Ecosystem status and indicators: a challenging exercise!
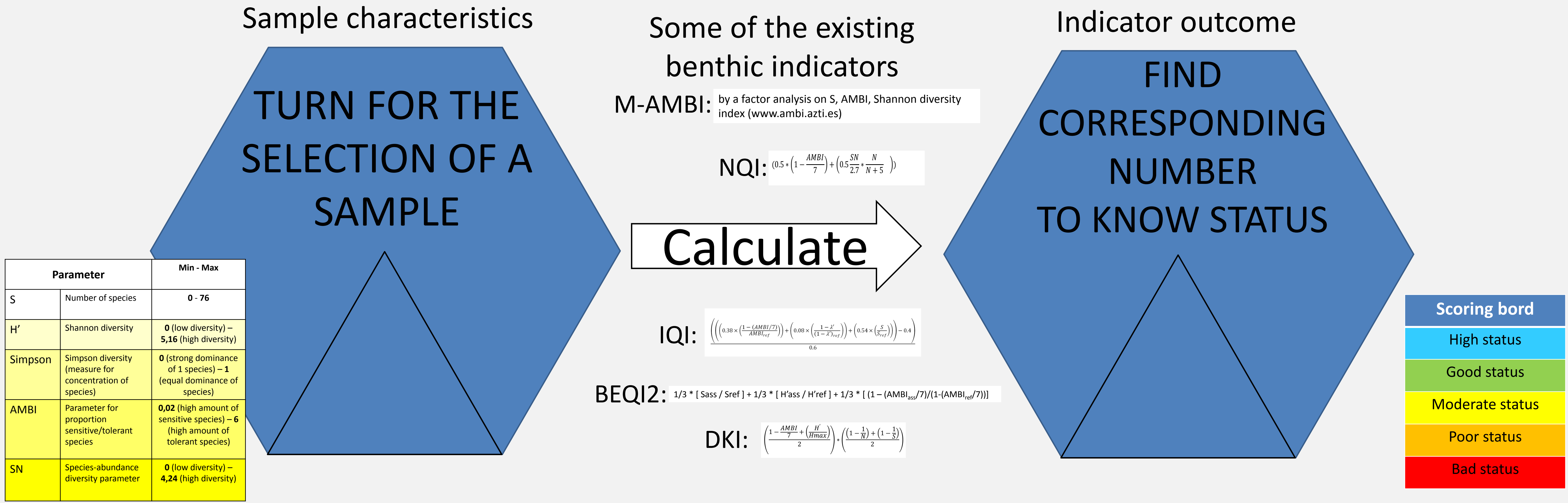
Flanders is agriculture and fisheries

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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: $(0.5*(1-\frac{AMBI}{7})+(0.5\frac{SN}{2.7},\frac{N}{N+5}))$

Calculate

IQI: $\frac{\left(\left(\left(0.38\times\frac{(1-(AMBI/7))}{AMBI_{ref}}\right)+\left(0.08\times\frac{1-\lambda'}{(1-\lambda'_{ref})}\right)+\left(0.54\times\frac{S}{S_{ref}}\right)\right)-0.4\right)}{0.6}$

BEQI2: 1/3 * [Sass / Sref] + 1/3 * [H'ass / H'ref] + 1/3 * [(1 – (AMBI$_{ass}$)/7)/(1-(AMBI$_{ref}$/7))]

DKI: $\left(\frac{1-\frac{AMBI}{7}+\left(\frac{H'}{Hmax}\right)}{2}\right)\cdot\left(\frac{(1-\frac{1}{N})+(1-\frac{1}{S})}{2}\right)$

Indicator outcome

FIND CORRESPONDING NUMBER TO KNOW STATUS

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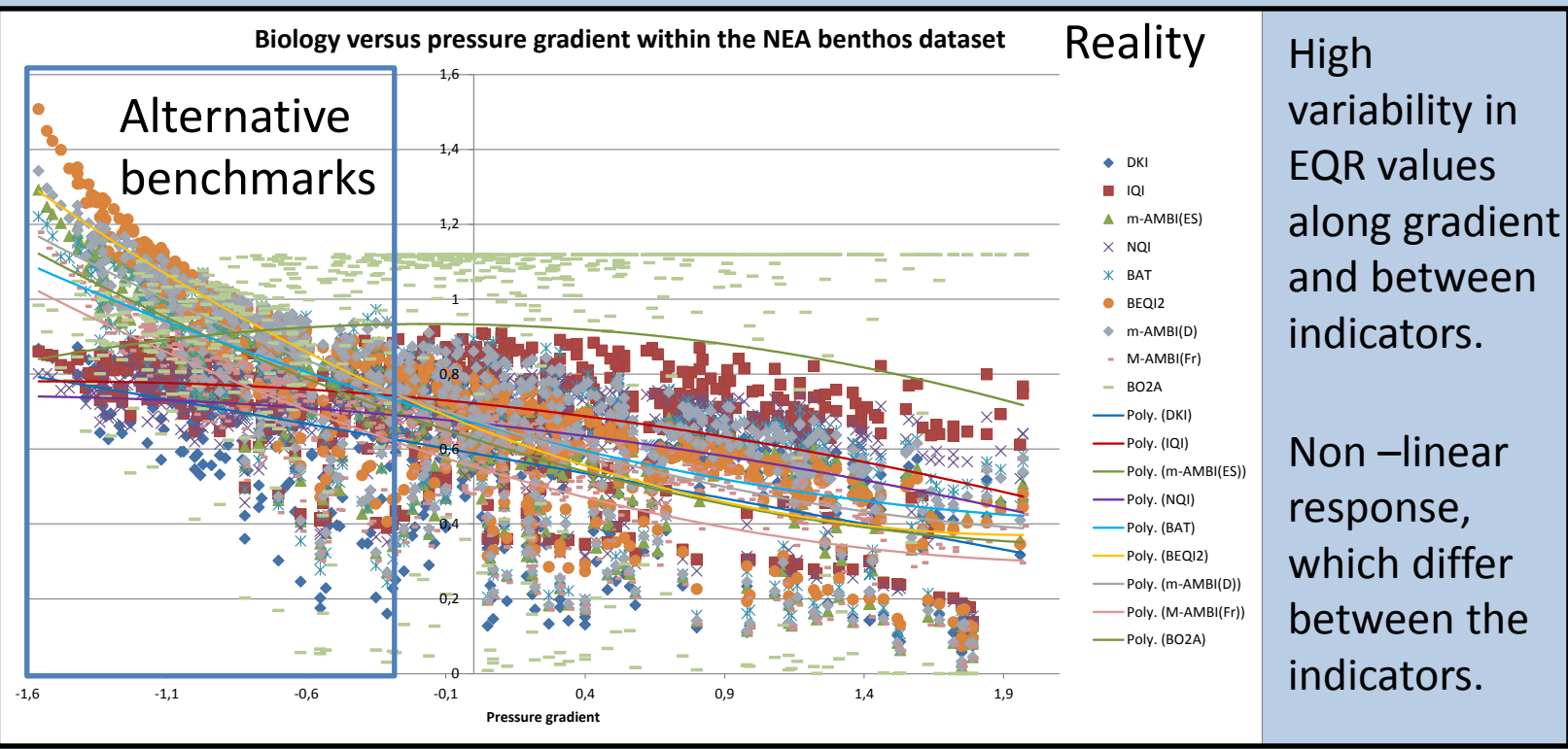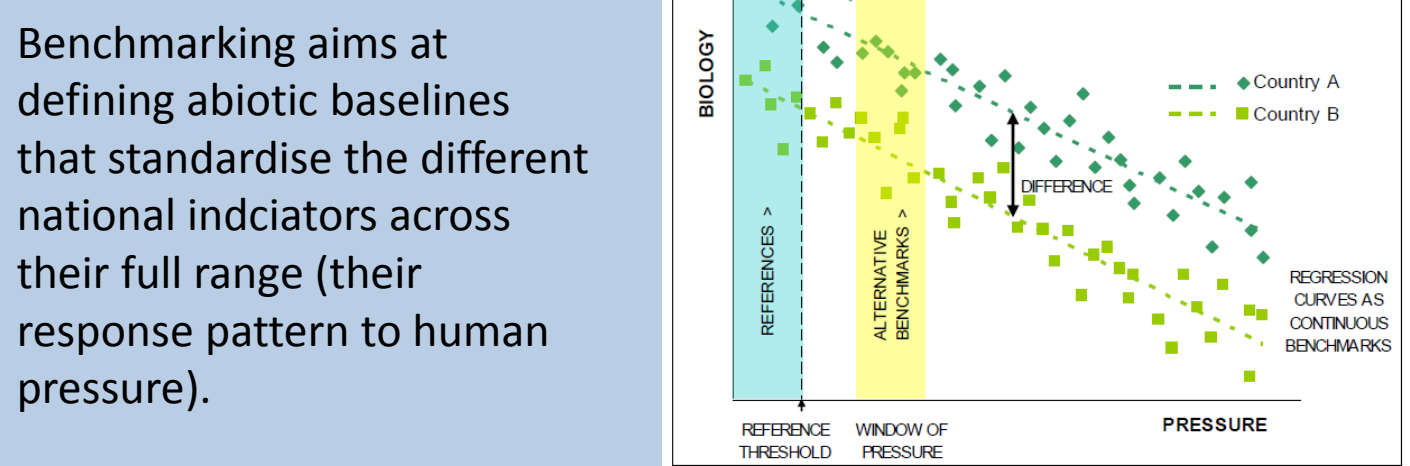- Moderate status
- Poor status
- Bad status

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

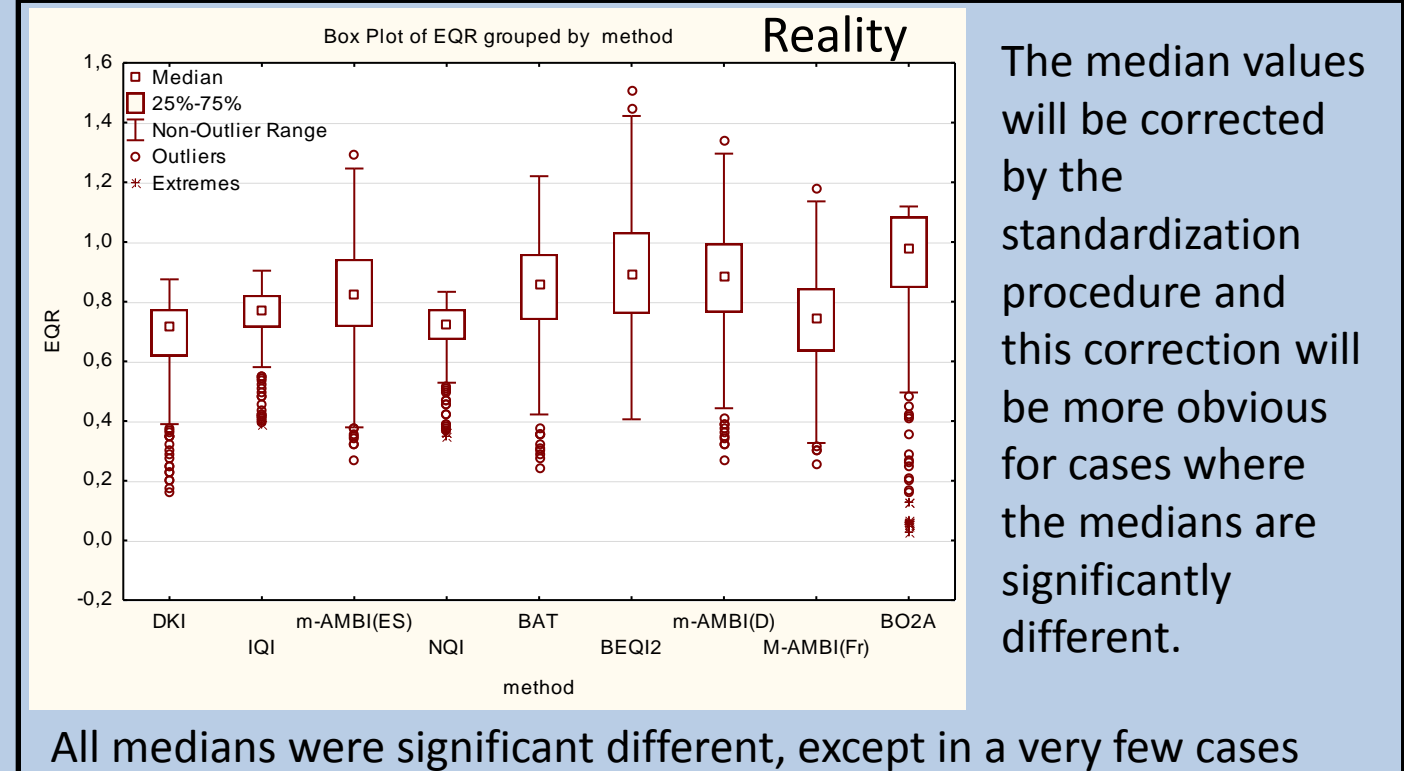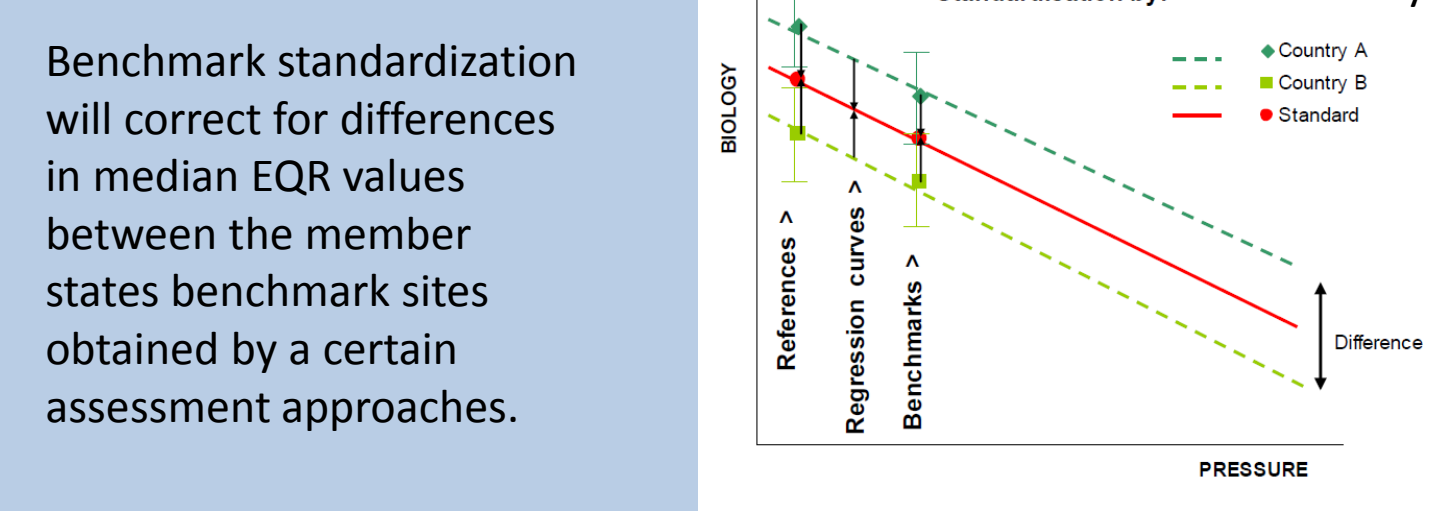## For the Water Framework Directive this lead to intercalibration exercises

Start 2004 → 2007 First results for 4 countries → Intercalibraton guidance availabe from 2010 → 2009-2012 Several attempts → 2012 Results not accepted → 2014 JPI Oceans Pilot Action → Current proposal in review

Intercalibration guidance principles:

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

Benchmarking aims at defining abiotic baselines that standardise the different national indicators across their full range (their response pattern to human pressure).

High variability in EQR values along gradient and between indicators.

Non –linear response, which differ between the indicators.

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.

The median values will be corrected by the standardization procedure and this correction will be more obvious for cases where the medians are significantly different.

All medians were significant different, except in a very few cases

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 (R²)	> 0,4	0,956	0,808	0,927	0,912	0,963	0,829	0,949	0,904	0,448
2: H/G bias_CW	>-0,25	0,535	-0,214	-0,070	0,058	-0,010	0,040	0,257	0,445	-1,377
2: G/M bias_CW	>-0,25	0,315	-0,227	-0,240	0,130	-0,144	0,094	0,295	0,261	-0,995
3: Absolute Class Difference	<0,5	0,506	0,456	0,325	0,401	0,333	0,366	0,383	0,380	0,756

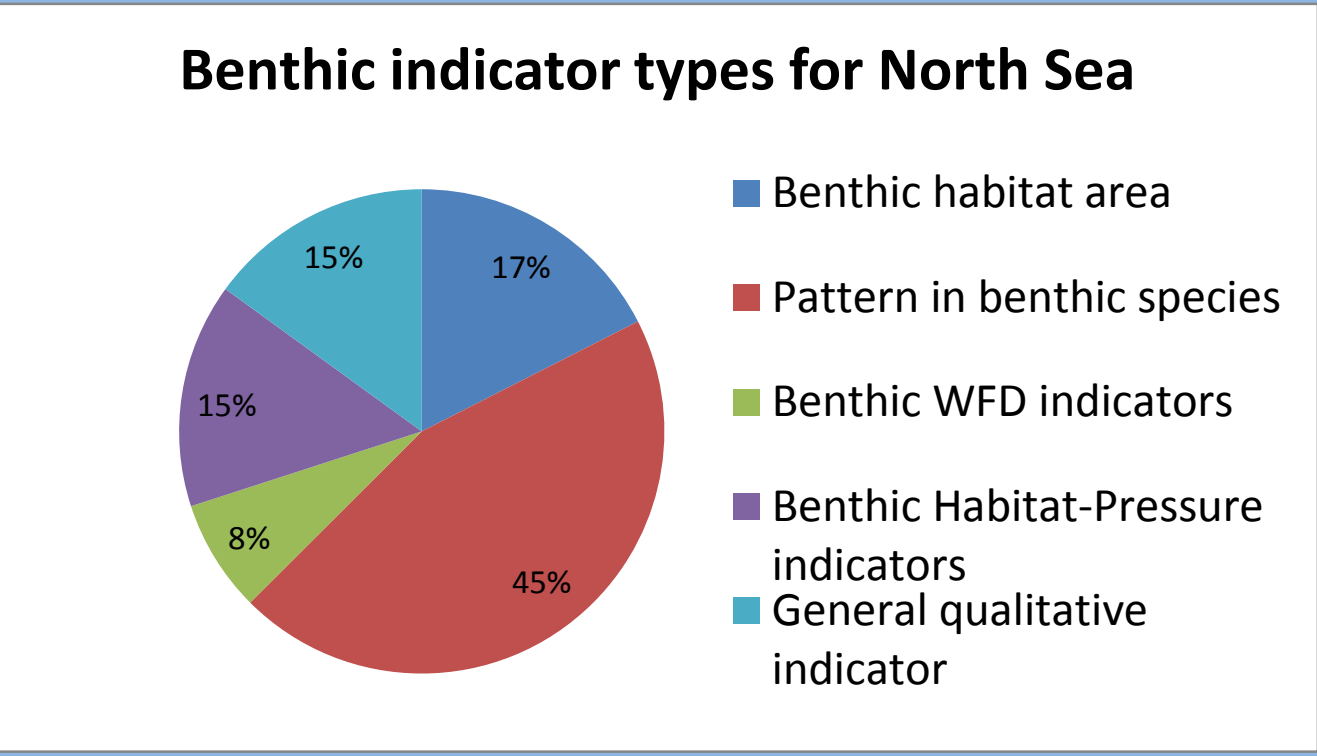[1]Different reference and boundary values   [2]Different reference values

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

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

The responsability 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 challange now is to find a 'common' indicator for benthos

Benthic indicator types for North Sea
- 17% Benthic habitat area
- 45% Pattern in benthic species
- 8% Benthic WFD indicators
- 15% Benthic Habitat-Pressure indicators
- 15% General qualitative indicator

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.