

**Comments from Dr Georgios Kazanidis and Dr Covadonga Orejas (members of the ATLAS project) to the Document MSCG\_22-2018-06, entitled “Good environmental status for MSFD Descriptor 1 (seabed habitats) and Descriptor 6 (sea-floor integrity)” prepared by DG Environment**

**Page 2:**

**Text of the document:** “Overall status for each benthic habitat is to be assessed at the scale of subdivisions of each region or subregion which reflect biogeographic differences in species composition of the broad habitat type”

**Comment:** Knowledge in the deep-sea is so scarce that this is not feasible, the GES assessment of the deep-sea is currently address at very local level (scale of 100’s of kms in the best cases).

**Page 4:**

**Text of the document:** (Chapter 4). Forward process for EU-level requirements of GES Decision

**Comment:** In overall we agree on the proposed steps to be taken to develop threshold values and values for the extent of habitat loss and adverse effects, and the way this will be delivered.

The procedure to be followed sounds logical. Below we have some suggestions that hopefully will be useful in the development/planning of next steps. Specifically:

**Text of the document:** (page 4, point a): “...define methods, present evidence, identify knowledge gaps”, we would like to highlight a number of things:

**Comments:** (1) There should be efforts for the collected evidence to be organised/presented in a quantitative way, so that results are presented in such a way [for instance number of damaged benthic ecosystem engineers species per surface area (e.g. per km<sup>2</sup> or per hectare)] that will facilitate comparisons and planning of next steps (e.g. development of threshold values).(2) The collected/presented evidence data should be assessed -among other- in terms of its representativity of the Marine Reporting Unit/(sub)region under examination each time (e.g. good/moderate/poor representativity of region under assessment), (3) is there a plan of how knowledge gaps (e.g. limited availability in deep-sea areas) is going to be dealt with?, (4) we would consider worthy to address separately the deep sea regions (considering deep sea in this context areas below 100-150 meters depth) as the degree of information compared to shallower areas is much lower as well as the extension of explored areas.

**Page 6:**

**Text of the document:** (Chapter 7). A request to ICES for advice aiming to: Advise on appropriate methods to assess the spatial extent and distribution of physical disturbance pressures on the seabed (including intertidal areas) in MSFD marine waters.

**Comments:** (1) Within the EU H2020 ATLAS project we are addressing GES in the European Case studies of the project and working at different scales depending on: (a) case study sites dimensions, (b) data available and (c) evaluating how representative they are of larger areas/regions. However, we are confident that the technological development that it is currently taking place with the possibility to map

at a high-resolution level (e.g. using AUVs) the seabed, will highly contribute to solve some of these currently important gaps.

**Text of the document:** Demonstrate the application of the advice by providing estimates of the spatial extent of physical disturbance per subdivision and per MSFD broad habitat type (where possible), together with associated distribution maps.

**Comments:** Our current experience within ATLAS where we are working with the tool NEAT (Nested Environmental status Assessment Tool) developed within the EU FP7 DEVOTES project (<http://www.devotes-project.eu/neat/>), is that the assessment of GES in the Deep-sea seems to be today a chimera. In the ATLAS project we have data for the indicators “Fishing Effort” (in two case studies) and “Areal extent of human affected area” (in six case studies) which will help us to investigate the physical disturbance.

#### **Page 7:**

**Text of the document:** (Chapter 8). Characterisation of natural seabed habitats

**Text of the document:** “Assessments of seabed habitats require the use of maps of habitat types as a prerequisite to estimate the extent of each habitat which is adversely affected by physical disturbance (D6C3) and by all anthropogenic pressures (D6C5).”

**Comment:** This is one of the clearly identified gaps in the deep-sea areas that prevent a good evaluation of GES except in some specific areas where studies have been conducted. This is also the exercise we are conducting within ATLAS → evaluate the degree of knowledge existent for the European ATLAS case studies. Modelling habitat suitability is one of the key objectives in the ATLAS project (e.g. De Clippele et al. 2017). This work will build on the knowledge gathered from previous EU-funded projects where habitat mapping of cold-water ecosystems was carried out (e.g. the EU-FP6 HERMES project – Wilson et al. 2007; De Mol et al. 2012; the EU-FP7 HERMIONE project – Weaver et al. 2009; Robert et al. 2017; the EU-FP7 CoralFISH project – Tempera et al. 2012; Savini et al., 2014).

**Text of the document:** “abiotic characteristics – the type of substrate... wave and current regimes.”

**Comment:** We think that there should also be a reference in the pH of the seawater especially keeping in mind ocean acidification. Also, another very important parameter (although not regarded as an abiotic one) is the quantity and the quality of organic matter (food supply). There are predicting maps available and probably the IPCC reports would be a great help to include these environmental parameters. Also predictive maps on OM supply in future scenarios are available (Sweetman et al. 2017).

#### **Page 8:**

**Text of the document (Chapter 8.3): “Defining the biological character of a natural habitat type”**

**Text of the document:** “The species which are considered typical of each habitat type fall into three categories: (a) Species which are always present in the community, even if not always in high abundance; (b) Species which are particularly characteristic of the community (i.e. not frequently found in other habitat types); (c) Species which are widespread (i.e. found in many habitat types) and therefore not characteristic of particular habitat types.

**Comments:** (1) One of the important handicaps in the deep-sea is that addressing species levels (taxonomic identification but also knowledge on the biology, physiology and ecology of the species) is very challenging when not impossible in most cases. Paramount example of this is the sponge-dominated communities where very few information is available. Furthermore, the fact that the deep-sea work on benthic communities, especially when dealing with hard substrate communities, is conducted by means of Remotely Operated Vehicles (ROVs) or cameras makes the identification of organisms at species level very challenging. (2) Consequently, we are addressing GES in ATLAS at the habitat/community level. For example, we have data for indicators like -among others- “Areal extent of biogenic/vulnerable habitats” (in three case studies), “Abundance of coral colonies alive” (in two case studies) and “Density of biogenic reef forming species” (in four case studies). For indicators related to fishes we have gathered data at species level e.g. for the indicators -among others- “Biomass of selected fish species” (in one case study) and “Abundance of non-commercial demersal fish and cephalopods” (in two case studies).

**Text of the document:** “Along with the species composition information, it is typical to derive the abundance of the species in the community, often expressed as absolute numbers, percentage cover of the seabed or qualitatively (e.g. rare, occasional, frequent, common, abundant). The typical abundance of each species in the community is also an important characteristic of the natural habitat. Thus, a kelp forest is distinguished from a kelp park by the density of the kelp plants; a seagrass or mussel bed is distinguished from surrounding habitats by the density of the habitat-forming species (here, seagrass or mussels). For habitats which lack a single dominant species (most habitat types) the relative abundance of species in the community remains an important characteristic of the natural habitat”

**Comments:** (1) This is the problem we mentioned in point “a” about the need for data to be given in a measurable/comparable way. Currently, and from our experience now within ATLAS, there is a lot of data from deep-sea regions which are available in relative numbers which are not comparable to the results from other areas. For instance: “number of specimens per ROV transect” or “number of specimens per image”. This situation is frequently even further hampered from the absence of important information (e.g. speed of the ROV, total length of the transect, or surface covered per photographic image), that could help to extract real quantitative data and make it comparable to the results from other areas. Further as mentioned before, given the challenges about taxonomic identifications it is frequently impossible to measure the abundance of each species.

**Text of the document:** “...statistical programmes such as SIMPER...”.

**Comment:** Since there is a reference to statistical programmes, we think it would be better to refer here to PRIMER which is the program, and not to SIMPER, which is a type of analysis within the programme PRIMER.

## **Page 9:**

**Text of the document:** “...However, these characteristics change due to the adverse effects of anthropogenic pressures...”.

**Comment:** We think that here clarification and rephrasing is needed since the biological characteristics can also change due to natural variability of the abiotic conditions and it is worthy to keep this distinction through the text.

**Text of the document:** "...different phases of the same habitat..."

**Comment:** We do not think that the term phase is the most suitable here; we would recommend "it is the *same* habitat under a different status".

**Text of the document:** "...e.g. rare, occasional, frequent, common, abundant..."

**Comment:** We think that in this point (and in overall, through the manuscript) the incorporation of references to peer-reviewed publications / books would help. But we are aware this is a technical document and probably scientific references cannot be added. In order to define these categories, producing a document with guidelines and ideas on how to set-up threshold values (as mentioned in a comment in page. 23 of the document) would be useful.

#### **Page 10:**

**Text of the document** (Chapter 9): Adverse effects and threshold values as a basis to define the state of a habitat

**Text of the document:** "For example, physical pressures (e.g. physical disturbance) may damage or kill fragile species in seabed communities, biological pressures (e.g. non-indigenous species) may out-compete species in the community, and chemical pressures (e.g. from hazardous substances) may affect..."

**Comments:** Maybe worthy to add here pH, O<sub>2</sub> changes...

**Text of the document.** Schema presented with the GES ad Sub GENs.

**Comments:** (1) It is important to highlight that this figure is based in shallow ecosystems, as, for instance within the main aspects to evaluate the GES is "indigenous species" as well as "dense green algae". These two aspects cannot really be considered in the deep-sea as the knowledge is so scarce that we cannot nowadays distinguish between indigenous species or not as many communities are being described now or in the last 20 years, hence, this is something that may apply to a very scarce number of locations. Moreover in the deep-sea the density of green algae is not a criteria as not light is available there. This highlight again the need to separate in some way the modus operandi when addressing GES in the deep-sea and the need to define specific conditions!

#### **Page 11:**

**Text of the document** (Chapter 9): Adverse effects and threshold values as a basis to define the state of a habitat

**Text of the document:** "... Habitat loss can be considered as the most severe form of adverse effect (i.e. when the habitat cannot recover)..."

**Comment:** Thinking in previous experiences in terrestrial ecosystems, sometimes habitat fragmentation is worse than habitat loss...

**Text of the document:** (Chapter 11). Basis for defining adverse effects on seabed habitats

**Text of the document:** a. "The abiotic characteristics, in combination with..."

**Comments:** Here pH, O<sub>2</sub>, etc could be included too

**Text of the document:** e. "...This scale of assessment is provided in the GES decision"

**Comments:** In cases as the deep-sea, if the regional or subregional scale have to be applied, it will be necessary the use of predictive habitat mapping as well as predicted conditions to identify pressures and potential impacts

**Text of the document:** "...total biomass of the community..."

**Comment:** We think that this is a quite challenging measurement to be achieved.

#### **Page 12:**

**Text of the document:** "...the nature of the pressure..."

**Comment:** Intensity and frequency of the pressure need also to be taken into account.

**Text of the document:** "...sensitivity of the habitat..."

**Comment:** Is there an agreement about the assessment of habitat sensitivity (e.g. criteria)?

**Text of the document:** "...should be compatible (Art. 4(1)(f))...(Figure 1)".

**Comment:** Compatible with what? These lines look vague. We suggest arranging accordingly.

#### **Page 13:**

**Text of the document. Table 2 Annex I**

**Comment:** Ideally this should be also applied to the deep-sea, but the current situation (on the light of the ATLAS case studies, in many cases examples of relatively well studied and known areas) show that the dimensions of the investigated zones are so small that a further subdivision in EUNIS habitat types might end with a puzzle of many small areas for the different habitat types. Tools like NEAT, specifically created to assess GES, work properly at the scale of 100 of kilometres hence, for the deep sea we choose the option to leave the classification of deep-sea habitats in a very high level (hard substrate/soft bottoms)

#### **Page 16:**

**Text of the document:** Annex II

**Text of the document:** "...Advice prepared by ICES should be applicable to all EU marine waters, distinguishing where necessary regional and subregional differences..."

**Comment:** Besides regional and subregional differences we consider bathymetric range should be also taken into account when assessing GES due to the remarkable differences existing between shallow-mesophotic and deep- habitats. Level of information is also remarkably different.

**Text of the document:** "...Advise on the benefits of knowing the variation and trends in the data during a six-year assessment periods (e.g. for environmental status or management purposes), and on the most appropriate spatial resolution for the data (e.g. in relation to spatial variation in the broad habitat types)"

**Comment:** For many deep-sea ecosystem engineers six years is too short to assess their recovery.

**Text of the document:** "Overall status of benthic habitats should be assessed at the scale of subdivisions of each region or subregion which reflect biogeographic differences in species composition of the broad habitat types"

**Comment:** Difficult when assessing deep-sea habitats.

#### **Pag. 17**

**Text of the document:** "As physical disturbance from bottom-contacting fishing gear is likely to be a substantial contribution to the total extent of physical disturbance, particular attention is needed to define an appropriate method or methods for this type of disturbance"

**Comment:** Access to Vessel Monitoring System (VMS) data is not always straightforward.

#### **Pag 25:**

**Text of the document (Annex 4):** "It is not clear why only the spatial extent and distribution are mentioned, and not the intensity or and spatial and temporal variation in the pressure. Taken those parameters into account would allow for a more precise assessment of the physical disturbance pressures."

**Comment:** We consider that bathymetric range is absent from this context and needs to be included.

#### **Page 31:**

**Text of the document:** (Annex 5) Comment on the draft Terms of Reference for a Technical Group (Annex 5), with a view to its adoption at MSCG in November 2018)

**Text of the document:** In page 31 of the paper it is mentioned that "the TG will address the task of proposing threshold (quality of habitat) and extent of loss and adverse effect values".

**Comment:** (1) Is there a plan of how the threshold values are going to be set up? Or is this something that it is planned to be decided within the TG? We feel that there should be an agreement on the rules of how this crucial step is going to be achieved. The same also applies for the definition of reference conditions (e.g. undisturbed status) (2) Further, as mentioned through this document the special

characteristics as well as current knowledge of deep-sea areas need to be considered when intending to address such challenging aspects.

#### **List of references used in our reply**

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- De Mol, L., Hilario, A., Van Rooij, D., Henriët, J-P. 2012. Habitat mapping of a cold-water coral mound on Pen Duick Escarpment (Gulf of Cadiz). *GeoHAB Atlas of Seafloor Geomorphic Features and Benthic Habitat*, 645-654.
- Robert, K., Huvenne, V.A.I., Georgiopoulou, A., Jones, D.O.B., Marsh, L., Carter, G.D.O., Chaumillon, L. New approaches to high-resolution mapping of marine vertical structures. *Scientific Reports* 7, Article number: 9005.
- Savini, A., Vertino, A., Marchese, F., Beuck, L., Freiwald, A. 2014. Mapping cold-water coral habitats at different scales within the Northern Ionian Sea (Central Mediterranean): An assessment of coral coverage and associated vulnerability. *PLoS One* 9: e87108. <https://doi.org/10.1371/journal.pone.0087108>.
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- Wilson, M.F.J., O'Connell, B., Brown C., Guinan, J.C., Grehan, A.J. 2007. Multiscale Terrain Analysis of Multibeam Bathymetry Data for Habitat Mapping on the Continental Slope. *Marine Geodesy* 30, 3-35.
- Weaver, P.P.E., Boëtius, A., Danovaro, R., Freiwald, A., Gunn, V., Heussner, S., Morato, T., Schewe, I., van den Hove, S. 2009. The Future of Integrated Deep-Sea Research in Europe: The HERMIONE Project. *Oceanography* 22, 178–191, <https://doi.org/10.5670/oceanog.2009.18>.