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Economic and social impacts of the proposed scenarios for a multi-annual management plan for Baltic pelagic fisheries

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ACRONYMS

AER – Annual Economic Report
B - Biomass
CFP – Common Fisheries Policy
DTS – Demersal Trawl and Seine
EC – European Commission
EFF - European Fishing Fund
EIAA - Economic Interpretation of ACFM Advice
EU - European Union
F – Fishing mortality
FTE – Full Time Equivalent
GT – Gross Tonnage
HCR – Harvest Control Rule
ICES - International Council for the Exploration of the Sea
ITQ – Individual Transferable Quota
MSY – Maximum Sustainable Yield
PG – Passive Gear
PTS – Pelagic Trawl and Seine
RSW - Refrigerated Sea Water
SMS - Stochastic Multi-Species Model
SD – Sub-Division
SSB – Spawning Stock Biomass
TAC – Total Allowable Catch
WKMAMPEL - Workshop on Multi-Annual Management of Pelagic Fish Stocks in the Baltic
WSSD - World Summit on Sustainable Development

0 EXECUTIVE SUMMARY

Introduction

1. There are six pelagic stocks in the Baltic Sea, five herring and one sprat stock. All of them have so far been managed by the setting of annual TACs and quotas and technical measures within Community waters. The Commission took the commitment to develop a management plan for the pelagic stocks in the Baltic Sea following the request by the Council of Ministers, at the October Council in Luxembourg, 26th October 2008. Accordingly, in 2009 the Commission requested ICES to develop harvest control rules for multiannual plans for the Baltic pelagic stocks.

2. ICES undertook this work, developing harvest control rules based around fishing mortality and biomass targets that provide long term sustainable yields. The long term yields for herring stocks are close to current yields, but sprat yields are likely to be significantly lower than at present.

3. This report assesses the likely environmental, economic and social impact on Baltic fisheries of a change from the current management system to that proposed by ICES. The source data for the analysis comprised assessments carried out by the ICES specialist Workshop on Multi-annual management of Pelagic Fish Stocks in the Baltic (WKMAMPEL); data from the 2008 Annual Economic Report (EC, 2008: SGECA 08-02), containing, by Member State, fleet sector level catch, costs and earnings data; data from various other economic and social reports; and results from a questionnaire sent to Baltic Member State authorities.

4. The analysis was undertaken within the framework of ICES stock assessment models, as used by WKMAMPEL, and the economic model EIAA model (Economic Interpretation of ACFM Advice model). The current situation of the Baltic fleets was analysed using the 2008 AER data, and a baseline of 2005-2007 was chosen (the 2008 data cover the years up to and including 2007). This was projected forwards under different conditions of changing catches and stock sizes to the reference year 2015. The basis of the model is an estimation of the change in effort that would be required to catch the quota in any future year compared with the quota in the reference period, taking into consideration changes in the size of the stock and quota and the dependence of effort on these, and also taking into account price elasticity.

5. Three scenarios were investigated

    a. Option 1 – no change, implemented through the assumption that fishing mortality remains at current levels;

b. Option 2 – implementation of ICES harvest control rules for the multi-annual management plan, implemented from 2009;

c. Option 3 – economic rationalisation, including several options such as further reducing the size of the fleet in line with current trends, and changing the uptake of herring and sprat quota.

Current status of the fishery

6. Catches of herring and sprat collectively account for 57% and 28% of the total volume and value of fish caught in the Baltic Sea. In the period 2005-2007, average annual herring landings accounted for 258,000 tonnes with a value of € 54 million, and sprat landings, 555,000 tonnes with a value of € 57 million. The percentage uptake for both species, across the different fishing regions was 82% and 78% for herring and sprat respectively.

7. 4,685 fishing vessels depend on the sector. These can be divided into 310 highly dependent (> 66% of vessel income), 1,795 intermediate (> 33% on vessel income) and 2,581 vessels with lower dependency (< 33%). By nationality, higher levels of dependency are found in the Finnish, Estonian, Latvian and Swedish pelagic sectors. Lower levels of dependency are due to partial dependency on other species (mostly cod), or also fishing activities outside the Baltic region (Danish and west coast Swedish vessels).

8. In Latvia and Estonia the passive gear sector, and in Latvia the smaller pelagic vessels (12-24m), are dependent mostly on herring. In Latvia, Estonia and Poland the large pelagic vessels (24-40m), and in Estonia the smaller pelagic vessels (12-24m), are mostly dependent on sprat. In Finland and Sweden the dependency is higher on herring than sprat.

9. Of the current (2005-2007) economic situation of the fleets, 12 are deemed to be profitable, 6 stable and 7 unprofitable.

10. There are 12,527 persons working in the sector dependent on Baltic pelagic species. These are 5,804 (full time equivalent) dependent fishermen, 5,303 dependent processing workers and 1,420 upstream (supplier and ancillary support staff). The processing sector employment is largely focussed on human consumption markets, but 36% of supplies are destined for fish meal, mainly into Denmark, and a further 11% sold as fodder for mink farms (Finland and Denmark). It is noteworthy that there is an increase in dependency of all countries on fish meal, largely in response to a significant increase in value (up by 50%) for fish destined for industrial purposes. This is in response to the growing demand for feed fish from China.

11. The Baltic region's pelagic dependent value added is € 72 million, of which € 39 million is attributed to the catching sector, and € 33 million to processing. Socially dependent communities dependent sectors

are Dirhami, Veere and Lehtma (West Estonia), Liepāja, Ventspils, Mērsrags, Salacgrīva, Pāvilosta and Roja (Latvia), Kolobrzeg, Wladyslawowo, Ustka, Gdynia and Swinoujscie (Poland), Kaskinen, Uusikaupunki and Kasnäs (Finland), Neu Mukran, Freest, Sassnitz, Griefswald, Thiessow and Gager (Germany), Nexø, Grenå and Skagen (Denmark), and the county of Västre Götaland on the west coast of Sweden. Pelagic fishing is only considered to be of medium to low in Lithuania. The main processing centres are Pärnumaa, Saaremaa and Läänemaa counties (Estonia), Kurzeme (Latvia), Pomorskie province (Poland), Rügen (Germany), Västre Götaland (Sweden), Skage and Bornholm (Denmark).

Impact Assessment results

12. Option 1 (no change) is not consistent with EC and WSSD objectives for sustainable environmental management. If policy were to follow this direction, the modelling predicts that:

- Herring and sprat TACs would fall by 2.5% and 38% respectively.
- The economic performance of the fleet would worsen with a decline in current value added to 9%. 8 vessel segments would be operating unprofitably, as compared with the current 7; on the other hand 13 would be operating profitably compared to 12 currently.
- Strong negative impacts would occur in the pelagic segments in Estonia, Latvia and Finland, particularly in those segments that have a high dependency on sprat. One segment in Denmark (12-24 m) and the German small scale passive gear fishery would also be affected;
- While fleet labour would remain constant, crew wages would fall by 2 %;
- The decline in fleet value added would be mirrored by a decline in processing value added;
- Processing employment would decline by 29% in the Baltic pelagic sector, and 7% in the national pelagic processing sector, with the greatest impacts being seen in Estonia, Latvia and Poland (each losing about 500-600 processing jobs);
- Communities affected by such a change would be Dirhami, Veere and Lehtma (West Estonia), Liepāja, Ventspils, Mērsrags, Salacgrīva, Pāvilosta and Roja (Latvia), Kaskinen, Uusikaupunki and Kasnäs (Finland), Neu Mukran, Freest, Sassnitz, Griefswald, Thiessow and Gager (Germany), Nexø, Grenå and Skagen (Denmark);
- Because of the 38% reduction in sprat catches, the processing sector as a whole would lose 29% of its throughput. The Danish fish meal sector would lose approximately 10% of its annual source of supply.

13. Option 2 is consistent with EC and WSSD objectives for sustainable environmental management. If policy were to follow this direction, the

modelling predicts that there would be only marginally negative impacts compared to the "no change" Option 1:

- Herring and sprat TACs would fall by 5% and 44% respectively, marginally more than under a "no change" scenario (Option 1);
- The economic performance of the fleet would also marginally worsen from Option 1, although the total numbers of profitable and unprofitable sectors would remain unchanged;
- Labour and crew wages would remain much the same as Option 1;
- There would be smaller additional declines in value added;
- Processing employment dedicated to the Baltic pelagic sector would fall by 33% from the base period, compared to 29% in Option 1, although total processing employment would fall only 8%, compared with 7% in Option 1;
- The same communities as listed above would be negatively affected.

14. ICES presented two alternative options for management of the Gulf of Riga herring stock. Estonia and Latvia receive larger herring quotas under the option that uses a fishing mortality value of 0.35 rather than 0.26, but this does not improve their profitability.

15. Although 2015 is taken by ICES as a future reference year, some herring stocks and the sprat stock are projected to continue to increase after this time, reaching maxima after 2020. For most fleets this marginally improves profitability. However, ICES has shown that multispecies effects, resulting from an increase in the eastern Baltic cod stock and the predation on sprat by cod, may be important in the future. These impacts would further decrease profitability for those fleets most dependent upon sprat (Estonia, Latvia and Poland).

16. Option 3 is consistent with EC and WSSD objectives for sustainable environmental management and additionally provides improved economic performance. If policy were to follow this direction, encouraging further reductions in fleet size following existing trends, the modelling predicts that:

- Herring and sprat TAC would fall by 5% and 44% respectively;
- Fleet numbers would be expected to have fallen by 1,141 vessels (24%, current trend) and 2,300 (49%, with improved profitability);
- Particularly large declines in fleet numbers would be anticipated in Latvia, Poland, Estonia and Germany;
- The economic performance of the fleet would improve significantly from Option 1, with only 7 groups still unprofitable by 2015 (current trends – Option 2a), or two groups (with additional fleet declines – Option 2b);
- Catching sector value added would remain below the base period (2005-2007) by 6%, but this would offset by an increase in catch uptake to 100% of the quota;

- Processing value added would increase from Options 1 and 2, though not as high as 2005-2007, as it would be offset by the projected decline in supplies;
- Fleet employment would decline from 9,294 by 2,792 (3b) and 4,244 (3c), as anticipated by the decline in fleet size. However, average crew wages would increase significantly by 35% (current trend) and 74% (profitable fleet) compared to the base line period;
- Processing employment would fall overall by 4% (a loss of 990 jobs) because of the reduction in catch and throughput;
- Fishing communities would be affected by the loss of jobs, but there would be a significant increase in living standards for those remaining in the fishery. The Goteborg area (Sweden), Kaskinen, Uusikaupunki and Kasnäs (in the western Finland), various ports in Latvia with Liepāja and Ventspils as the largest, and finally Dirhami, Veere and Lehtma (in west Estonia) are expected to experience greater levels of impact. Some of these ports are located in urbanised areas with alternative job opportunities, whereas others (and some of the minor ports which might have a higher relative pelagic dependency) are located in rural areas with high unemployment rates (12.5%). In many cases, Baltic country crews have migrated to fisheries elsewhere in Europe in response to a decline in earnings (Germany, Ireland, Sweden, Norway and the UK).

17. In 2005-2007 uptake of quota was 82% for herring and 78% for sprat. If uptake were to increase, some of the negative impacts of Options 1 and 2 would be further offset, both in terms of fleet profitability and processing employment and value added. For instance, the number of profitable fleet sectors would increase to 18, compared with 12 in 2005-07, 13 in Options 1 and 2 and 17 in Option 3. National pelagic processing employment would see a 2% increase over that anticipated for Option 1 (no change).

Conclusion

18. Our results show that with fleet rationalisation and increased uptake of herring and sprat quotas the impacts of the multiannual plans will be minor for most Baltic Member States. However, there will continue to be significant impacts on those sectors highly dependent upon Baltic sprat catches and processing, that is Estonia, Latvia and Poland.

19. Some consideration should be given to government intervention through mechanisms to facilitate fleet rationalisation (decommissioning or an ITQ system) and the support of heavily impacted communities. Some concentration in processing also seems inevitable, assuming that supplies cannot be sourced from other EU regions. The EFF provides the basis to facilitate such changes.

20. The modelling has its limitations in projecting likely social consequences on the fleet. The loss of sprat catches for some fishers could be offset by an increase in herring catches, but interviews with fishers suggests that this substitution is not easy to make, and is confounded by the difficulty of separating sprat and herring in catches at sea. Fishers appear to accept that fleet rationalisation is inevitable, even with the undesirable consequences that it brings. However, it is also expected that some fleets (Poland) currently seeking to adapt to an improved focus on pelagic fisheries, largely in response to non-availability of other target species, *e.g.* cod, will have to again re-think their strategies.

1 INTRODUCTION

1.1 Objective

Pelagic fisheries are particularly important in the Baltic, comprising 57% and 28% of the total Baltic Sea volume and value of fish respectively. The balance is primarily accounted for by cod. The stocks are managed by the EU in bilateral arrangements with Norway (in respect of Division IIIa) and Russia (in respect of the central Baltic).

The Commission took the commitment to develop a management plan for the pelagic stocks in the Baltic Sea following the request by the Council of Ministers, at the October Council in Luxembourg, 26th October 2008. The European Commission has stated its intention to develop a long-term management framework for pelagic species in the Baltic Sea as part of its work programme in 2009.

There are six pelagic stocks in the Baltic Sea, five herring and one sprat stock. All of the stocks are managed by the setting of annual TACs and quotas and technical measures within Community waters. The objective of the development of a long-term management framework for the pelagic stocks in the Baltic and their associated fisheries will be to ensure that the exploitation of the stocks is in conformity with the objective of providing a high yield and sustainable economic, environmental and social conditions.

In early 2009 the EC asked ICES to identify multi-annual management options for the Baltic pelagic stocks. ICES responded by identifying harvest control rules centred on the fishing mortality level required to deliver Maximum Sustainable Yield (MSY). This is in accordance with EU policy. At present ICES assesses all herring and sprat stocks in the Baltic, with the exception of those in the Bothnian Sea, as being overexploited with respect to F_{MSY} [1].

The present study was tasked with undertaking the following:

- Analysing the baseline economic and social situation for fishing fleets, onshore industries and communities dependent upon Baltic pelagic fisheries;
- Assessing the impacts of the ICES proposed multi-annual management plans on those industries;
- Determining alternative scenarios for management which continued to meet the core sustainability objectives of the Commission and assessing their impacts;
- Identifying other impacts, and the need for additional data collection, arising from the study.

[1] Source: most recent assessments, published by ICES 2009

This report is organised to present information on the baseline situation (section 2, referring to the first bullet above); an outline of the options tested in the impact assessment (section 3); and the impact assessment itself (section 4), which combines the last three bullets above.

1.2 Methods

1.2.1 Methods

The source data were: the assessments carried out by the ICES specialist Workshop on Multi-annual management of Pelagic Fish Stocks in the Baltic (WKMAMPEL); data from the 2008 Annual Economic Report (EC, 2008: SGECA 08-02), containing, by Member State, fleet sector level catch, costs and earnings data; data from various other economic and social reports (see References); and results from a questionnaire sent to Baltic Member States authorities during the project. At the time of writing responses to the questionnaire had been received from Denmark, Estonia, Finland, Germany, Latvia, Lithuania and Poland.

1.2.2 Modelling

Stock assessment modelling was undertaken using the Stochastic Multi-Species Model (SMS) of M. Vinther, which was also used by WKMAMPEL. Although this model can be used for assessing multispecies interactions, for the most part in this report it was used simply to explore the single-species consequences of different harvest control rules on stocks and catches of herring and sprat.

The baseline for the stock assessment modelling was the assessments undertaken by ICES in 2008 (ICES, 2008). Although new assessments became available in 2009 (ICES, 2009), these were not available throughout most of the project. Some of these latest assessments have been used in this report, notably the Bothnian Sea (SD 30) herring assessment undertaken by WKMAMPEL which was not available as an assessment in 2008; and some of the references to current status make use of the 2009 assessment results. However the core stock assessment modelling took place in WKMAMPEL before the latest assessments were undertaken, and therefore is not included in the modelling reported here.

Economic modelling was undertaken using the EIAA (Economic Interpretation of ACFM Advice; Frost et al, 2009) model. Input data for the EIAA model is taken from Annual Economic Reports (AERs). The EIAA model is used regularly by STECF to interpret the economic outcome as a result of changes in TAC. It relies on a significant amount of core data extracted from a combination of national fleets and country landing statistics, and provides outputs that allow for the interpretation of specific fleet segment data which gives a greater degree of confidence in the outputs[2]. The

[2] For analysis of alternative models see: Prellezo, R., Accadia, P., Andersen J. L, Little, A., Nielsen R., Andersen, B.S., Röckmann C., Powell J. and Buisman, E. (2009) Survey of

principal economic input variables for each vessel segment include gross vessel earnings as determined by annual volume of catches per species and price of those species, fuel costs, other variable costs (which vary as a function of gross sales or effort), crew share, fixed costs (constant costs such as maintenance, insurance and administration), depreciation and catch data (weight and value) for the top 5 species. Other variables include employment, capital costs and vessel characteristics (GT, kW and effort).

AER data is given by country for predefined fleet segments by year. It is important to analyse AER data with care as time series of AER data are not always complete. Gaps in data time series, as well as annual anomalies, are usually overcome by using three year averages. Another constraint is that in some cases new data are added without retrospective changes to the preceding time series, distorting the trend lines for these segments (e.g. for small scale Passive gear fleet segments). Finally, a further constraint is that historic catch data by segment is not defined by management area. This requires additional verification of dependency by management area from other sources.

The EIAA model first calculates the economic situation with respect to a reference period. The most recent AER data available were for 2005 to 2007 (EC, 2008). Consequently 2005 to 2007 was chosen as the reference period. The model is capable of calculating future economic performance based on projections of catch (TAC) and stock (spawning stock biomass) in addition to calculating output economic indicators for the reference year. The basis of the model is an estimation of the change in effort that would be required to catch the quota in any future year compared with the quota in the reference period, taking into consideration changes in the size of the stock and quota.

The model takes account of historic segment uptake of quota, and by default assumes this uptake to be constant. The number of vessels and fixed costs are assumed to be constant. Price levels are adjusted through changes in the volume of landings. Future prices are calculated based on a price flexibility rate with a default of -0.2. Consequently lower quotas are offset by a maximum increase in price of 20%, and higher quotas by a maximum reduction in price of 20%[3]. Changes in effort associated with changes in stock size are also incorporated within the model *e.g.* an increasing stock size should lead to a higher density of fish and a lower effort required to

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existing bioeconomic models: Final report. AZTI-Tecnalia. 283 pp. Available at: http://ec.europa.eu/fisheries/publications/studies/bioeconomic_models_en.pdf.

[3] The price flexibility rate can be changed for each species in the model and with a value at zero no price changes will occur. STECF has historically used a figure of -0.2, extracted from earlier indicators of price elasticity(s) for cod and herring (Frost, 2009). An analysis of the sector price changes (Denmark, Sweden, Latvia and Poland) showed that prices for herring 2005-2007 had remained almost constant in real terms, along with constant landings. Average sprat prices increased by 21%, in response to a 17% reduction in volume. This suggests that the 20% price flexibility applied is a reasonable assumption.

catch them. In reality, however, this effect is anticipated to be very small for herring and sprat given their schooling properties. The default flexibility of 0.1 was used for our models.

Principle calculated outputs for each fleet segment include:

Gross value added, defined as crew share plus depreciation, interest and net profit. This represents the value to the economy.

Gross cash flow, defined as gross value added less crew share (income to the vessel). This provides an indicator for the survival feasibility of fishing in the short term (2-3 years). Negative cash flows cannot be sustained for longer periods as the cash expenses will exceed gross revenues.

Crew share, defined as a percentage of the gross revenue less variable costs (fuel and running costs). The percentage is derived from historic crew share calculations. This covers payments to crew members, including the skipper. This report also summarises additional output variables notably average wage per crew member. Note that the default EIAA model calculates future wages by maintaining the ratio of average wage to turnover in the reference period. This calculation differs to the standard share remuneration system, and does not allow for the independent performance of the various components of costs to be modelled effectively.

Net profit, defined as gross revenues less variable costs, fixed costs, crew share and depreciation. This represents the economic remuneration of invested capital.

Table 1 The procedure of the EIAA calculations

Data type	Base line (3 years average (2005-2007))	Current year (2008)	Coming year (2009)	Long term
Economic	Costs and earnings, landings and species in volumes and value	Calculations determined by the model	Calculations determined by the model	Calculations determined by the model
TAC/quota	Provided from EC Regulation	Provided from EC Regulation	Provided from EC Regulation	Estimated for certain stocks (herring and sprat)
Stock abundance	Estimated for certain stocks	Estimated for certain stocks	Estimated for certain stocks	Estimated for certain stocks

Source: Frost et al, FOI, 2009.

Other derived indicators used to support EIAA model output projections include verbal classifications:

- **Profitable**: Net profit/gross value of landings > 5%;
- **Stable**: Net profit/gross value of landings > -5% and ≤ 5%;
- **Unprofitable**: Net profit/gross value of landings ≤ -5%.

These terms are applied to show the effects of a change in management measure/TAC. It is important to note that the performance of a management scenario should be assessed by comparison with the performance of the status quo management scenario, not by comparison to historical results. For example a management scenario delivering improved results at a given time compared to the status quo scenario is clearly beneficial, irrespective of its performance compared to historical results.

1.2.3 Impact Assessment

The combined impact of various scenarios on environmental (stock), economic and social indicators was assessed through an integrated set of Excel models. Although the terms of reference did not specify a standard EU Impact Assessment the chosen approach was to apply an Impact Assessment framework.

Although future outcomes can obviously be compared against the current situation (i.e. 2005-2007 or 2009) this is not a fair examination of the impact of the proposed actions. A key aspect of the Impact Assessment was projecting the likely status of stocks and catches in the absence of the adoption of a multi-annual management plan. The impact of chosen management actions must then be compared against this projection (also see discussion in 1.2.2).

Our approach was therefore to generate data for the current situation (2005-2007); for a future situation in which status quo management continues (Option 1 – no change); and for a future situation in which the multi-annual management plans were implemented from 2009 (Option 2 – implementation of ICES harvest control rules for the multi-annual management plan).

Several other scenarios were explored, principally involving changes to fleet structure or uptake of herring/sprat quota (Option 3).

2 BACKGROUND — SECTOR IMPORTANCE

2.1 The importance of Baltic Herring and sprat

2.1.1 Member State shares, catch uptake and catch values generated

Catches of herring and sprat collectively account for 57% and 28% of the total volume and value of fish caught in the Baltic Sea. In the period 2005-2007, average annual herring landings accounted for 258,000 tonnes with a value of € 54 million, and sprat landings accounted for 555,000 tonnes with a value of € 57 million.

There are five distinct quotas for herring in the Baltic, but these can be subdivided into two management areas, Western Baltic (ICES divisions 22, 23 and 24) and Eastern Baltic (ICES division 25-32) (Figure 1). Sprat is largely, but not exclusively, concentrated in the Eastern Baltic with a small pocket found in Kiel Bay in the west. Most pelagic fisheries in the Baltic take a mixture of herring and sprat which contributes to uncertainties in the actual catch levels (ICES, 2008).

The average quota in the reference period (2005-2007) for Baltic herring was 360,000 tonnes: 242,000 from the Eastern Baltic and 118,000 from the Western Baltic (22-24 and IIIa). The percentage uptake for this species (2005-2007) averaged 82.3 % (Table 2). The total quota for sprat in 2009 is 399,953 tonnes. The quota was and was much higher from 2005 to 2007, on average 455,000 t, but the percentage uptake has been lower, averaging 77.9 %.

Table 2 Landings and uptake by Baltic state of herring and sprat (average 2005-2007).

	Eastern Herring			**Western Herring**			**Herring**		
	Landings ('000 t)	National quotas ('000 t)	Uptake	Landings ('000 t)	National quotas ('000 t)	Uptake	Landings ('000 t)	National quotas ('000 t)	Uptake
Denmar	1.5	2.7	57.1%	22.8	41.0	55.6%	24.4	43.7	**55.7%**
Estonia	24.7	31.3	78.9%	0.0	0.0	0.0%	24.7	31.3	**78.9%**
Finland	78.3	94.3	83.0%	0.0	0.0	0.0%	78.3	94.3	**83.0%**
German	2.9	0.7	402.6	22.8	26.8	85.0%	25.7	27.6	**93.2%**
Latvia	22.2	24.1	92.0%	0.0	0.0	0.0%	22.2	24.1	**92.0%**
Lithuani	1.8	3.6	50.7%	0.0	0.0	0.0%	1.8	3.6	**50.7%**
Poland	18.4	29.9	61.4%	4.9	6.2	79.0%	23.3	36.1	**64.4%**
Sweden	50.8	55.7	91.3%	45.7	44.4	102.8	96.5	100.1	**96.4%**
Total	200.6	242.3	82.8%	96.2	118.5	81.2%	296.8	360.8	**82.3%**

	Sprat		
	Landings ('000 t)	National quotas ('000 t)	Uptake
Denmark	42.1	45.0	**93.4%**
Estonia	49.2	52.3	**94.1%**
Finland	20.5	23.6	**86.9%**
Germany	30.2	28.5	**105.8%**
Latvia	59.9	63.2	**94.9%**
Lithuania	12.1	22.9	**53.1%**
Poland	61.5	132.8	**46.3%**
Sweden	79.1	87.1	**90.8%**
Total	354.6	455.3	**77.9%**

Note: uptake above 100% signifies that quota swaps have occurred between Member States. Source: EC TAC Regulations (TACs and quotas) and ICES working group reports (landings)

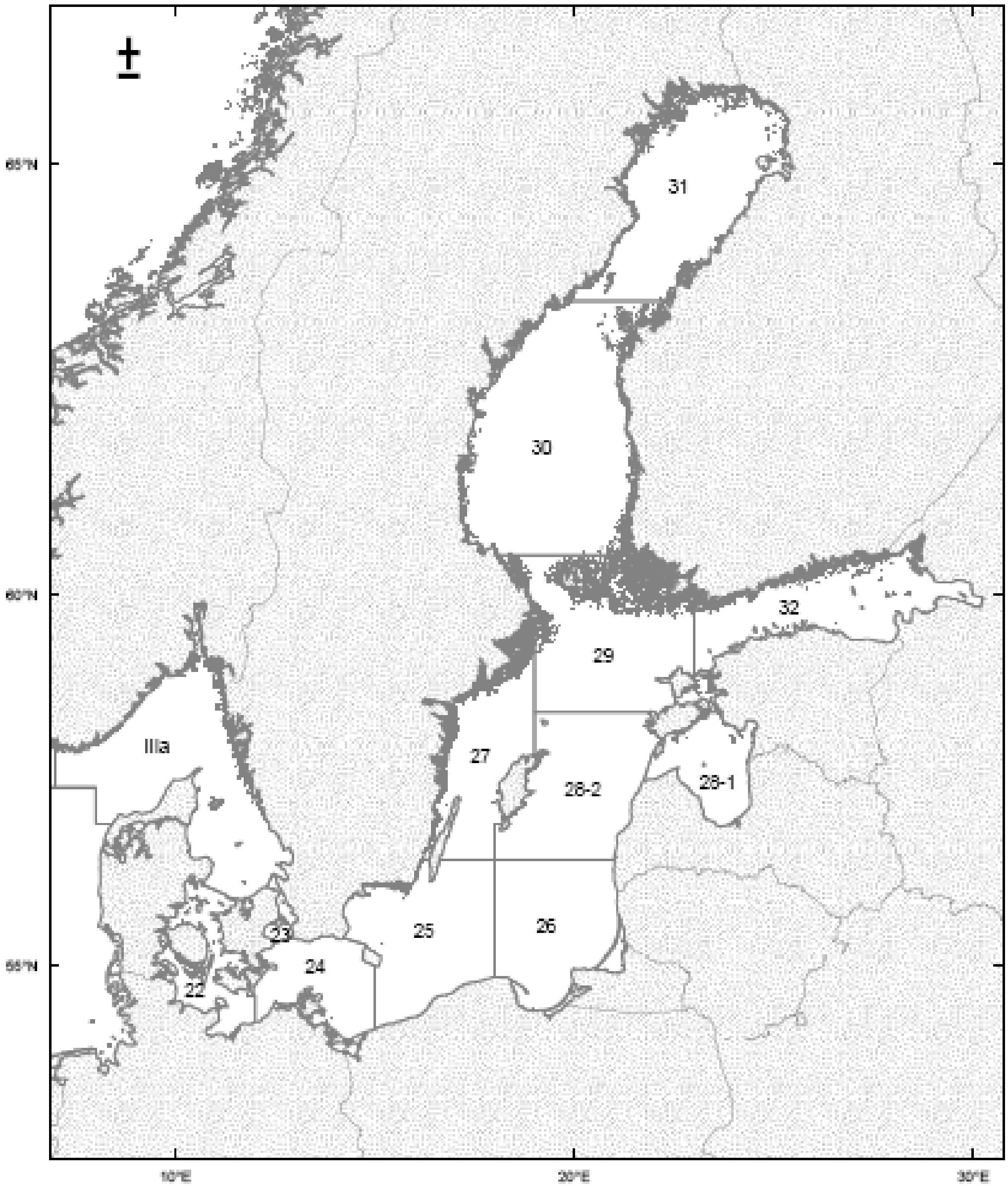


Figure 1 Baltic map showing ICES divisions

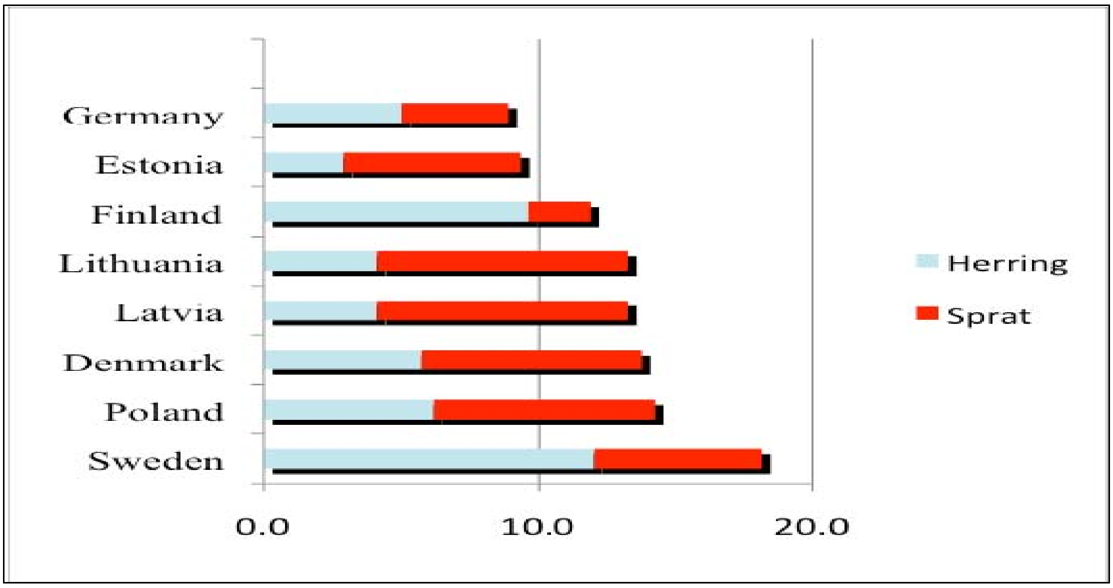


Figure 2 Annual value of herring and sprat landings, € million (average 2005-2007). **Source: ICES**

The value of herring and sprat catches (2005-2007) by Member State is provided in Figure 2. The average annual value, value per tonne and value added (profit and wages) generated from herring and sprat by Member State in the period 2005-2007 is shown in Table 3. The average price per tonne generated was € 163. The highest prices were recorded in Sweden (€ 279 per tonne) and the lowest in Finland (€ 120 per tonne). The differences reflect two factors: the relative national dependencies on food fish (Sweden) as opposed to feed fish (fish meal/fodder fish) (Denmark and Finland); and the human consumption markets as fresh herring generates higher prices compared to product destined for canning (the eastern Baltic states).

Table 3 Catching sector economic value of herring and sprat to Baltic countries (average 2005-2007)

Country	**Catch ('000 tonnes)**	**Value (€ million)**	**Average price (€/tonne)**	**Value added (€ million)**
Sweden	65	18	279	9.0
Denmark	91	14	152	6.1
Poland	85	14	169	7.1
Latvia	81	13	164	6.1
Finland	100	12	120	5.1
Estonia	75	9	125	1.2
Germany	53	9	168	3.9
Lithuania	10	1	144	0.3
Total	558	91	163	38.8

Source: EC-AER (2005-2007)

2.1.2 Food fish and feed fish (industrial) supplies

Figure 3 summarises the sales distribution by product type (human consumption food fish, industrial fish feed (fish meal) and fodder (average 2005-2007)

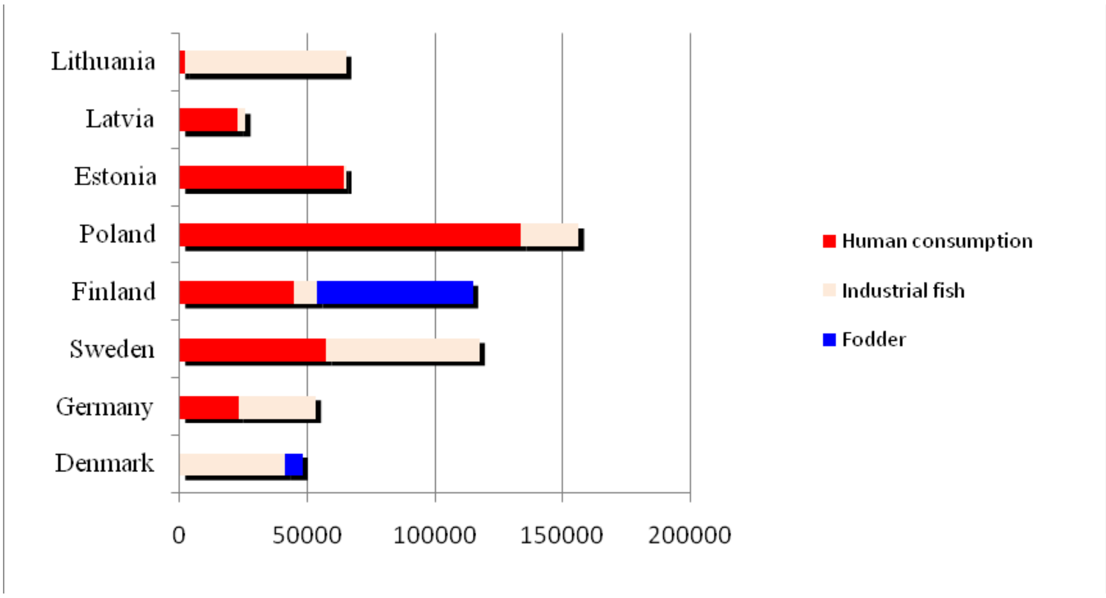


Figure 3 Herring and sprat sales by product form, € thousands. Source: MS questionnaire and Danish landings by species and nationality

The overall catch percentage of product destined for human consumption, fish meal and fodder is 54%, 38% and 11% respectively. Herring is primarily destined for human consumption, except in Denmark and half of Finland's catch. In these two countries herring is also sold as feed to mink farms. Forty two per cent of the Baltic region's sprat is sold for human consumption, with the remainder used for industrial purposes. Fish meal outlets include Denmark, Lithuania and Russia. Sprat is landed (and also over-landed (Germany)), predominantly into Denmark from all the Baltic States. However, Lithuania also processes sprat into fish meal (2 plans) or consigns some of its sprat for meal processing in Russia. Some clear national distinctions are as follows:

- In Denmark, the use of herring for human consumption is restricted by the national dioxin regulations. Baltic herring destined for human consumption is prevented by Danish national legislation and is deemed by the Danish authorities to be unsafe for human consumption[4]. As and when Danish herring is caught as by-catch in directed sprat fisheries, the herring is sold as fodder. This accounts for 6,900 tonnes.

[4] Dioxin contamination restrictions are as follows: A contamination level above the corresponding maximum limit will not be allowed for use in the production of fish and their by-products of above 1.25 ng/kg whole weight. Feeding stuffs e.g. fish with a contamination level of above 6 ng/kg or fish and fish meal are also prevented from sale. Dioxins are eliminated in the fish meal manufacturing process using carbon filtration. Exemptions are provided to EC Directive 102/2001 on the grounds of lower levels of dioxin recorded in the Eastern Baltic.

- A proportion of the Finnish herring catch (52,000 tonnes) is also sold as fodder for mink farms. A smaller proportion (9,000 tonnes) is landed as fish meal or silage into Skagen or Bornholm (Denmark).
- Sweden consumes the herring caught by its domestic fleets and lands most of its sprat (60,000 tonnes) into Denmark. A further 26,000 tonnes is processed for human consumption.
- Germany processes Baltic herring at a plant in Ruegen Island or over-lands its herring to Poland. Details of the specific dependency of the Ruegen factory were not available. Some sprat is landed directly into Denmark (16,000 tonnes), or over-landed (14,000 tonnes) for industrial feed processing.
- Poland is a consumer of herring and most of its sprat (80%). The Polish fleets also land a further 22,000 tonnes of sprat directly into Denmark for fish meal/industrial feed processing.
- Estonia, Latvia and Lithuania land 1,000, 3,000 and 13,000 tonnes of sprat respectively into Denmark, and the balance is used by the large number of smaller processors in these countries.
- Lithuania sells almost of its Baltic sprat to meal plants within the country, or to Russia (50,000 tonnes) and lands some sprat (13,000 tonnes) directly into Denmark.

There are two large fish meal plants in the Baltic region, one in Skagen and another in Thyboron in North Jutland, Denmark. Two other factories have closed in recent years: one based in Esbjerg (Denmark) closed in 2007; one near Göteborg (Sweden) closed in 2005. Sprat is either landed directly into Skagen or consigned through Grenaa, East Jutland. Sprat may also be sold for processing into a small fish silage plant operating on Bornholm, Denmark. Employment in these factories accounts for a total 250 workers. Sector value added from industrial fish meal is estimated at € 6 million[5]. Sector value added from human consumption processing is € 33 million. This represents an income multiplier (catching to processing) of 1:1.25 for human consumption and industrial feed collectively.

2.2 Sector dependencies

2.2.1 Catching sector dependency

There are 25 fleets operating (4,685 vessels) in the Baltic that target herring and sprat (Table 4). From these fleets, seven segments from Denmark and Sweden operate in other waters (the North Sea, Skagerrak and Kattegat). The Danish 12-24 m segment is mostly based in Eastern Denmark, with the other segments coming mostly from Jutland. Swedish vessels are divided into two groups, east coast vessels fishing only in the Baltic and west coast vessels fishing in the Baltic, Skagerrak/Kattegat and North Sea.

[5] Derived from fish meal value added calculations (Banks, 2005).

Table 4 shows the number of vessels, total catch by species and sector dependency (defined as value generated from both herring and sprat collectively) by country specific fleet segment.

Table 4 Fleet segments, vessel numbers, and landings (average 2005-2007). Blue indicates high dependency, light green indicates medium dependency, and low dependency fleets are left blank (see Table 5)

Vessel groups	No. vessels	Average landed catch herring ('000 tonnes)					Average values (€ million)					Dependencies		
		Herring	Sprat	Cod	Other	TOTAL	Herring	Sprat	Cod	Other	TOTAL	% herring dependency	% sprat dependency	Pelagic dependency
Denmark[6]														
Pelagic trawl 24-40m	7	5	53	0	0	58	1.4	2	0	4	8	17.2%	28.0%	45.2%
Pelagic trawl 12-24m	34	9	24	2	37	70	2	3	3	9	17	13.4%	18.5%	31.9%
Pelagic trawl 40m+	2	6	21	0	4	32	2	3	0	2	7	30.2%	39.1%	69.4%
														43.5%
Estonia														
Pelagic trawl 24-40m	53	16	49	0	33	99	2	6	0	0	9	24.3%	69.4%	93.7%
Pelagic trawl 12-24m	18	0	3	0	1	4	0	0	0	0	1	0.2%	84.9%	85.1%
Passive Gear 0-12m	880	6	0	0	2	9	1	0	0	2	3	27.7%	0.0%	27.7%
													Total	**77.5%**
Finland														
Pelagic trawl 24-40m	19	48	13	0	0	61	6	1	0	0	8	78.5%	16.6%	95.1%
Pelagic trawl 12-24m	34	20	6	0	0	26	2	1	0	0	3	79.5%	18.3%	97.7%
Passive Gear 0-12m	766	3	0	0	1	5	0	0	0	2	3	16.0%	0.0%	16.0%
													Total	**96.4%**
Germany														
Demersal trawl 0-12m	14	1	0	1	0	2	0	0	1	0	1	22.3%	0.2%	22.5%
Demersal trawl 12-24m	77	8	0	5	6	19	2	0	8	10	19	8.3%	0.0%	8.3%
Demersal trawl 24-40m	26	0	34	9	16	59	0	4	19	35	58	0.0%	6.7%	6.7%
Passive Gear 0-12m	1000	10	0	2	0	12	3	0	3	2	8	37.5%	0.0%	37.6%

[6] Mobile Baltic fleet dependency (Denmark): PTS 40 m + 2 from 37 vessels; PTS 24-40 m (10 from 76); PTS 12-24m (25 from 253), derived from Danish FKA and IOKS Fiskeridirektoraete, 2007.

Vessel groups	No. vessels	Average landed catch herring ('000 tonnes)					Average values (€ million)					Dependencies		
		Herring	Sprat	Cod	Other	TOTAL	Herring	Sprat	Cod	Other	TOTAL	% herring dependency	% sprat dependency	Pelagic dependency
													Total	**10.3%**
Latvia														
Pelagic trawl 24-40m	71	10	56	2	0	68	2	9	3	0	13	15.2%	65.1%	80.3%
Pelagic trawl 12-24m	36	10	3	0	0	13	2	0	0	0	2	74.4%	18.1%	92.5%
Passive Gear 0-12m	747	2	0	0	0	2	0	0	0	0	1	55.7%	0.0%	55.7%
													Total	**81.1%**
Lithuania														
Demersal trawl 24-40m	29	2	8	3	1	13	0	1	4	0		7.8%	17.6%	25.4%
													Total	**25.4%**
Poland														
Pelagic trawl 24-40m	52	17	57	2	1	77	5	7	2	1	15	33.5%	50.0%	83.4%
Demersal trawl 12-24m	103	1	0	4	3	8	0	0	4	2	6	5.8%	0.0%	5.8%
Demersal trawl 24-40m	41	1	6	2	2	11	0	1	3	1	4	3.8%	15.8%	19.6%
Passive Gear 0-12m	630	3	0	3	7	13	1	0	4	9	14	5.1%	0.0%	5.1%
													Total	**36.7%**
Sweden[7]														
Pelagic trawl 24-40m	19	28	21	0	11	60	7	3	0	3	14	52.2%	25.0%	77.2%
Pelagic trawl 40m+	6	17	15	0	12	43	4	2	0	3	9	46.1%	26.0%	72.0%
Pelagic trawl 12-24m	6	2	1	0	3	5	0	0	0	1	1	34.6%	7.8%	42.5%
Demersal trawl 12-	14	0	1	0	0	2	0	0	1	2	3	4.5%	4.4%	8.8%
													Total	**67.1%**

[7] Mobile Baltic fleet dependency (Sweden): PTS 40 m (6 from 13); PTS 24-40 m (19 from 35); PTS 12-24m (6 from 13); DTS 12-24 (14 from 156)

Table 5 Vessel dependency on Baltic pelagic species (average 2005-2007).

1. Very high dependency segments > 66%	**2. Intermediate segments 33%-66%**
• Finland - pelagic trawl 12-24, pelagic trawl 24-40m; • Estonia - pelagic trawl 12-24, pelagic trawl 24-40m; • Latvia - pelagic trawl 12-24, pelagic trawl 24-40m; • Poland - pelagic trawl 24-40 m; • Sweden - pelagic trawl 24-40 m, pelagic 40 m +; • Denmark - pelagic trawl 40m+	• Latvia - passive gear; • Sweden - pelagic trawl 12-24 m; • Denmark pelagic trawl 12-24m; Pelagic trawl 24-40m • Germany passive gear 0-12 m.
3. **Low dependency 3%-33%**	
• Finland - passive gear 0-12m; • Estonia - passive gear 0-12m; • Lithuania - demersal trawl 24-40m; • Poland - demersal trawl 24-40m; passive gear 0-12m; demersal trawl 12-24m; • Germany – demersal trawl 0-12m; demersal trawl 12-24m; demersal trawl 24-40m	

Some notable changes have occurred in the compositions of the fleet as a result of past and current structural measures (Table 6).

Table 6 Changes in vessel numbers (2003-2007)

	2003	2004	2005	2006	2007	% change
Denmark						
Pelagic trawl 24-40m	129	124	100	75	55	-57%
Pelagic trawl 12-24m	108	109	100	98	80	-26%
Pelagic trawl 40m+	42	48	46	47	35	-17%
Estonia						
Pelagic trawl 24-40m			63	55	41	-35%
Pelagic trawl 12-24m			22	15	17	-23%
Passive Gear 0-12m			881	879	879	0%
Finland						
Pelagic trawl 24-40m	20	24	18	20		0%
Pelagic trawl 12-24m	64	53	38	29		-55%
Passive Gear 0-12m	188	238	169	1,363		Na
Germany						
Demersal trawl 0-12m	14	21	14	14	13	-7%
Demersal trawl 12-24m	80	75	76	77	78	-3%
Demersal trawl 24-40m	30	24	27	26	26	-13%
Passive Gear 0-12m	938	926	977	1016	1008	7%
Latvia						
Pelagic trawl 24-40m	83	79	75	72	67	-19%
Pelagic trawl 12-24m	48	47	36	37	34	-23%
Passive Gear 0-12m	746	743	751	748		0 %
Lithuania						
Demersal trawl 24-40m	38	30	24	21	0	-45%
Poland						
Pelagic trawl 24-40m		80	66	41	49	-39%
Demersal trawl 12-24m		141	124	91	93	-34%
Demersal trawl 24-40m		74	48	44	32	-57%
Passive Gear 0-12m		757	685	622	584	-23%
Sweden						
Pelagic trawl 24-40m	42	46	37	41	28	-33%
Pelagic trawl 40m+	13	14	14	13	12	-8%
Pelagic trawl 12-24m			10	11	17	70%
Demersal trawl 12-24m	154	160	149	158	160	4%

Source: AER (2003-2007).
Note: Data refers to all vessels in each segment as opposed to those fully or partially dependent on the Baltic. Blanks indicate that data was unavailable for that sector in that year.

Estonia, Finland, Germany, Latvia, Lithuania and Poland have all followed a policy of decommissioning, resulting in ranges of segment specific fleet size reductions (for segments targeting pelagic species) of:

- Estonia: 0%-35%;
- Finland 0%-55%[8];

[8] The passive gear segment reports a 10 fold increase, but this has been due to an increase in the recording of this segment.

- Germany: 3%-13%, but with a 7% increase in the number of small-scale passive gear vessels;
- Latvia: 0% to 23%;
- Lithuania: 45%;
- Poland: 23% to 57%.

Sweden is changing from a decommissioning scheme to an ITQ system. Sweden's fleet has reduced by between 8% and 33% for the larger 24 m + vessels, but the 12-24 m sector has grown. Denmark's reductions reflect similar decommissioning/ITQ changes.

Denmark introduced an ITQ system for the pelagic fleet in 2003, with ITQs for demersal species introduced in 2007. As a result the fleet has fallen by between 17% and 57%, with reported greater degrees of rationalisation in the last two years.

2.2.2 Herring and sprat dependent fishing communities

There is no clear definition of community dependency. This concept could be seen from various perspectives, each with their advantages and disadvantages (e.g. community share of total herring/sprat catches in absolute terms or relative importance of herring/sprat share of total landings in the community). In this study we have taken a soft approach to the term dependency by letting government representatives in the Baltic countries identify the main home ports of the pelagic fleet and assess the importance of the fleet and the pelagic processing industry in the local areas in terms of employment and income generation. This information was taken from returned questionnaires[9]. The consequence of applying this method is that the assessments are based on local knowledge, but also that the degree of social importance cannot be compared across countries. For Denmark, Sweden and Germany assessments were based on available reports and statistics.

In *Estonia* there are three fishing ports where the social importance of the pelagic fleet is high: Dirhami, Veere and Lehtma. They are all located in western Estonia and are mainly sprat dependent. The pelagic fleet has a medium social importance for Virtsu port in west Estonia, though Virtsu is mainly herring dependent.

In *Latvia* the pelagic fleet has a high social importance. The major home ports of the pelagic vessels are Liepāja and Ventspils (with the first and second largest volume of sprat landings respectively) and Mērsrags, Salacgrīva, Pāvilosta and Roja (with the largest volume of herring landings). The social importance of the pelagic fishing industry in Riga is only assessed to be medium, despite of it accounting for the second largest volume of herring landings. This illustrates that the dependency is relative to other activities in the community.

[9] Questionnaire answered by national fisheries management agencies.

In *Lithuania* the social importance of the pelagic fishing industry is only considered medium to low in Klaipeda region.

In *Poland*, pelagic fisheries employ less than 10 % of the total labour force in all of the regions. The main fishing ports are Kolobrzeg, Wladyslawowo, Ustka, Gdynia and Swinoujscie.

In *Finland* the pelagic fleet is of high social importance for the three fishing ports of Kaskinen, Uusikaupunki and Kasnäs (in western Finland). The pelagic fleet is of medium social importance in Pori and Raumo.

In *Germany* herring is landed in a large number of communities along the Baltic coast. A considerable part of this is landed by small gill-net vessels fishing for herring in the spring. The ports with the largest herring landings (from the Baltic and the North Sea) are Neu Mukran, Freest, Sassnitz, Griefswald, Thiessow and Gager. These ports are all on, or close to, the island of Rügen in Mecklenburg-Vorpommern.

In *Denmark* the Baltic pelagic quotas are allocated to vessels with homeports in the Baltic Sea as well the North Sea. The ports with important pelagic landings from the Baltic Sea include Nexø, Grenå and Skagen. The ports of Rødbyhavn, Rødvig, Klintholm, Køge, Kerteminde and Frederikshavn receive landings of Baltic pelagic species, but in much smaller quantities.

In *Sweden* the pelagic fleet is mainly based in the county of Västre Götaland on the west coast. Vessels from there undertake fishing in the Baltic Sea as well as other waters. A small number of pelagic vessels are registered in the Baltic regions; most of these vessels are small and only fish in the Baltic Sea.

The processing sector and onshore industries also contribute to employment in coastal regions of the Baltic States; this is discussed in section 2.2.3.

2.2.3 Sector employment and dependencies

Importance of the fishing sector

Fishing and processing are important activities in the Baltic region, accounting for almost 88,000 and 47,000 jobs respectively. In terms of absolute numbers of people Poland, Germany, Latvia and Denmark are the most important, both for the fishing and processing sectors. However, when considering fishing employment and processing employment as a percentage of total national employment, Latvia, Estonia and Lithuania are the countries most dependent on the fisheries sector, where it makes up over 0.5% of national employment (Table 7). The processing sector is also particularly important in Denmark (0.19% of national employment) and Poland (0.11% of national employment). Overall, fishing employment represents 0.12% of total employment in the Baltic region, and processing employment represents 0.07% of employment in the Baltic region.

Table 7 Employment in the fisheries and processing sectors, and employment dependency, 2007.

	National total employ-ment ('000)	Total employ-ment in the fisheries sector	Employ-ment in the processing sector	Processing employ-ment as % of fisheries sector employ-ment	Dependence (as % of total national employment)	
					Fishing sector total	Processing sector
Denmark	2,784	9,000	5,200	57.8	0.32	0.19
Estonia	617	6,300	2,600	41.3	1.02	0.42
Finland	2,370	1,800	1,100	61.1	0.08	0.05
Germany	39,222	13,400	8,500	63.4	0.03	0.02
Latvia	1,049	11,000	7,400	67.3	1.05	0.71
Lithuania	1,489	7,800	4,400	56.4	0.52	0.30
Poland	14,390	24,500	16,000	65.3	0.17	0.11
Sweden	4,327	4,100	1,800	43.9	0.09	0.04
Total	**66,248**	**77,900**	**47,000**		**0.12**	**0.07**

Source; Eurostat -National total employment; Salz *et al* (2007) – Total employment in fisheries and processing sector

Pelagic fishing sector

The number of fishing jobs dependent on herring and sprat is provided in Table 8. Fishing employment dependent on herring and sprat is determined from actual employment numbers per vessel segment multiplied by the pelagic revenue dependency. The dependency of national employment and of employment in the fishing sector is also calculated. The results show a higher dependency on pelagic species for Estonia, Latvia, Finland and Poland both in terms of absolute number of jobs and in terms of number of jobs as a percentage of national and fishing employment. This is because of the high dependence on herring and sprat primarily in the Eastern Baltic. Lower employment dependencies exist for other countries either because they are more dependent on other species (German, Danish, Swedish and Lithuanian vessels), or fish mostly outside the Baltic (larger Danish and some Swedish vessels).

Table 8 Estimated Baltic pelagic fishing employment dependency (2005-2007)

Country	Number of pelagic vessels	Total employment on vessels*	Dependency on herring and sprat catches	Employment dependent on herring and sprat*	Dependency on Baltic pelagic fishing employment	
					% of national employment	% of fishing employment
Denmark	43	101	43%	44	0.0%	0.5%
Estonia	951	2,914	77%	2,259	0.37%	35.9%
Finland	819	1,063	80%	1,025	0.04%	56.9%
Germany	1,118	821	7%	84	0.0%	0.6%
Latvia	854	1,667	81%	1,351	0.13%	12.3%
Lithuania	29	166	25%	42	0.0%	0.5%
Poland	826	2,361	37%	865	0.01%	3.5%
Sweden	45	199	67%	134	0.0%	3,3%
Total	**4,685**	**9,294**		**5,804**		

Source: Extracted from AER data (2005-2007). National employment from Eurostat (2005), Fishing employment from Salz *et al* (2006) for 2002-2003.
* Employment in FTE (full time equivalent).

Processing and onshore sector

Information contained in this section is taken from the questionnaires sent to EU Member States as well as other (referenced) sources. The Baltic region is highly dependent on processing of pelagic species for human consumption (Eastern Baltic States and Poland) and fish feed (Denmark). Finland and Lithuania also have small scale fish meal/fodder sectors.

Overall, 5,303 jobs are dependent on processing Baltic herring and sprat in the Baltic region. This accounts for 24.5% of the Baltic region's processing employment. Poland, Latvia Estonia and Finland (Table 9) account for the largest number of Baltic dependent processing workers (93% of the total). The catching to processing sector employment multiplier is 1:0.91.

Baltic supplies make up 60% of the Baltic region's supply of herring and sprat, with Latvia, Poland and Lithuania involved in processing fish from other countries inside the Baltic region (Germany, Finland and Estonia). Denmark sources significantly from within the Baltic region, especially from Sweden, Germany and Poland.

The largest number of pelagic processing plants is found in Poland (126 plants employing 12,625 people), although these are not exclusively focussed on processing Baltic pelagics.

Table 9 Summary of Baltic pelagic processing sector employment and processing dependency on Baltic pelagic catches.

	Number of processing companies that process pelagics	Pelagic processing sector workers	Dependency on Baltic pelagic catches	Baltic herring and sprat processing employment
Denmark	3	250	30.0%	75
Estonia	35	1,100	80.0%	880
Finland	78	626	95.0%	595
Germany*	1	53	100.0%	53
Latvia	106	6,149	5.8%	4735
Lithuania	49	3,163	18.3%	95
Poland	126	12,625	18.3%	2926
Sweden*	-	129	40.0%	51
Total		24,095	24.5%	5.303

Source: Member State questionnaire responses and, where questionnaire responses were not sufficient to determine the dependency on Baltic pelagic resources (*), data were extracted from Salz *et al* (2007). Gender information was requested but not provided, with the exception of two countries (Estonia and Lithuania). In the case of Sweden and Finland, processing details were extracted from published sources.

A summary of specific national processing characteristics is provided below:

In ***Estonia*** the processing sector is heavily reliant on processing herring and most herring and sprat resources for processing come from the Baltic Sea. Most of the herring comes from the Central Baltic, and the sprat is almost exclusively from the Gulf of Riga. Although much of the resources for processing come from national landings, there is an increasing trend of sourcing from other Baltic countries (Finland, Sweden and Denmark) due to the higher quality of fish. The pelagic processing industry is of high importance in west Estonia, particularly in Pärnumaa, Saaremaa and Läänemaa counties, and of medium importance in Harjumaa and Ida-Virumaa counties of north and north-east Estonia.

The fillets and smoked fish products from herring and sprat processing are mainly consumed domestically (about 70%), and some are exported to Lithuania, Latvia and Russia. Frozen pelagic fish and canned products are mainly exported to Russia and Ukraine. New markets for Estonian products are also developing in Eastern European states, such as Bulgaria, Romania and Moldova. There is a trend towards vertical integration of the processing industry.

Fishing and processing industries are well developed in ***Latvia*** and make an important contribution to the economy, although this has declined as other sectors of the economy have grown (from 3.4% of GDP in 1996 to 1.15% of GDP in 2003). The processing industry is of high social importance and is mainly located in the western part (Kurzeme) of Latvia, particularly on the Baltic Sea and Gulf of Riga coasts near the fishing ports in the districts of Riga, Tukums, Talsi, Liepāja and Limbazi. The processing industry is predominantly based on Baltic herring and sprat and has always had a strong export component, exporting to Russia, Belarus, Lithuania, Ukraine, Eastern Europe and South Asia. 65% of processing companies use sprat sourced exclusively from the Baltic, and about 50% of the herring is also sourced from the Baltic.

There have been problems with the export of canned products, linked to a Russian phytosanitary ban on certain producers. There is also a trend towards increased export of frozen sprat due to the development of processing industries in other countries e.g. Belarus. Much of the raw material for processing is imported from Norway, Sweden and Lithuania, as well as smaller amounts from Mauritania, USA, Iceland and Russia. However, the sector is already changing to reflect market demand and the need to diversify, for example through increasing imports of mackerel and Atlantic herring.

In ***Lithuania***, processing is mainly based on imports (about 75% of raw material) from Norway, USA and Iceland (Salz *et al*, 2006). Most of the production is exported, although salted, dried and smoked products are generally for the domestic market. Companies involved have a low dependence on Baltic herring and sprat, with only 2% of total production from Baltic herring and sprat. Of this, most comes from the Central Baltic. As stated earlier, almost all Baltic sprat is processed into fish meal.

The processing sector has a high importance in Klaipeda (9 enterprises) and Kaunas (8 enterprises) regions. Its importance is low in Vilnius and North regions (4 enterprises in each).

The processing sector is very important and growing in ***Poland***. This has been stimulated by foreign capital flows into the sector due to cheaper labour costs compared to western European Member States. The growth has also been supported by FIFG funds. The main species processed are herring (33% of raw material), whitefish (30%) and sprat (14%). About 70% of raw material for the processing industry is imported (mainly from Norway and Iceland). Much of the pelagic raw material for processing is also imported, due to insufficient local landings — in 2008, Poland imported 95,200 tonnes of herring products, mainly from Norway, Denmark and Iceland. Sprat for processing comes exclusively from the Baltic (90% from Central Baltic, 10% from Western Baltic), but only 13% of herring is from the Baltic (70% of which is from the Central Baltic, 30% is from the Western Baltic). Much of the pelagic production is for internal consumption. However, fillets are often exported (60%), and some fresh/frozen and canned fish are also exported (15% and 25% respectively). The main export market is the EU, but products are also exported to Ukraine, Norway, Serbia, Russia and USA.

The centre for Baltic processing is in Promorskie province. However Baltic processing still represents less than 1% of total regional employment. In general, the sector is showing trends of increasing investment, diversifying product range and concentration of enterprises. It is seeking to promote the use of Refrigerated Sea Water (RSW) tanks on domestic vessels, so as to improve the product quality.

In ***Finland***, most of the national catch is herring and sprat, caught by industrial vessels. The majority is used for industrial processing for animal feed and the fur farming industry (mink farms). Almost all the sprat (90%) and herring (80%) is destined for reduction to fish meal. However, Baltic herring also makes up about half the fish for human consumption. The processing industry in Finland is stable. Domestic landings are usually sufficient for the needs of the processing industry. Of the herring, most (77%) comes from the Bothnian Sea, and most sprat comes from the Central Baltic (78%). The pelagic processing industry is mainly based in south-western and western Finland, where it is considered of high social importance.

Fillets and smoked pelagic fish are mainly consumed domestically. However, fresh/frozen whole fish are also exported — mainly to Russia, Estonia and Sweden. The market for frozen herring in Russia has been developing for some years.

In ***Germany***, Baltic herring is not fundamental to the processing industry, as a large proportion of the raw material originates from the North Sea and the Norwegian Sea. The main Baltic herring area is in Rügen, but even here, a considerable part of the production is based on herring from areas other than the Baltic. In 2006, marinated and canned fish had a 28% market share, and herring had a 17.5% market share by species.

In ***Denmark***, pelagic species from the Baltic Sea are almost exclusively used for fish oil and fishmeal processing, due to the Danish ban on using herring from the Baltic Sea for human consumption. Fish meal dependency on Baltic Sea herring is about 30% of total raw material supplies, and more non-Baltic species are being sourced. Sandeel, North Sea sprat, Norway pout, blue whiting and capelin are also used in the fish meal processing industry. In some cases, e.g. Sandeel, supplies have declined significantly forcing the two plants to close in Denmark and Sweden respectively. Skagen is particularly dependent on Baltic sprat for oil and meal processing, and Bornholm for ensilage (protein).

In ***Sweden***, most of the processing industry is located on the west coast. The main products are herring and cod, although 80% of the raw material is imported (mainly from Norway and Denmark). As with the pelagic fishing industry, the pelagic processing industry is primarily located in the county of Västre Götaland[10]. However, the sprat processing industry is of some importance in other localities such as the island of Gotland in the Baltic Sea and Västervik in the county of Kalmar. 24% of landings go for reduction processing; 18% of landings are herring and sprat for consumption.

Summary onshore sector employment dependencies is shown in Table 10.

[10] Based on the report: Ändret regulering av det pelagiske fisket (Changed regulation of the pelagic fishery), Fiskeriverket (Swedish Board of Fisheries), 2007.

Table 10 Summary of onshore sector dependents

Country	Onshore support workers	Total upstream and downstream dependents including processing (Table 8)
Estonia	837	1,717
Latvia	450	1,606
Poland	52	2,362
Finland	15	610
Sweden	19	71
Denmark	13	88
Germany	13	66
Lithuania	20	204
Total	**1,420**	**6,723**

Source: Extracted from Salz *et al* (2007)[11],

The principal conclusions drawn from Table 10 are as follows:

- 1 fisher dependent generates 0.26 onshore upstream (suppliers, boat servicing and building) dependent jobs. Estonia and Latvia have a particularly high number of upstream dependents in comparison with other countries.
- 1 fisher dependent generates 1.27 upstream and downstream (fish processing) dependent jobs.

2.3 Fleet costs and earnings in the base period (2005-2007)

Table 11 summarises the current results for all fleets with a dependency on pelagic species. The shading in the tables reflects the segment dependency rating (as defined in Table 5).

There are 4,685 vessels with dependency on Baltic pelagic species. Of these, 310 vessels have a high dependency, 1,795 intermediate and 2,581 lower dependencies. The total number of crew is 8,664, but these are also dependent on other species. The full time equivalent (FTE) is 5,804 (Table 8). Total crew share generated from these vessels is € 59 m with a Community annual average crew wage of € 6,900, with a range of € 500 per crew man (Estonia passive gear) to € 117,000 (Danish pelagic trawl 12-24m).

Total value added from these fleets is € 116 million, but in FTE pelagic dependency equivalents, this equates to € 38.8 million.

Seventeen fleets demonstrate positive cash flows. Negative cash flows are found in Estonian pelagic trawl fisheries (12-24m and 24-40m), Latvian pelagic trawl (12-24m), Latvian and German passive gears, Polish demersal

[11] Upstream multipliers were derived from national catching processor employment differentials (Salz *et al* (2007).

trawl (24-40m) and German demersal trawl (0-12m). The Estonian and Latvian fleets are highly dependent on pelagic species. The German passive gear fleet also has a significant (intermediate) dependency.

Of the fleets, 13 are deemed to be profitable, five stable and seven unprofitable. Negative profits are found in three of the seven very highly dependent fleets (Estonian pelagic trawls 12-24 m and 24-40m, and the Finish pelagic trawl 12-24 m segment. Negative profits are also found in the intermediate dependency category, Latvian and German passive gears. In general, small vessels appear less profitable than large vessels, and eastern Baltic fleets less profitable than western Baltic fleets.

An issue of negative cash flows was identified from some AER results causing concern in the validity of the data used. Observations from the AER experts provided the following:

- Most vessels have had some dependency on higher value cod where quotas were significantly reduced or the fishery was closed (Poland[12] and Lithuania);
- Some of the negative cash flows may hide the benefits of IUU fishing (Poland[13]);
- Smaller vessels (0-12 m) are part time and rely on other forms of income to supplement their wages, particularly in the winter months. Social (not specific to the fishing industry) subsidies may be paid, but these are included as income (Germany[14] and Poland) including national social benefits and casual work outside the fishery sector.

[12] Emil Kuzebski (Sea Fisheries Institute) and Arina Motova (LIAE), pers. com. June 2009

[13] Kuzebski (SFI), pers. com. June 2009

[14] Rainer Klepper (FAL), pers com June 2009

Table 11 Average economic performance for 2005-2007

Vessel groups	Number of vessels	Crew numbers	Crew wages	Average wage per crew member ('000)	Gross cash flow	Net profit	Gross value added	Net profit / Gross revenues	Classification
Denmark									
Pelagic trawl 24-40m	7	36	2.0	56.9	1.0	0.5	3.0	8%	PROFITABLE
Pelagic trawl 12-24m	34	40	4.7	116.9	1.2	-0.1	5.9	-1%	STABLE
Pelagic trawl 40m+	2	25	1.4	55.0	2.2	1.2	3.5	21%	PROFITABLE
Estonia									
Pelagic trawl 24-40m	53	329	3.5	10.8	-2.8	-9.0	0.7	-89%	UNPROFITABLE
Pelagic trawl 12-24m	18	57	0.2	3.0	-0.2	-1.0	0.0	-123%	UNPROFITABLE
Passive Gear 0-12m	880	2528	1.3	0.5	0.7	0.4	2.0	11%	PROFITABLE
Finland									
Pelagic trawl 24-40m	19	67	3.8	57.1	2.3	0.4	6.1	3%	STABLE
Pelagic trawl 12-24m	34	59	0.8	14.2	0.6	-0.1	1.4	-2%	STABLE
Passive Gear 0-12m	766	938	0.4	0.4	4.2	2.2	4.5	26%	PROFITABLE
Germany									
Demersal trawl 0-12m	14	34	1	17.8	-0.1	-0.2	0.5	-21%	UNPROFITABLE
Demersal trawl 12-24m	77	231	8	34.7	3.7	2.5	11.7	13%	PROFITABLE
Demersal trawl 24-40m	26	272	16	57.9	26.3	24.7	42.1	43%	PROFITABLE
Passive Gear 0-12m	1000	285[15]	1	5.2	-1.2	-2.5	0.3	-30%	UNPROFITABLE
Latvia									
Pelagic trawl 24-40m	71	428	1.8	4.2	6.1	6.1	7.9	42%	PROFITABLE
Pelagic trawl 12-24m	36	107	0.9	8.2	-1.2	-1.2	-0.3	-44%	UNPROFITABLE
Passive Gear 0-12m	747	1132	0.4	0.4	-0.2	-0.2	0.1	-28%	UNPROFITABLE
Lithuania									
Demersal trawl 24-40m	29	166	1	7.0	0.1	-0.1	1.2	-3%	STABLE
Poland									
Pelagic trawl 24-40m	52	406	3.5	8.7	1.7	0.5	5.2	3%	STABLE
Demersal trawl 12-24m	103	401	1.4	3.4	0.7	-0.1	2.0	-2%	STABLE
Demersal trawl 24-40m	41	254	0.7	2.6	-0.2	-1.3	0.4	-30%	UNPROFITABLE
Passive Gear 0-12m	630	1300	2.0	1.5	5.5	4.6	7.5	44%	PROFITABLE
Sweden									
Pelagic trawl 24-40m	19	102	2.3	22.1	4.9	3.3	7.1	22%	PROFITABLE
Pelagic trawl 40m+	6	54	1.0	18.7	3.2	1.6	4.2	16%	PROFITABLE
Pelagic trawl 12-24m	6	11	0.1	7.7	0.2	0.1	0.3	10%	PROFITABLE
Demersal trawl 12-24m	14	32	0.4	11.1	0.6	0.5	1.0	18%	PROFITABLE
TOTAL	**4685**	**8664**	**59**	**6.9**	**58**	**0.0**	**116**		

2.4 Stock assessments, stock status and the determination of TACs

Assessments for Baltic herring and sprat are undertaken by ICES. Five stocks of herring and one of sprat are recognised in the Baltic. At the time of undertaking the study the relevant assessments were those undertaken in

[15] Denotes full time equivalent for German Passive gear sector 1: 0.285)

2008, supplemented by assessments reported in the Workshop on Multi-annual management of Pelagic Fish Stocks in the Baltic (WKMAMPEL) report (ICES, 2009).

Western Baltic Herring (SD 22-24). Recruitment to this stock has shown a systematic decline since 2000, with the 2007 estimate being the lowest of the time series. The spawning stock biomass (SSB) declined during the early 1990s to approximately one-third of the 1990 levels, and has been relatively constant since although further declines are expected soon due to declining recruitment. SSB in 2007 was estimated as 133,000 tonnes. Fishing mortality (F) is at levels approximately double those appropriate for fishing at MSY, and ICES classifies the stock as being overfished. Reference points for biomass are not defined by ICES, and therefore the status of the stock to these reference points is unknown. The stock is fished in both SD 22-24 and IIIa, where it is part of a fishery taking both western Baltic spring spawning herring and North Sea autumn spawning herring.

Central Baltic Herring (SD 25-27, 28-2, 29 and 32). The assessment available at the time of undertaking this project indicated that fishing mortality (in 2007) was at a level indicating sustainable harvesting (F was about 0.16, compared to Fpa of 0.19). However, in 2008, F was estimated to be 0.251, above Fpa. ICES classifies the stock as overexploited. The SSB estimate for 2007 was about 25% below the long-term average but has been increasing steadily since 2000. Herring and sprat are taken in mixed fisheries, and there is some uncertainty about total catches of each. Furthermore, the assessment and the advice consider the Central Baltic herring stock taken both in and outside the Baltic Sea. In the past five years, the average catches of Central Baltic herring taken in the Gulf of Riga were 2900 t (2.5% of total catches of Central Baltic herring) and the catches of Gulf of Riga herring taken in Subdivision 28.2 were 300 t (less than 1% of the catches of herring in the Central Baltic).

Gulf of Riga herring (SD 28-1). Based on the most recent estimates of fishing mortality, ICES classifies the stock as being harvested sustainably although fishing mortality is still higher than F_{MSY}. Following high recruitment, SSB increased in the mid-1980s and has been around 23% above the long-term average, about 80,000 t, since that time. Fishing mortality is about 0.4.

Bothnian Sea Herring (SD 30). There was no agreed stock assessment for this stock in 2008, but WKMAMPEL used the last accepted assessment and undertook exploratory evaluations of multi-annual management options in the anticipation that an assessment would be forthcoming in 2009. This assessment indicated that spawning biomass increased in the mid-1980s to between 300,000 and 400,000 t, where it has remained since, with F at about 0.15. This is the assessment that was used in this impact analysis, and it was confirmed in the 2009 advice (2008 stock size 420,000 t, F = 0.16, lower than Fpa).

Bothnian Bay Herring (SD 31). There is no available information from which to evaluate trends of this stock. Catches are estimated to be low, around 3000 t per year.

Sprat (Subdivision 22-32). Recruitment was generally low in the 1970s and 1980s and started to increase at the beginning of 1990s, partly as a result of higher survival due to a decline in predation mortality from the decreasing cod stock. This was, however, followed by a decline starting in 1997, and the stock is now estimated to be at about 800,000 t, about 20% above the long-term average. Fishing mortality increased with the decline in biomass, and has been higher than Fpa since 2002 (being now about 0.5).

Management defines TACs for five herring areas. TAC proposals for **sub-divisions 22-24** and **division IIIa** assume a 50:50 split of catches between both areas. In addition, TAC proposals for division IIIa include a proportion of the North Sea Autumn Spawning Stock that is also caught here. However final TACs for both areas depend on political decision and may not reflect the proposed 50:50 split. The final TAC decision for division IIIa is also dependant on negotiations with Norway. This is taken into account in our calculation of future TACs.

Central Baltic herring and Gulf of Riga herring (**Sub-division 25-27, 28.2, 29, 32** and **Sub-division 28.1** respectively) are given their own management quota. The Bothnian Sea and Bay stocks are given a combined quota (**Sub-divisions 30-31**).

Russia takes about 8% of the central Baltic herring and 7% of the sprat catch. These catches are factored into the calculation of the EU quota.

Table 12 summarises the fishing morality reference points for the Baltic pelagic stocks determined in 2008 assessments (ICES, 2008).

Table 12 Fishing mortality reference points for the Baltic pelagic stocks

	Western Baltic Herring (SD 22-24)	**Central Baltic Herring (SD 25-27, 28-2, 29 and 32)**	**Gulf of Riga herring (SD 28-1)**	**Bothnian Sea Herring (SD 30)**	**Bothnian Bay Herring (SD 31)**	**Baltic Sprat (Subdivision 22-32)**
F2009	0.45					
Fsq (2007)	0.48	0.16	0.4	0.16	Not determined	0.44
Fpa	Not determined	0.19	0.4	0.21		0.4
F0.1	0.22	0.223	0.26	0.15		
Fmsy	0.25					

3 POLICY OPTIONS

3.1 Objectives

ICES was tasked by the European Commission to identify multi-annual management options for the Baltic herring and sprat stocks. ICES did this through the Workshop on ulti-annual management of pelagic fish stocks in the Baltic (WKMAMPEL) (Co-chairs: Carl O'Brien (UK) and Morten Vinther (Denmark)) which met at ICES Headquarters Copenhagen 23–27 February 2009. Its Terms of Reference were:

a. *Identify multi-annual management options for each of the Baltic herring stocks (Western herring in SD 22-24, Central Baltic, Gulf of Riga, SD 30, SD 31) and the sprat stock based on the following form:*

   i. *The sum of the regulated catches for the stock of ("the stock") shall be set according to a fishing mortality of **[A]**.*

   ii. *Notwithstanding paragraph i above, the sum of the regulated catches shall not be altered by more than **[B]** % with respect to the sum of the regulated catches for the previous year.*

   iii. *Notwithstanding paragraphs i and ii, in the event that the spawning stock size for the stock is estimated at less than **[C tonnes / appropriate model-specific units]**, the sum of the regulated catches for the stock shall be adapted to assure rebuilding of the spawning stock size to above **[C]** without incurring the restriction referred to in paragraph ii. ICES should propose a TAC-setting calculation in such cases.*

   ICES is asked to identify combinations of values for A, B and C that would assure management of the stock that would conform to the precautionary approach; i.e. a low risk of stock depletion, stable catches and sustained high yield.

   ICES should explore other relevant scenarios on its own initiative, but should include at least scenarios where A: F = S.Q. or MSY or below MSY (appropriate level to be selected by ICES) and B: limit on TAC changes = 15% or no limits.

   Multi-species considerations such as the implications from an increased cod stock should be taken into account.

b. *Evaluate the potential impact of stock density on growth parameters in the Bothnian Sea.*

c. *Evaluate the efficiency of existing area management approaches in relation to the overall objective to ensure highest sustainable yields in the long-term for each of the stocks concerned (division Central Baltic and Gulf of Riga, joint management of Herring stocks in Subdivisions 30-31 and the 50-50 split of the TAC for Western Herring between SD 22-24 and IIIa).*

d. *Evaluate the ecosystem effects (including the size of the cod stock) of a reduction of the size of the sprat stock through an increased fishing mortality for sprat.*
e. *Provide proposals on how the industry can contribute to an improvement of the assessment of the pelagic stocks (quality of data).*

ICES produced its report (WKMAMPEL: ICES CM 2009/ACOM:38) and in addition some specific advice in response to the EC request (8.3.3.1 Multi-annual management of pelagic fish stocks in the Baltic[16]). This included specific recommendations for the central Baltic and Gulf of Riga stocks as well as Baltic sprat, but it did not include specific advice for western Baltic herring or Bothnian sea herring although some commentary was included in the advice on these two stocks.

Table 13 Reproduction of the ICES advice (2009) on Baltic herring and sprat

	Western Baltic herring (*)	Central Baltic herring	Gulf of Riga herring		Sprat
Fishing mortality [A] (year^{-1})	< 0.25	0.22	0.26	0.35	0.40
Annual TAC variation [B] (± percentage)	15	15	15	20	20
Spawning-stock biomass trigger [C] ('000 t)	None	800	60		400
Probability of SSB_{2015}<[C]	< 5% (**)	< 5%	< 5%		< 5%
B_{lim} ('000 t)	110 (***)	385	40		200
When SSB<B_{lim}	F = 0	F = 0	F = 0		F = 0
F when B_{lim}<SSB_y<[C]	Not Applicable	0.22*[(SSB_y-385)/(800–385)]	0.26*[(SSB_y-40)/(60–40)]	0.35*[(SSB_y-40)/(60–40)]	0.40*[(SSB_y-200)/(400–200)]
Spawning-stock biomass in 2015 SSB_{2015} ('000 t)	(*)	1 056	117	101	962
Yield in 2015 Y_{2015} ('000 t)	(*)	190	24	29	256

(*) WKHMP (ICES 2008) provided preliminary recommendations of the values for [A], [B], and [C]. The end results should be regarded only as indicative of what a management plan for Western Baltic herring should include; no quantitative results are therefore calculated for SSB and Yield in 2015.
(**) probability of SSB < 110 000 t (as suggested by WKHMP 2008).
(***) no value for [C] or B_{lim} available, 110 000 t is used (as suggested by WKHMP 2008).

The primary **objective** of this impact assessment is to determine the impact that multi-annual management plans based on the above harvest control rules would have on Baltic pelagic fisheries.

16 http://www.ices.dk/committe/acom/comwork/report/2009/Special%20Requests/EC%20Multiannual%20management%20pelagic%20stocks%20Baltic.pdf

For the present report stock assessments undertaken by WKMAMPEL were repeated using the Stochastic Multi-Species model (SMS) in order to provide stock-specific SSBs and quotas to be used by the EIAA models to generate predictions of economic indicators. Stock assessments were made using the final run code provided by WKMAMPEL, including runs for western Baltic herring and Bothnian Sea herring. The harvest control rules ([A], [B], [C] above) were implemented for future projections of 20 years. Stock and catch trajectories are shown in Annex 1.

3.2 Definition of the options

Three long-term management scenarios form the basis of the bio-economic modelling projections:

- The ‘no change’ long-term management scenario. Fishing mortalities were assumed to be equal to likely ICES advice and recent historic TAC setting behaviour on behalf of the EU;
- Implementation of the ICES long-term management plan, with all other variables remaining constant (*inter alia* fleet segment capacities remain constant at 2005 – 2007 levels). Stocks are managed under a long term Harvest Control Rule (HCR) management reference points determined by ICES. All other variables are assumed to remain constant *e.g.* vessel numbers, employment;
- ICES long-term management plan as above, but with appropriate changes in national fleet segment capacities and quota uptake. Vessel costs and capital investment are assumed to be dependent on vessel numbers, with depreciation set at 10 % of capital investment and crew share is assumed to be follow the same proportion of residual gross value as in 2005-07.

Variations in critical assumptions of either parameter values or relationships between variables are also considered in order to capture the sensitivity of the predicted results to the assumptions made.

Table 14 Summaries of the variables used for each management option. Some runs are termed "outputs" rather than "options" to indicate that the same basic run parameters were used, but different outputs were examined. Fuller descriptions are given below.

Option descriptions	Stock Managem-ent	Gulf of Riga HCR	Reference date for TAC	Fleet size	Prices	Fuel
Option 1 - no change, situation in 2015	Status Quo F (see text)	n/a	2015	No change in capacity	20% price flexibility	no change
Option 2a ICES HCR, 2015, Gulf of Riga F=0.26	ICES HCRs	F=0.26	2015	No change in capacity	20% price flexibility	no change
Option 2b ICES HCR, Gulf of Riga 0.35, 2015	ICES HCRs	F=0.35	2015	No change in capacity	20% price flexibility	no change
Output 2a_1 - ICES HCR, 2020, Gulf of Riga F=0.26	ICES HCRs	F=0.26	2020	No change in capacity	20% price flexibility	no change
Option 2a_2, ICES multispecies, 2015, Gulf of Riga F 0.26	ICES HCRs with multispecies	F=0.26	2015	No change in capacity	20% price flexibility	no change
Option 3a: Option 2a + full uptake and expected vessel trend	ICES HCRs	F=0.26	2015	Continued trend of fleet reduction	20% price flexibility	no change
Option 3b: Option 3a + additional reductions required to reach profitability	ICES HCRs	F=0.26	2015	Further reduction in fleet size if necessary to achieve profitability	20% price flexibility	no change
Option 3c: Option 3a + adjustment to uptake	ICES HCRs but allowing catches to reach a maximum of historical uptake or the TAC.	F=0.26	2015	Further reduction in fleet size if necessary to achieve profitability	20% price flexibility	no change
Output 3a_1: Option 3a with increased (x1.5) fuel cost	ICES HCRs	F=0.26	2015	Continued trend of fleet reduction	20% price flexibility	1.5 times 2005-7 price

Table 14 summarises the variables used for each management option considered. More detailed descriptions of the different management options and the rationale for their use is included below. All management options are evaluated at 2015, unless otherwise stated. Price flexibility was taken into account in all EIAA model runs at a level of 20%; and stock flexibility was assumed to be 0.1 for herring and sprat in all runs. Changes to these parameters have a very small impact on overall profitability.

3.2.1 Option 1

Option 1 assumes that long-term management of the Baltic pelagic stocks remains as it currently stands. Fishing mortalities and quotas are assumed to be set in a similar fashion to recent historic ICES advice and management. The option one runs were all made without constraints and assumed an F equal to likely ICES advice and recent historic TAC setting behaviour on behalf of the EU:

- Western Baltic herring: there is no F_{pa}. ICES gave advice on a range of options in 2008, including F=0.25. The Commission's proposal for Area 22-24 recommended a 63% reduction in the TAC in line with scientific advice, but the Council agreed to a 39% reduction, equivalent to a Western Baltic herring stock catch of 54000 t and an F of about 0.45, a little lower than Fsq. This was used in stock projection, which gives a relatively high probability (36%) of being below Blim.
- Central Baltic herring: Fsq is close to Fpa, so Fpa was used
- Gulf of Riga herring: Fsq is close to Fpa, so Fpa was used
- Bothnian Sea: From the WKMAMPEL work, Fsq=0.44
- Sprat: The Council set the 2009 TAC at a high 399,000 tonnes, which equates to at least a continuation of Fsq and probably F>Fsq=0.55. However, Fsq=0.44 was used for this management option.

Table 15 Management reference points, by stock, for the 'no change' scenario

Management reference points	Western Baltic Herring	Central Baltic Herring	Gulf of Riga Herring	Herring 30	Baltic Sprat
Fishing mortality [A]	0.48	0.19	0.4		0.44
Annual TAC variation [B]	none	none	none	none	None
Blim	110	385	40	135	200
SSB trigger [C]	none	none	none	none	None
F when SSB<Blim	none	none	none	none	None
F when Blim<SSB<[C]	none	none	none	none	None
Probability SSB2015<Blim	36.0%	0.0%	0.5%	0.0%	0.0%

3.2.2 Option 2

Option 2 assumes the introduction of the ICES long-term management plan from 2009 onwards. It is assumed that fleet capacities and all other economic variables remain at the average level for 2005 to 2007.

Stock assessments were made using the final run code provided by ICES, developed by WKMAMPEL, with some slight modifications:

- Western Baltic herring: ICES had not provided advice. In the absence of a long-term management plan for this stock developed by ICES, a target F_{msy} ([A]) and annual TAC constraint ([B]) were set in this report for Western Baltic herring which were consistent with the ICES' long-term management plan harvest control rule (HCR). No SSB limit point ([C]) was set. We note that discussions between the Baltic Sea RAC and the Pelagic RAC were ongoing at the time of undertaking this review which may decide on a long-term management plan that differs from that adopted in this report. However, the approach adopted here is, we believe, a realistic and pragmatic approach in the absence of additional specific advice from the EC, the RACs or ICES.

- Herring 30 (Bothnian Sea): WKMAMPEL had undertaken runs but not provided the final results. We repeated these runs.

The full suite of HCR parameters is shown in Table 16. The trajectories are shown in Annex 1.

Table 16 Management reference points, by stock, used in stock projections for the ICES HCR

Management reference points	Western Baltic Herring	Central Baltic Herring	Gulf of Riga Herring (F=0.26 option)	Gulf of Riga Herring (F=0.35 option)	Herring 30	Baltic Sprat
Fishing mortality F	0.25	0.22	0.26	0.35	0.16	0.4
Annual TAC variation [B]	15	15	15	20	15	20
Blim	110	385	40	40	135	200
SSB trigger [C]	none	800	60	60	250	400
F when SSB<Blim	F=0	F=0	F=0	F=0	F=0	F=0
F when Blim<SSB<[C]	not applicable	linear from [C] to 0	Linear from [C] to 0	linear from [C] to 0	linear from [C] to 0	linear from [C] to 0
Probability SSB2015<[C]	0.4%	1.7%	0.3%	4.3%	3.4%	2.1%
SSB in 2015	219	1050	119	101	338	944
Yield in 2015	46	188	26	29	50	249

Two sets of management reference points for Gulf of Riga herring were considered: a target fishing mortality of 0.26 and maximum annual TAC variation of 15 %, and a target fishing mortality of 0.35 and a maximum annual TAC variation of 20 %. This allows for examination of the implications of allowing higher fishing mortalities, but with greater potential decreases, and increases, in TAC levels.

Option 2a assumes that the Gulf of Riga herring management reference points are F=0.26 [A] and maximum annual TAC variation is 15 % [B].

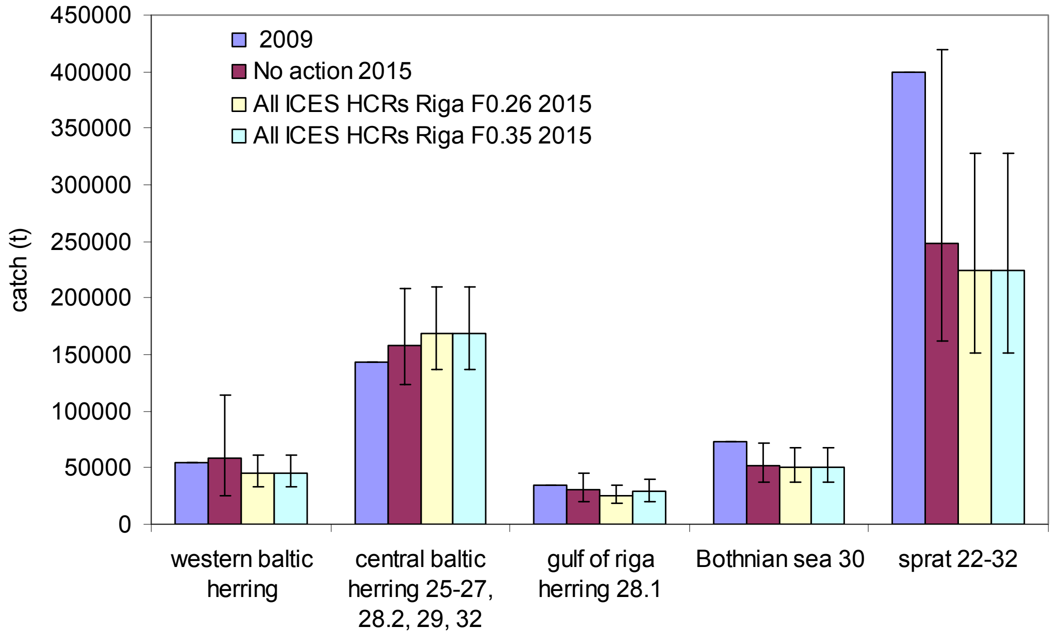
Option 2b assumes that the Gulf of Riga herring management reference points are F = 0.35 [A] and maximum annual TAC variation is 20 % [B].

The outputs presented for Options 2a and 2b are given as at 2015 for consistency with the ICES WKMAMPEL report. The results by stock are shown in (Figure 4). The ICES long-term management plans do not generate significant changes in yield over the assumed 'no change' scenario, although there are gains in the probability of stock sizes being above trigger levels. In general, catches are slightly decreased and SSBs are slightly increased under the ICES HCR compared to the 'no change' scenario. The exception to this is the Central Baltic herring stock where the opposite is true.

Summary TAC allocations under current relative stability conditions are shown in Table 17. However, some of the stock and yield trajectories (Annex 1) did not stabilise until 2020. Furthermore, the WKMAMPEL also presented results for expected stock size and yields taking into account the multispecies interaction between cod, herring and sprat, which depresses herring and sprat stock sizes due to predation pressure. Results for both these calculations are given in respect of Option 2a, as **Output 2a_1** and **Output 2a_2** respectively.

Note that the plots in Annex 1 and the results in Figure 4 display the trajectories of the median values of the stock indicators (with variability indicated as 95% confidence intervals) and there could therefore be significant deviations away from this. Consequently there may be significant variation in yield within and between years which is not identified by these trajectories.

In all the projections, the ICES HCR was implemented in full from 2009 onwards. Although there may be some small gains from implementing the HCR later than 2009, in practice the trajectories of Option 1 and Option 2 are so close that there would be little practical effect of a delayed implementation.



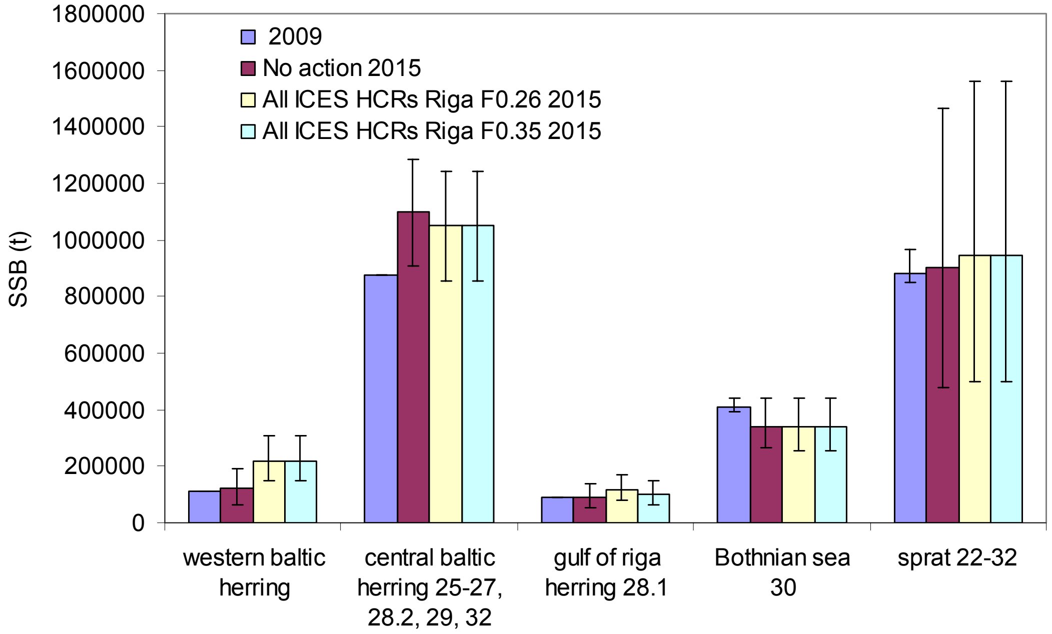


Figure 4 Predicted SSB and EU quota for the different Baltic pelagic stocks in 2015 for the no action (purple) and the ICES HCR with herring F = 0.26 in the Gulf of Riga (cream) and herring F = 0.35 in the Gulf of Riga (sky blue) compared to the situation in 2009.

Table 17 TAC allocations by country for herring (division IIIa, sub-divisions 22-24, Central Baltic herring, Subdivision 28.1, sub-divisions 30-31) and sprat arising from the adoption of the ICES long-term management plan harvest control rules

Herring								
	Denmark	**Estonia**	**Finland**	**Germany**	**Latvia**	**Lithuania**	**Poland**	**Sweden**
2009 TAC	22584	32253	99274	16080	22759	4167	39337	84087
Option 1 no action 2015	24542	33587	88690	17249	20989	5101	47588	92339
Option 2a: ICES HCR, 2015, Gulf of Riga F=0.26	20424	32995	90565	13879	19048	5452	49809	91440
Option 2b: ICES HCR, 2015, Gulf of Riga F=0.35	20424	34509	90565	13879	20812	5452	49809	91440
Output 2a_1: ICES HCR, 2020, Gulf of Riga F=0.26	25482	34497	89969	17790	20277	5599	51969	98146
Output 2a_2: Multispecies HCR, 2015, Gulf of Riga F=0.26	19920	30420	85541	13746	18413	4788	44099	83779
Sprat								
	Denmark	**Estonia**	**Finland**	**Germany**	**Latvia**	**Lithuania**	**Poland**	**Sweden**
2009 TAC	39451	45815	20651	24993	55333	20016	117428	76266
Option 1 no action 2015	27267	31666	14274	17274	38245	13835	81162	52713
Option 2a: ICES HCR, 2015, Gulf of Riga F=0.26	24546	28506	12849	15551	34428	12454	73063	47452
Option 2b: ICES HCR, 2015, Gulf of Riga F=0.35	24546	28506	12849	15551	34428	12454	73063	47452
Output 2a_1: ICES HCR, 2020, Gulf of Riga F=0.26	27397	31817	14342	17357	38427	13900	81549	52964
Output 2a_2: Multispecies HCR, 2015, Gulf of Riga F=0.26	19728	22910	10327	12498	27670	10009	58721	38137

3.2.3 Option 3

Option 3a assumes the full implementation of the ICES long-term management plan as in option 2a but also investigates the potential for expected changes in fleet capacity to increase the profitability of fleet sectors. Analysis of trends in fleet size over recent years was used to project likely fleet sizes in 2015 (Table 18). Full uptake of quota is assumed. ITQs were implemented in Denmark for the pelagic fleet in 2003 and it is assumed that capacity adjustment has already taken place in the Danish fleets, with further capacity reductions unlikely. Consequently Danish fleet capacities are assumed to remain constant at the level observed in 2007.

The EIAA model can allow for the consideration of capacity reductions through constraints on segment specific vessel numbers and average sea days per vessel. However the data required for this feature of the EIAA model was not available for all fleet segments. Instead, the input AER economic indicator data was modified to reflect a change in capacity to a specified level. Economic indicators directly linked to effort (*e.g.* fuel costs) do not need to be altered with changes in capacity as the level of effort required to make the long-term catches will not change with capacity. However vessel costs and capital investment, and consequently depreciation, will change with vessel numbers. Pro rata changes in these costs with changes in vessel numbers were applied for all management scenarios with changes in capacity.

Table 18 Assumed reductions in fleet size by 2015 following current (2005–2007) trends

Member State	Fleet	Fleet size 2005-2007 (vessels)	% reduction	Fleet size 2015
SWE	PTS2440	19	0.47	10
SWE	PTS 40	6	0.38	4
SWE	PTS 1224	6	0.11	5
SWE	DTS1224	14	0.32	10
DNK	PTS2440	7	0.28	5
DNK	PTS1224	34	0.14	30
DNK	PTS 40	2	0.18	2
FIN	PTS2440	19	0.32	13
FIN	PTS1224	34	0.44	19
FIN	PGP012	766	0.00	766
LVA	PTS2440	71	0.35	46
LVA	PTS1224	36	0.38	22
LVA	PG012	747	0.03	722
POL	PTS24-40	52	0.40	31
POL	DTS1224	103	0.42	60
POL	DTS 24-40	41	0.53	19
POL	PG	630	0.40	378
EST	PTS2440	53	0.51	26
EST	PTS1224	18	0.38	11
EST	PG012	880	0.35	568
DEU	DTS 0012	14	0.36	9
DEU	DTS 1224	77	0.35	50
DEU	DTS 2440	26	0.36	17
DEU	PG	1000	0.30	703
LTU	DTS 2440	29	0.40	18
Total		**4685**	**0.24**	**3543**

Source: AER data

*** Danish fleet capacities are assumed to remain at 2007 levels (see discussion of Option 3a in 3.2.3.**

Option 3b takes option 3a to its logical conclusion, applying reductions in fleet capacity required to create profitability for fleet sectors that are still unprofitable with the expected capacity reductions of Option 3a[17]. Fleet sectors that are either stable or profitable under Option 3a keep fleet size changes given in Table 18.

All of the options described so far assume that uptake of herring and sprat remains at the levels seen in 2005-2007 (82.3% and 77.9% respectively, see Table 2). This is unlikely to represent a realistic response to declining TACs, particularly for sprat. It is more likely that countries will increase uptake in response to declining TACs in order to maintain current catches of Baltic pelagic to meet current levels of demand for these products. **Option 3c** examined the level of uptake that would be required for countries to maintain their catch at current levels under the changes to herring and sprat quota predicted when moving from the quotas in 2009 (assuming uptake in 2009 is

[17] Required capacity reductions were calculated using the Excel add-in Solver.

at a similar level to uptake in 2005-2007) to the quotas in 2015 under Option 2a. This approach assumes that the current demand for Baltic sprat products is indicative of demand levels in 2015. Expected fleet sizes in 2015 (see Table 18) are assumed.

Uptake of herring would have to increase only marginally in most countries to cope with this reduction in TAC (Table 19) to deliver a catch that is equivalent to the current catch. Sprat TAC reduces to 56% of its 2009 level, indicating that uptake would have to increase in many countries by more than 100% (i.e. more than the available quota) in order to maintain current levels of sprat catch. If we assume that uptake will increase as much as possible to maintain the previous catch, but not beyond 100% (i.e. catch in 2015 will be either equal to expected 2009 catch or the total Option 2a quota, whichever is the lower) the total catch of sprat is likely to be reduced to about 68% of its current level (Figure 5). For all Member States except Poland and Lithuania this would require uptake to increase to 100%. If the Polish surplus was swapped with other Member States the total catch of Sprat could rise to a maximum of 223,964 tonnes, i.e. 69% of the expected total catch in 2009.

Table 19 Changes in TAC and uptake required to maintain catches of herring and sprat under Option 2a compared with 2009.

	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Sweden
Herring								
TAC in 2015 Option 2a as % of 2009 TAC	89%	96%	87%	86%	81%	118%	115%	101%
Current uptake	55%	79%	83%	93%	92%	51%	64%	96%
Potential catch (equal to current quota * uptake, or Option 2a quota, whichever is lower)	12351	25447	82397	13770	18527	2113	25333	81060
Reduction in current realised catch	0%	0%	0%	8%	12%	0%	0%	0%
Uptake 2015	62%	82%	95%	100%	100%	43%	56%	95%
Expected catch in 2009	264626							
Catch in 2015 Option 2a	260997	(99% of 2009 total)						
Sprat								
TAC in 2015 Option 2a as % of 2009 TAC	56%	56%	56%	56%	56%	56%	56%	56%
Current uptake	93%	94%	87%	106%	95%	53%	47%	100%
Potential catch (equal to current quota * uptake, or Option 2a quota, whichever is lower)	22091	25655	11564	13996	30985	10629	55191	42707
Reduction in current realised catch	40%	40%	36%	47%	41%	0%	0%	44%
Uptake 2015	100%	100%	100%	100%	100%	95%	84%	100%
Expected catch in 2009	311108							
Catch in 2015 Option 2a	211996	(68% of 2009 total)						

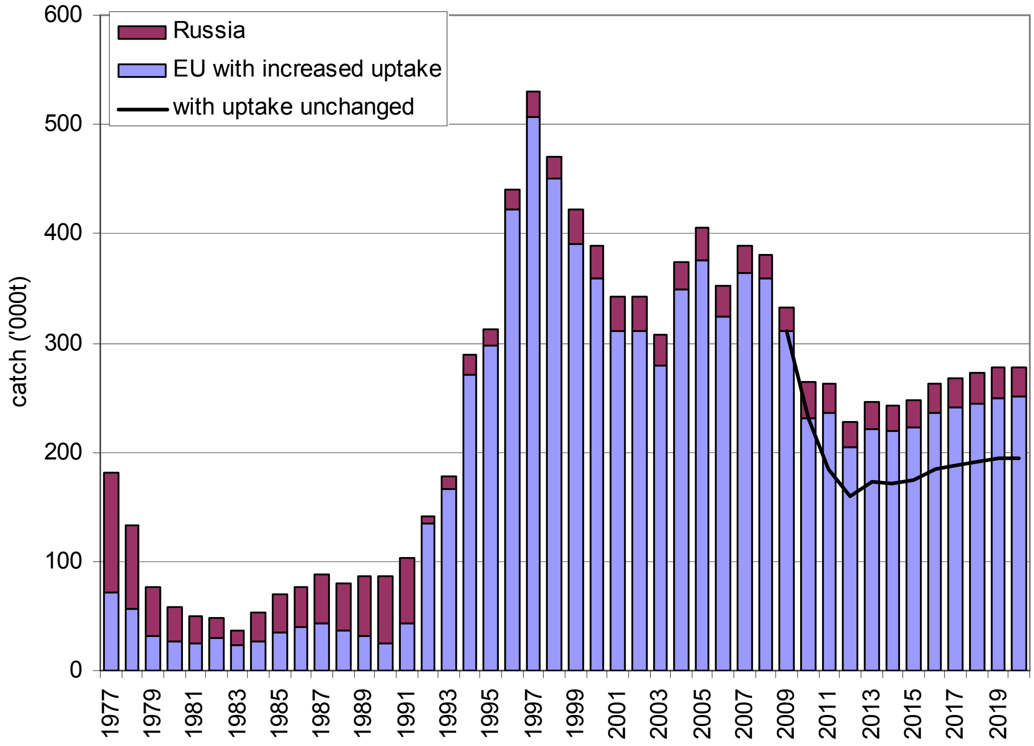


Figure 5 Historical and projected (median) sprat catches[18]. The blue bars are projected beyond 2010 assuming that sprat uptake does increase. Russian catches are shown as 10% of the TAC. The solid line shows projected catches with uptake unchanged from its present level.

One final option (Output 3a_1) was considered, combining option 3a and a 50 % increase in fuel costs compared to 2005-07 levels. This increase is fairly close to those experienced in mid-2008, when fuel price reached a recent all-time high. This option assumes that the behaviour of the fleets will not change from that during the base line period *i.e.* rising fuel costs will not induce changes in fishing operations of the fleet. This assumption would likely be violated as fleets would adapt to rising fuel costs in order to mitigate the impacts of the rising costs *e.g.* shifting effort to closer fishing grounds, or vessels leaving the fishery. Consequently it is likely that this scenario represents a worst case scenario for economic performance of the fleet in the face of rising fuel costs.

[18] Russian catches up to 1992 include catches by Latvia, Lithuania and Estonia. Catches up to 2008 are taken from the 2009 ICES assessment report. Catches in 2009 are assumed to be the historical uptake (81%) applied to the EU TAC (399953 t), plus the same Russian catch as in 2008. Projections from 2010 onwards assume that 10% of the TAC is taken by Russia, and of the balance 81% (the historical uptake rate) is taken by the EU in 2010 and from 2011 onwards the EU responds to declining TAC by increasing uptake to 100%.

4 IMPACT ASSESSMENT

4.1 Environmental Impact

The objective of the multi-annual management plan requested by the Commission is to change herring and sprat management in the Baltic to that which uses a pre-defined, and tested, harvest control rule (HCR) with a target fishing mortality associated with Maximum Sustainable Yield. The European Community and Member States committed themselves to maintaining or restoring fish stocks to levels that can produce at MSY no later than 2015 at the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002. The plan for Baltic herring and sprat is consistent with and delivers this management, by adopting a target fishing mortality close to Fmsy for all Baltic herring and sprat stocks. All stocks are likely to achieve the biomass associated with MSY by 2020, and most by 2015; all will be managed at the fishing mortality associated with MSY by 2015.

It should be noted that ICES did not recommend a full HCR for western Baltic herring and the Bothnian Sea (sub-division 30) (Table 13). This impact assessment uses the results of the WKMAMPEL report to derive HCRs that are likely to be consistent with the Commission and ICES objectives.

Adoption of MSY targets is likely to improve general ecosystem health in addition to improving the health of the target species. This is because managing fish stocks at MSY almost always involves an increase in stock biomass, which creates a larger available resource for other predators in the ecosystem. However, the anticipated maximum yield may not be achievable, because of other ecosystem interactions; this is well demonstrated by the interaction with cod which depresses yields of herring and sprat in the multispecies scenario (Output 2a_2).

Option 1 is not consistent with EC and WSSD objectives for sustainable environmental management.

Option 2 (a-b) is consistent with EC and WSSD objectives for sustainable environmental management.

Option 3 (a-c) is consistent with EC and WSSD objectives for sustainable environmental management and additionally provides improved economic performance.

4.2 Economic

4.2.1 Fleet profitability

The predicted performance of the fleet under the various options and outputs is summarised in Table 20. Table 21, Table 22 and Table 23 present summary results and comparisons between the different segments for the various options. The full results are shown in Annex 2.

Table 20 Summary results by option. The key options are shown in bold.

Options	Total gross rev. €m	Total wages €m	Avg crew wage €'000	Total value added €m	No profitable fleets	No of stable fleets	No. unprofitable fleets
Baseline 2005-2007	**226.0**	**57.6**	**6.2**	**114.4**	**12**	**6**	**7**
Option 1 - no change, situation in 2015	**213.4**	**54.9**	**5.9**	**108.1**	**12**	**5**	**8**
Option 2a ICES HCR, 2015, Gulf of Riga F=0.26	**211.0**	**54.6**	**5.9**	**107.1**	**12**	**5**	**8**
Option 2b ICES HCR, Gulf of Riga 0.35, 2015	211.4	54.6	5.9	107.2	12	5	8
Output 2a_1 - ICES HCR, 2020, Gulf of Riga F=0.26	214.8	55.6	6.0	109.2	12	5	8
Output 2a_2, ICES multispecies, 2015, Gulf of Riga F 0.26	208.5	53.9	5.8	105.5	12	5	8
Option 3a: Option 2a + expected vessel trend	**211.0**	**54.6**	**8.4**	**116.6**	**16**	**2**	**7**
Option 3b: Option 3a + additional reductions required to reach profitability	211.0	54.6	10.8	120.1	20	3	2
Option 3c: Option 3a with adjusted uptake	215.8	55.8	8.6	118.8	17	1	7
Output 3a_1: Option 3a with increased fuel cost	211.0	43.3	6.7	98.4	12	7	6

A brief summary of the total changes are as follows:

- Option 1 (no change) results in a minor loss in value added across the fleet between 2005-7 and 2015 (down 5.5%), which is consistent with the reduction in catch of sprat that would accompany this. The number of unprofitable fleets increases by 1 and average profitability is reduced.

- Option 2a (implement multi-annual management plan) results in a marginally higher loss in value added across the fleet (down 6.4% compared to 5.5%), but with similar results to Option 1. The further reduction in sprat catch accompanying a move to the ICES HCR (Option 2a) is offset by the increase in central Baltic herring catch for some fleets, resulting in a neutral impact of the implementation of the multi-annual management plan. Profitability decreases only slightly, and the number of unprofitable fleets is the same as in Option 1.

- Option 3 (reduced fleet size): Profitability for all fleets improves under Option 3a because of the reduction in fleet size. The number of profitable fleets increases from 12 to 16, but with 7 segments remaining as unprofitable. The results are improved significantly if the policy of fleet adjustment is improved for specific countries (see Table 23), or if uptake is assumed to increase to the maximum available.

Although there are changes between the current situation (2005-07) and the various options, the main comparison in this impact assessment must be between Option 2 and Option 1.

Moving to Option 2a from Option 1 (Table 20) results in no impact on most fleets, and only a minor negative impact on profitability for the following fleets:

- Latvia: Passive gear 0-12m
- Latvia: Pelagic trawl 24-20m
- Sweden: Pelagic trawl 40m+
- Sweden: Pelagic trawl 12-24m

A significant impact is only apparent in the following fleets

- Latvia: Pelagic trawl 12-24m
- Estonia: Pelagic trawl 24-40m
- Estonia: Pelagic trawl 12-24m

These fleets tend to have a high dependency on herring (Latvian fleets – Table 5) and sprat (Estonian fleets) and show very low or negative gross value added, negative cash flow and profitability even in the reference years of 2005-07. Although their situation gets worse under Option 2a, the changes in percentage profit are largely a result of the very small volumes being generated by these fleets. Thus we conclude that Option 2a **does not** create a significantly poorer situation for all Baltic pelagic fleets compared to Option 1, the no change scenario.

Moving to Option 3a improves profitability and crew wage for the majority of fleets, although some remain unprofitable. The Latvian 12-24m and passive gear are marginally less profitable under Option 3a than 2a. Because this option requires a reduction in fleet size employment is negatively impacted. However, almost all fleets are more profitable under this option than they were in 2005-2007, the base year; the only fleets that are not more profitable are the aforementioned Latvian fleets, and the Swedish Pelagic 12-24m fleet.

Table 21 EIAA modelling results for the situation in 2005-07, Option 1 (no change), Option 2 and Option 3 (base cases). Dependencies are highlighted following the scheme in Table 4

	2005-7				Option 1 - no change, situation in 2015				Option 2a ICES HCR, 2015, Gulf of Riga F=0.26				Option 3a: Option 2a + expected vessel trend			
	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)
Denmark																
PTS 24-40m	2.99	8%	36	56.9	2.87	7%	36	55.1	2.85	7%	36	54.8	3.18	15%	26	76.5
PTS 12-24m	5.95	-1%	40	116.9	5.75	-2%	40	114.0	5.72	-2%	40	113.5	6.00	3%	35	131.7
PTS 40m+	3.55	21%	25	55.0	3.34	19%	25	52.4	3.30	19%	25	52.0	3.47	25%	21	63.4
Estonia																
PTS 24-40m	0.72	-89%	329	10.8	-0.60	-128%	329	7.4	-0.74	-137%	329	7.0	1.03	-64%	162	14.2
PTS 12-24m	0.01	-123%	57	3.0	-0.12	-187%	57	1.8	-0.14	-199%	57	1.7	-0.01	-117%	36	2.7
PG 0-12m	1.98	11%	2528	0.5	1.97	11%	2528	0.5	1.96	11%	2528	0.5	1.97	15%	1631	0.8
Finland																
PTS 24-40m	6.09	3%	67	57.1	4.92	-1%	67	46.1	4.87	-1%	67	45.7	4.87	5%	45	67.2
PTS 12-24m	1.42	-2%	59	14.2	1.13	-9%	59	11.3	1.12	-9%	59	11.2	1.12	5%	33	20.0
PG 0-12m	4.55	26%	938	0.4	4.46	26%	938	0.4	4.46	26%	938	0.4	4.46	26%	938	0.4
Germany																
DTS 0-12m	0.53	-21%	34	5.2	0.53	-21%	34	17.9	0.53	-21%	34	17.9	0.59	-10%	22	27.7
DTS 12-24m	11.70	13%	231	57.9	11.73	13%	231	34.7	11.73	13%	231	34.7	12.54	20%	149	53.8
DTS 24-40m	42.06	43%	272	34.7	40.77	42%	272	56.4	40.61	42%	272	56.2	43.15	48%	173	88.1
PG 0-12m	0.28	-30%	285	17.8	0.33	-29%	285	5.3	0.32	-29%	285	5.3	1.12	-15%	200	7.5
Latvia																
PTS 24-40m	7.88	42%	428	4.2	5.22	38%	428	3.0	4.84	37%	428	2.8	5.30	42%	279	4.3
PTS 12-24m	-0.32	-44%	107	8.2	-0.36	-47%	107	6.3	-0.34	-56%	107	7.5	-0.16	-48%	67	12.0
PG 0-12m	0.08	-28%	1132	0.4	0.21	-28%	1132	0.4	0.20	-29%	1132	0.3	0.20	-29%	1094	0.3
Lithuania																
DTS 24-40m	1.22	-3%	166	7.0	1.11	-4%	166	6.6	1.11	-4%	166	6.6	1.39	6%	100	11.0
Poland																
PTS 24-40m	5.21	3%	406	8.7	4.41	1%	406	7.7	4.42	1%	406	7.7	5.15	10%	242	12.9
DTS 12-24m	2.04	-2%	401	3.4	2.08	-2%	401	3.5	2.09	-2%	401	3.5	2.31	7%	233	6.0
DTS 24-40m	0.43	-30%	254	2.6	0.36	-32%	254	2.4	0.36	-32%	254	2.4	0.70	-10%	120	5.2
PG 0-12m	7.50	44%	1300	1.5	7.59	44%	1300	1.5	7.62	44%	1300	1.6	7.83	49%	780	2.6
Sweden																
PTS 24-40m	7.15	22%	102	22.1	5.76	19%	102	17.9	5.61	19%	102	17.5	5.71	26%	54	33.1
PTS 40m+	4.23	16%	54	18.7	3.44	12%	54	15.4	3.36	11%	54	15.0	3.45	20%	33	24.4
PTS 12-24m	0.28	10%	11	7.7	0.24	8%	11	6.7	0.24	7%	11	6.6	0.24	9%	10	7.4
DTS 12-24m	0.99	18%	32	11.1	0.97	18%	32	10.9	0.96	18%	32	10.8	0.99	21%	22	15.8

Note: PTS – Pelagic Trawl; DTS – Demersal Trawl; PG – Passive Gear.

As would be expected the Estonian and Latvian fleets are affected positively by choosing the ICES alternative fishing mortality for the Gulf of Riga (F=0.35 with TAC variation = 20%), but this still does not raise most of the fleets into profitability (see Option 2b, Table 22). Also as expected, profitability will improve by 2020 as stocks of western Baltic herring, Gulf of Riga herring and central Baltic sprat increase to their asymptotic levels (Output 2a_1). Profitability is reduced if the likely impact of multispecies interactions between cod, herring and sprat are taken into account (Output 2a_2).

Table 22 EIAA modelling results for Option 1 (no change) and the variants on Option 2

	Option 1 - no change, situation in 2015				Option 2b ICES HCR, Gulf of Riga 0.35, 2015				Output 2a_1 - ICES HCR, 2020, Gulf of Riga F=0.26				Output 2a_2, ICES multispecies, 2015, Gulf of Riga F 0.26			
	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)
Denmark																
PTS 24-40m	2.87	7%	36	55.1	2.85	7%	36	54.8	2.87	7%	36	55.2	2.84	7%	36	54.8
PTS 12-24m	5.75	-2%	40	114.0	5.72	-2%	40	113.5	5.76	-2%	40	114.2	5.71	-2%	40	113.4
PTS 40m+	3.34	19%	25	52.4	3.30	19%	25	52.0	3.35	19%	25	52.6	3.30	19%	25	51.9
Estonia																
PTS 24-40m	-0.60	-128%	329	7.4	-0.71	-135%	329	7.1	-0.52	-127%	329	7.6	-0.95	-146%	329	6.5
PTS 12-24m	-0.12	-187%	57	1.8	-0.14	-199%	57	1.7	-0.12	-186%	57	1.9	-0.16	-214%	57	1.5
PG 0-12m	1.97	11%	2528	0.5	1.98	11%	2528	0.5	1.99	11%	2528	0.5	1.95	11%	2528	0.5
Finland																
PTS 24-40m	4.92	-1%	67	46.1	4.87	-1%	67	45.7	4.95	-1%	67	46.4	4.75	-1%	67	44.5
PTS 12-24m	1.13	-9%	59	11.3	1.12	-9%	59	11.2	1.14	-8%	59	11.4	1.09	-10%	59	10.9
PG 0-12m	4.46	26%	938	0.4	4.46	26%	938	0.4	4.46	26%	938	0.4	4.45	26%	938	0.4
Germany																
DTS 0-12m	0.53	-21%	34	17.9	0.53	-21%	34	17.9	0.54	-21%	34	17.9	0.53	-21%	34	17.8
DTS 12-24m	11.73	13%	231	34.7	11.73	13%	231	34.7	11.75	13%	231	34.8	11.73	13%	231	34.7
DTS 24-40m	40.77	42%	272	56.4	40.61	42%	272	56.2	40.78	42%	272	56.4	40.45	42%	272	56.0
PG 0-12m	0.33	-29%	285	5.3	0.32	-29%	285	5.3	0.35	-29%	285	5.3	0.31	-29%	285	5.3
Latvia																
PTS 24-40m	5.22	38%	428	3.0	4.91	37%	428	2.8	5.23	38%	428	3.0	4.51	36%	428	2.7
PTS 12-24m	-0.36	-47%	107	6.3	-0.34	-51%	107	7.1	-0.32	-57%	107	8.5	-0.35	-55%	107	7.0
PG 0-12m	0.21	-28%	1132	0.4	0.21	-29%	1132	0.4	0.21	-29%	1132	0.4	0.20	-29%	1132	0.3
Lithuania																
DTS 24-40m	1.11	-4%	166	6.6	1.11	-4%	166	6.6	1.13	-4%	166	6.7	1.08	-5%	166	6.5
Poland																
PTS 24-40m	4.41	1%	406	7.7	4.40	1%	406	7.7	4.71	2%	406	8.1	4.11	0%	406	7.3
DTS 12-24m	2.08	-2%	401	3.5	2.09	-2%	401	3.5	2.10	-1%	401	3.5	2.08	-2%	401	3.5
DTS 24-40m	0.36	-32%	254	2.4	0.36	-32%	254	2.4	0.37	-32%	254	2.5	0.34	-33%	254	2.4
PG 0-12m	7.59	44%	1300	1.5	7.62	44%	1300	1.6	7.64	44%	1300	1.6	7.61	44%	1300	1.6
Sweden																
PTS 24-40m	5.76	19%	102	17.9	5.61	19%	102	17.5	6.00	20%	102	18.7	5.43	18%	102	17.0
PTS 40m+	3.44	12%	54	15.4	3.36	11%	54	15.0	3.57	13%	54	15.9	3.25	11%	54	14.6
PTS 12-24m	0.24	8%	11	6.7	0.24	7%	11	6.6	0.25	9%	11	7.0	0.23	7%	11	6.4
DTS 12-24m	0.97	18%	32	10.9	0.96	18%	32	10.8	0.97	18%	32	10.9	0.96	17%	32	10.8

Note: PTS – Pelagic Trawl; DTS – Demersal Trawl; PG – Passive Gear.

Further reductions in fleet size are able to create positive profits for most fleets that remain unprofitable under Option 3a (Option 3b, Table 23) but in some cases (particularly the Latvian and Estonian fleets) fleet size had to be reduced very significantly to achieve this (Table 24). Even then for two Latvian fleets (Pelagic trawl 12-24m and Passive Gear 0-12m) profitability could not be achieved. Profitability under option 3b is at least equal to, if not greater than, profitability under option 3a for all fleet segments.

As would be expected, most of the fleets become more profitable than under Option 3a when uptake is allowed to increase (Option 3c). This includes the poorly performing Latvian pelagic trawl 12-24 segment. However, some fleets experience declining profitability due to the increase in effort required to catch the increased quantities of fish which is not matched by the increase in value of the catch. These fleets are Germany demersal 24-40, Latvia passive gear, Poland demersal 12-24 and passive gear, and Sweden pelagic 12-24. This result shows the sensitivity of some fleets to the costs involved in fishing pelagics.

The relative performance of fleet segments under options 3b and 3c is dependent on the relative magnitude of: the improvement in profitability of a segment under option 3b compared to option 3a; and, the change in profitability of the fleet segment with increases in uptake (option 3c) compared to option 3a.

14 fleet segments have higher profitability under option 3c compared to option 3b. All of these fleet segments are already profitable under option 3a, so option 3b does not result in an increase in profitability. However option 3c gives an increase in profitability for these fleet segments through increased uptake. The magnitude of increase in profitability is in general very low, not exceeding 2.1 % for any fleet segment.

However for 11 fleet segments, profitability is lower for option 3c than for option 3b. For the five fleets that experience declining profitability with increased uptake (see discussion above), profitability under option 3c is lower than for option 3a. Consequently profitability under option 3c must also be lower than for 3b, as profitability under option 3b is always equal to, if not greater than, profitability under option 3a. However the magnitude of decrease in profitability is generally low, only exceeding 0.5 % for one fleet segment (Latvian passive gear 0-12m).

The remaining six fleets segments experiencing decreased profitability under option 3c (relative to option 3b) are all highly unprofitable under option 3a. Consequently large capacity reductions are required under option 3b to achieve large increases in profitability in order for the segments to be classified as profitable. In contrast the increase in profitability for these fleets segments through increased uptake (option 3c) is much lower due to the relatively small changes in quota (see Table 19). Consequently these fleet segments perform significantly better under option 3b compared to 3c. The magnitude of improvement is most pronounced for the profitability of the Estonian 12-24m and 24-40m pelagic trawl segments with a difference of 117 % and 62 % between options 3b and 3c.

As expected, all fleets become less profitable with an increase in fuel price (Output 3a_1). However, 12 out of the 25 fleets remain profitable even with this increase in price, compared to the 16 that are profitable without an increase (Option 3a).

Table 23 EIAA modelling results for Option 1 (no change) and the variants on Option 3

	Option 1 - no change, situation in 2015				Option 3b: Option 3a + additional reductions required to reach profitability in 2015				Option 3c: Option 3a with adjusted uptake in 2015				Output 3a_1: Option 3a with increased fuel cost in 2015			
	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)	gross value added (€M)	net profit/gross revenues	Employment	crew wage (€'000)
Denmark																
PTS 24-40m	2.87	7%	36	55.1	3.18	15%	26	76.5	3.19	15%	26	76.7	2.54	9%	26	64.3
PTS 12-24m	5.75	-2%	40	114.0	6.00	3%	35	131.7	6.01	3%	35	132.0	5.23	0%	35	118.6
PTS 40m+	3.34	19%	25	52.4	3.47	25%	21	63.4	3.49	26%	21	63.7	3.10	21%	21	57.9
Estonia																
PTS 24-40m	-0.60	-128%	329	7.4	2.62	1%	13	175.6	1.15	-61%	162	14.8	0.18	-66%	162	9.8
PTS 12-24m	-0.12	-187%	57	1.8	0.17	5%	3	30.0	0.00	-112%	36	2.9	-0.17	-131%	36	0.5
PG 0-12m	1.97	11%	2528	0.5	1.97	15%	1631	0.8	1.99	15%	1631	0.8	1.70	12%	1631	0.7
Finland																
PTS 24-40m	4.92	-1%	67	46.1	4.87	5%	45	67.2	5.51	7%	45	76.1	4.13	3%	45	57.0
PTS 12-24m	1.13	-9%	59	11.3	1.12	5%	33	20.0	1.27	7%	33	22.8	0.90	0%	33	16.1
PG 0-12m	4.46	26%	938	0.4	4.46	26%	938	0.4	4.54	26%	938	0.4	4.00	21%	938	0.4
Germany																
DTS 0-12m	0.53	-21%	34	17.9	0.68	5%	5	125.7	0.59	-10%	22	27.8	0.46	-12%	22	22.5
DTS 12-24m	11.73	13%	231	34.7	12.54	20%	149	53.8	12.56	20%	149	53.9	11.39	17%	149	49.4
DTS 24-40m	40.77	42%	272	56.4	43.15	48%	173	88.1	43.07	48%	173	88.0	41.29	45%	173	84.7
PG 0-12m	0.33	-29%	285	5.3	2.30	5%	76	19.9	1.14	-15%	200	7.6	0.43	-19%	200	5.8
Latvia																
PTS 24-40m	5.22	38%	428	3.0	5.30	42%	279	4.3	5.51	42%	279	4.5	4.33	34%	279	3.6
PTS 12-24m	-0.36	-47%	107	6.3	0.09	-35%	11	75.2	-0.15	-47%	67	12.9	-0.70	78%	67	-34.2
PG 0-12m	0.21	-28%	1132	0.4	0.22	-26%	113	3.4	0.21	-29%	1094	0.4	0.10	-16%	1094	0.2
Lithuania																
DTS 24-40m	1.11	-4%	166	6.6	1.39	6%	100	11.0	1.48	7%	100	11.5	0.96	1%	100	8.4
Poland																
PTS 24-40m	4.41	1%	406	7.7	5.15	10%	242	12.9	5.94	11%	242	14.6	2.89	2%	242	8.2
DTS 12-24m	2.08	-2%	401	3.5	2.31	7%	233	6.0	2.29	7%	233	6.0	1.14	-1%	233	3.3
DTS 24-40m	0.36	-32%	254	2.4	0.94	5%	27	23.1	0.74	-9%	120	5.4	-0.51	-21%	120	-1.0
PG 0-12m	7.59	44%	1300	1.5	7.83	49%	780	2.6	7.77	49%	780	2.6	7.25	45%	780	2.4
Sweden																
PTS 24-40m	5.76	19%	102	17.9	5.71	26%	54	33.1	5.76	26%	54	33.4	4.45	19%	54	26.0
PTS 40m+	3.44	12%	54	15.4	3.45	20%	33	24.4	3.48	20%	33	24.6	2.50	11%	33	18.0
PTS 12-24m	0.24	8%	11	6.7	0.24	9%	10	7.4	0.24	9%	10	7.4	0.16	1%	10	5.0
DTS 12-24m	0.97	18%	32	10.9	0.99	21%	22	15.8	0.99	21%	22	15.8	0.69	13%	22	11.3

Note: PTS – Pelagic Trawl; DTS – Demersal Trawl; PG – Passive Gear.

Table 24 Prospective changes to fleet numbers (Option 3b) (significant differences from Table 18 are shown in bold)

Country	Segment	Fleet size (2005-2007)	% reduction	Final fleet size (2015)
SWE	PTS2440	19	0.47	10
SWE	PTS 40	6	0.38	4
SWE	PTS 1224	6	0.11	5
SWE	DTS1224	14	0.32	10
DNK	PTS2440	7	0.28	5
DNK	PTS1224	34	0.14	30
DNK	PTS 40	2	0.18	2
FIN	PTS2440	19	0.32	13
FIN	PTS1224	34	0.44	19
FIN	PGP012	766	0.00	766
LVA	PTS2440	71	0.35	46
LVA	**PTS1224**	**36**	**0.90**	**4**
LVA	**PG012**	**747**	**0.90**	**75**
POL	PTS24-40	52	0.40	31
POL	DTS1224	103	0.42	60
POL	**DTS 24-40**	41	0.90	4
POL	PG	630	0.40	378
EST	**PTS2440**	**53**	**0.96**	**2**
EST	**PTS1224**	**18**	**0.94**	**1**
EST	PG012	880	0.35	568
DEU	**DTS 0012**	14	0.86	2
DEU	DTS 1224	77	0.35	50
DEU	DTS 2440	26	0.36	17
DEU	**PG**	**1000**	**0.73**	**267**
LTU	DTS 2440	29	0.40	18
Total		**4685**	**0.49**	**2384**

4.2.2 Economic vulnerability and value added

Changes in fleet sector value added were shown in Table 20. Options without changes in fleet size (i.e. Options 1 and 2) resulted in a reduction in value added of about 6% (e.g. Option 2a, 6.1% reduction). Options in which fleet size was reduced – Options 3a and 3b, for instance – resulted in significant increases in fleet value added (3% for Option 3a, 6% for Option 3b and 5% for Option 3c).

In order to understand the possible impact on total pelagic sector value added, fleet value added is derived from catch revenues attributable to pelagic species (using the dependency data in Table 4.) Total sector value added is calculated as the sum of pelagic species fleet value added and the processing multiplier associated with this figure, adjusted for the reduction in processing volume anticipated to arise from reductions in catch. Processing income multipliers were derived from Salz *et al* (2007). The results are shown in Table 25.

The value added of the pelagic component (fleet value added and processing value added) would reduce from the base period from €96 million to 82 million in Option 1 (no change), with a further small reduction, 81 million, in Option 2a. The results improve significantly as a result of reduced fleet sizes and uptake (€88 million for Option 3a and €91 million for Option 3b and 3c).

The main beneficiaries as result of fleet structural change, improving the profitability of some fleets, would be Estonia and Latvia, and Poland. However, this requires a substantial commitment to capacity reduction.

Table 25 Estimated pelagic sector value added resulting from the different management options in 2015 (€ million). Option 1 - no change; Option 2a Gulf of Riga F=0.26; Option 3a: expected vessel trend; Option 3b: Option 3a with further capacity reductions to force profitability; Option 3c: Option 3a with adjusted uptake.

	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Sweden	Total	Change on base year	Change on Option 1
Fleet value added (Tables 20-22)											
Base year: 2005-2007	12.5	2.7	12.1	54.6	7.6	1.2	15.2	12.7	119		
Option 1 no change	12.0	1.3	10.5	53.4	5.1	1.4	14.4	10.4	108	-9%	
Option 2a	11.9	1.1	10.5	53.2	4.7	1.4	14.5	10.2	107	-9%	-1%
Option 3a	13.8	3.0	10.5	57.4	5.3	1.4	16.0	10.4	118	-1%	9%
Option 3b	13.8	4.8	10.5	58.7	5.6	1.4	16.2	10.4	121	2%	12%
Option 3c	13.8	3.1	11.3	57.4	5.6	1.5	16.7	10.5	120	1%	11%
Pelagic sector value added	6	2.4	5.1	3.9	5.6	0.4	6.5	6.1			
Pelagic dependency	49%	45%	94%	7%	79%	25%	33%	71%			
Catching value added (pelagic component)											
Base year: 2005-2007	6.1	1.2	11.4	3.9	6.1	0.3	5.1	9.0	43		
Option 1 no change	5.9	0.6	9.9	3.8	4.0	0.4	4.8	7.4	37	-15%	
Option 2a	5.8	0.5	9.9	3.8	3.7	0.4	4.8	7.2	36	-16%	-2%
Option 3a	6.8	1.4	9.9	4.1	4.3	0.4	5.3	7.4	39	-8%	7%
Option 3b	6.8	2.2	9.9	4.2	4.5	0.4	5.4	7.4	41	-6%	10%
Option 3c	6.8	1.4	10.7	4.1	4.4	0.4	5.6	7.4	41	-5%	11%
Processing income multiplier	1.63	0.99	1.18	1.02	1.36	1.26	1.21	1.07			
Total value added (pelagic component)											
Base year: 2005-2007	16.2	2.4	24.8	7.9	14.3	0.7	11.2	18.5	96.1		
Option 1 no change	15.5	1.1	21.6	7.7	9.5	0.8	10.6	15.2	82.1	-14%	
Option 2a	15.4	1.0	21.5	7.7	8.8	0.8	10.7	14.9	80.7	-16%	-2%
Option 3a	17.8	2.7	21.5	8.3	10.0	0.8	11.8	15.2	88.2	-8%	7%
Option 3b	17.8	4.3	21.5	8.5	10.5	0.8	11.9	15.2	90.6	-6%	10%
Option 3c	17.9	2.8	23.3	8.3	10.5	0.9	12.3	15.3	91.3	-5%	11%

Table 21 – Table 23 (Fleet Value added), Table 3 (Pelagic sector value added), Table 8 (Pelagic dependency), Salz *et a*l (2007) (Income multiplier coefficients).

4.3 Impact on third countries

Third countries affected by this proposal are Russia, in respect of central Baltic herring and sprat, and Norway in respect of herring in IIIa, a component of which is comprised of the western Baltic herring (22-24) stock.

The methods adopted for allocating western Baltic herring catches to Divisions IIIa and 22-24 are described in Section 2.4. The EU quota in IIIa is adjusted to take account of Norwegian catches under the EU-Norway agreement. In Option 2 the proposed harvest control rule and long-term management plan would not alter the need to reach agreement with Norway on a split of the TAC in Division IIIa. As shown in Figure 4, the proposed multi-annual plan will not significantly change the TAC over the current level (although it will change it compared to Option 1, no change), and would therefore be unlikely to have significant impacts on EU-Norway negotiations or relations.

For central Baltic herring and sprat, the EU takes into account catches by Russia when setting its TAC. Russian catches of Baltic herring and sprat are about 7% of the total. The most significant consequence of the adoption of a multi-annual plan will be to require negotiation and agreement with Russia on the TAC. We understand that these agreements will be achievable, and will probably result in allocation of 10% of central Baltic herring and Baltic sprat TAC to Russia. This potential allocation has been included in our calculations above.

4.4 Social Impact

4.4.1 Employment effects

The analysis of the different options reveals very little change in catching sector wages between Options 1 and 2a (or with any other of the option 2 variations). However, Options 3a and 3b result in fleet reductions with a consequence of reduced employment (Table 26). Were capacity to reduce according to existing structural trends, the number of fishers would fall by 2,792, from 9,294 to 6,502 (down by 30%)[19]. Were capacity to reduce to a level where fleets were profitable, the number of fishers employed would fall by 4,244 (down by 45%).

Onshore sector employment is likely to be directly related to the reduction in tonnage throughput, following the different options. The impact on pelagic sector employment was estimated by adjusting the total pelagic processing employment to account for reductions in Baltic-dependent processing employment (Table 9) anticipated under the catch reductions in the different options (where catch is equal to TAC times uptake). Upstream employment was adjusted in proportion to total pelagic employment changes using the

[19] The base year period is based on average crew numbers for the years 2005-2007. In actual fact, employment had fallen to 8,664 (Table 8) by 2007.

employment multipliers (Table 8, Table 9 and Table 10). Changes in employment were calculated for the Baltic pelagic processing and upstream sectors (Table 27) as well as for the national pelagic processing sector (

Table 27 Projected processing and upstream employment changes for Baltic pelagic processing sectors in 2015 (no. employees). Option 1 - no change; Option 2a ICES HCR, 2015, Gulf of Riga F=0.26; Option 2b, Gulf of Riga F=0.35; Output 2a_2, multispecies results; Option 3c: Option 3a with adjusted uptake

	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Swed
Total employment								
Base year: 2005-2007	75	880	595	53	1156	183	2309	
Option 1 no change	41	616	491	31	725	118	1680	
Option 2a	36	578	493	26	654	111	1622	
Option 2b	36	592	493	26	677	111	1622	
Output 2a_2	33	542	482	25	608	102	1515	
Option 3c	39	609	566	26	697	168	2172	

Table 28) in order to show the overall social effect resulting from the change.

Projected reductions in overall employment are relatively modest (down 4% and a loss of 990 jobs in the processing sector, and a further 252 upstream) compared to the total pelagic processing sector (

Table 27 Projected processing and upstream employment changes for Baltic pelagic processing sectors in 2015 (no. employees). Option 1 - no change; Option 2a ICES HCR, 2015, Gulf of Riga F=0.26; Option 2b, Gulf of Riga F=0.35; Output 2a_2, multispecies results; Option 3c: Option 3a with adjusted uptake

	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Swed
Total employment								
Base year: 2005-2007	75	880	595	53	1156	183	2309	
Option 1 no change	41	616	491	31	725	118	1680	
Option 2a	36	578	493	26	654	111	1622	
Option 2b	36	592	493	26	677	111	1622	
Output 2a_2	33	542	482	25	608	102	1515	
Option 3c	39	609	566	26	697	168	2172	

Table 28), though account for a much higher proportion of the Baltic pelagic processing sector (Table 27). Nevertheless, for some key producers, the impacts are likely to be high, particularly in those states that have high dependency on processing sectors such as Latvia. The reductions in processing employment, of 460 in Latvia and 271 in Estonia, are fairly significant. The ability to sustain labour would thus depend on the ability of the

main producers (Poland and the Baltic States for human consumption fisheries, Denmark for fish meal) to sustain supplies by sourcing from elsewhere.

It should be noted that option 3a is identical in terms of processing to option 2a, since it only concerns a reduction in fleet size. Option 3c allows for more product, and therefore more employment, than Options 1 and 2 (i.e. the increase in uptake offsets the reduction in TAC from following the multi-annual management plan. The highest impact is seen if, under Option 2, the stock responds to cod recovery as anticipated by the multispecies model, in which case herring and sprat stocks decline further (Option 2a_2).

Table 26 Employment reduction as a result of fleet capacity changes

Country	Segment	2005-2007 Average		Option 3a: Current trend		Option 3b: Profitable fleet		Loss in employment	
		Fleet (vessels)	Employment (persons)	Fleet (vessels)	Employment (persons)	Fleet (vessels)	Employment (persons)	3a (persons)	3a (persons)
SWE	PTS2440	19	102	10	54	10	54	48	48
SWE	PTS 40	6	54	4	33	4	33	21	21
SWE	PTS 1224	6	11	5	10	5	10	1	1
SWE	DTS1224	14	32	10	22	10	22	10	10
DNK	PTS2440	7	36	5	26	5	26	10	10
DNK	PTS1224	34	40	30	35	30	35	5	5
DNK	PTS 40	2	25	2	21	2	21	4	4
FIN	PTS2440	19	67	13	45	13	45	22	22
FIN	PTS1224	34	59	19	33	19	33	26	26
FIN	PGP012	766	938	766	938	766	938	0	0
LVA	PTS2440	71	428	46	279	46	279	149	149
LVA	PTS1224	36	107	22	67	4	11	40	96
LVA	PG012	747	1132	722	1094	75	113	38	1019
POL	PTS24-40	52	406	31	242	31	242	164	164
POL	DTS1224	103	401	60	233	60	233	168	168
POL	DTS 24-40	41	254	19	120	4	27	134	227
POL	PG	630	1300	378	780	378	780	520	520
EST	PTS2440	53	329	26	162	2	13	167	316
EST	PTS1224	18	57	11	36	1	3	21	54
EST	PG012	880	2528	568	1631	568	1631	897	897
DEU	DTS 0012	14	34	9	22	2	5	12	29
DEU	DTS 1224	77	231	50	149	50	149	82	82
DEU	DTS 2440	26	272	17	173	17	173	99	99
DEU	PG	1000	285	703	200	267	76	85	209
LTU	DTS 2440	29	166	18	100	18	100	66	66
Total		**4684**	**9294**	**3543**	**6502**	**2384**	**5050**	**2792**	**4244**

Table 27 Projected processing and upstream employment changes for Baltic pelagic processing sectors in 2015 (no. employees). Option 1 - no change; Option 2a ICES HCR, 2015, Gulf of Riga F=0.26; Option 2b, Gulf of Riga F=0.35; Output 2a_2, multispecies results; Option 3c: Option 3a with adjusted uptake

	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Sweden	Total	Change on base year	Change on Option 1
Total employment											
Base year: 2005-2007	75	880	595	53	1156	183	2309	51	5303		
Option 1 no change	41	616	491	31	725	118	1680	37	3739	-29%	
Option 2a	36	578	493	26	654	111	1622	35	3554	-33%	-5%
Option 2b	36	592	493	26	677	111	1622	35	3591	-32%	-4%
Output 2a_2	33	542	482	25	608	102	1515	34	3341	-37%	-11%
Option 3c	39	609	566	26	697	168	2172	36	4313	-19%	15%

Table 28 Projected processing and upstream employment changes for National pelagic processing sectors in 2015 (no. employees). Option 1 - no change; Option 2a ICES HCR, 2015, Gulf of Riga F=0.26; Option 2b, Gulf of Riga F=0.35; Output 2a_2, multispecies results; Option 3c: Option 3a with adjusted uptake

	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Sweden	Total	Change on base year	Change on Option 1
Total pelagic processing employment											
Base year: 2005-2007	250	1100	626	53	6149	3163	12625	129	24095		
Option 1 no change	216	836	523	31	5718	3097	11996	114	22531	-6%	
Option 2a	211	798	524	26	5647	3091	11937	113	22346	-7%	-1%
Option 2b	211	812	524	26	5670	3091	11937	113	22383	-7%	-1%
Output 2a_2	208	762	513	25	5601	3081	11831	111	22133	-8%	-2%
Option 3c	214	829	597	26	5690	3147	12488	113	23105	-4%	3%
Upstream employment											
Base year: 2005-2007	13	837	15	13	450	20	52	19	1420		
Option 1 no change	11	636	13	8	419	20	50	17	1173	-17%	
Option 2a	11	607	13	7	414	20	50	17	1136	-20%	-3%
Option 2b	11	617	13	7	415	20	50	17	1149	-19%	-2%
Output 2a_2	10	580	12	6	410	20	49	17	1104	-22%	-6%
Option 3c	11	630	14	7	417	20	52	17	1168	-18%	0%
Combined Processing and Upstream											
Base year: 2005-2007	263	1937	641	66	6599	3183	12677	148	25514		
Option 1 no change	227	1472	535	38	6137	3117	12046	131	23704	-7%	
Option 2a	221	1404	536	33	6060	3110	11987	130	23482	-8%	-1%
Option 2b	221	1429	536	33	6085	3110	11987	130	23532	-8%	-1%
Output 2a_2	219	1342	525	31	6011	3101	11880	128	23237	-9%	-2%
Option 3c	225	1459	611	33	6107	3167	12540	131	24272	-5%	2%

A final feature of this analysis that should be noted is that the overall employment reductions may be less than are shown in

Table 27 Projected processing and upstream employment changes for Baltic pelagic processing sectors in 2015 (no. employees). Option 1 - no change; Option 2a ICES HCR, 2015, Gulf of Riga F=0.26; Option 2b, Gulf of Riga F=0.35; Output 2a_2, multispecies results; Option 3c: Option 3a with adjusted uptake

	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Swed
Total employment								
Base year: 2005-2007	75	880	595	53	1156	183	2309	
Option 1 no change	41	616	491	31	725	118	1680	
Option 2a	36	578	493	26	654	111	1622	
Option 2b	36	592	493	26	677	111	1622	
Output 2a_2	33	542	482	25	608	102	1515	
Option 3c	39	609	566	26	697	168	2172	

Table 28 and Table 27. This is because the catches in the base years, 2005-2007, were greater than in the current year (2009) – see Figure 5. If the projection is undertaken from anticipated 2009 catch data (which assumes that employment in 2009 was equivalent to employment in 2005-2007) the reduction in employment in Option 2a is only about 10%.

4.4.2 Adaptability and vulnerability and critical issues, flexibility of fishing operations

Baltic fisheries vary in regard to fisheries pattern, vessel types, technology etc. The adaptability and vulnerability therefore also differ between and within countries and vessel segments. The following is an overview of central issues and critical points in regard to adaptability and flexibility of the fisheries and is not a quantitative assessment.

A few fleets are identified in the EIAA modelling (Table 21) as those which can expect a loss in net profit of three percentage points or more in 2015, in the case of implementation of the ICES proposal (option 2a)[20]. Specific interviews were held with some Member States fishermen to explore their potential for adaptability under these scenarios; these form the supporting information for the following sections.

A dynamic sector adapting to new conditions

[20] Note that this does not imply that the rest of the fleets are profitable, nor that the affected fleets are unprofitable – just that they are negatively effected.

First and foremost, it is clear that pelagic fisheries in the Baltic are in a very dynamic phase, undergoing important changes in recent years. The sector has adapted to the new conditions under the EU management regime, quotas etc., with differences between the countries. In some countries fleet reductions have already improved economic conditions for the fleets, often a result of recent effective scrapping programmes. As a result, in some fleets and countries, the current economic conditions could differ from the base years used for analysis (2005-2007). As shown above, we have attempted to deal with this through our projection of fleet reductions (Option 3a) but in some cases these reductions have already taken place.

In Sweden, a system of individual transferable quotas (ITQ) will be implemented in the pelagic fisheries from 01/01/2010. This is likely to lead to a restructuring of the Swedish pelagic fishing industry, which the industry expects will halve the fleet within a short time (against our anticipated reduction of 40% by 2015 over the fleet size in 2005-2007 for the Swedish pelagic trawl 12-24, 24-40 and 40+ sectors). This process has already begun to some extent; as a result, the consequences of the sprat quota reduction will hardly impact fleet profitability (as shown in Options 3a and 3c).

Finally, and more unpredictably, there are changes in the markets which may influence the effects of the management plan. Despite of a tendency of higher cod quotas, fishing for cod might not be an alternative for some of the pelagic fishermen as the cod prices have tended to decrease due to inflow of cheap substitutes into the European market. There has also been a tendency to shift from consumption of unprocessed products to value added product forms. This is as a result of increasing incomes in Russia (and probably also in other eastern European countries)[21].

It is also noted that fish meal prices have increased significantly in recent years as a result of an increase in demand (up by 53%) following the growth of aquaculture, especially in China. This has caused some shift in dependency for some fleets from human consumption to industrial fisheries (e.g. Germany) with small quantities of Polish and the Baltic States' product also landed direct for Danish fish meal processing.

Adaptability and flexibility of fleets and vessels

For the assessment of consequences of changed quotas following the proposed multi-annual management plans, the relatively low uptake of the quota for herring in some countries is of interest. The modelling included the possibility that uptake of sprat would increase in an attempt to replace sprat lost to reducing quotas. We did not model the possibility of replacing sprat with herring, but if the fleet was able to augment the use of the herring quota to 100 %, the effects of quota reductions might be reduced considerably. This would especially be the case if fishing activities targeting sprat could be re-targeted towards herring.

[21] Lien, Kristin, Ragnar Tveterås and Sigbjørn Tveterås 2009: The structure of herring product demand in Russia.

Is a changing emphasis from sprat to herring possible? As Table 19 shows, even with the uptake adjustments anticipated in Option 3c, herring uptake is projected to be only 89% (against sprat being 95%) with additional quota available to Estonia, Lithuania, Sweden and Poland.

Two factors have been mentioned to explain situations of low quota uptake (aside from the price/market relations mentioned above). These are: a lack of capacity and tradition for fishing the resources in the season and area where they peak; and quota restrictions for other species which limit mixed fishery participation.

For some countries the low uptake is the result of a combination of tradition and technology. For example, small Polish vessels have no tradition of fishing north of Goteland for sprat and herring. Furthermore, they lack cooling technology for maintaining a sufficient quality of catch on trips of such distances.

Quota restrictions in mixed fisheries can prevent a full quota uptake for some species. For some fleets the traditional fishing pattern and technology allows for taking of the quota in relatively clean (or separate) fisheries for herring and for sprat. A considerable part of the Danish pelagic trawl fishery takes place during the spring, where herring and sprat are largely separate, and it is possible to fish with a low level of by-catch of other species. The same goes for the German coastal fleet, which fish their herring quota in gill nets in the spring. However, in many other pelagic fisheries, the fishing activity takes place later in the year, where herring and sprat are more mixed, as is the case for the Estonian and Polish pelagic fisheries.

In a mixed fishery of herring and sprat, reduction of the sprat quota could have a negative influence on the catch of herring, despite there being sufficient herring quota. In such mixed fisheries a limitation of the sprat quota would lead to decreasing catches of herring. In such cases, individual vessels have no opportunity to switch to or substitute fishing for sprat with fishing for herring. This is seen in the Finnish case, where a low herring uptake is seen as a result of the low sprat quota[22]. If the existing fishing pattern continues, the uptake of the Finnish herring quota would decrease further within the multiannual management plan.

A shift from a mixed sprat/herring fishery to a more targeted herring fishery is not regarded as a viable alternative. It could be possible in some cases to shift the fishing pattern and gear, for example from a small mesh size to a larger mesh size, in order to retain herring and allow sprat to escape. There is a general resistance towards loss of catch from larger mesh sizes[23], but such

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[22] Finland currently prohibit pelagic fisheries in the main basin of the Baltic early in the spring reserving sprat quota for fishermen of the important Gulf of Bothnia fishery targeting herring but also catching sprat.

[23] There seem also to be a concern among fishermen about a high mortality for escaped pelagic species, which gives resistance to gear with large mesh sizes.

a technological change would also have economic implications in the form of investments in new gear, loss of income from the escaping species and individuals (in this case sprat), and general loss of catch in the period when the fishermen learn to handle the new gear. It is not clear if it is technically possible in all fleet segments to use trawls or nets with a larger mesh size.

If substituting sprat with herring is not possible in the dominant mixed herring and sprat fisheries, one could consider the possibility of adapting to other species or to another fishing technology and pattern for a more selective fishery.

In general, the responses from the fishermen's organisations indicated that they cannot think of a general way to change fishing patterns. There are no other pelagic species to exploit if the sprat and herring quotas are reduced. Although some demersal and passive gear fleet segments might be able to shift to other demersal species (primarily cod or salmon), this is not regarded as possible for the pelagic trawl segments.

Adaptation and flexibility in the pelagic processing industries

Seen from the processing industry perspective, the multi-annual management plan (Option 2a) will lead to considerably lower landings of sprat compared to the 2009 levels. The consequences with regard to herring are difficult to predict. The quotas will in general increase, but if the catch of herring is closely related to sprat fishing due to a mixed fishery, the consequence could be a decrease in the landings of Baltic herring as well. However, it should be noted that it is processing industries with a high dependency of herring that will likely face a decrease in supply, especially in the eastern Baltic where dependency on Baltic pelagic catches appears to be greater than in the west (Table 9).

Due to exports or direct landings abroad, the effects of reduced quotas on processing can be felt in other countries. The Danish fish meal sector is particularly dependent on Swedish pelagic catches. Finnish, German and Polish catches and smaller quantities of sprat catches are also landed directly into, or consigned to, Denmark. Reduction in the fisheries will therefore be felt deeply in Denmark, especially for the fish meal and oil factory in Skagen, which has a 30 % dependency on supplies from the Baltic Sea[24].

Whilst most Swedish sprat is landed directly into Denmark, there are minor sprat freezing plants in Gotland and in Västervik in the Baltic area. These small plants are mainly supplied by local vessels and to some extent, German vessels. The Swedish processors export block frozen sprat for further processing abroad. In the Swedish ITQ process, the minor vessels in the Baltic were overcompensated in the initial allocation. If the quotas are kept locally, consequences for the local sprat freezing industry might be less than the general quota reduction. But as the quotas are transferable, the local quotas might be sold to vessels that land into Denmark. Therefore the

[24] Fiskerforum.dk: Kvote chok påvej for Østersøens brislingefiskere

consequences for the small Baltic sprat industries are hard to predict, mainly due to effects of quota re-allocation.

The processing industries in the eastern Baltic States – Estonia, Latvia and Finland – are those most dependent upon Baltic pelagic sources. Dependency on sprat is high, and it will therefore require some increase in imports, or a decrease in employment and processing turnover, to accommodate the reductions in quota foreseen even if uptake increases, without the ability to substitute with herring. If vessels were able to increase their uptake of herring, the 13% shortfall in processing capacity would be partially filled.

Although the western fishmeal processors could substitute sprat with other species, such as sandeel and Norway pout, stocks of these species remain low, and they would be no substitute for the human consumption processors in the eastern Baltic.

4.4.3 Resilience of the community in the face of the proposed changes, alternative to fishing activities

At the community level it is difficult to discuss the resilience of specific fishing communities. This would take a more detailed study, as for example the recent profiling study on small-scale fishing communities in the Baltic Sea (Delaney, 2007). The discussion above shows that the consequences of a multi-annual management plan are not totally clear because of the inter-relationship between targeting sprat and herring. Nevertheless, it is expected that the direct consequences of changes in short-term fishing opportunities will be felt in the home ports for the vessels that specifically target pelagic species. The main home ports or home regions of the five fleets which are expected to lose more than three percentage points in net profit from the Table 21 are: the Goteborg area (Sweden), Kaskinen, Uusikaupunki and Kasnäs (in the western Finland), various ports in Latvia with Liepāja and Ventspils as the largest, and finally Dirhami, Veere and Lehtma in western Estonia.

Some of these ports are located in urbanised areas with alternative job opportunities, whereas others (and some of the minor ports which might have a higher relative pelagic dependency) are located in rural areas with high unemployment rates. Furthermore, in many fleets the education level is relatively low which restricts the possibilities for fishermen (crew or vessel owner) to leave the sector and find alternative jobs in other sectors. Some of the small Baltic countries report an actual unemployment rate at 12.5 %, which indicates a generally very low level of available positions in these areas. In Latvia, where the EU scrapping programme is seen by the fishermen as a way to leave a local unprofitable fishery, many are seeking jobs in the fisheries of other countries (e.g. Germany, Ireland, Sweden, Norway and the UK).

5 COMPARING THE OPTIONS

A comparison of the three main options is given in Table 29. Impacts on **communities** are likely to be greatest under Options 1 and 2, and least under the fleet reduction and increased uptake scenarios explored in Option 3. Regions with high employment dependency on Baltic pelagics will be most affected: Finland, Latvia and Estonia. In particular, fleets in Latvia and Estonia show negative profitability that does not significantly improve even taking into account anticipated reductions in fleet size and uptake. Some other fleets, with partial dependency on pelagic species, also show negative profits, in particular the Polish Demersal trawl 24-40m, and the German Demersal trawl 0-12m and passive gear.

Maximum losses of employment in the processing sector are expected in Latvia and Estonia, whose processing industries are heavily dependent upon Baltic sprat and herring. Impacts of reductions in sprat quota will not be easily offset by increases in herring quota and catches in the eastern Baltic. Processing industries in the western Baltic and in Poland, Lithuania and Sweden, are likely to be less affected by reductions in sprat quota because of their lower dependency on Baltic supplies of pelagic species.

Table 29 Comparison of options.

	Option 1 (no change)	Option 2 (ICES HCRs)	Option 3 (Additional measures: fleet reduction and uptake)
Environmental	Reductions in herring and sprat TAC (2.5% and 38% respectively), but not sufficient reductions in fishing mortality to be consistent with long-term sustainability and EU/WSSD objectives of MSY.	Reductions in herring and sprat TAC (5% and 44% respectively). Consistent with EU/WSSD objectives.	Reductions in herring and sprat TAC (5% and 44% respectively) but with the potential, through increasing uptake, to realise only a 0% reduction in herring and 22% reduction in sprat catch. Consistent with EU/WSSD objectives.
Economic: fleet	Overall reduction in profitability and gross value added compared to the baseline 2005-2007 (€119 million to €108 million).	Small additional reductions in value added over Option 1, but overall numbers of profitable fleets is the same as Option 1, although significant improvement by 2020. Additional reductions if stocks behave as anticipated in a multispecies model.	Anticipated declining trends in fleet size lead to gross value added and profitability being higher than Option 1 and even the Baseline 2005-2007 situation. Even higher performance can be expected if uptake of herring and sprat quota increases.
Economic: processing	Decline in total value added from processing and catching from €96 million to €82 million. The Danish fish meal sector would lose approximately 10% of its annual supply	Small additional declines in total value added, consistent with the declines in fleet value added	Higher value added from processing and catching, though not as high as 2005-2007.
Social: fleet employment	No decline in fleet employment.	No decline in fleet employment.	Decline in fleet employment consistent with a decline in fleet size. This is offset with an increase in crew wage from €6000 to €8500 per year (Table 20).
Social: processing employment	Anticipated 29% decline in processing due to a decline in catches, primarily sprat.	Small additional decline in processing employment.	A reduction in processing employment (down 4% and a loss of 990 jobs in processing, and 252 onshore. However, if uptake is also increased this leads to increased employment over Option 1, although still a decline over the baseline 2005-2007, due to decreased levels of catch even with uptake.

6 Conclusions and future data requirements / Monitoring and evaluation

6.1 Additional data and monitoring

It is clear that the most vulnerable communities and fishing sectors are those in Latvia, Estonia and Finland. Unfortunately, the quantity of economic data, particularly on the processing and upstream sectors, is low for these countries as is the understanding of alternative employment opportunities for fishing communities.

As the multi-annual management plan is debated and established it will be important to monitor these communities and fishing sectors particularly well, by the development of specific community case studies such as those developed for cod by Delaney (2007).

Although we have used the most current stock assessment models, including multispecies impact models, and the most up-to-date implementation of the EIAA model, there are significant uncertainties associated with using both model types in this analysis. This is partly due to a lack of available data for some fleet segments. However the approach of the models The inability to treat the fleets as individual metiers, for instance, has meant that assumptions have had to be made about the relative importance of North Sea and Baltic fishing to those fleets fishing in both areas, and about the ability of eastern Baltic fleets to partition their catch between sprat and herring. Development of more detailed modelling, such as that being undertaken for Division IIIa in the JAKFISH project, could be extended to other Baltic areas.

6.2 Community support measures

This analysis reveals that some areas could be focused on by EU community support measures in order to mitigate the negative effects of the multi-annual management plan in the 2015 perspective.

Within the support framework of the fishing sector, the study has emphasised that fishing vessel capacity reduction should feature highly if fleets are to be profitable. Some countries are following the ITQ system (Denmark and Sweden), whilst others have a preference for decommissioning. Using the European Fishing Fund (EFF) programme for scrapping would be a strong measure to assist fleet rationalisation and improve the economic wealth of the remaining vessels. However scrapping does not focus on the regional consequences of lost jobs. Moreover, as fleet profitability is restored to some sectors, alternative rights based management systems might be a preferred means for other countries to reduce capacity.

There are other focus areas that may warrant attention:

- The indications of a low uptake of pelagic quota in some countries, which can partly be explained by the technical limitations of vessel and gear. Full exploitation of the available quota and high quality and prices could mitigate the consequences of TAC reductions. Support measures could therefore increase the incentives to promote increased targeting of herring, as opposed to sprat. The EFF currently allows for diversification of fishing opportunities to under exploited fisheries.

- The EFF also allows for promotion of fish quality in the expectation that prices can be improved. This is also an important feature if volumes are likely to fall, or to ensure that prices remain strong relative to the threat of imported fish products. The expectation is that some countries will pace a stronger focus on the use of RSW tanks on board fishing vessels.

- Special measures may also have to be envisaged to support the rationalisation of the processing sector. If possible, the processing sector in Latvia and Estonia should be encouraged to diversify to take more herring.

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ANNEX 1. STOCK TRAJECTORIES FOR THE ICES MULTI-ANNUAL MANAGEMENT PLAN HARVEST CONTROL RULES

Figure 6 Western Baltic Herring trajectories with target F [A] shown.

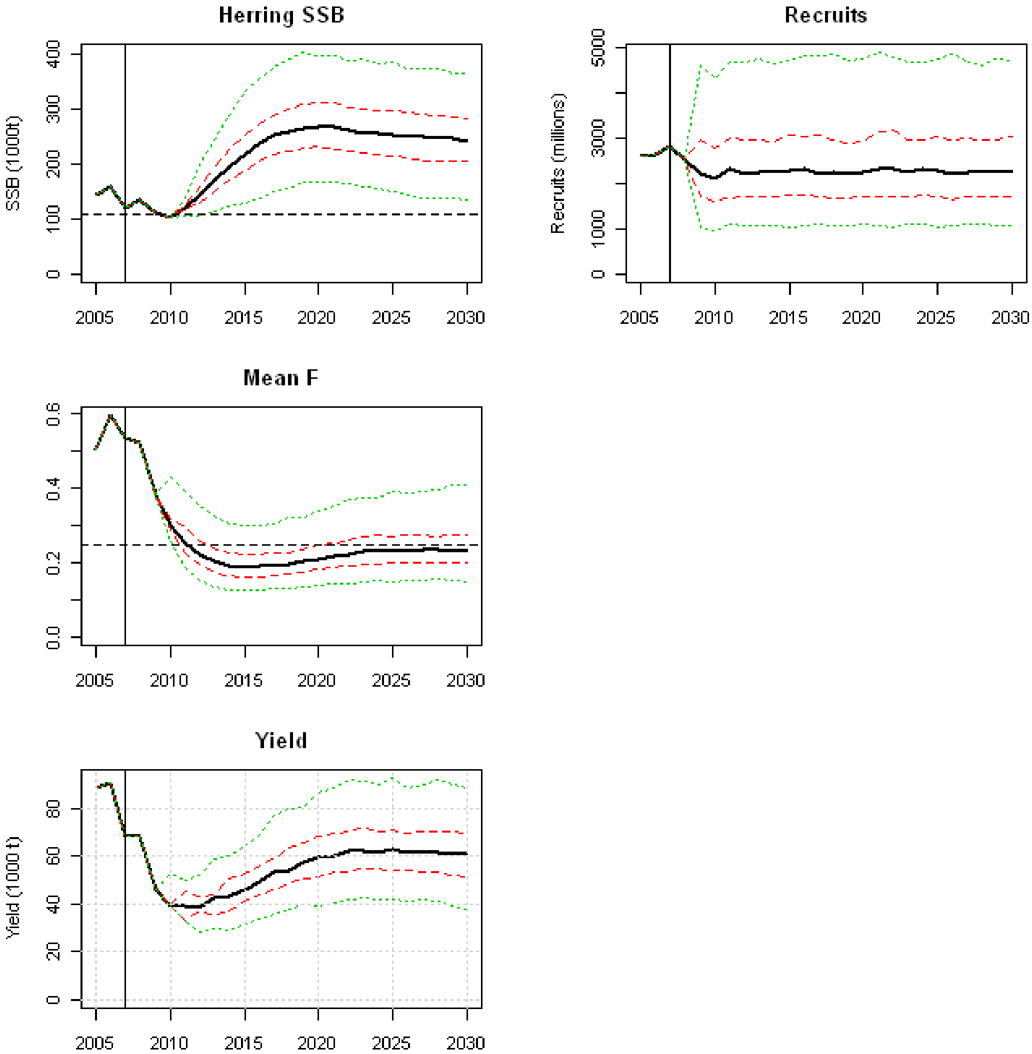


Figure 7 Central Baltic herring trajectories with spawn stock biomass trigger [C] and target F [A] shown.

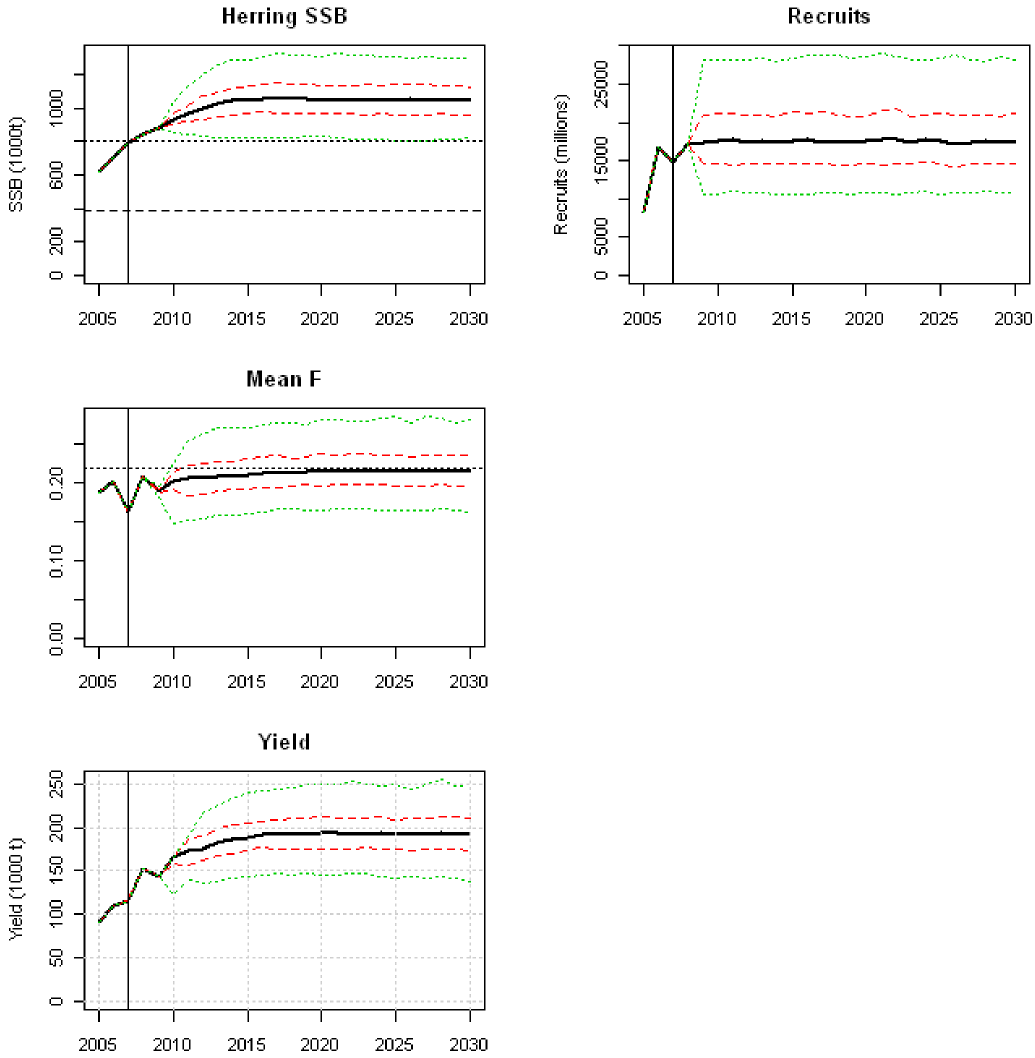


Figure 8 Gulf of Riga herring trajectories with spawn stock biomass trigger [C] and target F [A] = 0.26 shown.

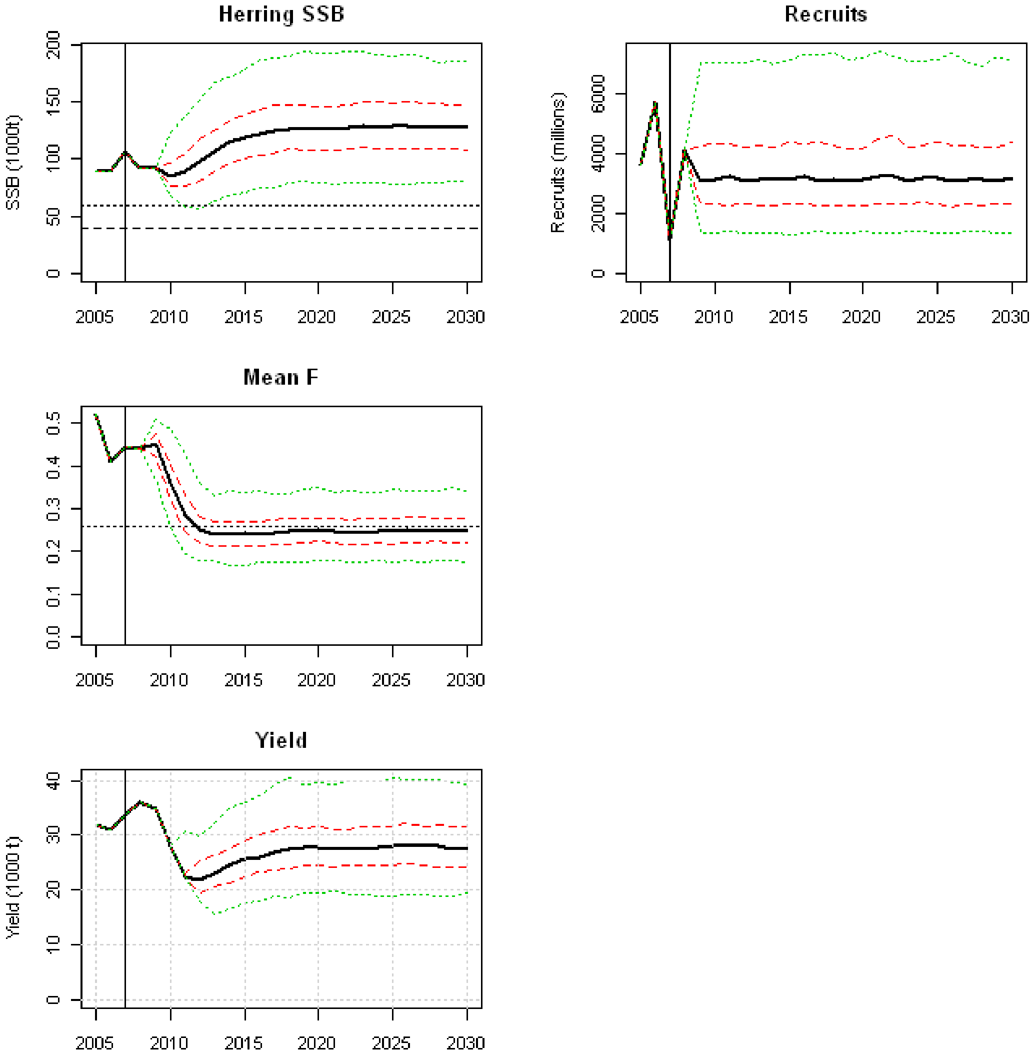


Figure 9 Herring trajectories in subdivision 30 with spawn stock biomass trigger [C] and target F [A] shown.

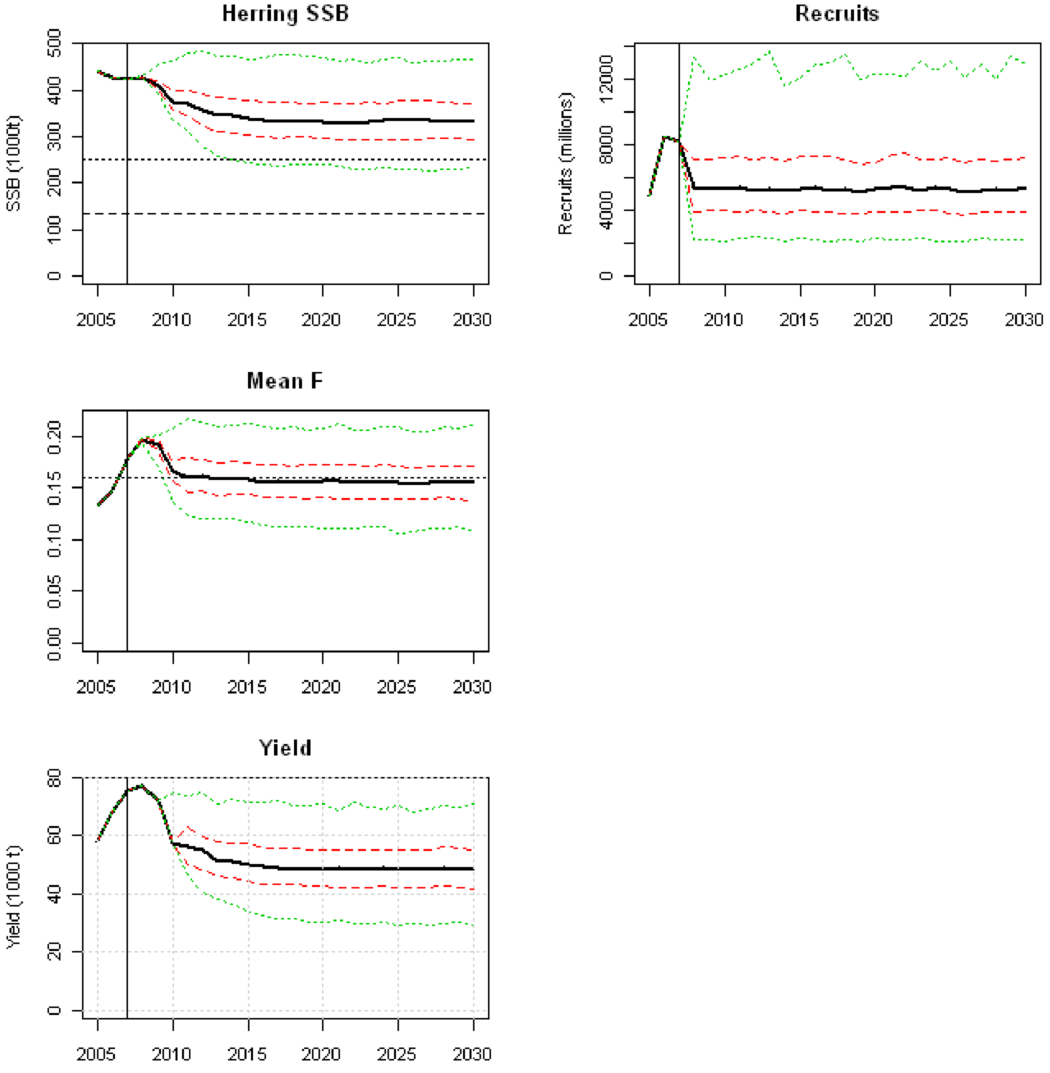
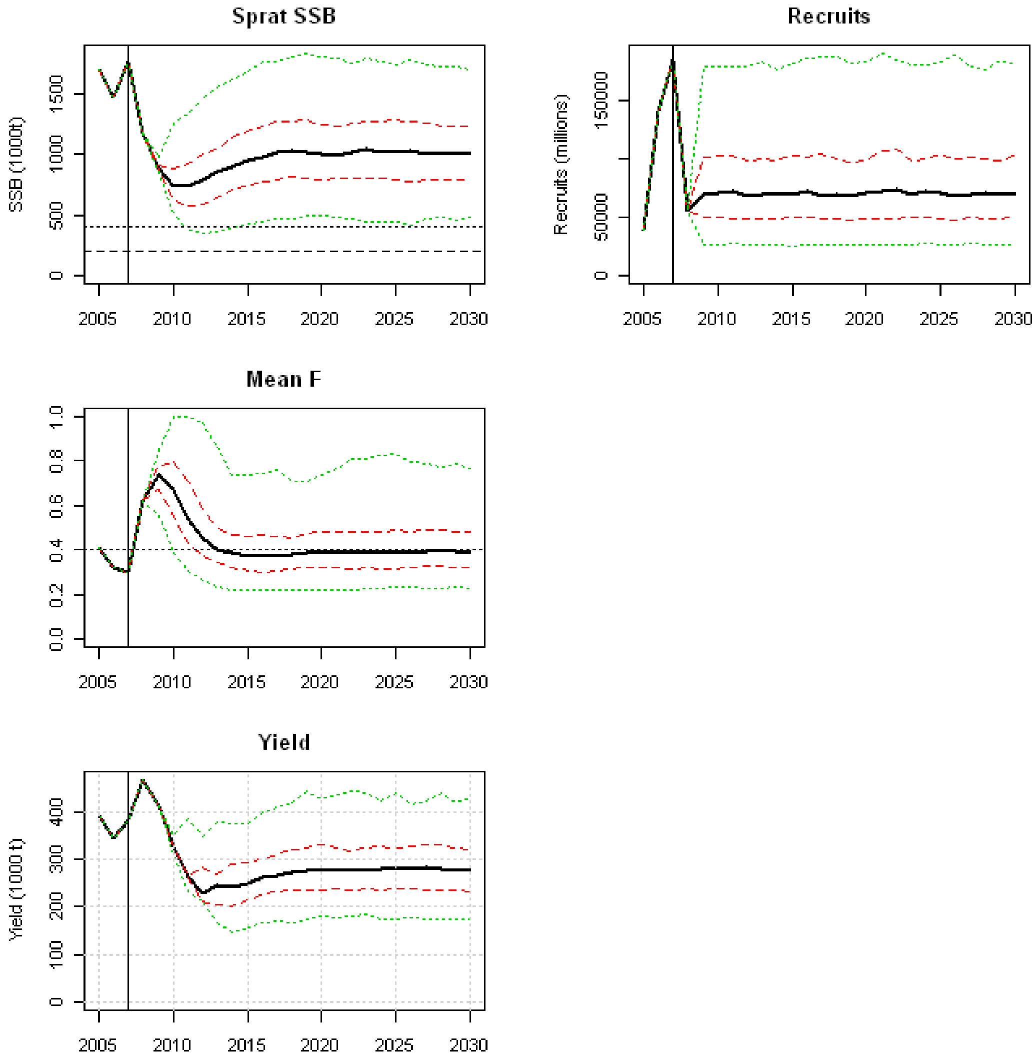


Figure 10 Baltic sprat trajectories with spawn stock biomass trigger [C]and target F [A] shown



ANNEX 2 FULL DETAILED RESULTS OF THE ECONOMIC MODEL SCENARIOS

All values are in millions € unless otherwise stated. Gross and Net are abbreviated to Gr and Nt respectively.

Option 1 - no change, situation in 2015

Country	Segment	Gross(Gr) Revenue	Gr Cash Flow	Net(Nt) Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	12.0	3.9	2.3	5.8	1.8	1.00	17.9	19%	PROFITABLE	19	102
SWE	PTS40	8.5	2.6	1.0	3.4	0.8	1.00	15.4	12%	PROFITABLE	6	54
SWE	PTS 1224	0.7	0.2	0.1	0.2	0.1	1.00	6.7	8%	PROFITABLE	6	11
SWE	DTS1224	2.6	0.6	0.5	1.0	0.3	1.00	10.9	18%	PROFITABLE	14	32
DNK	PTS2440	6.0	0.9	0.4	2.9	2.0	1.00	55.1	7%	PROFITABLE	7	36
DNK	PTS1224	10.5	1.2	-0.2	5.8	4.6	1.00	114.0	-2%	STABLE	34	40
DNK	PTS40	5.4	2.0	1.0	3.3	1.3	1.00	52.4	19%	PROFITABLE	2	25
FIN	PTS2440	10.0	1.9	-0.1	4.9	3.1	1.00	46.1	-1%	STABLE	19	67
FIN	PTS1224	2.1	0.5	-0.2	1.1	0.7	1.00	11.3	-9%	UNPROFITABLE	34	59
FIN	PGP012	8.3	4.1	2.1	4.5	0.4	1.00	0.4	26%	PROFITABLE	766	938
LVA	PTS2440	10.4	3.9	3.9	5.2	1.3	1.00	3.0	38%	PROFITABLE	71	428
LVA	PTS1224	2.2	-1.0	-1.0	-0.4	0.7	1.00	6.3	-47%	UNPROFITABLE	36	107
LVA	PG012	0.7	-0.2	-0.2	0.2	0.4	1.00	0.4	-28%	UNPROFITABLE	747	1132
POL	PTS2440	13.2	1.3	0.1	4.4	3.1	1.00	7.7	1%	STABLE	52	406
POL	DTS1224	6.2	0.7	-0.1	2.1	1.4	1.00	3.5	-2%	STABLE	103	401
POL	DTS2440	4.1	-0.3	-1.3	0.4	0.6	1.00	2.4	-32%	UNPROFITABLE	41	254
POL	PG	10.6	5.6	4.7	7.6	2.0	1.00	1.5	44%	PROFITABLE	630	1300
EST	PTS2440	7.2	-3.0	-9.3	-0.6	2.4	1.00	7.4	-128%	UNPROFITABLE	53	329
EST	PTS1224	0.6	-0.2	-1.0	-0.1	0.1	1.00	1.8	-187%	UNPROFITABLE	18	57
EST	PG012	3.4	0.7	0.4	2.0	1.2	1.00	0.5	11%	PROFITABLE	880	2528
DEU	DTS0012	1.1	-0.1	-0.2	0.5	0.6	1.00	17.9	-21%	UNPROFITABLE	14	34
DEU	DTS1224	19.1	3.7	2.5	11.7	8.0	1.00	34.7	13%	PROFITABLE	77	231
DEU	DTS2440	56.5	25.4	23.8	40.8	15.3	1.00	56.4	42%	PROFITABLE	26	272
DEU	PG	8.5	-1.2	-2.5	0.3	1.5	1.00	5.3	-29%	UNPROFITABLE	1000	285
LTU	DTS2440	3.4	0.0	-0.1	1.1	1.1	1.00	6.6	-4%	STABLE	29	166

Option 2a ICES HCR, 2015, Gulf of Riga F=0.26

Country	Segment	Gr Revenue	Gr Cash Flow	Nt Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	11.6	3.8	2.2	5.6	1.8	1.00	17.5	19%	PROFITABLE	19	102
SWE	PTS40	8.3	2.5	0.9	3.4	0.8	1.00	15.0	11%	PROFITABLE	6	54
SWE	PTS 1224	0.7	0.2	0.1	0.2	0.1	1.00	6.6	7%	PROFITABLE	6	11
SWE	DTS1224	2.6	0.6	0.4	1.0	0.3	1.00	10.8	18%	PROFITABLE	14	32
DNK	PTS2440	6.0	0.9	0.4	2.8	2.0	1.00	54.8	7%	PROFITABLE	7	36
DNK	PTS1224	10.4	1.2	-0.2	5.7	4.6	1.00	113.5	-2%	STABLE	34	40
DNK	PTS40	5.3	2.0	1.0	3.3	1.3	1.00	52.0	19%	PROFITABLE	2	25
FIN	PTS2440	9.9	1.8	-0.1	4.9	3.0	1.00	45.7	-1%	STABLE	19	67
FIN	PTS1224	2.1	0.5	-0.2	1.1	0.7	1.00	11.2	-9%	UNPROFITABLE	34	59
FIN	PGP012	8.3	4.1	2.1	4.5	0.4	1.00	0.4	26%	PROFITABLE	766	938
LVA	PTS2440	9.8	3.6	3.6	4.8	1.2	1.00	2.8	37%	PROFITABLE	71	428
LVA	PTS1224	2.0	-1.1	-1.1	-0.3	0.8	1.00	7.5	-56%	UNPROFITABLE	36	107
LVA	PG012	0.6	-0.2	-0.2	0.2	0.4	1.00	0.3	-29%	UNPROFITABLE	747	1132
POL	PTS2440	13.1	1.3	0.1	4.4	3.1	1.00	7.7	1%	STABLE	52	406
POL	DTS1224	6.2	0.7	-0.1	2.1	1.4	1.00	3.5	-2%	STABLE	103	401
POL	DTS2440	4.1	-0.3	-1.3	0.4	0.6	1.00	2.4	-32%	UNPROFITABLE	41	254
POL	PG	10.6	5.6	4.7	7.6	2.0	1.00	1.6	44%	PROFITABLE	630	1300
EST	PTS2440	6.8	-3.1	-9.3	-0.7	2.3	1.00	7.0	-137%	UNPROFITABLE	53	329
EST	PTS1224	0.5	-0.2	-1.0	-0.1	0.1	1.00	1.7	-199%	UNPROFITABLE	18	57
EST	PG012	3.4	0.7	0.4	2.0	1.2	1.00	0.5	11%	PROFITABLE	880	2528
DEU	DTS0012	1.1	-0.1	-0.2	0.5	0.6	1.00	17.9	-21%	UNPROFITABLE	14	34
DEU	DTS1224	19.1	3.7	2.5	11.7	8.0	1.00	34.7	13%	PROFITABLE	77	231
DEU	DTS2440	56.4	25.3	23.7	40.6	15.3	1.00	56.2	42%	PROFITABLE	26	272
DEU	PG	8.5	-1.2	-2.5	0.3	1.5	1.00	5.3	-29%	UNPROFITABLE	1000	285
LTU	DTS2440	3.4	0.0	-0.1	1.1	1.1	1.00	6.6	-4%	STABLE	29	166

Option 2b ICES HCR, Gulf of Riga 0.35, 2015

Country	Segment	Gr Revenue	Gr Cash Flow	Nt Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	11.6	3.8	2.2	5.6	1.8	1.00	17.5	19%	PROFITABLE	19	102
SWE	PTS40	8.3	2.5	0.9	3.4	0.8	1.00	15.0	11%	PROFITABLE	6	54
SWE	PTS 1224	0.7	0.2	0.1	0.2	0.1	1.00	6.6	7%	PROFITABLE	6	11
SWE	DTS1224	2.6	0.6	0.4	1.0	0.3	1.00	10.8	18%	PROFITABLE	14	32
DNK	PTS2440	6.0	0.9	0.4	2.8	2.0	1.00	54.8	7%	PROFITABLE	7	36
DNK	PTS1224	10.4	1.2	-0.2	5.7	4.6	1.00	113.5	-2%	STABLE	34	40
DNK	PTS40	5.3	2.0	1.0	3.3	1.3	1.00	52.0	19%	PROFITABLE	2	25
FIN	PTS2440	9.9	1.8	-0.1	4.9	3.0	1.00	45.7	-1%	STABLE	19	67
FIN	PTS1224	2.1	0.5	-0.2	1.1	0.7	1.00	11.2	-9%	UNPROFITABLE	34	59
FIN	PGP012	8.3	4.1	2.1	4.5	0.4	1.00	0.4	26%	PROFITABLE	766	938
LVA	PTS2440	9.9	3.7	3.7	4.9	1.2	1.00	2.8	37%	PROFITABLE	71	428
LVA	PTS1224	2.2	-1.1	-1.1	-0.3	0.8	1.00	7.1	-51%	UNPROFITABLE	36	107
LVA	PG012	0.7	-0.2	-0.2	0.2	0.4	1.00	0.4	-29%	UNPROFITABLE	747	1132
POL	PTS2440	13.1	1.3	0.1	4.4	3.1	1.00	7.7	1%	STABLE	52	406
POL	DTS1224	6.2	0.7	-0.1	2.1	1.4	1.00	3.5	-2%	STABLE	103	401
POL	DTS2440	4.1	-0.3	-1.3	0.4	0.6	1.00	2.4	-32%	UNPROFITABLE	41	254
POL	PG	10.6	5.6	4.7	7.6	2.0	1.00	1.6	44%	PROFITABLE	630	1300
EST	PTS2440	6.9	-3.0	-9.3	-0.7	2.3	1.00	7.1	-135%	UNPROFITABLE	53	329
EST	PTS1224	0.5	-0.2	-1.0	-0.1	0.1	1.00	1.7	-199%	UNPROFITABLE	18	57
EST	PG012	3.4	0.7	0.4	2.0	1.3	1.00	0.5	11%	PROFITABLE	880	2528
DEU	DTS0012	1.1	-0.1	-0.2	0.5	0.6	1.00	17.9	-21%	UNPROFITABLE	14	34
DEU	DTS1224	19.1	3.7	2.5	11.7	8.0	1.00	34.7	13%	PROFITABLE	77	231
DEU	DTS2440	56.4	25.3	23.7	40.6	15.3	1.00	56.2	42%	PROFITABLE	26	272
DEU	PG	8.5	-1.2	-2.5	0.3	1.5	1.00	5.3	-29%	UNPROFITABLE	1000	285
LTU	DTS2440	3.4	0.0	-0.1	1.1	1.1	1.00	6.6	-4%	STABLE	29	166

Output 2a_1 - ICES HCR, 2020, Gulf of Riga F=0.26

Country	Segment	Gr Revenue	Gr Cash Flow	Nt Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	12.3	4.1	2.5	6.0	1.9	1.00	18.7	20%	PROFITABLE	19	102
SWE	PTS40	8.7	2.7	1.1	3.6	0.9	1.00	15.9	13%	PROFITABLE	6	54
SWE	PTS 1224	0.8	0.2	0.1	0.3	0.1	1.00	7.0	9%	PROFITABLE	6	11
SWE	DTS1224	2.6	0.6	0.5	1.0	0.3	1.00	10.9	18%	PROFITABLE	14	32
DNK	PTS2440	6.0	0.9	0.4	2.9	2.0	1.00	55.2	7%	PROFITABLE	7	36
DNK	PTS1224	10.5	1.2	-0.2	5.8	4.6	1.00	114.2	-2%	STABLE	34	40
DNK	PTS40	5.4	2.0	1.0	3.4	1.3	1.00	52.6	19%	PROFITABLE	2	25
FIN	PTS2440	10.1	1.9	-0.1	5.0	3.1	1.00	46.4	-1%	STABLE	19	67
FIN	PTS1224	2.2	0.5	-0.2	1.1	0.7	1.00	11.4	-8%	UNPROFITABLE	34	59
FIN	PGP012	8.3	4.1	2.1	4.5	0.4	1.00	0.4	26%	PROFITABLE	766	938
LVA	PTS2440	10.3	3.9	3.9	5.2	1.3	1.00	3.0	38%	PROFITABLE	71	428
LVA	PTS1224	2.1	-1.2	-1.2	-0.3	0.9	1.00	8.5	-57%	UNPROFITABLE	36	107
LVA	PG012	0.6	-0.2	-0.2	0.2	0.4	1.00	0.4	-29%	UNPROFITABLE	747	1132
POL	PTS2440	13.7	1.4	0.3	4.7	3.3	1.00	8.1	2%	STABLE	52	406
POL	DTS1224	6.2	0.7	-0.1	2.1	1.4	1.00	3.5	-1%	STABLE	103	401
POL	DTS2440	4.2	-0.3	-1.3	0.4	0.6	1.00	2.5	-32%	UNPROFITABLE	41	254
POL	PG	10.7	5.6	4.7	7.6	2.0	1.00	1.6	44%	PROFITABLE	630	1300
EST	PTS2440	7.3	-3.0	-9.2	-0.5	2.5	1.00	7.6	-127%	UNPROFITABLE	53	329
EST	PTS1224	0.6	-0.2	-1.0	-0.1	0.1	1.00	1.9	-186%	UNPROFITABLE	18	57
EST	PG012	3.4	0.7	0.4	2.0	1.3	1.00	0.5	11%	PROFITABLE	880	2528
DEU	DTS0012	1.1	-0.1	-0.2	0.5	0.6	1.00	17.9	-21%	UNPROFITABLE	14	34
DEU	DTS1224	19.2	3.7	2.5	11.8	8.0	1.00	34.8	13%	PROFITABLE	77	231
DEU	DTS2440	56.6	25.4	23.9	40.8	15.3	1.00	56.4	42%	PROFITABLE	26	272
DEU	PG	8.6	-1.2	-2.5	0.3	1.5	1.00	5.3	-29%	UNPROFITABLE	1000	285
LTU	DTS2440	3.5	0.0	-0.1	1.1	1.1	1.00	6.7	-4%	STABLE	29	166

Output 2a_2, ICES multispecies, 2015, Gulf of Riga F 0.26

Country	Segment	Gr Revenue	Gr Cash Flow	Nt Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	11.3	3.7	2.1	5.4	1.7	1.00	17.0	18%	PROFITABLE	19	102
SWE	PTS40	8.1	2.5	0.9	3.2	0.8	1.00	14.6	11%	PROFITABLE	6	54
SWE	PTS 1224	0.7	0.2	0.0	0.2	0.1	1.00	6.4	7%	PROFITABLE	6	11
SWE	DTS1224	2.6	0.6	0.4	1.0	0.3	1.00	10.8	17%	PROFITABLE	14	32
DNK	PTS2440	6.0	0.9	0.4	2.8	2.0	1.00	54.8	7%	PROFITABLE	7	36
DNK	PTS1224	10.4	1.1	-0.2	5.7	4.6	1.00	113.4	-2%	STABLE	34	40
DNK	PTS40	5.3	2.0	1.0	3.3	1.3	1.00	51.9	19%	PROFITABLE	2	25
FIN	PTS2440	9.8	1.8	-0.1	4.7	3.0	1.00	44.5	-1%	STABLE	19	67
FIN	PTS1224	2.1	0.5	-0.2	1.1	0.6	1.00	10.9	-10%	UNPROFITABLE	34	59
FIN	PGP012	8.3	4.1	2.1	4.5	0.4	1.00	0.4	26%	PROFITABLE	766	938
LVA	PTS2440	9.3	3.4	3.4	4.5	1.1	1.00	2.7	36%	PROFITABLE	71	428
LVA	PTS1224	2.0	-1.1	-1.1	-0.3	0.7	1.00	7.0	-55%	UNPROFITABLE	36	107
LVA	PG012	0.6	-0.2	-0.2	0.2	0.4	1.00	0.3	-29%	UNPROFITABLE	747	1132
POL	PTS2440	12.6	1.1	0.0	4.1	3.0	1.00	7.3	0%	STABLE	52	406
POL	DTS1224	6.2	0.7	-0.1	2.1	1.4	1.00	3.5	-2%	STABLE	103	401
POL	DTS2440	4.1	-0.3	-1.3	0.3	0.6	1.00	2.4	-33%	UNPROFITABLE	41	254
POL	PG	10.6	5.6	4.7	7.6	2.0	1.00	1.6	44%	PROFITABLE	630	1300
EST	PTS2440	6.4	-3.1	-9.3	-1.0	2.1	1.00	6.5	-146%	UNPROFITABLE	53	329
EST	PTS1224	0.5	-0.2	-1.1	-0.2	0.1	1.00	1.5	-214%	UNPROFITABLE	18	57
EST	PG012	3.3	0.7	0.4	2.0	1.2	1.00	0.5	11%	PROFITABLE	880	2528
DEU	DTS0012	1.1	-0.1	-0.2	0.5	0.6	1.00	17.8	-21%	UNPROFITABLE	14	34
DEU	DTS1224	19.1	3.7	2.5	11.7	8.0	1.00	34.7	13%	PROFITABLE	77	231
DEU	DTS2440	56.2	25.2	23.6	40.5	15.2	1.00	56.0	42%	PROFITABLE	26	272
DEU	PG	8.5	-1.2	-2.5	0.3	1.5	1.00	5.3	-29%	UNPROFITABLE	1000	285
LTU	DTS2440	3.4	0.0	-0.2	1.1	1.1	1.00	6.5	-5%	STABLE	29	166

Option 3a: Option 2a + expected vessel trend

Country	Segment	Gr Revenue	Gr Cash Flow	Nt Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	11.6	3.9	3.1	5.7	1.8	0.53	33.1	26%	PROFITABLE	10	54
SWE	PTS40	8.3	2.6	1.6	3.4	0.8	0.62	24.4	20%	PROFITABLE	4	33
SWE	PTS 1224	0.7	0.2	0.1	0.2	0.1	0.89	7.4	9%	PROFITABLE	5	10
SWE	DTS1224	2.6	0.6	0.5	1.0	0.3	0.68	15.8	21%	PROFITABLE	10	22
DNK	PTS2440	6.0	1.2	0.9	3.2	2.0	0.72	76.5	15%	PROFITABLE	5	26
DNK	PTS1224	10.4	1.4	0.3	6.0	4.6	0.86	131.7	3%	STABLE	30	35
DNK	PTS40	5.3	2.2	1.4	3.5	1.3	0.82	63.4	25%	PROFITABLE	2	21
FIN	PTS2440	9.9	1.8	0.5	4.9	3.0	0.68	67.2	5%	PROFITABLE	13	45
FIN	PTS1224	2.1	0.5	0.1	1.1	0.7	0.56	20.0	5%	STABLE	19	33
FIN	PGP012	8.3	4.1	2.1	4.5	0.4	1.00	0.4	26%	PROFITABLE	766	938
LVA	PTS2440	9.8	4.1	4.1	5.3	1.2	0.65	4.3	42%	PROFITABLE	46	279
LVA	PTS1224	2.0	-1.0	-1.0	-0.2	0.8	0.62	12.0	-48%	UNPROFITABLE	22	67
LVA	PG012	0.6	-0.2	-0.2	0.2	0.4	0.97	0.3	-29%	UNPROFITABLE	722	1094
POL	PTS2440	13.1	2.0	1.3	5.1	3.1	0.60	12.9	10%	PROFITABLE	31	242
POL	DTS1224	6.2	0.9	0.5	2.3	1.4	0.58	6.0	7%	PROFITABLE	60	233
POL	DTS2440	4.1	0.1	-0.4	0.7	0.6	0.47	5.2	-10%	UNPROFITABLE	19	120
POL	PG	10.6	5.8	5.3	7.8	2.0	0.60	2.6	49%	PROFITABLE	378	780
EST	PTS2440	6.8	-1.3	-4.4	1.0	2.3	0.49	14.2	-64%	UNPROFITABLE	26	162
EST	PTS1224	0.5	-0.1	-0.6	0.0	0.1	0.62	2.7	-117%	UNPROFITABLE	11	36
EST	PG012	3.4	0.7	0.5	2.0	1.2	0.65	0.8	15%	PROFITABLE	568	1631
DEU	DTS0012	1.1	0.0	-0.1	0.6	0.6	0.64	27.7	-10%	UNPROFITABLE	9	22
DEU	DTS1224	19.1	4.5	3.8	12.5	8.0	0.65	53.8	20%	PROFITABLE	50	149
DEU	DTS2440	56.4	27.9	26.9	43.1	15.3	0.64	88.1	48%	PROFITABLE	17	173
DEU	PG	8.5	-0.4	-1.3	1.1	1.5	0.70	7.5	-15%	UNPROFITABLE	703	200
LTU	DTS2440	3.4	0.3	0.2	1.4	1.1	0.60	11.0	6%	PROFITABLE	18	100

Option 3b: Option 3a + additional reductions required to reach profitability

Country	Segment	Gr Revenue	Gr Cash Flow	Nt Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	11.6	3.9	3.1	5.7	1.8	0.53	33.1	26%	PROFITABLE	10	54
SWE	PTS40	8.3	2.6	1.6	3.4	0.8	0.62	24.4	20%	PROFITABLE	4	33
SWE	PTS 1224	0.7	0.2	0.1	0.2	0.1	0.89	7.4	9%	PROFITABLE	5	10
SWE	DTS1224	2.6	0.6	0.5	1.0	0.3	0.68	15.8	21%	PROFITABLE	10	22
DNK	PTS2440	6.0	1.2	0.9	3.2	2.0	0.72	76.5	15%	PROFITABLE	5	26
DNK	PTS1224	10.4	1.4	0.3	6.0	4.6	0.86	131.7	3%	STABLE	30	35
DNK	PTS40	5.3	2.2	1.4	3.5	1.3	0.82	63.4	25%	PROFITABLE	2	21
FIN	PTS2440	9.9	1.8	0.5	4.9	3.0	0.68	67.2	5%	PROFITABLE	13	45
FIN	PTS1224	2.1	0.5	0.1	1.1	0.7	0.56	20.0	5%	STABLE	19	33
FIN	PGP012	8.3	4.1	2.1	4.5	0.4	1.00	0.4	26%	PROFITABLE	766	938
LVA	PTS2440	9.8	4.1	4.1	5.3	1.2	0.65	4.3	42%	PROFITABLE	46	279
LVA	PTS1224	2.0	-0.7	-0.7	0.1	0.8	0.10	75.2	-35%	UNPROFITABLE	4	11
LVA	PG012	0.6	-0.2	-0.2	0.2	0.4	0.10	3.4	-26%	UNPROFITABLE	75	113
POL	PTS2440	13.1	2.0	1.3	5.1	3.1	0.60	12.9	10%	PROFITABLE	31	242
POL	DTS1224	6.2	0.9	0.5	2.3	1.4	0.58	6.0	7%	PROFITABLE	60	233
POL	DTS2440	4.1	0.3	0.2	0.9	0.6	0.11	23.1	5%	PROFITABLE	4	27
POL	PG	10.6	5.8	5.3	7.8	2.0	0.60	2.6	49%	PROFITABLE	378	780
EST	PTS2440	6.8	0.3	0.1	2.6	2.3	0.04	175.6	1%	STABLE	2	13
EST	PTS1224	0.5	0.1	0.0	0.2	0.1	0.06	30.0	5%	PROFITABLE	1	3
EST	PG012	3.4	0.7	0.5	2.0	1.2	0.65	0.8	15%	PROFITABLE	568	1631
DEU	DTS0012	1.1	0.1	0.1	0.7	0.6	0.14	125.7	5%	PROFITABLE	2	5
DEU	DTS1224	19.1	4.5	3.8	12.5	8.0	0.65	53.8	20%	PROFITABLE	50	149
DEU	DTS2440	56.4	27.9	26.9	43.1	15.3	0.64	88.1	48%	PROFITABLE	17	173
DEU	PG	8.5	0.8	0.4	2.3	1.5	0.27	19.9	5%	PROFITABLE	267	76
LTU	DTS2440	3.4	0.3	0.2	1.4	1.1	0.60	11.0	6%	PROFITABLE	18	100

Option 3c: Option 3a with adjusted uptake

Country	Segment	Gr Revenue	Gr Cash Flow	Nt Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	11.7	4.0	3.1	5.8	1.8	0.53	33.4	26%	PROFITABLE	10	54
SWE	PTS40	8.3	2.7	1.7	3.5	0.8	0.62	24.6	20%	PROFITABLE	4	33
SWE	PTS 1224	0.7	0.2	0.1	0.2	0.1	0.89	7.4	9%	PROFITABLE	5	10
SWE	DTS1224	2.6	0.6	0.5	1.0	0.3	0.68	15.8	21%	PROFITABLE	10	22
DNK	PTS2440	6.0	1.2	0.9	3.2	2.0	0.72	76.7	15%	PROFITABLE	5	26
DNK	PTS1224	10.5	1.4	0.3	6.0	4.6	0.86	132.0	3%	STABLE	30	35
DNK	PTS40	5.3	2.2	1.4	3.5	1.3	0.82	63.7	26%	PROFITABLE	2	21
FIN	PTS2440	11.2	2.1	0.8	5.5	3.4	0.68	76.1	7%	PROFITABLE	13	45
FIN	PTS1224	2.4	0.5	0.2	1.3	0.7	0.56	22.8	7%	PROFITABLE	19	33
FIN	PGP012	8.4	4.1	2.2	4.5	0.4	1.00	0.4	26%	PROFITABLE	766	938
LVA	PTS2440	10.1	4.3	4.3	5.5	1.2	0.65	4.5	42%	PROFITABLE	46	279
LVA	PTS1224	2.1	-1.0	-1.0	-0.1	0.9	0.62	12.9	-47%	UNPROFITABLE	22	67
LVA	PG012	0.6	-0.2	-0.2	0.2	0.4	0.97	0.4	-29%	UNPROFITABLE	722	1094
POL	PTS2440	15.0	2.4	1.7	5.9	3.5	0.60	14.6	11%	PROFITABLE	31	242
POL	DTS1224	6.2	0.9	0.4	2.3	1.4	0.58	6.0	7%	PROFITABLE	60	233
POL	DTS2440	4.3	0.1	-0.4	0.7	0.6	0.47	5.4	-9%	UNPROFITABLE	19	120
POL	PG	10.6	5.8	5.2	7.8	2.0	0.60	2.6	49%	PROFITABLE	378	780
EST	PTS2440	7.1	-1.3	-4.3	1.2	2.4	0.49	14.8	-61%	UNPROFITABLE	26	162
EST	PTS1224	0.5	-0.1	-0.6	0.0	0.1	0.62	2.9	-112%	UNPROFITABLE	11	36
EST	PG012	3.4	0.7	0.5	2.0	1.3	0.65	0.8	15%	PROFITABLE	568	1631
DEU	DTS0012	1.1	0.0	-0.1	0.6	0.6	0.64	27.8	-10%	UNPROFITABLE	9	22
DEU	DTS1224	19.2	4.5	3.8	12.6	8.0	0.65	53.9	20%	PROFITABLE	50	149
DEU	DTS2440	56.3	27.8	26.8	43.1	15.3	0.64	88.0	48%	PROFITABLE	17	173
DEU	PG	8.6	-0.4	-1.3	1.1	1.5	0.70	7.6	-15%	UNPROFITABLE	703	200
LTU	DTS2440	3.6	0.3	0.2	1.5	1.1	0.60	11.5	7%	PROFITABLE	18	100

Output 3a_1: Option 3a with increased fuel cost

Country	Segment	Gr Revenue	Gr Cash Flow	Nt Profit	Gr Value Added	Crew Share	Fleet reduction	Crew wage ('000 €)	Nt Profit/ Gr revenues	Classification	Fleet size	Employment
SWE	PTS2440	11.6	3.0	2.2	4.5	1.4	0.53	26.0	19%	PROFITABLE	10	54
SWE	PTS40	8.3	1.9	0.9	2.5	0.6	0.62	18.0	11%	PROFITABLE	4	33
SWE	PTS 1224	0.7	0.1	0.0	0.2	0.0	0.89	5.0	1%	STABLE	5	10
SWE	DTS1224	2.6	0.4	0.3	0.7	0.2	0.68	11.3	13%	PROFITABLE	10	22
DNK	PTS2440	6.0	0.9	0.5	2.5	1.6	0.72	64.3	9%	PROFITABLE	5	26
DNK	PTS1224	10.4	1.1	0.0	5.2	4.1	0.86	118.6	0%	STABLE	30	35
DNK	PTS40	5.3	1.9	1.1	3.1	1.2	0.82	57.9	21%	PROFITABLE	2	21
FIN	PTS2440	9.9	1.6	0.2	4.1	2.6	0.68	57.0	3%	STABLE	13	45
FIN	PTS1224	2.1	0.4	0.0	0.9	0.5	0.56	16.1	0%	STABLE	19	33
FIN	PGP012	8.3	3.7	1.7	4.0	0.3	1.00	0.4	21%	PROFITABLE	766	938
LVA	PTS2440	9.8	3.3	3.3	4.3	1.0	0.65	3.6	34%	PROFITABLE	46	279
LVA	PTS1224	2.0	1.6	1.6	-0.7	-2.3	0.62	-34.2	78%	PROFITABLE	22	67
LVA	PG012	0.6	-0.1	-0.1	0.1	0.2	0.97	0.2	-16%	UNPROFITABLE	722	1094
POL	PTS2440	13.1	0.9	0.2	2.9	2.0	0.60	8.2	2%	STABLE	31	242
POL	DTS1224	6.2	0.4	-0.1	1.1	0.8	0.58	3.3	-1%	STABLE	60	233
POL	DTS2440	4.1	-0.4	-0.9	-0.5	-0.1	0.47	-1.0	-21%	UNPROFITABLE	19	120
POL	PG	10.6	5.4	4.8	7.3	1.9	0.60	2.4	45%	PROFITABLE	378	780
EST	PTS2440	6.8	-1.4	-4.5	0.2	1.6	0.49	9.8	-66%	UNPROFITABLE	26	162
EST	PTS1224	0.5	-0.2	-0.7	-0.2	0.0	0.62	0.5	-131%	UNPROFITABLE	11	36
EST	PG012	3.4	0.6	0.4	1.7	1.1	0.65	0.7	12%	PROFITABLE	568	1631
DEU	DTS0012	1.1	0.0	-0.1	0.5	0.5	0.64	22.5	-12%	UNPROFITABLE	9	22
DEU	DTS1224	19.1	4.0	3.3	11.4	7.4	0.65	49.4	17%	PROFITABLE	50	149
DEU	DTS2440	56.4	26.6	25.6	41.3	14.7	0.64	84.7	45%	PROFITABLE	17	173
DEU	PG	8.5	-0.7	-1.7	0.4	1.2	0.70	5.8	-19%	UNPROFITABLE	703	200
LTU	DTS2440	3.4	0.1	0.0	1.0	0.8	0.60	8.4	1%	STABLE	18	100