dypterygia</i>	Blue ling
<i>Phycis blennoides</i>	Forkbeards
<i>Centroselachus crepidater</i>	Longnose velvet dogfish
<i>Scymnodon ringens</i>	Knifetooth dogfish
<i>Hexanchus griseus</i>	Six-gilled shark
<i>Chlamydoselachus anguineus</i>	Frilled shark
<i>Oxynotus paradoxus</i>	Sailfin roughshark (Sharpback shark)
<i>Somniosus microcephalus</i>	Greenland shark
<i>Pagellus bogaraveo</i>	Blackspot seabream
<i>Chimaera monstrosa</i>	Rabbit fish
<i>Macrourus berglax</i>	Roughhead grenadier
<i>Mora moro</i>	Common mora
<i>Antimora rostrata</i>	Blue antimora (Blue hake)
<i>Epigonus telescopus</i>	Black (deep-water) cardinal fish
<i>Helicolenus dactylopterus</i>	Bluemouth (Blue mouth redfish)
<i>Lepidopus caudatus</i>	Silver scabbardfish
<i>Alepocephalus bairdii</i>	Baird's smoothhead
<i>Lycodes esmarkii</i>	Eelpout
<i>Raja hyperborea</i>	Arctic skate
<i>Hoplostethus mediterraneus</i>	Silver roughy (Pink)
<i>Trachyscorpia cristulata</i>	Spiny (Deep-sea) scorpionfish
<i>Raja nidarosiensis</i>	Norwegian skate
<i>Chaceon (Geryon) affinis</i>	Deep-water red crab
<i>Raja fyllae</i>	Round skate
<i>Hydrolagus mirabilis</i>	Large-eyed rabbit fish (Ratfish)
<i>Rhinochimaera atlantica</i>	Straightnose rabbitfish
<i>Alepocephalus rostratus</i>	Risso's smoothhead
<i>Polyprion americanus</i>	Wreckfish
<i>Brosme brosme</i>	Tusk
<i>Sebastes mentella</i>	Beaked redfish
<i>Reinhardtius hippoglossoides</i>	Greenland halibut

Annex 2. Proposed list of species to be used for licensing purposes in a revised EU Deep-sea Access Regime

Species Roundnose grenadier (*Coryphaenoides rupestris*)

EC Management units	ICES Assessment units	Comment	Recommendation
EU and international waters of: Vb, VI, VII (RNG/5B67-)	Faroe-Hatton area, Celtic sea (Divisions Vb and XIIb, Subareas VI, VII)	Advice for landings in are given separately for: (1) Vb, VI, VII (2) XIIb	Add XIIb to these areas
VIII, IX, X, XII and XIV (RNG/8X14-)	Mid-Atlantic Ridge 'MAR' (Divisions Xb, XIIc, Subdivisions Va1, XIIa1, XIVb1)	EU TAC mostly exploited in XIIb and set according to advice for Divisions Vb and XIIb, Subareas VI, VII (see above). Minor EU fisheries in other areas	Separate XIIb (Western Hatton) from other areas in management unit and merge it with Vb, VI and VII
III (RNG/03-)	Division IIIa		No change
I, II, IV (RNG/124-)	All other areas (Subareas I, II, IV, VIII, IX, Division XIVa, Subdivisions Va2, XIVb2)	Small fisheries in all areas, TAC set to prevent misreporting	No change

Species Black scabbardfish (*Aphanopus carbo*)

EC Management units	ICES Assessment units	Comment	Recommendation
EU and international waters of I, II, III and IV (BSF/1234)	Other areas (Divisions IIIa and Va Subareas I, II, IV, X, and XIV)	Minor TAC set to prevent misreporting	
EU and international waters of V, VI, VII and XII (BSF/56712-)	Northern (Divisions Vb and XIIb and Subareas VI and VII)	In subarea XII, landings out of XIIb are minor	Separate XIIb (Western Hatton) from other area (Mid-Atlantic ridge) in management unit
EU and international waters of VIII, IX and X (BSF/8910-)	Southern (Subareas VIII and IX) Other areas (Divisions IIIa and Va Subareas I, II, IV, X, and XIV)	Most of the fishery in VIII and IX occur in IXa and in other areas in X, both are Portuguese	Split the management area in: - X - VIII and IX
EU and international waters of CECAF 34.1.2 (BSF/C3412))	Not an ICES area	CECAF area 34.1.2 covers Madeira and Canaries, not appropriate to managed the assume spawning area around Madeira	No change

Species Greater forkbeard (*Phycis blennoides*)

EU and international waters of I, II, III, IV (GFB/1234-)	Entire ICES Area		
EU and international waters of V, VI and VII (GFB/567-)	Entire ICES Area	Recommended assessment from indicator trends by area	No change. Use trend to set TAC at area level
EU and international waters of VIII, IX (GFB/89-)	Entire ICES Area		
EU and international waters of X, XII (GFB/1012-)	Entire ICES Area		

Species Alfonsinos

EU and international waters of: III,IV, V, VI, VII, VIII, IX, X, XII and XIV (ALF/3X14-)	Entire ICES Area	Recommended monitoring and assessment from indicator trends by area	Split management areas as: (1) VIIIc and IXa, (2) X and (3) Other areas
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Species Orange roughy (*Hoplostethus atlanticus*)

EU and international waters of: VI (ORY/06-)	Northern (Subarea VI)	No current method for reliable monitoring	No change until method for assessment and management are found
VII (ORY/07-)	Southern (Subarea VII)	No current method for reliable monitoring	DEEPFISHMAN assessment allow for estimate of impact of other fisheries in the current 0 TAC regime
I, II, III, IV, V, VIII, IX, X, XII and XIV (ORY1CX14C)	All other areas (Subareas X, XI, Vb, Va and XIV)	No current method for reliable monitoring	

Species Blue ling (*Molva dypterygia*)

Icelandic stock	Iceland and Reykjanes ridge (Subdivisions Va and XIV)	Catches in these areas are from Iceland and Faroe, management is under the jurisdiction of Iceland and relies upon effort ceiling	
EU waters and international waters of Vb, VI, VII (BLI/5B67-)	Faroes Rockall and Celtic shelf (Division Vb and Subareas VI, and VII)	TAC applies to EU waters, ICES advice covers the full Vb area. The scientific recommendation for catch is treated by managers in the EU-Faroes Islands negotiation	Add Division XIIb to the management area
II, and IV (BLI.24-)	All other regions (Subdivisions I, II, IIIa, IVa, VIII, IX, and XII)	Small TAC to manage small by-catch	Management area appropriate
III (BLI/03-)	All other regions (Subdivisions I, II, IIIa, IVa, VIII, IX, and XII)	Small TAC to manage small by-catch	Management area appropriate

Species Red seabream (*Pagellus bogaraveo*)

EU and international waters of: VI, VII and VIII (SBR/678-)	(Subareas VI, VII, VIII)		No change
IX (SBR/09-)	(Subarea IX)		No change
X (SBR/10-)	Azores (Subarea X)		No change

Species Portuguese dogfish (*Centroscymnus coelolepis*)

Community waters and waters not under the sovereignty or jurisdiction of third countries of V, VI, VII, VIII and IX (DWS/56789-)	One single assessment unit in the northeast Atlantic	Probably one single population unit in the NE Atlantic. TAC (currently 0) applies to all deep-sea sharks	Management area appropriate under the current regime of closed fishery
Community waters and waters not under the sovereignty or jurisdiction of third countries of XII (DWS/12-)	One single assessment unit in the northeast Atlantic	Probably one single population unit in the NE Atlantic. TAC (currently 0) applies to all deep-sea sharks	Management area appropriate under the current regime of closed fishery

Species Leafscale gulper shark (*Centrophorus squamosus*)

Community waters and waters not under the sovereignty or jurisdiction of third countries of V, VI, VII, VIII and IX (DWS/56789-)	One single assessment unit in the northeast Atlantic	Probably one single population unit in the NE Atlantic. TAC (currently 0) applies to all deep-sea sharks	Management area appropriate under the current regime of closed fishery
Community waters and waters not under the sovereignty or jurisdiction of third countries of XII (DWS/12-)	One single assessment unit in the northeast Atlantic	Probably one single population unit in the NE Atlantic. TAC (currently 0) applies to all deep-sea sharks	Management area appropriate under the current regime of closed fishery

Species Kitefin shark (*Dalatias licha*)

EU and international waters of X (DWS/10-)	One single assessment unit in the northeast Atlantic	Species occur at low density out of Azorean area (ICES Subarea X), where landings records back to 1972 exist (ICES 2011). TAC (currently 0) applies to all deep-sea sharks	Management and assessment area appropriate
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Species Birdbeak sharks (*Deania* spp.)

Community waters and waters not under the sovereignty or jurisdiction of third countries of XII (DWS/12-)	No assessment	Birdbeak sharks are explicitly mentioned for the management area XII only. TACs (currently 0) applies to all deep-sea sharks in all areas, so 0 TACs for birdbeak sharks everywhere.	Management and assessment area appropriate
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