Monitoring programme: Biodiversity - Fish
Programme topic: Fish, shellfish and fisheries

SUB-PROGRAMME: MIGRATORY FISH

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **partly coordinated.** The sub-programme is partly coordinated within ICES WGBAST. Missing: sea trout parr densities and most of eel monitoring.

- Common monitoring guidelines: Monitoring is coordinated under ICES groups: Assessment Working Group on Baltic Salmon and Trout and Joint EIFAAC/ICES Working Group on Eels.
- Common quality assurance programme: ICES
- Common database: There are no centralised databases in ICES that cover data for baltic salmon and trout, other than the ground fish trawl surveys. A common, coordinated analysis of database is made under ICES by the Finnish Game and Fisheries Research Institute.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiveristy D3 Commercial fish and shellfish D4 Food webs
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 1.6 Habitat condition 3.1 Level of pressure of the fishing activity 3.2 Reproductive capacity of the stock 3.3 Population age and size distribution 4.1 Productivity (production per unit biomass) of key species or trophic groups 4.3 Abundance/distribution of key trophic species
	Features (Q5c)	Habitat types: Identification and mapping of special habitat types, especially those recognised or identified under Community legislation (the Habitats Directive and the Birds Directive) or international conventions as being of special scientific or biodiversity interest. Biological features: Information on the structure of fish populations, including the abundance, distribution and age/size structure of the populations
	Activities (Q7a, 7b)	Extraction of living resources: Fisheries
Other relevant legislation (Q8a)	Common Fisheries Policy (CFP) and Data Collection Framework (DCF) Habitats Directive Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures	X	
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: Salmon assessment units/river specific	X

MONITORING CONCEPTS

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
ICES	Fish abundance	Life history stage (e.g. egg, juvenile, adult)	Sea trout parr density surveys-rivers	Other	Yearly	Targeting river basins	Abundance of sea trout spawners and parr	1.1.1 Distributional range, 1.2.1 Population abundance and/or biomass, 1.3.1 Population demographic characteristics, 1.3.2 Population genetic structure	MS land/FW	Varies by river – earliest 1976	SE, FI, RU, EE, LT, PL, DK, DE

ICES	Fish abundance	Life history stage (e.g. egg, juvenile, adult)	Sea trout parr density surveys - areas	Other	Yearly	Targeting areas	Abundance of sea trout spawners and parr	1.3.1 Population demographic characteristics, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation), 3.3.4 Size at first sexual maturation	Territorial waters	Varies by area – earliest 1980	FI, RU, EE, LV, LT, PL
ICES	Sampling from sea trout catch	Composition of catch	Biological sampling	Other	Yearly	Main fisheries	-	1.3.1 Population demographic characteristics, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 3.3.4 Size at first sexual maturation	Territorial waters	Early 2000s	All HELCOM Contracting Parties

ICES	Population dynamics salmon	Population size (abundance)	Stock assessment	Other	Yearly	Stock wide assessment Gulf of Finland	-	3.2.1 Spawning Stock Biomass (SSB), 3.2.2 Biomass indices, 1.3.1 Population demographic characteristics, 1.2.1 Population abundance and/or biomass, 3.1.1 Fishing mortality, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 4.3.1 Abundance trends of functionally important selected groups/species	EEZ	1993	All HELCOM Contracting Parties

ICES	Population dynamics salmon	Population size (abundance)	Stock assessment	Other	Yearly	Stock wide assessment Main Baltic Basin and GoB and on river basis	-	3.2.1 Spawning Stock Biomass (SSB), 3.2.2 Biomass indices, 1.3.1 Population demographic characteristics, 1.2.1 Population abundance and/or biomass, 3.1.1 Fishing mortality, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 4.3.1 Abundance trends of functionally important selected groups/species	EEZ	1993	All HELCOM Contracting Parties
ICES	Catch statistics of salmon	Composition and number of retained/landed catch	Time series of catches of salmon	Other	3-monthly	Offshore, coastal, river, commercial and angling	-	3.1.1 Fishing mortality	MS land/FW	1972	All HELCOM Contracting Parties
ICES	Salmon parr densities	Life history stage (e.g. egg, juvenile, adult)	Electrofishing	Other	Yearly	River areas, rolling programme	Abundance of salmon spawners and smolt	1.1.1 Distributional range, 1.2.1 Population abundance and/or biomass), 1.3.2 Population genetic structure	MS land/FW	1980	All HELCOM Contracting Parties

ICES	Salmon spawning runs	Reproduction rate	Monitoring at fish ladders with traps or DIDSON	Other	Yearly	At the few index rivers	Abundance of salmon spawners and smolt	3.2.1 Spawning Stock Biomass (SSB)	MS land/FW	Traps since 1990s, DIDSON since 2008	All HELCOM Contracting Parties
ICES	Salmon smolt production	Life history stage (e.g. egg, juvenile, adult)	Traps and mark recapture	Other	Yearly	At the few salmon index rivers and other rivers	Abundance of salmon spawners and smolt	1.2.1 Population abundance and/or biomass, 1.3.2 Population genetic structure	MS land/FW	1990	All HELCOM Contracting Parties
ICES	Sampling from salmon catch	Composition of catch	Biological sampling	Other	Yearly	All main fisheries	-	1.3.1 Population demographic characteristics, 1.3.2 Population genetic structure, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 3.3.4 Size at first sexual maturation	MS land/FW	2003	All HELCOM Contracting Parties

ICES under WGEEL Group	Yellow eel recruitment	Life history stage (e.g. egg, juvenile, adult)	traps	Other	Yearly	At 5 Baltic rivers	-	1.3.1 Population demographic characteristics, 3.2.1 Spawning Stock Biomass (SSB), 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 3.3.4 Size at first sexual maturation	MS land/FW	1950	SE and DK
ICES under WGEEL Group	Yellow eel abundance	Population size (abundance)	traps	other	Yearly	2 locations		1.2.1 Population abundance and/or biomass	MS land/FW	2004	SE
ICES	Silver eel escapement	Life history stage (e.g. egg, juvenile, adult)	Catch per unit effort of silver eel	Other	Yearly	3 locations in Sweden	-	1.3.1 Population demographic characteristics, 3.2.1 Spawning Stock Biomass (SSB), 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 3.3.4 Size at first sexual maturation	Territorial waters	1950	SE
ICES	Eel commercial catch	Composition and number of retained/landed catch	Monitoring of catches	Other	Yearly	Across the Baltic	-	3.1.1 Fishing mortality	Territorial waters	1945	All HELCOM Contracting Parties

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	Salmon, sea trout, eel/catches
Method	All catches are monitored.
Spatial resolution	The catch monitoring occurs across the Baltic. Catch monitoring collates national catch records (but method varies by country across sea trout, salmon and eel).

Element / parameter	Salmon population/stock assessment
Method	Smolt and parr surveys (traps, DIDSON and electrofishing) at index rivers, and other locations. Stock assessments exist for the main salmon population in the Baltic and the overall trends for Gulf of Finland salmon determined using various methods f interpolating monitoring trends. Stock assessments integrate time series trends and biological information.
QA/QC	Either by ICES protocol, benchmark or workshop. Some though use national approaches.
Frequency	The frequency varies, with some series stopping and then starting again. Varieties of rivers can be monitored each year. The salmon index rivers should be monitored annually. Sea trout and salmon don't occur parallel in all rivers, selection of index rivers need to be considered separately for salmon and sea trout.
Spatial Scope	Monitoring for salmon is carried out by assessment unit.
Spatial resolution	Stock assessments are region specific. The surveys of recruitment, escapement, smolts or parrs are river specific (see ICES SGBALANST REPORT 2007 page 10 for a summary of sea trout monitoring in the Baltic ; ICES WGBAST REPORT 2013 page 18 for a table of biological sampling of salmon in the Baltic in 2012 and page 270 for assessment units).

Element / parameter	Sea trout population/Stock assessment
Method	Smolt and parr surveys (traps, DIDSON and electrofishing) at index rivers, and other locations. Stock assessments exist for overall trends for sea trout, determined using various methods of interpolating monitoring trends. Stock assessments integrate time series trends and biological information.
QA/QC	Either by ICES protocol, benchmark or workshop. Some though use national approaches.
Frequency	The frequency varies, with some series stopping and then starting again. Varieties of rivers can be monitored each year. The salmon index rivers should be monitored annually. Sea trout and salmon don't occur parallel in all rivers, selection of index rivers need to be considered separately for salmon and sea trout.
Spatial Scope	Region specific / River specific. Assessment is river specific, results can be summed up by coastal area or sub basin.
Spatial resolution	Stock assessments are region specific. The surveys of recruitment, escapement, smolts or parrs are river specific (see ICES SGBALANST REPORT 2007 page 10 for a summary of sea trout monitoring in the Baltic ; ICES WGBAST REPORT 2013 page 18 for a table of biological sampling of salmon in the Baltic in 2012 and page 270 for assessment units).

Element / parameter	Eel population/Stock assessment
Method	The abundance trends of various life stages (recruits, yellow eel and silver eel) are monitored. Yellow eel monitoring by traps in specific locations. Silver eel by catch per unit of fishing effort estimates. The Baltic is a component of the Europe wide stock assessment. Overall trends for eel are determined using various methods of interpolating monitoring trends. Stock assessments integrate time series trends and biological information.
QA/QC	Either by ICES protocol, benchmark or workshop. Some though use national approaches.
Frequency	The frequency varies, with some series stopping and then starting again. Varieties of rivers can be monitored each year. The salmon index rivers should be monitored annually.

Spatial Scope	Most monitoring for eel is carried out in Sweden.
Spatial resolution	Stock assessments are region specific.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

Monitoring is to be carried out to fulfill assessment requirements of HELCOM ecological objectives that are specified through HELCOM core indicators. The requirements on monitoring can include number of stations, the sampling frequency and replication.

Monitoring requirements	The current management regime requires an evaluation of the status of individual salmon stocks. This implies that stock-specific information needs to be collected from all salmon rivers; currently there are about 40 spawning rivers of salmon in the Baltic Sea (and 16 rivers in Kattegat). The regime has a high priority to establish at least one index river in each Assessment Unit (AU) of Baltic salmon. Data from an index river consists of monitoring of salmon spawning runs and their composition, smolt runs, river catches and parr densities. Monitoring in all non-index salmon rivers should be arranged so that each juvenile cohort is sampled at least once before smoltification. Electrofishing surveys in non-index salmon rivers are of high priority but it is not necessary to have annual surveys in every river. Periodic smolt trapping in non-index rivers and monitoring of the M74 mortality in a subset of rivers supplement assessment by improving the accuracy of stock estimates. Updating any information relevant to the migration and/or reproduction possibilities of salmon in rivers (e.g., changes in migration obstacles, restoration of river habitat, measures affecting water quality and/or flow regimes) is also needed. Assessment requirements concerning monitoring at sea covers: fishing effort and catches (incl. discarding and estimates of unreporting), catch sampling from which the stock composition and the origin (wild/hatchery-reared) is analysed. These data are needed on fleet basis (offshore/coastal fishing by gear type). Also catch data on recreational fisheries at sea and in rivers is necessary and used in the salmon assessment. Monitoring requirements concerning sea trout are very similar to those of salmon. However, the current trout assessment does not require as broad range of datasets as is required for salmon assessment. The datasets of highest priority are: parr densities and inventories of river habitat. Establishment of index rivers similar to salmon index rivers is highly recommended. This would enable supplementing of parr density information with counts of trout smolts and ascending spawners in a part of rivers. Catches, tag recaptures from fisheries, and information about fishing pressure and fishing pattern (gear and mesh sizes used) are also required for in-depth assessment of sea trout stocks. There is no such thing as Baltic eel. Eel is pan-European, so the monitoring programmes must be European wide.
Gaps	Currently, few salmon index rivers in the Baltic Sea provide a full set of information (monitoring of salmon spawning runs, smolt runs and river catches, and parr densities) required from index rivers. Full scale monitoring takes place only in Finland and Sweden and covers Assessment Units 1, 2 and 4. More index rivers with full set of information are especially needed from Assessment Units 5 and 6. Complete and more accurate estimates about recreational salmon catches are needed both from the sea and the rivers. The spatio-temporal coverage of catch sampling from sea may need to be increased for assessment efforts serving stock specific management and restoration of weak stocks. For sea trout, establishment of index rivers similar to salmon index rivers is highly recommended.

Adequacy for assessment of GES (Q5d)

Monitoring should provide adequate data and information to enable the periodic assessment of environmental status, and distance from and progress towards GES as required by MSFD under Article 9 and 11.

Adequate data?	Yes
Established methods for assessment?	Yes. Expert evaluations are available and a substitutive model to estimate reference densities in a certain areas is available, but a generally working model for all areas is still missing. In addition a criteria for selection of monitoring sites need to be developed.
Adequate understanding of GES?	Yes i.e. 50% of the max. reference density.
Adequate capacity to perform assessments?	Yes. ICES WGBAST have a capacity to perform the expert evaluation on the status of stock and to run potential models.

Assessment of natural variability (Q5e)

Quantitative and by expert opinion. Natural variation is quantified by analytical assessment tools (life cycle models for salmon and other statistical analyses methods for sea trout) and the results are complemented by expert opinions, trend analyses etc.

DATA PROVIDERS AND ACCESS

Data access point	National databases

Data type (Q10c)	Processed Data sets Data Products Modelled data
Data availability (Q10c)	Provide location of data in national data centre: Modelled data available in the Finnish Game and Fisheries Research Institute. Provide location of data in international data centre (e.g. RSC, ICES, EEA, EMODnet): Catch sampling data of salmon available in the ICES Regional database.
Data access (Q10c)	Restricted by specific licence Data will not be available
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	Unclear
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Unclear
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes

REFERENCES

Stock assessment of Gulf of Finland Salmon

Stock assessment of salmon in Baltic main basin and Gulf of Bothnia

Monitoring of smolts and migrating adults: Annex of the WGBAST report

Study group on data requirements and assessment needs for Baltic Sea trout (SGBALANST)

SALAR project

Report of the Joint EIFAAC/ICES Working Group on Eels (WGEEL)

Electrofishing method manual: Bohlin T, S Hamrin, T G Heggberget, G Rasmussen & S Jakob Saltveit (1989) Electrofishing — Theory and practice with special emphasis on salmonids. Hydrobiologia 173: 9-43.