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MSFD – how to measure and evaluate targets?

Implementation: the MSFD

Baltic NGO Network Meeting

Palanga, Lithuania, 10 May 2010

Poul Degnbol

ICES

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MSFD descriptors

(1) Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.

(2) Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.

(3) Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.

(4) All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive Capacity.

(5) Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.

(6) Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.

(7) Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.

(8) Concentrations of contaminants are at levels not giving rise to pollution effects.

(9) Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.

(10) Properties and quantities of marine litter do not cause harm to the coastal and marine environment.

(11) Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

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Task Groups developing criteria and methodological standards for MSFD descriptors

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Pressures and impacts versus descriptors

Annex III Pressures and Impacts*		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
Physical loss	Smothering	X			X		X					
	Sealing	X			X		X					
Physical damage	Siltation	X			X		X					
	Abrasion	X			X		X					
	Extraction	(X)			X		X					
Other physical disturbance	Noise	(X)			(X)							X
	Marine litter	(X)					(x)				X	
Interference with hydrology	Change in thermal regime	(X)			X		(X)	X				X**
	Changes in salinity	(X)			X		(X)	X				
Contamination	Synthetic substances	(X)			X		X		X	X		
	Non-synthetic substances	(X)			X		X		X	X		
	Radionuclides	(X)			X		(X)		X	X		
Systematic release of substances	Introduction of other substances	(X)			X		X		X			
Nutrient and organic matter enrichment	Input of fertilizer	(X)			X	X	X					
	Input of organic matter	(X)			X		X					
Biological disturbance	Microbial pathogens	X			X	X	(X)					
	Non-indigenous species	(X)	X	(X)	X		X					
	Selective extraction	(X)		X	X	X	(X)					

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So many words.....

Descriptor: MSFD descriptor of GES (for instance biological diversity is maintained)

Attribute: The combined attributes describe all qualities of Descriptor (for instance states of species, habitat, ecosystem)

Criteria: to asses an attribute 'distinctive technical features that are closely linked to qualitative descriptors'

Indicators: measurement of criteria

Target: the desired minimum condition to fullfill GES

Targets have been indentified in a few cases where they are defined in other legislation (fishing mortaliity, contaminants in seafood) – otherwise to be identified in process

Do the criteria and methodologies proposed give sufficient guidance for target identification?

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Information basis

The collection of marine data is expensive – use indicators which can be based on existing data collection programmes

Different indicators require different scales of space and time (biodiversity, food web versus seafloor inegrity and eutrophication)

It may be difficult to find indicators which are directly linked to a descriptor and to management measures

Insufficient knowledge about marine ecosystems – Marine research strategy

Adapt

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1. Biodiversity

Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.

Good Environmental Status for Descriptor 1 will be achieved given no further loss of the diversity of genes, species and habitats at ecologically relevant scales and when deteriorated attributes, where intrinsic environmental conditions allow, are restored to target levels.

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1. Biodiversity

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Species state	Species distribution	Range
		Pattern
	Population size	Abundance and/or biomass
	Population condition	Demographic characteristics
		Genetic structure
Habitat state	Distribution	Range
		Pattern
	Extent	Area (volume)
	Condition	Condition of typical species
		Relative abundance/biomass
		Physical, hydrological, chemical composition
Ecosystem state	Ecosystem structure	Condition and relative proportion of habitats and species

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2. Non-indigenous species

Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Prevalence	Abundance and state of non-indigenous species (esp invasive species)	Trends in abundance, tempral occurence, spatial distribution
Impacts	Environmental impact of invasive species	Ratio between invasive species and native species Impacts of invasive species + species, habitats, ecosystems

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3. Commercially exploited fish and shellfish populations

Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Sustainability of exploitation	Exploitation systainable consistent with high long-term yield	Fishing mortality (F equal to or lower than FMSY) If F not available: ratio catch/biomass
Reproductive capacity	Reproductive capacity should not be compromised	Spawning stock biomass or biomass indices
Age and stock composition	Enough older/larger fish to ensure stock resilience	Proportion of fish larger than size of first maturity Mean maximum length across all species found in research vessel surveys 95% percentile of fish length distribution observed in research vessel surveys Secondary: size at first sexual maturity

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Is MSY a step forward?

Present sutuation: Fishing mortality 2-3 times FMSY for many stocks

This means that there are excessively high pressures on marine ecosystems – habitat impacts, bycatches etc

Member States have subscribed to a MSY by 2015 target

Reducing Fishing mortality is IN THE PRESENT SITUATION the most significant step one can take to reduce ecosystem impacts (bycatches, habitat impact, ecosystem integrity impact)

In paralllel to that efforts must be made to reduce bycatches and habitat impacts

MSY by 2015 is a first step only which in itself does not address all aspects of an ecosystem approach – beyond 2015 further steps are required

MSY is a necessary but not sufficient element in an ecosystem aproach

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4. Food webs

All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive Capacity.

Good Environmental Status of Food Webs will be achieved when the indicators describing the various attributes of the descriptor reach the thresholds set for them. These should ensure that populations of selected food web components occur at levels that are within acceptable ranges that will secure their long-term viability.

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4. Food webs

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Energy flow in food webs	Productivity of key species or groups	Performance of key predator species (production/biomass)
Structure of food webs	Proportion of selected species at the top of food webs Abundance of key groups/species	Proportion of large fish Abundance of functionally important groups/species -Early warning indicators/fast turnover -Affected by human activities -Habitat defining -Top of food web -Migratory -Spexies tighly linked to species at other trophic level

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5. Eutrophication

Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters. – linked to Water Framework Directive

GES with regard to eutrophication has been achieved when the biological community remains well-balanced and retains all necessary functions in the absence of undesirable disturbance associated with eutrophication (e.g. excessive algal blooms, low dissolved oxygen, declines in seagrasses, kills of benthic organisms and/or fish) and/or where there are no nutrient-related impacts on sustainable use of ecosystem goods and services.

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5. Eutrophication

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Nutrient levels	Increase Deviation from normal proportions	Nutrient concentration in water column Nutrient ratios (Si, N, P)
Direct effects		Chlorophyll concentrations Water transparency related to suspended algae Abundance of opportunistic macroalgae (detrimental effects, blankets) Species shift in floristic composition
Indirect effects	Adverse impacts on perennial flora Decrease in O2 due to increased organic decomposition	Abundance of perennial seaweeds and seagrasses Dissolved oxygen

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6. Sea floor integrity

Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Physical damage having regard to substrate chracteristics	Biogenic substate impact Overall impact	Type, abundance and areal extent of biogenic substrate Extent of seabed affected by human activities for different substrate types
Condition of benthic community		Presence of particularly sensitive or tolerant species Indexes assessing bentic community function and functionality (diversity, richness, proportion of opportunistic or sensitive species)

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7. Hydrographical conditions

Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.

Linked to specific installations etc.

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Spatial characterisation of permanent alterationes	Case-by-case basis	Extent of area affected by the alteration
Impact of permanent hydrographical changes	Case-by-case basis	Spatial extent of affected habitats Changes in habitats, in particular functions provided (spawning, breeding, feeding areas etc)

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8. Contaminants and pollution effects

Concentrations of contaminants are at levels not giving rise to pollution effects.

- Linked to Water Framework Directive

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Concentration of contaminants	'Presence ... kept within acceptable limits'	Concentration in relevant biota/sediment/water
Effects of contaminants	'effects are kept within acceptable limits'	Levels of pollution effects on ecosystem components concerned Occurence, origin and extent of acute pollution events (such as oil slicks) and their impacts on biota physically affected

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9. Contaminants in fish and other sea food

Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Level, number and frequency of contaminants	Regulatory levels not exceeded	Actual level of contaminants that have been detected Number of contaminants having exceeded maximum regulatory level Frequency of regulatory levels being exceeded

10. Litter

Properties and quantities of marine litter do not cause harm to the coastal and marine environment.

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Charcteristics of litter in the marine and coastal environment		Trends in litter washed ashore - composition, spatial distribution, source Trends in litter floating at surface Trends in micro-particles
Impacts of litter on marine life		Trends in amount and composition of litter ingested by marine mammals

11 Energy and noise

Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

ATTRIBUTE	**Criteria** to assess the descriptor	**Indicators** to be measured
Distribution in time and place of loud, low and mid+frequency impulsive sounds		Proportion of days and sirtibution over year and in space exceeding high levels (sound exposure level or peak level) 10 Hz to 10 kHz
Continuous low frequency sound		Trends in continuous ambient noise level arond 63 and 125 Hz

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Measurement of indicators

Data are collected with research vessles, from comercial vessels, bouys and from satelites

Most comprehensive European data collection framework – Data Collection Framework Regulation to support CFP implementation

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Data

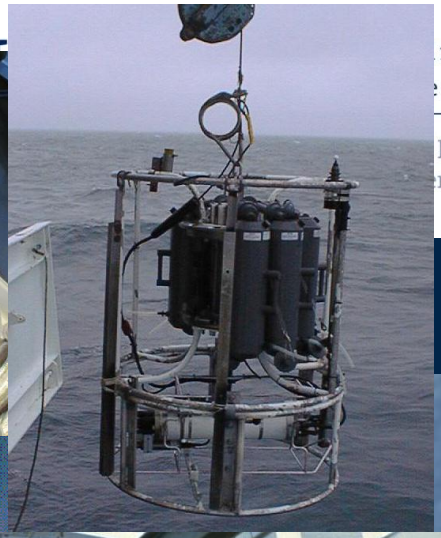
Fisheries

- Discards and landings
- Effort in time and space

Cruises with R/V

-Abundance of fish/shellfish species

- Population structure size/age
- Biological parameters
- Hydrograhy



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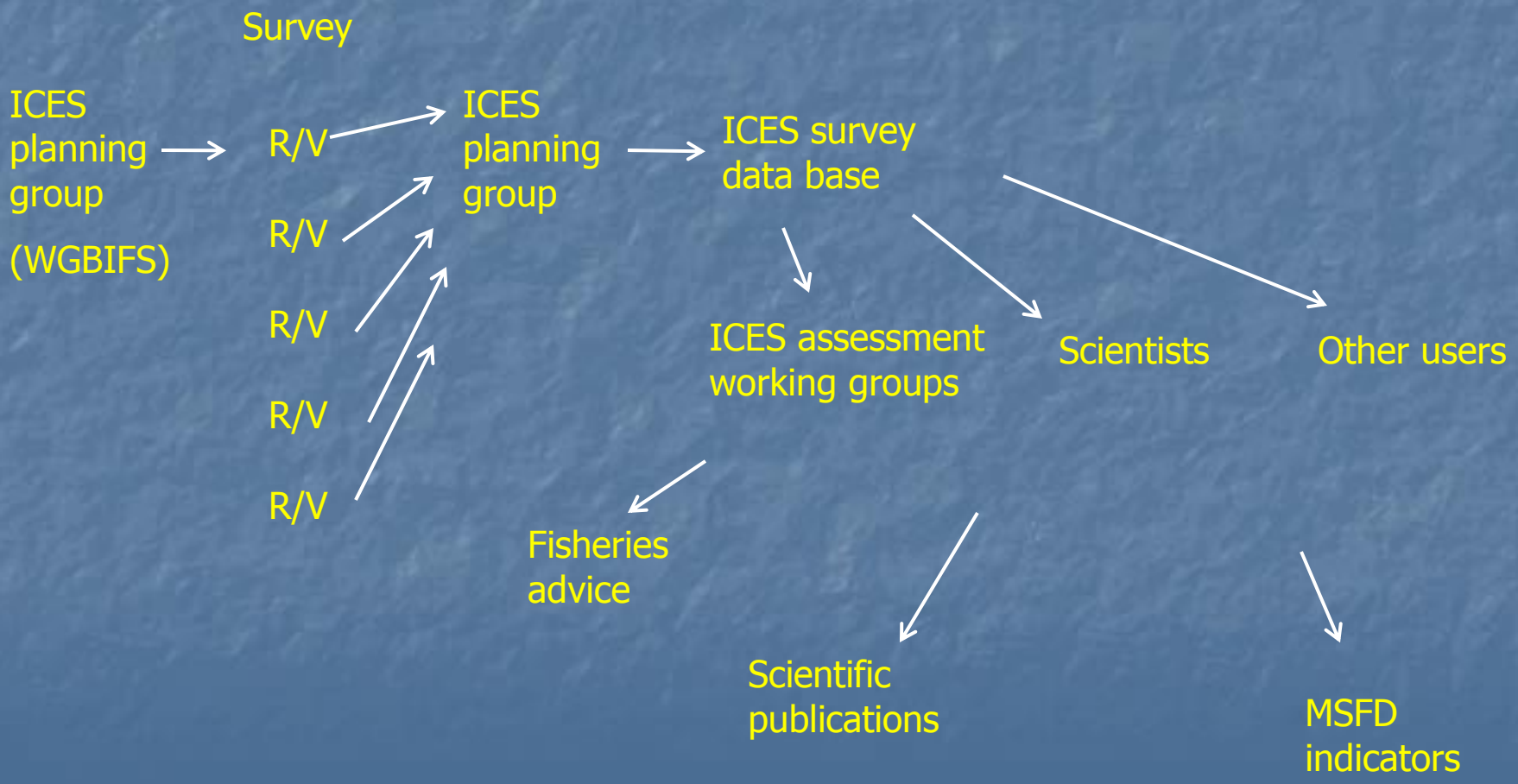
R/V surveys



ICES WGBIFS REPORT 2009

ICES Living resources Committee

ICES CM 2009/LRC:05

Ref. TGISUR, ACOM

Report of the Working Group on Baltic International Fish Survey (WGBIFS)

30 March – 3 April 2009

Lysekil, Sweden

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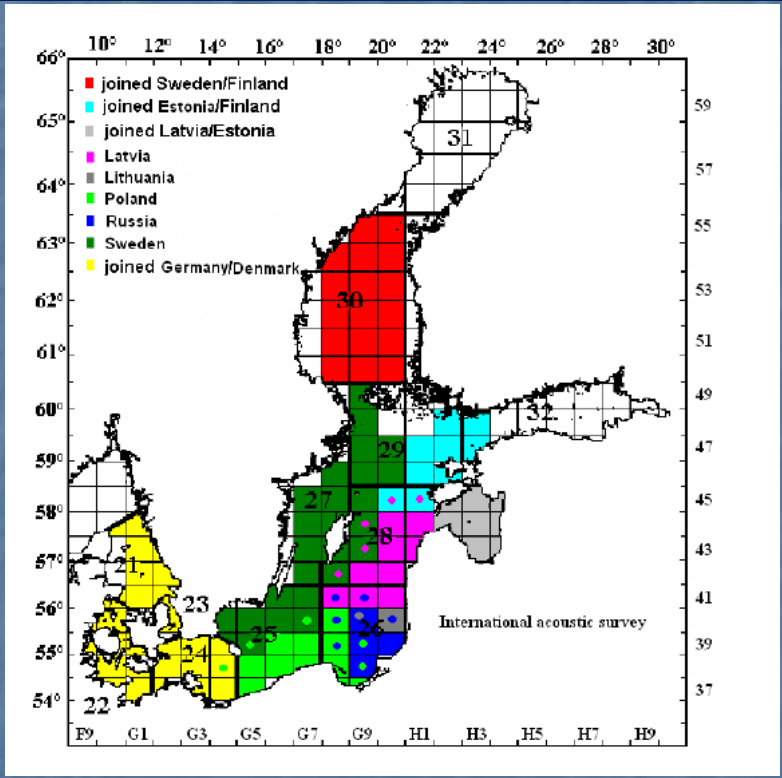

Acoustic survey oct 2008

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Data outputs

Abundance of fish and shellfish species

Size and age distributions

Spatial distributions

Hydrograhic data

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Ecosystem impact indicators in DCF

Indicators of fisheries impacts on marine ecosystems:

-Conservation status of fish species

-Proportion of large fish

-Mean maximum length of fishes

-Size at maturation of exploited fish species

-Distribution of fishing activities

-Aggregation of fishing activities

-Areas not impacted by mobile gears

-Discarding rates of commercially exploited species

-Fuel efficiency of fish capture

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Public (nearly) access to data

‘ ‘end-users’ means bodies with a research or management interest in the scientific analysis of data in the fisheries Sector’

‘Member States shall make detailed and aggregated data available to end-users to support scientific analysis:

(a) as a basis for advice to fisheries management, including toRegional Advisory Councils;

(b) in the interest of public debate and stakeholder participation in policy development;

(c) for scientific publication.’

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Further technical details: