COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels,11.4.2008
SEC(2008) 449

COMMISSION STAFF WORKING DOCUMENT

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

The role of the CFP in implementing an ecosystem approach to marine management

[COM(2008) 187 final]

Report of the Ad Hoc Meeting of independent experts on Indicators and associated data requirements to measure the impacts of fisheries on the marine ecosystem

1. INTRODUCTION

Two recent research projects on the development of indicators to support the CFP (Anon, 2006, 2007) and two STECF SGRN meetings (SGRN 05-03 and SGRN 06-01) have focused on the development of indicators that might underpin the implementation of an ecosystem approach to fisheries. This document synthesises and builds on the outputs of these projects and meetings to propose a preliminary set of indicators and to describe the data requirements needed to operationalise them. The document also identifies other indicators that will need to be introduced and the research and data requirements associated with their introduction.

In these projects it was decided that two types of indicators were needed to support the environmental integration process, indicators of the state of the marine environment and indicators of the pressure that affects state. The state indicators should cover a broad range of ecosystem features and the pressure indicators should cover the most important aspects of how fishing impacts the ecosystem. For the current preliminary set of indicators we preferred those indicators for which there was sufficient scientific justification, but in case there was no agreed "best" indicator for a particular ecosystem state or fishing impact a pragmatic choice was made for the indicators we deemed most informative. A prerequisite for selection was that the indicators could be quantified based on existing or proposed monitoring programmes, if needed after a slight modification or expansion.

SGRN 06-01 recognised that the introduction of indicators and associated data collection procedures would need to be incremental, but that some indicators could be made operational in the short term, based on existing knowledge of these indicators and data that were already collected as stipulated in the DCR. A summary table based on SGRN 06-01 (Table 1) was taken as a starting point for the present exercise. This was used to distinguish operational indicators (tabulated as 'operational immediately') from those that required additional data or research before they could be made operational. Indicators in these two categories are dealt with in two sections of this report. First, a section on indicators which are 'operational immediately' describes how these indicators would be calculated and the associated requirements for data. Second, a section on indicators that require further development identifies the research and data needs to support this development.

The work of the present group builds on reports of two previous SGRN meetings (SGRN 05-03, SGRN 06-01) and outputs of EC funded projects Indicators of Environmental Integration (INDENT) (Anon 2006) and Development of Indicators of the Environmental Performance of the Common Fisheries Policy (INDECO) (Anon 2007). In relation to indicators which were 'operational immediately', the group reviewed the SGRN and project reports and material cited therein to develop and define precise names and specifications for these indicators and the data requirements to calculate them, taking account of the STECF response to the SGRN 06-01 report. These specifications are summarised in a table in the section on 'Operational indicators' and reported more comprehensively in a series of supporting appendices. These appendices provide essential information for groups calculating the indicators and it is essential that the appendices are read in conjunction with the summary table and made available if the summary table is reproduced in other documents. In relation to the indicators that require additional development, the section 'Further research and data collection requirements' specified priorities for research and data collection.

Operational' indicators

This section provides precise specifications for indicators that are considered to be operational or can be made operational if small changes are made to existing data collection procedures as described in the DCR. Table 2 summarises these specifications and they are more comprehensively described in supporting appendices relating to each indicator. The Table and appendices provide a recommended name for the indicator, define the indicator, list the data required for calculation of indicator values, describe how the indicator should be calculated, describe the expected precision of supporting data, describe the existing availability of data collected under the DCR and list any issues that need to be considered by the EC before the indicator is introduced.

2. **TABLE 1. STATE OF DEVELOPMENT OF INDICATORS TO SUPPORT AN ECOSYSTEM APPROACH TO FISHERIES (SGRN 06-01) AND FUTURE DEVELOPMENT OF THESE INDICATORS AND ASSOCIATED RESEARCH PROJECTS AS DESCRIBED IN TABLES 2 AND 3. NUMBERS PRECEDING INDICATORS REFER TO THE CODES ADOPTED IN TABLE 2 AND FOR THE ASSOCIATED APPENDICES.**

Indicator	SGRN (2006) recommendation	Proposed indicators or research projects	Purpose	Table
Conservation status of vulnerable fishes according to IUCN decline criterion	Operational immediately	1. Conservation status of fish species	State	2
Abundance of vulnerable marine mammals, reptiles or seabirds	Additional data sources required, research priority	Research project	—	3
Mean weight and mean maximum length of fish assemblage	Operational immediately	2. Proportion of large fish 3. Mean maximum length of fishes	State State	2
Proportion of sensitive habitats impacted	Additional data sources required, research priority	Research project	—	3
Abundance of sensitive benthos species	Additional data sources required, research priority	Research project	—	3
Age and size at maturation of exploited fish species	Operational in some regions and for some species	4. Size at maturation of exploited fish species	State	2
Spatial and temporal distribution of fishing effort	Mostly already part of DCR but issues of availability, reliability and consistency	5. Distribution of fishing activities 6. Aggregation of fishing activities 7. Areas not impacted by mobile bottom gears	Pressure Pressure Pressure	2
Catch and discard rates	Mostly already part of DCR but issues of reliability and representation need to be dealt with before they can be made operational	8. Discarding rates of commercially exploited species 9. Discarding rates in relation to landed value 10. (Fuel efficiency of fish capture)	Pressure Pressure Pressure	2

3. TABLE 2. SPECIFICATIONS OF PROPOSED INDICATORS AND THE ASSOCIATED DATA REQUIREMENTS. NOTE THAT TECHNICAL SPECIFICATIONS FOR EACH INDICATOR ARE PROVIDED IN THE ACCOMPANYING APPENDICES.

Code/ Annex	Indicator	Definition	Data required	Precision level
1	**Conservation status of fish species**	Indicator of biodiversity to be used for synthesizing, assessing and reporting trends in the biodiversity of vulnerable fish species	**Species, length and abundance** from fisheries-independent research survey(s) for relevant marine region. Accurate reporting of these indicators require that all species that contribute to the indicator are consistently and reliably identified. Survey catches must be fully sorted (not sub-sampled) to ensure that all individuals of every species that contributes to the indicator are recorded.	Research survey should cover largest proportion of the marine region over the longest available time period. The indicator would be survey specific. The methods require that surveys are conducted annually in the same area with a standard gear.
2	**Proportion of large fish**	Indicator for the proportion of large fish by weight in the assemblage, reflecting the size structure and life history composition of the fish community.		
3	**Mean maximum length of fishes**	Indicator for the life history composition of the fish community		
4	**Size at maturation of exploited fish species**	Indicator of the potential "genetic effects" on a population	**Individual measurements of age, length, sex and maturity** from fisheries-independent research survey(s) for relevant marine region.	At least 100 individuals per age class but more fish will improve the power of this indicator.
5	**Distribution of fishing activities**	Indicator of the spatial extent of fishing activity. It would be reported in conjunction with the indicator for 'Aggregation of fishing activity'.	**Position and vessel registration** data based on VMS Available within two months of position reports being received, with all positions linked to the 6 level metier classification recommended in SGRN 06-03. This does not include vessels below 15 m.	Preference for position reports every half hour.
6	**Aggregation of fishing activities**	Indicator of the extent to which fishing activity is aggregated. It would be reported in conjunction with the indicator for 'Distribution of fishing activity'.		
7	**Areas not**	Indicator of the area of seabed that has		

	impacted by mobile bottom gears	not been impacted by mobile bottom fishing gears in the last year. It responds to changes in the distribution of bottom fishing activity resulting from catch controls, effort controls or technical measures (including MPA established in support of conservation legislation) and to the development of any other human activities that displace fishing activity (e.g. wind farms).		
8	**Discarding rates of commercially exploited species** ling can also include ed bycatch that is lan	Indicator of the rate of discarding of commercially exploited species in relation to landings.	**Species, length and abundance of catches and discards** based on respectively logbooks and observer trips processed separately, **economic data** from regulation in draft. Data linked to the 6 level metier classification recommended in SGRN 06-03.	As specified in current discard regulation and (new DCR economic data collection)
9	**Discarding rates in relation to landed value** (discarding can also include unwanted bycatch that is landed)	Indicator of the rate of discarding of commercially exploited species in relation to the total value of landings. It is one measure of the relative environmental impact of different fisheries.		
10	**Fuel efficiency of fish capture**	Indicator of the relationship between fuel consumption and the value of landed catch. It will provide information on trends in the fuel efficiency of different fisheries.	**Value of landings and cost of fuel.** Value calculated as the product of landings by species (revised DCR) and prices (revised DCR). Cost of fuel as defined in (new DCR economic data collection). The indicator would be calculated for each metier based on the six level classification recommended in SGRN 06-03 by marine region,	As specified in current DCR and proposed in (new DCR economic data collection)

			quarter and year.	

4. APPENDICES TO TABLE 2.

4.1. Appendix 1. Specification and calculation of indicator for 'Conservation status of fish species

Name: Conservation status of fish species

Definition: This is an indicator of the conservation status of fishes to be used for synthesising, assessing and reporting trends in the biodiversity of vulnerable fish species (where maximum (asymptotic) body size is taken as a measure of a species' vulnerability to a given rate of fishing mortality).

Purpose: State indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: Bottom trawl survey data for relevant marine region. This indicator should be calculated using species, length and abundance survey data that have been collected from the largest proportion of the marine region over the longest available time period. The indicator would be survey specific. The methods require that surveys are conducted annually in the same area with a standard gear.

Calculation of indicator: This is a two stage process where the species to include in the indicator are identified and then used to build a dataset for calculating indicator values.

When calculating the indicator, species should be excluded if:

(1) They have morphology, behaviour or habitat preferences that are expected to lead to low and variable catchability in the survey gear (this does not exclude species that should, in theory, be effectively sampled by the gear but which have become so scarce that they are now caught infrequently- unless excluded under '2' below)

(2) Mean annual catch rates of the species in the entire survey area over the entire survey period are less than 20 individuals (of any length)

(3) They have an asymptotic total length (L_∞) and/or maximum recorded total length of <40 cm

(4) They cannot be identified reliably (although all practicable effort should be made to ensure species-level identification)

The following process should be used to select species and size-classes when calculating the indicator:

(5) Compile a list of species recorded in the history of the survey and their mean asymptotic total length (L_∞) and/or maximum recorded total length (if $\geq$ 40 cm). Asymptotic total length or maximum recorded total length are ideally determined from total length and age data collected on the same survey. A mean value for the survey period should be used when there are multiple estimates of L_∞, but the highest recorded value of maximum total length should be used.

(6) Rank the species listed under '1' from high to low asymptotic total length (L_∞) and/or maximum recorded total length (use maximum total length only in those cases when L_∞ cannot be calculated from available size at age data)

(7) Select the 20 largest species by total length (or all the species in the list if <20) from the rankings produced in '2'. Once this list has been defined it should be used for calculating indicator values in all subsequent years.

(8) For each of the species identified in '3' calculate mean catch rates, standardised to account for any changes/ differences in tow duration (e.g. number per hour) for individuals of length $\geq 0.5\ L_\infty$ only.

Two indicators of the biodiversity of vulnerable fish species can be calculated from data compiled according to the preceding process: (a) an indicator of the biodiversity of vulnerable fish species that responds to changes in the proportion of contributing species that are threatened and (b) an indicator of the biodiversity of vulnerable fish species that tracks year-to-year changes in the abundance of contributing species. Both indicators assume that the survey catch rate provides an index of abundance.

(a) For each species, catch rates in the first year of the survey are compared with catch rates 10 years later. To achieve this a linear model is fitted to the first *x* years of data, $t_1 - t_x$ and to each successive year, i.e. $t_1 - t_{x+1}$, $t_1 - t_{x+2}$,…, $t_1 - t_{maximum}$, where $t_{maximum}$ is the final year for which data are available. The percent change in catch rate of the species is then calculated from the initial (t_1) and final (t_x to $t_{maximum}$) catch rate as predicted from the least squares linear model fit. Species that meet any one of the decline criteria in any year of the time series are categorised as threatened; unless their numerical catch rate subsequently increases above a preset catch rate threshold. This should be taken as the mean catch rate over the first 3 years of the time series. The composite threat indicator is then calculated for each year as the average of the species threat scores (critically endangered if ≥ 90% decline- score =3, endangered if ≥70% decline- score=2, vulnerable if ≥50% decline- score=1) and allocated to the final year of the period over which the decline was measured. The indicator value is readily interpreted because the scores can vary from 0 to 3, such that a score of 0 is equivalent to no species meeting any of the threat criteria and a score of 3 is equivalent to each species being critically endangered.

(b) The proposed reference direction for indicator (a) is a significant reduction in the rate of increase, consistent with the WSSD target of achieving a significant reduction in the rate of biodiversity loss (by 2010). A decrease in the value of the indicator would also show progress towards the CFP objective of ensuring that the impacts of fishing on marine ecosystem are sustainable. A limit reference point for this indicator would be 1 (when all species are listed as 'vulnerable' on average).

(c) Benefits of indicator (a): Values of the indicator can be linked directly to the IUCN process for identifying critically endangered, endangered and vulnerable species. The indicator is therefore consistent with other threat-based indicators used to report on the status of mammals, birds and amphibians and which are used to track progress in relation to the WSSD biodiversity commitments.

ICES assessed stocks that meet these simple but widely used threat criteria have been shown, without exception, to be exploited beyond safe biological limits (note that the decline associated with 'vulnerable' exceeds that which would be required to achieve MSY and that the declines associated with 'endangered' and 'critically endangered' would place stocks at risk of reduced reproductive capacity). It is also possible to set limit reference points and reference directions for this indicator.

(d) Catch rates in a given year are expressed as a proportion of the mean catch rate in the first 3 years of any given survey (for which the mean catch rate is defined as 1). In any given year, the indicator is calculated as the geometric mean of relative adult numerical abundance. When calculating the geometric mean, proportions are log transformed as $\log(x+a)$, where x is the proportion and a is 0.5 times the minimum non-zero proportion in the time series.

The proposed reference direction for indicator (b) is a significant reduction in the rate of decline, which would be consistent with the WSSD target of achieving a significant reduction in the rate of biodiversity loss (by 2010). An increase in the value of the indicator would show progress towards the CFP objective of ensuring that the impacts of fishing on marine ecosystem are sustainable.

Benefits of indicator (b): Values of the indicator track interannual changes in the catch rates of the larger, and therefore more vulnerable, species in a fish community. Reference directions can be set for this indicator.

Data availability from DCR: Data collected during the existing DCR surveys should be used to calculate this indicator. No substantial modifications to existing surveys are likely to be required, but the processing of catches may need to be conducted more rigorously to ensure that all species used to calculate the indicator are identified and counted without subsampling and that identifications are reliable.

Precision: With a given survey area and gear, greater replication in space and time will improve the power of this indicator to detect trends in the relative abundance of large fish species. Measure fish length in cm, count individuals.

Issues:

(1) Accurate reporting of this indicator requires that all species that contribute to the indicator are consistently and reliably identified.

(2) Survey catches must be fully sorted (not subsampled) to ensure that all individuals of every species that contributes to the indicator are recorded.

(3) Both indicator summarise trends in catch rates for a number of species and it is likely that users would also request species by species information on catch rates to identify the species responsible for reported trends in either indicator.

(4) The indicator has been most thoroughly tested with data from demersal trawl surveys. Appropriate surveys see SGRN 07-01.

4.2. Appendix 2. Specification and calculation of indicator for the 'Proportion of large fish'

Name: Proportion of large fish

Definition: This is an indicator for the proportion of large fish in the assemblage by weight, reflecting the size structure and life history composition of the fish community.

Purpose: State indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: Bottom trawl survey data for relevant marine region. This indicator should be calculated using species, length and abundance survey data that have been collected from the largest proportion of the marine region over the longest available time period. The indicator would be survey specific. The methods require that surveys are conducted annually in the same area with a standard gear.

Calculation of indicator: The indicator can be calculated for the entire assemblage that is caught by that particular gear or a subset based on morphology, behaviour or habitat preferences (e.g. bottom-dwelling species only).

The "large" fish threshold needs to be set at a level that decreases the noise around the trend caused by e.g. recruitment effects while maintaining the indicators' sensitivity. In the IBTS North Sea data set a threshold of 40 cm was used, which amounted to between 5800 and 25000 fish being sampled in each year. Across the whole time series fish over 40 cm represented over 0.5% of the total number of fish sampled.

The proportion of "large fish" is calculated as: $P_{>40cm} = \frac{W_{>40cm}}{W_{Total}}$ where $W>40cm$ is the weight of fish greater than 40 cm in length and W_{Total} is the total weight of all fish in the sample.

Data availability from DCR: Data collected during the existing DCR surveys should be used to calculate this indicator. No substantial modifications to existing surveys are likely to be required.

Precision: With a given survey area and gear, greater replication in space and time will improve the power of this indicator to detect trends in the relative abundance of large fish species. Measure fish length in cm, count individuals.

4.3. Appendix 3. Specification and calculation of indicator for 'Mean maximum length of fishes'

Name: Mean maximum length of fishes

Definition: This is an indicator for the life history composition of the fish community

Purpose: State indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: Bottom trawl survey data for relevant marine region. This indicator should be calculated using species, length and abundance survey data that have been collected from the largest proportion of the Marine region over the longest available time period. The indicator would be survey specific. The methods require that surveys are conducted annually in the same area with a standard gear.

Calculation of indicator: The indicator can be calculated for the entire assemblage that is caught by a particular gear or a subset based on morphology, behaviour or habitat preferences (e.g. bottom-dwelling species only).

Mean maximum length is calculated as: $\overline{L_{\max}} = \sum_j (L_{\max j} N_j) \Big/ N$ where $L_{\max j}$ is the maximum length obtained by species j, N_j is the number of individuals of species j and N is the total number of individuals. Asymptotic total length (L_∞) is preferred to maximum recorded total length if an estimate is available, but it is recognised that such data may not be available for many species (see 'Issues' below).

Data availability from DCR: Data collected during the existing DCR surveys should be used to calculate this indicator. No substantial modifications to existing surveys are likely to be required.

Precision: With a given survey area and gear, greater replication in space and time will improve the power of this indicator to detect trends in the relative abundance of large fish species. Measure fish length in cm, count individuals.

Issues:

(1) Accurate reporting of this indicator requires that all species that contribute to the indicator are consistently and reliably identified.

(2) Survey catches must be fully sorted (not subsampled- except within species groups for the purposes of obtaining size-frequency distributions) to ensure that all individuals of every species that contributes to the indicator are recorded.

(3) The indicator has been most thoroughly tested with data from demersal trawl surveys and is likely to be most usefully applied to data from those surveys. For appropriate surveys in each marine region see SGRN 07-01.

(4) Asymptotic total length (L_∞) is preferred to maximum recorded total length when calculating this indicator but is unlikely to be available for all species. Values of L_∞ are ideally determined from total length and age data collected on the same survey. A mean value for the survey period should be used when there are multiple estimates of L_∞. For maximum total length the greatest length recorded in the survey region should be used (including records from reliable data collected prior to the start of a given survey).

(5) 4.4. Appendix 4. Specification and calculation of indicator for 'Maturation of exploited fish species'

Name: Maturation of exploited fish species

Definition: This is an indicator of the potential "genetic effects" of fishing on exploited populations.

Purpose: State indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: Owing to the sampling requirements the indicator is best applied to species that are already subject to stock assessment. Fisheries-independent data with measurements of age, length, sex and maturity status (immature or mature) for the same individual. If resting individuals (i.e. individuals that are mature but do not spawn in the sampled season) can be mistaken for immature individuals, they need to be classified as juvenile, an adult that spawn(ed) within the season or a resting adult individual. Many existing schemes for classifying gonadal maturity status by macroscopic observation allow the grouping of individuals into these categories. Individual measurements (age, length, sex and juvenile/spawning adult/resting adult) should be taken for at least 100 individuals per age class per year in the population. These age classes need to contain both juvenile and adult individuals. Completely juvenile age groups or age groups in which all individuals are adults do not have to be sampled *if* they stay so during the whole monitoring period. The necessary sample size in a given year can thus be derived from the number of age groups in the population.

Calculation of indicator: The indicator is the probabilistic maturation reaction norm (i.e. the probability of maturing) and this is derived from the maturity ogive (i.e., the probability of being mature) and from the mean annual growth at age as

$$m(a,s)=(o(a,s)-o(a\text{-}1,\ s-\Delta s(a)))/(1-o(a\text{-}1,s-\Delta s(a)))$$

where a is age, s is length, $o(a,s)$ is the maturity ogive, and $\Delta s(a)$ is the length gained from age a-1 to a. Estimation of the probabilistic maturation reaction norm thus requires (i) estimation of maturity ogives, (ii) estimation of growth rates (from length at age), (iii) estimation of the probabilities of maturing, and (iv) estimation of confidence intervals around the obtained maturation probabilities (see SGRN 06-01 for further details).

Data availability from DCR: A requirement of the monitoring program is that it covers a large enough part of the marine region and/or the population for which the indicator is calculated. Data collected during the existing DCR surveys should be used to calculate this indicator. No substantial modifications to existing surveys are likely to be required, but the number of fish for which this information is collected may need to be increased in order to obtain the 100 individuals per age and year-class.

Precision: If this information is collected for more fish it will improve the power of this indicator.

Issues:

(1) Owing to the sampling requirements the indicator is best applied to species that are already subject to stock assessment.

4.5. Appendix 5. Specification and calculation of indicator for 'Distribution of fishing activity'

Name: Distribution of fishing activity

Definition: This is an indicator of the spatial extent of fishing activity. It would be reported in conjunction with the indicator for 'Aggregation of fishing activity'.

Purpose: Pressure indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: VMS vessel position records reported at intervals of 2h for vessels assigned to metiers according to the 6 level metier classification recommended in SGRN 06-03.

Calculation of indicator: Individual vessel identifiers associated with VMS vessel position records should be replaced with metier codes and data filtered to provide 2h position records if monitoring is more frequent. Vessel position records should be assigned to 3km*3km grid cells and the total numbers of vessel position records by metier in each cell in each calendar month should be reported. When methods exist for separating 'fishing' and 'not fishing' vessel position records, these should be applied and the 'fishing' records reported.

For reporting purposes, the indicator would state the total area (sum of areas of 3km grid cells) where fishing activity was recorded for each fishing technique in each month and year. Presentation of the underlying processed data (vessel position records by fishing technique and month) would also be needed to facilitate the development of other indicators.

Precision: Maximum reporting interval for VMS vessel position records should be 2 h. Geographic resolution of each position record must be sufficient to assign the record to a 3km grid cell (it is already far in excess of this). All VMS data for all European vessels should be available for processing within 2 months of transmission.

Data availability from DCR: The collection of VMS data is not supported by the DCR, but it is essential that the VMS data collected for enforcement are also made available for scientific purposes.

Issues:

(1) This indicator would provide greater insight into the extent of fishing activities if the frequency of VMS records were increased to 0.5 h and coverage were extended to vessels with lengths less than 15m (ideally to 10m).

(2) It is essential that the DCR structure allows all vessel identifiers in the VMS data to be linked to metiers as specified in the 6 level metier classification recommended in SGRN 06-03.

(3) To accurately represent fishing activity, it should be possible to distinguish pings associated with 'fishing' and 'not fishing'. This can be achieved by post-processing of the data, but greater accuracy would be achieved if it were required that information on whether vessels were 'fishing' or 'not fishing' was transmitted with the position.

(4) Need to agree a datum so that the locations of grid cells are consistent throughout all Marine regions.

(5) The proposed 3km*3km grid cell resolution is based on initial analyses of VMS data for the NSRAC and NWWRAC. It is recommended that the EC solicit feedback on the utility of this resolution as some issues (e.g. local habitat impacts) may need to be dealt with on finer scales. The grid size used should, however, be the same in all marine regions- to allow for a comparison of indicator values within and among marine regions.

4.6. Appendix 6. Specification and calculation of indicator for 'Aggregation of fishing activity'

Name: Aggregation of fishing activity

Definition: This is an indicator of the extent to which fishing activity is aggregated. It would be reported in conjunction with the indicator for 'Distribution of fishing activity'.

Purpose: Pressure indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: VMS vessel position records reported at intervals of 2h for vessels assigned to metiers according to the 6 level metier classification recommended in SGRN 06-03.

Calculation of indicator: Individual vessel identifiers associated with VMS vessel position records should be replaced with metier codes and data filtered to provide 2h position records if monitoring is more frequent. Vessel position records should be assigned to 3km*3km grid cells and the total numbers of vessel position records by metier in each cell in each calendar month should be reported. When methods exist for separating 'fishing' and 'not fishing' vessel position records, these should be applied and the 'fishing' records reported.

For reporting purposes, the indicator would state the total area (sum of areas of 3km grid cells) where 90% of fishing activity (90% of the total number of position records) was recorded for each fishing technique in each month and each year. Presentation of the underlying processed data (vessel position records by fishing technique and month) would also be needed to facilitate the development of other indicators.

Precision: Maximum reporting interval for VMS vessel position records should be 2 h. Geographic resolution of each position record must be sufficient to assign the record to a 3km grid cell (it is already far in excess of this). All VMS data for all European vessels should be available for processing within 2 months of transmission.

Data availability from DCR: The collection of VMS data is not supported by the DCR, but it is essential that the VMS data collected for enforcement are also made available for scientific purposes.

Issues:

(1) This indicator would provide greater insight into the extent of fishing activities if the frequency of VMS records were increased to 0.5 h and coverage were extended to vessels with lengths less than 15m (ideally to 10m).

(2) It is essential that the DCR structure allows all vessel identifiers in the VMS data to be linked to assigned to metiers according to the 6 level metier classification recommended in SGRN 06-03.

(3) To accurately represent fishing activity, it should be possible to distinguish pings associated with 'fishing' and 'not fishing'. This can be achieved by post-processing of the data, but greater accuracy would be achieved if it were required that information on whether vessels were 'fishing' or 'not fishing' was transmitted with the position.

(4) Need to agree a datum so that the locations of grid cells are consistent throughout all Marine regions.

(5) The proposed 3km*3km grid cell resolution is based on initial analyses of VMS fishing activity data for the NSRAC and NWWRAC. It is recommended that the EC solicit feedback on the utility of this resolution as some issues (e.g. local habitat impacts) may need to be dealt with on finer scales. The grid size used should, however, be the same in all marine regions- to allow for a comparison of indicator values within and among marine regions.

(6) The 90% threshold for defining the aggregation of fishing activity is based on analysis of VMS fishing activity data in the NSRAC and NWWRAC. It is recommended that the EC solicit feedback on the acceptability of this threshold in other areas. The value used for the threshold should, however, be the same in all Marine regions.

4.7. Appendix 7. Specification and calculation of indicator for 'Areas not impacted by mobile bottom gears'

Name: Areas not impacted by mobile bottom gears

Definition: This is an indicator of the area of seabed that has not been impacted by mobile bottom fishing gears in the last year. It responds to changes in the distribution of bottom fishing activity resulting from catch controls, effort controls or technical measures (including MPA established in support of conservation legislation) and to the development of any other human activities that displace fishing activity (e.g. wind farms).

Purpose: Pressure indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: VMS vessel position records reported at intervals of 2h by vessels using mobile bottom fishing gears, as identified in the 6 level metier classification recommended in SGRN 06-03.

Calculation of indicator: VMS vessel position records for mobile bottom fishing gears should be identified (and data filtered to provide 2h position records if monitoring is more frequent). These VMS position records should be assigned to 3km*3km grid cells and the total numbers of vessel position records in each cell in each year should be reported. When methods exist for separating 'fishing' and 'not fishing' vessel position records, these should be applied and the 'fishing' records reported.

Precision: Maximum reporting interval for VMS vessel position records 2h. Resolution must be sufficient to assign position records to 3km grid cells (it is already far in excess of this). All VMS data for all European vessels fishing with towed bottom fishing gears should be available for processing within 2 months of the end of a reporting year.

Data availability from DCR: The collection of VMS data is not supported by the DCR, but it is essential that the VMS data collected for enforcement are also made available for scientific purposes.

Issues:

(7) This indicator would provide greater insight into the extent of fishing activities if the frequency of VMS records were increased to 0.5 h and coverage were extended to vessels with lengths less than 15m (ideally to 10m).

(8) To accurately represent fishing activity, it should be possible to distinguish pings associated with 'fishing' and 'not fishing'. This can be achieved by post-processing of the data, but greater accuracy would be achieved if it were required that information on whether vessels were 'fishing' or 'not fishing' was transmitted with the position.

(9) Need to agree a datum so that the locations of grid cells are consistent throughout all Marine regions.

(10) The proposed 3km*3km grid cell resolution is based on initial analyses of VMS fishing activity data for the NSRAC and NWWRAC. It is recommended that the EC

solicit feedback on the utility of this resolution as some issues (e.g. local habitat impacts) may need to be dealt with on finer scales. The grid size used should, however, be the same in all marine regions- to allow for a comparison of indicator values within and among Marine regions.

(11) For reporting purposes, the indicator could be reported annually and would state the total proportion of the area by depth strata (0- 20m, 20-50m, 50-80m, 80-130m, 130-200m, >200m) in each marine region that has not been fished with bottom gear in the preceding one year period. The 3 km grid cells should be assigned to depth strata based on recognised bathymetric maps (EC to specify)

4.8. Appendix 8. Specification and calculation of an indicator for 'Discarding rates of commercially exploited species'

Name: Discarding rates of commercially exploited species

Definition: This is an indicator of the rate of discarding of commercially exploited species in relation to landings.

Purpose: Pressure indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: Discard rates by species measured in weight (as detailed in revised DCR), landings rates by species measured in kg (as detailed in revised DCR) and metier according to the 6 level metier classification recommended in SGRN 06-03.

Calculation of indicator: Calculate total discard weight as a proportion of landed weight by species, fishing technique, quarter and year. As the indicator is a ratio it may be calculated with discards and landings data collected on the same trips or with raised data.

Data availability from DCR: All the data required to calculate this indicator are collected under the existing DCR.

Precision: As specified for discards and landings data collection in the revised DCR.

Issues:

(12) The indicator summarises trends in discard rates for a number of species and it is likely that users would also request species by species information on discard rates to identify the species responsible for reported trends in the composite indicator.

(13) To minimise the amount of information reported when summarising patterns of discarding, discard rates in any given year and for any given fishing technique could be expressed as a proportion of the discard rates in the first 3 years of the time series. In any given year, a composite indicator would be calculated as the geometric mean of relative annual discard rates.

(14) The current DCR does not specify the collection of discard data for many of the species that are most vulnerable to fishing. It is recommended that bycatch and discard monitoring should be extended to at least all the species that are used to compile the indicator 'Biodiversity of vulnerable fish species' in each marine region (see Appendix 1).

(15) The current DCR should also be extended to record the numbers and sizes of any seabirds, reptiles or marine mammals taken as bycatch to allow for the development of comparable indicators for these groups.

4.9. Appendix 9. Specification and calculation of an indicator for 'Discarding rates in relation to landed value'

Name: Discarding rates in relation to landed value

Definition: This is an indicator of the rate of discarding of commercially exploited species in relation to the total value of landings. It is one measure of the relative environmental impact of different fisheries.

Purpose: Pressure indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: Discard rates by species measured in weight (as detailed in revised DCR). Value of landings calculated from the product of landings by species (as detailed in revised DCR) and prices (as detailed in the draft economics tables for the new DCR). The indicator would be calculated for each metier according to the 6 level metier classification recommended in SGRN 06-03.

Calculation of indicator: Calculate total discards (weight in kg or tonnes) of all species as a proportion of the first sale value of landings (Euro) of all species by fishing technique, by quarter and year. As the indicator is a ratio it may be calculated with discards, landings and prices data collected on the same trips or with raised data.

Data availability from DCR: Collection of all the data required to calculate this indicator is supported by the revised/ new DCR.

Precision: As specified for discards, landings and prices data collection in DCR.

Issues:

(16) The current DCR does not specify the collection of discard data for many of the species that are most vulnerable to fishing. It is recommended that bycatch and discard monitoring should be extended to at least all the species that are used to compile the indicator 'Biodiversity of vulnerable fish species' in each marine region (see Appendix 1).

(17) The current DCR should also be extended to record the numbers and sizes of any seabirds, reptiles or marine mammals taken as bycatch to allow for the development of comparable indicators for these groups.

4.10. Appendix 10. Specification and calculation of an indicator for 'Fuel efficiency of fish capture'

Name: Fuel efficiency of fish capture

Definition: This is an indicator of the relationship between fuel consumption and the value of landed catch. It will provide information on trends in the fuel efficiency of different fisheries. This information is relevant when assessing the relative contribution of the different metiers, and the fishery sector more widely, to greenhouse gas emissions.

Purpose: Pressure indicator. Contributes to assessing the performance of CFP in relation to the objectives of 'minimising the impact of fishing activities on the marine eco-system [sic]' and therefore helps to underpin the 'progressive implementation of an eco-system-based [sic] approach to fisheries management'.

Data required: Value of landings calculated as the product of landings by species (species as detailed in proposed revision of DCR) and prices (as defined in proposed economic revision of DCR). Cost of fuel (as defined in proposed economic revision of DCR). The indicator would be calculated for each metier according to the 6 level metier classification recommended in SGRN 06-03 by marine region, quarter and year.

Calculation of indicator: Calculate total value of landed catch (Euro) by fishing technique, quarter and year. Divide value by cost of fuel used to take this landed catch (Euro).

Data availability from DCR: All the data required to calculate this indicator will be collected based on the revised/ new DCR.

Precision: As specified in the DCR.

Issues:

Indicator is reliant on the availability of data describing the fuel costs for fleet segments. This will require that the addition to the DCR that relates to the collection of economic data in the fishing sector will be agreed.

References

Anon (2006). Indicators of Environmental Integration (INDENT): Final Report. Tender Ref FISH/2004/12, 288 p.

Anon (2007). Development of Indicators of the Environmental Performance of the Common Fisheries Policy (INDECO): final analysis and evaluation of the INDECO indicators. Project 513754, 39p.

Commission Staff Working Paper SEC (2005, xxx): Report of the STECF Sub-group on Research Needs (SGRN 05-03): environmental integration and move towards an ecosystem approach, Brussels 20-24 June, 2005, 48p.

Commission Staff Working Paper SEC (2006, xxx): Report of the STECF Sub-group on Research Needs (SGRN-06-01): environmental integration and move towards an ecosystem approach, Brussels 19-23 June, 2006, 88p

Commission Staff Working Paper SEC (2006, xxx): Report of the STECF Sub-group on Research Needs (SGRN-06-03): Revision of the Biological Data Requirements under the Data Collection Regulation. Brussels 27 November-1st December 2006, 48 p + annexes.

Commission Staff Working Paper SEC (2007, xxx): Report of the STECF Sub-group on Economic Affairs (SGECA 07-01): Meeting on Data Collection Commission Regulation Nº1543/2000, Nº1639/2001, and N º 1581/2004. Salerno, Italy, 15-19 January 2007, 21p+ annexes

Commission Staff Working Paper SEC (2007, xxx): Report of the STECF Sub-group on Research Needs (SGRN-07-01): Review of list of surveys at sea (Appendix XIV of EU Commission Regulation N°1581/2004) with their priorities. Brussels, 12-16 February 2007, 25 p.

5. FURTHER RESEARCH AND DATA COLLECTION REQUIREMENTS

This section prioritises research activities and data collection procedures that will be needed to make more of the indicators recommended by SGRN 06-01 operational.

SGRN 06-01 identified three indicators which also support the integration of environmental protection requirements into the Common Fisheries Policy (CFP) but which require further data collection and research before they can be implemented (Table 1). These indicators are:

- Abundance of vulnerable marine mammals, reptiles or seabirds
- Proportion of sensitive habitats impacted
- Abundance of sensitive benthos species

Data in support of these indicators are not currently collected under the current DCR, although a review of existing data for each indicator conducted by SGRN 06-01 (see Appendices 11-13), indicated that in most cases, there is information available through EU funded projects, national and voluntary monitoring programmes, but that in other cases, there is no data to support the indicator. SGRN 06-01 identified the data required for the implementation of these three indicators.

This section outlines research needs for these indicators with a view to their implementation in the medium to longer term. The requirements for research needs in relation to each indicator are summarised in Table 3 and detailed below.

Table 3. Suggested research projects for indicators that require further research before adoption, based on SGRN 06-01. Indicators and supporting research projects are listed in order of priority. All are recommended for funding under the 'Studies' mechanism.

Indicator	Suggested research projects	App.
Abundance of vulnerable marine mammals, reptiles or seabirds	The development of bycatch indicators requires (1) measures of bycatch rates in different metiers, (2) estimates of population size for species taken as bycatch. Research projects should contribute this information. 1. A pilot program is necessary to investigate the extent of mammal and bird by-catch in different métiers, in order to select the metiers and/or marine regions in which routine collection of by-catch data is necessary. The programme should also determine best practice for by-catch recording (studies). 2. In addition, a research project to collate and evaluate available data from existing monitoring programmes throughout the EU is also proposed (studies). 3. A project to identify the synergies between existing instruments, for example, the Bird Directive (Council Directive 79/409/EEC on the conservation of wild birds), the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) and the CFP would also help to rationalise the use and sharing of data and relationships among objectives (studies).	11
Proportion of	Development of indicators of the proportion of sensitive habitat impacted	12

sensitive habitats impacted	requires (1) that the sensitivity of habitat is described and mapped in a consistent way in all marine regions and (2) that the distribution of fishing impacts on those habitats can be described in space and time. (2) is largely achieved with the VMS, but (1) requires new research. This research should focus on: 1. Developing an agreed and workable EU-wide method for mapping the sensitivity of marine habitats in marine regions. The first step would be to examine and collate existing information on approaches used for habitat mapping in all marine regions and to consider the opportunities for harmonising approaches to sensitivity mapping across marine regions (studies). 2. An examination of synergies between CFP requirements and othermonitoring efforts in relation to sensitive habitats within Natura 2000 sites (EC Habitats and Birds Directives) (studies).	
Abundance of sensitive benthos species	Development of indicators of the abundance of sensitive species requires that the sensitivity of species (to fishing impacts) can be assessed and that their abundance can be quantified. To achieve this, the following research is recommended. 1. A research project which will bring together an expert group including benthic ecologists from each of the marine regions to identify sensitive benthic species, develop indicators and suggest reference levels for these indicators. The expert group could be tasked to identify one or a few sentinel species per marine region for which abundance or distribution data may readily be collected as added value on existing surveys and to comment on the practicality or otherwise of introducing this indicator (studies). 2. A research project to analyse /or collate existing information about benthic organisms which are taken as bycatch and may be sensitive to fishing (studies).	13

Further information on the research issues relating to each indicator (as described in Table 3) is provided in the following text.

Abundance of vulnerable marine mammals, reptiles or seabirds

Currently the collection of abundance data on marine mammals, reptiles or sea birds is not required under the DCR. In contrast to indicators relating to fish, responsibilities for management, conservation status and health of mammals, birds and reptiles are shared between separate sections of the European Commission and member states. Consequently, some relevant information is gathered to meet other statutory or other requirements, not directly related to fisheries, for example, the Habitats and Birds Directives (see section 4.1.2.1 of the SGRN 06-01 report). Due to the high public interest, additional information needed for this indicator has been/is being already collected by voluntary organisations and individuals. Recognising the data already collected, SGRN identified specific data requirements in order to operationalise this indicator:

- Independent estimates of total catch in numbers (described mainly as incidental catch or by-catch) of different species of birds and mammals in relevant métiers
- Estimates of abundance and distribution of vulnerable species of birds, mammals and reptiles for all regions

Proportion of sensitive habitats impacted

Information on the state of sensitive habitats, including exact maps of habitat distribution, substrate and species composition, are a prerequisite when the proportion of impacted habitats is to be used as a state indicator. However, today, limited geographically referenced information exists on the distribution and status of marine habitats in European seas. In addition, the spatial scale required for environmental habitat assessments is usually incomparable with the larger spatial scales that are currently used in fisheries monitoring and management (e.g. ICES squares). A number of ongoing projects deal with habitat mapping in European seas (e.g. MESH, BALANCE etc. See ICES WG on Marine Habitat Mapping, ICES CM 2006/MHC:05 Ref. FTC, ACE), but substantial gaps still remain.

SGRN 06-01 identified the following data requirements in support of the indicator::

- Mapping of marine habitats in European seas
- Information on distribution, composition and status of marine sensitive habitats
- Gear specific mapping of fisheries effort using VMS

Abundance of sensitive benthos species

In some regions there are programs currently monitoring (part of) the benthos in one or more sub-areas, but to data no indicators have been suggested in previous studies (e.g. INDENT, INDECO) that adequately describe changes in the benthos that may be caused by fishing. SGRN 06-01 did not propose indicators. A large number of national programs exist to monitor benthos in regions such as the Baltic and the North Sea. The suitability of using data from these programmes is limited by a) in the general availability of the data, and b) identification of benthic species sensitive to fishing. Several international sources have provided lists of sensitive or vulnerable benthic species. However, most of the current species lists have been assembled as potential indicators of environmental change caused by, for example, effluents or eutrophication, rather than through a classification of species being sensitive to fishing. Therefore these lists cannot be used without further checking to determine if the species are specifically sensitive to fishing.. Lists of sensitive species have been prepared by ICES, OSPAR and other groups. However, of benthic species sensitive to fishing has been agreed.

SGRN 05-03 recommended that a first step towards providing readily usable indicators would be to focus on species that are:

(a) known to be affected by fishing,

(b) sufficiently abundant and with a high-enough catchability in the sampling gear to serve as indicators,

(c) relatively easy to identify

The latter would allow recording of the species' distribution and abundance in existing fisheries surveys.

At present there is relatively little information on wide-scale changes or variance in the distribution of benthic invertebrate species offshore in European waters. However, there have been several monitoring programs specifically aimed at catching benthos and some of the

beam trawl surveys catch benthos and even though the sampling gear used in most of the international surveys aimed at monitoring fish (e.g. IBTS) is often inadequate for sampling benthos, gears that do sample benthos can be carried on research vessels and used during such surveys at relatively little extra cost in terms of time or personnel.

In order to progress on the indicators for sensitive benthos which are impacted by fishing, there is a need to revisit the current lists available and isolate a list of species (not necessarily comprehensive) that are particularly vulnerable for fishing and that fulfil the criteria for species that may be used as indicators of the overall status of the benthos communities. Obviously, this would need to be done on the level of regional seas and would, for regions not represented by the above list of initiatives, need to be expanded.

5.1. Excerpts from SGRN 06-01 report relating to existing information in support of 'Abundance of vulnerable marine mammals, reptiles or seabirds'. Full details of the cited references are provided in the SGRN 06-01 report.

Existing international commitments

The EU and its member states have, separately or collectively, already agreed to a number of commitments which provide for data collection relevant to Indicator 1. . Some of these commitments have been better implemented than others.

1. Habitats Directive (*Council Directive 92/43/EC on the Conservation of Natural Habitats and of Wild Fauna and Flora*)

Under Article 12(4) of the Habitats Directive, Member States must introduce a system to monitor the incidental capture and killing of all species listed on Annex IVa – this list includes all cetaceans and all turtles (that occur regularly in European waters). In light of the results of this monitoring, Member States are required to undertake further research or conservation measures to ensure that the incidental capture and killing "*does not have a significant negative impact on the species concerned*". The deliberate capture, killing or disturbance of cetaceans is prohibited by Article 12(1). Member States have a duty under Article 2 to ensure that any measures taken under the Directive are designed to "*maintain or restore, at a favourable conservation status, natural habitats and species of wild fauna … of Community interest* (which includes all cetaceans and all turtles)*."*

2. Council Regulation (EC) No 812/2004

This regulation came into force on the 1st of July, 2004. The regulation lays down measures aimed at mitigating incidental catches of cetaceans by fishing vessels operating in specific fisheries described in Annexes I and III. Under Annex I, Member States are required to assess the effects of acoustic deterrent devices over time, on vessels over 12m operating in the fisheries and areas concerned. Under Annex III, Member States are required to design and implement independent at-sea observer schemes to monitor cetacean by-catch on board vessels over 15m operating in the relevant fisheries. Additional monitoring is required on vessels less than 15m that operate in the same fisheries. Although this Regulation is very limited geographically and by fisheries, commitments exist on certain Member States.

3. Food and Agriculture Organisation (FAO) Code of Conduct for Responsible Fisheries.

This Code, which was unanimously adopted on 31st of October 1995 by the FAO Conference, provides a necessary framework for national and international efforts to ensure sustainable exploitation of aquatic living resources in harmony with the environment. Article 6 of the Code states that "*The right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources*". It further states that fisheries management "*should not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species*".

Article 7 of the Code specifically deals with measures to reduce the by-catch of non-target species, which includes cetaceans. The Code says "*States should take appropriate measures to minimise …. catch of non-target species, both fish and non-fish species, and negative impacts on associated or dependent species, in particular endangered species*.

Under the code, a number of voluntary International Plans of Action (IPOA) have been drawn up to make these Articles more specific. One of these IPOAs concerns by-catch of seabirds in longline fisheries. Under this IPOA, states with longline fisheries should conduct an assessment to determine if a problem exists with respect to incidental catch of seabirds. Although no figure is provided to define "problem", a technical note attached to the IPOA indicates that the statues of seabird populations, the total annual catch of seabirds and (the results of) monitoring of incidental catch of seabirds should be taken into account.

4. Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS).

ASCOBANS was set up under the auspices of the Convention on Migratory Species of Wild Animals (CMS) and came into force in March 1994. The Agreement was drawn up to co-ordinate and implement conservation measures for small cetaceans in the North and Baltic Seas. The Agreement has recently been extended to include Atlantic waters as far as 15^{o}W and south to be contiguous with ACCOBAMS (see below) to the south of Portugal. Ten European countries are currently Parties to the Agreement, with a number of Range States considering whether to accede. The Agreement requires Member States to, amongst other commitments, to make efforts towards reducing by-catch in fishing nets. At the third Meeting of Parties to ASCOBANS a resolution was passed which called on competent fishery authorities to ensure that the total anthropogenic removal of marine mammals was reduced as soon as possible to below an unacceptable interaction. An unacceptable interaction was agreed as being above 1.7% of the best estimate of abundance. The resolution also underlined that the intermediate precautionary objective was to reduce by-catch to less than 1% of the best available population estimate. Note that this requirement means that a "best available population assessment" is available as well as a measure of by-catch levels. OSPAR has adopted a very similar Ecological Quality Objective (EcoQO), with the implication that similar measurements are also required.

5. Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)

ACCOBAMS was concluded in Monaco in 1996 and entered into force in 2001. The Agreement presently has 18 Parties, with 7 of these being EU Members (and two further to join shortly). Under it, Parties have agreed, both through its Action Plan and through subsequent resolutions (e.g. Resolution 2.21 of the second Meeting of Parties) to "assess …impacts of interactions between cetaceans and fishing activities in the ACCOBAMS area."

Existing information

Mammals

The abundance of cetaceans has been assessed comprehensively in two surveys (both conducted under joint European and Member State funding) for waters off northern and western Europe. In 1994, this survey (SCANS I) covered the North Sea, the southern Baltic Sea and the Celtic shelf. In 2005 (SCANS II), all shelf waters from 62^{o}N to southwest Portugal and the south-western Baltic were surveyed. It is worth noting that these surveys each took one month of one year – variations in abundance between years or within years (seasonal) have not been described. Other surveys have covered smaller parts of this wide area, other times of year and some parts of waters further west (summarised by ICES 2005). There has been no comprehensive abundance survey of cetaceans in the Mediterranean or

Black Seas, but some smaller areas, especially the Ligurian Sea and the waters around the Balearic islands have been surveyed. Plans exist or are in preparation for full abundance surveys of deeper waters off Western Europe (CODA – project turned down for Life funding in 2006) and in the Mediterranean. Surveillance of cetaceans is required under the Habitats Directive, but there is at present no obvious European funding for this obviously multinational requirement, in contrast to funding that is provided from Europe to national programmes of protected areas.

The numbers of seals in the Baltic are surveyed frequently and summarised by ICES for HELCOM on a bi-annual basis (see e.g. ICES 2005). Seal numbers in the North Sea (including the English Channel) have been summarised in OSPAR (2005). Seals in western Britain are counted annually or every five years (depending on species). Numbers around Ireland are not counted regularly. In the Mediterranean, numbers of the endangered monk seal are assessed regularly.

Assessment of cetacean by-catch assessment has been patchy in all European waters despite statutory requirements for such assessment to be undertaken. CEC (2002a, b) gathered existing information together and identified major gaps, but did not assess the effects of the sum of all fisheries by-catches on any one species. This would still be a difficult assessment to make. It may be possible to approximate this figure in some of the better studied areas – for example the by-catch of harbour porpoises in the North Sea.

Seabirds

Numbers of breeding seabirds are counted nationally in many, probably most, countries of Europe, but these are only rarely compiled internationally (see e.g. Tucker and Heath, 1994; ICES 2002). It would not be difficult to compile an update of these figures (and possibly identify gaps); resources would be needed for a compiler and negotiation of the submission of national datasets.

European seas, especially Atlantic seas, also support large numbers of migratory seabirds that breed elsewhere (e.g. the Arctic or southern hemisphere). Assessment of the abundance of these birds requires dedicated at-sea surveys. No comprehensive survey has been undertaken, but most existing data for the European Atlantic and North Sea has been compiled (voluntarily) into the European Seabirds at Sea (ESAS) database. Other data exist for the Baltic Sea but these are less accessible. Little or no at-sea data exists for the Mediterranean or Black Seas. Analyses can be undertaken of the ESAS database to indicate trends in relative abundance and geographic distribution.

There have been few studies of the scale of by-catch of seabirds in European waters, but northern fulmars appear to be particularly susceptible to by-catch on longlines in northern European waters (Dunn and Steel 2001), auks, cormorants and seaducks in gill nets (e.g. in the Baltic, Kattegat and nearshore off Iberia) and Cory's shearwaters to longlines off southern Europe and in the Macronesian seas. In the Mediterranean, limited studies suggest that the Balearic shearwater (red-listed as Critically Endangered) is particularly susceptible to by-catch (Cooper *et al.*. 2003).

Reptiles

Very little information exists to quantify marine turtle populations in Europe. In some places, an indication of numbers hauling out onto breeding beaches is available, with some attempts

to assemble this information (e.g. Groombridge 1990). There appears to be no knowledge of at-sea distribution and abundance.

There have been studies of by-catch of turtles in European waters (e.g. Aguilar *et al.*. 1992; Panou *et al.*. 1992; Camiñas1997; Ferreira *et al.*. 2001; Pierpoint 2000, CEC 2005), and in some countries this has been comprehensive, but there has been no overall assessment of total by-catch or of population effects.

5.2. Excerpts from SGRN 06-01 report relating to existing information in support of 'Proportion of sensitive habitats impacted'. Full details of the cited references are provided in the SGRN 06-01 report.

- Information from national monitoring programmes of Member States (usually available)

- EUNIS Classification system (http://eunis.eea.europa.eu/habitats.jsp)

- VMS data existing but not (yet) available for scientific purposes

- Databases of regional seas conventions:

- OSPAR priority habitat mapping programme, led by JNCC (UK), in which OSPAR Contracting Parties have submitted data on the distribution of 14 threatened habitats which are presented in a web-based mapping application. Whilst substantial progress has been made, WGMHM recognised some significant gaps in the data coverage. (http://www.searchnbn.net/hosted/ospar/ospar.html)

- Interreg-funded MESH programme (www.searchMESH.net), which has now released a web-GIS application of habitat maps and an associated metadata catalogue the north-west Europe area, and is developing broadscale habitat distribution models, together with guidance on protocols and standards for habitat mapping. WGMHM considered that the framework developed by MESH needed to be continued beyond the project end data (April 2007), both to add further data within the MESH area and to expand the mapping to other parts of Europe.

- Interreg-funded BALANCE project, led by DFNA (Denmark), which is developing a broadscale map of marine landscapes for the Baltic Sea and finer scale habitat maps in four pilot areas, forming the basis for spatial planning of marine activities.

- EUNIS habitat classification. Improvement of the EUNIS marine section for the north-east Atlantic and Baltic is underway, via practical mapping programmes (such as MESH and BALANCE) and a standard proforma for proposing modifications to the classification.

- Developments in habitat maps for the North Sea considered EUNIS, MarGIS, UKSeaMap and MESH project outputs, some still in draft form. Work in other regions in progress.

- Summaries of national habitat mapping activities taking place in a number of Member States.

5.3. Excerpts from SGRN 06-01 report on existing information in support of 'Abundance of sensitive benthos species'. Full details of the cited references are provided in the SGRN 06-01 report.

Lists of vulnerable or sensitive species

A large number of national programs exist to monitor benthos in regions such as the Baltic and the North Sea. The suitability of using data from these programmes is limited by a) in the general availability of the data, and b) identification of benthic species sensitive to fishing. Several international sources have provided lists of sensitive or vulnerable benthic species. However, most of the current species lists have been assembled as potential indicators of environmental change caused by, for example, effluents or eutrophication, rather than through a classification of species being sensitive to fishing. Therefore these lists cannot be used without further checking to determine if the species are specifically sensitive to fishing.

The ICES Study Group on Ecological Quality Objectives for Sensitive and for Opportunistic Benthos Species (2004) analysed the category of sensitive species for the development of EcoQOs. While a preliminary list of sensitive species was presented by WGECO (2003), the study group suggested expanding that list under the perspective of the above definition for sensitive species. In this, the purpose was to look on the one hand for sensitive species in general, on the other for species particularly sensitive to fishing. The "Sensitive Species" category was used as defined in the "Texel/Faial criteria" (see above). As the study group pointed out, the term "sensitivity" takes into account both the tolerance to and the time needed for recovery (largely species dependent) from the stressor, in which fragile species are considered especially susceptible to physical/mechanical disturbance.

The ICES study group drew attention to a list of initiatives presenting more promising lists of sensitive species in relation to a range of factors (stressors). These initiatives are: the (a) AZTI Marine Biotic Index (AMBI), which identifies sensitive species from survey data in areas affected by different stressors. (b) The Swedish tolerance values ($ESO_{0.05}$), which are derived from survey data from the whole Swedish coast indicating the richness of the communities in which a species is found (only non-rare species included). (c) The *MarLIN* database which, based on literature review, includes indices of tolerance and recoverability from which sensitivity is identified. (d) The Marine Biological Association of the UK review of literature identifying species that respond to stressors.

Additional lists have been provided by:

- OSPAR (2004) List of threatened and/or declining species and habitats.
- HELCOM (2006) list of endangered species and habitats (HELCOM_5.1-2-add1 fact sheets)
- The ICES-ACE Advice 2005 did not provide a detailed species list, but a general advice on the effects of fishing on benthic communities (ICES 2005a, section 1.3.3). The 2006 ICES advice on request of OSPAR includes a recommendation of an "EcoQO for changes in zoobenthos in relation to long-term eutrophication", but not yet an advice targeted specifically to the effects of fishing (ICES 2006e, Vol. 1, section 1.5.5.4).