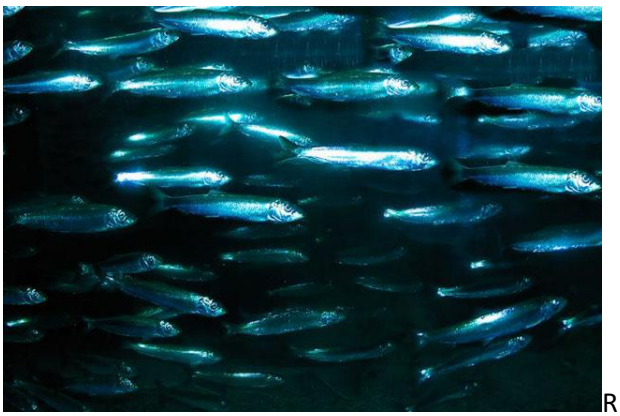
FISHERY ASSESSMENT REPORT

IFFO GLOBAL STANDARD FOR RESPONSIBLE SUPPLY OF FISHMEAL AND FISH OIL


R1

FISHERY:	**Herring (*Clupea harengus*)**
LOCATION:	**Gulf of Bothnia: Subdivision 30, Bothnian Sea and subdivision 31 Bothnian Bay**
DATE OF REPORT:	**August 2018**
ASSESSOR:	**Deirdre Hoare**

1. APPLICATION DETAILS AND SUMMARY OF THE ASSESSMENT OUTCOME			
Name:			
Address:			
Country: Denmark, Sweden, Finland		**Zip:**	
Tel. No.		**Fax. No.**	
Email address:		**Applicant Code**	
Key Contact:		**Title:**	
Certification Body Details			
Name of Certification Body:	**Global Trust Certification Ltd.**		
Assessor Name	**Peer Reviewer**	**Assessment Days**	**Initial/Surveillance/ Re-certification**
Deirdre Hoare	Jim Daly	2	Surveillance
Assessment Period	2017		
Scope Details			
1. Scope of Assessment	IFFO Global Standard for Responsible Supply – Issue 1		
2. Fishery	Herring (*Clupea harengus*)		
3. Fishery Location	Gulf of Bothnia: Subdivision 30, Bothnian Sea and subdivision 31 Bothnian Bay		
4. Fishery Method	Pelagic trawl		
Outcome of Assessment			
5. Overall Fishery Compliance Rating	High		
6. Sub Components of Low Compliance	None		
7. Information deficiency	None		
8. Peer Review Evaluation	Maintain approval		
9. Recommendation	Maintain approval		

2. QUALITY OF INFORMATION

High

3. COMPLIANCE LEVEL ACHEIVED

High

Recommendation

Approve

4. GUIDANCE FOR ONSITE ASSESSMENT

Based on HIGH compliance findings

Based on MEDIUM compliance findings

Based on LOW compliance findings

5. ASSESSMENT DETERMINATION

The EU component of the Gulf of Bothnia herring fishery is managed within the CFP framework and as such is subject to research, control and enforcement typical of European fisheries. Scientific understanding of the stock appears to be good, and ICES has made annual management and quota recommendations for nearly 30 years.

A management plan has been agreed and implemented, meaning there are now explicit management objectives and evidence of an ecosystem approach to fishery management.

However, the fishery has been awarded a medium compliance rating in sections A3 and D3. A3 is due to the management plan formally covering herring in this area as two stocks, corresponding to subdivisions 30 and 31. The combined stock of herring in subdivisions 30 and 31 is not currently specified in the plan. D3: *The multiannual management plan has been implemented, along with the ecosystem-based management approach within, however there is a lack of information on the impacts of the fishery on the Baltic Ecosystem and ETP species*.

Peer Reviewer is in agreement with this assessment. Future assessments to determine if the scope of the management plan covers the combined stock of herring in subdivisions 30 and 31 also to determine if more information is provided on the impacts of fishery on the Baltic Ecosystem and ETP species.

HIGH Compliance

A1, A2, B1, B2, C1, D1, D2, E1, E2

MEDIUM Compliance

A3, D3

LOW Compliance

SUMMARY OF LEVEL OF COMPLIANCE

	The Management Framework and Procedures	Stock assessment procedures and management advice	Precautionary approach	Management measures	Implementation
legal and administrative basis	A1				
Fisheries management should be concerned with the whole stock unit	A2				
Management actions should be scientifically based	A3				
Research in support of fisheries conservation and management should exist		B1			
Best scientific evidence available should be taken into account when designing conservation and management measures		B2			
The precautionary approach is applied in the formulation of management plans			C1		
The level of fishing permitted should be set according to management advice given by research organisations				D1	
Where excess fishing capacity exist, mechanisms should be in established to reduced capacity				D2	
Management measures should ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment				D3	
A framework for sanctions of violation of laws and regulations should be efficiently exists					E1
A management system for fisheries control and enforcement should be established					E2

KEY: Low Compliance: Medium Compliance: High Compliance:

6. RATIONALE OF THE ASSESSMENT OUTCOME

A. THE MANAGEMENT FRAMEWORK AND PROCEDURE

LEVEL OF COMPLIANCE	
A1. The management of the fishery must include a legal and administrative basis for the implementation of measures and controls to support the conservation of the fishery.	
LOW	An administrative framework that ensures an efficient management of the fishery for its conservation is not established.
MEDIUM	An administrative framework that ensures an efficient management of the fishery for its conservation is somehow established, but there is evidence of not being efficient to ensure the conservation of the stock.
HIGH	A legal and administrative framework that ensures an efficient management of the fishery for its conservation is established and works efficiently toward the conservation of the stock.

Determination: A legal and administrative framework that ensures an efficient management of the fishery for its conservation is established and works efficiently toward the conservation of the stock. H

Europe:

Denmark, Finland and Sweden are Member States of the European Union, and therefore in Community waters implement the Common Fisheries Policy (CFP). In force since 1983, the CFP aims to reconcile resource conservation with the preservation of income and jobs in coastal zones that offer few alternatives in terms of production or employment. It therefore covers not just resources but also markets and structures.

With regards to resource management, the CFP regulations comprise:

- A traditional management tool based on TACs and quotas;
- Technical measures relating to gear or catch;
- Effort-related management, based on vessel engine power and the number of days at sea.

The CFP also provides for the introduction of measures to rebuild, over a period of several years, stocks that are threatened in terms of sustainable harvesting, and for recourse to effort-related management rules to supplement TACs and quotas.

The CFP is periodically reviewed and reformed. The most recent CFP reform process was completed in 2013 and came into effect from the 1st January 2014. Key changes include:

- The introduction of an objective to 'ensure high long-term fishing yields for all stocks by 2015 where possible, and at the latest by 2020' (i.e. movement towards an MSY-based approach).
- The gradual (2015-2019) introduction on a fishery-by-fishery basis of a 'landing obligation', which effectively bans discarding.
- An overhaul of the management structure, including increased regionalisation and more extensive stakeholder consultation.

Denmark

The responsible authority for monitoring and enforcing EU and national conservation policies is the Danish Agrifish Agency, which is a part of the Ministry of Food, Agriculture and Fisheries, under the 1999 Fisheries Act. The Agency carries out inspections at sea and on landing, as well as verification of EU marketing standards. The Ministry also works for Danish fisheries and aquaculture through:

- Regulation and inspections of the fishing industry
- Support for research in fisheries and aquaculture production
- Support for the development of fisheries, the fish industry, fishery harbours and aquaculture
- Fish management and fishing license arrangements for recreational fisheries

The primary provider of scientific information and advice at the national level within Denmark is the National Institute of Aquatic Resources at the Technical University of Denmark (DTU Aqua). DTU Aqua's stated mission is to conduct research, provide advice, educate at university level and contribute to innovation in sustainable exploitation and management of aquatic resources. DTU Aqua directly advises the Danish Ministry of Food, Agriculture and Fisheries and other public authorities.

Finland

As Finland is a member of the European Union, the Common Fishery Policy (CFP) and its legislation are directly applicable. Commercial fishing at sea is controlled by the Southwest Finland Centre for Economic Development, Transport and the Environment (ELY Centre), the Provincial Government of Åland and the Finnish Border Guard. The ELY Centre and the Provincial Government of Åland also control landings and the first-hand trade of fish. The Finnish Border Guard operates the Fisheries Monitoring Centre. Control measures and inspections concern fishing vessels and their fishing activities at sea, the landings of catches and the activities of first-hand buyers of fish. The traceability of fishery and aquaculture products and consumer information concerning the products are controlled by the Finnish Food Safety Authority Evira and municipal food authorities.

Sweden

As Sweden is a member of the European Union, the Common Fishery Policy (CFP) and its legislation are directly applicable. The general principles governing the national fishery policy are established in a Parliamentary Act. This act also authorises the Government to issue legal acts in order to supplement the CFP and to regulate the fishery not covered by the CFP. The Government has forwarded this authorisation to the National Board of Fisheries together with general principles and guidelines. The central administration of fisheries policy is divided between the Ministry of Agriculture and the National Board of Fisheries (NBF). The Ministry draws up the framework of the fishery policy and represents Sweden at international negotiations. The NBF is the executive branch of the administration and responsible for the implementation of the fisheries policy and for giving technical advice to the government. At the regional level, the 21 county administrative boards include fisheries experts.

A large part of the fisheries research and development is carried out by the NBF at its three institutes of marine, coastal and freshwater research. Research is also undertaken at the universities and other public institutions. The Coast Guard carries out the fisheries control and surveillance at sea and in harbours in cooperation with the NBF.

International science

Science-based fishery management advice at the international level is provided by the International Council for the Exploration of the Sea (ICES). ICES is a network of more than 1,600 scientists from 200 institutes (including DTU Aqua), linked by an intergovernmental agreement (the ICES Convention) to add value to national research efforts. Scientists working through ICES gather information about the marine ecosystem.

Besides filling gaps in existing knowledge, this information is developed into unbiased, non-political fishery management advice. The 20 member countries that fund and support ICES use this advice to help them manage the North Atlantic Ocean and adjacent seas. ICES provides annual stock assessment and management advice in relation to the Baltic Sea Herring fishery via its Baltic Fisheries Assessment Working Group (WGBFAS).

Baltic Sea AC

Also relevant to the management of herring in the Gulf of Bothnia is the Baltic Sea Advisory Council (BSAC), which was set up in March 2006 as a result of the 2002 CFP reform. The role of Advisory Councils (ACs) was

further refined by the 2013 reform. The main objective of the BSAC is to provide advice on the management of Baltic fisheries, through its membership of representatives of the fishing industry and other non-governmental groups affected by the CFP, including eNGOs, consumers and others.

Helcom

HELCOM (Baltic Marine Environment Protection Commission - Helsinki Commission) is the governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea Area, known as the Helsinki Convention. The Contracting Parties are Denmark, Estonia, the European Union, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.

HELCOM was established about four decades ago to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental cooperation.

R2, 4, 5, 29, 30, 31, 33

LEVEL OF COMPLIANCE	
A2. Fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account fishery removals and the biology of the species.	
LOW	Fisheries management is not concerned with the whole stock unit over its entire area of distribution and do not take into account any of the matters listed in 'A1'.
MEDIUM	Fisheries management is concerned with matters listed in 'A1' but not entirely. Fisheries, in relation to 'A1' statement, should improve to ensure the long term conservation of the marine resource.
HIGH	Fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account: • All fishery removals • The biology of the species

Determination: The stock management unit reflects the current best scientific understanding of the biological stock. Discard data are not currently available but discarding is generally thought to be limited. H

In the Gulf of Bothnia the stock boundary is set between Subdivisions 30 (Bothnian Sea) and Subdivision 31 (Bothnian Bay) at 63° 30' N in the north and at 60° 30' N in the south. Stock distribution is uncertain for Atlantic herring in this area. Many local populations with differing growth rates share similar habitats and may mix during certain times of the year. There has been little indication that the Bothnian stock mixes with the other stocks in the Baltic. In a recent benchmark assessment (ICES 2017; ICES 2017b), the Bay of Bothnia (SD 31) and the Bothnia Sea (SD 30) stocks were combined into one unit the Gulf of Bothnia (SD 30 and 31).

While discarding is considered negligible for this stock, the EU landing obligation should not influence the future perception of this stock.

Comments added post IFFO-RS peer review:

Future assessments should verify the level of discarding in the fishery. Reports from observers at sea would confirm the implementation of the no-discard rule as the landing obligation does not of itself limit the commitment to "negligible" discards.

Herring is managed in the Baltic Sea by two quotas: one EC and one Russian quota.

The units were changed in 2005 to be:

• SD 22–24

• SD 25–27, 28.2, 29 and 32 (EC and Russian quotas)

• Gulf of Riga (SD 28.1)

• SD 30, 31 R7, 8,9,13,14, 34,35	

HLEVEL OF COMPLIANCE	
A3. Management actions should be based on long-term conservation objectives	
LOW	Management actions are not based on long term management objectives.
MEDIUM	Management actions are based on long term management objectives. However the actions are not scientifically formulated.
HIGH	Management actions are based on long term management objectives, and actions are science based.

M

Determination: There are implicit long-term objectives for the Baltic herring stock based on the requirements of the CFP. A management plan was proposed at the end of 2014 and was agreed in early 2016 this was then officially adopted in July 2016. The plan formally covers herring in this area as two stocks, corresponding to subdivisions 30 and 31. The combined stock of herring in subdivisions 30 and 31 is not currently specified in the plan therefore a medium compliance rating is appropriate.

Comments added post IFFO-RS peer review:

In a recent benchmark assessment (ICES 2017; ICES 2017b), the Bay of Bothnia (SD 31) and the Bothnia Sea (SD 30) stocks were combined into one unit the Gulf of Bothnia (SD 30 and 31). The management plan in force covers herring in this area as two stocks. Future reviews of the management plan should take into account ICES advice based on a single stock unit.

The CFP is the primary instrument for sustainable fisheries management. As such it addresses the impacts of fishing on target stocks as well as impacts on other ecosystem components. Implementing an EAFM has been set as one of the objectives of the Common Fisheries Policy (Regulation(EU) No1380/2013) "…to ensure that negative impacts of fishing activities on the marine ecosystem are minimized..." and "…that aquaculture and fisheries activities avoid the degradation of the marine environment." (Article 2.3).

The CFP, specifically after the 2013 reform, presents some specific measures which should impulse the implementation of EAFM within European Fisheries. Among these measures are a) fishing at Maximum Sustainable Yield (MSY); b) avoid and reduce unwanted catches; and c) manage stocks by means of multi-annual plans. Specifically, for these plans, multiple stocks should be covered when those stocks are jointly exploited (1380/2013).

In October 2014 an EC proposal for establishing a multi-annual plan for cod, herring and sprat in the Baltic Sea was published. The plan was developed through stakeholder consultation and impact assessments, and included the following explicit management objective in relation to the Bothnian sea herring stock:

- Achieve the target fishing mortality of 0.13-0.17 by 2015

The proposed management plan was agreed by the European Parliament in March 2016. The plan was officially adopted in July 2016 by *Regulation (EU) 2016/1139 of the European Parliament and of the Council of 6 July 2016 establishing a multiannual plan for the stocks of cod, herring and sprat in the Baltic Sea and the fisheries exploiting those stocks, amending Council Regulation (EC) No 2187/2005 and repealing Council Regulation (EC) No 1098/2007*.

R2

B. STOCK ASSESSMENT PROCEDURES AND MANAGEMENT ADVICE

LEVEL OF COMPLIANCE	
B1. Research in support of fisheries conservation and management should exist.	
LOW	Research to support the conservation and management of the stock, non-target species and physical environment does not exist
MEDIUM	Research to support the conservation and the management of the stock, non-target species and physical environment exists, however research programmes could be significantly improved to decrease scientific advice uncertainty.
HIGH	Research to support the conservation and the management of the stock, non-target species and physical environment exist, and existent research is considered most adequate for the long term conservation of the target, non-target and physical environment

H

Determination: Fishery dependent and independent data are collected for the stock, and a stock assessment is conducted annually by ICES. In general, the level of research appears to be sufficient for the informed management of the stock.

Management of the Gulf of Bothnia herring stock is supported by the collection of fishery-dependent and fishery-independent data, and by more general research on the ecosystems and species which affect the stock.

Fishery-dependent research

In Subdivision 30 from Finnish commercial catches, 73 length-samples and 53 age-samples were taken in 2015, and 14 length-samples and 6 age-samples from the Swedish fisheries. In total in 2015, 28,485 herring were length-measured from commercial catches and 4,094 aged from both commercial catches and surveys.

In Subdivision 31 from Finnish commercial catches, 18 length-samples and 14 age-samples were taken in 2015, and 5 length-samples and 5 age-samples from the Swedish fisheries. In total in 2015, 6,635 herring were length-measured from commercial catches and 914 aged from both commercial catches and surveys.

Table 1. Herring in SD 30, 31. Sampling by country in 2015.

	Quarter	Landings in tons	Number of length samples	Number of fish measured	Number of age samples	Number of fish aged
Finland	1	23561	15	4725	10	190
	2	49869	30	5292	18	260
	3	12939	13	3335	11	204
	4	10045	15	4455	14	242
	Total	96414	73	17807	53	896

	Quarter	Landings in tons	Number of length samples	Number of fish measured	Number of age samples	Number of fish aged
Sweden	1	4258	3	3788		
	2	8178	5	3071	3	217
	3	91	5	2616	3	238
	4	1473	1	1203		
	Total	14001	14	10678	6	455

Subdivision 31	Country	Quarter	Landings in tonnes	Number of samples	Number of fish measured	Number of age samples	Number of fish aged
	Finland	1	396				0
		2	3187	12	3223	7	220
		3	750	6	1627	4	129
		4	35			3	140
		Total	4369	18	4850	14	489
	Sweden	1	0				0
		2	35	3	1242	3	195
		3	48	2	543	2	230
		4	74				0
		Total	157	5	1785	5	425
	Total	1	112	0	0	0	0
		2	3192	13	4024	1252	415
		3	1350	7	2223	700	359
		4	178	4	1280	407	140
		Total	4525	23	6635	19	914

Fishery-independent research

A joint Swedish – Finnish hydroacoustic survey has been annually conducted in late September – early October in the Bothnian Sea, starting from 2007 until 2010 with Swedish RV Argos and continuing in 2011 and 2012 with Danish RV Dana, in years 2013-2016 with Finnish RV Aranda and in 2017 with RV Dana (the latest in late October).

The biological samples for ages from the surveys in 2007–2017 have been annually used for 3rd and/or 4th quarter ALK's for length distributions from commercial sampling and calculations for mean weights at age in the input data.

Quality of Assessment

The tuning is based on acoustic surveys in the Bothnian Sea since 2007 and commercial trapnet data from the Bothnian Sea herring stock assessments from the years 1990–2006. Trapnet data from later years have not been included in the assessment, because the effort decreased a lot in later years and they are regarded too unreliable. Presently the time series is too short in the acoustic survey data to be used alone (WKBALT 2017).

The results from especially the acoustic surveys of 2016 and 2017 give a very uncertain figure of the stock status, as the estimate of stock numbers decreased a lot for all age groups compared to the previous year and this large drop is not reflected in the commercial catch data.

As discarding is considered negligible for this stock, the EU landing obligation should not influence the future perception of this stock.

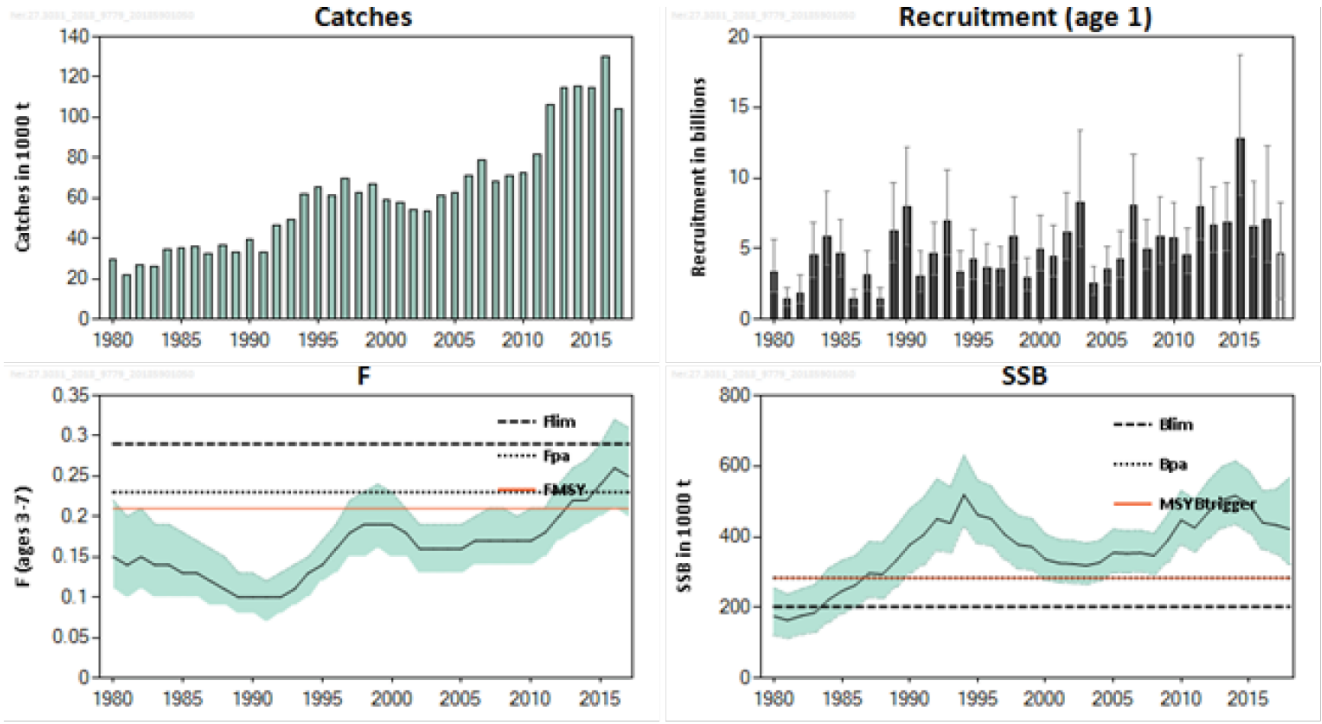


Figure 1. Herring in subdivisions 30 and 31. Summary of stock assessment (weights in thousand tonnes). Recruitment and SSB in 2018 are predicted. Recruitment, F, and SSB have confidence intervals (95%) in the plot. Assumed values are not shaded.

R7, 8

LEVEL OF COMPLIANCE	
B2. Best scientific evidence available should be taken into account when designing conservation and management measures.	
LOW	Scientific advice is not taken into account when designing conservation and management measures.
MEDIUM	Scientific advice is taken into account, when designing conservation and management measures. However some areas of discrepancy are identified that could have a significant impact in the long term conservation of the marine environment.
HIGH	Scientific advice is taken into account, when designing conservation and management measures, in a comprehensive manner.

Determination: ICES research and advice is the primary source of scientific information for developing fishery conservation and management measures. The organisations supporting the CFP are structured to ensure the inclusion of best available scientific evidence in the decision-making process.

The European Commission receives scientific advice on EU fisheries from its Scientific, Technical and Economic Committee for Fisheries (STECF). STECF is composed of independent scientists and experts representing a broad range of opinion, and is systematically consulted before any proposals are drafted. On biological issues, STECF depends to a great extent on advice from ICES for the North-East Atlantic, North Sea and Baltic Sea. The advice provided by ICES includes the stock assessments and deeper analysis on which the Commission bases both its annual recommendations for setting TACs and quotas, and more long-term proposals on how fisheries in European waters can be managed sustainably. Increasingly ICES also provides a great deal of integrated advice at ecosystem level, in support of the shift towards a more holistic approach to managing Europe's seas.

STECF plays a leading role in helping the Commission to formulate policies ranging from long-term plans to emergency closures, by providing an authoritative and highly targeted scientific opinion which goes well beyond the purely biological dimension and can be made available at short notice. It also provides extensive economic and social advice, not only on the impact of policy proposals, but also as a support for better management (for instance, on the impact of discarding), or on fleet dynamics and economic performance.

In March 2016 a new spatial management plan was agreed by the European Parliament, and was implemented in July 2016.

From the ICES advice June 2018 – The spawning-stock biomass (SSB) has decreased in the last five years and has been above MSY Btrigger since 1987. Fishing mortality (F) was below FMSY until 2012, but above since 2013. Recruitment shows an overall increasing trend over time. The ICES advice for 2019 recommends catches of no more than 88,703t. The two stocks in subdivisions 30 and 31 were merged into one stock during a benchmark (WKBALT; ICES, 2017). The reference points for the merged stock therefore differ from the ones in the Baltic MAP that were relevant to the two stocks when they were divided in herring in SD 30 and herring in SD 31 (EU, 2016). The reference points calculated by the benchmark are presented in Table 5. The resulting FMSY value is 0.21. Corresponding FMSY ranges were calculated and resulted in FMSY lower = 0.15 and FMSY upper = 0.21. For this stock, there is a 5% probability that SSB < Blim in the long term when FMSY is used in combination with the ICES advice rule (i.e. where F is adjusted by the factor SSB/MSY Btrigger when SSB is below MSY Btrigger). Therefore, FMSY upper coincides with FMSY.

Table 2. Herring in subdivisions 30 and 31. Reference points, values , and their technical basis. Weight in tonnes

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	283180	5th percentile of the distribution of SSB when fishing at F_{MSY}, based on stochastic simulations.	ICES (2017)
	F_{MSY}	0.21	Maximizes median long-term yield, based on stochastic simulations.	ICES (2017)
Precautionary approach	B_{lim}	202272	B_{pa}/1.4 (as it is not possible to estimate B_{lim} from stock–recruitment data).	ICES (2017)
	B_{pa}	283180	MSY $B_{trigger}$ (as it is not possible to estimate B_{lim} from stock–recruitment data).	ICES (2017)
	F_{lim}	0.29	F that results in 50% probability of being above or below B_{lim}, based on stochastic simulations.	ICES (2017)
	F_{pa}	0.23	$F_{lim} \times \exp(-1.645 \times \sigma)$, with $\sigma = 0.14$	ICES (2017)
Management plan	SSB_{mgt}	Not defined		
	F_{mgt}	Not defined		

R2, 8, 10

C. THE PRECAUTIONARY APPROACH

LEVEL OF COMPLIANCE	
C1. The precautionary approach is applied in the formulation of management plans.	
LOW	The precautionary approach is not applied in the formulation of management plans.
MEDIUM	The precautionary approach is applied, however not all uncertainties are taken into account.
HIGH	The precautionary approach is applied, taking into account uncertainties relating to the dynamic of fish population (recruitment, mortality, growth and fecundity), and the impact of the fishing activities, such as discards and by-catch of non-target species as well as on the physical environment (Habitats).

Determination: The precautionary approach is applied, taking into account uncertainties relating to the dynamics of the fish population and the impact of the fishing activities, such as discards and by-catch of non-target species as well as on the physical environment.

The EU CFP makes a broad commitment to the application of the precautionary approach, and ICES advice is

provided largely on the same basis. Stocks are ordered into six main categories according to the level of scientific information available, from category 1 stocks where full quantitative assessments are possible, to categories 5 and 6 stocks which have little or no data beyond total landings. Advice for stocks in higher categories is more conservative and precautionary than for those in lower categories which are better understood. Where there is a change in the level of uncertainty in the understanding of a stock, this can result in a change in categorisation. Herring in Subdivision 30 and 31 is considered a Category 1 stock, with a full quantitative assessment conducted. Reference points have been defined for the stock based on the MSY and precautionary approaches (see below).

Table 3. Herring in subdivisions 30 and 31. Annual catch scenarios. All weights are in tonnes. From the June 2018 ICES advice (R8)

Basis	Catch (2019)	F_{total} (2019)	SSB (2019)	SSB (2020)	% SSB change *	% TAC change **	% Advice change ***
ICES advice basis							
MSY approach: F_{MSY}	88703	0.21	414047	394945	-5%	5%	-7%
Other scenarios							
F = 0	0	0	427665	499703	17%	-100%	-100%
F = F_{pa}	96179	0.23	412682	386391	-6%	14%	1%
F = F_{lim}	117632	0.29	408765	361564	-12%	39%	23%
SSB (2020) = B_{lim}	264259	0.84	376633	202272	-46%	212%	177%
SSB (2020) = B_{pa}	189165	0.52	394597	283180	-28%	124%	98%
SSB (2020) = MSY $B_{trigger}$	189165	0.52	394597	283180	-28%	124%	98%
F = F_{2018}	84133	0.198	414846	399991	-4%	-1%	-12%
F = proposed $F_{MSY\ lower}$ ^	65662	0.151	418125	421393	1%	22%	-31%^^^
F = proposed $F_{MSY\ upper}$ ^^	88703	0.21	414047	394945	-5%	5%	-7%‡

* SSB 2020 relative to SSB 2019.
**Catch in 2019 relative to TAC in 2018 (84 599 tonnes).
***Advice value 2019 relative to advice value 2018.
^ Lower F_{MSY} range calculated during the stock benchmark in 2017 (ICES, 2017).
^^ Upper F_{MSY} range calculated during the stock benchmark in 2017 (ICES, 2017).
^^^ Advice value for in 2019 relative to Advice value for the proposed $F_{MSY\ lower}$ 2018 (70617 tonnes).
‡ Advice value for in 2019 relative to Advice value for the proposed $F_{MSY\ upper}$2018 (95566 tonnes).

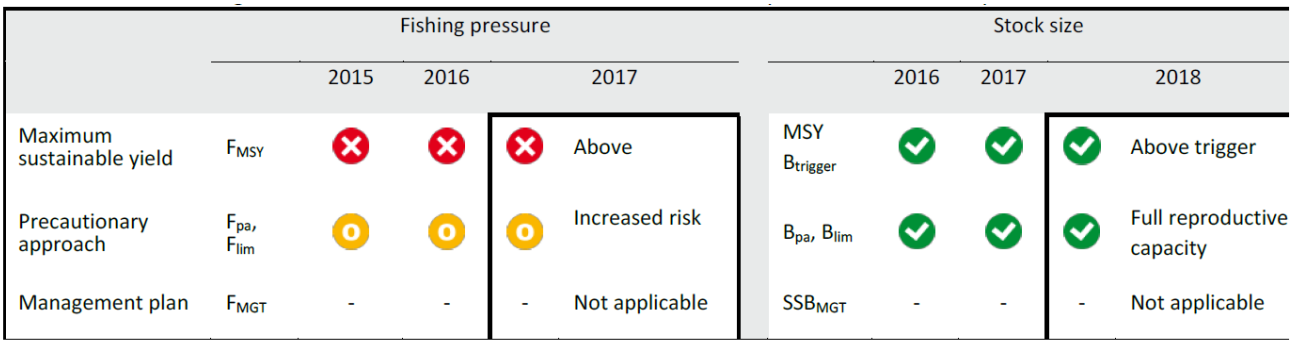


Figure 2. State of the Herring Subdivision 30 and 31 stock, 2015 – 2018, in relation to MSY-based and PA-based reference points. From the June 2018 ICES advice (R8)

Because both Bay of Bothnia (SD 31) and the Bothnia Sea (SD 30) stocks were only recently combined into one unit in early 2017, managers have yet to develop a management plan that can incorporate a rebuilding strategy. ICES recommends, however, that a control rule be adopted which reduces F linearly to 0 at Blim

should the stock fall below MSY Btrigger. Such a rule would be consistent with how herring are managed in other Baltic Sea regions(European Commission 2016; ICES 2017a).

R8, 34, 36

D. MANAGEMENT MEASURES

LEVEL OF COMPLIANCE	
D1. The level of fishing permitted should be set according to management advice given by research organisations.	
LOW	The level of fishing permitted is not set according to management advice given by research organisations.
MEDIUM	The level of fishing permitted is higher than management advice given by research organisations. However, the difference is not considered to have a significant impact of the sustainability of the stock
HIGH	The level of fishing permitted is set according to management advice given by research organisations.

H

Determination: The level of fishing permitted is set according to management advice given by research organisations.

Annual stock assessments are carried out by ICES, and TACs are set according to scientific advice. Reported landings were below the TAC from 1991-present, with the exception of 2013. No unallocated landings were reported and data reporting is high – 93% of catches are reported with the EU fishing logbook. Reporting of catches is mandatory in Finland and voluntary in Sweden.

Comments added post IFFO-RS peer review:

The level of compliance awarded in this clause should be reviewed annually by confirming that all catches from the Swedish fleet are indeed being reported voluntarily.

Discarding is negligible in Finland and attained 6-12% of herring catches by the Swedish fleet between 2008-2010; further analysis is required.

Table 4. Herring in subdivisions 30 and 31. ICES advice, TACs and catches. All weights are in tonnes

Year	ICES advice for SD 30	ICES advice for SD 31	Catch corresponding to advice	Agreed TAC*	ICES catch
2014	MSY approach (F_{MSY})	Increase catches by no more than 20%	142300	138000	115300
2015	MSY approach (F_{MSY})	Increase catches by no more than 20%	186434	158470	114900
2016	MSY approach (F_{MSY} = 0.15)	Precautionary approach (≤ 20% increase in catch)	103254	103254	128330
2017	MSY approach (F_{MSY} = 0.15)	Precautionary approach	140998	140998	104 358

* TAC for subdivisions 29N, 30 and 31 (IBSFC Management Unit 3), and from 2005 for subdivisions 30 and 31.

Table 7b Herring in subdivisions 30 and 31. ICES advice, TAC and catches. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC	ICES catch
2018	MSY approach (F_{MSY} = 0.21)	≤ 95 566	84 599	
2019	MSY approach (F_{MSY} = 0.21)	≤ 88 703		

R7, 12,13

LEVEL OF COMPLIANCE	
D2. Where excess fishing capacity exist, mechanisms should be in established to reduced capacity to allow for the recovery of the stock to sustainable levels.	
LOW	Mechanisms to allow for recovery of the stock to sustainable levels are not established.
MEDIUM	Mechanisms to allow for recovery of the stock to sustainable levels are somehow established. However there is no evidence of the efficiency of the methods used.

HIGH	Mechanisms are established to reduce capacity to allow for the recovery of the stock to sustainable levels and there are evidences of recovery.

Determination: Mechanisms are established to manage European fishing capacity, both in general and (through the application of an annual quota) specifically in the case of the Gulf of Bothnia herring fishery. H

The EU CFP includes provisions to limit, and historically reduce, total fishing capacity through a combination of subsidising fishery exits and restricting new entries. The entry-exit regime, which applies to the majority of EU Member State vessels, is one of the main pillars of the European-wide fishing capacity management system. The entry-exit regime applies separately to the capacity measured in terms of gross tonnage, and power (in kilowatts). Any entry of capacity into the fleet of a Member State has to be compensated by the previous exit of at least the same amount of capacity. As a general rule, the capacity of the national fleets cannot increase with respect to its levels on 1 January 2003, for 'EU 15' Member States and on the accession date for Member States which acceded to the Community after 2003. The second pillar of the fishing capacity management system is the rule that capacity leaving the fleet with public aid cannot be replaced. Such capacity, expressed both in tonnage and power, is subtracted directly from the maximum fleet capacity of each Member State. Capacity reductions supported with public aid are therefore permanent.

Stock-specific capacity limitation is applied primarily through the annual herring quota. As annual landings have matched the TAC in recent years, it is clear that the fleet capacity is sufficient to catch the quota. Excess capacity is clearly not leading to excess fishing pressure in the Gulf of Bothnia herring fishery at present.

R15

LEVEL OF COMPLIANCE	
D3. Management measures should ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment.	
LOW	There are no management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment.
MEDIUM	There are management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. However it is not science based.
HIGH	There are management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. Measures are based on scientific information.

Determination: The multiannual management plan has been implemented, along with the ecosystem-based management approach within. However, information is limited on the impacts of the fishery on the Baltic ecosystem and ETP species. M

Non-target species

The 2013 revision of the CFP introduced a landing obligation to ensure that all catch, including bycatch, of species managed through TACs and quotas is landed in EU fisheries. This obligation is being introduced on a fishery-by-fishery basis and has been applicable in the Baltic sprat fishery since 1 January 2015. The decision to apply the landing obligation as early as possible was made in consultation with industry groups and on the advice of scientific organisations. Herring is caught mixed with sprat, as in most pelagic fisheries in the Baltic.

Most herring in the Bothnian Sea is taken in a directed fishery. Sprat is the main bycatch species, but only occurs during autumn and early winter and rates are considered to be minimal (ICES, 2013). Mesh size of traditional gears should be reviewed to minimize indiscriminate catch of herring, especially of undersized individuals (Lundin, 2011). Bycatch composition is not known.

Ecosystems

A decrease in herring body weight has been noted in the last 20 years, probably in result of density-dependent factors and a decrease in the food availability (zooplankton) (ICES, 2013). No effects of pelagic

trawl are known or expected to occur in the ecosystem. But the impact of bottom trawls, with distinct compositions by the Finnish and Swedish fleets, is not known (ICES, 2013).

Anthropic activities such as construction and extraction of marine aggregates impact the spawning and nursery areas of herring, mainly situated in coastal areas (Fredriksson et al, 2011; Backer and Frias, 2013; ICES, 2013). With several sources of pollution, levels of dioxins in herring remain high and above stipulated EU values for human consumption (Wiberg *et al.* 2013) but have been decreasing since the 1990s (ICES, 2013).
Information on the impacts of herring removals on the ecosystem appears to be limited, although the multiannual plan notes that there are some indications that the biological interactions between cod, herring and sprat may indicate that higher fishing pressures than currently advised may be sustainable (although also notes that the STECF have advised more research be conducted). One of the objectives of the plan is to implement the ecosystem-based approach to fisheries management in order to ensure that negative impacts of fishing activities on the marine ecosystem are minimised. It shall be coherent with Union environmental legislation, in particular with the objective of achieving good environmental status by 2020 as set out in Article 1(1) of Directive 2008/56/EC. Measures under the plan shall be taken in accordance with the best available scientific advice.

ETP species

Marine mammals and seabirds in EU waters are currently protected by a set of directives, conventions (e.g. Bern Convention and the Habitats Directive) and multilateral international agreements.
Current impacts of the Finnish fishery on Protected, Endangered and Threatened (PET) species are not known (Leppänen, 2012). At present, the effects of the fishery in the Bothnian Sea ecosystem are not understood.

The Baltic ringed seal subspecies *Phoca hispida botnica* is the only mammal considered to be endangered in the Bothnian Sea (HELCOM, 2009a). The Baltic population is thought to be increasing at 5% a year, and Bothnian Bay is its main habitat, with a population estimated at 5,020 individuals (ICES, 2008d). There are reports of seal bycatch in set nets in the Baltic (ICES, 2008e) but no estimates for this fishery, and only 0.2% of catches are taken with gillnets (ICES, 2009a). Some ringed-seal hunting is permitted in both Sweden and Finland (HELCOM, 2009b).
Twenty-four species of seabirds and sea ducks are also considered endangered in the region, among them several gulls *Larus spp*, terns *Sterna spp,* Steller's eider *Polysticta stelleri* (Vulnerable), Red-breasted Merganser *Mergus serrator* (Least concern) and Black guillemot *Cepphus grylle* (Least concern) (HELCOM, 2009a), and two of which: Velvet scoter *Melanitta fusca* (Endangered) and Common eider *Somateria mollissima* (Least concern) have reported considerable mortality in set nets (ICES, 2008e; IUCN, 2013).
Grey seals *Halichoerus grypus* (Least Concern) increased exponentially between 1985-2005 in the Baltic Sea (Lundin, 2011; Gardmark et al, 2012) and were at around 20,400 in 2009 (Lundin, 2011). They prey preferably on age-6 herring, competing directly with the commercial herring fishery; there are concerns about this interaction which influences the age structure of the stock (Lundström et al., 2010; Lindegren et al., 2011; ICES, 2011b; Lundström, 2012) but the impact of grey seal in the Bothnian Sea herring only needs to be assessed if stock composition, grey feeding preferences or stock development changes (Gardmark et al, 2012).
Within other species Cormorant *Phalacrocorax carbo sinensis* and Atlantic salmon *Salmo salar* (Least concern but considered as Vulnerable by the 2013 Helcom list) are herring predators (ICES, 2013b; IUCN, 2013).
Mitigation experiments of seal-induced damages on fishing gears aim to diminish the interaction of grey seals with trapped fishes (Lundin, 2011).

Physical environment

Covering 4.4% of the Gulf of Bothnia, four Baltic Sea Protected Areas (BSPAs) are defined within the Bothnian Sea, three along Finland's coastline and one on Sweden's: the Uusikaupunki Archipelago, the Oura Archipelago, the Outer Bothnian Threshold Archipelago (the Quark) and the Trysunda/Ullanger/Ulvoarna/Ulvo (HELCOM, 2009c). The aim of BSPAs is to contribute to the protection of the entire functional ecosystem and not just isolated species or habitats. Some overlap occurs with areas designated as EU Natura 2000 sites, which have more complete legal protection, but a narrower scope in terms of habitats and species protected (HELCOM, 2009b). New areas were proposed to the Helsinki Commission in mid-2013, increasing to 4.8% of coverage (Helcom, 2013a,b).

Pelagic trawling is generally considered to have virtually no impact on the benthic environment, although some interactions have been reported.

R2,12, 13,14, 16-28

E. IMPLEMENTATION

LEVEL OF COMPLIANCE	
E1. There should be a framework for sanctions of violation of Laws and regulations.	
LOW	A framework for sanctions of violation of Laws and regulations do not efficiently exist.
MEDIUM	A framework for sanctions of violation of Laws and regulations do exist but do not work efficiently.
HIGH	A framework for sanctions of violation of Laws and regulations exists and is proven to be efficient.

H

Determination: A framework for sanctions of violations exists and is generally considered to work efficiently.

To ensure that fishing rules are applied in the same way in all member countries, and to harmonise the way infringements are sanctioned, the EU has established a list of serious infringements of the rules of the common fisheries policy. EU countries must include in their legislation effective, proportionate and dissuasive sanctions, and ensure that the rules are respected.

Since 1 January 2012, EU countries have been required to have a point system for serious infringements. Under the scheme, national authorities:

- assess alleged infringements involving vessels registered under its flag, using standard EU definitions;
- impose a pre-set number of penalty points on vessels involved in serious infringements (points are recorded in the national registry of fisheries offences);
- suspend the vessel's licence for 2, 4, 8 or 12 months when a pre-set number of points have been accumulated in a 3-year period.

Points are attributed to the fishing licence that is linked to a vessel, so they will stay with the vessel even when it is sold on to a new owner. Monitoring the number of cases detected and the nature and the level of the sanctions imposed is a key part of the Commission's task of ensuring a level playing field for all EU fishers. 2008 Council Regulation (EC) No 1005/2008 established a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing. Through EU Fishery Policy and Regulations, Member States must apply effective, proportionate and dissuasive sanctions against natural or legal persons engaged in IUU activities. A maximum sanction of at least five times the value of the fishery products obtained is provided for with regard to the committing of the said infringement.

In the event of a repeated infringement within a five-year period, the Member States shall impose a maximum sanction of at least eight times the value of the fishery products obtained by committing the serious infringement.

Infringements of CFP rules are dealt with by the Member State concerned:

Denmark - the Danish Agrifish Agency is the competent authority with responsibility of enforcement of sanctions and penalties with respect to the prosecution of fishery rules.

Sweden - the Swedish Agency for Marine and Water Management is the competent authority

Finland - the Southwest Finland Centre for Economic Development, Transport and the Environment (ELY Centre), the Provincial Government of Åland and the Finnish Border Guard are the competent authorities.
R29, 30, 31

LEVEL OF COMPLIANCE	
E2. A management system for fisheries control and enforcement should be established.	
LOW	A management system for fisheries control and enforcement is not established.
MEDIUM	A management system for fisheries control and enforcement is established but do not work efficiently.
HIGH	A management system for fisheries control and enforcement is established and work efficiently.

H

Determination: Management systems for fisheries control and enforcement are established and are generally considered to work effectively.

To ensure that the rules of the CFP are followed in practice, the policy also includes a control system with the necessary tools to enforce them. This system is designed to:

- ensure that only the allowed quantities of fish are caught
- collect the necessary data for managing fishing opportunities
- clarify the roles of EU countries and the Commission
- ensure the rules are applied to all fishers in the same way, with harmonised sanctions across the EU
- ensure that fisheries products can be traced back and checked throughout the supply chain, from net to plate

The system was laid down in the Control Regulation (Council Regulation (EC) No 1224/2009) which entered into force on 1 January 2010. Europe-wide coordination of control and enforcement activities is provided by the European Fisheries Control Agency (EFCA), which aims to ensure the uniform and effective application of the rules of the CFP by the Member States.
In practice, CFP control as carried out by the Member States' control authorities can be broken down into three broad areas: conservation, structures, and markets.
Conservation measures cover issues such as quota management or the implementation of technical measures (e.g. mesh sizes). Inspections are used to ensure that the fishing gear on board vessels meets official norms and that the information entered in log-books.
Structural policy plays a key role in the search for a balance between the fishing capacity of Member States, the fishing effort actually deployed, and the available fish resources. Checks are therefore necessary to establish that allocated days-at-sea have not been exceeded.
Finally, national inspections are not limited to the catching sector, but also include all operations from landing and marketing to storage and transportation. Operators must, at all times, be in possession of proper documentation detailing the origin, nature, quantity and quality of fish involved in transactions, so that it can be cross-checked with data in log-books and from other sources, such as fish auctions.

As with the application of sanctions, the bodies responsible for control and enforcement are set up by the

individual EU states; in Denmark the responsible authority is the Danish Agrifish Agency, in Sweden it is the Swedish Agency for Marine and Water Management, and in Finland it's the The Finnish ELY Centre.

The European Fisheries Control Agency (EFCA) is a European Union body established in 2005 to organise operational coordination of fisheries control and inspection activities by the Member States and to assist them to cooperate so as to comply with the rules of the Common EU Fisheries Policy in order to ensure its effective and uniform application. EFCA has its official seat in Vigo, Spain. Below are tables detailing a summary of activity carried out as a joint campaign in the Baltic Sea JDP operational area. The report provides summary information concerning the joint control activities that were carried out as from the 6th of January 2014 until the 21st of March 2014:

Table: quantities of fish inspected ashore per species

Species	quantity
salmon (SAL)	521 indv.
cod (COD)	1081 t
herring (HER)	2788 t
sprat (SPR)	5251 t
others	435 t

Table: quantities of fish inspected at sea per species

species	quantity
salmon (SAL)	5 indv.
cod (COD)	245 t
herring (HER)	839 t
sprat (SPR)	1556 t
others	61 t

R 29- 32

7. KEY STAKEHOLDERS

8. REFERENCES

- R1- Image of *Clupea harengus* http://fishbase.org/photos/PicturesSummary.php?StartRow=0&ID=24&what=species&TotRec=13
- R2 -REGULATION (EU) 2016/1139 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 6 July 2016 establishing a multiannual plan for the stocks of cod, herring and sprat in the Baltic Sea and the fisheries exploiting those stocks, amending Council Regulation (EC) No 2187/2005 and repealing Council Regulation (EC) No 1098/2007 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R1139&from=EN
- R3- Fisheries control authorities in the Baltic Sea area. https://ec.europa.eu/fisheries/cfp/control/who_does_what/baltic_sea_authorities_en
- R4 - CFP_Regulation_1380_2013 https://ec.europa.eu/fisheries/cfp_en

- R5 – ICES http://www.ices.dk/community/groups/Pages/WGBFAS.aspx
- R6 - STECF: https://stecf.jrc.ec.europa.eu/
- R7- ICES. 2018. Report of the Baltic Fisheries Assessment Working Group (WGBFAS), 2018, ICES HQ, Copenhagen, Denmark. http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2018/WGBFAS/06%20WGBFAS%20Report%202018%20-%2004%20Herring%20in%20the%20Baltic%20Sea.pdf
- R8- ICES advice 2018 Herring (*Clupea harengus)* in subdivision 30 and 31 (Gulf of Bothnia) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/2018/her.27.3031.pdf
- R10 -STECF home page: https://stecf.jrc.ec.europa.eu/
- R11 – Fishsource https://www.fishsource.org/stock_page/2038
- R12 - ICES, 2013a. Report of the ICES Advisory Committee, Book 8: Baltic Sea 8.4.2 Ecoregion: Baltic Sea. Stock Herring in Subdivision 30 (Bothnian Sea). Advice summary for 2014, 7 pp. http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2013/2013/her-30_201304142144.pdf
- R13- Stock Annex: Herring (Clupea harengus) in subdivision30 (Bothnian Sea) http://ices.dk/sites/pub/Publication%20Reports/Stock%20Annexes/2016/her-30_SA.pdf
- R14 - Stock Annex: Herring (Clupea harengus) in subdivision31 (Bothnian Bay) http://ices.dk/sites/pub/Publication%20Reports/Stock%20Annexes/2016/her-31_SA.pdf
- R15 -Facts and Figures on the Common Fisheries Policy https://ec.europa.eu/fisheries/sites/fisheries/files/docs/body/pcp_en.pdf
- R16 - Lundin, M. 2011. Herring (Clupea harengus membras) in the Baltic and Bothnian Sea: Biology, behavior and a sustainable, viable fishery, Introductory Research Essay No. 13, Department of Wildlife, Fish, and Environmental
- Studies, Swedish University of Agricultural Sciences, 17 pp. http://pub.epsilon.slu.se/8365/1/Lundin_M_111013.pdf
- R17- Fredriksson, R., Bergström, U., et al. 2011. Plan Bothnia MSP 3 Meeting Helsinki 19-20, Fisheries-Background Document, Swedish University of Agricultural Sciences (SLU) Coastal laboratory team, 10 pp.http://meeting.helcom.fi/c/document_library/get_file?p_l_id=80557&folderId=1612076&name=DLFE-47142.pdf
- R18- Backer, H. and Frias, M. (eds.) 2013. Planning the Bothnian Sea – key findings of the Plan Bothnia project. Digital edition, 153 pp. http://www.helcom.fi/Documents/Action%20areas/Maritime%20spatial%20planning/Planning%20The%20Bothnian%20Sea%20(digital%20edition%202013).pdf
- R19 - Wiberg, K. et al. 2013. Managing the dioxin problem in the Baltic region with focus on sources to air and fish, Final report from the research project Baltic POPs, Report 6566, 132 pp.
- http://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6566-9.pdf
- R20 - HELCOM, 2009a. Baltic Sea Protected Areas Database. Endangered Species by Subregion: Bothnian Sea. Helsinki Commission – Baltic Marine Environment Protection Commission. http://bspa.helcom.fi/flow/bspa.tammi.esbyregion.search.w.2?nop&Id=3
- R21 - HELCOM, 2009b. Biodiversity in the Baltic Sea: an integrated thematic assessment on biodiversity and nature conservation in the Baltic Sea. Baltic Sea Environment Proceedings No. 116B. http://www.helcom.fi/stc/files/Publications/Proceedings/bsep116B.pdf

- R22 - HELCOM, 2009c. HELCOM Atlas. Helsinki Commission – Baltic Marine Environment Protection Commission. http://www.helcom.fi/GIS/helcom_atlas/en_GB/atlas/
- R23 - Helcom, 2013c. HELCOM Red List Species Information Sheets (SIS) Fish, Baltic Marine Environment Protection Commission, 306 pp. http://helcom.fi/Documents/Ministerial2013/Associated%20documents/Background/HELCOM%20RedList%20All%20SIS_Fish.pdf
- R24-Helsinki Commission (Helcom), 2013a. Oceana: New proposals for Marine Protected Areas in the Baltic Sea and Kattegat, Agenda Item 3 Matters arising from the HELCOM Groups HELCOM HOD 41/2013, Heads of Delegation 41st Meeting, Helsinki, Finland, 17-18 June 2013, 8pp. http://meeting.helcom.fi/c/document_library/get_file?p_l_id=18975&folderId=2258447&name=DLFE-54253.pdf
- R25 - Helsinki Commission (Helcom), 2013b. HELCOM PROTECT - Overview of the status of the network of Baltic Sea marine protected areas, 31 pp. http://www.helcom.fi/Lists/Publications/PROTECT/HELCOM%20BSPAs%20report%202013.pdf
- R26 - Gårdmark, A., Östman, Ö, Nielsen, A., Lundström, K., Karlsson, O., Pönni, J., Aho, T. 2012. Does predation by grey seals (*Halichoerus grypus*) affect Bothnian Sea herring stock estimates? ICES Journal of Marine Science 69(8): 1448–1456. http://icesjms.oxfordjournals.org/content/69/8/1448.full.pdf+html
- R27 - Lundström, K., Hjerne, O., Lunneryd, S-G., Karlsson, O. 2010. Understanding the diet composition of marine mammals: grey seals (*Halichoerus grypus*) in the Baltic Sea. – ICES Journal of Marine Science, 67: 1230–1239http://icesjms.oxfordjournals.org/content/67/6/1230
- R28 - Lindegren, M., Östman, Ö., Gardmark, A. 2011. Interacting trophic forcing and the population dynamics of herring, Ecology, 92(7): 1407–1413. http://www.esajournals.org/doi/pdf/10.1890/10-2229.1
- R29 - Danish Agrifish Agency. http://agrifish.dk/fisheries/fishery-control-and-enforcement/
- R30 – The Swedish Agency for Marine and Water Management. https://www.havochvatten.se/en/swam/policy-regulation/commercial-fishing.html
- R31 - Ministry of Agriculture and Forestry. http://mmm.fi/en/fisheries/fisheries-industry
- R32 - EFCA joint campaign details BALTIC SEA 2014 http://www.efca.europa.eu/sites/default/files/atoms/files/THE%20BALTIC%20SEA%20JOINT%20CAMPAIGN%20-%2003%20MONTHLY%20REPORT%20-%20JDP-BS-2014-01.pdf
- R33 – Helcom website. http://helcom.fi/about-us
- R34 - ICES. 2017a. Report of the Baltic Fisheries Assessment Working Group (WGBFAS). Page 503. https://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2017/WGBFAS/01%20WGBFAS%20Report%202017.pdf
- R35 - ICES. 2017b. Herring (Clupea harengus) in subdivisions 30 and 31 (Gulf of Bothnia). ICES. http://ices.dk/sites/pub/Publication%20Reports/Advice/2017/2017/her.27.3031.pdf
- R36 - European Commission. 2016. Regulation (EU) 2016/1139 of the European Parliament and of the Council of 6 July 2016 establishing a multiannual plan for the stocks of cod, herring and sprat in the Baltic Sea and the fisheries exploiting those stocks, amending Council Regulation (EC) No 2187/2005 and repealing Council Regulation (EC) No 1098/2007. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R1139