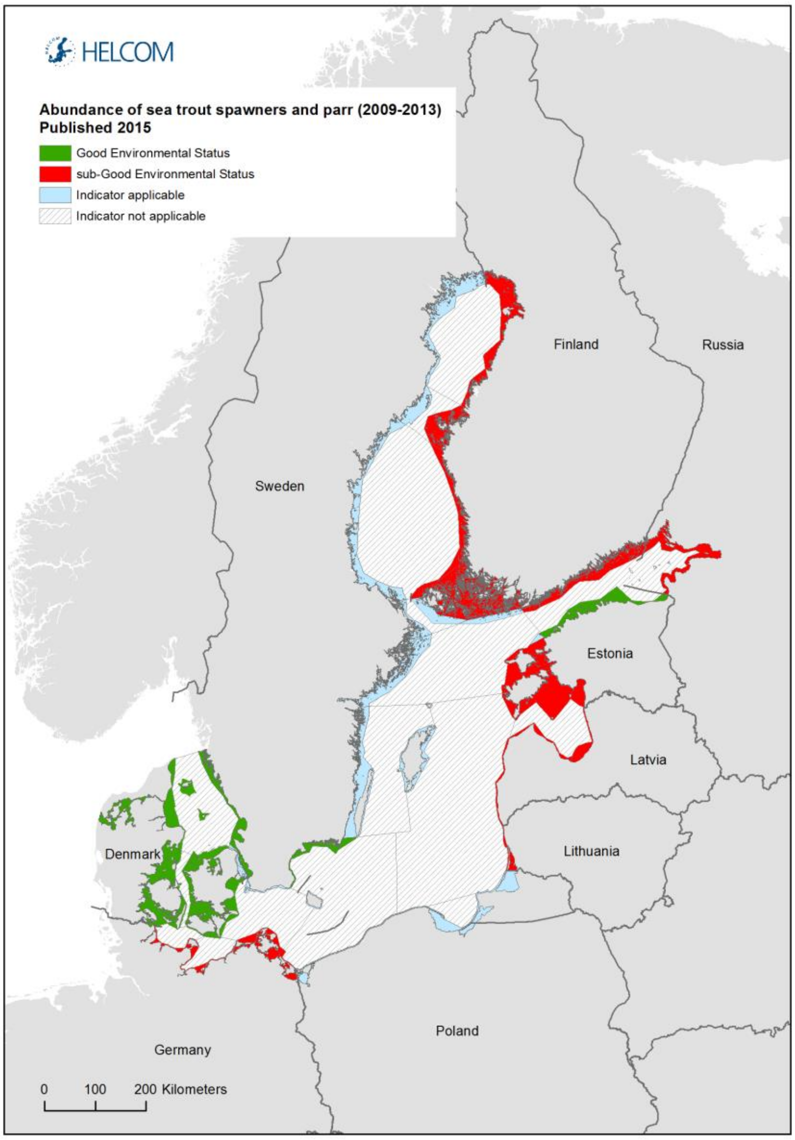
HELCOM INDICATORS

HELCOM core indicator report
October 2015

Abundance of sea trout spawners and parr

Key message

This core indicator evaluates the status of coastal sea areas of the Baltic Sea based on the abundance of sea trout parr in rivers where they breed. The determination of whether Good Environmental Status (GES) is reached is based on a comparison of the observed parr densities in rearing habitats with the reference potential parr densities in the specified habitats. The current evaluation assesses the status of sea trout populations using data from 2014 and expert evaluations.



Key message figure 1: Status assessment results based evaluation of the indicator 'abundance of sea trout spawners and parr'. The assessment is carried out using Scale 3 HELCOM assessment units (defined in the HELCOM Monitoring and Assessment Strategy Annex 4). Click to enlarge.

The current evaluation shows that the status reflected by populations of sea trout is sub-GES in most Baltic Sea coastal areas. GES is not achieved in the Bothnian Bay, the Bothnian Sea and Gulf of Finland. A positive development in parr densities since 2012 has been observed in some rivers in Finland (Gulf of Finland), Estonia (Gulf of Finland) and Sweden (Bothnian Sea), reflecting management improvements in these countries.

In the Baltic Proper, the status of sea trout stocks is better in south-western sub-basins where the majority of stocks reach production levels reflecting GES.

The level of confidence of the assessment is moderate to high.

The indicator is applicable in the rivers of all countries bordering the Baltic Sea.

Relevance of the core indicator

The densities of parr measured in rearing areas in rivers reflect the abundance of the adult sea trout spawners and success of recruitment. Adult sea trout carry out feeding migrations in the Baltic Sea where they are top predatory fish.

Sea trout abundance is affected by commercial and recreational fishing at sea and in rivers. The parr densities measured in rivers are affected by migration barriers to reproduction areas and habitat quality. Thus the indicator reflects the state of the ecosystem as it is sensitive to river connectivity (effect of dams) and the quality of spawning and rearing habitats.

Policy relevance of the core indicator

	BSAP Segment and Objectives	**MSFD Descriptors and Criteria**
Primary link	Biodiversity and nature conservation • Thriving and balanced communities of plants and animals • Viable populations of species	D1 Biodiversity 1.1 Species distribution 1.2 Population size 1.3 Population condition 1.5 Habitat extent
Secondary link		D4 Food-web 4.3 Abundance/distribution of key trophic groups and species D3 Commercial fish and shellfish 3.1 Level of pressure of the fishing activity 3.2 Reproductive capacity of the stock
Other relevant legislation: In some Contracting Parties of HELCOM potentially also EU Water Framework Directive		

Cite this indicator

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[Core indicator report – web-based version October 2015 (pdf)]

[Extended core indicator report – outcome of CORESET II project (pdf)]

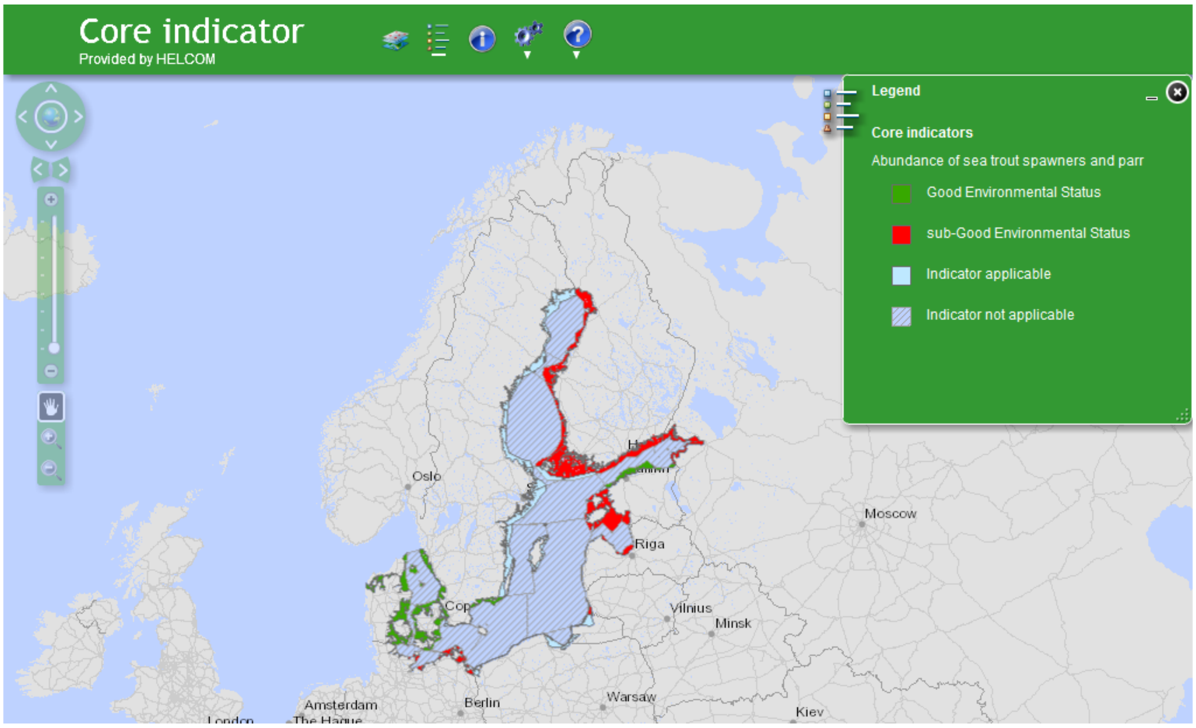
Results and confidence

According to the current assessment, good environmental status (GES) is achieved in the Sound, along the Swedish coast of the Bornholm Basin and along the Estonian coast of the Gulf of Finland. All other areas are classified as having sub-GES status.

Current status and trends in the Baltic sea trout

Of the 629 sea trout river populations, 185 were evaluated as having good environmental status (GES), 144 were evaluated as sub-GES and 320 were not evaluated at all. The present status of sea trout populations is very alarming in some areas, where only 26% wild and mixed sea trout river populations had estimated smolt production above the 50% GES boundary during 2014 (ICES 2015).

A positive development in parr densities since 2012 has been observed in some rivers in Finland (Gulf of Finland), Estonia (Gulf of Finland) and Sweden (Bothnian Sea), reflecting management improvements in these countries.



The ICES Assessment Working Group on Baltic Salmon and Trout (ICES WGBAST) has evaluated the status of sea trout populations for 2014 (ICES 2015). The status of populations in the Main Basin (all sub-basins south of the Gulf of Bothnia and Gulf of Finland) is known for 177 rivers with wild populations and unknown for 218 rivers. The status of 26 populations (wild and mixed populations, including tributaries in large systems) is sub-GES (below 5% of the potential smolt production). In several areas in the Baltic Proper a worrying decline of parr densities has been found, although the densities are still at a reasonable level. In ICES sub-divisions 22 and 26, however, the parr densities are at a low level.

In Sweden, densities of parr in rivers entering into The Sound, Arkona Basin and Bornholm Basin (ICES SD 23–25) have remained stable during 1990–2014. In the Western Gotland Basin, Bothnian Sea and Bothnian

Bay (ICES SD 27, 30, 31) the densities have increased during the same period but in the Bothnian Bay the densities are still very low.

In Estonia, parr densities in rivers entering the Gulf of Finland, Northern Baltic Proper and Gulf of Riga have increased since 2001 in all the spawning rivers that have good or very good habitat quality. However, the Northern Baltic Proper stocks on the islands of Saaremaa and Hiiumaa are at low levels.

In Finland, parr densities have been far below the reference production level in all rivers for several years. There are high annual fluctuations in the observed densities and most of the rivers show densities of less than 1–5 parr per 100 m^2. In the Gulf of Finland, the river Ingarskila had parr density of over 80 per 100 m^2 in 2009, but the annual variance is very high. There have been improvements in the state of the stock in several rivers in recent years, probably as a result of implementation of new management measures.

In the Russian part of the Gulf of Finland, parr densities are estimated to be at a level of 5–10 parr per 100m^2, which is considered low or below optimal.

In Latvia, the rivers Salaca, Gauja and Venta are the three most important sea trout rivers for wild smolt production. In Salaca, the parr density was on average 6.3 parr (0+ and older) per 100 m^2, which is below average for earlier years. In Gauja, the average density was 5.3 parr per 100 m^2 in 2010, which is less than the average in previous years. No recent data are available for the river Venta, but in the period from 2007–2009 averages varied between less than one to 2.2 parr per 100 m^2. There do not seem to be improvements in the abundance of sea trout in Latvian rivers, however there is much uncertainty since very recent data are not available.

In Lithuania, almost all spawning rivers reflect sub-GES status. The average density of juveniles (0+ – 2+) in rivers have fluctuated in the last years, from very high to very low numbers. Surveys were carried out at 75 sites, where the average mean density of juveniles varied from 2.9 to 28.2 per 100 m^2 (mean – 12 individuals/100 m2). The main reasons for the present decline are exceedingly high fishing pressure in the sea and coastal fishery as well as illegal fishing in rivers during spawning migration and during the spawning period. The majority of sea trout are caught in coastal areas as a by-catch by gillnets targeting other species.

In Poland, there is only one stream with a wild sea trout stock, 16 with mixed and 8 with reared stocks. The average density of 0+ parr at monitored spawning grounds is usually around 50 per 100 m^2, but on some sites can exceed 150 individuals per 100 m^2. There have not been great changes in the densities during the last 6 years. The main causes for the sub-GES status of sea trout stocks is the lack of suitable spawning habitats due to dams, water discharge times and gravel extractions. However, also poaching, by-catch of smolts in the coastal herring fishery and diseases negatively affect the stocks.

In Germany, there are nine rivers with natural reproduction (eight of them initiated with stocking). The numbers of parr have increased during the last 11 years. The status of the stocks is mostly sub-GES.

In Denmark, approximately 26% of the streams (either small entire streams or parts of larger streams) with original populations of sea trout produce less than 50% of stream capacity. The reasons for this are, in most cases, poor habitat conditions (including heavy sand transport) or barriers (including newly established artificial lakes in the lower parts of the streams). The wild sea trout smolt production has, however, increased in the entire country and not least in the streams inside the Baltic area where wild smolt production has increased more than twofold over the last decade.

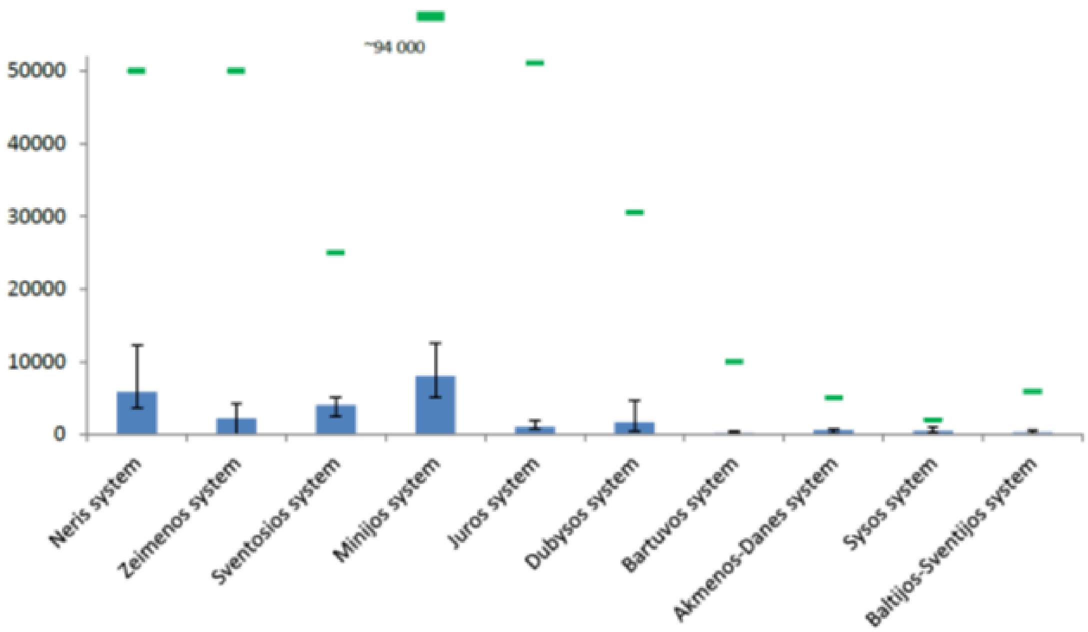
For more information about the state of sea trout stocks, see ICES 2015, HELCOM 2011 and Pedersen et al. 2012.

Smolt production and post-smolt survival

The smolt production of rivers in the Russian Kaliningrad and St. Petersburg regions and Latvia, are shown in Results table 1. In Lithuania, it was estimated that in 1999 the rivers produced 323,800 sea trout smolts, but in recent years annual smolt production has dropped to 34,000–46,000 smolts (Results figure 2).

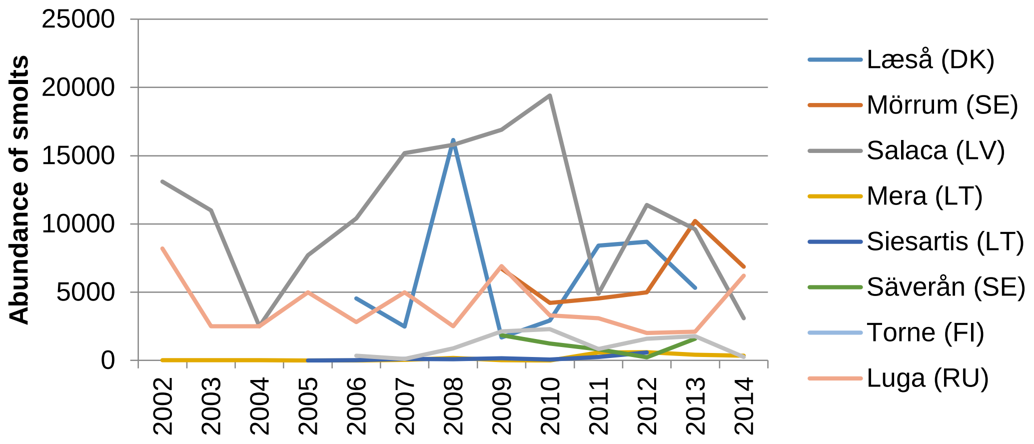
Results table 1: Smolt production in Russia and Latvia. Source: Pedersen et al. 2012.

Region/Country	Smolt production	Potential
Kaliningrad region	3,500	200,000 – 250,000
St. Petersburg region –Northern part	6,000-8,000	
St. Petersburg region –Southern part	4,000	
Latvia	61,000	



Results figure 2. Average annual smolt production in Lithuanian river systems (mean and range) during 2005-2010 and the potential smolt production capacity (green lines). The average of the total annual smolt production was 24,500 individuals. Source: Pedersen et al. 2012.

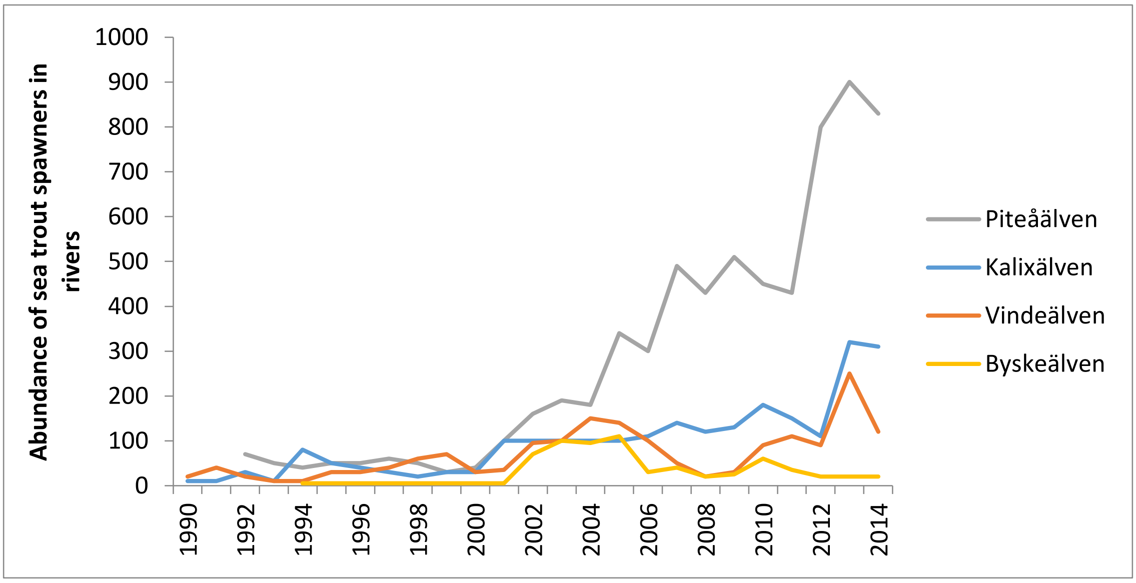
Tagging studies on post-smolts at sea show a continuous decrease in returns (ICES 2015). Carlin tagging results in the Gulf of Bothnia and Gulf of Finland show that a large and increasing proportion, often the majority, of the sea trout are caught already during their first year in sea. Trout are caught as by-catch in the whitefish fishery by gillnets and fykenets. Based on tagging data, the proportion of fish caught as undersized during the first sea year is still increasing, even though the total effort of gillnet fishery by professional fishermen has not changed during the past ten years. The recapture rate of sea trout shows a continued decreasing trend for more than 20 years in the Gulf of Bothnia, although it may have levelled off in recent years. In the Swedish parts of the Gulf of Bothnia, the recapture rate was similar to Finland in the period 1980–2002.



Results figure 3. The abundance of sea trout smolts in nine rivers. Source: ICES 2015.

Number of sea trout spawners

The number of ascending sea trout spawners is followed only in a few large rivers. Five Swedish rivers in the Bothnian Sea and Bothnian Bay have automatic or manual counting. According to Pedersen et al. (2012) the number of spawners in these rivers were too low to populate all available habitats. In River Piteälven the number has increased continuously, and for some years there was also an increase in Kalixälven, Vindelälven and Byskeälven (see Results figure 4). However, the number of spawners ascending Kalixälven and Byskeälven declined again between 2010 and 2011. The increase in the River Piteälven is likely due to the closing of salmon traps in the river estuary. In general, the number of spawners has increased since 2012.



Results figure 4. Abundance of sea trout spawners in four Swedish rivers. Source: ICES 2015.

Even though the number of spawners increased in River Piteälven during the period 2001–2012, the number of spawners observed entering rivers in northern Sweden is still extremely low, especially taking into account the size of the rivers. This is likely due to both low recruitment and elevated mortalities at sea. In addition, anglers' catch, which to some extent indicates the number of spawners, does not suggest any increase in the number of spawners in this area either.

The estimated number of spawners migrating to the Lithuanian Nemunas catchment area varies between 11,500 individuals (in 1992) and 1,800 (in 2003), but on average it is around 4,000 individuals per year.

In the German river Hellbach, a pilot counting of adult spawners estimated nearly 1,600 ascending fish in 2009. In 2010, this number was 500, but that was considered an underestimate due to flood conditions.

Confidence of the indicator status evaluation

The estimation of the reference parr density is made using the assessment model in the southern Baltic Sea and on the expert evaluation in the northern Baltic Sea. Both methods are considered to give an accurate enough estimate on the potential maximum parr density to allow for the evaluation of the stock status. Hence, there is no significant regional difference in the confidence of indicator status when it comes to the reference densities.

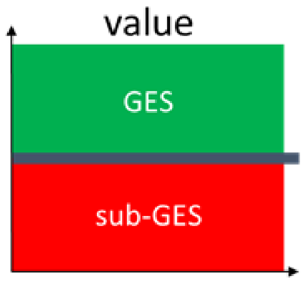
A counterpart for the reference densities in GES criteria is planned to be based on the 4-5 year moving average of parr densities. In some areas (e.g. in Denmark) there are too many rivers to be surveyed annually with available resources. However, most of the rivers are still surveyed at regular intervals and in these a different calculation for the average parr densities can be used. This does not decrease the level of confidence in the evaluation of the state of the stock.

Good environmental status

The assessment of environmental status is based on the comparison of the observed parr densities in rearing habitats with the reference potential parr densities in the specified habitats, which can be based on model estimations or expert judgement.

Parr is a young sea trout living in the river before the smoltification and start of feeding migration to the sea. The parr stage is sometimes subdivided according to age, where parr 0+ are young fish less than one year old. Depending on the river, sea trout parr spend 1-3 years in the river before the sea run.

The site specific reference parr densities exhibit a rather large natural variation between years. In rivers where the abundance of spawners has been estimated to continuously meet the conservation limits, and are thus considered to reflect Good Environmental Status (GES), the parr densities have varied between 60-100% of the estimated reference potential densities. In this evaluation, GES is achieved when the moving parr density average remains above 50% of the reference parr density. Consequently, the GES boundary is a moving average of parr densities over 4-5 years (good environmental status figure 1). It should be noted that only rivers accessible to spawners and containing suitable good quality spawning habitat are evaluated.



Good environmental status figure 1. Reference parr densities are determined either through model estimations based on actual reference data or expert judgment. GES is achieved if the site-specific moving parr density average remains above 50% of the site specific reference potential parr density.

The reference potential parr densities are estimated for each river by a rigid Baltic assessment model that takes into account the physical characteristics of the river habitat (see e.g. ICES 2015). The present model is applicable to rivers where the parr density is estimated to have reached the full production level at least once in the available time series. Rivers in Denmark and some other areas in the southern Baltic Sea meet this requirement. For the northern rivers, the Baltic assessment model indicates sub-GES conditions in accordance with other data, however, there is still some uncertainty as to the precision of the model in this area. The uncertainty is due to the quality of the background data that do not include full production level conditions and since natural conditions differ significantly from other parts of the Baltic, implying that the production levels from the southern areas cannot be used as reference values in the northern areas. Rivers in the northern areas are presumed to have a naturally lower overall productivity due to lower temperatures and other environmental factors. In these areas, the maximum potential parr densities have been provided by expert evaluations. Currently, a list of river specific reference values is not available.

The GES boundary has mainly been defined based on expert judgement and long-term data on reference conditions, and therefore the confidence of the target is considered to be moderate to high.

Assessment protocol

The Baltic assessment model focuses on the state of recruitment, which is defined as the observed recruitment (i.e. observed densities) compared to the potential reference recruitment (i.e. maximal densities that could be expected under the given habitat conditions). The model uses electrofishing data of the individual sea trout populations, together with habitat information collected at the same sites, to calculate the trend in population development over time. The examination of the data is site-specific (several sites can exist in one river) but the evaluation of the state of the stock can be concluded on the river level and also at a sub-area level. Average values of recruitment state are calculated for assessment areas, sub-divisions, and, where more countries have streams in one sub-division, for each individual countries (ICES 2011; ICES 2015).

At the annual meetings of the International Council for the Exploration of the Seas Assessment Working Group on Baltic Salmon and Trout (ICES WGBAST), all available data from the Baltic countries on estimated abundance of sea trout parr (per 100 m^2) from individual sites are compiled. In 2014, data was available from a total of 237 sites in about 120 streams, which reflects the general situation of data availability. For the evaluation, parr abundance are divided into young of the year (0+) and older trout (>0+). If there is a lack of data, young of the year (0+) and older trout (>0+) can be aggregated instead of analysed separately.

Differences in habitat qualities (e.g. suitability for trout) influence trout abundance. Selected monitoring sites are situated in small rivers, focused on typical habitats of sea trout. To be able to compare trout abundances between sites with different habitat quality, a sub-model has been proposed: the Trout Habitat Score (THS). The THS is calculated by first assigning values (scores) for each habitat parameter for 0+ trout: average/dominating depth, water velocity, dominating substrate, stream wetted width, slope (where available) and shade. Values (scores) are assigned between 0 (for sites with poor conditions) and 2 (for best conditions) by using suitability curves and partly by expert judgement (ICES 2011). All scores are then summed, resulting in a THS between 0 (zero) for sites with very poor conditions and 12 (10 if slope is omitted) for sites with very good conditions for sea trout parr. The THS scores obtained are then combined into Habitat Classes (HC) that range between 0 (poorest) and 3 (best).

Due to the significant climatic (e.g. temperature and precipitation) and geological differences across the Baltic Sea region, the densities of sea trout parr vary between areas. The predicted reference potential densities for sites across the Baltic at full recruitment are determined through a multiple linear regression analysis using the following parameters: stream wetted width, climate (average air temperature), latitude (proxy for productivity due to climate), longitude (proxy for the gradient from oceanic to continental climate) and the habitat score (0-1-2-3; see ICES 2011) with log (0+ trout density + 1) as dependent variable. For this analysis, only sites with the best quality and highest observed densities are used.

Sites judged to have good to intermediate water quality (a prerequisite for trout to fulfil their life cycle) are selected for assessment, irrespective of the habitat quality class (HC) of the site.

Recruitment trend over time is calculated for each site through linear regression of parr density versus years (currently 2000–2014) as Pearson r correlation coefficient, resulting in values from -1 to +1. Values close to -1 indicate a high correlation to a straight line, representing a negative development.

In addition to parr density data, evaluations of GES can be supported by direct counts of ascending spawners in some rivers. This is possible by means of video counting which distinguishes between sea trout and salmon. Also smolt counting is carried out in a couple of rivers. Both spawner and smolt counting data provide complementary input to the estimation of stock status based on the parr densities. However, electrofishing survey monitoring, which measures the parr densities, provides the primary data used for evaluating sea trout stock status in the Baltic Sea area.

Assessment units

Since all the Baltic sub-basins have naturally reproducing stocks of sea trout, this indicator is relevant in the entire Baltic Sea. Sea trout migrate between fresh water river systems and the marine area, mainly feeding within <100 km from their home river. The assessment units most applicable for evaluating GES using sea trout are therefore the coastal assessment units.

While it appears that most populations of sea trout make relatively short feeding migrations (a few hundred kilometres), it is known that all sea areas have populations with long migration patterns where the sea trout spread into neighbouring coastal areas. For example fish tagged in the Finnish part of the Gulf of Finland are found in Estonia and Russia (and vice versa), and similarly, fish tagged in the Finnish side of Gulf of Bothnia are found in Sweden (and vice versa). According to previous work by SGBALANST (ICES 2008, 2009), the sea trout populations in the Bothnian Sea, Bothnian Bay and Gulf of Finland (ICES sub-divisions 30, 31 and 32) have been pointed out as highly separated units with respect to state of the stock and migration patterns.

For the purposes of this HELCOM core indicator on sea trout spawners and parr, the environmental status is assessed for coastal areas using HELCOM assessment unit scale 3. Some sub-basins may be combined for evaluations at a later stage, if necessary, when the migration patterns of the sea trout populations become better known.

The assessment units are defined in the HELCOM Monitoring and Assessment Strategy Annex 4.

Relevance of the indicator

Biodiversity assessment

The status of biodiversity is assessed using several core indicators. Each indicator focuses on one important aspect of the complex issue. In addition to providing an indicator-based evaluation of the abundance of sea trout spawners and parr, this indicator will also contribute to the next overall biodiversity assessment to be completed in 2018 along with the other biodiversity core indicators.

Policy relevance

The core indicator of the Baltic sea trout addresses the Baltic Sea Action Plan's (BSAP) Biodiversity and nature conservation segment’s ecological objectives 'Thriving and balanced communities of plants and animals' and 'Viable populations of species'.

The indicator is relevant to the following specific BSAP actions:

- 'Classification and inventorying of rivers with historic and existing migratory fish species no later than by 2012',
- 'Development of restoration plans (including restoration of spawning sites and migration routes) in suitable rivers to reinstate migratory fish species, by 2010'.

The core indicator also addresses the following the qualitative descriptors of the MSFD for determining good environmental status (European Commission 2008):

Descriptor 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';

Descriptor 3: 'Populations of commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock'; and

Descriptor 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'.

and the following criteria of the Commission Decision (European Commission 2010):

- Criterion 1.1 (species distribution)
- Criterion 1.2 (population size)
- Criterion 1.3 (population condition, particularly the genetic structure)
- Criterion 1.5 (habitat extent)
- Criterion 3.1 (level of pressure of the fishing activity)
- Criterion 3.2 (reproductive capacity of the stock)
- Criterion 4.3 (abundance/distribution of key trophic species).

Sea trout rivers and brooks are also within the focus of EU Water Framework Directive (WFD) and all actions improving the habitat quality of these watersheds will benefit also the sea trout stocks accordingly.

Role of sea trout in the ecosystem

Sea trout play an important role in maintaining the balance in riverine food webs, both by harvesting invertebrate populations and also serving as an important food source for other predatory species (ICES 2015).

There are around 1,000 sea trout rivers and streams in the Baltic Sea (HELCOM 2011), with an estimated 395 populations of wild sea trout (and 77 mixed populations) in the Baltic Proper, 28 wild populations (and 28 mixed populations) in the Gulf of Bothnia and 85 wild populations (and 16 mixed population) in the Gulf of Finland. Altogether this adds up to 508 wild and 121 mixed sea trout populations in brooks/rivers in the Baltic Sea area (ICES 2015). The migration patterns of different trout populations vary, with the adult trout of some populations spending their entire life cycle in the same river, whereas the adults of other populations carrying out feeding migrations to the coastal areas of the sea where they feed on various invertebrates and small fish. The exact migration patterns of the sea trout are not known, however, they are generally considered to feed in the vicinity of the coastline and to migrate up and down the coast, making them good indicators of food availability in the coastal area. As a predatory fish species, sea trout generally has a structuring role in the ecosystem, mainly via top-down control on lower trophic levels.

Human pressures linked to the indicator

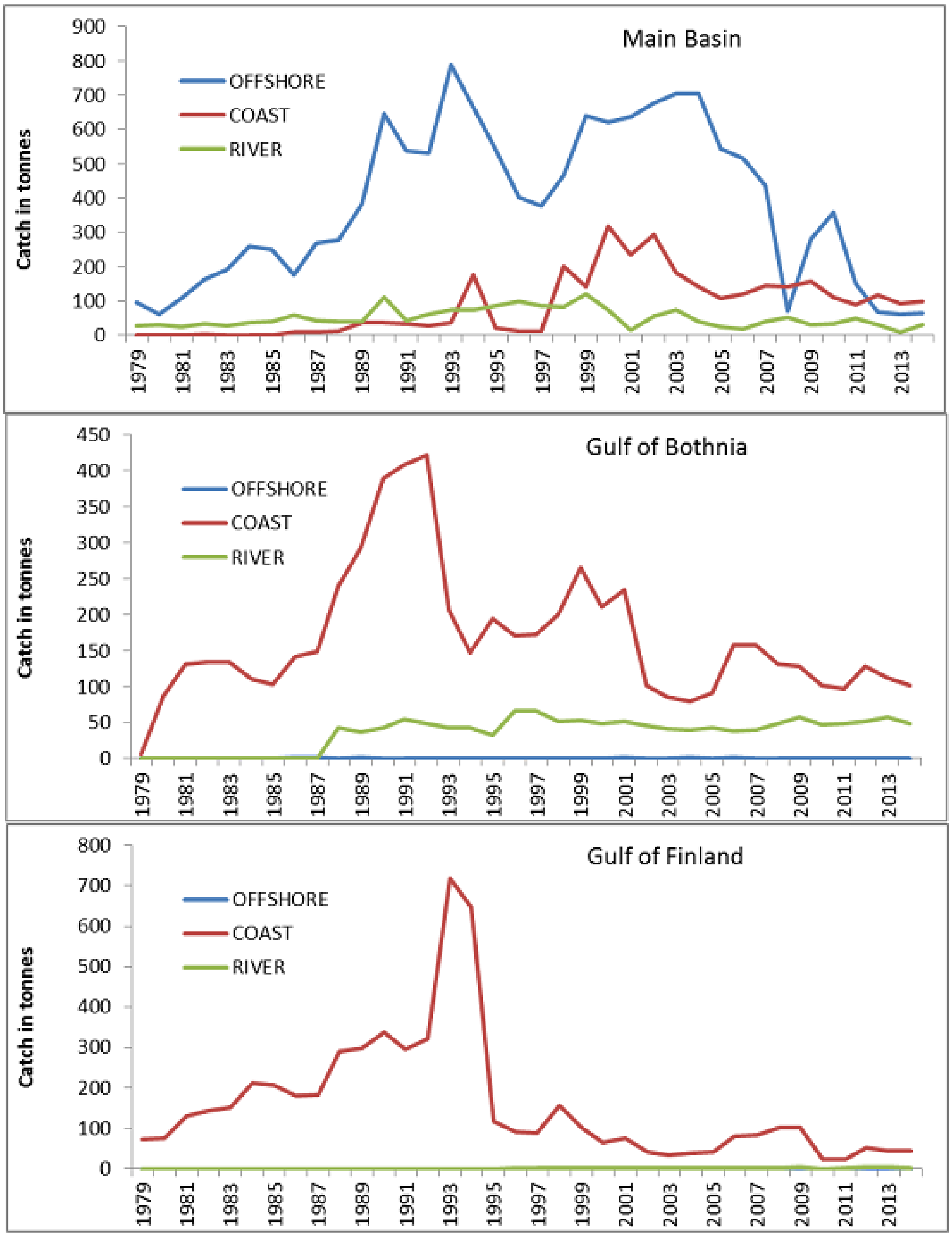
	General	MSFD Annex III, Table 2
Strong link	Fishing of sea trout as well as habitat quality degradation are the main pressures on sea trout	Biological disturbance selective extraction of species
Weak link	-	

Sea trout abundance is affected by commercial and recreational fishing at sea and in rivers. The abundance of spawners returning from feeding migrations in the coastal areas to the rivers is related to the densities of parr in the rivers. The density of sea trout parr also reflects the success of recruitment and depends on other factors such as climate, the size of the river, habitat characteristics and quality and is affected by migration barriers to reproduction areas. This indicator reflects the state of the ecosystem as it is sensitive to river connectivity (effect of dams) and the quality of spawning and rearing habitats.

The main reason for the sub-GES status of sea trout populations in the northern areas of the Baltic Sea is high fishing pressure, particularly by-catch of post smolts in the gillnet fishery. In the Bothnian Bay, Bothnian Sea and the Gulf of Finland young age classes of sea trout are also by-caught in sea fisheries targeting other species, often whitefish. In the Gulf of Finland, the by-catch occurs mainly in gillnets targeting pikeperch. Sea trout is also reported as being by-catch along the Swedish coast in the Bothnian Sea and Bothnian Bay in the commercial coastal salmon trapnet fishery.

The total reported sea trout catch in the Baltic Sea marine area in 2014 was 308 tonnes, which is approximately the same as in 2013 but about 70% less than in 2004 when the decrease in catch begun (ICES 2015, Relevance figure 1). In 2014, around 60% of the total Baltic catch (marine + river) was taken by the coastal fishery, equally from the Gulf of Bothnia and the Main Basin (Baltic Proper). The marine catch in the Gulf of Bothnia was 101 tonnes in 2014, which is close to the ten year average catch. In the Gulf of Finland, marine catches have for many years been on a level of 80–100 tonnes per year, until 2010 when the catch dropped to below 50 tonnes (ICES 2014). The Swedish and Finnish offshore fishery targeting salmon and sea trout in the Baltic Proper was phased out in 2013.

River catch in 2014 was 81 tonnes. Of this, the largest parts were reported from Swedish rivers flowing to the Gulf of Bothnia (43 tonnes, mainly as anglers' catch), and from Polish rivers (28 tonnes, partly as commercial catch in lower Vistula and partly as broodstock fishery in Vistula and Pomeranian rivers).



Relevance figure 1. Fishery catches of sea trout in Main Basin (Baltic Proper), Gulf of Bothnia and Gulf of Finland. Note that offshore catches include in some countries and years also coastal catches and that riverine catches have not been reported from all countries (ICES 2015).

In addition to the effects of fisheries on sea trout, the deterioration of habitat quality and damming of rivers affects the populations. Channelizing of rivers has altered the spawning habitats which decreases the number of spawners (ICES 2009). Also dredging, pollution, acidification and siltation of rivers have negative effects on sea trout populations. The magnitude of the different factors influencing sea trout varies locally within a sub-basin.

Predation by cormorants influences the abundance of sea trout both locally and in larger areas (Dieperink et al. 2001; 2002). The predation can be severe in rivers, at river mouths and in coastal areas. An increase in the population size of cormorants has been observed in many countries and the sea trout stock size may have decreased in areas where large cormorant colonies are present, although this needs further investigation (Bzoma 2004; Leopold et al. 1998).

Sea trout rivers and brooks are also in the focus of EU WFD and all actions improving the habitat quality of these watersheds will benefit also the sea trout stocks. Quality improvement of the spawning and rearing habitats will also positively affect the potential production capacities of the rivers.

Monitoring requirements

Monitoring methodology

Monitoring practices for sea trout spawners and parr are described on a general level in the

HELCOM Monitroing Manual in the Sub-programme: Migratory fish.

Specific guidelines are under development, with the aim to publish them in the manual during 2015.

Current monitoring

The monitoring activities relevant to the indicator which are currently carried out by HELCOM Contracting Parties are described in the HELCOM Monitoring Manual in the Monitoring Concepts table.

Sub-programme: Migratory fish
Monitoring Concepts table

The intensity and period during which monitoring has been carried out varies between countries (ICES 2008). Some countries started monitoring only in recent years, whereas very long data series exist for a few streams.

Sea trout is monitored by all Baltic Sea coastal countries by electrofishing for parr in the natal streams, giving a good index measure of recruitment. Parr densities are measured by regular electrofishing surveys in early autumn (August-September). One river can be surveyed annually or at 2-7 years intervals. Electrofishing usually takes place at fixed sites to allow for comparison of the densities between years. There are usually several electrofishing sites in one river.

In a couple of countries sampling of parr densities is used to calculate the smolt production by a relation of parr to smolt survival either developed in the same stream or in different streams (ICES 2008). In most countries (not in Denmark or Poland) this is supplemented with monitoring of smolt escapement by trapping and counting smolt numbers in one or more streams. In total, smolt production estimates exist for nine rivers in the entire Baltic area, but the time series are not complete for all years.

In only one river (Åvaån in Sweden) is the number of spawners monitored by trapping and inspection of the ascending sea trout. In Lithuania, the spawning run is estimated by test fishing in a couple of rivers. In nine rivers (eight in Sweden, one in Poland) is the number of spawners monitored by automatic fish counters. Determination of species is possible in these, but the exact size, sex, etc. cannot always be determined. In three rivers, the total run of salmonids is determined with an echo sounder, however this technique does differentiate between sea trout and salmon.

An indication of spawning intensity by count of redds is collected from a number of streams in Poland, Lithuania and Denmark (ICES 2008). In a couple of streams in Denmark the catch in sports fisheries has also been used to estimate the development in the spawning run. Catch numbers from sports fishery in rivers are available also for some Swedish rivers.

Tagging and marking are used as methods to obtain quantitative and qualitative information on trout populations.

Description of optimal monitoring

There are too many sea trout rivers and brooks to monitor them all. It is recommended that monitoring of sea trout is carried on the main stocks and expanded to stocks which are poorly known.

Part of the monitoring of sea trout parr takes place in connection with monitoring salmon populations, which results in less precise estimates of sea trout recruitment because of differences in habitats used by the two species. More electrofishing sites should be established in smaller rivers and streams, e.g. tributaries of salmon rivers, to ensure sufficient coverage of sea trout nursery areas.

Sea trout rivers and brooks are also within the focus of EU Water Framework Directive (WPD). Regular monitoring of selected of rivers, and additionally more rigorous inventories at 5-10 years intervals, would fit as a part of national WFD programmes.

Data and updating

Access and use

The data and resulting data products (tables, figures and maps) available on the indicator web pages can be used freely given that the source is cited. The indicator should be cited as following:

HELCOM (2015) Abundance of sea trout spawners and parr**.** HELCOM core indicator report. Online. [Date Viewed], [Web link].

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Metadata

In total, data was available from 240 sites in about 120 streams and rivers for period 2012-2014. ICES sub-divisions 21 to 32 are represented. At least ten sites are included from each of the ICES sub-divisions 25, 27, 30, 31 and 32.

Due to continuous concerns about the state and information available on sea trout in the Baltic Sea, a Study Group on Data Requirements and Assessment Needs for Baltic Sea Trout (SGBALANST) was established by ICES to work for a period of two years to identify a common classification system of habitats between countries (ICES 2011).

Contributors and references

Tapani Pakarinen, Stig Pedersen, Antti Lappalainen, Wojciech Pelczarski, ICES Working Group for Baltic Salmon and Sea trout (WGBAST) and results of the HELCOM SALAR project.

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