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”MiniPANACEA” expert workshop report - Madrid (Spain) 25th to 27th May 2022

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Abigail McQuatters-Gollop, Ulrike Schückerl, Izaskun Preciado, Cristina Vina-Herbon, Laurent Guérin.
”MiniPANACEA” expert workshop report - Madrid (Spain) 25th to 27th May 2022. Minutes of NEA-
PANACEA Expert Groups, 43 p., 2022. mnhn-04149157

HAL Id: mnhn-04149157

<https://mnhn.hal.science/mnhn-04149157>

Submitted on 3 Jul 2023

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NEA-PANACEA Expert Groups

North-East Atlantic project on biodiversity and eutrophication assessment integration and creation of effective measures

“MiniPANACEA” expert workshop report
Madrid (Spain) 25th to 27th May 2022
Location: Nuevos Ministerios, Madrid



Co-chairs: Abigail McQuatters-Gollop (Pelagic Habitats, United Kingdom), Ulrike Schüchel (Food Webs, Germany), Izaskun Preciado (Food Webs, Spain), Cristina Vina-Herbon (Benthic Habitats, United Kingdom), Laurent Guerin (Benthic Habitats, France)



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Executive summary and key messages

The MiniPANACEA workshop was organised by the leads of the expert groups that are part of NEA PANACEA– see below. It was attended by over 20 experts from 7 Contracting Parties mainly from the expert groups on food webs, benthic habitats, and pelagic habitats.

The expert group leads are:

- Pelagic habitats: Abigail McQuatters-Gollop (abigail.mcquatters-gollop@plymouth.ac.uk)
- Food webs: Ulrike Schüeckel (ulrike.schueckel@lkn.landsh.de), Izaskun Preciado (izaskun.preciado@ieo.csic.es)
- Benthic habitats: Cristina Vina-Herbon (cristina.herbon@jncc.gov.uk), Laurent Guerin (laurent.guerin@mnhn.fr)

The main objectives of this meeting were to progress common themes across benthic-pelagic-food webs components as well as addressing specific issues with the assessments. More specifically, there were three primary objectives:

A: Progress the State Chapter of each Thematic assessment: Discuss the level of information required (ecosystem types & assessment scales of indicators, qualitative/quantitative, trends/thresholds, etc.), and the integration between indicators (e.g., BH1/BH3/FW4 Spain initiative) for the development of the state chapter

B: Specific focus on common points and links across indicators and between ecosystem components: Discuss relationship between indicators and components (e.g., BH1/BH2/BH6, BH3/BH4, PH1/PH2/PH3, etc.) and also PH/BH/FW following the work from EcApRHA [WP4 project](#), evaluate the cohesion or incorporation/links towards other types of assessments (e.g., between component (benthic, pelagic, food web), and also with eutrophication pressures.

C: Climate change effects: Discuss the development of the biodiversity summaries, including common environmental background (temperatures, acidification, etc.) and specific inputs needed (pelagic, benthic and food webs specific impacts). The Climate Change and Ocean Acidification thematic assessment draft with common environmental background to be used for climate change signals from indicators for the specific topics covered.

This report outlines the minutes from each of the three expert groups as well as the specific conclusions and actions which came out of discussions.

Pelagic Habitats expert group

Participants

In person:

Abigail McQuatters-Gollop, University of Plymouth, UK, Chair
Matt Holland, University of Plymouth, UK
Arnaud Louchard, Centre national de la recherche scientifique, FR
Birgit Heyden, AquaEcology, DE
Rafael Gonzalez Quiros, Instituto Español de Oceanografía, ES
Isabelle Rombouts, Flanders Marine Institute, BE
Lisette Enserink, Rijkswaterstaat, NL
Fabrice Lizon, Université de Lille, FR
Michelle Devlin, Centre for Environment, Fisheries and Aquaculture Science, UK
Eileen Bresnan, Marine Scotland Science, UK
Lena Avellan, OSPAR Secretariat, UK

Links

[MiniPANACEA QSR space](#)

[QSR Guidance](#)

[Pelagic Thematic Assessment](#)

[Standard definitions for assessment areas](#)

Pelagic Habitats Timeline

- May 25-27: MiniPANACEA
- June 14-16, 2022: UltraCOBAM to focus on thematic assessment (TA)
- June – Aug 2022: PHEG works on pelagic thematic assessment
- 22 August 2022: Expect final QSR indicator assessment for feedback by pelagic experts
- 5 Sept 2022: Deadline for return of comments on QSR indicator assessments to UoP/CNRS
- 3 October 2022: Expect QSR thematic assessment for feedback by pelagic experts
- 17 October 2022: Deadline for return of comments on draft TA to UoP
- 17 October 2022: Document deadline for QSR indicator assessments and CEMP guidelines to COBAM
- 7-9 November 2022: ICG COBAM 2022
- 21 November 2022: Document deadline for BDC. TA to be submitted to BDC by UoP.
- 12-15 December 2022: Final version thematic assessment due
- January – February 2023: Integration of ICG QSR feedback into pelagic TA by UoP

Actions

Priorities before UltraCOBAM

Action: Matt, Arnaud and Birgit. Based on the [standard definitions table](#) [https://osparcsp.sharepoint.com/:w:/r/sites/QSR/_layouts/15/doc2.aspx?sourcedoc={5633FAC6-61B2-4F76-838E-88766B49884C}&file=COMP4 categorisation list.docx&wdLOR=c20C34F76-CFE8-47FE-B844-04F80C35BC2F&action=default&mobileredirect=true&cid=6b477664-e167-4fb6-8113-1f610e030a26](https://osparcsp.sharepoint.com/:w:/r/sites/QSR/_layouts/15/doc2.aspx?sourcedoc={5633FAC6-61B2-4F76-838E-88766B49884C}&file=COMP4%20categorisation%20list.docx&wdLOR=c20C34F76-CFE8-47FE-B844-04F80C35BC2F&action=default&mobileredirect=true&cid=6b477664-e167-4fb6-8113-1f610e030a26) started by Lena, the Pelagic and Eutrophication groups must reach agreement on the classification of all COMP4 assessment areas so there is agreement in the assessments between Pelagic and Eutrophication. Matt and Arnaud to coordinate with Birgit on this. Most are easy but

some will need to be decided upon (e.g. Kattegat, Norwegian Trench). Needs to be done ASAP as other work depends on these decisions before it can happen!

Action: Birgit to add a column indicating OSPAR regions covered to the [standard definitions table](#) on the SharePoint which will have habitat classifications coordinated with Matt and Arnaud

Action: Matt to lead some thinking on the generation of clear colour coded summary tables based on tables Lena started for the pelagic thematic assessment. This is specific to the detailed tables describing results and how we then integrate those results into the colour table.

Action: Matt and Arnaud to generate a table of indicator results for PH1, PH2 and PH3 by assessment area to help with the thematic assessment. Matt and Arnaud to have the first application of these tables summarising the indicator results for each habitat type in each region.

Action: Abigail to write letter to Eileen's managers to state how instrumental she has been to the progress we have made in Madrid and to encourage her further involvement in OSPAR meetings

Action: Abigail and Matt to create a deadlines summary table for the working group leads with key paper deadlines, etc. Include periods of review by EGs. Also update pelagic timeline table.

Action: Matt and Arnaud to notify Lena when indicator assessments are ready for policy review (and will therefore not be changed again)

Actions for after UltraCOBAM

Action: Michelle to provide all monthly in-situ nutrient data from the COMPEAT tool for the COMP4 areas to Matt and Arnaud

Action: Matt and Arnaud to check methods of indicator assessments to make sure that it is clearly stated that the shapefile is being often updated and may not perfectly reflect the true state of the environment.

Action: Matt and Arnaud to check N-P ratios in their models.

Action: Matt to provide some code to Arnaud to help automate switching between in-situ and modelled variables.

Action: Arnaud to coordinate with Peter Land and Gavin Tilstone to understand how their productivity work can benefit one another.

Action: Matt and Arnaud to work out confidence score based on number of samples for each assessment area for their indicator assessments

Action: Matt to update PH1 tool. Isabelle requested the PH1 tool be updated to allow the calculation of an annual PI in addition to the single PI to represent the entire comparison period

Action: Arnaud and Birgit to work together to reach an agreement in the reporting of their indicators to ensure they are compatible. Otherwise, this may be an issue flagged by BDC.

Action: Matt to use slides from the meeting for the MiniPANACEA workshop report

Action: Matt to insert pressures table for PH1 into MiniPANACEA workshop report. Completed

Action: Matt to try extending modelling to 1960 with available variables with complete time-series only.

Action: Matt to change workflow so that climate change effects can only be reported where temperature is significantly increasing over the time period assessed, where temperature has one of the highest variable importance rankings and where lifeform abundance is increasing or decreasing.

Action: Arnaud to provide EQR maps for PH3 or list of EQR by assessment area to Birgit.

Action: Matt to see if the tables from the CC chapter of IA2017 are useful for our work on the TA

Action: Matt and Arnaud to ensure that cases, where climate change signals are detected, are commented on specifically in the climate change chapter.

Action: Arnaud to write a section in his indicator assessments about the limitations of using a fixed assessment period, versus identifying ecologically meaningful assessment periods from the actual data

Less time sensitive actions

Action: Arnaud to consider the same temporal resolution as the eutrophication group. Completed.

Action: Matt to generate a heat map of Kendall statistics for the assessment areas for the paper and for conceptualising the thematic assessment, but probably not needed in the PH1 indicator assessment.

Action: Arnaud to write a paper on whether the taxonomical level has an impact on the diversity indicator. May be good to coordinate with Eileen.

Action: Eileen to write a paper on the challenges in assessing phytoplankton biodiversity within the overall community using standard microscopic identification techniques.

Action: Matt to assess Pearson correlation for each of the variables presented in the summary table but assess at different timeframes.

Day 1 – 25/05/2022

PH1 overview – Matt Holland

- COMP4 shapefile is outdated but we can't keep reanalysing the data.
- The Portuguese and Spanish assessment areas have been updated by those contracting parties, otherwise the rest of the assessment areas have only had minor changes

Action: Matt and Arnaud to check methods of indicator assessments to make sure that it is clearly stated that the shapefile is being often updated and may not perfectly reflect the true state of the environment.

PH2 overview - Arnaud

- Arnaud has conducted a random forest analysis like the one Matt did for PH1
- Examined anomalies rather than 12-month smoothed values as was used for PH1
- Ranked variable importance by assessment area with a separate random forest model
- Patterns of change in phytoplankton biomass linked to variation in light attenuation in North Sea re: Capuzzo paper on change in turbidity in the North Sea
- Michelle: Imbalanced ratio of N-P is driving the change in phytoplankton
 - Do we need to add the ratio as a pressure in our models?
 - Yes, we can try this
 - But it needs to be molar ratio. Not just NO₃:PO₄
 - We can get this data from the COMPEAT tool via Michelle

Action: Matt and Arnaud to check N-P ratios in their models.

- Biomass is declining, which is an anthropogenic impact resulting from change in nutrients
- Chl-a and nutrient data available through ICES
- Michelle can help access the monitoring data from ICES
- Where in-situ data are available, they are used rather than the modelled data for PH1
- Michelle can help access the in-situ data from the COMPEAT tool, rather than using the high-resolution CTD data from the ICES data portal

Action: Michelle to provide all monthly in-situ nutrient data from the COMPEAT tool for the COMP4 areas to Matt and Arnaud

- For PH1, data workflow uses in-situ data instead of modelled where it was available. Matt can provide the code to Arnaud to automate this process for PH2

Action: Matt to provide some code to Arnaud to help automate switching between in-situ and modelled variables.

- Si was not available from ERSEM, but was available for some of the stations
- Also, important to consider Si as a nutrient driving variation in the abundance of diatoms
- Would be interesting to assess at multiple temporal scales, monthly, seasonally and summer versus winter as the Eutrophication team has done

Action: Arnaud to consider the same temporal resolution as the eutrophication group. Decision – not to rerun models for the indicator or thematic assessment but might rerun on the side to progress our work further in the future.

- Arnaud used Spearman rank correlation between each environmental variable and lifeform abundance and displayed on heatmap. Could do this for PH1, but would need one heatmap per lifeform.
- It might also be useful to use this heat map method to report the Kendall statistics for PH1 in the paper, as it can aid visualisation of consistent trends across lifeforms within assessment areas. Split up the two clusters into two tables.

Action: Matt to generate a heat map of Kendall statistics for the assessment areas for the paper and for conceptualising the thematic assessment, but probably not needed in the PH1 indicator assessment.

- Zooplankton abundance most closely linked to O2 in offshore areas

Return to Plenary

- Follow the example provided by the Benthics. Generate a summary table by assessment area with assessment areas as rows and indicators as columns with indicator results in the fields
- This is a logical first step which could help us integrate the results for the thematic assessment
- For PH1/FW5 there will be 8 columns, for PH2 and PH3 there will be two columns each
- For the integrated assessment to be useful for MSFD reporting we need to report on variable salinity, coastal, shelf and oceanic/beyond shelf
- Subdivision of these categories can then be reported on in greater detail

Action: Matt and Arnaud to generate a table of indicator results for PH1, PH2 and PH3 by assessment area to help with the thematic assessment.

- Do we report PH1/FW5 in food webs chapter as well as pelagic chapter? Or only in one? Still unclear

After lunch – Activity 2 – Eutrophication assessment

- Anouk on the FW and P indicators
 - To what extent has Arnaud looked to determine whether the assessment areas are suitable for the analysis for FW2?
 - Made the decision to use the same assessment scale for the entire pelagic assessment for compatibility
 - PH1/FW5 - Change in lifeforms – Anouk would like to assess how patterns in the gridded data compare to patterns in the COMP4 assessment areas. Matt mentioned that Carolyn Graves (Cefas) is already working on a similar analysis as part of DDIPA. We will set up a meeting to discuss further after MiniPANACEA.
 - Matt has sent figures and contact details for Carolyn to Anouk
 - PH3 – Change in biodiversity index – To what extent are the assessment areas used relevant for the assessment of this indicator? - untested
- Peter Land and Gavin Tilstone on PP trends in NW European shelf from satellite
 - Big difference in trends <2005 and >2005
 - Calculated seasonality and subtracted it from the data
 - Detected opposite trends in North Sea and Atlantic in comparison to what we detected in PH1, however, their data was only 2007-2019
 - 2006-2018 trends in PP were mostly negative
 - Peter's work is very similar to the work Arnaud did on FW2 with the same PML data
 - Need to find a way to harmonise this work with Arnaud's work
 - Birgit: Perhaps a way forward is to consider that FW2 assessment used OSPAR assessment period, whereas Peter examined the data and had to decide where the trends were significant to shape their assessment temporal scale.
 - Since the comparison and assessment periods are different, they are essentially separate analyses

Action: Arnaud to coordinate with Peter Land and Gavin Tilstone to understand how their productivity work can benefit one another.

Post afternoon tea – overview of discussions for next day on state chapter

- Lena: for each assessment need to provide a summary statement on the status of each OSPAR region (e.g. Region I, II, III)
- We need a narrative story for each region
- Table of habitat types by region for each indicator
 - e.g. for Region IV - Bay of Biscay & Iberian Coast: variable salinity, coastal, shelf, beyond shelf as rows, PH1, PH2, PH3 as columns
- PH3 is currently a common indicator for Region III, but not for Region II or Region IV, so currently only reported for Region III unless we petition for it to be extended to other regions as common.
- Ways we can summarise multiple results across lifeforms and assessment areas for pelagic habitats within OSPAR regions:

- Identify COMP4 areas which have statistically significant increase or decrease
- Or describe for each OSPAR region the number of assessment units displaying a particular trend
- Can use a confidence score for each indicator depending on the quantity of samples used to calculate the indicator for each assessment area
- It is important to be able to have a confidence score to apply to each component
- Can use total area or nSamples as a weighting for each area. This data is already present in the PH1 results output

Action: Matt and Arnaud to work out confidence score based on number of samples for each assessment area for their indicator assessments

- Where there are CC signals in the indicator results, we should comment on these specifically for the CC chapter

Action: Matt and Arnaud to ensure that cases, where climate change signals are detected, are commented on specifically in the climate change chapter.

- Logical first step would be to categorise all of the COMP4 areas into geographic categories (i.e. coastal, shelf, beyond shelf, variable salinity)
- Pull out all the main messages about CC from each assessment for the CC chapter
- The finest spatial scale we need to report on is the coastal, shelf, off shelf etc for each region, and we can describe specific example COMP4 assessment areas as we see fit
- Lena has populated this in the draft thematic assessment on the QSR Sharepoint
- If we see change and it is bc of human pressure than it is inherently bad
- Making a judgement of good or bad can be based on link to human pressure
- State chapter
- Need to assign COMP4 units to water types and regions where there is overlap – Birgit table is a start. All fixed-point stations will be coastal type.

Action: Matt, Arnaud and Birgit. Based on the table started by Lena, the Pelagic and Eutrophication groups must reach agreement on the classification of all COMP4 assessment areas so there is agreement in the assessments between Pelagic and Eutrophication. Matt and Arnaud to coordinate with Birgit on this. Most are easy but some will need to be decided upon (e.g. Kattegat, Norwegian Trench). Needs to be done ASAP.

Day 2 – 26/05/2022

Back to the plenary discussion

- One methodology used for reporting by Benthics is to report as proportion of WFD regions in different quality status categories
- These proportions can be weighted by spatial area
- BDC will ensure that the research groups are sharing a similar message across the same marine areas (e.g. benthic cannot say North Sea is impacted by eutrophication if there is not agreement from the Eutrophication group)

Post morning tea break – More discussion of PH2 and coordination with Eutrophication

Action: Matt to update PH1 tool. Isabel requested the PH1 tool be updated to allow the calculation of an annual PI in addition to the single PI to represent the entire comparison period

- Issues in compatibility of the PH2 phytoplankton indicator contradicting with the eutrophication indicate for bulk Chl-a

Action: Arnaud and Birgit to work together to reach an agreement in the reporting of their indicators to ensure they are compatible. Otherwise, this may be an issue flagged by BDC.

- Satellite data for Chl-a has issues because there is very little representation in northern latitudes during winter. Significant temporal interpolation of up to 3 months was required for PH2.
- Discussion of FW2 primary productivity and how that one compares to the outputs of the eutrophication assessment.
 - Arnaud to do Cumulative Sums of PH2 to compare to FW2
 - Many notable changes in Cumulative Sums of FW2 in 2005 – good synergy with MSS data
- 2005 was an important change in productivity in the North Sea
- Solvang and Planque (2020) - Estimation and classification of temporal trends to support integrated ecosystem assessment paper in ICES JMS might be helpful for sorting out trends in the PH2 and/or FW2

Action: Arnaud to write a section in the thematic assessment about the limitations of using a fixed assessment period, versus identifying ecologically meaningful assessment periods from the actual data

- Rafael has conducted principal component analysis to define appropriate ecologically meaningful areas based on patterns in Chl-a for Spanish marine areas
- ICES regions largely line up with the results of the principal component analysis
- In oceanic areas, a greater proportion of PP sinks and closer to the coast a greater proportion of PP moves up the food web
- We may be able to make late-stage changes to the indicators, since nobody in BDC has seen our assessment, but eventually we need to call it and move on the thematic assessment

Action: for Matt and Arnaud to decide when to stop making changes (based on the conversations in Madrid) and notify Lena that the indicators are ready for policy review.

Post lunch - Discussion of the ECOHAM model from Hermann Lenhart

- Hermann Lenhart – Climate change is more than an increase in temperature!
 - Hydrodynamic changes, increase in storm events, changes in wind direction, circulating pattern, flushing, hydrology and river nutrient loads, changes in ecology
 - Occurrence of O₂ deficits are seasonal and regional in the North Sea
 - O₂ increase in wintertime and slow decline during stratified growing season and rapid increase when storm events occur in autumn
 - There is uncertainty in what is driving this annual cycle
 - Reduction in O₂ concentration is purely driven by biological parameters, according to the ECOHAM model situation
 - Takes 12 years for O₂ to be depleted in NNS, v 2 years to be depleted in SNS
 - NNS has higher stratification, but also greater volume of water due to bathymetry
 - Impact of CC on O₂ in the GNS
 - Earlier onset and increased intensity of stratification – Lowe et al 2009
 - Increase in water temp – Weston et al 2008

- Reduced winter nutrient import by Atlantic – Groger et al 2013
- Higher increase in winter temperature v summer – Mathis and Pohlman 2014

Lena – Lena made a table Pt 3

- Habitat type categories: Plume areas, coastal, shelf assessment units, oceanic assessment units
- >200 m = oceanic (standard definition)
- Lena has already categorised the COMP4 areas into habitat type categories in a table
- Need a column to identify which OSPAR regions each assessment area belongs to

Action: Birgit to add this column to the standard definitions table which will have habitat classifications coordinated with Matt and Arnaud

- What to do about the Norwegian Trench? – unique assessment unit
 - Atlantic is fully oceanic
 - Portuguese units are also probably oceanic
 - Kattegat Deep and Skagerrak should be treated separately, as in IA2017
 - This table will be available on the Pelagic drafting folder for the QSR
 - Table of mean salinity and depth available for all COMP4 areas from the GitHub
 - Coastal Portuguese areas no longer included in the current version. Use the updated version if possible.
- Good talk by Matt on pelagic and climate change!

Action: Matt to use slides from the meeting for the MiniPANACEA workshop report

Action: Matt to insert pressures table for PH1 into MiniPANACEA workshop report. Completed.

Environmental pressures which could affect plankton lifeform pairs and specific lifeforms they might affect indicated.

Table 1 Environmental and anthropogenic pressures and their significance to each of the plankton lifeform pairs.

	Temp	Sal	Nuts	1° Prod	Wind	MLD	Heat-Flu	Transparency	Sus	Solids	FW input	Offshore circ	Climate index	Grazing pressure	Carbonate	Disturbance	Fishing	Aquaculture	Contaminants
Dino/Diat	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Gel Zoo/Fish L	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Small/Large(Cop)	Y			Y							Y	Y	Y	Y			Y		
Crust/JellyZoo	Y			Y	Y	Y						Y	Y	Y		Y	Y		
Large/Small phyto	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Phyto/Non-car Zoo	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pelagic/tychopel	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Holo/Mero	Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cer/Non-C	Y			Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Diat/Auto mix Dino	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tox Dia / Tox Dino	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ciliate/MicroBog	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

**low confidence*

Priority
 direct pressure (an anthropogenic pressure that can potentially be managed at an appropriate scale)
 direct pressure and priority parameter
 note caution in the term "pressure"

The above table (**Table 1**) applied to individual lifeforms using the available data to represent the above listed pressures.

Table 2 Relevant Links between pressures and lifeforms.

Variable in Figure 3	Variable name	Diatoms	Dinoflagellates	Holoplankton	Meroplankton	Gelatinous	Fish larvae/eggs	Large copepods	Small copepods
Temp	Sea surface temperature	✓	✓	✓	✓	✓	✓	✓	✓
Salinity	Salinity	✓	✓	✓	✓	✓	✓		
Nutrients	Ammonium	✓	✓						
	Total nitrogen	✓	✓						
	Nitrate	✓	✓						
	Phosphate	✓	✓						
	Total phosphorous	✓	✓						
	Silicate	✓	✓						
Wind	Wind speed	✓	✓	✓	✓	✓	✓		
MLD	Mixed layer depth	✓	✓	✓	✓	✓	✓		
Attenuation	Light attenuation	✓	✓			✓	✓		
Precip	Precipitation	✓	✓	✓	✓	✓	✓	✓	✓
Current	Current velocity	✓	✓	✓	✓	✓	✓	✓	✓
Climate indices	Atlantic Multidecadal	✓	✓	✓	✓	✓	✓	✓	✓

	Oscillation								
	North Atlantic Oscillation	✓	✓	✓	✓	✓	✓	✓	✓
Carbonate	Surface pressure of CO ₂	✓	✓	✓	✓				
Year	Sampling year	✓	✓	✓	✓	✓	✓	✓	✓

Pelagics: Climate change discussion

- Need to make sure we are looking at the trends in environmental data if we want to draw conclusions on climate change
- We are missing trends in lifeforms because we are limited by time-series length because the nutrient datasets are so short (25 years)
- We would have to eliminate all nutrient data if we wanted to extend the timeseries of climatological data.
- Should NAO be in the same model as other climate variables?
- If NAO isn't important the model won't select it
 - But will it influence model training? No, because not all variables are assessed at the same time and the decision trees are averaged into each random forest.
 - Useful paper: Cycles, trends and residual variation in the Iberian sardine recruitment time series and their relationship with the environment – Santos et al 2012
 - Reference that could be useful for stats: ICES Journal of Marine Science (2012), 69(5), 739–750. doi:10.1093/icesjms/fsr186
 - Can we run the model using only ICOADS data since it's long to see what we get?
 - This will include several climate variables, but not all
 - Otherwise, we miss the NS regime shift and are missing actual climate-driven change. If we stay with 1993, we are only looking at the new regime and picking up noise.
 - Can we check between long and short time-series of lifeforms to see how close change is (as in Bedford et al 2020 but with models)?

Action: Matt to try extending modelling to 1960 with available variables with complete time-series only.

- Modify the algorithm so that the dataset commences in 1960
- Use the p-value of the correlation between observed and predicted test values as a test of model quality to decide whether or not to report relationships with environmental variables
- Use the Kendall statistic to examine whether the change in temperature is increasing, decreasing or steady. For CC to be true, temperature must be increasing over the period assessed

- For assessment area to be impacted by climate change there are several criteria which must be met:
 - The abundance of the lifeform must be increasing or decreasing
 - The temperature must be increasing over the same time period
 - The temperature must be one of the most important of the variables examined

Action: Matt to change workflow so that climate change effects can only be reported where temperature is significantly increasing over the time period assessed, where temperature has one of the highest variable importance rankings and where lifeform abundance is increasing or decreasing.

- Best way forward is to assess where temperature has increased in the environmental data and we can only claim that climate change has had an effect where temperature has increased.

Action: Matt to Assess Pearson correlation for each of the variables presented in the summary table but assess at different timeframes.

Day 3 – 27/05/2022

Day 3 – morning plenary

- We have decided to go ahead and change the linking to environmental drivers by lengthening the time series and using ICOADS data to 1960. The NEMO/ERSEM modelled data will have to be dropped for this.
- We need to be prepared for the climate change component before we go to Utrecht
- Benthics have come up with a reporting system in Excel which varies by indicator, but the colours are the same. Some indicators have more categories than others, but the colours remain the same. We have adapted that for pelagic based on the McQuatters-Gollop et al paper (in press)
- Each boundary between each colour will have a numerical threshold to decide which category to place for each assessment area
- This is meant to provide a simple understandable way to represent data
- Blue, green, yellow, orange, red = from healthy to not healthy
- Each group will upload their notes from the meeting to the QSR Sharepoint, with clear actions indicated.
- Add the presentations and notes from the meetings to the OHBEG miniPANACEA folder on the QSR Sharepoint
- Useful paper: Nature communications paper on “The Misuse of colour in Science Communication” – Crameri Shephard and Heron 2020

Arnaud on the PH3 indicator

- Background to indicator – PH3 tells us about community structure.
- This is a controversial indicator because big questions remain around what biodiversity means and how change in biodiversity impact ecosystem services
 - How are rare species being factored in? Are there criteria for inclusion?
- What about just look at 10 (or) most dominant groups? But is this still biodiversity? Does abundance equate with importance? However, is it useful to look at only dominant taxa, as this may not be a true representation of biodiversity. Does abundance mean importance?
 - Traits could be a good way forward to deal with this issue.
 - Could it be useful to take a lifeform approach to PH3 or are we travelling in circles?

- PH3 indices calculated for each COMP4 area
- No taxonomic aggregation of the data in this process. The samples were used as they were received.
 - Had to compromise between losing data resolution and dealing with bias
- All indices integrated for phyto and then also for zoop
- New 2D plots of PH3 index by year and month for each assessment area from CPR data
- No significant trends detected in the EQR over the whole region, but looks like mostly negative trends
- Birgit: In the indicator assessment, maybe we only display the overall maps in increasing or decreasing trends, but it would be very useful to also show the underlying EQR maps as well to support the interpretation of trends. This may have to go into the extended results.
- Consider that decline in Ceratium taxa could be driving the change in the EQR
- We still do not understand what drives diversity in plankton communities
- Rafael and Eileen: Diversity indices are not particularly useful or meaningful because the taxonomic resolution is not reliable for taxa identified via microscope. The fact that we don't fully understand how the biodiversity indices work means this indicator is not particularly useful for MSFD assessment. We cannot call this diversity. It should be considered as a topic for research, but not for reporting
- Eileen: The PH3 index is very misleading (at least for phytoplankton) and not appropriate, and she disagrees in reporting it as we have due to issues in identification and variability in the identification of samples.

Action: Arnaud to write a paper on whether the taxonomical level has an impact on the diversity indicator. May be good to coordinate with Eileen.

Action: Arnaud to provide EQR maps for PH3 or list of EQR by assessment area to Birgit.

- Rafael: taxonomic analysts may have expertise in identifying particular taxa, however this biases the various datasets overall because they are better at identifying to high taxonomic resolution within some taxonomic categories than others.
- CPR was designed for zooplankton, but if we look at phytoplankton there will be a real issue with biases but every dataset has bias and no dataset is perfect.

Action: Eileen to write a paper on the challenges in assessing phytoplankton biodiversity within the overall community using standard microscopic identification techniques.

Post morning tea – Discussion on Summary Table for State Chapter of the Thematic Assessment

- Not the role of the Pelagics team to write the non-state components of the TA
- It is our job in Utrecht to advise the people writing DIPSR without the state component
- Pelagics are writing the state chapter only
- We need a table to summarise what is happening
- We need to produce similar summary tables to what the Benthic groups has produced
- We have provided an approach which uses three categories, however the benthic are using a finer 5-category system
- Eileen: We have anecdotal evidence of gill issues in farmed fish from diatoms. Concerning for the future of pelagic ecosystems.
- We cannot discuss the impacts in this chapter. That would be for the impact chapter

- Rafael: We should use more cautious language in our approach on reporting. “high likelihood of ...”, “small likelihood of ...”, etc.
- Birgit: Maybe we use “not good” instead of “poor”. But otherwise, she supports this approach.
- Rafael: If we use more cautious language as described above, we can eliminate the “uncertain” category
- We don’t use this approach for every lifeform, and we use a semi-quantitative approach per habitat type, per subregion, per indicator
- This is due in November, but we need to be sure that we do not miss a chance to present a clear message that we understand pelagic habitats are changing and this is not a good thing
- Birgit: Suggesting we use Good, not good and uncertain to keep things simple
- Margarita: Red=“many concerns”, amber =“some concerns”, green=“few or no concerns”
- This was a suggestion from policy and was applied in the latest Scottish assessment
- Matt: We can maintain the focus of the blunt categorisation for policy, but internally for us we can think of this from the more cautious POV. For us to conceptualise assigning these categories, since scientists want to use cautious language and policy want to use certain language.
- Final categories: not good = many concerns, uncertain = some concerns, good = few or no concerns, or unassessed
- Decision: We will have three tables (For Region II, III, IV) with words describing state and three tables with colour categorising state

Action: Matt and Arnaud to start working on the three tables from our indicator results in time for UltraCOBAM.

- We need a bit of time to assign to these categories
- We should present this at UltraCOBAM in June

Action: Abigail to write letter to Eileen’s managers to state how instrumental she has been to the progress we have made in Madrid and to encourage her further involvement in OSPAR meetings

Climate change chapter of pelagic TA:

- Need to include a summary of what are the climate change considerations that are important for each ecosystem component – so climate change in an issue for pelagic bc of x,y,z
- If there are CC signals in the indicator results, we should comment on these specifically for the CC chapter of the pelagic TA
- Pull out all the main messages about CC from each indicator assessment for the CC chapter of the ecosystem component TA
- It seems that the pelagic component of the Climate Change chapter of the TA is a literature review, reflecting the current state of climate change plankton research for the region, whereas the climate change component of the state chapter of the pelagic TA is meant to describe our findings from the indicator assessments in relation to climate change. This is however still unclear and not the approach benthic is taking.
- FW downloaded tables from CC chapter of IA2017

Action: Matt to see if the tables from the CC chapter of IA2017 are useful for our work on the TA

Action: Abigail and Matt to create a deadlines summary table for the working group leads with key paper deadlines, etc. Include periods of review by EGs. Also update pelagic timeline table.

Questions for UltraCOBAM in Utrecht – Bee Berx

1. Are we meant to extract pelagic info from climate change TA?
2. Is the climate change part of the pelagic TA meant to concentrate on our indicators or pelagic habitats in general from the literature?

Summary tables for Pelagic TA

- **It's critical to end up with a clear summary table (similar to the benthic colour table) so that our indicator messages can be communicated clearly to readers**
 - For benthic each colour category has an assigned group of values representing 'poor', 'good', etc. This varies for each indicator. These are not GES thresholds!

Action: Matt to lead some thinking on the generation of clear summary tables based on tables Lena started for pelagic. This is specific to the detailed tables describing results and how we then integrate those results into the colour table.

Action: Matt and Arnaud to have the first application of the coloured tables summarising the indicator results for each habitat type in each region.

Table 3 High level table for policy makers. Colours determined by McQuatters-Gollop et al (2022).

REGION III	PH1/FW5	PH2	PH3
Variable salinity	Orange	Grey	Green
Coastal	Red	Orange	Green
Shelf	Green	Green	Red
Oceanic/ beyond shelf	Green	Grey	Red

Table 4 Descriptions of each category designation from McQuatters-Gollop et al (2022).

Not good	Indicator value is below assessment threshold, or change in indicator represents a declining state, or indicator change is linked to increasing impact of anthropogenic pressures (including climate change), or indicator shows no change but state is considered unsatisfactory
Uncertain	No assessment threshold and/or unclear if change represents declining or improving state, or indicator shows no change but uncertain if state represented is satisfactory
Good	Indicator value is above assessment threshold, or indicator represents improving state, or indicator shows no change but state is satisfactory

Unassessed	Indicator was not assessed in a region due to lack of data, lack of expert resource, or lack of policy support.
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Table 5 Table of key summary details and narrative.

REGION II	PH1/FW5	PH2	PH3
Variable salinity	<p>“River plumes are represented as triangles.”</p> <p>Long-term statistically significant increase of Meroplankton, Fish larvae</p> <p>Long-term statistically significant decreasing trend of Holoplankton</p> <p>Long-term decreasing trend of Diatoms, Dinoflagellates</p>		
Coastal	<p>‘Channel well mixed’ COMP4 assessment area;</p> <p>Holoplankton, Meroplankton, fish larvae, large copepods: increasing trend</p> <p>OR</p> <p>Holoplankton: 2 units increasing trend / 5 units decreasing trend</p> <p>Meroplankton: 5 units increasing trend / 4 units decreasing trend</p> <p>Large copepods: 1 units increasing trend / 7 units decreasing trend</p>		
Shelf	<p>Significant decreasing trend; Dinoflagellates</p> <p>Decreasing trend; Diatoms, Holoplankton, Small copepods:</p> <p>Increasing trend: Fish larvae, large copepods</p> <p>OR pairs?</p> <p>RED result: Gelatinous – Fish larvae</p> <p>GREEN result: Holoplankton – Meroplankton, Large copepods, Small copepods</p>		
Oceanic/ beyond shelf			

Conclusions and next steps

Objective A - State chapter thematic assessment

- Agreement was reached on the categorisation of COMP4 areas into pelagic habitat categories. Further discussion on this topic to happen at UltraCOBAM in June
- Agreement was reached on specific categorisation of indicator results based on an “in press” manuscript summarising methods used for IA2017
- Agreement was reached that summary tables need to be easy to understand and have a mutual language of results (colours/categories/trends)
- Indicator leads to start drafting narrative summary text in QSR SharePoint and pulling out key messages from results and any links between indicators

Objective B - Links across indicators and between ecosystem components

- Indicator assessments need to be updated to incorporate feedback provided in MiniPANACEA. Indicator results can only be linked once this initial work is completed
- Integration of pelagic indicators and other ecosystem components will not be possible within QSR23
- Inclusion of pelagic data and indicator results into FW components has lots of potential for future integration and assessment, where possible, potential links to be included in knowledge gaps

Objective C - Climate change effects

- Indicator leads to review climate change pressure drivers and activities and consider the potential impacts on pelagic ecosystems
- Members of the climate change assessment group will help drafting the assessments
- Indicator leads to provide content in the thematic assessment to assist the climate change assessment group to complete their work

Benthic Habitats expert group

Participants

In person:

Laurent Guérin, Office français de la biodiversité, FR, Co-Chair
Cristina Vina- Herbon, Joint Nature Conservation Committee, UK, Co-chair
Stephan Duncombe-Smith, Joint Nature Conservation Committee, UK
Stefano Marra, Joint Nature Conservation Committee, UK
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Dennis Walvoort, Wageningen University & Research Centre; NL
Mats Blomqvist, Hafok AB, SE

Actions

indicator	action	responsible
all indicators & TA	<ul style="list-style-type: none"> complete the table with the assessment areas and indicator status results need to establish common colours for indicators presentation in TA Inserted any results on T&D from indicator calculations as a separate narrative from the POSH tables In the State Chapter revise text to ensure there is a clear narrative, with links between indicators and key messages given to fill the climate change example table with reference numbers in the relevant cells, reference papers given below table, add additional information for T&D but without duplication the results from the POSH assessments 	Cristina & Laurent, indicator leads, OBHEG experts
BH1	<ul style="list-style-type: none"> change unit in TA table from km² to percentage for habitat 	Ana Garcia-Alegre/Maidier Plaza-Morlote
BH2a	<ul style="list-style-type: none"> change the unit of assessment from number of water bodies to area (km²) 	Anna Lizinska

	<ul style="list-style-type: none"> make tables containing a summary of the coastal water bodies surfaces for each WFD status add information in the description of indicator that relates to historical changes in methods and results masking any conclusions or trends in assessment periods is not possible 	
BH2b	<ul style="list-style-type: none"> values rescaling to 0-1 to aid interpretation. to determine categories of “good” or “bad” 	Sander Wijnhoven
BH3	<ul style="list-style-type: none"> Add 2 columns for results in TA - with impact and type of fishing 	Stephen Duncombe-Smith
BH4	<ul style="list-style-type: none"> Revise the suggestions for the summarise tables 	Petra Schmitt

Day 1 – 25/05/2022

Objective A - State chapter thematic assessment

Progress on the STATE chapter – Cristina Vina-Herbon

- Discussion on the best approaches to present Benthic Habitat types in the Indicator tables for the STATE chapter
- Summary of the results per indicator needs to include a short narrative explaining the results and any key messages. Caveats or key limitations to be included to aid the interpretation of results
- The state chapter will have one table per assessment unit, containing:
 - Row for each BHT
 - Column for Indicator BH2/BH3/BH4 etc
 - Result for each habitat/indicator (where relevant)

Results will also need to be summarised per OSPAR region with a set of key messages. Presentation of indicators showing their applicability per OSPAR region was discussed (**Table 6**)

Table 6 Overview of Assessment Units and common benthic indicators

Region	Subregions	BH1	BH2a	BH2b	BH3	(BH4)
Region I	N/A	N/A	N/A	N/A	N/A	N/A
Region II	Central NS		x	x	x	(x)
	SNS		x	x	x	(x)
	Channel		x	x	x	(x)
	Kattegat		x	x	x	?
	Norwegian Trench		x		x	?
Region III	SCS		x		x	

		NCS		x		x	
Region IV		North Iberian Atlantic	x	x		x	
		South Iberian Atlantic	x	x		x	
		Gulf of Biscay	x	x		x	
		Gulf of Cadiz	x	x		x	
Region V		Wider Atlantic					
		Macaronesia					
		Atlantic projection (Hatton)				(x)	

BH1 SoS Update - Ana García-Alegre (ES)

- A draft rapid assessment has already been sent to OBHEG
- Working on final draft BH1 assessment now
- Also, working on approaches for an alignment and/or integration between BH1 and BH3. This is based on a case study using BH1 state curves for the calibration of the habitats disturbance matrices within the BH3 method. Hope to write a paper on this new approach
- If data is not received from FR or PT, BH1 will apply indicator using the Spanish assessment results (response curves). This will assume the same response across different regions to pressure

How the State chapter will be drafted - Lena (OSPAR)

- Start by compiling all the results and tables, summaries in the narrative text can be filled in later
- Region I Norway has already started
 - o All are invited to check and comment
- POSH assessments, some are complete
 - o Summary table of results
 - o The secretariat will proofread assessments
 - o The secretariat will also pull out/highlighting any results/messages that are particular important for the state chapter
 - o Please review/elaborate any comments or key messages
- Indicator leads need to complete AU tables of results in excel and paste into the word file
 - o It will really help to read across indicators/assessments/Regions for trends and patterns
 - o Do we want to include pilot assessments in indicators table?
 - o Do we want to have an additional summary for assessments that are not fully agreed?
- Final assessments units agreed at BDC to be used for the OSPAR regions narrative

- The chapters will be interactive with hyperlinked images to link to the main assessment of each indicator

Discussion:

Cristina – How will we add BH3 T&D habitat assessment to the state chapter?

Lena – Do not change the POSH tables, it would be best to add the narrative text with the results of BH3 T&D separately and link to the indicator assessment

UK – Agrees to only include pilot in text, not table

Action: Inserted any results on T&D from indicator calculations as a separate narrative from the POSH tables

Action: Cristina & Laurent revise text to ensure there is a clear narrative, with links between indicators and key messages given

STATE chapter thematic assessment results tables discussion

Cristina – Proposal to fill in the table with BHT and indicators with examples, to see how it will work and potential shortcomings.

- Suggestion for BH1; could have “41% GES” per BHT
Maider (ES) – Suggest precautionary values “###% highly affected”
Mats – Suggests using colours to avoid too much text
- Suggestion to only include “uncertain” within text narrative

Sander – for BH2b results are median values but include uncertainties. Also, different assessment periods, suggests giving results from past and present as a trend “up or down arrow”

- Normalised Margalef for each sample site (with references by country, to account for different sample methods)
- Some areas show change (some improvements in southern north seas, others show no change)
- Suggests giving Margalef result with Arrow of change since previous assessment (up, down, no change)

Stephen – For BH3 we could group low/med/high % disturbance per BHT

- Also, constant/variable fishing results for BH3 can be included

Anna (FR) BH2a – WFD quality status

- Outputs per region for each waterbody, 7 assessments (invert., macroalgae, etc.), 5 categories/colours (7 categories including 2 grey) of results
- Regions don't all have the same number of waterbodies
- Suggest using percentage categories for the table
- Results can't be split by BHT
- Sediment and rock habitats for invertebrates and macroalgae could be included in the table

Mats – Raised the problem of soft sediment macroalgae/angiosperms (eelgrass?) in sediment

Mats – Questioned waterbody groups included in Norwegian Trench

Anna – waterbodies were defined by countries for WFD, and assessment unit (e.g. Norwegian trench) were agreed by OSPAR following proposal made at SuperCOBAM.

Anna – Some of the waterbodies were split between the 2010 and the 2016 assessment, which makes it impossible to compare

Mats – Raised the problem of historical changes in methods and results masking any conclusions or trends in assessment periods

Cristina – Changes in assessment methods can be explained in the narrative, if results can't be in the table they will have to be left out

Sander – Highlights that POSH trend assessments are expert judgement, not defined by statistical results

Example of the suggested summaries for the presentation of results can be found in **Table 7 & Table 8**.

Table 7 Benthic state chapter Assessment Unit tables

Broadscale habitat type	BH1	BH2a (invertebrate)	BH2a (plants)	BH2b	BH3	BH4 (Candidate) Offshore	
Littoral rock and	NO	NO	X	NO	X		
Littoral sediment	NO	X		NO	X		
Infralittoral rock and	NO	NO		NO	X		
Infralittoral coarse sediment	The proportion of sentinel species (between 0 and 1). These values can be divided into 3 categories (highly disturbed, not highly disturbed, Mod/uncertain)	Total area (%) of 5 categories (5 WFD categories Bad, poor, medium, good, high) or make two groups High/Good & Others	Total area (%) of 5 categories (5 WFD categories Bad, poor, medium, good, high) or make two groups High/Good & Others	Median Relative Dm values [between 0 and 1] in categories with three colours (High, Mod, low) for [2016-2021], poss with arrow trends	% Total disturbance 3 categories [Low, medium, High] [+ Trends/Arrow?] for fishing. % Total disturbance 3 categories [Low, medium, High] for aggregate extraction	% of Sealed loss (per category -none, low, md, high - or total) % of Unsealed loss (per category or total)	Trends for BH2a = just in indicator assessment and note here that no real state trends available (as due to lack of data of last WFD assessment periode or monitoring changes)
Infralittoral mixed				NO	X		
Infralittoral sand				X	X		
Infralittoral mud				X	X		
Circalittoral rock and	NO	NO	X	NO	X		
Circalittoral coarse		X (sediment)		X	X		
Circalittoral mixed				NO	X		
Circalittoral sand				X	X		
Circalittoral mud				X	X		
Offshore circalittoral rock and biogenic reef	NO	NO	?	NO	X		
Offshore circalittoral		NO	?	X	X		
Offshore circalittoral		NO	?	NO	X		
Offshore circalittoral sand		NO	?	Median Relative Dm values [between 0 and 1] or Dm categories with colours (Good, Mod, Mod to Poor, Poor) for [2016-2021], poss with arrow trends	% Total disturbance 3 categories [Low, medium, High] [+ Trends/Arrow?] for fishing. % Total disturbance 3 categories [Low, medium, High] for aggregate extraction	% of Sealed loss (per category or total) % of Unsealed loss (per category or total)	
Offshore circalittoral		NO	?	X	X		
Upper bathyal rock and	NO	NO	NO	NO	?		
Upper bathyal sediment	%: e.g. 50% Highly disturbed and 50% not	NO	NO	NO	?		
Lower bathyal rock and	NO	NO	NO	NO	?		
Lower bathyal	NO	NO	NO	NO	?		
Abyssal	NO	NO	NO	NO	?		

Use of colors (e.g. green, grey, orange/red)

Table 8 Proposed colours and categories for benthic Assessment Unit summary tables

BH1			BH2a					BH3			BH2b			(BH4)			
not highly disturbed %	Mod/uncertain dist %	highly disturbed %	High Status	Good Status	Mod Status	Poor Status	Bad Status	Low disturbed %	Mod disturbed %	High disturbed %	High diversity	Mod diversity	Low diversity	no loss	low loss	Mod loss	High loss

Action: Indicators leads to complete the table with the assessment areas and indicator status results

Action: All to establish common colours for indicators presentation in TA

BH2b presentation – Sander Wijnhoven

- Methodology is slightly different from Intermediate Assessment 2017, as calculations are now at BHT and per assessment unit
- So far only results calculated from grab and core data (still processing others)
- There appears to be some results following dredge and trawl pressure, but outcomes still being interpreted and need input from DK
- To standardise data, the lowest level of taxonomic resolution for a taxa has been used (e.g. presence/absence for a taxa if it was P/A in any dataset)
- Very mixed results when looking at different countries
 - o Therefore, used reference values by country to adjust for this (different sampling methods)
- Currently used temporary assessment units (although not much different from new ones)
 - o will re-run with the new final assessment units
- Looking at three assessment periods
- The VMS pressure map was only used to identify reference areas. Used a percentage cut-off for reference values dependent on Swept Area ration (SAR) (e.g., where no zero SAR reference data is available)
 - o Assigned quality codes (number of years/samples in pressure areas)
 - o Used best quality available (depends on samples in low pressure areas/quality) to set reference values
- Results show lots of low-quality status in coastal areas
- 2009-2015 has more data for interpretation
 - o Quality gradient evident across dogger bank area from west to east
 - o Low quality scores can't all be related to fishing pressure
 - o Some patterns that will need discussing further with the group
- Suggests using median values for a BHT (for use in summary tables of the state chapter)

Discussion:

Mats - Questions how is relative Margalef above one (this is above reference value?)

Sander - this is a problem with areas without c-square VMS data

Mats – Raises the need to take into account confidence in c-squares

Sander – VMS is only used when taking reference values, and these are only in low pressure areas with the best quality score.

Cristina – SAR values are good indication of pressure but there can also be additional pressure, including fishing within Low SAR values

Cristina – Questions if BH2b reference values will be recalculated with the new data?

Sander – because reference is taken at “75%” there is still data above the reference value. This is a product of reference taken from non-reference states

Cristina & Sander – agree, values might need rescaling to 0-1 to aid interpretation. Also, need to determine categories of “good” or “bad”

Sander – Requests feedback on how to assess trends and add to the summary table

Group – Proposes Median relative Margalef values for BH2b or categories with colours, including “arrow” trends for assessment periods. Proposed categories (good, moderate, moderate-poor, poor)

BH3 presentation – Stephen Duncombe-Smith (UK)

- Assessments discussed with experts and data providers at the BH3/BH4 workshop in London
- Feedback and suggestions for the regional focused workshops have been incorporated. The species data have been incorporated following the updated method
- No trends from aggregates
- Fishing disturbance with three groups and trends
- Same for aggregate extraction if possible
- % areas for constant and variable fishing (only on pressure data)

Discussion:

- Cristina – Highlighted that at present we need to keep aggregates separate from fishing disturbance as the method to combine both alongside other pressures types is not yet developed

Cristina – Highlighted that requests for results of constant and variable fishing are common from fishing management

Sander – Suggested two columns, impact and type of fishing

Cristina – Need to see example results in the table – it could get very complicated as impacts within a c-square are not always caused by just one type of fishing

Cristina – Suggested option to combine values of constant fishing and high SAR could end into one result

Sander – Suggested an additional table to present pressure data

BH4 Presentation (from hybrid meeting) - Cristina Vina-Herbon (on behalf of Petra Schmitt)

- BH4 is candidate indicator, we need to discuss if and how it could be included in table
- Petra has already created a good model/diagram of interactions
- Two types of assessment sealed/unsealed loss
- Results by broadscale habitats and activity types
- Uses category approach to estimate risk of loss by fishing and aggregate extraction

Discussion:

Hannah Schambil – Suggests adding BH4 results to the table but grey them out. Sander agrees

Mats – It's important to highlight that BH4 is only offshore values (there will be much more loss at the coast)

Cristina – Important to represent confidence in the table, agrees with the suggestion to grey out BH4 results or another symbology to show it is only candidate indicator

Hannah Schambil – Questions how confidence can be normalised across the table/indicators

Stefano – Gives the example of birds assessments, confidence is given as broad categories (confidence on methodology and confidence on data)

Cristina – Proposes confidence should be mentioned in the state chapter, given in the narrative.

Action - All to check the QSR guidelines for what is recommended regarding confidence.

Further discussion on the summary tables for assessment units:

Ana (ES) – Suggest changing BH1 from km² to percentage for habitat. (e.g., “% highly disturbed” and “% not highly disturbed”)

Cristina - Mats suggested splitting cells into colours, important that the table is easy to understand – there will be many tables across regions (AUs). Example proposed in **Table 8**. Maybe it could be possible to split the cells into colour scales?

Day 2 – 26/05/2022

Objective A - State chapter thematic assessment

Presentation on thematic assessment report structure – Lena Avellan

Structure -

Overview: RI – RII – RIII – RIV – RV (in a table with red/green)

- Confidence statement – expert judgement, not statistical (following Annex 1 guidance documents), Confidence depends on integrations, thresholds etc.

- Very short – just main message (finger in the air), can be arrows, very broad message

Region I:

Narrative text (only)

Region II:

Narrative text (short summary for whole Region II taken from AUs; Key message)

Region II

AU1: Table of indicators/BHT (e.g. **Table 7**)

AU1 – Narrative text

AU2: Table of indicators/BHT

AU2 – Narrative text

AU3: Table of indicators/BHT

AU3 – Narrative text

..... (5 AUs)

Region III:

Narrative text

Region III

AU1: Table of indicators/BHT

AU1 – Narrative text

AU2: Table of indicators/BHT

AU2 – Narrative text

Region IV:

Narrative text

Region IV

AU1: Table of indicators/BHT

AU1 – Narrative text

AU2: Table of indicators/BHT

AU2 – Narrative text

AU3: Table of indicators/BHT

AU3 – Narrative text

AU4: Table of indicators/BHT

AU4 – Narrative text

- There will be opportunity to tidy tables later (to remove habitats not present in different Regions etc.)

Discussion:

Cristina – Highlighted that the tables and text need to be clear and untestable to a broad audience

Lena – Any results given in the summary tables need to be very clear in the final indicator assessment. Need to have a clear main result. Readers shouldn't need to go through many tables/maps/charts to get the final result. BH3 needs a condensed result (overarching main message) not lots of different maps and tables without a conclusion. OSPAR Regions scale is more of a key message, detail will be in the individual indicator assessments

Cristina– Highlighted that BH3 needs to be decided for use in the Region V Atlantic projection (BH3 is not a common indicator in RV), so results can also be shown as candidate indicator

Objective B - Links across indicators and between ecosystem components

Presentation “can the environment status of benthic habitats be a good indicator of the status of food web?” – Izaskun Preciado

- How can we integrate BH1 and FW4?

FW4 summary:

Mean Trophic Level

- Change in trophic level to reduce top predators with pressure
- Uses the same BH1 (BESITO) international trawling dataset (IBTS)
- Performs different cut-offs (top predators trophic level 4) to get a mean Trophic level per haul (fish => MTL 4)
 - Performs again with MTL >3.25 (fish and cephalopod)
 - Performs again with all biomass (MTL>2.0) all fish and inverts.
- Same analysis as BESITO (GAMs)
 - Clear decrease of MTL with SAR
- Results show areas where we can expect MTL to increase by 20% without trawling
- Would like to analyse how BH1-FW4 are interacting (bottom up/top down etc.)
 - We have BH1 per trawl and FW4 per haul (do they correlate?)
 - Expect to find correlation
 - This will be done per MSFD BHT
 - Will try with different scenarios: MTL cut offs >2, >3.25, >4 and broad habitats

Discussion:

Cristina – Questions if the relationships will be true correlation or just because they are from the same datasets

Izaskun – believe it should be separate, BH1 doesn't use MTL >3.25 taxa and vice versa

Stefano – Ecopath is a model designed to get a snapshot of the food web in each unit, approach is more benthic orientated (benthic functional groups, traits, feeding type etc.)

Cristina – Biomass assumptions in models are usually incorrect for benthic data

Izaskun – Spain has very good benthic data for these areas (trawl surveys) with biomass for long time series.

Cristina & Stefano – Agrees this approach is very interesting and keen to see results

Izaskun – Results are still ongoing, not likely by QSR23, also no specific chapter for it

Stefano – Questions next steps or it's uses

Izaskun – Currently it will be very helpful to validate results of indicators of different descriptors (benthic vs food webs) following an integration method

Cristina – Questions how will it be extended to other regions, for example BH1 needs adapting outside of R IV, data isn't collected in the same way (endobenthos not epibenthos and sometimes only fish data, sometime inverts only, not all together), we don't have equivalent IBTS biomass data

Cristina – IBITS in the North Sea have continued for a long time, it's not likely the different method/data will be resolved

Izaskun – Suggests the possible use of beam trawl data could be used in the North Sea

Cristina – Agrees, we can look into North Sea beam trawl data, although they are usually fish focused. Could possibly look at biomass from grabs along with trawl data, interesting possibilities to bring them together

Cristina – Very interesting for next steps following QSR, really good to demonstrate bringing the benthic fish data together. Need to open discussion on how this data can be collated in the future.

Sander – NL has benthos data from trawls (biomass) that can potentially be used

Cristina – Certainly some biomass data we can look at (NL), can bring this together with ecopath/BH1 work

Ana (ES) – BH1 can be used with endobenthos and then can use with FW4 in other regions.

Cristina – Highlights those differences in assessment areas/units will need addressing (FW looking at COMP4)

Cristina – very important we pursue this following the results from R IV. Will see how it can be applied in areas where the surveys/data are not so standardised.

Izaskun – Fishnet is a project with similar goals

Sander/ Cristina – Highlight that DE might have some biomass data suitable, should all be available through ICES open source. Denmark has biomass too.

Action - Sander to provide links to datasets to Hannah

Objective A - State chapter thematic assessment

Anna (FR) – Questions if there are colour style guides

Hannah – There are guides for colours per country but not defined for results etc.

Anna (FR) – Raised that colours vary for indicators (red-green/green-blue etc.), these need to be easy for the end user to read

Cristina – Agrees, need comparison of meaning between colours/indicators

Hannah – Highlighted that the text also needs to be non-scientific; if possibly, use the same colours across tables/indicators.

An example based on the discussion is shown in **Table 9** with the suggestions from presentation of results for three indicators

Table 9 Example values for benthic Assessment Unit tables (BH1, BH2b & BH3)

Broadscale habitat type	BH1 (% Not Highly disturbed/ % Moderate disturbed/ % Highly disturbed. Green/Grey/Red)	BH2a	BH2b	BH3 Low disturbance (inc. <1)	BH3 Low disturbance	BH3 Moderate disturbance	BH3 High disturbance	BH3 (low, mod, high)
Circalittoral coarse sediment	NO	X (sediment)	NO	NO	NO	NO	NO	NO
Circalittoral mixed sediment	NO		1,18 ↗	NO	NO	NO	NO	NO
Circalittoral sand	NO		0 ↘	60% ↘	10% ↘	30% ↔	10% ↔	10% ↘, 30% ↔, 10% ↔
Circalittoral mud	NO		NO	60% ↗	30% ↗	25% ↔	15% ↘	30% ↗, 25% ↔, 15% ↘
Offshore circalittoral rock and biogenic reef	NO	?	NO	60% ↗	30% ↗	25% ↘	15% ↗	30% ↗, 25% ↘, 15% ↗
Offshore circalittoral coarse sediment	NO	?	0,83 ?					
Offshore circalittoral mixed sediment	19.33 / 33.28 / 47.39	?	0,59 ↘					
Offshore circalittoral sand	43.55 / 27.35 / 29.11	?	0,63 ?					
Offshore circalittoral mud	9.28 / 14.84 / 75.88	?	0,95 ↔					

BH3 summary table notes:

- Should the area in disturbance categories <1 (e.g., no pressure data) be included in the “low” group for the summary table (“inc. <1”)
- % of each group is for the aggregated assessment 2009-2020, arrows would be for any trend identified over the annual layers
- Option to colour code on the trend “Up or Down” or based on category.
- If the “Low” category includes <1 disturbance, increasing % trend would be green (increasing Moderate or High = Red)
- Option to just colour the % of each group with a trend arrow (far right above)
- For aggregate extraction assessment

Action: Indicator leads BH1 to change unit in TA table from km2 to percentage for habitat

Action: Indicators leads BH2a:

- change the unit of assessment from number of water bodies to area (km2)
- make tables containing a summary of the coastal water bodies surfaces for each WFD status
- add information in the description of indicator that relates to historical changes in methods and results masking any conclusions or trends in assessment periods is not possible

Action: Indicators leads BH2b to change values rescaling to 0-1 to aid interpretation.

Action: Indicator leads BH3 to add 2 columns for results in TA - with impact and type of fishing

Action: Indicators leads BH4 to revise the suggestions for the summarise tables

Day 3 – 27/05/2022

Update on benthic group progress - Cristina Vina-Herbon

- The group discussed colours further and the presentation in the state chapters
- The group decided to keep candidate indicators on the table, have them in brackets to indicate they are not the same as agreed indicators
- The group discussed methods to make the state chapter easy to understand with policy makers, using clear language that will be understood by non-scientific readers
- Encourage others to think on how they will present their results in an understandable way
- Objective C, the group looked at previous QSR assessment on climate change and what was expected or predicted to happen. Agreed to interpret the new assessment with previous climate change predictions.

Discussion:

Abigail – Questioned how the benthic group will present results without thresholds

Jose & Cristina – Explained that indicator results are groups of values, they are not thresholds, intended to be a simple summary of values that are easy to understand. There is lots of variations in types of values (% , area, diversity, status etc.,)

Laurent – Raised Concerns about the colours used in the summary tables (red/green, good/bad!), colours used might need to be more subtle

Rafael – Recommended the paper “the misuse of colour in science communication”, paper shared over Teams chat

Cristina – The tables proposed are not final, requests feedback from all. Highlights that they need to be easy for policy readers to understand quickly

Jose – The MSFD is good status/bad status, so why create more categories. BH1 categories are currently chosen to align for MSFD.

Cristina – Highlighted that the proposed groups are not agreed, they need to be discussed further in the benthic group. Any categories need to work for both OSPAR and MSFD. The proposal is a starting point for further agreement.

Objective A - State chapter thematic assessment

Overview of previous discussions on state chapter summary tables - Cristina Vina-Herbon

- Table of AUs and which indicators will be included (**Table 6, Table 9**)
- Structure of STATE chapter will follow Lena’s diagram
 - This is not going to be printed, will be interactive
 - The summaries need to be per OSPAR Region

Discussion:

Jose – for MSFD it will be two colours but agrees other categories for OSPAR could be included

Laurent – for OSPAR it's possibly better to include more categories so nationally they can choose what they want to consider good/bad

Jose – BH1 will always be a continuous value (proportion of species) but will be given as two categories for MSFD

Cristina– The tables need to have the same interpretations (e.g., in Pelagic “up arrows” are bad!). All these documents will be online for further comments and discussion following the workshop

Names/categories used in summary table:

Jose – Happy to use similar approach to BH3 for BH1 (“highly disturbed”)

Jose – BH1 includes standard error, proposing to include error within the “highly disturbed” category in line with the precautionary approach

Laurent – Proposes uncertainty needs to be separate

Jose – Proposes including “moderately disturbed” category as well:

- Highly disturbed
- Moderate disturbed
- Not disturbed
- Uncertain

Objective C - Climate change effects

Presentation on climate change chapter – Lisette Enserink

- Climate change expert group is working on the thematic assessment (written based on their own research and literature review)
- It's an additional assessment, doesn't fall under OSPAR directly yet
- Table of activities and expected trends (please review for links to benthic assessments)
- Information is given on pressure drivers (temperature, reduced sea ice etc.), mostly oceanographic. Lots to review and look at for potential pressures involving the benthic component
- QSR2010 was a starting point for assessing climate change effects, much more has been added since then
- There are sections on ecosystem components (birds, intertidal, etc.)
 - Request input on the benthic ecology section
- It's important the benthic group looks at the pressures section
- Folder is under CoG assessments in SharePoint (need to request access to Cog/Climate Change/Assessment/Drafting folder)

Laurent – Proposes a table of BHT and pressures that could summarise per OSPAR Region (**Table 10**) (remove what is not relevant for each Region). References of supporting literature can be added under the table. T&D habitats could be captured on a similar table (**Table 11**)

During this session, pressure listed in the Climate change thematic assessment was crossed (as column) with the different habitat types (as lines) used for assessments. The idea is then to fill each by expert judgement (later work to be planned after) through OBHEG, according to different colours highlighting the known or assumed intensity/effects. The letters refer to scientific publications to be added, for each cell, line or column, to add more certainties in the judgment made. This table will be further worked at UltraCOBAM next June, notably to start to fill the colours and add publications, before submitting after summer to the whole OBHEG group for final inputs.

Discussion:

Sander – Questions if there are outputs of maps etc., these could be helpful for working with benthic assessments

Cristina – Agrees, a table is a good way to compile evidence for benthic

Jose – Proposes using a paper that has maps of expected habitat loss of deep-sea coral, the paper gives indication of scale of loss possible with climate change. Questions if the climate change section needs quantitative results

Cristina & Laurent – this is very useful to add to the references under the summary table

Sander – Requests pressure maps to have a better interpretation with our benthic assessments. Questions if the benthic group is expected to review literature to fill in these tables/summaries

Cristina – Proposes using already available pressure maps in literature. However, the time available for review within the QSR deadlines is low; proposes adding to knowledge gaps

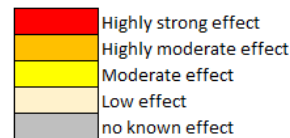
Hannah – Requests inclusion on any discussions of climate change pressures, this is the area their team are working on

MiniPANACEA workshop report
By PANACEA expert group leads

Table 10 Climate change summary table

OSPAR Region N (anticipation for the next N decades)		Climate change pressures (CC TA chapters) on Biodiversity (Ref A, B, C, D, ...)															
"Broad-Broad" Habitat Types																	
		Increased sea temperatures	Reducing sea ice	Increased freshwater input	Changed salinity	Slowed Atlantic overturning circulation	Shelf sea stratification	Open ocean stratification	Increased storms	Increased sea level	Reduced uptake of CO2	Acidification	Coastal erosion	Nutrient enrichment	Oxygen fluxes	Changes in upwelling intensity	Extreme events (heatwaves, plankton blooms, etc)
Littoral sediments	strongly depending of region										a, b						
Littoral rocks & Biogenic Reefs												b					
Infralittoral sediments												b					
Infralittoral rocks & Biogenic Reefs												c					
circalittoral sediments																	
circalittoral rocks & Biogenic Reefs																	
offshore circalittoral sediments																	
offshore circalittoral rocks & Biogenic Reefs																	
Deep sea sediments																	
Deep sea rocks & Biogenic Reefs													d				







BBHT References (North-East Atlantic or others) a=
A= b=
B= c=
C= d= Morato et al, 2020
D= e= Puerta et al, 2020



MiniPANACEA workshop report
By PANACEA expert group leads

Table 11 Climate change summary table 2

OSPAR Region N (anticipation for the next N decades)		Climate change pressures (CC TA chapters) on Biodiversity (Ref A, B, C, D, ...)														
"Broad/Broad" Habitat Types	Increased sea temperatures	Reducing sea ice	Increased freshwater input	Changed salinity	Slowed Atlantic overturning circulation	Shelf sea stratification	Open ocean stratification	Increased storms	Increased sea level	Reduced uptake of CO2	Acidification	Coastal erosion	Nutrient enrichment	Oxygen fluxes	Changes in upwelling intensity	Extreme events (heatwaves, plankton blooms etc)
Seagrass	Region I +II ?															
Maeri beds																
Carbonate mounds																
Coral gardens																
Cymdocea meadows																
Deep-Sea & Sponge aggregations																
intertidal mudflats																
Kelp forest																
Littoral Chalk communities																
Lophelia pertusa reefs																
Modiolus modiolus beds																
Oceanic ridges with hydrothermal vents																
Ostrea edulis beds																
Sabellaria spinulosa reefs																
Seamounts																
Haploops habitat																
intertidal Mytilus edulis beds																
Sea-pen & burrowing megafauna																
T&D References (North-East Atlantic or others)	a =															
A=	b =															
B=	c =															
C=	d =															

	Highly strong effect
	Highly moderate effect
	Moderate effect
	Low effect
	no known effect
	Increased area / "positive" effect on habitat condition

Action – All to fill the example table (**Table 10**) with reference numbers in the relevant cells, reference papers given below table, add additional information for T&D (**Table 11**), but without duplication the results from the POSH assessments

Objective C – benthic group summary (Laurent)

- Discussed and tried to fill in Lisette’s table of BHT climate change impacts, discussed how the group could give a summary of affects expected (e.g., colour gradient; **Table 10**)
- Proposed using numbers/codes in cells for reference literature to help reinforce judgements
- Proposed additional rows for T&D habitats

Discussion:

Abigail – Questions which chapter this is relevant for

Laurent & Cristina – Confirm this is the benthic assessment, climate change chapter

Abigail – Proposes this method could be used across other assessments (e.g., Pelagic)

Lisette – Requests habitats are grouped to avoid too many categories within the table/summary

Cristina– Confirms the benthic statement will be a limited number of categories

Lisette – Highlights benthic habitats will probably be requested to group into fewer categories (e.g., intertidal, coastal)

Conclusions and next steps

Objective A - State chapter thematic assessment

- Indicator leads to confirm which indicators are applicable to the different habitats within each of the assessment units (**Table 6 & Table 7**)
- Agreement was reached that summary tables need to be easy to understand and have a mutual language of results (colours/categories/trends)
- Indicator leads to review proposed categories and presentation of the Assessment Unit summary tables (categories, values, trends and colours; **Table 8 & Table 9**)
- Indicator leads to finish example summary results in QSR SharePoint and discuss with the group (e.g., **Table 9****Error! Reference source not found.**)
- The inclusion of pilot indicator results in summary tables needs to be agreed (e.g., in parenthesis or greyed out)
- Indicator leads to start drafting narrative summary text in QSR SharePoint and pulling out key messages from results and any links between indicators

Objective B - Links across indicators and between ecosystem components

- An example of BH1 integration with FW4 opened the discussion for similar integrations in other Regions

- Integration of benthic indicators and other ecosystem components will not be possible within QSR23
- Inclusion of benthic data (biomass) and indicators into FW components has lots of potential for future integration and assessment, where possible, potential links to be included in knowledge gaps

Objective C - Climate change effects

- Proposed table to be used to start building a summary of predicted impact of climate change by subregion
- Indicator leads to review climate change pressure drivers and activities and consider the potential impacts on benthic ecosystems (**Table 10 & Table 11**)
- Indicators leads to continue adding to CoG assessments in SharePoint (access will need to be requested)
- Members of the climate change assessment group will help drafting the assessments

Food Webs expert group

Participants

Lena Avellan, OSPAR Secretariat, UK

Andrea Belgrano, Swedish University of Agricultural Sciences, SE

Lisette Enserick, Rijkwaterstaat, NL

Hans Jakobsen, Aarhus University, DK

Fabrice Lizon, Université de Lille, FR

Stefano Marra, Joint Nature Conservation Committee, UK

Johanna Osterberg, State agency for coastal protection, national parks and marine protection, DE

Izaskun Preciado, Instituto Español de Oceanografía, ES

Actions

State chapter thematic assessment: send an email to inform each indicator leads to fill in the template. Food web co-chairs

State chapter thematic assessment: fill in the template for each indicator (table + narrative). Indicator leads

FW9 indicator: organise an online meeting to discuss FW9 issues (which indices will be used for the QSR2023 assessment) as soon as possible. FW9 indicator lead

Climate change chapter: send an email to ask indicator leads if they will address the impact of CC on their indicators' assessments. Food web co-chairs

Climate change chapter: fill in the template on the impact of CC on indicators' assessments. Indicator leads

Climate change chapter: revise and update the Tables downloaded from IA2017. Food Web group

Climate change chapter: organise an online meeting to discuss on CC chapter. Food web co-chairs

Day 1 – 25/05/2022

Food web group – Objective A State chapter thematic assessment

Objective: discuss thematic assessment state chapter

(Fabrice, Izaskun, Andrea, Hans, Lena, Stefano, Lisette, Johanna)

- Chapter is supposed to be purely descriptive
- ENA can serve both functions: used as indicator as well as option for integrating different indicators
- New guidance for article 8 -> assessment is supposed to be based on trophic guilds
- Table used to discuss whether there will be an assessment for each listed indicator
- Reoccurring discussions, which need clarification:
 - o how to expand small scale approach (ENA “pilot” Kattegat) to a large scale approach (e.g. OSPAR regions)?
 - o How are ENA indicators responding to pressure?

- OSPAR/HELCOM overlap especially for the Kattegat
- Table of chapter template: add expected results to each indicator for each trophic guild
- Differentiate between common indicators and candidate indicators
- Too many trophic guilds (makes table hard to read)? -> maybe change structure of table
- Fabrice suggests combining PH2 (biomass of phytoplankton itself) and FW2 (output/production of phytoplankton)
- Think of a common narrative, maybe include some ICES approaches as a “reference”
- Izaskun shows a slide with a simplified food web and the corresponding indicators for each group/guild. All indicators from different groups (mammals, birds, benthic habitats etc.) are included.

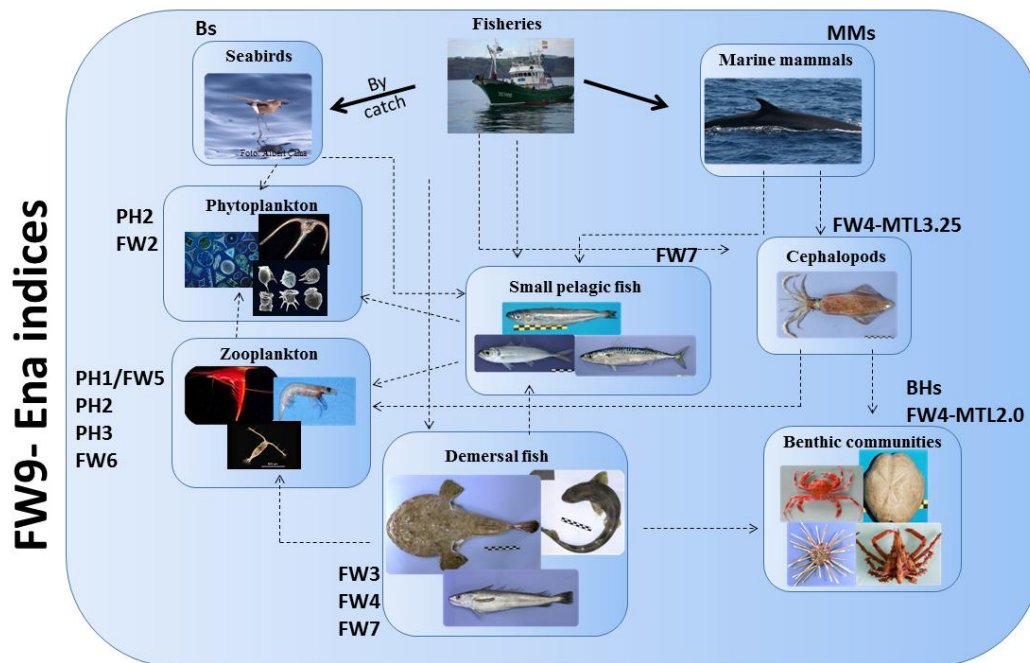


Figure 1 ENA network model diagram.

- Discussion about FW9 indicators: which should be chosen for the assessment?
- Lena suggests restructuring the table in the following way:

Table 12 Restructuring of Food Webs summary table.

REGION II	FC2	FW3	FW2	FW4	FC3	FW6	FW7	FW9
	Sub-apex demersal predators	Sub-apex predators demersal	Pelagic primary producer	Benthic filter feeding invertebrates; Benthic feeding invertebrates; Planktivorous fish and invertebrates; Sub-Apex pelagic predators; Sub-apex demersal predators	Sub-apex predators demersal	Secondary producer	Planktivorous fish and invertebrates; Sub-Apex pelagic predators; Sub-apex demersal predators; Mammal apex predators	Pelagic primary producers; Secondary producer; Benthic filter feeding invertebrate; Benthic feeding invertebrate; Planktivorous fish and invertebrate; Sub-Apex pelagic predators; Sub-apex demersal predators; Mammal apex predators; Fish apex predators
Coastal ecosystems								

Shelf ecosystems								
Deep-sea ecosystems								

- Lena proposed to separate common and candidate indicators (grey ones). The table should be filled in showing if indicator assessment results can be expected and what they would be like.
- The table should be supplemented by a narrative text. Structure: separate paragraphs + tables for each region and indicator; show, which indicator applies for which trophic guilds. Be clear, which indicator would be relevant for which region. The entire assessment supposedly will be 30-50 pages. In the end, summarise what results we might get from all indicators combined for each region and each habitat type.

Afternoon session

Continued discussion on A

(Izaskun could not attend the afternoon session, no official chair was present)

Presentation by Stefano Marra (JNCC) – MarBEM Marine Benthic Ecosystem Model Development for the southern North Sea

- Continued discussion about the table, used new structure proposed by Lena to fill in for which indicators a result can be expected
- Discussion about definitions of regions/differentiation between coastal, shelf and habitat
 - o How are these defined/distinguished?
 - o Why has differentiation been made?
 - o Regions/ecosystem definitions should be similar among expert groups (food web, pelagic, benthic)
 - o Article 8 defines regions by water depth
 - o COMP units need to be associated with habitat types

Day 2 – 26/05/2022

Food web group – Objective B Links across indicators and between ecosystem components and Objective A

Morning session

- Still ongoing discussion about differences of EwE models and ENA and whether EwE might be better fitting as an indicator
- Separate meeting with Ulrike necessary to discuss the reasons for choosing ENA as an indicator
- Table for thematic assessment filled with Xs, where results might be expected. The rest should be filled in by indicator leads

Afternoon session – Objective C Climate change effects

- Discussion about FW2 (production of phytoplankton)

- Climate change can affect species composition, shift distribution patterns and thereby also potentially cause mismatches (decouplings) in spawning + reproduction events of e.g. copepods
- Changes in storm frequencies can also affect species distribution patterns
- Impacts of climate change on species will ultimately affect trophic levels and trophic interactions
- Example Thorpe et al (2022) -> effects of temperature increases on fish stocks
- Template: draft first notes for indicators FW2, FW3/4/7 and FW9 regarding effects of climate change
- Take a look at work of pelagic group as they are already quite advanced in terms of their climate change work -> might give us direction and ideas for common features in terms of linkage between expert groups in QSR
- Focus on key points/messages, which can be underlined by references instead of writing a comprehensive chapter about climate change effects
- Talk to climate change expert group as they will mainly write the chapter on climate change effects supplemented by input of food web expert group
 - o discuss approach (who will input which information, what is needed from food web expert group?)

Day 3 – 27/05/2022

Food web group – Objectives A, B and C

Objective: discuss thematic assessment state chapter and chapter on climate change effects, note key messages and work on drafts

- Lisette presents the draft of climate change expert group
 - o Important section for us is the paragraph on pressure, could serve as a guideline for focus of information
- Izaskun: each indicator lead should compile info on effects of cc for their own indicator
- Lisette: suggests contacting either Susana or Barbara- prior to the UltraCOBAM to check with the cc expert group, whether they are fine with the information we can provide (regarding cc effects on indicators) and what else they would need
- Izaskun shows tables of previous intermediate assessment from 2017 (table 3 and 4) including info on cc effect of indicators used for this assessment
 - o Table 3: mammals, birds and fish
 - o Table 4: benthic habitat communities and food webs
 - o We can use these tables as a starting point, revise and update them with current references
- General discussion about schedule and upcoming deadlines, also in relation to UltraCOBAM
 - o Requested tasks should be manageable, if we use already existing tables/drafts/Templates etc. and include updated and revised information
 - o For cc effects: use revised table (4 mostly) + interlink it with info of cc draft, particularly in relation to pressure section; this document should serve as a sufficient basis for a discussion with the cc expert group (check the following for example: what info have they already compiled? Is our info sufficient? What more or what other aspects should be included?)

- In general, a meeting with Ulrike (and other indicator leads like Chris Lynam) will be necessary, to discuss the ENA approach (FW9) in more detail, as well as the necessary next steps
 - If possible before the UltraCOBAM, otherwise afterwards as soon as possible

Conclusions and next steps

Objective A – State chapter thematic assessments

- The draft on the sharepoint has been updated. Ulrike/Izaskun will send around an email to the indicators leads to fill in the table and the template for each indicator.
- FW9: more discussions are needed since it will be interesting to know what kind of indices will be used for the QSR2023 assessment. There will be an online meeting to discuss FW9 issues as soon as possible.

Objective B – Common points and links across indicators and between ecosystem components

It was agreed within the group that FW9 is the best way of integrating all ecosystem components and FW indicators (**Figure 1**), although some discussions are still needed to operationalise the integration.

Objective C – Climate change effects

- There is strong evidence that CC are impacting specific compartments of the ecosystem and marine food webs (many papers). However, we need to ask indicator leads if they will address the impact of CC on their indicators' assessments.
- As a starting point, the FW group suggest using Tables from IA2017 CC chapter, revise and update them.
- FW group agreed to have an online meeting with CC Expert group as soon as possible.