

Ecosystem status and indicators: a challenging exercise!

Benthic indicator assesment: the way it works...

TRY TO FIND THE RIGHT STATUS OF THE BENTHOS SAMPLES FROM WITHIN THE EU

Sample characteristics

TURN FOR THE
SELECTION OF A
SAMPLE

Parameter	Min - Max
S	Number of species 0 - 76
H'	Shannon diversity 0 (low diversity) - 5,16 (high diversity)
Simpson	Simpson diversity (measure for concentration of species) 0 (strong dominance of 1 species) - 1 (equal dominance of species)
AMBI	Parameter for proportion sensitive/tolerant species 0,02 (high amount of sensitive species) - 6 (high amount of tolerant species)
SN	Species-abundance diversity parameter 0 (low diversity) - 4,24 (high diversity)

Some of the existing
benthic indicators

M-AMBI: by a factor analysis on S, AMBI, Shannon diversity index (www.ambi.azti.es)

$$NQI: (0,5 \cdot (1 - \frac{AMBI}{7})) + (0,5 \cdot \frac{SN}{N+5})$$

Calculate

$$IQI: \left(\left(\left(0,38 \cdot \left(\frac{1 - \frac{AMBI}{7}}{2} \right) + \left(0,08 \cdot \left(\frac{1 - \frac{SN}{N+5}}{2} \right) + \left(0,54 \cdot \left(\frac{S}{76} \right) \right) \right) \right) - 0,4 \right)$$

$$BEQI2: \frac{1}{3} * [S_{ass} / S_{ref}] + \frac{1}{3} * [H'_{ass} / H'_{ref}] + \frac{1}{3} * \left[\frac{1 - (AMBI_{ass}/7)}{1 - (AMBI_{ref}/7)} \right]$$

$$DKI: \left(\frac{1 - \frac{AMBI}{7}}{2} \right) \cdot \left(\frac{1 - \frac{SN}{N+5}}{2} \right)$$

Indicator outcome

FIND
CORRESPONDING
NUMBER
TO KNOW STATUS

Scoring bord
High status
Good status
Moderate status
Poor status
Bad status

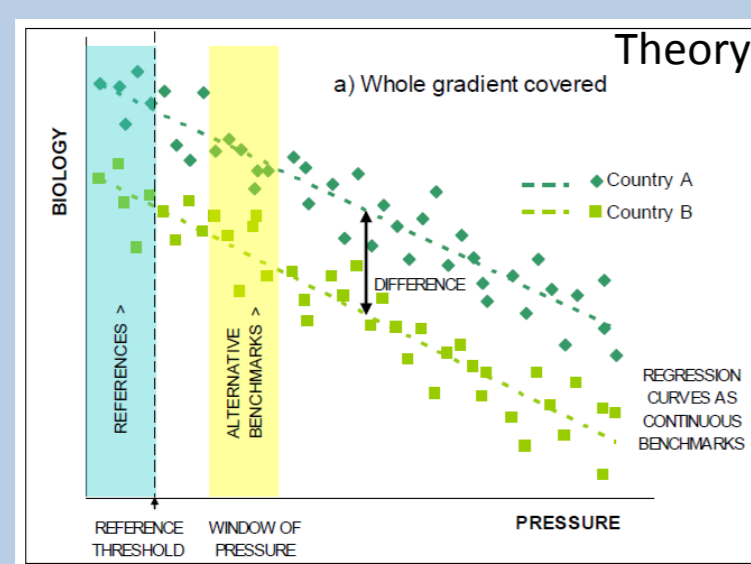
For environmental assessment purposes, the benthic indicators of the different countries are expected to give comparable results.

For the Water Framework Directive this lead to intercalibration exercises

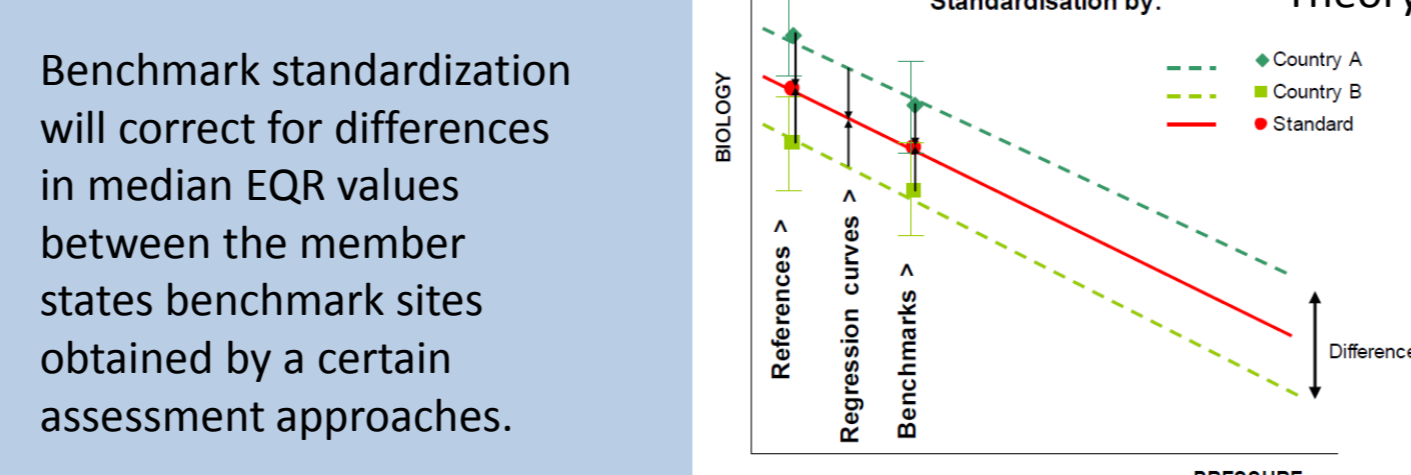


Intercalibration guidance principles:

Step 1: Benchmarking: Search for similarly disturbed sites among countries.



Step 2: Standardisation: to bring countries on the same level along the gradient.



Benchmark standardization will correct for differences in median EQR values between the member states benchmark sites obtained by a certain assessment approaches.

Step 3: Comparability criteria: (1) R² of regression needs to be > 0,4; (2) boundary bias of High/Good and Good/Moderate more than -0,25 (allowed to be more than 0,25, because this indicate a more stringent indicator and (3) Absolute class difference below 0,5

Country	Denmark	UK & Ireland	Spain Basque & Cantabria	Norway	Portugal	Netherlands	Germany	France	Spain Andalusia
Benthic indicator	DKI	IQI	m-AMBI	NQI	BAT	BEQI2	m-AMBI ¹	m-AMBI ²	BOPA
Max EQR value	1,000	1,000	1,292	1,000	1,220	1,508	1,342	1,179	1,119
High/Good EQR value	0,800	0,750	0,770	0,720	0,790	0,800	0,850	0,770	0,830
Good/Moderate EQR value	0,600	0,640	0,530	0,630	0,580	0,600	0,700	0,530	0,500
Moderate/Poor EQR value	0,400	0,440	0,380	0,400	0,440	0,400	0,400	0,380	0,400
Poor/Bad EQR Value	0,200	0,240	0,200	0,200	0,270	0,200	0,200	0,200	0,200
CRITERIA									
1: Regression (R ²)	> 0,4	0,956	0,808	0,927	0,912	0,963	0,829	0,949	0,904
2: H/G bias_CW	> -0,25	0,535	-0,214	-0,070	0,058	-0,010	0,040	0,257	0,445
2: G/M bias_CW	> -0,25	0,315	-0,227	-0,240	0,130	-0,144	0,094	0,295	0,261
3: Absolute Class Difference	< 0,5	0,506	0,456	0,325	0,401	0,333	0,366	0,383	0,380

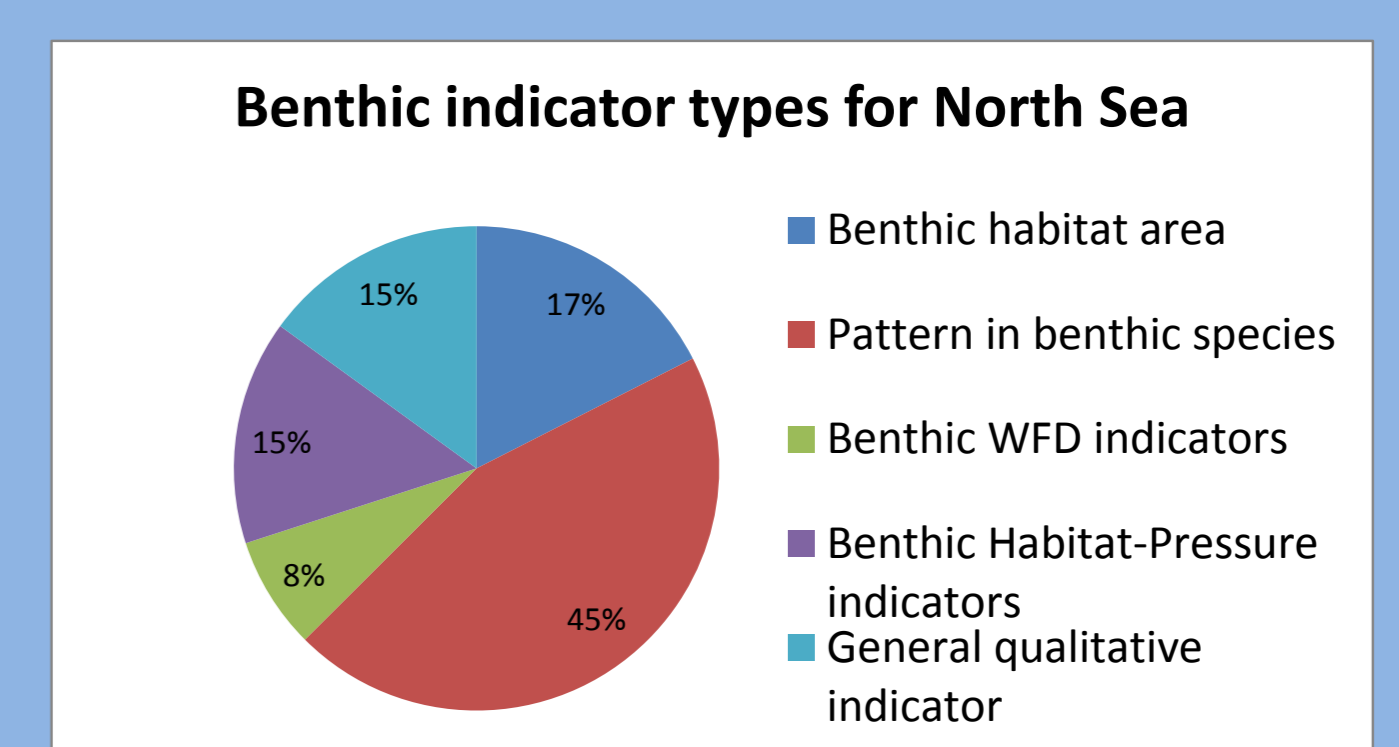
→ 9 countries, all indicators meet comparability criteria, except BOPA of Andalusia

For the Marine Strategy Framework Directive 'COMMON' indicators need to be defined

The responsibility of indicator selection for the MSFD is for the countries, which has lead to a list of **45 different** benthic related indicators for 5 North Sea countries.

- Only 3 countries select a benthic indicator in correspondence with the WFD.
- Most MSFD benthic indicator approaches are still under development

The challenge now is to find a 'common' indicator for benthos



Conclusion: Good news: most of the existing benthic indicators developed for WFD purposes are more or less comparable and can be used for a reliable environmental assessment. Bad news: MSFD does not make use of this intercomparability; more indicators are still being developed.