

# Sea trout populations and rivers in the Baltic Sea

Sea trout (*Salmo trutta*) river and stock status assessment  
report of the Interreg RETROUT project

Pre-layout version

Published by:

HELCOM - Helsinki Commission Katajanokanlaituri 6 B FI-00160 Helsinki, Finland

www.helcom.fi

For bibliographic purposes this document should be cited as: XXXX

© Baltic Marine Environment Protection Commission – Helsinki Commission (2021)

All rights reserved. Information included in this publication or extracts thereof, with the exception of images and graphic elements that are not HELCOM's own and identified as such, may be reproduced without prior consent on the condition that the complete reference of the publication is given as stated above.

This document is a HELCOM report approved by the HELCOM Fish Group. Maps are used for illustration purposes and do not necessarily designate the exact boundaries of sovereign states and entities.

Editor: H. Jokinen<sup>1</sup>

Authors: Abersons K.<sup>2</sup>, Bajinskis J.<sup>2</sup>, Drigins E.<sup>3</sup>, Häggström H.<sup>4</sup>, Jokinen H.<sup>1</sup>, Kalinowski M.<sup>5</sup>, Kesler M.<sup>6</sup>, Kuczyński T.<sup>5</sup>, Nika N.<sup>7</sup>, Oisalu S.<sup>8</sup>, Piotrowicz J.<sup>5</sup>, Roge E.<sup>8</sup>, Šatkus M.<sup>9</sup>, Singh N.<sup>10</sup>, Ustups D.<sup>2</sup>,

Contributors:

Affiliations: 1) HELCOM; 2) BIOR, Latvia; 3) Kurzeme planning region, Latvia; 4) County Administrative Board of Stockholm, Sweden; 5) Maritime Institute, Gdynia Maritime University, Poland; 6) Estonian Marine Institute (University of Tartu), Estonia; 7) Klaipeda University, Lithuania; 8) BEF Estonia, Estonia; 9) Ventspils county municipality, Latvia; 9) Klaipeda district municipality, Lithuania; 10) Water Centre for Innovation (UCV), Campus Roslagen AB, Sweden

Layout: XXXX

Cover: XXXX

ISSN XXXX

## Contents

Executive summary .....	1
1 Introduction .....	3
2 Background .....	4
2.1 Sea trout biology and ecology .....	4
2.2 Sea trout in the Baltic Sea .....	5
2.3 Sea trout fisheries in the Baltic Sea .....	5
2.4 Monitoring and assessment of Baltic Sea sea trout.....	6
3 Rationale and approaches.....	9
3.1 Rationale for and approaches used in this assessment report.....	9
3.1.1. Recreational fishing overview .....	9
3.1.2 Sea trout population and river status assessment.....	10
3.2 Policy relevance .....	11
4 Recreational fishing and its impact on sea trout in the Baltic Sea region .....	12
4.1 Recreational sea trout fishing in the Baltic Sea region .....	12
4.2 Country specific information .....	12
4.2.1 Fishing restrictions .....	13
4.2.2 Fishing licences .....	13
4.2.3 Country-specific information regarding recreational fishing of sea trout .....	13
4.3 Monitoring and data collection on sea trout recreational fishing in the Baltic Sea region .....	16
4.4 Impact of recreational fishing on sea trout in the Baltic Sea region.....	18
5 Assessment of sea trout river and stock statuses.....	20
5.1 Data and approaches .....	20
5.2 Results and interpretation .....	21
6 Conclusions .....	28
6.1 Recreational sea trout fishery in the Baltic sea .....	28
6.2 Sea trout river status in the Baltic sea region.....	28
7 Literature .....	30
Supplement A. Additional information on the sea trout data used .....	
Annex 1. List of all 346 assessed sea trout rivers in the Baltic sea over the period 2015–2018. ....	
Annex 2. Black list of sea trout rivers (river recruitment status $\leq 0.2$ ) listed by country. ....	

## 1 Executive summary

2 This report is produced within the Interreg RETROUT project to support management of sea trout  
3 populations and rivers in the Baltic sea region. The report is based on existing information on sea  
4 trout river populations and river habitats available via project partners and ICES Assessment Working  
5 Group on Baltic Salmon and Trout (ICES WGBAST). The aim of this report is to assess the status of sea  
6 trout rivers and populations and provide an overview on the impacts on Baltic sea se trout caused by  
7 recreational fisheries. The output complements existing sea trout assessments by ICES WGBAST and  
8 HELCOM and supports the implementation of national and international policies regarding sea trout,  
9 migratory fish and river habitats.

10 In the Baltic Sea region, the long-term neglect of rivers and their fish have destroyed or degraded  
11 most of the original salmonid populations. Degraded and inaccessible river habitats together with  
12 pressure from fisheries have had negative consequences on the status of Baltic Sea salmonids. In  
13 addition to the ecological effects, these losses also reduce the possibility to use these fish as  
14 resources by commercial and recreational fisheries. Sea trout, as one of the two most important  
15 salmonids in the Baltic sea, has historically been a common species in the Baltic Sea region, with only  
16 around 500 natural populations remaining. Sea trout in the Baltic Sea is classified as vulnerable, and  
17 large part of the populations and rivers are in urgent need of recovery measures. The status of the  
18 sea trout populations and rivers are to a large extent a result of past management practice and of  
19 potential restoration activities if such has been undertaken. To produce information on the sea trout  
20 river and stock statuses therefore help understand the current situation, learn from past practice,  
21 and plan and identify future needs.

22 Recreational fishing for sea trout in the Baltic sea is becoming increasingly popular. The current  
23 overall yearly catch from recreational sea trout fishing is coarsely around 500 tonnes, and is already  
24 at the same level or higher than commercial catches. Thus, recreational fishery should not be  
25 neglected when assessing the impact from fisheries on the sea trout stock. How the sea trout stocks  
26 endure the fishing pressure, and thus what impact the fishing has on the stocks, depend on the  
27 status of the sea trout stocks. To assess the impact of recreational fishing on the natural sea trout  
28 stocks can be challenging as a considerable amount of reared sea trout is released to the Baltic Sea  
29 or its rivers. Natural production of sea trout in rivers depends on the number of successful spawning  
30 fish and on the survival of eggs and juveniles. Hence, the production can be hampered by migration  
31 barriers and poor habitat quality, ultimately affecting the stock size. When the stocks are decreasing  
32 due to poor reproduction, the relative effect of an unchanged fishing pressure increase. Against this  
33 background it might become important to better consider and adapt the level of recreational fishery  
34 to the development in sea trout stock sizes. Various regulations and restrictions are already in use in  
35 different countries in order to address this. There is also still a considerable uncertainty in the data  
36 on recreational fishing effort and catches, and information on these need to improve to better understand the  
impact from recreational fishing on sea trout.

37 Sea trout 0+ parr densities are used as the basis for the standard sea trout river status assessments  
38 in the Baltic sea region. In the assessment done for this report, sea trout parr densities varied up to  
39 over two orders of magnitude between different rivers and monitoring data. Over the assessment  
40 period 2010–2018 the sea trout parr densities also varied between years and countries, with an  
41 average level being highest in Denmark and lowest in Lithuania. No obvious trend over the  
42 assessment period was seen in the parr densities in any country, and the differences between  
43 countries partly reflect differences in monitoring sites and river types included.

44 The index used for evaluation the status of sea trout rivers/populations, *recruitment status RS*,  
45 relates the observed parr densities to a habitat-based estimation of the potential maximum parr  
46 density that the site could produce. Recruitment status varied considerably both between years and  
47 countries and assessment areas. In general, the *RS* was highest in Gulf of Finland and Estonian rivers and  
lowest in the southern Baltic sea, especially in Germany. Finland and Estonia showed the strongest  
indications of a positive overall trend over the last decade, while Poland had the only negative trend  
indication.

48 The assessed current status of sea trout river populations, taken as an average of the last four years,  
49 showed the best status for Estonia and the poorest situation for Germany. The list of rivers with  
50 *black* status, that is rivers with dangerously low sea trout production ( $RS \leq 0.2$ ), contains 67 rivers of  
51 which the largest share was found in the southern Baltic sea region. The highest share of rivers  
52 belonging to the best status class *green* was found in the Gulf of Finland area. The Baltic sea black  
53 list of sea trout rivers is provided in Annex 2.

54 Although restricted in extent due to data availability, the outcome of this assessment highlights the  
55 current situation with a considerably high share of rivers still failing to reach a good status, and also  
56 pinpoints those rivers in the poorest condition needing urgent and prioritised recovery measures. At  
57 the same time, in certain areas positive development have been witnessed following increased  
58 emphasis and better management practices of sea trout populations and their rivers.

62

63

## 64 1 Introduction

65 Constantly discharging fresh water to the Baltic Sea, a large number of rivers, streams, and brooks  
66 occupy the drainage area of one of world's largest brackish seas. Rivers not only supply fresh water,  
67 but also connect the sea with the inland and function as essential habitats for many species,  
68 including the migratory fish. One of the most important and iconic migratory fish species in the Baltic  
69 Sea is the sea trout (*Salmo trutta*).

70 The negative impact of human activities on river environments and migratory fish is indisputable.  
71 Dams and other construction as well as pollution and eutrophication have deteriorated the hydro-  
72 morphological conditions and the water quality of many rivers, while fisheries exploit migratory fish  
73 populations both in the sea and in rivers. Migratory fishes use rivers, streams, and brooks as  
74 spawning and nursery habitats before migrating to the sea. When access to or conditions within  
75 these essential habitats are hampered, fish populations decline and can even face extinction. In the  
76 Baltic Sea region, the long-term neglect of rivers and their fish have destroyed or degraded most of  
77 the original salmonid populations. Degraded and inaccessible river habitats together with pressure  
78 from fisheries have had negative consequences on the status of Baltic Sea salmonids. In addition to  
79 the ecological effects, these losses also reduce the possibility to use these fish as resources by  
80 commercial and recreational fisheries.

81 Sea trout has historically been a common species in most of the numerous rivers and streams of the  
82 Baltic Sea region. Only around 500 natural populations are estimated to exist today, of which a large  
83 part is in urgent need of recovery measures (HELCOM 2011). Overall, the sea trout in the Baltic sea is  
84 classified as vulnerable (HELCOM 2013). The status of the sea trout populations and rivers are to a  
85 large extent a result of past management practice and of potential restoration activities if such has  
86 been undertaken. Therefore, to produce information on the sea trout river and stock statuses help to  
87 understand the current situation, learn from past practice, and plan and identify future needs.

88 This report is produced within the Interreg RETROUT project (Box 1) to support management of sea  
89 trout populations and rivers in the Baltic sea region. The report is based on existing information on  
90 sea trout river populations and river habitats available via project partners and ICES Assessment  
91 Working Group on Baltic Salmon and Trout (ICES WGBAST; see Chapter 3 for more information). The  
92 aim of this report is to assess the status of sea trout rivers and populations and provide an overview  
93 on the impacts on Baltic sea se trout caused by recreational fisheries. The output complements  
94 existing sea trout assessments by ICES WGBAST and HELCOM, and supports the implementation of  
95 national and international policies regarding sea trout, migratory fish, and river habitats.

Box 1. Information on the RETROUT project

RETROUT – *Development, promotion, and sustainable management of the Baltic Sea Region as a coastal fishing tourism destination*

With 14 partners from Estonia, Latvia, Lithuania, Poland and Sweden, and including HELCOM, [RETROUT](#) is a 3 ½-year Interreg project running until end-March 2021. RETROUT is a flagship project of the EU Strategy for the Baltic Sea Region [Policy Area Bioeconomy](#). It is co-financed by the [Interreg Baltic Sea Region Programme](#) under the Natural resources priority field.

Part of the RETROUT project focuses on assessing sea trout stock and river habitat status, and on evaluating river restoration practices to improve trout populations. By improving the environment in rivers around the Baltic Sea and developing destinations and ethical guidelines for fishing tourism, RETROUT promotes healthy environments and development of sustainable fishing tourism.

More information: RETROUT project homepage <https://retROUT.org/>

Baltic Sea Fishing <http://balticseafishing.com/>

## 98 2 Background

### 99 2.1 Sea trout biology and ecology

100 Sea trout is a sea migrating form of brown trout (*Salmo trutta* L.), and it usually occupies the same rivers  
101 as non-migrating brown trout for part of their life (Harris and Milner 2007). Sea trout and brown  
102 trout can be either genetically isolated from each other or belong to the same population, with  
103 populations being partially migratory, i.e., one part (predominantly females) of the population leaves  
104 to the sea for feeding (ICES 2012a).

105 Sea trout need flowing river waters for spawning and as juvenile nursery habitats. The life history  
106 and life cycle of sea trout resembles that of salmon (Froese and Pauly 2020). Individuals live their  
107 first 1–5 years as parr in the stream, migrating as smolts to the sea for a feeding for up to 5 years,  
108 after which they return to their natal stream for spawning (ICES 2012, Froese and Pauly 2020).  
109 Spawning takes place in autumn and winter. About 10 000 eggs per female are laid in suitable gravel  
110 beds and hatch in spring when water temperature is suitable (HELCOM 2011, Froese and Pauly  
111 2020). Alevins (i.e., the yolk-sac larvae) stay within or in close proximity to the spawning gravel until  
112 yolk-sac depletion, whereafter the fry and later the parr inhabit suitable habitats with enough  
113 shelter and food (Harris and Milner 2007). For spawning, sea trout prefer smaller rivers and streams  
114 with swift current, often the upper reaches or in tributaries, where suitable nursery areas are also  
115 found (Armstrong et al. 2003). Juveniles feed mainly on aquatic and terrestrial invertebrates (Froese  
116 and Pauly 2020). After 1–4 years the parr smoltify, i.e., attain a silvery colour and begin a  
117 physiological adaptation to marine life and migrate to the sea (Harris and Milner 2007). While in the  
118 sea, sea trout feeds on predominantly on forage fish (HELCOM 2011). Sea trout mature in the age of  
119 3–4 years, whereafter the first spawning migration to the home river can occur (Froese and Pauly  
120 2020). Sea trout can spawn on several separate occasions, and thus the migration pattern between  
121 the river and the sea can be a continuous ongoing element of the sea trout life cycle (Harris and  
122 Milner 2007).

123 Sea trout is naturally distributed along the European coast of the northern Atlantic from  
124 northern Spain to the White Sea, including the entire Baltic Sea area (Froese and Pauly 2020). Sea  
125 trout reside in coastal waters usually within a few hundred kilometres from their home river,

126 although some specimens and certain populations (e.g., strains in the southern Baltic Sea) migrating  
127 longer distances into the open sea (ICES 2020).

128 More information on sea trout biology, ecology, conservation, and management can be found in the  
129 literature (e.g., Harris and Milner 2007).

130

## 131 2.2 Sea trout in the Baltic Sea

132 In the Baltic Sea, sea trout together with Atlantic salmon, European eel, and migratory whitefish  
133 constitute keystone diadromous species, but sea trout inhabit a much larger number of rivers and  
134 streams than salmon for instance (ICES 2020). Many of the Baltic Sea sea trout rivers and streams  
135 are in lowland areas, often strongly influenced by human activity (ICES 2020). Of the roughly 25000  
136 rivers and streams of the Baltic sea drainage area assessed under the EU Water Framework Directive  
137 (WFD) only about 30% has good or high ecological status (European Commission 2000, WISE 2021).  
138 Because of this and other pressures such as fishing, many anadromous sea trout populations in the  
139 Baltic sea have been degraded. According to the HELCOM Red List for the Baltic Sea, sea trout is  
140 classified as vulnerable (HELCOM 2013).

141 Although there are no firm estimates of the historical numbers of sea trout populations in the Baltic  
142 Sea, sea trout has been common in most of the rivers and streams flowing to the Baltic Sea, while  
143 currently of the approximately 1000 sea trout populations about 500 are wild and reproduce  
144 naturally (HELCOM 2011). Most of the current sea trout rivers flow to the Baltic sea main basin  
145 (HELCOM 2011). The latest evaluation of the HELCOM core indicator on sea trout shows that of the  
146 310 evaluated sea trout populations 54% had good status (see section 2.4 for definition), with a  
147 status less than good in most of northern Baltic Sea (especially Gulf of Bothnia), but better in parts of  
148 the central and southern regions (HELCOM 2018). Comparably, in the latest ICES WGBAST  
149 assessment a general slight decline in status was observed in the last years, with the best status in  
150 the Gulf of Finland and poorest in the southern Baltic Sea (ICES 2020).

151 Habitat degradation, migration barriers, and fishing are the main pressures threatening sea trout in the  
152 Baltic Sea, with habitat destruction affecting more than 40% of reported populations (HELCOM 2013,  
153 2018, ICES 2020). In addition to the hydro-morphological alterations caused by damming and other  
154 barriers and constructions, habitat quality has been deteriorated also through channelization,  
155 dredging, pollution, acidification, eutrophication, and siltation of rivers, having negative effects on  
156 sea trout populations (HELCOM 2018). Both commercial and recreational fishing at sea and in rivers  
157 target sea trout (see section 2.3). High fishing pressure is, for instance, the main reason for the  
158 poorer status of sea trout populations in the northern areas of the Baltic sea, where particularly by-  
159 catch of young fish in the coastal gillnet fishery is severe (HELCOM 2018). Many sea trout  
160 populations are also limited by poor habitat conditions and migration obstacles in their natal rivers,  
161 whereby the parr densities are too low and exploitation too high to allow effective recovery of the  
162 populations (ICES 2019a). Therefore, fishing should be reduced in such areas (namely ICES  
163 subdivisions 30 and 31, eastern 26, and the southern parts of subdivisions 22 and 24, see Figure 1 for a map  
with the subdivisions), and habitat restoration should be promoted where needed, and accessible migration  
routes should be secured (ICES 2019a).

166

## 167 2.3 Sea trout fisheries in the Baltic Sea

168 Sea trout is caught both by the commercial and the recreational fishery. A large part of the  
169 commercial sea trout catch is taken as by-catch with coastal gillnets, trap nets and longline, while



170 small scale gillnetting and various handheld gear are mostly used in the recreational fishery  
171 (HELCOM 2018; ICES 2020). Coarsely around 500–800 tonnes of sea trout are caught yearly of which  
172 over 50% by recreational fisheries (ICES 2020). In the 1990s the combined commercial and  
173 recreational nominal catches reached above 1300 tonnes in some years but have been decreasing  
174 since 2001 to the level of 700–800 tonnes in recent years (ICES 2020). A clear majority of the  
175 commercial catch is taken from the sea, with only a minor importance of river catches, while for  
176 recreational fishing in some areas the river catches dominate over the catches in the sea (HELCOM  
177 2018).

178 The nominal commercial catches of sea trout in the Baltic Sea have decreased from about 300  
179 tonnes in 2018 to 169 tonnes in 2019 (ICES 2020). Most of the commercial catch (77%) is taken in  
180 the Baltic Sea Main basin where the Polish fishery accounts for the largest share (71%). Reported  
181 catches have likely been overestimated due to misreporting of salmon as sea trout in the Polish sea  
182 fishery, a problem that, however, has now been solved (ICES 2020). Recreational fishing of sea trout  
183 is an increasingly popular activity along most of the coastal Baltic Sea, and catches amount to a  
184 considerable share of the total catch. A more detailed account and figures on the Baltic Sea  
185 commercial sea trout fishery can be found in ICES 2020, while a thorough review on recreational  
186 fishing of sea trout is given in Chapter 4 in this report).

187

## 188 2.4 Monitoring and assessment of Baltic Sea sea trout

189 To follow the development of sea trout populations and as basis for their assessment, both fishery  
190 and biological monitoring of sea trout populations is carried out in all Baltic Sea countries. According  
191 to the European Union regulation (2016/1251) on the collection, management and use of data in the  
192 fisheries and aquaculture, all EU countries are obliged to collect sea trout catch data. In addition,  
193 numbers of released stocked sea trout are recorded and reported. Biological population data have  
194 also been gathered in form of parr densities in rivers and to some extent regarding smolt production  
195 (ICES 2020). Although all Baltic Sea countries participate in the biological sea trout monitoring, the  
196 temporal and spatial extent and intensity varies between countries (ICES 2008a). Monitoring of 0+  
197 parr densities together with habitat data is conducted by means of electrofishing in predefined sea  
198 trout juvenile habitats in rivers (in total 598 electrofishing sites in 2019), which is supplemented in  
199 most countries with estimation of descending smolts by means of trapping and counting in 12–13  
200 rivers in the entire Baltic area (ICES 2020). Additionally, in 20–30 rivers the numbers of ascending  
201 spawners are monitored by trapping or with automatic counters. As a further measure to monitor  
202 spawning intensity, counting of redds has also been carried out in a number of streams at least in  
203 Poland, Lithuania, and Germany (ICES 2008b). Tagging and marking are used as additional methods  
204 for obtaining information on sea trout movements (ICES 2020). The monitoring and data collection  
205 for sea trout could be improved e.g., by standardising electrofishing and parr density estimation  
206 methods (ICES 2020). Also problematic for the data quality is that many of the sea trout  
207 electrofishing sites have originally been established for salmon and may not be optimal for the  
208 monitoring of sea trout (ICES 2020).

209 An international assessment of sea trout populations in the Baltic is carried out by the ICES  
210 Assessment Working Group on Baltic Salmon and Trout (WGBAST). The assessment is largely based  
211 on an index of sea trout recruitment status (*RS*) and is conducted for different assessment areas, but  
212 sometimes also presented on the level of ICES subdivisions or countries. For calculation of *RS* for sea  
213 trout stocks, ICES uses densities of sea trout parr expressed as a percentage of model-predicted  
214 potential maximum densities derived from a regression model with habitat predictors (ICES 2011,  
215 2020). The current assessment methodology has been in use since 2012. Theory, method

216 development, and the resultant basic methodology are described in ICES (2011, 2012b), and are  
217 briefly summarised in Box 2. The used assessment approach can be further improved, for instance to  
218 more adequately reflect interregional differences in productivity when predicting potential  
219 maximum parr densities, and hence, an optimal approach for the assessment of sea trout is under  
220 continuous development (ICES 2020). The quality of the assessment could be further improved also  
221 by incorporating more information from tagging and genetic studies (ICES 2020).

222 The latest ICES WGBAST assessment (ICES 2020) summarise that there has been a positive  
223 development in the status of sea trout in most of the Baltic Sea areas during the years 2015–2017,  
224 but that an overall slight decline was observed in the most recent years (2018–2019). A detailed  
225 account on the assessment is provided in the original assessment report (ICES 2020).

226 In addition to the international yearly assessment of Baltic sea sea trout by ICES WGBAST, the status  
227 of sea trout is also addressed and assessed by HELCOM in context of the HELCOM core indicator  
228 '*Abundance of sea trout spawners and parr*' (HELCOM 2018). The core indicator assessment uses the  
229 same data and the same principal assessment index and methodology as in the ICES assessment (Box  
230 2). Status is assessed as the moving average of the last four to five years, and good status is achieved  
231 when the ratio of observed parr densities to reference potential maximum parr densities is at least  
232 50% (HELCOM 2018). Recruitment trend over time is calculated by correlation of parr density versus  
233 time in years. The reference potential maximum parr density is estimated using the assessment  
234 model (Box 2) in the southern Baltic Sea and based on expert evaluation in the northern regions  
235 (HELCOM 2013). The status is assessed for coastal areas using HELCOM assessment unit scale 3<sup>1</sup>.

---

<sup>1</sup> HELCOM Sub-basins with coastal and offshore division. Division of the Baltic Sea into 17 sub-basins and further division into coastal and off-shore areas. The assessment units are defined in the [HELCOM Monitoring and Assessment Strategy, Appendix 4](#) (updated 2018).

Box 2. Approach for obtaining sea trout recruitment status index (modified from ICES 2020).

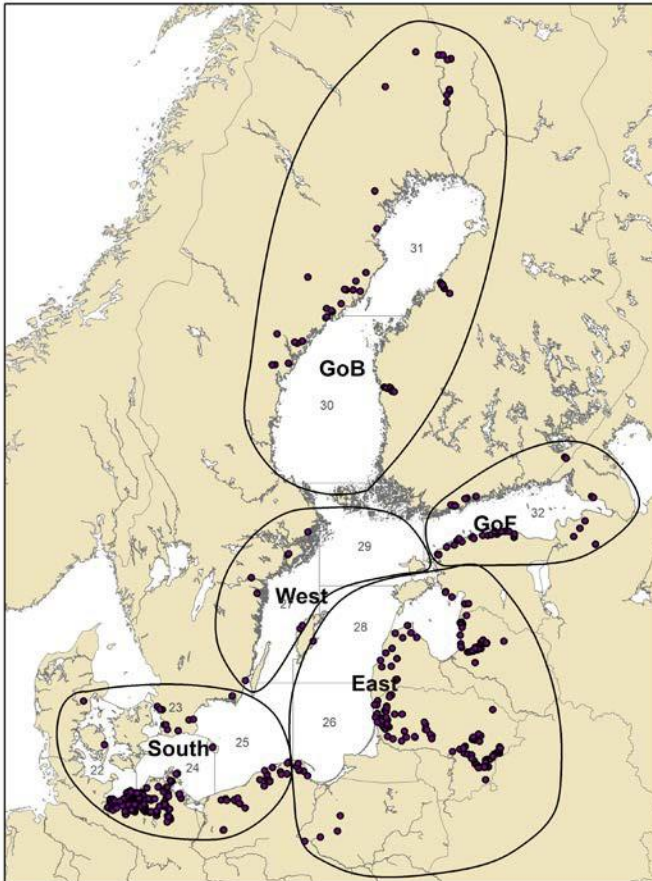
Sea trout recruitment status (*RS*) is defined as the observed 0+ parr densities relative to the potential maximum 0+ parr densities under the given habitat conditions. *RS* is thus calculated on monitoring site level based on the electrofishing and habitat data. To obtain the *RS* for an individual river population, potential multiple monitoring site-specific *RS*-values are averaged. Similarly, for mean *RS* estimates over larger assessment areas, the river-specific *RS* values are averaged. The observed 0+ parr densities are often parr density estimates based on electrofishing, often using some method and calculations of removal sampling (Zippin 1956, Bohlin et al. 1989). Due to large variation in climatic (e.g., temperature and precipitation), geological features, stream sizes, and other habitat characteristics among the rivers in the Baltic sea area influencing the suitability of the river for the sea trout, these habitat factors are taken into account when predicting the potential maximum 0+ parr densities. To account for the effect of habitat quality on potential parr density, the Trout Habitat Score (THS) sub- model is used (Pedersen et al. 2017). THS is obtained by scoring (0 for poor to 2 for best conditions) the following habitat variables: dominating depth, water velocity, dominating substrate, stream wetted width, shade, and slope if available. The obtained total THS values (0–12) are grouped in four Habitat Classes (HC) from 0 for poorest to 3 for the best (ICES 2011, Pedersen et al. 2017). A multiple linear regression model is developed based on parr density and river habitat data from rivers with expected optimal conditions and trout recruitment. Thus, the potential maximum parr densities are predicted by the regression model using the following equation:

$$\log_{10}(0+ \text{ density}) = 0.963 - (0.906 \times \log_{10}(\text{width})) + (0.045 \times \text{airtemp.}) - (0.037 \times \text{longitude}) + (0.027 \times \text{latitude}) + (0.033 \times \text{HC})$$

Finally, with the observed 0+ parr density estimate and the predicted potential maximum 0+ parr density available the recruitment status given as a percentage is calculated as:

$$RS = (\text{Observed } 0+ \text{ density} / \text{Predicted maximum } 0+ \text{ density}) \times 100$$

If the observed parr density is higher than the predicted maximum densities, the resulting recruitment status is larger than 100%. This is possible as the individual observations may occasionally exceed the predicted (average) maximum. The applicability of the assessment model is uncertain for the northern parts of the Baltic sea, as the model is developed using data from more southern rivers.



237237  
 238 *Figure 1. Electrofishing sites as dots and the Baltic sea assessment areas Gulf of Bothnia (GoB), Gulf of Finland (GoF),*  
 239 *western Baltic sea (West), eastern Baltic sea (East), and southern Baltic sea (South) marked, as used for the ICES*  
 240 *assessment of sea trout recruitment status (Source: ICES 2020).*

241241

## 242 3 Rationale and approaches

### 243 3.1 Rationale for and approaches used in this assessment report

244 The report is based on existing information on sea trout river populations and river habitats available  
 245 via project partners, ICES WGBAST, HELCOM, and other reports and documents. The rationale of  
 246 this report is to provide an overview on the status of sea trout population and the field of  
 247 recreational fisheries in the Baltic sea, to complement existing status assessments and summarise  
 248 the current view of the status and role of recreational fishery to the species. Thus, the aim of this  
 249 report is to assess the status of sea trout rivers and populations and provide a literature overview on  
 250 the impacts on Baltic sea sea trout caused by recreational fisheries. The output complements existing  
 251 sea trout assessments by ICES WGBAST and HELCOM and provides current information on the  
 252 recreational fishing and its impact on sea trout in the Baltic sea, to support the management of sea  
 253 trout populations and give context to the further development of the field of recreational fishing in  
 254 the Baltic sea.

255255

#### 256 3.1.1. Recreational fishing overview

257 The overview on the status and impact of recreational fishery on sea trout in the Baltic sea concerns  
 258 the different types of recreational fishing activities that catch sea trout in the Baltic Sea region,

259 including fishing in the sea and the rivers. The overview also concerns the current management rules  
260 and legislation in force restricting and steering recreational fishing of sea trout in the Baltic Sea  
261 region. Further, the overview regards the matter of how information on sea trout recreational  
262 fishing is gathered and how the fishing efforts and catches are assessed and estimated. And finally,  
263 the estimates of the current impact of recreational fishing on sea trout in the Baltic Sea region is  
264 addressed and any trends or signs significant recent changes in this context are reviewed. The  
265 overall state as well as geographical and country-specific differences in the recreational fishing  
266 features are presented. The overview was compiled based on existing literature as publications and  
267 reports, mainly from ICES WGBAST, ICES WGRFS, HELCOM and CCB. References to the sources are  
268 provided in the overview chapter.

269

### 270 3.1.2 Sea trout population and river status assessment

271 A Baltic sea-wide assessment of the status of sea trout rivers and populations is conducted. Beyond  
272 the existing current sea trout assessments in form of the annual ICES WGBAST work (e.g., ICES 2020)  
273 and the related HELCOM core indicator work (HELCOM 2018), this assessment contributes with  
274 higher resolution presenting river-level results, instead of presenting assessment results merely on  
275 larger assessment divisions and areas. Although with different basis for the assessment (parr-based  
276 vs. smolt based), this assessment attempts to update the HELCOM SALAR assessment (HELCOM  
277 2011) to some extent although considerably fewer rivers are now concerned (346 vs. 572 rivers).  
278 Based on the results a river-specific comparison is done to the SALAR red list of sea trout rivers.

279 The spatial extent of the assessment is the whole Baltic Sea region, i.e., the rivers flowing to the BS  
280 as addressed by ICES WGBAST. Within the scope of this report the assessment was restricted to  
281 rivers with both available electrofishing-based sea trout parr density data and habitat-based  
282 estimates of potential maximum parr densities. All rivers in the available datasets are included in the  
283 assessment. The time period chosen to be examined was period 2010–2018. This starting year was  
284 based on the notion that the HELCOM SALAR report reached to year 2009 making 2010 the first year  
285 not covered by that assessment. The end-year 2018 was determined by the data availability at the time of  
the data request. The temporal extent what comes to status is the current situation, assessed as the  
average of the last four years. The trend in the status is assessed by correlating the status indicator with  
years. Only rivers for which monitoring data was available for at least seven years in the period 2010–2018  
was included in the analysis.

286 The status assessment is principally based on the same method as used in ICES WGBAST and  
287 HELCOM core indicator, i.e., Recruitment Status ( $RS$ ) = observed 0+ parr density / potential  
288 maximum 0+ parr density (ICES 2011, 2020, HELCOM 2018, this report section 2.4 and Box 2). The  
289 observed parr density data are based on electrofishing results from national river monitoring  
290 programs of the Baltic sea countries. The potential maximum parr density estimates are based on  
291 the Trout Habitat Score and the Baltic sea trout model (ICES 2011, Pedersen et al. 2017). Based on  
292 the calculated average  $RS$  for each river or river system, the results are evaluated for status against  
293 pre-chosen thresholds determining four status classes.

294 The status assessment was conducted based on existing sea trout population and habitat data from  
295 monitored rivers in the Baltic sea region. Most of the data was obtained through ICES WGBAST, and  
296 additional Latvian data through the Latvian RETROUT project partner BIOR, following a request to  
297 the original data providers for permission to access and use the data for the purpose of this  
298 assessment. A more detailed description of the data and approaches used for the status assessment  
299 is given in Chapter 5.

300 3.2 Policy relevance

301 The assessment of status of sea trout rivers and stocks will support existing work on sea trout  
302 management and policies by HELCOM and ICES. and provides provide support for the national  
303 implementation of [HELCOM Recommendation 32-33/1](#) '*Conservation of Baltic salmon and sea trout*  
304 *populations by the restoration of their river habitats and management of river fisheries*'.

305 This report addresses several ecological objectives and specific actions related to migratory fish and  
306 river habitats in the of the current and updated HELCOM Baltic Sea Action Plan (BSAP; HELCOM  
307 2007, 2020a). The assessment also relates to qualitative descriptors of the EU Marine Strategy  
308 Framework Directive and EU Water Framework Directive for determining good environmental status  
309 (European Commission 2000, 2008).

314

315

## 316 4 Recreational fishing and its impact on sea trout in the Baltic Sea 317 region

### 318 4.1 Recreational sea trout fishing in the Baltic Sea region

319 Recreational fisheries include non-commercial fishing activities. According to the definition by the  
320 International Council for the Exploration of the Sea (ICES) “*recreational fishing is the capture or*  
321 *attempted capture of living aquatic resources mainly for leisure and/or personal consumption*” (ICES  
322 2013). Food and Agriculture Organization (FAO) defines recreational fishing as “*fishing of aquatic*  
323 *animals (mainly fish) that do not constitute the individual’s primary resource to meet basic*  
324 *nutritional needs and are not generally sold or otherwise traded on export, domestic or black*  
325 *markets*” (ICES 2013). Recreational fisheries cover active fishing methods including line, spear, and  
326 hand-gathering and passive methods including nets, traps, pots, and set-lines.

327 Recreational fishing is popular in all countries of the Baltic Sea region. Around 10 million people, or  
328 approximately 10% of the population in the Baltic Sea catchment area, fish for recreation (CCB  
329 2017). Recreational fishing is practiced mainly for leisure and/or personal consumption. Sea trout  
330 along with salmon are among the most attractive recreational fishing species. Sea trout have a  
331 similar anadromous life cycle to salmon, but do not migrate as far, instead reside in coastal waters a  
332 few hundred kilometres from their home river (ICES 2019b) Hence, most fishing for sea trout in the  
333 Baltic Sea takes place in the coastal zone.

334 Recreational fishing of sea trout is substantial compared to the commercial fisheries of the species,  
335 particularly in the western part of the Baltic Sea. Sea trout recreational catches tend to be even  
336 more important than the commercial ones (CCB 2017, ICES 2020). However, estimation of catches is  
337 complex as sea trout is fished both in the sea and in rivers. The coverage and data quality of the  
338 recreational river catches are relatively good due to obligatory catch reporting in several countries,  
339 but the data quality and coverage of marine recreational catches is still underdeveloped. In catch  
340 statistics, sea trout is sometimes mistaken for salmon (and salmon misreported as sea trout), which  
341 causes further inconsistencies (ICES 2019b). This poses a strong need for improvement in assessing the  
342 extent and impact of sea trout recreational fishing in the Baltic Sea more effectively.

343 Recreational fisheries in the Baltic Sea region, including information about characteristics, efforts  
344 and impacts of sea trout recreational fishing, have been addressed and assessed in a few different  
345 reports and compilations including work by ICES and HELCOM. In 2017 Coalition Clean Baltic  
346 presented “*Recreational fishing in the Baltic region*” Report with detailed country-specific  
347 information regarding fishing regulations, limits, and licensing (CCB 2017). Moreover, to better  
348 understand the recreational fishing process, HELCOM compiled information on coastal recreational  
349 fisheries in all HELCOM States based on questionnaires from 2015 and further updated in 2017  
350 (HELCOM 2019).

351

### 352 4.2 Country specific information

353 All Baltic Sea countries distinguish between angling/sport fishing and recreational fishing with  
354 passive gears. Angling/sport fishing is performed with a rod and line, while fishing with passive gears  
355 includes the use of gillnets, traps, longlines and other stationary methods. Angling accounts for the  
356 majority of the recreational sea trout catches in the Baltic Sea. Passive gears are common in the  
357 northern Baltic Sea, and sea trout are caught as a target species, but often to a high degree as  
358 bycatch in other coastal recreational fisheries (CCB 2017). The most common recreational fishing  
359 methods are spin and fly fishing from the shore or in rivers and trolling from small boats at sea (ICES

360 2019b). The recreational fishery along coasts and in rivers is seasonally and geographically variable.  
361 In the southern Baltic Sea, recreational fishing for sea trout takes places during the whole year, with  
362 distinct high seasons in spring and autumn. In more northern areas of the Baltic Sea, sea trout fishing  
363 is more strictly concentrated to the spring and autumn. In rivers, sea trout are fished during their  
364 spawning migrations in autumn or during occasional feeding ascensions to river mouths.

365

#### 366 4.2.1 Fishing restrictions

367 Restrictions for sea trout recreational fishing vary between countries. In most Baltic Sea countries  
368 passive gears are allowed in recreational fisheries (HELCOM 2019). However, in Poland only angling  
369 and spearfishing is allowed. In Germany, only ‘hobby fishermen’ (having a former job in the fishing sector)  
are allowed to use passive gears, and anglers are only allowed to use rods and sinking bait nets, the  
370 latter being rarely used. In Russia sea trout is protected and all fishing is prohibited. Bag limits (i.e.,  
371 limiting the daily catch to a certain number of sea trout) are established in Sweden, Latvia, Estonia,  
372 Poland and Germany. In Finland, sea trout fishing is allowed only for reared fin-clipped sea trout, as  
373 wild sea trout are protected throughout the Finnish coastal areas and Baltic Sea rivers. In most Baltic  
374 Sea countries, the minimum allowed gillnet mesh sizes are regulated, and minimum size limits for  
375 sea trout are applied. Other management measures include closed areas or seasons, mainly to  
376 protect the migration to rivers and the spawning. Additionally, in many countries specific restrictions  
377 can be set by water owners.

379

#### 380 4.2.2 Fishing licences

381 Fishing licence is a card, or document mandatory in order to carry out recreational fishing, usually  
382 supported with a fee used by some countries as the method of collecting funds for stock  
383 conservation and recreational fisheries management. In some Baltic Sea countries angling without  
384 reel is free (e.g., Sweden, Finland, Estonia). For other gear types, licenses and permits from water  
385 owners are required, and often the license is granted for a restricted number of gear units. In  
386 Germany, anglers need to pass an exam to obtain a license. In the Kaliningrad Region in Russia, there is  
387 free access for recreational fishermen to common waters without any licenses, however access to  
388 private or rented area depends on the owner.

389

#### 390 4.2.3 Country-specific information regarding recreational fishing of sea trout

391 Below, country-specific information regarding recreational fishing of sea trout in the Baltic Sea  
392 region is presented based on information predominantly from CCB 2017 and HELCOM 2019.

##### 393 Finland

394 *Numbers of recreational fishers:* 1.5 million

395 *Fishing licensing:* Payment of national fisheries management fee intended for stock conservation and  
396 management measures are required for all between 18–65 years. No permit required for recreational  
397 fishing in public waters in the sea.

398 *Angling and other recreational fishing:* Minimum size limits for sea trout: 50 cm for all reared fin-  
399 clipped specimens and wild specimens caught in inland waters north of 67° N; 60 cm for wild  
400 specimens caught in inland waters between 64° N and 67° N.



401 There is a fishing ban for wild sea trout, in force since 2019 in the entire Finnish coastal zone.  
402 Consequently, one is allowed to retain only fin-clipped specimens. Additionally, there is a  
403 seasonal fishing ban for salmonids in rivers and streams from 1 September to 30 November each  
404 year.

405 Recreational sea trout catches fluctuate, with a possibly declining overall trend. Sea trout is a  
406 common bycatch in the whitefish fishery (gillnets) and thus there is a further need for restrictions in  
407 the whitefish fishery and the gillnetting in general.

#### 408 Estonia

409 *Numbers of recreational fishers:* 0.15 million

410 *Fishing licensing:* Fishing with one simple hand line is free and open to everyone; for other gear a  
411 fishing licence is required. There is a limited number of licences for gillnets, longlines and other  
412 multi-catching gears. Special permits are needed for certain areas.

413 *Angling and other recreational fishing:* Minimum size limits for a range of species, such as perch,  
414 pike, pikeperch, salmon, and sea trout (50 cm).

415 Sea trout are caught in gillnets, rod fishing on the coast, and in the rivers. In Estonian rivers fishing  
416 salmonids can only be fished by angling, which is greatly restricted and allowed only in certain rivers  
417 requiring a special fishing permit. In addition, it is prohibited to catch salmon and sea trout in inland  
418 waters from 1 October to 30 November. According to Estonian Fisheries 2014–2015, the total  
419 (commercial and recreational gillnets) coastal sea trout catch in 2015 was 22.7 tonnes. According to  
420 a fishing survey-based estimate for 2016, the total catch from coastal angling for sea trout was 35  
421 tonnes.

#### 422 Latvia

423 *Numbers of recreational fishers:* 0.12 million

424 *Fishing licensing:* For angling, there is a general fishing licence, as well as additional fishing permits  
425 for specific water bodies. Gear-specific limited licences are required for other recreational fisheries.

426 *Angling and other recreational fishing:* Catch per person and occasion restricted to 1 salmon and/or  
427 sea trout. Fishing for sea trout is prohibited in inland waters throughout the year (with some  
428 exceptions), and between 1 October and 15 November in coastal waters. The snagging method or  
429 use of natural bait when angling for salmon, grayling and sea trout are both prohibited. Catch is  
430 limited to a maximum of 5 sea trout. Minimum size for sea trout is 50 cm.

431 The overall status of sea trout is reasonably good in Latvia, with wild sea trout populations found in  
432 about 14 rivers. In 2016, Latvia reported 5.1 tonnes of recreational catches of sea trout, of which 5  
433 tonnes were taken in coastal waters and 1 tonne in the rivers. The commercial catch was 5 tonnes.

#### 434 Lithuania

435 *Numbers of recreational fishers:* 0.12 million

436 *Fishing licensing:* A fishing licence is needed for all recreational fishing and in some waters a special  
437 fishing permit is required as well. Sea trout fishing requires an amateur fishing permit.

438 *Angling and other recreational fishing:* Catch per person and occasion restricted: 1 sea trout.  
439 Minimum size limit for sea trout is 60 cm.

440 Sea trout may not be targeted using natural bait. From 15 August to 31 October, fishing for salmon  
441 and sea trout is restricted to outside 500 metres of Klaipėda Straight and the B. Šventoji river mouth.

442 There are no data on recreational catches of sea trout in Lithuania. ICES WGBAST specifically  
443 recommends that data on recreational sea trout catches should be consistently collected, taking into  
444 account the potentially high impact of recreational fisheries on sea trout stocks and the lack of these  
445 data in several countries.

447 Russia (Kaliningrad Region)

448 *Numbers of recreational fishers:* > 0.1 million

449 Sea trout is on the Russian Red List and fishing for this species is completely prohibited. However,  
450 due to issues in distinguishing between salmon and sea trout, both species are generally labelled as  
451 salmon.

452 Poland

453 *Numbers of recreational fishers:* 1.5–2 million

454 *Fishing licensing:* For inland waters, a mandatory rod licence as well as an area-specific permit are  
455 needed by everyone above 14 years. To acquire the rod licence, a passed exam is required. For the  
456 Baltic Sea, a sea fishing permit is required.

457 *Angling and other recreational fishing:* There are daily catch limits for a number of species and  
458 general rod rules; 1 rod per person when targeting salmonids (using artificial bait or fish as a bait) or  
459 spin fishing, other fishing methods allow for 2 rods. Minimum size limit for sea trout is 50 cm. The  
460 fishery for salmon and sea trout is closed from 15 September to 30 November out to 4 nautical miles  
461 from the coast. Sea trout recreational fishery catches are 2.4 tonnes in 2012.

462 A study on the recreational fisheries of salmon and sea trout in Polish waters takes place since 2017.  
463 The aim of the study is to gather information and identify potential issues in order to devise a more  
464 long-term programme for monitoring the catches. Catch and effort data are available since 2019.

465 Germany

466 *Numbers of recreational fishers:* 3.4 million

467 *Fishing licensing:* Both a federal fishing rod licence and a coastal fishing permit are required (except  
468 in Lower Saxony). German anglers must pass a sport fishing exam to get a licence. In both Baltic  
469 coastal States, domestic and foreign tourists can purchase a restricted tourist licence (valid for 28  
470 days) without passing an exam.

471 A special licence only available to people with a professional education in fisheries (mostly former  
472 fishermen) allows limited use of passive gears. Additionally, in Schleswig-Holstein, holders of a rod  
473 licence can also apply for an extra licence for minimal use of passive gears.

474 *Angling and other recreational fishing:* In Mecklenburg-Western Pomerania, a licence holder may  
475 keep up to 3 salmonids (salmon, sea trout). Minimum size limit for sea trout: 40–45 cm depending  
476 on the region. There is a seasonal closure in place for salmon and sea trout caught in the sea in  
477 Schleswig-Holstein from 1 October to 31 December (with exception of silver fish with loose scales).  
478 In Mecklenburg-Western Pomerania, angling for salmon and sea trout is closed from 15 September  
479 to 14 December. No detailed data on recreational sea trout catches are available.

480 Denmark

481 *Numbers of recreational fishers:* 0.5 million

482 *Fishing licensing:* Anyone between 18 and 65 years needs a licence for angling or other recreational  
483 fishing in Danish territorial waters. The recreational fishing licence has higher fee than basic angling  
484 license and it also covers angling activities.

485 *Angling and other recreational fishing:* There are local regulations and bag limits for sea trout. Sea  
486 trout is perhaps the most popular target species in the angling community. Minimum size limit for  
487 sea trout is 40 cm. Since 2010, catch estimates for sea trout do exist. The 2011/2012 survey included  
488 an estimate of 400 tonnes of sea trout (including freshwater catches), mainly caught by anglers. This  
489 accounts for 88% of the total catch.

#### 490 Sweden

491 *Numbers of recreational fishers:* 1.4 million

492 *Fishing licensing:* Recreational fishing does not require a licence and fishing with handheld gears is  
493 free all around the Swedish Baltic Sea coast. It is also free to use a limited number of passive gears in  
494 the coastal areas. Special permits may be required in private waters.

495 *Angling and other recreational fishing:* Daily quotas for sea trout in some areas (usually 2 sea trout  
496 per day). Size limit for sea trout: 40 cm in ICES sub-division (SD) 29 north of 60° N; 50 cm in rest of  
497 the Baltic Sea. Seasonal spawning closures in rivers.

498 For sea trout 80% of catches are recreational. Catches have declined considerably since the late  
499 1970s and remain low. The commercial catch was 12 tonnes in 2016, the majority of which was  
500 taken in the Gulf of Bothnia. In the same year, the estimated recreational catch was 22.1 tonnes  
501 (21.7 tonnes from Gulf of Bothnia). Commercial catches were from coastal fisheries, whereas  
502 recreational catches were mostly river-based. In 2016, the angling catch of wild sea trout in rivers in  
503 SD 31 had increased compared to previous years. Overall, the estimated recreational salmon catches  
504 in Sweden are around 20% of total catches, whether in tonnes or numbers. Recreational sea trout  
505 catches are around twice the size of the commercial catches, making recreational fishing potentially  
506 impactful. Sea trout fishing is not allowed during 15 September – 31 December on the South coast,  
507 and from 15 September until 1 April on the West coast.

508

#### 509 4.3 Monitoring and data collection on sea trout recreational fishing in the Baltic Sea 510 region

511 The requirement to conduct pilot studies in the framework of the new EU-Map for EU Aquaculture  
512 sector (Commission Decision (EU) 2016/1251) will improve information on the recreational sea trout  
513 fishery in the years to come<sup>2</sup>. The ICES Working Group on Recreational Fisheries (WGRFS) points out  
514 the urgent need to collect more information (catch, effort, post-release mortality, socio-economic  
515 importance) from the recreational sea trout fishery in the Baltic Sea Region (ICES 2018). Moreover,  
516 the Group notes that studies of the impacts of catch and release are still lacking for the most  
517 common recreational fisheries species.

518 The monitoring of marine recreational catches has been a legal requirement for all EU Member  
519 States since 2002<sup>3</sup>. In the Baltic Sea, this covers cod, salmon, sea trout, and eel. Despite the legal  
520 obligation to monitor marine recreational fisheries, the available data is still not complete. Data and  
521 information on sea trout recreational fishing are gathered through both national and regional (e.g.,  
522 EU data Collection Framework for member states) requirements. Recreational efforts and catches

---

<sup>2</sup> European Commission (access on 15 Dec 2019) <https://datacollection.jrc.ec.europa.eu/dc/aqua/eum>

<sup>3</sup> see (EC) No 1639/2001 | EU 2008/949 | 2010/93/EU | C(2013) 5243 | (EU) 2016/1251

523 can be estimated from obligatory reporting or through occasional interview and questionnaire  
524 surveys.

525 The methods used for monitoring recreational fisheries differ among the Baltic Sea countries. In  
526 Estonia, catch reporting has been mandatory since 2005. The data are reported to and stored in the  
527 Estonian Fisheries Information System (EFIS) for passive gears (gillnets, longlines) and salmon and  
528 sea trout rod-and-line fishing in rivers. The most recent recreational fishery survey was carried out in  
529 2016, based on direct phone call surveys.

530 In Sweden, data on recreational sea trout river fisheries are collected mostly in the larger salmon  
531 rivers, and therefore river catch statistics are not complete. Currently, information on recreational  
532 fishery originates from a national mail survey conducted by the Swedish Agency for Marine and  
533 Water Management (SwAM). The survey is sent to about 17 000 randomly selected persons each  
534 year, and it collects statistics on general aspects of recreational fishing (catches, costs, fishing trips  
535 etc.).

536 In Finland, since 2002, the official catch estimates of the recreational sea trout fishery are based on a  
537 national recreational fisheries survey. This biannual survey is conducted to estimate participation,  
538 fishing effort and catches of the recreational fishery<sup>4</sup>. Obtained through a stratified sample, about  
539 7500 households are contacted. The last survey covering year 2016 took place in 2017.

540 In Germany, a nationwide phone call survey with quarterly follow-ups was conducted in 2014/2015,  
541 contacting 50 000 households to collect representative data on recreational fish catches, including  
542 sea trout. Currently, a more detailed literature study is being prepared, also covering rivers fisheries.

543 In Lithuania, since 2015, recreational (anglers) sea trout catches are estimated by an online survey, a  
544 face-to-face interview survey, and individual interviews and catch reporting with diaries of selected  
545 anglers and experts. Catch per unit effort (CPUE) is estimated from survey data and combined with  
546 number of licences sold to anglers to calculate the total angling catch.

547 In Latvia, the first attempt to estimate total sea trout catches from angling was done in 2018 using  
548 Internet surveys. Monitoring of salmon/sea trout trolling has started in 2019 and is being continued  
549 in 2020.

550 In Denmark, there is no coastal fish monitoring programme and the data provided relies on  
551 voluntary catch registration by recreational fishermen through the "key-fishermen" project, which  
552 has no long-term secured funding (initiated in 2005; HELCOM 2018). Since 2009, recreational  
553 catches of sea trout in Denmark have been estimated based on an interview-based recall survey,  
554 which is conducted by DTU Aqua in cooperation with Statistics Denmark.

555 In Poland, since 2017, the National Marine Fisheries Institute in Gdynia (MIR) is carrying out a board  
556 observer programme (Multi-Annual Programme of Fishery Data Collection, responding to the  
557 requirements of the EU Data Collection Framework - DCF). Its aim is to test methods for monitoring  
558 of recreational fisheries in Polish marine waters, identify fishing areas and potential issues and  
559 analyse former laws and procedures (Lejk and Dziemian 2019). Salmon/sea trout/eel recreational  
560 fisheries monitoring is carried under EU MAP since 2020 (2017–2019 pilot study), including on-site  
561 questionnaire interviews, off-site questionnaire interviews, on-board observations – participation in  
562 salmon trolling cruises, annual fishing logbooks for trolling boats skippers/owners, remote CCTV  
563 cameras monitoring to provide accurate fishing effort estimates, and trolling boats counting  
564 (monthly). In addition, an annual questionnaire interview is conducted (HELCOM 2020b).

---

<sup>4</sup> Natural Resources Institute Finland website: <http://stat.luke.fi/en/recreational-fishing>

565 In Russia, sea trout is a protected species in the Baltic Sea, and recreational fishers are not allowed  
566 to target sea trout in the sea nor in rivers. Hence, there is no monitoring or data collection need in  
567 Russian waters.

568

#### 569 4.4 Impact of recreational fishing on sea trout in the Baltic Sea region

570 The significance of recreational fisheries has increased, and the catches of most desired species  
571 (including sea trout) clearly exceed or at least equal the commercial catches. Assessing trends in sea  
572 trout recreational fishing reveals that the development in Sweden and Finland is largely similar. The  
573 use of gillnets and other passive gear has become less popular, and rod fishing takes a larger  
574 proportion of the catches than before. The equipment for rod fishing is very effective and species-  
575 specific methods and lures are available. In Finland, a new Fishing Law came into force in the  
576 beginning of the 2016, which caused changes concerning the national fishing license and minimum  
577 size limits of some fish species, and fishing bans for some threatened species in the sea area. In  
578 Sweden, recreational fishery for sea trout is very common and most catches come from recreational  
579 fisheries. A major part of the Swedish recreational catch is taken along the Baltic coast (>2400 km,  
580 including Öland and Gotland islands), in particular by angling from shore or small boats, and from  
581 use of gillnets (ICES 2019). Offshore recreational fisheries are in most cases done by trolling salmon,  
582 with sea trout caught only occasionally. However, trolling closer to the coast for sea trout is starting  
583 to be popular in some Swedish areas. In Denmark, the recreational catches are visibly smaller than  
584 the commercial fisheries, although there is large variation between areas.

585 Availability of specialised equipment and fishing methods has largely increased. There are also  
586 visible conflicts between anglers and commercial fishermen. In Lithuania, salmon and sea trout  
587 fishing in marine waters has become more popular which will further negatively influence the sea  
588 trout stocks (HELCOM 2019, 2020).

589 In 2016, the total recreational sea trout catch Baltic Sea Region was 743 tonnes, compared to 481  
590 tonnes in 2017, 427 tonnes in 2018, and 318 tonnes in 2019 (ICES 2018, 2020). Most of the  
591 recreational sea trout catch in the coastal zones is taken by fishermen from Finland in the Gulf of  
592 Bothnia and the Gulf of Finland (232 tonnes in 2018; ICES 2019). Moreover, recreational sea trout  
593 river catches in 2018 amounted to 15.5 tonnes and in 2019 to 35 tonnes, and originated mainly from  
594 rivers in the Swedish Gulf of Bothnia (ICES 2019, 2020). This is a much smaller river catch than the  
595 ten years average (47 tonnes). In the Polish marine waters and rivers rising popularity of  
596 recreational fishing is also notable. Average sea trout catches in years 2013–2016 in four Polish rivers  
597 were: river Słupia: 132 Rega: 284, Ina: 327 and Parsęta: 599. Results from on-site surveys performed  
598 in 2017 and 2018 on those monitors rivers, indicated that anglers reported a total of 774 sea trout:  
599 519 in 2017 and 255 in 2018. The average catch per angler in seasons 2017–2018 was 1.6 sea trout  
600 (ICES 2019).

601 A considerable amount of reared sea trout is released to the Baltic Sea or its rivers on a yearly basis.602  
To assess the impact of recreational fishing on the natural sea trout stocks, the share of reared fish in the  
catch would be important information. In Sweden, Finland, and Estonia all reared sea trout are mandatorily marked  
by clipping the adipose fin. The total number of fin-clipped sea trout in the Baltic Sea area was 1 718 891 smolts and  
277 741 parr.

606 Sea trout abundance is affected by commercial and recreational fishing at sea and in rivers. The  
607 production of sea trout parr in rivers depends on the number of successful spawners reaching the  
608 riverine spawning sites, and on the survival of spawned eggs and juveniles. Hence, the production  
609 can be hampered by migration barriers and poor habitat quality. The abundance of spawners

610 returning from feeding migrations in the coastal areas to the rivers is related to the densities of parr  
611 in the rivers. The density of sea trout parr also reflects the success of recruitment and depends on  
612 other factors such as climate, the size of the river, habitat characteristics and quality and is affected  
613 by migration barriers to reproduction areas (ICES 2019).

614 There is still a lack of reliable recreational fishing data which would allow to assess its further impact  
615 on sea trout stocks. Recreational catch figures are often more or less uncertain estimates based on  
616 limited information, and, hence, the usefulness of this type of data needs to be evaluated and  
617 possibilities to establish regional databases should be explored. To progress with this, data on  
618 recreational sea trout fisheries need to be routinely collected and the quality of the data need to be  
619 improved. Progressing with those elements is important, taking into account the potentially high  
620 impact of recreational fisheries on sea trout stocks and the lack of these information in several  
621 countries.

622 Lately, improvements have been noticed in the approaches for inclusion of recreational fisheries  
623 data in western Baltic Sea fisheries assessments, and in the estimates of trolling catches of both  
624 salmon and sea trout (HELCOM 2019). Studies of the impacts of catch and release are lacking for  
625 most common recreational species, including sea trout, but proposals for addressing the issue have  
626 been initiated (ICES 2018).

627 Moreover, the recreational fishing sector needs to be acknowledged in terms of its socio-economic  
628 role and has to be given rights, as well as responsibilities, to be a part of management discussions  
629 and decisions. Many angler groups also do engage in local habitat restoration activities, supporting  
630 development and conservation of sea trout in the Baltic Sea region.

631

## 632 5 Assessment of sea trout river and stock statuses

### 633 5.1 Data and approaches

634 For the assessment of sea trout river and stock status, existing sea trout population data and data on  
635 river habitat characteristics were used. The basis for the biological population data was the  
636 estimated sea trout parr densities (number of 0+ individuals per 100 m<sup>2</sup>) from electrofishing surveys  
637 in monitoring sites. The habitat data consisted of site and river specific environmental factors and  
638 qualities, including inter alia, Trout Habitat Score and THS classes (ICES 2011, Pedersen et al. 2017),  
639 factors needed for THS (river width, depth, slope, water velocity, substrate and shade), average air  
640 temperature, ecological status according to WFD classification, as well as information on migration  
641 hindrances. To some extent data was also available on sea trout stocking and possible restoration  
642 measures taken. Data was provided as per monitoring occasion and site, and organised under river  
643 name, country, and ICES assessment area (for assessment areas see Figure 1). Additional basic  
644 information such as site coordinates, distance to sea, and extent of catchment area were also given.  
645 All data were organised and included to large parts in the variables shown in the data set  
646 structure in Table S1 with the variable headings listed.

647 Both the estimated parr densities and the corresponding habitat data were obtained from two  
main sources: centrally from the ICES WGBAST and additional data directly from the Latvian Institute of  
Food safety, Animal Health and Environment "BIOR". The sea trout river data for the Baltic Sea  
region is requested by ICES WGBAST work group from all Baltic Sea countries on a yearly basis as  
part of the sea trout stock status assessment. The data obtained through ICES WGBAST was  
652 specifically requested for the purpose of this report from each of the data provider country  
653 representatives in the group. Permission to access and use the data was granted from all  
other countries except Russia. Hence no data from Russian rivers are included here. The additional  
data from Latvia was submitted by BIOR through an internal RETROUT project data call on the  
matter, and permission was granted for the data to be used for the purpose of this report. The data  
obtained through ICES WGBAST spanned the years 1975 to 2018 and consisted of a total of 4360 sea  
trout river monitoring records. The additional Latvian data covered years 2007–2018 with a total of  
276659 monitoring data records. Altogether the data set contained information from 377 unique  
rivers including separately reported tributaries). In addition, the Water Information System Sweden  
(WISS) Database was used for information on migration hindrances in the Stockholm area, as detailed in Annex  
1 (WISS 2021).

661 From the full data set a sub-set covering the most recent period, 2010–2018 was selected. Year 2010  
662 was chosen as the first year to be included based on the notion that the assessment of the HELCOM  
663 SALAR project (HELCOM 2011) reached up to year 2009. Although different in extent and used  
664 approaches, here the choice of the starting year was made as to not overlap with HELCOM 2011  
665 assessment. From the selected data period first descriptive features of the rivers, habitat  
666 characteristics and parr densities were explored.

667 The assessment of the sea trout population status in the rivers was based on the established general  
668 approach used by both ICES WGBAST and HELCOM Core indicator. The basic principle is that the  
669 estimated real parr densities (obtained from electrofishing monitoring) are related to calculated  
670 potential maximum densities that are based on measured habitat characteristics. By this an index of  
671 'recruitment status' RS [0,1] is obtained, functioning as a relative measure of the state of the sea  
672 trout river population. A more detailed account of this approach is given in ICES 2011 and Pedersen  
673 et al. 2017, and summarised in HELCOM 2018, ICES 2020, and Box 2.

674 The recruitment status was calculated for each monitoring occasion and annually averaged for every  
675 river. For the rivers with RS available for more than 7 years, a recruitment trend over time is

676 calculated through linear regression of *RS* against years as the Pearson *r* correlation coefficient,



677 resulting in values from -1 to +1 (-1 representing a negative development). The assessment of the  
678 current status is conducted by calculating an average *RS* over the last four years in the data period  
679 (i.e., 2015–2018). The obtained statuses are classified in four colour-coded status categories, where  
680 green corresponds to  $RS > 0.8$ , yellow to  $0.8 \geq RS > 0.5$ , red to  $0.5 \geq RS > 0.2$ , and black to  $RS \leq 0.2$ .  
681 This classification compares to that used in HELCOM 2011<sup>5</sup>, with the difference that the original red  
682 class is now further divided in red and black, with black corresponding to dangerously low  
683 recruitment status. Further, this classification relates to HELCOM core indicator on sea trout  
684 (HELCOM 2018), where ‘good environmental status’ is achieved when the moving parr density  
685 average remains above 50% of the site-specific reference potential parr density (i.e.,  $RS > 0.5$ ). The  
686 obtained status assessment results were then explored against some available river information  
687 (e.g., stocking, migration hindrances, ecological status).

688

## 689 5.2 Results and interpretation

690 The selected data period 2010–2018 included 3332 monitoring records, 1714 yearly average river  
691 values, and a total of 368 rivers. Over the whole period 2010–2018 the highest count of yearly river-  
692 specific data was from Sweden (461 records) and the lowest from Poland (73 records; Table 1). The  
693 sea trout monitoring sites and rivers included different sort of river waters that varied considerably  
694 in characteristics. For instance, the distance to the sea varied between 0.1 and 475 km, and the  
695 wetted width of the river sites ranged from <1 m up to 45 m (mean 8.2 m  $\pm$  8.7 SD). The THS habitat  
class (mean 1.9  $\pm$  0.9 SD) summarising the habitat characteristics of monitoring sites was dominated by class  
2 (36%) while class 0 had the smallest share (8%), indicating overall good habitat  
698 characteristics for sea trout (Pedersen et al. 2017). The shares of the different habitat classes  
699 seemed to be fairly stable across years, with a notable decrease in the share of habitat class 3 during  
700 2010 and 2011 (Figure 2), indicating occurred changes in monitoring sites. Regarding the ecological  
701 status (WFD) of the monitored rivers (mean 3.5  $\pm$  0.8 SD), there was an overall domination of rivers  
702 of *Good* status (51%) while rivers of *Bad* status had the smallest share (1%), indicating overall good  
703 ecological conditions in the monitored rivers. The shares of the different ecological status groups  
704 seemed to be stable across years (Figure 3). Close to a fourth (24%) of the yearly river-specific  
705 records had some sort of an artificial migration hindrance mentioned, affecting adult or juvenile up  
or down migration. Over the years 2010–2018 the yearly share of the monitored rivers with some  
migration hindrance varied between 13% and 34%. Of all the assessed rivers over the whole period 2010–  
708 2018, 27% had reported migration hindrances. Most (83%) of the yearly river-specific records  
709 showed no stocking of sea trout, and of all the assessed rivers over the period 2010–2018 about 23%  
710 had been stocked at least once.

711 The estimated 0+ sea trout parr densities varied between monitoring occasions from 0 up to 584.7  
712 ind. 100 m<sup>-2</sup>, with a global average of 27.2  $\pm$  49.9 (SD) ind. 100 m<sup>-2</sup> (N = 3332) and no consistent  
713 trend in yearly averages ind. 100 m<sup>-2</sup> (19.8  $\pm$  36.9 SD – 37.1  $\pm$  59.4 SD; N = 331 and N = 515  
714 respectively) over time during the 2010–2018 period. The record-high parr density was from river  
715 Kopparviksbäcken in Sweden year 2017. Over the whole period 2010–2018 the average 0+ parr  
716 density was highest in Denmark (61.4  $\pm$  67.3 SD; N = 88) and lowest in Lithuania (5.4  $\pm$  11.2 SD; N =  
717 713). The development of the yearly average parr densities over the period 2010–2018 is shown for  
718 each country in Figure 4. The differences seen between countries partly reflect differences in  
719 monitoring sites and river type included, and there is each year large variation in the number and  
720 identity of sampled sites.

---

<sup>5</sup> In HELCOM 2011 the assessment was based on an expert evaluated status index measuring the realised smolt production as percentage of potential production capacity.

721 The overall yearly average *RS* across all monitored rivers varied between 0.54 ( $\pm 0.88$  SD; N = 190)  
722 and 1.16 ( $\pm 2.03$  SD; N = 226) without any consistent trend over time during the 2010–2018 723  
724 period. The global average *RS* of all rivers and years was 0.79 ( $\pm 1.26$  SD; N = 1714). Within the  
725 period 2010–2018, the average river *RS* differed between countries and assessment areas (Table 2).  
726 The highest average river *RS* was from Estonia (1.77  $\pm$  1.90 SD; N = 197) and the lowest from  
727 Germany (0.19  $\pm$  0.21 SD; N = 224). Of the assessment areas, the highest average river *RS* was from  
728 GoF (1.54  $\pm$  1.54 SD; N = 200) and the lowest from assessment area South (0.56  $\pm$  0.90 SD; N = 450).  
729 The maximum river *RS* value (16.9) was calculated for river Valkeajoki in Finland 2015, resulting from  
730 a very high estimated electrofishing-based parr density (231.2 ind. 100 m<sup>-2</sup>) and a very low THS-  
based potential maximum parr density (13.7 ind. 100 m<sup>-2</sup>).

731 For assessing the possible trends over time in river *RS*, a total of 146 rivers with seven or more yearly  
732 *RS* records over the period 2010–2018 were available. Analysing the river-specific data, only very  
733 few rivers with indications of a negative or a positive linear trend were found, with only about 9% of  
734 the rivers having a Pearson's product moment correlation coefficient *r* below -0.5 (as an indication  
735 for a negative trend over time), and about 14% having a Pearson's *r* larger than 0.5 (as an indication  
736 for a positive trend over time). When analysing the same 146 rivers with seven or more yearly *RS*  
737 records over the period 2010–2018, but averaged for countries, mostly positive trend indications  
738 were seen (Figure 5). No trend indication from Germany was obtained as there were no rivers  
739 matching the requirement of data from seven or more years within the period 2010–2018. Finland  
740 and Estonia showed the strongest indications of an increasing trend (Pearson's *r* 0.80 and 0.58  
741 respectively), while Poland had the only negative trend indication (Pearson's *r* -0.62).

742 For assessing the current status of sea trout river populations, an average of river *RS* of the last four  
743 years was taken (2015–2018). This subset contained then a total of 346 rivers (Denmark 10, Estonia  
744 23, Finland 13, Germany 94, Latvia 48, Lithuania 75, Poland 16, and Sweden 67 rivers). The mean *RS*  
745 was highest for Estonia (2.29) and lowest for Germany (0.12), corresponding to the pattern seen  
746 from the whole 2010–2018 data set. The average river *RS* over the assessment period 2015–2018  
747 varied between 0 and 9.21, with a global average river *RS* of 0.75. When divided into the *RS*  
748 categories, with *green* corresponding to  $RS > 0.8$ , *yellow* to  $0.8 \geq RS > 0.5$ , *red* to  $0.5 \geq RS > 0.2$ , and 749  
*black* to  $RS \leq 0.2$ , the poorest status class, *black*, dominated with 41%, class *red* had 1%, and *yellow* and  
*green* 21% and 26% respectively. The list of rivers with *black* status class contains 67 rivers. The share of the  
status categories varied across countries and assessment areas (Figures 6 and 7).

752 Estonia showed the highest share of class *green* (91%), while Germany had the largest share of class  
753 *black* (79%). Regarding the ICES assessment areas, GoF had the largest share of class *green* (87%)  
754 and assessment area South the largest share of class *black* (66%). Among the *RS* categories, the  
755 average ecological status (WFD; 1-Bad – 4-High) was highest for category *green* (3.7) but did not  
756 differ considerably between categories (>3 for all). The prevalence of migration hindrances did not  
757 show any consistent pattern across the categories but was highest in category *red* and lowest in  
758 categories *black* and *yellow* (green: 33%, yellow: 22%, red: 43%, black: 21%). The prevalence of trout  
759 stocking was lowest in category *green* and highest in category *yellow* (green: 12%, yellow: 30%, red:  
760 13%, black: 22%), showing no consistent pattern across the *RS* categories. A full country-wise list of  
761 the assessed rivers with statuses and additional information is provided in Annex 1. A list of rivers  
762 with sea trout populations of a dangerously low status (Baltic Sea black list) is provided in Annex 2.

763 Although with status assessed differently (model predicted potential maximum parr densities vs.  
764 expert evaluated potential maximum smolt production capacity), in comparison with the sea trout  
765 red list rivers (i.e., rivers < 50% of potential maximum smolt production capacity) in the decade old  
766 SALAR report (HELCOM 2011), the current comparable list of rivers contains 181 rivers (106 without

767 Germany) versus 572 rivers in the older assessment (rivers from Russia included, from Germany  
 768 not). Of the now assessed 346 rivers, 51 were found from the old red list. Of these, about 50% had  
 769 still a status comparable to the red list criteria (new status class red and black together). Also, of the  
 770 rivers now assessed to have a status comparable to the old red list, 81 rivers were not included in  
 771 the old red list. Bearing in mind the differences in methods and uncertainties in such comparison, it  
 772 however, might indicate that fewer rivers have recovered compared to the one that have degraded.

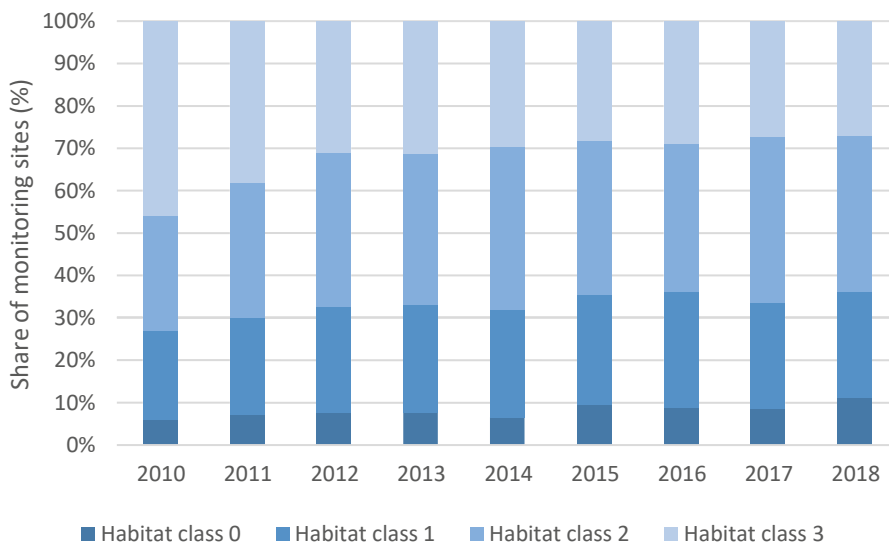
773

774

775 *Table 1. Distribution of river specific data across years and countries within the selected data period 2010–2018*

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Sweden	Total
2010	7	23	5	0	8	0	5	51	99
2011	10	23	10	0	11	0	5	49	108
2012	10	23	11	17	14	60	6	46	187
2013	10	21	11	18	15	56	8	51	190
2014	10	23	11	41	15	64	7	55	226
2015	10	21	11	9	21	66	7	50	195
2016	10	23	12	16	15	55	7	50	188
2017	9	20	13	80	18	68	13	45	266
2018	10	20	12	43	29	62	15	64	255
<b>Total</b>	86	197	96	224	146	431	73	461	1714

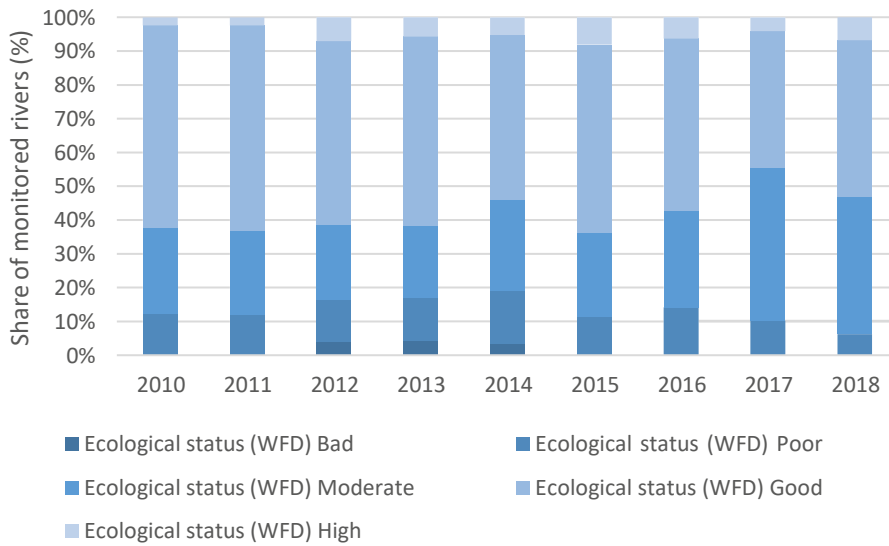
776



777

778 *Figure 2. The percentage share of monitoring sites in the 2010–2018 dataset across the four THS habitat classes 0–3.*

779



780

781

*Figure 3. The percentage share of monitored rivers in the 2010–2018 dataset across the five ecological status categories according to the WFD.*

782

783

784

785

786

787

788

789

790

791

792

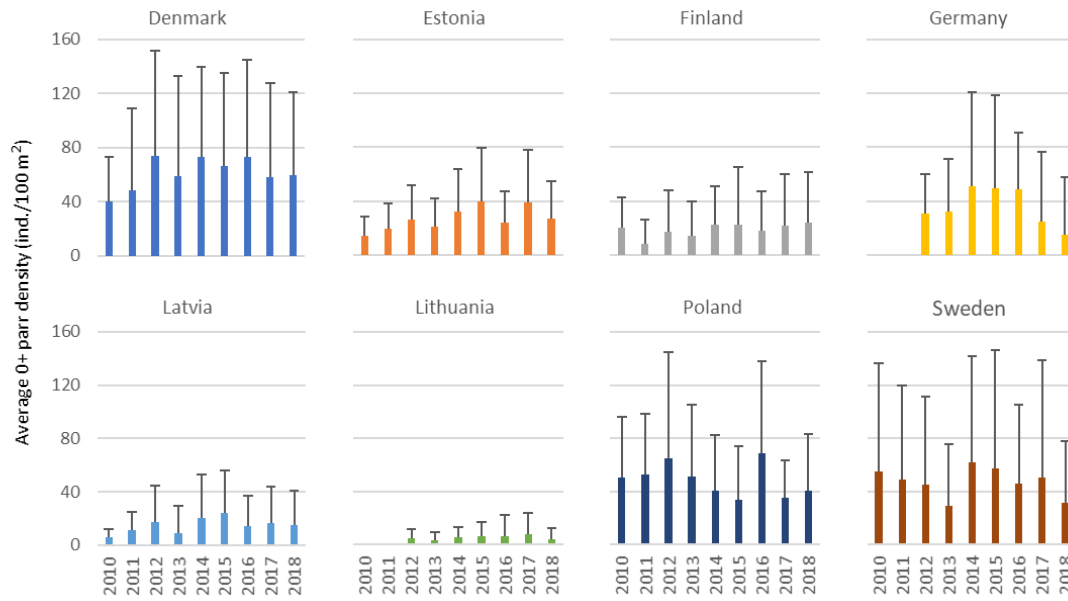


Figure 4. Yearly 2010–2018 mean 0+ parr densities for all Baltic sea countries except Russia. Error bars indicate standard deviation

793

794

795

796

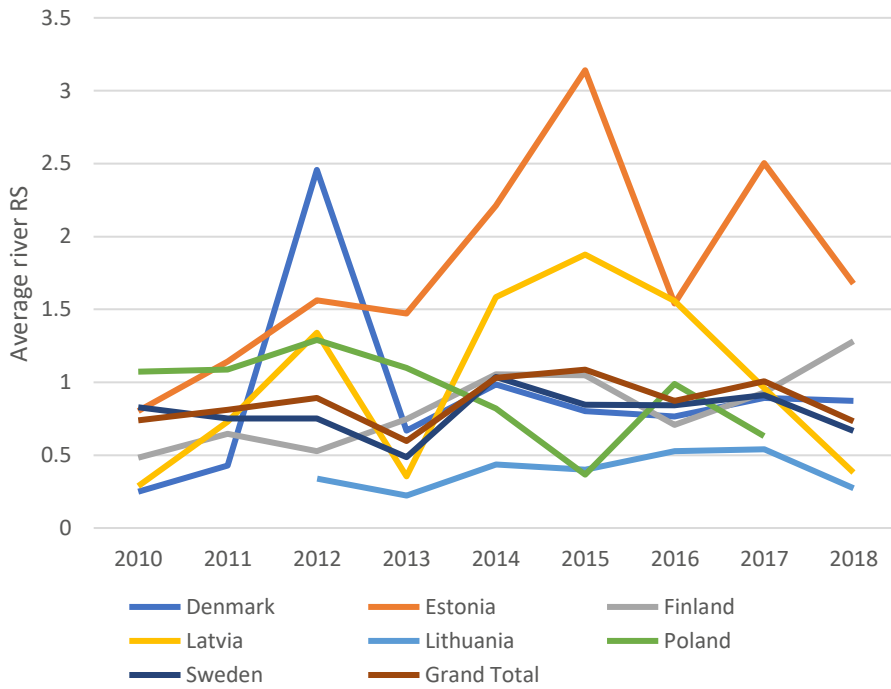
797

Table 2. Average and standard deviation of river recruitment status (RS) index values for countries and ICES assessment areas (AU). Assessment area abbreviations as East = eastern Baltic Sea, GoB = Gulf of Bothnia, GoF = Gulf of Finland, and West = western Baltic Sea

Country	Average of river RS	Standard deviation of river RS
Denmark	0.72	1.29
Estonia	1.77	1.90
Finland	1.19	2.11
Germany	0.19	0.21
Latvia	1.06	1.49
Lithuania	0.34	0.52
Poland	1.00	0.74
Sweden	0.89	1.08
<b>ICES AU</b>		
East	0.63	1.16
GoB	0.91	1.55
GoF	1.54	1.54
South	0.56	0.90
West	0.92	0.92

798

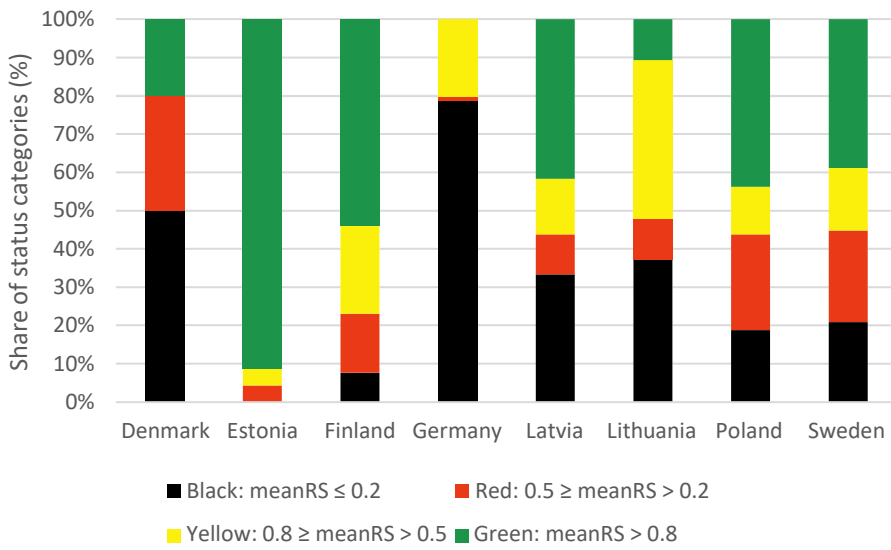
799



800

801 *Figure 5. Development of the average river RS over years for different countries. No trend information available for*  
 802 *Germany.*

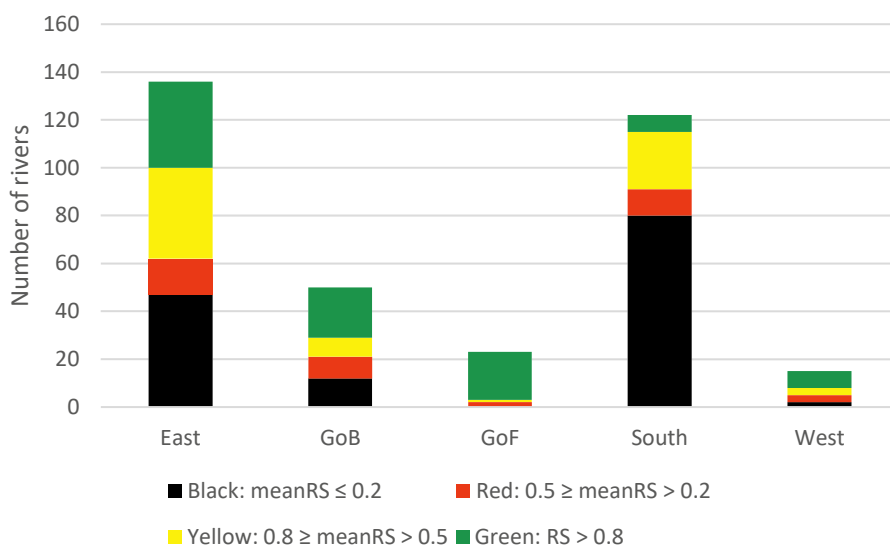
803



804

805 *Figure 6. The percentage share of status categories across the Baltic sea countries, based on the average over the last four years.*

806



807 *Figure 7. Number of assessed rivers (last four years 2015–2018) divided across the Baltic sea assessment areas.*

808

809

810

## 811 6 Conclusions

### 812 6.1 Recreational sea trout fishery in the Baltic sea

813 Recreational fishing is increasing in popularity and impact. Rod fishing from the shore or small boats  
814 is becoming more important than before to the expense of other methods and gear in recreational  
815 sea trout fishing. The current overall yearly catch from recreational sea trout fishing is coarsely  
816 around 500 tonnes and is already at the same level or higher than commercial catches. Hence,  
817 conflicts between anglers and commercial fishermen are not uncommon.

818 As the interest in sea trout recreational fishing increases or when the interest towards certain  
819 methods or modes change, the impact from the fishing on the stocks also vary. How the sea trout  
820 stocks endure the fishing pressure, and thus what impact the fishing absolutely has on the stocks,  
821 also depend on the status of the sea trout stocks. To assess the impact of recreational fishing on the  
822 natural sea trout stocks can be challenging as a considerable amount of reared sea trout is released to the  
823 Baltic Sea or its rivers. However, in many countries reared fish are fin clipped helping to  
824 discern them from natural fish. Natural production of sea trout in rivers depends on the number of  
825 successful spawners reaching the riverine spawning sites, and on the survival of spawned eggs and  
826 juveniles. Hence, the production can be hampered by migration barriers and poor habitat quality,  
827 affecting the stock size. When the stocks are decreasing due to poor reproduction, the relative effect  
828 of an unchanged fishing pressure increase. With as high catches as the recreational fishery currently  
829 has of sea trout, it can become increasingly important to consider and adapt the level of recreational  
830 fishery harvest to the development in stock sizes. This can be done by various regulations and  
831 restrictions, of which some are already in use in different countries (e.g., no natural sea trout  
832 allowed to be caught in the Finnish coastal waters).

833 There is still a considerable uncertainty in the data on recreational fishing effort and catches, which  
834 should be improved to enable better assessments of the impact from recreational fishing on sea  
835 trout in the Baltic sea. Moreover, the recreational fishing sector needs to be acknowledged in terms  
836 of its socio-economic role and included in management discussions and decision processes.

837

### 838 6.2 Sea trout river status in the Baltic sea region

839 Sea trout 0+ parr densities are used as the basis for the standard sea trout river status assessments  
840 in the Baltic sea region. In the assessment done for this report, sea trout parr densities varied up to  
841 over two orders of magnitude between different rivers and monitoring data. Over the assessment  
842 period 2010–2018 the sea trout parr densities also varied between years and countries, with an  
843 average level being highest in Denmark and lowest in Lithuania. No obvious trend over the  
844 assessment period was seen in the parr densities in any country, and the differences between  
845 countries partly reflect differences in monitoring sites and river type included.

846 The index used for evaluation the status of sea trout rivers/populations, *recruitment status RS*,  
847 relates the observed parr densities to a habitat-based estimation of the potential maximum parr  
848 density that the site could produce. Recruitment status varied considerably both between years and  
849 countries and assessment areas. In general, the *RS* was highest in GoF and Estonian river and lowest in the  
850 southern Baltic sea especially Germany. Finland and Estonia showed the strongest indications of a positive  
851 overall trend over the last decade, while Poland had the only negative trend indication.

852 The assessed current status of sea trout river populations, taken as an average of the last four years,  
853 showed the best status for Estonia and the poorest situation for Germany. The list of rivers with *black* status,  
854 that is rivers with dangerously low sea trout production ( $RS \leq 0.2$ ) contains 67 rivers, of



855 which the largest share was found in the southern Baltic sea region. The highest share of rivers  
856 belonging to the best status class *green* was found in the Gulf of Finland area. The Baltic sea black  
857 list of sea trout rivers is provided in Annex 2.

858 Although restricted in extent due to data availability, the outcome of this assessment highlights the  
859 current situation with a considerably high share of rivers still failing to reach a good status, and also  
860 pinpoints those rivers in the poorest condition needing urgent and prioritised recovery measures. At  
861 the same time, in certain areas positive development have been witnessed following increased  
862 emphasis and better management practices of sea trout populations and their rivers.

863

864

865 7 Literature

- 866 Armstrong J.D., Kemp P.S., Kennedy, G.J.A. et al. 2003. Habitat requirements of Atlantic salmon and  
867 brown trout in rivers and streams. *Fisheries Research* 62, 143–170.
- 868 Bohlin T., Hamrin S., Heggberget T.G. et al., 1989. Electrofishing – Theory and practice with special  
869 emphasis on salmonids. *Hydrobiologia* 173, 9–43.
- 870 CCB, 2017. Recreational fishing in the Baltic region Report. URL: [https://ccb.se/wp-](https://ccb.se/wp-content/uploads/2018/02/ccb_recreational_fishing.pdf)  
871 [content/uploads/2018/02/ccb\\_recreational\\_fishing.pdf](https://ccb.se/wp-content/uploads/2018/02/ccb_recreational_fishing.pdf)
- 872 European Commission, 2000. Directive 2000/60/EC of the European Parliament and of the council of  
873 23rd October 2000 establishing a framework for community action in the field of water policy.  
874 Official Journal of the European Communities, L327 /1. Brussels, European Commission.
- 875 European Commission, 2008. Directive 2008/56/EC of the European Parliament and the Council of  
876 17 June 2008 establishing a framework for community action in the field of marine environmental  
877 policy (Marine Strategy Framework Directive). Official Journal of the European Union, L 164/19,  
878 25.06.2008.
- 879 Froese R. and Pauly D. (Eds.), 2020. FishBase. World Wide Web electronic publication. URL:  
880 [www.fishbase.org](http://www.fishbase.org), version (12/2020). [Accessed 3/25/2021]
- 881 Harris G. and Milner N. (Eds.), 2007. *Sea Trout: Biology, Conservation and Management*. Blackwell  
882 Publishing Ltd. 4
- 883 HELCOM, 2007. Baltic Sea Action Plan. Adopted at HELCOM Ministerial Meeting in Krakow, Poland  
884 on 15 November 2007.
- 885 HELCOM, 2011. Salmon and Sea Trout Populations and Rivers in the Baltic Sea – HELCOM  
886 assessment of salmon (*Salmo salar*) and sea trout (*Salmo trutta*) populations and habitats in rivers  
887 flowing to the Baltic Sea. *Baltic Sea Environment Proceedings* 126A. Helsinki Commission, 79 pp.
- 888 HELCOM, 2013. HELCOM Red List of Baltic Sea species in danger of becoming extinct. *Baltic Sea*  
889 *Environment Proceedings* 140. Helsinki Commission, 106 pp.
- 890 HELCOM, 2018. Abundance of sea trout spawners and parr. HELCOM core indicator report. Online.  
891 [https://helcom.fi/wp-content/uploads/2019/08/Abundance-of-sea-trout-spawners-and-parr-](https://helcom.fi/wp-content/uploads/2019/08/Abundance-of-sea-trout-spawners-and-parr-HELCOM-core-indicator-2018.pdf)  
892 [HELCOM-core-indicator-2018.pdf](https://helcom.fi/wp-content/uploads/2019/08/Abundance-of-sea-trout-spawners-and-parr-HELCOM-core-indicator-2018.pdf). [3/10/2021]
- 893 HELCOM, 2019. Compiled information on coastal recreational fisheries in the HELCOM countries.  
894 FISH PRO III 1-2019. URL: [https://portal.helcom.fi/meetings/FISH-PRO%20III%201-2019-](https://portal.helcom.fi/meetings/FISH-PRO%20III%201-2019-592/MeetingDocuments/6-1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HELCOM%20countries.pdf)  
895 [592/MeetingDocuments/6-](https://portal.helcom.fi/meetings/FISH-PRO%20III%201-2019-592/MeetingDocuments/6-1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HELCOM%20countries.pdf)  
896 [1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HEL](https://portal.helcom.fi/meetings/FISH-PRO%20III%201-2019-592/MeetingDocuments/6-1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HELCOM%20countries.pdf)  
897 [COM%20countries.pdf](https://portal.helcom.fi/meetings/FISH-PRO%20III%201-2019-592/MeetingDocuments/6-1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HELCOM%20countries.pdf) [Accessed on 15 Dec 2019]
- 898 HELCOM, 2020a. First draft of the updated BSAP. Meeting document (HOD 59-2020, doc. 5-8). URL:  
899 [https://portal.helcom.fi/meetings/HOD%2059-2020-784/MeetingDocuments/5-](https://portal.helcom.fi/meetings/HOD%2059-2020-784/MeetingDocuments/5-8%20First%20draft%20of%20the%20updated%20BSAP.pdf)  
900 [8%20First%20draft%20of%20the%20updated%20BSAP.pdf](https://portal.helcom.fi/meetings/HOD%2059-2020-784/MeetingDocuments/5-8%20First%20draft%20of%20the%20updated%20BSAP.pdf)
- 901 HELCOM, 2020b. Compiled information on coastal recreational fisheries in the HELCOM countries  
902 2020. FISH PRO III 2-2020. URL: [https://portal.helcom.fi/meetings/FISH-PRO%20III%202-2020-](https://portal.helcom.fi/meetings/FISH-PRO%20III%202-2020-700/MeetingDocuments/6-1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HELCOM%20countries%202020.docx)  
903 [700/MeetingDocuments/6-](https://portal.helcom.fi/meetings/FISH-PRO%20III%202-2020-700/MeetingDocuments/6-1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HELCOM%20countries%202020.docx)  
904 [1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HEL](https://portal.helcom.fi/meetings/FISH-PRO%20III%202-2020-700/MeetingDocuments/6-1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HELCOM%20countries%202020.docx)  
905 [COM%20countries%202020.docx](https://portal.helcom.fi/meetings/FISH-PRO%20III%202-2020-700/MeetingDocuments/6-1%20Compiled%20information%20on%20coastal%20recreational%20fisheries%20in%20the%20HELCOM%20countries%202020.docx) [Accessed 2/19/2020]
- 906 ICES, 2008a. Report of the Workshop on Baltic Salmon Management Plan Request (WKBALSAL), 13–  
907 16 May 2008, ICES, Copenhagen, Denmark. ICES CM 2008/ACOM:55. 61 pp.

908

909 ICES, 2008b. Report of the Baltic Salmon and Trout Assessment Working Group (WGBAST). ICES CM  
910 2008/ACOM:05.

911 ICES, 2011. Report of the Baltic Salmon and Trout Assessment Working Group (WGBAST), 22–30  
912 March 2011, Riga, Latvia. ICES 2011/ACOM:08. 297 pp.

913 ICES, 2012a. ICES Advice 2012. Sea trout - Baltic Sea. FIRMS Reports. In: Fisheries and Resources  
914 Monitoring System (FIRMS) [online]. Rome. Updated. [Cited 24 March 2021]. URL:  
915 <http://firms.fao.org/firms/resource/10481/en>

916 ICES, 2012b. Report of the Baltic Salmon and Trout Assessment Working Group (WGBAST), 15–23  
917 March 2012, Uppsala, Sweden. ICES 2012/ACOM:08. 353 pp.

918 ICES, 2013. Report of the ICES Working Group on Recreational Fisheries Surveys 2013 (WGRFS). URL:  
919 <http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2013/WGRFS%202013/WGRFS%20Report%202013.pdf>  
920

921 ICES, 2018. Report from the Working Group on Recreational Fisheries Surveys (WGRFS), 11–15 June  
922 2018, Faro, Portugal. ICES CM 2018/EOSG:19. 111 pp.

923 ICES, 2019a. Sea trout (*Salmo trutta*) in subdivisions 22–32 (Baltic Sea). In Report of the ICES  
924 Advisory Committee, 2019, trs.27.22–32. URL: <https://doi.org/10.17895/ices.advice.4744>

925 ICES, 2019b. Baltic Salmon and Trout Assessment Working Group (WGBAST). ICES Scientific Reports.  
926 1:23. 312 pp.

927 ICES, 2020. Baltic Salmon and Trout Assessment Working Group (WGBAST). ICES Scientific Reports  
928 2:22. 261 pp.

929 Lejk A.M. and Dziemian Ł., 2019. Polish Pilot Study – development of methods for monitoring of  
930 recreational fisheries. Presentation during HELCOM FISH PRO III Meeting, Helsinki 2019 URL:  
931 <https://portal.helcom.fi/meetings/FISH-PRO%20III%201-2019-592/Documents/Presentation%208.pdf> [Accessed 12/15/2019 ]  
932

933 Pedersen S., Degerman E., Dębowski P. and Petereit C., 2017. Assessment and recruitment status of  
934 Baltic sea trout populations. In: Harris G. (Ed.). *Sea Trout – Science and Management - Proceedings*  
935 *of the 2nd International Sea Trout Symposium*. Matador, pp: 423–441.

936 WISE, 2021. The Water Information System for Europe – Freshwater. European Environment Agency.  
937 URL: [https://www.eea.europa.eu/themes/water/european-waters/water-quality-and-water-](https://www.eea.europa.eu/themes/water/european-waters/water-quality-and-water-assessment/water-assessments/ecological-status-of-surface-water-bodies)  
938 [assessment/water-assessments/ecological-status-of-surface-water-bodies](https://www.eea.europa.eu/themes/water/european-waters/water-quality-and-water-assessment/water-assessments/ecological-status-of-surface-water-bodies) [Accessed 3/25/2021]

WISS, 2021. Water Information System Sweden (WISS). <https://viss.lansstyrelsen.se/> [Accessed 6/2/2021]

939 Zippin C., 1956. An evaluation of the removal method of estimating animal populations. *Biometrics*  
940 12, 163–169.

941 Supplement A. Additional information on the sea trout data used

942

943 Table S1. Headings of the collected sea trout population and river data dataset.

Variable	Explanation	
<b>BASIC INFORMATION</b>	Year	Year of sampling
	Country	Country name in English.
	ICESSubdiv	ICES Subdivision; e.g. Gulf of Finland = 32
	ICES Assessment unit	ICES WGBAST ST assessment unit (east, west, GoB, GoF)
	River	Your name of the river.
	Latitude	Latitude, given as WGS84, In degrees followed by a decimal point.
	Longitude	Longitude, given as WGS84, In degrees followed by a decimal point.
	Site_name	Your name of the site
Site_distance_to_sea (km)	How many km from fishing site to outlet	
<b>SALMONID DATA</b>	Density_0+ (ind/100m2)	Estimated abundance of trout 0+ per 100 m <sup>2</sup> .
	Density >0+ (ind/100m2)	Estimated abundance of trout >0+ per 100 m <sup>2</sup> .
	Density estimation method	Method used for estimating parr density
	Resident / brown trout (Y/N)	Are there on the site, or in the area around, a population of trout larger than the maximal smolt size
	Trout stocking (Y/N)	Are trout stocked on / near the site? (Y=yes, N=no)
	Stocking add. Info (if Y-->amount, year)	Additional information on trout stocking (amount and year, if possible)
Salmon_density (ind/100m2)	Estimated abundance of salmon parr (all age groups) per 100 m <sup>2</sup> .	
ST river/population category	<a href="#">Category of ST population according to HELCOM SALAR report</a>	
<b>HABITAT DATA</b>	Wetted width of stream (m)	Given in meters at sampling site
	Slope (%) of section	Given in percent (altitude change divided by stream length) for the site.
	Water velocity class	According to trout habitat score (see attached table 8)
	Average/dominating depth (m)	According to trout habitat score (see attached table 8)
	Dominating substratum	According to trout habitat score (see attached table 8)
	Shade (%)	According to trout habitat score (see attached table 8)
	River_habitat	Three classes; Good, Intermediate, Poor
	Waterquality (WFD)	Three classes; Good, Intermediate, Poor
	Ecol_status (WFD)	Ecological status given as required by the Water framework directive; High, Good, Moderate, Poor, Bad
	Catchment_area (m2)	Catchment of whole river given i km <sup>2</sup> .
Average_air_temp	Average annual air temperature, given in °C.	
<b>THS</b>	THS_0-12 (10)	What is the trout habitat score (THS) on the scale 0-12 (10) - see table (from SGBALANST 2011) below for scores at different variable values
	THS Habitat class 0-3	THS habitat class according to SGBALANST (2011) (0-1-2-3)
<b>POTENTIAL PARR DENSITY</b>	THS-based	calculated with the equation: $pot\_parr\_dens=10^{(0.963-0.906*LOG10(average\_wetted\_width)+0.045*average\_air\_temp-0.037*longitude+0.027*latitude+0.033*habitat\_class)}$
	expert opinion	Potential parr density according to expert opinion (if THS-based estimate not available)
	other method	Potential parr density according to other method (if THS-based estimate not available)
<b>STATUS</b>	RS	Recruitment status (estimated parr density/potential parr density)
<b>MIGRATION HINDRANCES</b>	smolt downstream artificial Number of barriers	How many barriers of this type between the outlet and the fishing site
	Function	Is downstream migration past barrier in your opinion easy and with no or insignificant mortality - write 1, associated with some mortality - write 2, with heavy mortality - write 3
	Barrier type	Write in text (E.g. turbine, lake (including lake upstream to turbine)....)
	Remarks	Any remarks - please write in text
	smolt natural downstream Number of barriers	How many barriers of this type between the outlet and the fishing site
	Function	Is downstream migration past barrier in your opinion easy and with no or insignificant mortality - write 1, associated with some mortality - write 2, with heavy mortality - write 3
	Barrier type	E.g. waterfall, lake...Remarks -
	Remarks	please write in text
	adult upstream artificial Number of barriers	How many barriers of this type between the outlet and the fishing site
	Passage function	Is the upstream migration past the man made barrier in your opinion almost free and with no or insignificant delay - write 1, is passage variable probably some delay - write 2, always difficult but possible - write 3, impossible write 4) if several barriers with different passage explain in text
	Passage type	Has the barriers fish passage installed - write 1, different type of passage - write 2.
	Remarks	Any remarks - please write in text
adult upstream natural Number of barriers	How many artificial barriers are found between the site and the outlet	
Passage function	Is the upstream migration past the man natural barrier in your opinion almost free and with no or insignificant delay - write 1, is passage variable probably some delay - write 2, always difficult but possible - write 3, impossible write 4) if several barriers with different passage explain in text	
Passage type	Has the barriers fish ladder installed - write 1, different type of passage - write 2.	
Remarks	Any remarks - please write in text	
<b>RESTORATION MEASURES</b>	Measure 1	any restoration measure done in river (type of measure and year of implementation)
	Measure 2	any restoration measure done in river (type of measure and year of implementation)
	Measure 3	any restoration measure done in river (type of measure and year of implementation)
	Measure 4	any restoration measure done in river (type of measure and year of implementation)
	Measure 5	any restoration measure done in river (type of measure and year of implementation)
	Additional information	Any additional information regarding the restoration measure
	Note1	
Note2		
Note3		
Note 4		

944

945

946 Annex 1. List of all 346 assessed sea trout rivers in the Baltic Sea over  
 947 the period 2015–2018.

948

### Denmark

<i>River</i>	<i>RS category</i>	<i>ES (WFD)</i>	<i>Trout stocking (Y/N)</i>	<i>Migration hindrances (Y/N)</i>
Brændemølle Å	4	-	N	N
Jeksen Bæk	3	4	N	Y
Lilleå	4	4	N	N
Lollikebæk	4	4	N	N
Odense Å	3	3	N	Y
Stokkebækken	4	4	N	N
Stubberup bæk	1	4	N	N
Svenskebæk	3	4	N	Y
Tjærbæk	4	4	N	N
Villestrup å	1	4	N	N

### Estonia

<i>River</i>	<i>RS category</i>	<i>ES (WFD)</i>	<i>Trout stocking (Y/N)</i>	<i>Migration hindrances (Y/N)</i>
Altja	1	4	N	N
Höbringi oja (tributary of Riguldi)	1	4	N	N
Jämaja oja	1	4	N	N
Kaberla oja	1	4	N	N
Keila	1	2	N	N
Kolga oja	1	4	N	N
Loo oja	1	4	Y	N
Loobu	1	2	N	N
Männiku oja	1	4	N	N
Mustoja	1	4	N	N
Pada	1	4	N	N
Pidula oja	1	4	N	N
Pirita	2	2	Y	Y
Pudisoo	1	2	Y	N
Riguldi	1	4	N	N
Timmkanal	1	4	N	N
Toolse	1	4	N	N
Vääna	1	2	N	N
Vainupea	1	4	N	N
Valgejõgi	3	4	Y	N
Vasalemma	1	2	N	N
Vihterpalu	1	4	N	N
Võsu	1	4	N	Y

### Finland

<i>River</i>	<i>RS category</i>	<i>ES (WFD)</i>	<i>Trout stocking (Y/N)</i>	<i>Migration hindrances (Y/N)</i>
Espoonjoki	1	4	N	N
Ingarskilanjoki	1	3	N	Y
Isojoki	1	4	Y	Y
Kuerjoki	1	5	N	N
Lestijoki	2	-	Y	N
Longinoja	1	3	N	N
Mankinjoki	1	4	N	N
Mustajoki	3	3	N	Y
Naalastojoki	2	-	N	N
Naamijoki	3	-	N	N
Olosjoki	4	-	N	N
Pakajoki	2	5	N	N
Valkeajoki	1	5	N	N

### Germany

<i>River</i>	<i>RS category</i>	<i>ES (WFD)</i>	<i>Trout stocking (Y/N)</i>	<i>Migration hindrances (Y/N)</i>
Althöfer Bach	4	3	N	N
Au bei Klein Grödersby	4	3	N	N
Au bei Königstein	4	3	N	N
Augraben	4	3	N	Y
Bach aus Bernstorf	4	3	N	N
Bach aus Neu Karin	2	-	N	N
Bach aus Parchow	2	-	N	N
Bach aus Thorstorf	4	-	N	N
Bach aus Zierow	4	3	N	N
Bach bei Karschau	2	3	N	Y
Bachgraben	4	3	N	N
Bäk	4	-	N	N
Beke	2	4	N	N
Bienebek	4	3	Y	Y
Blowatzer Bach	4	3	N	N
Bollhäger Fließ	4	-	N	N
Carbäk	4	3	N	N
Damshäger Bach	4	3	N	N
Farpener Bach	4	3	N	N





					<u>Sweden</u>				
					<i>River</i>	<i>RS category</i>	<i>ES (WFD)</i>	<i>Trout stocking (Y/N)</i>	<i>Migration hindrances (Y/N)</i>
Širvinta	4	4	Y	Y					
Skerdyksna	4	4	N	N					
Skinija	2	-	N	N					
Šlūžmė	2	-	N	N	Aapuajoki	3	-	N	Y
Smiltele	2	-	N	N	Älandsån	3	-	N	Y
Store	2	4	N	N	Åvaån	1	3	N	Y
Šunija	2	-	Y	N	Bergshamraån	1	4	N	Y
Šustis	1	-	Y	N	Björkån	4	-	N	Y
Šventoji	2	4	Y	N	Bönälven	1	-	N	Y
Šventupis	2	-	N	N	Borgforsälven	1	4	N	Y
Šyša	1	-	Y	Y	Börrumsån	2	4	N	N
Upyna	3	-	N	N	Byskebäcken	4	4	N	N
Upynik?	2	-	N	N	Degerbäcken	4	3	N	Y
Veiviržas	2	-	N	N	Edstabäcken	3	-	N	Y
Venta	4	3	N	Y	Fällforsån	4	3	N	N
Vilnia	1	4	Y	Y	Gådeån	2	-	N	Y
Virinta	2	5	Y	N	Hagbyån	2	4	N	N
Visete	4	3	Y	N	Halmstadsbäcken	3	3	N	Y
Voke	4	3	Y	Y	Harrijoki	1	-	N	Y
Žalesa	2	4	Y	N	Hugraifsån	3	4	N	N
Žeimena	4	5	N	N	Idbyån	1	-	N	Y
Žiežmara	4	5	Y	N	Inviksån	1	-	N	Y
Žvelsa	4	4	N	N	Jyryjoki	1	-	N	Y
					Kääntöjoki	1	-	N	Y
					Kagghamraån	3	3	N	N
					Keräntöjoki	3	-	N	Y
					Kitkiöjoki	2	3	N	Y
					Klappmarksbäcken	2	4	N	Y
					Kolmårdsbäcken	2	3	N	N
					Kopparviksbäcken	1	4	N	N
					Kramforsån	1	-	N	Y
					Kulleån	1	4	N	Y
					Kutsasjoki	4	-	N	Y
					Kvarnån	1	-	N	Y
					Kvarsebobäcken	1	4	N	N
					Lahnajoki	1	-	N	Y
					Ljustorpsån	1	-	N	Y
					Loån	1	4	N	Y
					Lyckebyån	2	3	N	Y
					Malbäcken	2	3	N	Y
					Merasjoki	4	-	N	Y
					Moraån	3	4	N	Y
					Nätraån	1	-	N	Y
					Pålböleån	4	3	N	Y
					Prästbäcken	4	4	N	N
					Råån	1	3	N	Y
<u>Poland</u>									
<i>River</i>	<i>RS category</i>	<i>ES (WFD)</i>	<i>Trout stocking (Y/N)</i>	<i>Migration hindrances (Y/N)</i>					
Czarna Wda	1	3	N	N					
Drweca	1	4	N	Y					
Ina	3	3	N	Y					
Kacza	4	2	N	Y					
Leba	1	2	N	Y					
Lupawa	1	4	N	N					
Motława	4	4	Y	Y					
Orzechowka	2	4	N	N					
Parseta	3	4	Y	Y					
Piasnica	4	4	N	Y					
Reda	3	3	N	Y					
Rega	2	4	N	Y					
Slupia	3	3	N	Y					
Wieprza	1	2	N	Y					
Zagorska Struga	1	4	N	N					
Zielona Struga	1	3	N	Y					



Ramlösabäcken	3	3	N	N	Tolkkijoki	3	-	N	Y
Råtjärnbäcken	1	4	N	Y	Torsbäcken	4	4	N	N
Risängesbäcken	3	3	N	N	Tostarpsbäcken	3	3	N	Y
Risebergabäcken	3	3	N	N	Trunnerupsbäcken	2	4	N	N
Saluån	1	4	N	N	Tryssjöbäcken	3	4	N	Y
Sege å	4	2	N	N	Valtiojoki	4	4	N	Y
Själsöån	3	4	N	N	Västanbäcken	1	4	N	Y
Skärjån	4	3	N	N	Vedån	1	4	N	N
Skeboån	4	2	N	Y	Verkaån	2	4	N	N
Smörbäcken	1	4	N	Y	Virån	4	3	N	Y
Stenbitbäcken	1	-	N	Y	Vitsån	1	4	N	Y
Stridbäcken	2	4	N	N					
Strinneån	3	-	N	Y					

## Annex 2. Black list of sea trout rivers (river recruitment status $\leq 0.2$ ) listed by country.

<b>Denmark</b>	Hanshäger Bach	Ringsberger Au
Brændemølle Å	Haubach	Rosengartener Bek
Lilleå	Hohen Sprenger Mühlbach	Sagarder Bach
Lollikebæk	Holmbacher Graben	Schmieden Au
Stokkebækken	Hopfenbach	Schwinge
Tjærbæk	Katzbach	Sehrowbach
	Klosterbach	Siesbek
<b>Finland</b>	Köhntop	Stepenitz
Olosjoki	Königsau	Strasburger Mühlbach
	Köppernitz	Strehlower Bach
<b>Germany</b>	Körkwitzer Bach	Swinow
Althöfer Bach	Korleputer Bach	Tarnewitzer Bach
Au bei Klein Grödersby	Korleputer Mühlbach	Tessenitz
Au bei Königstein	Krieseby Au	Thorstorf
Augraben	Lange Rie	Waidbach
Bach aus Bernstorf	Linde	Wallbach
Bach aus Thorstorf	Maibach	Warnow
Bach aus Zierow	Marlower Bach	Wittbeck
Bachgraben	Maurine	Wolfsbach
Bäk	Mechelsdorfer Bach	Zarnow
Bienebek	Mildenitz	Zierower Bach
Blowatzer Bach	Moltenower Bach	
Bollhäger Fließ	Mühlenbach Strelasund	<b>Latvia</b>
Carbäk	Mühlenfließ	Abava
Damshäger Bach	Nebel	Bērzene
Farpener Bach	Neu Karin	Ciecere
Fauler Bach/Plastbach	Poischower Mühlenbach	Durbe
Gätenbach	Rabeler Scheidebach	Grīva
Goldbach	Radebach	Inčupe
Göwe	Randkanal	Lielā Jugla
Graben aus Ahrendsee	Recknitz	Loja
Graben aus Sandhagen	Reppeliner Bach	Lorupe

Mazā Jugla

Pilsupe

Rakšupe

Šepka

Užava

Vējupīte

Virbupe

### **Lithuania**

Aitra

Akmėna

Bezdonė

Dubysa

Ežeruona

Irtuona

Jūra

Jusine

Kražantė

Lokys

Minija

Neris

Peršokšna

Plaštaka

Ringelis

Šate

Šerkšne

Šešuola

Šiaušė

Siesartis

Širvinta

Skerdyksna

Venta

Visete

Voke

Žeimena

Žiežmara

Žvelsa

### **Poland**

Kacza

Motława

Piasnica

### **Sweden**

Björkån

Byskebäcken

Degerbäcken

Fällforsån

Kutsasjoki

Merasjoki

Pålböleån

Prästbäcken

Sege å

Skärjån

Skeboån

Torsbäcken

Valtiojoki

Virån