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Report of the Study Group on Fish and Fisheries Issues in the BSRP (SGBFFI)

9–13 June 2005

Riga, Latvia

International Council for the Exploration of the Sea
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Executive Summary

The Study Group on Fish and Fisheries Issues in the BSRP (SGBFFI) addressed all Terms of Reference. Concerning open sea fish species (herring, sprat and cod) the main effort was allocated to growth modelling of Baltic herring (i), environmental factors affecting fishes recruitment (iii) and status of compilation of the Baltic fish historical data that are partly financed by Baltic Sea Regional Project (iii).

The Study Group made an inventory on available time-series on zooplankton abundance, hydrography and mean weights-at-age to start a meta-analysis of growth changes of Baltic herring and sprat and suggested possible ways of growth modelling for stock development forecasts. Concerning environmental factors affecting fish recruitment the Study group mainly focused on different Baltic herring populations and summarized presently available knowledge.

Due to significant age reading inconsistencies of the Baltic cod between the countries it is considered that an alternative method for cod age reading could be based on otolith weight data. The Study group reviewed the status of cod otolith weight data compilation that was agreed during SGBFFI meeting in 2004. As a result was suggested:

1) For commercial fishery data (2001–2004): It is necessary by national laboratories to prepare and upload otolith weight data in FishFrame database. Deadline – November 2005.

2) For research survey data (2001–2004): It is necessary to prepare a haul based size distribution of cod from research surveys in March and November BITS surveys.

The Study group updated existing knowledge on environmental processes affecting dynamics of coastal fish species. In addition, most important gaps in the current knowledge that should be considered when planning/designing future research activities are also provided. These are: (1) rates and patterns of impact of fish and invertebrate invasions on native coastal fish species/communities, (2) predation of coastal fish by marine mammals and fish-eating birds, (3) coastal-open sea trophic interactions, (4) food-web interactions in coastal areas and (5) factors affecting formation of recruitment of coastal fish species. One of the most important outcomes of the meeting was providing suggestions for improvement of the HELCOM Thematic assessment report on coastal fish. The SG response was structured into two major sub-items (1) General comments for the topic and (2) Specific comments on the report. The recent evidence suggests that the provided suggestions are being considered by the authors of the HELCOM report.

It appeared that there exists quite a lot of information on population structure of non-assessed commercial stocks, especially for the most valuable coastal species like pikeperch, flounder and vimba. Despite of significant role of other coastal fish species like perch, roach, eel in the coastal environment and fishery, relevant research activities of those species have been weak in the past. Gaps in knowledge for several species (like eel, perch, European whitefish and twaite shad) will be improved by currently ongoing activities in several regions in the Baltic Sea. Overview on ongoing stock assessment (of other fish than cod, herring, sprat and salmon) shows that at least 18 stocks of various fish are currently being assessed with the most significant activities in Poland, Russia, Finland and Sweden and with no respective ongoing activities in Estonia, Latvia and Lithuania.

The meeting finalised the coastal fish meta-database. The database has divided into three sections: experimental surveys on (1) warm-water and (2) cold-water fish and (3) commercial sampling. The database format is slightly different for the above three sub-parts. The following countries have submitted the information: Estonia, Finland, Latvia, Lithuania, Poland, Russia and Sweden.

Strategic coordination and planning activities were conducted together with SGMAB and addressed first specific actions like the organization of a common cod stomach sampling program, and data requirements from future ecosystem oriented surveys. Secondly structural requirements for conducting a regional integrated assessment of the Baltic Sea were discussed. This resulted in a suggestion to restructure the WG and SG group set-up underneath the Baltic and Advisory Committees. This suggestion should be seen as a starting point of a discussion in a broader forum rather than a well defined plan.

Finally, the Study Group suggested that for next year's meeting, more effort should be allocated to fish species that have strong open sea and coastal interactions e.g., Baltic herring and flounder.

1 Introduction

1.1 Participation

SGMAB and SGBFFI members

Tatjana Baranove	Latvia	(SGBFFI)
Massimiliano Cardinale	Sweden	(SGBFFI & SGMAB)
Margit Eero	Estonia	(SGBFFI & SGMAB)
Valeri Feldman	Russia	(SGBFFI & SGMAB)
Georgs Kornilovs	Latvia	(SGBFFI & SGMAB)
Atis Minde	Latvia	(SGBFFI)
Christian Möllmann	Denmark	(SGBFFI & SGMAB)
Bärbel Müller-Karulis	Latvia	(SGBFFI & SGMAB)
Henn Ojaveer (Co-Chair)	Estonia	(SGBFFI)
Wojciech Pelczarski	Poland	(SGBFFI)
Maris Plikshs (Co-Chair)	Latvia	(SGBFFI & SGMAB)
Rimantas Repecka	Lithuania	(SGBFFI)
Włodzimierz Grygiel	Poland	(SGBFFI & SGMAB)
Tiit Raid	Estonia	(SGBFFI & SGMAB)
Yvonne Walther	Sweden	(SGBFFI)
Tomas Zolubas	Lithuania	(SGBFFI)

The full list of participants is represented in Annex 1.

1.2 Terms of Reference

According to Annual Science Conference Resolution in 2004 (C.Res 2004/2H05), A Study Group on Baltic Fish and Fisheries Issues in the BSRP [SGBFFI] (Co-Chairs: Maris Plikshs, Latvia and Henn Ojaveer, Estonia) will meet in Riga, Latvia, from 9–13 June 2005 to:

a) finalize the inventory on available time-series on zooplankton abundance, hydrography and mean weights at-age, start a meta-analysis of growth changes of Baltic herring and sprat and suggest possible ways of growth modelling for stock development forecasts;

b) produce a status summary on and identify gaps in operational models for use in stock projections for eastern Baltic cod, sprat and herring which include ecosystem variability;

c) produce a status summary on and identify ways to promote progress in compiling and computerizing historic data from research vessels surveys, commercial catches, fish stomach analyses and otolith biometric studies;

d) update status of and identify gaps in compiling meta-databases of coastal fish:

  i) for commercial sampling by country, region, species, years, parameters measured and calculated indices,

  ii) for experimental sampling by country, region, purpose of the study, species, years, parameters measured and calculated indices.

e) update existing knowledge on environmental processes affecting dynamics of coastal fish species;

f) summarize and identify gaps in knowledge of population structure of non-assessed commercial stocks;

g) compile and summarize available information on environmental condition of herring spawning grounds, with particular emphasis on loss of spawning habitat and population subcomponents;

h) plan its meeting in 2005 or 2006 as a joint or overlapping meeting with at least one other Baltic Study Group (e.g., SGPROD, SGGIB, SGBEM, SGMAB).

SGBFFI will report by 13 July 2005 for the attention of the Baltic Committee, ACFM and ACE.

1.3 Activities of BSRP related to SGBFFI 2004 recommendations

ICES began the implementation of the Large Marine Ecosystem Activities with the formation of a Planning Group on the Implementation of the Baltic Sea Regional Project and the formation of four study groups to support the BSRP (Study Group on Baltic Fish and Fisheries Issues in the BSRP [SGBFFI], Study Group on Baltic Sea Productivity Issues in support of the BSRP [SGPROD], Study Group on Baltic Ecosystem Health Issues in support of the BSRP [SGEH], Study Group on Baltic Ecosystem Model Issues in support of the BSRP [SGBEM]).

The ICES SGBFFI was established with aim of setting a scientific basis for implementation of BSRP plans in relation to Fish and Fisheries issues and the coordination is done by Fish and Fisheries coordination centre (CCFF).

Under the CCFF are 4 lead laboratories (LL):

1) ICES surveys in Kaliningrad;
2) Coastal Activities in Tallinn;
3) Fish age and Stomach analyses in Riga;
4) Salmon River restoration in Riga.

BSRP implementation and establishment of CCFF and LL has been started in February 2004. Only LL on ICES surveys in the Baltic was established in August 2004.

During first year of work the main directions in the CCFF and LL was concentrated in following directions:

1) improvement of age reading of commercial fish species;
2) historical fish biological data compilation from commercial and research surveys;
3) improvement of area coverage of Baltic international hydro-acoustic surveys;
4) coordination and improvement of coastal fish monitoring network;
5) upgrade of national laboratories of Eastern Baltic countries with equipment.

Age reading of the Baltic herring was continued. This was previously done by the SG on Baltic herring age reading. At first a group of national experts was established. Secondly, eight herring otolith samples was prepared and aged by national experts. Results were discussed during EU herring age reading workshop in Finland, June 2005. In principal the age reading of herring is quite consistent and otolith sample regular exchange helps to maintain the present level.

Similar activities were performed in relation to sprat. Presently exchange of otolith collection is ongoing. The age reading workshop is planned during autumn 2005 or early 2006.

Concerning other fish species, the perch which is probably the most widespread commercial species in the coastal zone, age reading workshop was held in Riga, February 2005. Additionally the flounder age reading workshop is planned in January–February 2006.

In relation to cod based on recommendations of SGBFFI 2004 and SGABC 2004 was initiated otolith weight data collection from 2001–2003 research surveys and commercial fishery sampling. It is considered that due to significant inconsistencies in age reading of the Baltic cod national age readers (the agreement between separate readers is low, mainly below 60% - based on SGABC results) the cod otoliths weights could be the only independent and age portioning method. In this respect the technical assistance possibilities was used from LL and

CCFF for Poland, Russia and Latvia. However, this was available only since March of 2005 only.

As it is stated in BSRP project implementation plan (PIP Sub-activity 2(b) Conduct Joint, Integrated Open Sea Surveys and Task (3) Joint Baltic International Acoustics Surveys (BIAS) the area coverage of Baltic hydro-acoustic surveys is critical to obtain the appropriate tuning indices for pelagic fish (sprat, herring) species. Therefore the one of main tasks in this relation is investigations on possibilities and feasibility of improvement of area coverage of surveys in the Northern Baltic SD 29, 32 and coastal areas of SD 26 and 28. The additional coverage in coastal areas of SD 26 and 28 in Latvian and Lithuanian zone is necessary because the surveys in 2005 is planned to conduct by foreign vessel (e.g. Polish RV "Baltica") which is not able to enter the national 12 mile zones where depths are deeper than 20m. For Russian national zone additional survey with chartered c/v is necessary because RV "ATLNTNIRO" is not able operate on depths shallower that 30 m. Coastal zone area coverage also is necessary because of possible juvenile fish (sprat) distribution in these areas. Juvenile sprat abundance is used as recruitment indices for stock assessment and predictions (Figure 1.1).

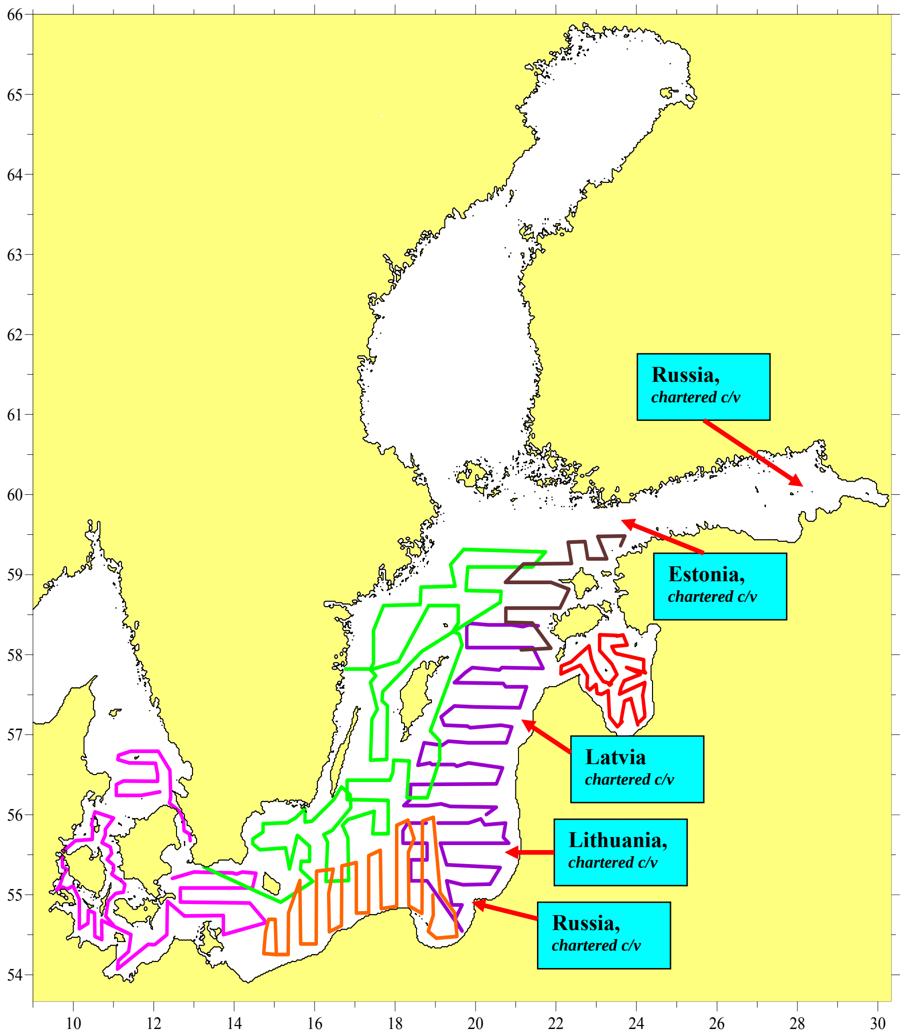


Figure 1.1: Tracks of International hydro-acoustic survey coverage in the Baltic in the 2004 and areas of necessary extension of survey.

Coloured tracks indicate present national acoustic survey coverage: green – Sweden, violet – Denmark/Germany, red – Poland, blue – Russian/Latvian, brown – Estonian, orange – Latvia/Estonia (Gulf of Riga).

The first attempt of historical data compilation was made to compile the herring mean weight-at-age data from commercial fish sampling and hydro-acoustic surveys. The main aim of this activity was to perform the herring growth modelling including environmental parameters e.g. hydrography and zooplankton. The status of compiled data and progress made towards the modelling is shown in Section 2. Besides the growth modelling for Gulf of Riga herring is initiated by Chairs of SGPROD and SGBEM (Bärbel Müller-Karulis and Wolfgang Fennel). The corresponding data sets were made available for Gulf of Riga herring.

That has not been started yet is length based cod assessment data compilation. This was delayed because it is still not clear that otolith weight measurements be able to fully replace the traditional age reading by otoliths (SGABC).

In autumn 2004 CCFF has organized the workshop on data upload and management in FishFrame database. In 2005 is planned follow up workshop of FishFrame database and also workshop on data upload and management in DATRAS (Baltic trawl survey) database.

Seven countries (Estonia, Finland, Latvia, Lithuania, Poland, Russia and Sweden) are included into the coastal fish network. Most important success has been achieved in the following activities of the network: (1) describing and discussing sample/analysis methodologies of the Baltic coastal fish monitoring; (2) preparation of the coastal fish assessment report (see Section 5.1.2.) and (3) creation of the coastal fish meta-database (see Annex 2).

2 Baltic herring growth modelling

The Study Group made an inventory on available time-series on zooplankton abundance, hydrography and mean weights at-age to start a meta-analysis of growth changes of Baltic herring and sprat and suggested possible ways of growth modelling for stock development forecasts.

2.1 Herring growth database

A unique database on herring growth data (i.e. weight, length, age) has been assembled intersessionally and during the meeting. Presently the database contains 129875 single fish entries collected during the Baltic International Acoustic Survey (BIAS) in October 1986–2003 (Table 2.1.1). Data are available for ICES Subdivisions (SD) 25–29S and were provided by Sweden, Poland, Latvia and Germany. Further data from Russia will be submitted shortly after the meeting and included into the database. A separate analysis of the Russian data, which in contrast to data from the other countries contain population type (coastal vs. open-sea), indicated significant differences in growth rates between the populations. This difference will be considered when conducting spatio-temporal comparison of growth rates.

Table 2.1.1: Number of individual herring growth records from hydroacoustic surveys per Sub-division (SD).

YEAR	SD 25	SD 26	SD 27	SD 28	SD29	TOTAL
1986	3023	3379	2906	2879	1739	13926
1987	1064	2089	2723	2656	1007	9539
1988	4030	2996	1766	3785	271	12848
1989	2804	2590	3663	2098	1226	12381
1990	2189	1240	3883	2979	1707	11998
1991	-	-	-	-	-	-
1992	2461	1222	1975	659	632	6949
1993	-	659	-	574	-	1233
1994	1874	688	1101	2079	683	6425
1995	1165	580	615	2527		4887
1996	2073	1885	965	1837	710	7470
1997	329	1258	-	1958	-	3545
1998	1538	1282	812	2420	431	6483
1999	1239	1247	538	2806	480	6310
2000	1282	3469	383	2545	186	7865
2001	1848	1449	677	2902	506	7382
2002	1040	361	873	70	587	2931
2003	1661	1209	1077	2835	921	7703
Total	29620	27603	23957	37609	11086	129875

(- no data)

A second database on herring growth data from the commercial fishery for the years 1980–2003 is presently under construction. Because of the success of the effort for herring, a similar initiative database for sprat is envisaged for the meeting of SGBFFI in 2006.

2.2 Environmental data

Previous analyses in different areas of the Baltic Sea demonstrated the importance of hydrographic variability, zooplankton population size and community composition as well as competition for growth and condition of herring (Cardinale and Arrhenius, 2000; Möllmann *et al.*, 2003, 2005; Rönkkönen *et al.*, 2004). Hence, the group decided to base the analysis of the effect of abiotic and biotic environmental conditions on clupeid fish growth on these variables for which already existing and easily accessible databases are available. These are the ICES-hydrographic database, hydrography and zooplankton time-series from LatFRA and SD-specific stock sizes of herring and sprat from MSVPA-runs conducted during SGMAB. The possibility of getting data-series of especially zooplankton standing stocks from other areas will be further explored. Especially access to the HELCOM zooplankton database held by ICES is needed.

2.3 Analysis of temporal and spatial variability

During the meeting a preliminary analysis of changes in herring condition was conducted using the hydroacoustic survey data. As condition of fish is regarded as the best descriptor of growth we adopted the approach to use a (double logarithmic) length-weight regression as an index of condition (Cardinale and Arrhenius, 2000; Winters and Wheeler, 1994; Tanasichuk, 1997). Regressions were performed on an annual basis and condition was calculated as the weight at 15 and 20 cm (CF_{15} and CF_{20}). CF at both lengths showed a similar time-trend with a decline in condition from the mid-1980s to the mid-1990s (Figure 2.3.1). An increase is visible after the year 2000 for all SDs. The downward trend in condition since the mid 1980s is even more pronounced for herring of 20 cm length (Figure 2.3.2).

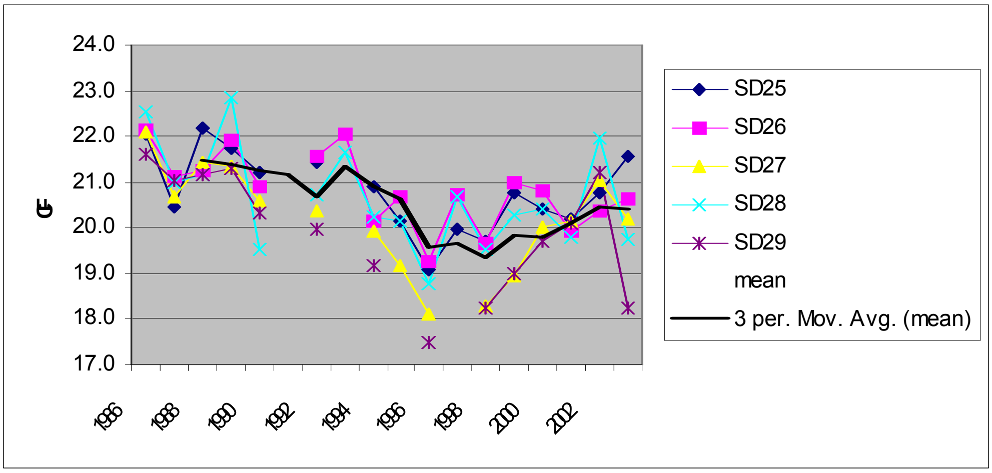


Figure 2.3.1: Condition (CF) at 15 cm for different SDs and the mean as a 3 point moving average.

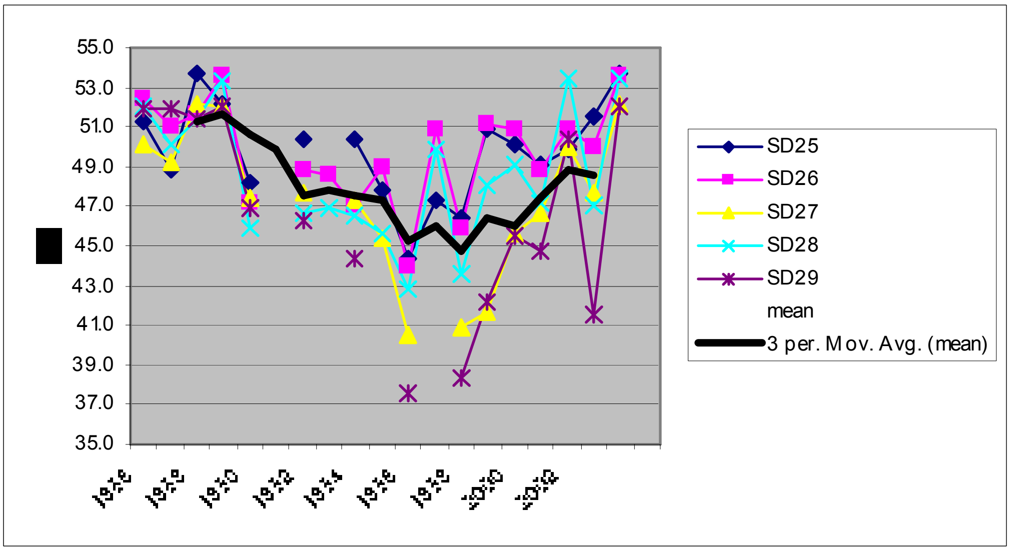


Figure 2.3.2: Condition (CF) at 20 cm for different SDs and the mean as a 3 point moving average.

Cluster Analysis (Wards Method of Squared Euclidean Differences) was used to investigate spatial differences (Figure 2.3.3). Clearly, SDs 27 and 29 differ from the SDs 25, 26 and 28. Within the latter group the highest similarity exists between SDs 25 and 26. The differences between the two “area-groups” are maximal when condition is lowest during the late 1990s.

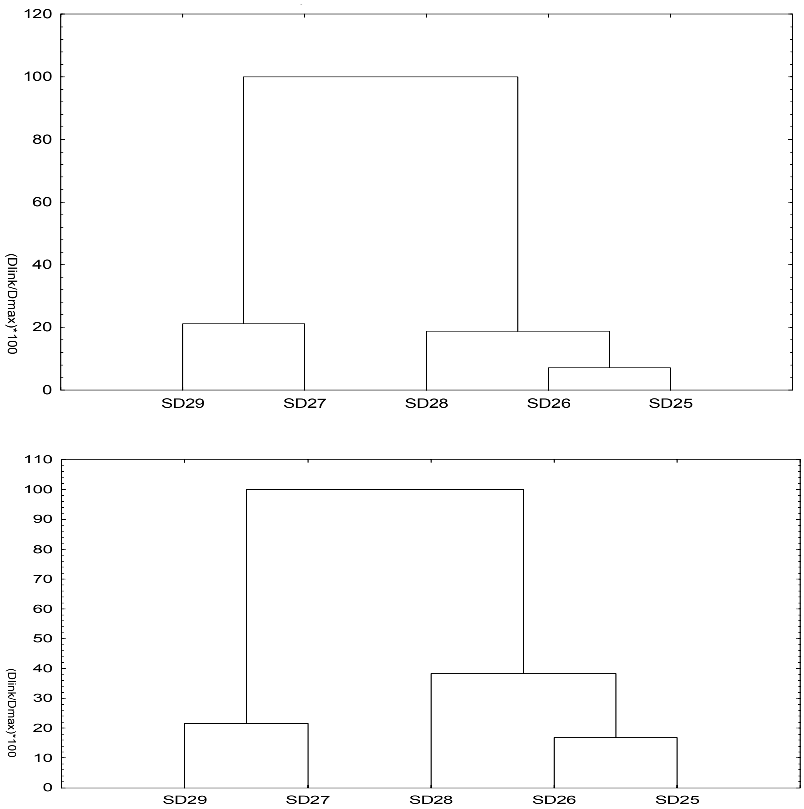


Figure 2.3.3: Results of the Cluster-Analysis of the spatial difference in CF_{15} (above) and CF_{20} (below).

2.4 Analysis of the effect of environmental variables on CF_{20}

Due to the best data available, SD 28 was selected as a case study for investigating the influence of the abiotic and biotic environment on CF_{20}. The following time-series for the years 1986–2003 were available for the analysis:

- Annual herring, sprat and total clupeid abundance and biomass of the 1^{st} quarter from area-disaggregated MSVPA;
- *Pseudocalanus* sp. and *Temora longicornis* abundance and biomass of copepodites C4–5 and adults C6 in spring (May) and summer (August) from the LatFRA database;
- Temperature and salinity in 0–50 m and 50–100 m in spring (May) and summer (August) from the LatFRA database.

Trends in environmental variables Sprat biomass and stock numbers increased drastically until 1995, levelling off afterwards (Figure 2.4.1). Herring stock numbers were relatively stable during the considered period while biomass was considerably lower during the 2^{nd} half of the 1990s. Due to the present dominance of the sprat stock, the development of the total clupeid stock resembles mostly the sprat stock.

Abundance and biomass of the dominating copepod species in the Central Baltic are displayed in Figure 2.4.2. Both in terms of numbers and biomass *Acartia* spp. is the prevailing species in spring with an increasing trend. *T. longicornis* and *Pseudocalanus* sp. are on a lower level, decreasing slightly since the late-1990s. Also in summer *Acartia* spp. is the most abundant copepod, while in biomass *T. longicornis* dominates. The *Pseudocalanus* sp. summer population declined during the considered period, while the two other copepods are relatively stable.

The hydrographic situation during the considered period is described in Figure 2.4.3. While the thermal conditions remained stable in both water layers, salinity showed differing trends. Surface salinity declined continuously, while deep water salinity increased after 1993.

2.5 Statistical modelling

For the statistical analyses time-series were normalized by using the natural logarithm (ln+1). General Linear Models (GLM) were used for modelling the influence of different variables on herring condition. Firstly, a stepwise selection of influential variables was performed within the 3 categories, i.e. clupeid stock sizes, zooplankton standing stocks and hydrography. Identified significant variables were clupeid abundance (clupnumb), *Pseudocalanus* sp. abundance (SpPsab) in spring and *T. longicornis* (SuTeab) in summer. No hydrographic variable was found to significantly relate to CF_{20}.

As the next step of the analysis a model selection approach was adopted. CF_{20} was modelled as a function of all possible combinations (1, 2 and 3-parameter models) of above identified variables. Models were compared with the Akaike Information Criterion (AIC), containing information on the explained variance, but incorporating a penalty for the numbers of parameters (Akaike, 1974). The results of the model selection exercise are given in Table 2.5.1.

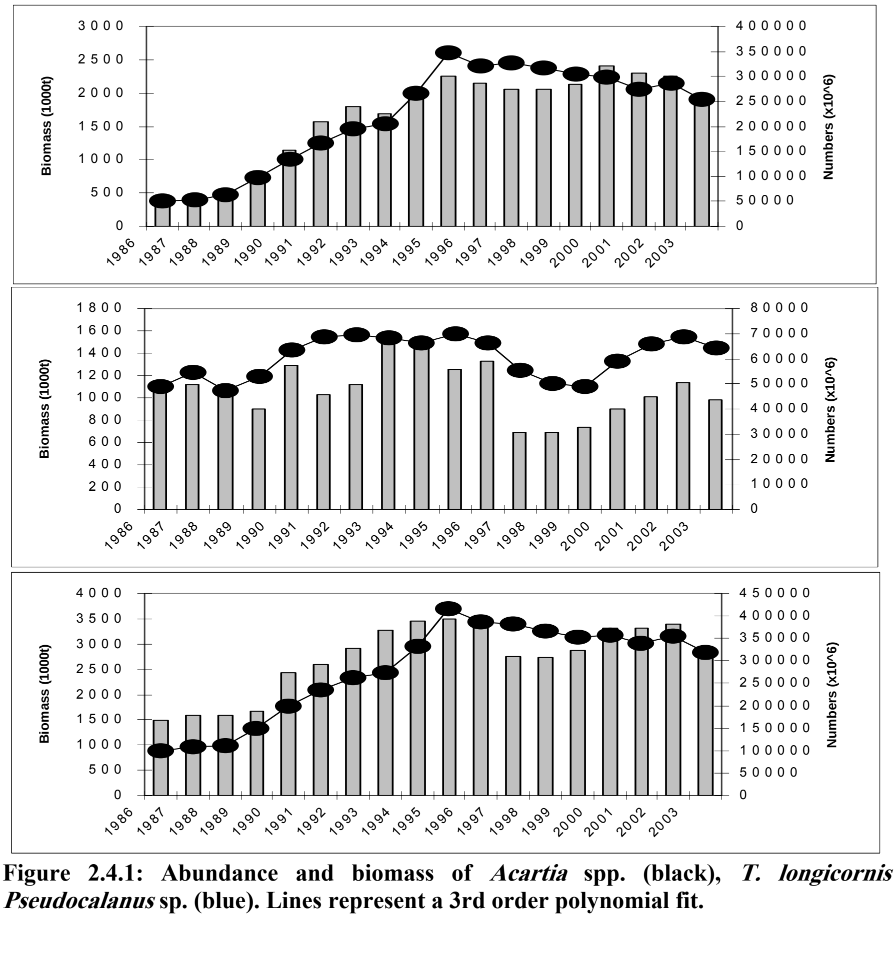
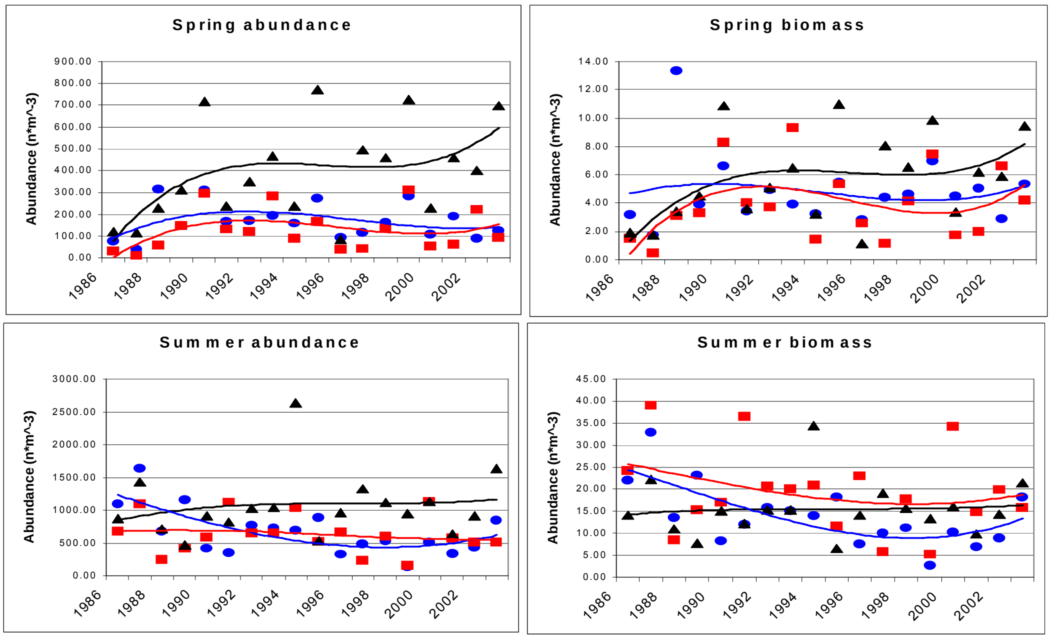


Figure 2.4.1: Abundance and biomass of *Acartia* spp. (black), *T. longicornis* (red) and *Pseudocalanus* sp. (blue). Lines represent a 3rd order polynomial fit.



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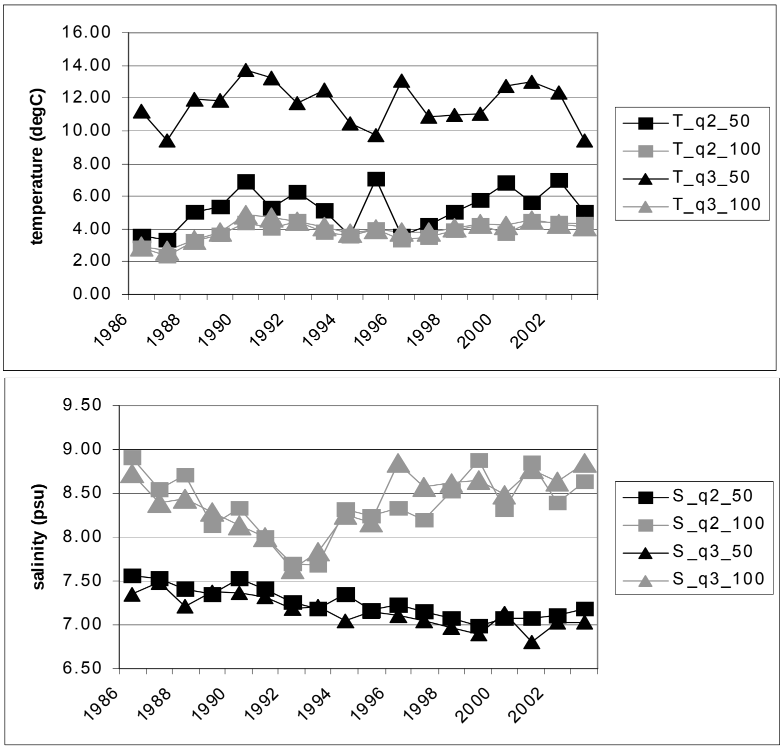

Figure 2.4.3: Temperature and salinity in quarter 2 and 3 (q2, q3) in 0-50m (50) and 50–100 m (100).

Table 2.5.1: Results of the GLM-modelling of CF_{20}. Models are ordered according to the value of the AIC.

Model	Variables			Df	P	N	AIC	%Var
3			Clupnumb	15	1	17	85.2	0.31
1	clupnumb	SpPsab	SuTeab	13	3	17	85.4	0.45
4		Clupnumb	SuTeab	14	2	17	86.3	0.37
2		Clupnumb	SpPsab	14	2	17	86.4	0.33
5		SpPsab	SuTeab	15	1	17	91.5	0.20

Df-degrees of freedom, p-number of parameters, n-number of data points, %Var-explained variance

The model with lowest AIC was a simple 1-parameter model with the total stock of clupeids as the explaining variable (Model 3). The model explaining the highest variance in the data is the 3-parameter model using both copepod variables and the clupeid abundance (Model 1). For the model with the selected three variables, clupeids number explained 56%, *T. longicornis* 26% and *Pseudocalanus* sp. 18% of total variance of the model.

2.6 Discussion

The results of this preliminary analysis support recent analyses on herring growth using different datasets. Although the time-series used is relatively short, clupeids number (hypothesis of density dependence) explained the largest part of the variance, with low growth rates associated to period of large stock size of clupeids. At the same time, while *T. longicornis* has a positive effect on the herring growth, *Pseudocalanus* sp. was found to have a negative effect which is in contrast with other studies. Rönkkönen *et al.* (2004) and Möllmann *et al.* (2003, 2005), using longer time-series, showed the importance of *Pseudocalanus* sp. for herring growth in the Gulf of Finland and the Central Baltic, respectively. Also the population of *Pseudocalanus* sp., which is the main food source for herring in spring (Möllmann *et al.* 2004), decreased in parallel to salinity (Möllmann *et al.,* 2000), and it was pointed out as the main cause of the decline in herring growth. This inconsistency needs further exploration.

Also competition was shown to influence herring growth (Cardinale and Arrhenius, 2000; Möllmann *et al.*, 2005). Competition increased drastically during the 1990s because of the high sprat stock (see above), thus decreasing the food availability for individual fish. Contrary Rönkkönen *et al.* (2004) could not find density-dependent growth in the Gulf of Finland, which is probably due to not considering the interaction with the sprat stock.

A new result from this analysis is the importance of *T. longicornis* in summer for herring condition. This is explainable by the dominance of this copepod in the diet of herringin summer, while in spring *Pseudocalanus* sp. dominates (Möllmann *et al*., 2004). Contrary to former studies (Rönkkönen *et al.*, 2004); no direct influence of salinity on herring condition could be found using the present dataset. In all previous studies no effect of temperature on herring growth and condition could be detected, which is confirmed by the present analysis.

2.7 Future growth modelling for stock development forecasts

Intersessionally the present preliminary analysis of environmental variables affecting herring growth will be continued. Further analyses on sprat growth will be started as soon as the database is completed.

The final goal of these analyses is the identification of the main drivers for Baltic clupeid fish growth and incorporates these in models for stock forecasts. Our preliminary analyses point to the importance of density-dependence and zooplankton food availability for herring growth. As the density-dependence integrates in a way also the food supply, the easiest and probably most operational growth model would just a density-dependent one. A way of incorporating environmental factors would be to modify e.g. the von Bertanlanffy growth model by adding terms for the influential variable. The different possibilities of constructing growth models for herring will be further explored and preliminary models will be constructed for herring. These will be available for the next meeting of SGBFFI.

3 Environmental parameters affecting herring population dynamics

The Study Group of Herring Assessment Units in the Baltic has distinguished 11 local herring stocks in the Baltic (ICES, 2001). These local stocks differ from each other to a smaller or larger extent both in morphology as well as in dynamics of stock parameters (Figure 3.1).

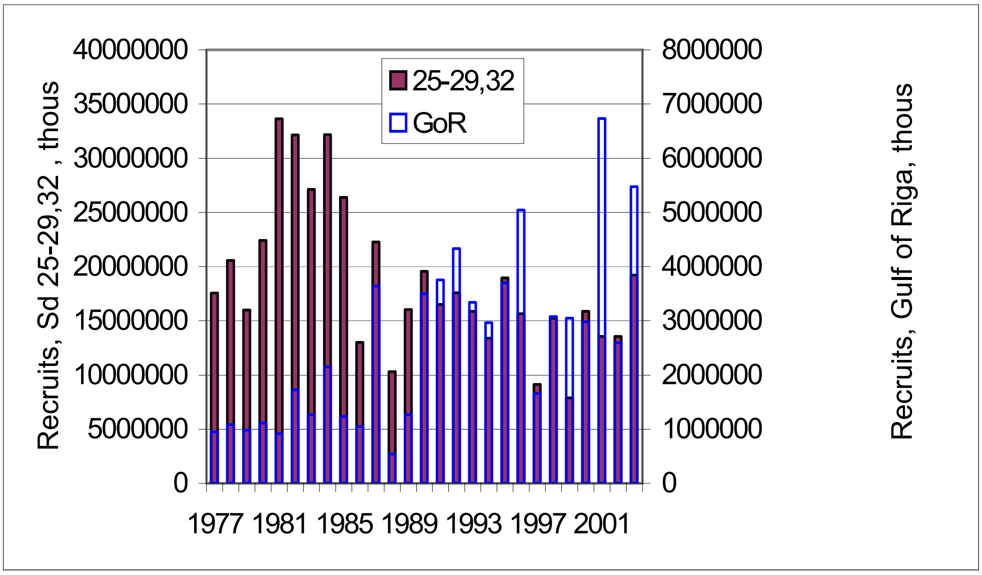

Figure 3.1: Recruitment dynamics in herring in SD. 25, 29, 32 and in the Gulf of Riga (ICES, 2004).

The local populations are affected by different environmental conditions prevailing in the main area distribution of every particular stock. Temperature, salinity and trophic interactions are the key factors directly and/or indirectly affecting the population dynamics. The observations have indicated that the populations inhabiting the Baltic larger gulfs have somewhat different dynamics compared to those located in the Baltic proper.

3.1 Gulf of Riga herring

Gulf of Riga herring is a separate population of Baltic herring *(Clupea harengus membras)* that is met in the Gulf of Riga (the eastern part of ICES Subdivision 28). It is a slow-growing herring with one of the smallest length and weight-at-age in the Baltic and thus considerably differs from the neighbouring herring stock in the Baltic Proper (Subdivisions 25–29).

The stock is assessed using analytical model (XSA) tuned on CPUE data and acoustic estimates.

The historical dynamics of the recruitment (age 1) reveal a rather similar to that of spawning stock biomass trend. The recruitment fluctuated at the level of 1000–3000 millions in the 1970s and 1980s. In the 1990s the recruitment increased, reaching values above 3000–6000 millions (Table 3.1.1). In 2000s two record high year classes appeared reaching values of 7000 millions at age 1 in the beginning of the year.

However environmental factors, particularly the winter temperature and zooplankton abundance are believed to have significant effect on the recruitment of the Gulf of Riga herring and use for prediction of recruitment (ICES, 2005). The severity of winter significantly influences the year-class strength; already observed by L. Rannak since 1950s (Rannak, 1971). Since 1989 a period of mainly mild winters resulted in series of rich year-classes and increase in SSB. After severe winters of 1996 and 2003 poor year classes appeared. It is considered that after mild winters the spawning of herring is distributed more evenly and spawning period is longer, the zooplankton abundance is higher improving the feeding conditions of herring larvae. The linear regressions plots between of estimated recruits abundance and mean surface temperature in April and mean zooplankton abundance are shown in Figure 3.1.1.

A number of abundant year classes have been recruited into the stock on the background of increasing trends observed in temperature and zooplankton during the recent decades. So, the period since the late 1980, when most of the winters were mild, a series of rich recruitments can be observed. The severe winter of 1996 and 2003 resulted in a poor year-class.

On the basis of that assumption, the values of mean water temperature in April and abundance of zooplankton in May (factors which significantly influence the year class strength of Gulf herring (Kornilovs, 1995)) are regressed to the 1-group from the XSA using the RCT3 program (Table 3.1.2.). The resulting estimates for the 2004 year class would be 3466 millions that is above the average.

The weight of zooplankton abundance in the prediction of recruitment has considerably decreased in the last years due to appearance of two very rich year classes. Zooplankton abundance in May in those years was only slightly above the average and thus these years stand out of line in the relationship between zooplankton abundance and year-class strength. Obviously some other factors favoured the reproduction of herring or the zooplankton survey missed the period of its high abundance in 2000 and 2002.

Table 3.1.1. Gulf of Riga herring. Input data for RCT3.

2	28	2	
'Year'	'VPA'	'Temp.'	'Zoopl.'
1977	1077181	40	6.1
1978	978112	60	9.3
1979	1111981	30	5.3
1980	910995	50	6.6
1981	1705524	70	6.1
1982	1260089	100	8.6
1983	2095173	140	12.9
1984	1238620	90	7.6
1985	1045741	10	4.2
1986	3631090	90	21
1987	535271	5	4
1988	1251944	40	4.7
1989	3473835	310	7.9
1990	3719060	380	20.3
1991	4301668	170	13.3
1992	3323880	270	19.5
1993	2937156	200	10.8
1994	3649703	90	15.3
1995	5019975	130	31.5
1996	1656654	10	10.6
1997	2969889	100	21.5
1998	3073028	200	17.7
1999	2867650	120	24.2
2000	7149835	210	16.7
2001	2761527	160	19.8
2002	7229050	170	8.6
2003	-11	5	4.6
2004	-11	120	16.5

VPA - recruitment values (age 1) from 2005 VPA in thousands
Temp.- mean water temperature in April, all values multiplied by 100
Zoopl. - the abundance of zooplankton in May (number* 1000)

Table 3. 1. 2 Gulf of Riga herring. RCT3 analysis.

```
Analysis by RCT3 ver3.1 of data from file : c:\RCT3\DOC\recrdata.txt
Herring    recruitment in    the   Gulf  of    Riga
Data for    2 surveys over   28 years :  1977 - 2004
Regression type = C
Tapered time weighting applied
power =    3 over  20 years
Survey weighting not applied
Final estimates shrunk towards mean
Minimum S.E. for any survey taken as    .20
Minimum of   3 points used for regression
Forecast/Hindcast variance correction used.

Yearclass =   2000
         I-----------Regression----------I  I-----------Prediction---------I
Survey/  Slope  Inter-   Std  Rsquare  No.  Index Predicted   Std     WAP
Series           cept   Error          Pts  Value   Value    Error   Weights
Temp.      .57  12.17    .42   .637     23   5.35   15.24     .487     .359
Zoopl.    1.27  11.35    .44   .618     23   2.87   15.00     .501     .339
                                       VPA Mean =   14.82     .531     .302

Yearclass =   2001
         I-----------Regression----------I  I-----------Prediction---------I
Survey/  Slope  Inter-   Std  Rsquare  No.  Index Predicted   Std     WAP
Series           cept   Error          Pts  Value   Value    Error   Weights
Temp.      .65  11.88    .48   .594     24   5.08   15.17     .548     .379
Zoopl.    1.60  10.50    .59   .493     24   3.03   15.35     .677     .248
                                       VPA Mean =   14.92     .552     .373

Yearclass =   2002
         I-----------Regression----------I  I-----------Prediction---------I
Survey/  Slope  Inter-   Std  Rsquare  No.  Index Predicted   Std     WAP
Series           cept   Error          Pts  Value   Value    Error   Weights
Temp.      .65  11.84    .47   .554     25   5.14   15.20     .544     .373
Zoopl.    1.72  10.09    .63   .417     25   2.26   13.98     .756     .193
                                       VPA Mean =   14.94     .505     .434

Yearclass =   2003
         I-----------Regression----------I  I-----------Prediction---------I
Survey/  Slope  Inter-   Std  Rsquare  No.  Index Predicted   Std     WAP
Series           cept   Error          Pts  Value   Value    Error   Weights
Temp.      .78  11.30    .57   .473     26   1.79   12.69     .875     .248
Zoopl.    3.77   4.48   1.66   .096     26   1.72   10.97    2.310     .036
                                       VPA Mean =   15.04     .514     .717

Yearclass =   2004
         I-----------Regression----------I  I-----------Prediction---------I
Survey/  Slope  Inter-   Std  Rsquare  No.  Index Predicted   Std     WAP
Series           cept   Error          Pts  Value   Value    Error   Weights
Temp.      .81  11.16    .59   .434     26   4.80   15.04     .685     .335
Zoopl.    5.88  -1.52   2.55   .040     26   2.86   15.29    2.937     .018
                                       VPA Mean =   15.06     .494     .646

Year     Weighted      Log      Int      Ext      Var      VPA       Log
Class     Average      WAP      Std      Std     Ratio               VPA
         Prediction             Error    Error
2000     3383673     15.03      .29      .12      .18 ******    15.78
2001     3700119     15.12      .34      .12      .12 ******    14.83
2002     2824224     14.85      .33      .31      .88 ******    15.79
2003     1642578     14.31      .44      .84     3.75
2004     3466294     15.06      .40      .02      .00
```

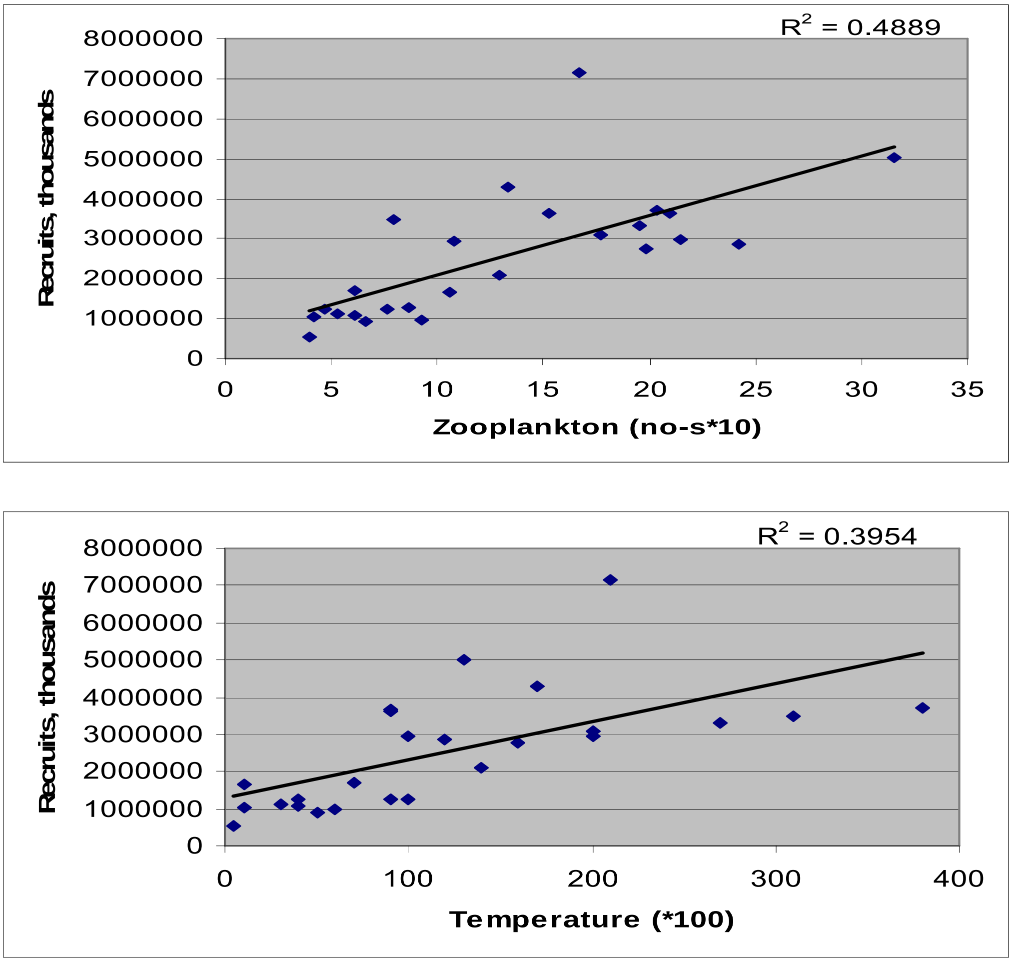

Figure 3.1.1: Recruitment estimates of the Gulf of Riga herring plotted against of mean zooplankton abundance in May (upper panel) and mean surface temperature in April (lower panel) (ICES, 2005).

3.2 Herring in the Bothnian Sea

The comparison of trends in recruitment (Figure 3.2.1) in the Gulf of Riga and the Bothnian Sea indicate that the similar hydro-meteorological conditions may favour the origin of abundant year classes in both Gulfs (Figure 3.2.1). The general trends in SSB are also relatively coherent over the recent decades (ICES, 2005).

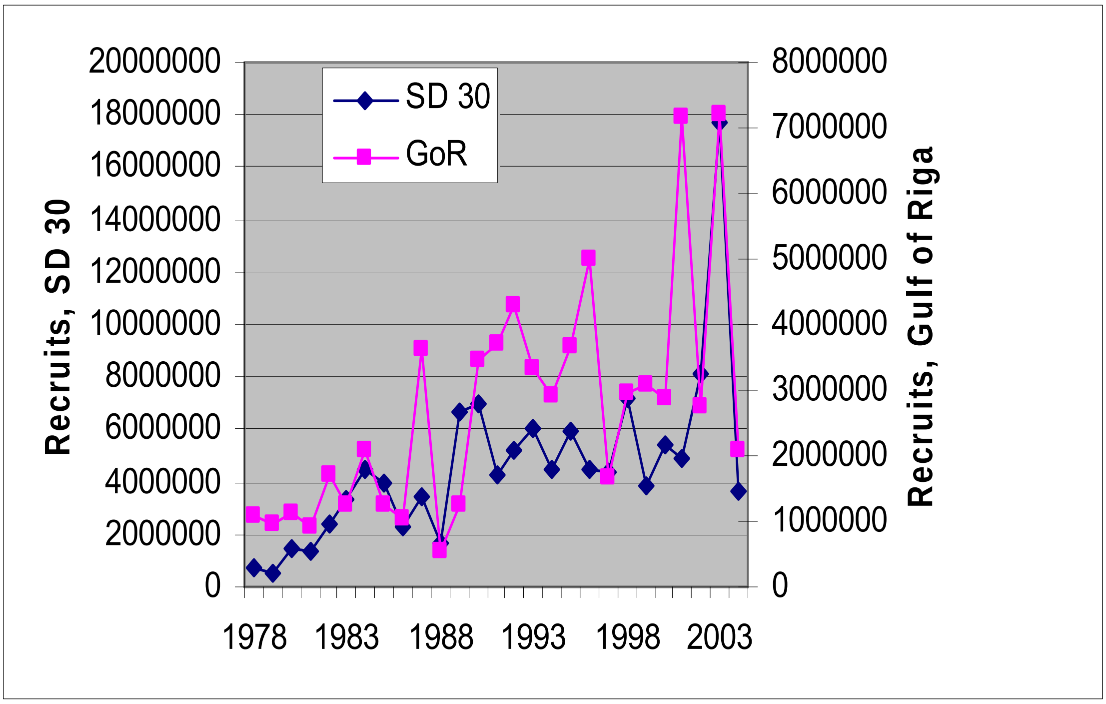

Figure 3.2.1: Herring recruitment dynamics in the Bothnian Sea and the Gulf of Riga (ICES, 2005).

3.3 Herring in the Gulf of Finland

The dynamics of reproduction success in the Gulf of Finland was similar to that of in the Gulf of Riga with respect to the year-class abundance during the period of the separate assessments prior to 1991 (ICES, 1992). Also in recent years rich year-classes in the Gulf of Riga herring in 2000 and 2002 appeared to be abundant in the Gulf of Finland as well.

3.4 Herring stocks in the Baltic proper

The mechanisms affecting on year-class formation of herring stocks in the Central Baltic proper are not fully understood, but they seem to differ from those in gulf herring stocks. The separate assessments for three separate units in the Central Baltic performed by the Study Group on Baltic Herring Assessment Units (ICES, 2003) revealed similar general pattern in recruitment dynamics, however, the magnitude of fluctuations was higher for the southern coast herring. In 1990s mainly average or poor year-classes appeared in the Central Baltic (Figure 3.4.1).

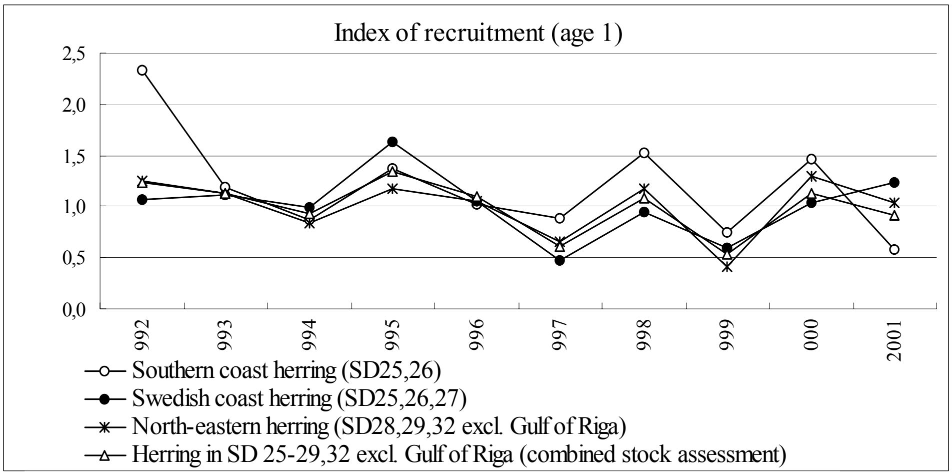

Figure 3.4.1: Recruitment estimates of different herring stock components and that of Central Baltic herring from 1992 to 2001 (ICES, 2003).

The effect of increased sprat stock as food competitor of the herring is more obvious in the Baltic proper then compared to the large gulfs, where abundance of sprat is lower. The decrease in mean weight-at-age of herring, supported by increased competitive effect of sprat stock, possibly has effected also on reproductive capacity of herring stocks in the Baltic proper.

4 Compilation of historical data on Baltic fish species

4.1 Cod otolith weight data

The ICES Study Group on Baltic Fish and Fisheries Issues in the BSRP (SGBFFI) concluded in 2004 (ICES, 2004) that future development and operational implementation of recruitment models for Baltic cod will require:

a) Computerization and archiving of otolith weight data existing in Denmark, Poland, Latvia, Sweden and Russia;

b) Compilation of existing historic data from research vessels surveys and commercial catches in order to reconstruct length based cod stock assessment data. In this process all countries supplying data for assessment should be involved.

The BSRP Fish and Fisheries coordination centre (FFCC) in cooperation with Lead Laboratory on Fish age and Stomach analysis (LLFAS) agreed to use the technical assistance possibilities to compile the cod otolith weight data and commercial landing size distribution data by quarters and gears. The compilation shall include relevant data that have been sampled by Poland, Russia and Latvia. Size distributions from research surveys are already available in the DATRAS database. However, administrative problems have delayed the start of the compilation in Latvia and Poland until March/April 2005. Current plans are that the BSRP projects will be operational in Russia by June/July 2005. The delayed start of the projects and taking into account that the BSRP project period ends in May 2006, it will not be possible to compile all otolith data that was agreed during SGBFFI and SGABC 2004 meetings e.g. period before 2001. Furthermore, it is not possible to estimate a time schedule for the data compilation until to the status of data has been assessed (revisit former otolith collection and weighting the otoliths or earlier weighted otolith data implementation in electronic format). It is, however, clear that the BSRP support to Poland, Russia and Latvia will be insufficient and therefore the additional financing need to be considered.

Taking into account above mentioned during SGBFFI meeting was decided:

1) For commercial fishery data (2001–2004): It is necessary by national laboratories to prepare and upload otolith weight data in FishFrame database. Deadline – November 2005. Due to problems for some national laboratories the upload procedure can be done during BSRP planned FishFrame workshop in Poland, November 2005.

2) For research survey data (2001–2004): It is necessary to prepare a haul based size distribution of cod from research surveys in March and November BITS surveys.

4.2 Cod stomach analyses

There are considerable amounts of stomach content data for the 1960's and 1970's and this information would be very useful for estimation of consumption rates and understand cod cannibalism. Additionally some new stomach data will be sampled in the nearest future under the umbrella of BSRP ("Baltic Sea Regional Program" on Large Marine Ecosystems).

From inspection of the original stomach content data, cannibalism appears to be related both to the prey sizes and spatial overlap. However, cannibalism is most likely also related to shifts in the distribution of predator and prey in response to changes in hydrographical conditions, resulting in pronounced changes in the spatial overlap of predator and prey. This part of exploratory work is ongoing and there are plans to tackle these issues both in BECAUSE and BSRP.

The study group recommends compilation of cod stomach data for 1990'ies from ATLANTNIRO and LATFRA surveys. The data compilation should be done on single stomach basis. For each stomach following records should be made:

1) Parameters of individual fish:

Year, date month, trawl number, cruise (research or commercial), Latitude and Longitude, rectangle/square, gear, sampling depth, fish length, fish weight, Sex, maturity stage

2) Food items in fish stomach:

Year	Cruise	Trawl/ Station	Stomach Nr	Prey						
				Species	Number	Weight	Length_min	Length_max	Sex/ Stage	Digestion

The study-group recommends sampling of cod stomachs on all standard surveys in the Eastern Baltic Sea. The standard surveys include the BITS survey in March and November and the hydroacoustic surveys in May and Sept./Oct. Sampling every 3rd year or alternatively after an inflow is considered necessary in order to reflect possible changes in the cod feeding due to fluctuations in prey abundances or in environmental boundary conditions. Stomach sampling could start during the hydroacoustic survey in autumn 2005 and continue throughout 2006.

Sampling stations have to be randomly distributed over the survey area. Stomachs should be taken stratified by 10 cm cod total length groups. Measuring the cod to the nearest cm below, the length-groups are <10 cm, 10–19 cm, 20–29 cm, 30–39 cm, 40–49 cm, ≥ 50 cm . From each length-group maximally 10 cod stomachs will be collected per station. Cod are processed immediately after the sample got on board. Stomachs that have obviously been partially or completely regurgitated during trawling as well as stomachs indicating trawl feeding are excluded from the analysis. Each individual cod stomach gets an identification number, linking the stomach to the fish and single fish data. For the station at least date, time of the day, GPS position of catch, catch-depth and number of the trawl station are recorded. Recording the number of the trawl station aims at enabling the link between stomach data and catch composition data. All stomachs sampled are preserved in at least 70–80 % ethyl alcohol and transported to LATFRA.

4.3 Data requirements from ecosystem surveys

To facilitate a future ecosystem approach to the management of marine resources, SGMAB and SGBFFI recommend during its common session to initiate an ecosystem-oriented surveying of the Baltic Sea. The Baltic International Trawl Survey (BITS) and the Baltic International Acoustic Survey (BIAS) could be extended to provide a holistic view of the state of the ecosystem. This includes not only recording the physical environment (i.e. hydrography), but also simple indicators of productivity within the phyto- and zooplankton.

A trial example of an "ecosystem survey" was conducted by the Baltic Sea Regional Project (BSRP) during May 2005, where additional sampling was integrated into the Latvian/Russian Hydroacoustic survey in the Eastern Gotland Basin (ICES 2005; SGPROD-Report). Tables 4.1 and 4.2 provide a proposal for sampling the ecosystem.

Additional sampling on Baltic fish surveys required to provide an assessment of the state of the ecosystem is listed in Table 4.2. As evident from Table 4.2 there is a lack of observation during summer. Since summer is a highly dynamic period within the ecosystem this gap has to be overcome, e.g. through bilateral surveys as proposed for 2006.

Table 4.1: A proposal for sampling scheme for the ecosystem survey in the Baltic.

VARIABLE	GEAR	FREQUENCY OF SAMPLING	OTHER SPECS.
Hydrography	CTD + O_2	Every fishing station	5m-Resolution (2.5 m in the euphotic zone)
Nutrients	Rosette-sampler	2 stations per ICES-rectangle	
Chl a (Phytoplankton)	Probe attached to CTD	Every fishing station	5m-Resolution (2.5 m in the euphotic zone)
Phytoplankton species composition	Rosette-sampler	2 stations per ICES-rectangle	
Mesozooplankton	WP-2 (100 µm)	2 stations per ICES-rectangle	Vertically-integrated
Ichthyoplankton	Bongo (335 µm)	2 stations per ICES-rectangle	Vertically-integrated
Herring and sprat stomachs	Trawl	Every fishing station	Length-stratified sampling
Cod stomachs	Trawl	Every fishing station	Length-stratified, every second year
Nektobenthos	IKMT	8 transects per SD	During night
Macrozoobenthos	Van Veen Grab	2 stations per ICES-rectangle	During daytime <70 m

Table 4.2: Present annual surveys and sampling on Baltic fish. Additional sampling required to provide an assessment of the state of the ecosystem.

SURVEY	MONTH/ QUARTER	CH L A	ZOO-/ ICHTHYO-PLANKTON	COD STOMACHS	CLUPEID STOMACHS	NEKTOBENTH OS	BENTHO S
BITS	March/1	X	X	X	X	X	X
BIAS	May/2	X	X	X	X	X	X
BIAS	October/4		X	X	X	X	X
BITS	November/4			X	X	X	X

4.4 Historical stock assessment data of cod

The time series of estimation of cod stock size (SD 25–32) currently available from the WGBFAS starts only in 1966 and therefore does not match the time period when key changes to the Baltic ecosystem occurred (e.g. huge increase in fishing effort, eutrophication). Availability of longer time-series of stock dynamics could help to disentangle the impact of fishery and environmental variability on the stock and could help to develop long-term fisheries management objectives. Considerable amount of data necessary for analytical stock size estimation has been collected around the Baltic earlier than the starting point of the available assessment. In the Danish Institute for Fisheries Research these data are currently compiled, which is also related to the Census of Marine Life History of Marine Animal Populations project Baltic group activities.

The data of interest include time series of age and length composition of the commercial cod catches, weight-at-age, fishing effort and relative indices of stock size from commercial fisheries and research surveys. The available commercial age and length distribution data, weight-at-age and several series of commercial CPUE have been compiled for the eastern countries (former USSR, GDR, and Poland). The main source for the compiled data has been available literature. National laboratories around the Baltic have contributed to the job by providing access to internationally non-available literature and in some cases also raw data have been provided. The earliest regular investigations on cod in the Baltic were started after the II WW. Therefore analytical estimation of cod stock size will probably not be possible for the time period earlier than 1946.

The quality of the compiled historical data and its possible usage for analytical stock size estimation is going to be analyzed. In addition, the analysis of the quality of underlying data and the relative reliability of the stock parameters estimated for the first decade in the current assessment compared to the more recent time period are considered to be necessary. Since the first decade in the current assessment stands as a starting point for extending the time series further back in time. In relation to this, national commercial age and length composition data for the first 1–2 decades covered by the current assessment are also compiled from the national data reports presented to the ICES, from the available literature or from the raw data. Compiling these national cod age distribution data for the 1970s–80s is contributing also to the SGMAB by making available data series that are not incorporated into the current multispecies database.

4.5 Status of coastal fish meta-database

During the Study group meeting the coastal fish meta-database was updated. The database gives an overview by countries on: experimental surveys on warm-water fish (1), experimental surveys on cold-water fish (2) and sampling from commercial catches (3). The database format agreed during the ICES BSRP SGBFFI 2004 meeting has been further amended by several additional information details such as the ICES SD and depth (range) of a sampling site, coordinates of sampling location (if available), name and e-mail address of a contact person. However information from some countries that were not participated in the SG meeting was not available for several fields in the database. The latest updated version of coastal fish meta-database is presented in Annex 2.

5 Fish stock dynamic in the coastal zone

5.1 Environmental effects on coastal fish stocks

5.1.1 Update of existing knowledge on environmental processes affecting dynamics of coastal fish species

Baltic-wide coastal fish monitoring is performed in 14 monitoring areas in several parts of the Baltic Sea, incl. various localities in the Baltic Proper, Gulf of Finland, Botnian Bay and Gulf of Bothnia. The time-series cover 11–22 years of annual monitoring data obtained by means of multimesh gill nets or gillnet series in shallow water (2–5 m depth) in August (Thoresson, 1993). The obtained data are currently being analysed. Amongst others, the analysis include: patterns in spatial distribution and relative abundance of species/ecological groups (incl. also threatened and alien species), trends in the catch per unit effort of fish species/groups over the time in various areas and in relation to the measured abiotic variables as temperature and Secchi depth. The findings will be discussed in the context of environmental parameters/processes of both natural and antrophogenic origin that essentially affect the structure and functioning of the Baltic Sea ecosystems. The final report (HELCOM Thematic assessment report on coastal fish) will be ready later in 2005.

The spatial distribution pattern of smelt larvae and juveniles was studied in the Polish part of the Vistula Lagoon at 15 stations during four subsequent cruises with different distribution patterns. It was found that their distribution is mainly influenced by the direction and velocity of winds and by the movement of large water masses. During calm weather (low wind velocity and variable wind direction) smelt gathered in the central part of the lagoon. Gentle winds blowing in a stable direction several days prior to sampling pushed smelt larvae to the opposite site of the lagoon. Strong winds especially caused juvenile fish to seek calm and shallow waters at the side from which the wind was blowing. The movement of large water masses along the lagoon significantly affected the horizontal distribution of smelt juveniles by dragging or pushing them from one site to another (Margonski, 2000).

Using data from 1950–2000, the high amplitude of inter-annual variability of the time of spawning of herring in the Vistula Lagoon was shown within a wide range of environmental conditions and stock characteristics. The principal factors which have a prevalent effect on the timing of spawning included the time of ice break-up and clearing from the lagoon, which is related to the severity of the preceding winter, further warming processes and water salinity values. In spite of the inter-annual diversity of spawning time, abiotic conditions, stock size etc., a noticeable constancy was observed in the spawning run (changes in CPUE, age composition, and mean weight-at-age of herring during the spawning period). The trend towards milder winters and the early occurrence of spring should be mentioned, and the distinct shift of herring spawning in the Vistula Lagoon towards an earlier time and at lower temperatures was observed in spite of the positive trend of mean water temperature in spring (Krasovskaya, 2001).

Results of major coastal fish sampling in the Vistula Lagoon with fyke nets indicate that the main abiotic parameter determining fish assemblages (dominated by ruffe *Gymnocephalus cernuus*) in the central-eastern part of the basin was salinity whereas temperature was the most important factor in the western part of the basin. Cyprinids dominated in the southern part of the lagoon and dynamics of fish assemblages was mostly influenced by the organic pollution index (chemical oxygen demand, COD) (Psuty-Lipska and Borowski, 2003).

Preliminary results of analysis of fish monitoring data in Daugavgriva (near Riga) indicate that proportion of roach *Rutilus rutilus* and pikeperch *Zander lucioperca* have decreased and that of ruffe, white bream *Blicca bjoerkna* and perch *Perca fluviatilis* increased in the coastal fish community. The reasons behind are complex and include: (1) significant decrease of the number of large industries as well as the total area of the land used for agriculture, (2) the change to a better agriculture practices (i.e. less use of fertilisers and pesticides), (3) significant increase of the wastewater treatment resulted in less nutrient loads and (4) increase of overall quality of underwater environment in the research area. The data collected by Institute of Hydrobiology, Latvian University on macrozoobenthos biomass in the Daugavgriva region show gradual recovery (from collapse) of the macrozoobenthos communities in the Gulf of Riga in the 1990s. This could be another support of this hypothesis. That could explain the decrease in the total proportion of omnivorous and opportunistic species like roach and increase of more specialised benthivorous species like white bream *Abramis brama* and ruffe. In the same time, the decrease of pikeperch is associated mainly with over-fishing. Substantial increase of abundance of perch is thought to be the result of perch taking the top predator role in fish communities in the Gulf of Riga (A. Minde, unpubl. data)

Data on abundance of juvenile freshwater species during the ten last years revealed that most of the outer archipelago areas along the coast of the Baltic Proper had low or no recruitment of perch. The most affected areas in the Baltic Proper was the Kalmar sound, Stockholm Archipelago and coastal areas of Gotland. In the Bothnian Sea and the inner archipelagos of the Baltic Proper the recruitment was normal. The situation was similar for pike *Esox lucius* and other freshwater species except sticklebacks. In the most severely affected areas, the juvenile fish community was dominated by stickleback. The geographical pattern of the problem indicates that the reason for the declined coastal fish stocks should be sought in the offshore areas of the Baltic Proper. It was found that the problem appears during the larval and early juvenile stages. No correlation was found between recruitment failure (of perch and pike) and vegetation community composition or vegetation coverage, neither was there any correlation between recruitment failure and abundance of filamentous algae. There was clear relationship between abundance of adult sticklebacks in spring and recruitment failure. Further analysis indicates that high abundance of sticklebacks does not necessarily mean negative impact to recruitment of perch and pike. However, there was a strong correlation between the larval food (zooplankton) at the time of onset of feeding and recruitment success of perch. Common for all stations with recruitment problems was significantly lower abundance of zooplankton compared to reference areas. Therefore it was suggested that the recruitment of coastal species might be affected by large-scale changes in the pelagic ecosystem of the Baltic Sea (Ljunggren *et al.*, 2005).

Correlation between stocks of migratory fish species and pollutants (BOD7 and nitrogen emissions) was studied in the Curonian Lagoon. The reliable correlation was registered between the commercial catches of vimba with BOD7 and nitrogen emissions from the Lagoon to Baltic Sea. The similar correlation between experimental catches of twaite shad with BOD7 and nitrogen emissions was registered (Repecka, 2003; Kesminas and Repecka, 2003). Increase of experimental gillnet catches of freshwater and diadromous fish species, such as pikeperch *Sander lucioperca*, perch *Perca fluviatilis*, vimba *Vimba vimba* and twaite shad *Alosa fallax* was registered recently. This increase could be attributed to more intensive freshening and warming of water in the coastal zone in the process of deepening of the Klaipeda Strait (R. Repecka and L. Lozys, unpubl. data). In addition, increased catches of diadromous fish can be a result of improvement of the recruitment conditions as a result of decreased pollution in the River Nemunas basin. For instance, nitrogen and phosphorus levels of the River Nemunas are currently several times lower than ca 10 years ago (Stankevicius, 1998). Deepening of the Klaipeda port also had a positive effect on the diadromous fish species. After the deepening of the port the water balance between the Curonian Lagoon and the Baltic Sea increased in 20–25% (Gailiusis *et al*,. 2001) and diadromous fish species migrate to Curonian Lagoon and River Nemunas basin more intensively. In addition, more intensive migration of freshwater fish species (e.g., perch, pikeperch and roach) from the Curonian Lagoon to coastal zone in recent years were noted (R. Repecka and L. Lozys, unpubl. data).

Gaps in the current knowledge that should be considered when planning/designing future research activities:

- Rates and patterns of impact of fish and invertebrate invasions on native coastal fish species/communities;
- Predation of coastal fish by marine mammals and fish-eating birds;
- Coastal-open sea trophic interactions;
- Food-web interactions in coastal areas;
- Factors affecting formation of recruitment of coastal fish species.

5.1.2 Suggestions from the ICES BSRP SGBFFI to the HELCOM Thematic assessment report on coastal fish

This section contains response to the request from the BSRP HELCOM Second Coastal Fish Monitoring Workshop (held in Helsinki January–February 2005) in order to get feedback to the HELCOM Thematic assessment report on coastal fish.

I General comments

1) The HELCOM Thematic assessment report on coastal fish should be considered as an important development for describing dynamics of the Baltic coastal fish communities and trying to identify the factors responsible. Data from a number of sites at both Northern and Southern coast of the Eastern Baltic are for the first time presented together. Indicators show regional differences as well as time trends that can be related to several factors like eutrophication or fisheries. Therefore, these activities should be continued and expanded in future.

2) In the current report, data collected by different sampling methodologies are presented and compared. Further reports should contain analysis of actual comparability of these data. In addition, the data cover different time-periods during which factors influencing fish communities may vary greatly. Therefore, regional comparisons should be made for similar (comparable) time-periods only.

3) Fisheries are an important structuring factor of fish communities, especially in the eastern Baltic since the early 1990s. Therefore, the section dealing with fisheries impact on coastal fish needs more detailed analysis, by including also regional aspects.

4) Fish communities are influenced by variety of factors, both of natural and anthropogenic origin, like eutrophication, temperature, predation etc. Therefore, the report should also contain a synthesis section where relative impacts of the above-named more important factors are analyzed and discussed.

5) In the current report, the catch per unit effort (CPUE, both in numbers and weight) analysis is performed for data where fish of all sizes per sampling are put together. We suggest that in the future analysis; the data should be broken down both by different mesh sizes and fish length groups. This would provide more detailed information (e.g., for recruitment)

6) Fish catch composition depends highly on abiotic environment. During the coastal fish monitoring activities, water temperature and wind data should be routinely collected. Thus, future analysis should also include impact of variability of selected abiotic factors on fish catch composition and long-term dynamics of fish communities based on monitoring activities.

7) The future reports would benefit from to including regional distribution maps of the CPUE (abundance and/or biomass) of selected species, especially when regional coverage of the data will be expanded by involving stations not included currently into the COBRA database.

II Specific comments on the report

1) We suggest that a general paragraph about limitations of the data (i.e., pelagic and small-sized fish are non-representatively present in catches) and data interpretations should be written in the section 'Sampling program'.

2) Due to substantial variability of forcing factors over the time, regional comparisons could be based on similar time-periods only. There are several parts in the report where this suggestion was not followed.

3) What does the regression line difference on the Figures 3 and 4 actually show? Is it due to methodological difference or because of different time-period sampled? This should be explained in the text.

4) Comment on the terminology used: it should be checked whether usage of 'catch' and 'CPUE' is correct throughout the text and whether these terms are not mixed up.

5) In the section of Ecological indicators. Index of Abundance it is stated that 'The roach CPUEs in the Baltic Proper showed another consistent development at a large geographical scale. In four out of a total eight areas/sub areas CPUE decreased significantly (Figure 7). It must be added how the time-series performed in the other four areas. And what are the reasons behind the observed different changes – can other factors besides eutrophication be excluded (e.g. fishery)?

6) Section Ecological indicators. Ratio between perch/roach based on weight. What, if any, are the other potential factors for the observed regional differences? And how this indicator performs in other areas? Please explain in short.

7) We suggest that the section on 'Trophic level of fish communities' should be expanded by explanatory text how fish communities (species composition, relative abundance) have spatio-temporally varied in the time periods/locations studied. This will help to interpret the observed values presented on Figures 10 and 11. Another option would be to present WPUE's of the dominant species (or species groups).

5.2 Data on population structure of non-assessed commercial fish stocks in the Baltic

The following summary contains available published information that can help to define and identify natural stock units and/or fish populations of currently internationally non-assessed and managed species (i.e., other than cod, herring, sprat and salmon). For this purpose, information on fish migrations (based on tagging experiments), morphometric measurements and genetic analysis is provided by species. In addition, information on ongoing relevant studies is provided, together with ongoing stock assessments.

5.2.1 Results of the completed studies by fish species

The pikeperch *Sander lucioperca*

The pikeperch spawn in inlets and shallow bays in April-May (Lehtonen and Toivonen, 1981). After spawning it stays in the spawning grounds and feeds there (Lehtonen and Toivonen, 1987) or it may perform feeding migrations inside the archipelagoes, to the open sea or along the coasts (Henking, 1923). The annual migrations take place between the spawning inlets or bays, feeding areas in the archipelagoes and wintering areas in deeper waters (Toivonen, 1968; Lehtonen, 1977, 1981b). The average dispersal area is shown to be smaller when the coast is open and larger when the archipelago is rich (Toivonen, 1968; Lehtonen and Toivonen, 1987). During the winter a part of the stock stays in shallow inlets but a majority spends the winter in deeper waters (Winkler and Thieme, 1978). The mixing of local neighbouring stocks occurs in the wintering areas, but pikeperch shows a clear homing behavior to its former spawning grounds (Lehtonen, 1985). In the southern Baltic the feeding migration is directed to the open sea and pikeperch overwinter in shallow inlets (Henking, 1923; Filuk, 1962).

More recent studies in three inlet/bay areas in the Finnish Archipelago Sea (during 1998, 1999 and 2000) have shown that during the feeding and wintering migrations, individuals originating from the three tagging sites occur together but they show clear homing during the spawning season. None of pikeperch tagged in one spawning area has been found in other spawning areas during the following spawning season. In addition, pikeperch can undertake fairly long migrations: some of fish tagged in the northernmost, and according to the fishermen, very important spawning area, were later (late summer-early autumn) caught about 200 km to north (Tarja Wiik, unpubl. data).

Not all individuals of a pikeperch population perform migrations. The populations have a resident and migrating component of a stock. Genetic investigations of the protein structure of the fish carried out in Curonian Lagoon and Lithuanian coastal waters in 2001-2002 show that individuals of the fish that migrate for feeding out of the Lagoon to the Baltic Sea differ from individuals that stay for feeding in the Lagoon. (Paulauskas and Lozys, 2001; Lozys, 2003). However, despite the regular dispersal pattern, some fish may migrate differently. For instance, one fish tagged in the Bay of Stettin was caught nine months later in Masurian lakes in Poland (Lehtonen *et al.*, 1996 and references therein).

Pikeperch tagging experiments in a shallow and relatively enclosed Pärnu Bay (NE Gulf of Riga) show that the fish forms separate population in this bay. However, some tagged fish were found in the southern Gulf (rivermouth of Daugava, Erm 1964). More recent tagging of the species in the southern part of the Gulf of Riga near the Daugava river mouth (1994–1995) show that recaptures were mostly recorded in the southern part of Riga Gulf. However, there were several recaptures from sites as far as the NE part of the Gulf (Pärnu Bay) and even outside the basin (Väinameri Archipelago at Estonian west coast) (Anon., 1996).

The whitefish *Coregonus lavaretus* and *Coregonus widegreni*

The two whitefish species, river spawning whitefish (*Coregonus lavaretus* L. s. str.) and the sea-spawning whitefish (*Coregonus widegreni* Malmgren), have different migration patterns. They are distributed along the coastal areas in the Baltic. They are rare in the Belt Seas and south coast of Sweden (Svärdson, 1979), more abundant in the Gotland Island area, west coast of Estonia, the Gulf of Finland and the Gulf of Bothnia (Lehtonen, 1981a). The spawning time is in October-November and the spawning migration takes place in July-September (Lehtonen, 1981a). The feeding migration patterns vary between species and populations. After spawning the river spawning whitefish disperse along the coasts. From the Bothnian Bay and the Quark (sub-division 31) the feeding migration regularly occurs between the Åland Island and the spawning grounds (Wigren, 1962) and the specimens show a clear homing behaviour. In the Bothnian Sea (Subdivision 30) the feeding migrations are not so extensive (Olsson, 1978) and the specimens remain in the Bothnian Sea and the Archipelago Sea. In the Gulf of Finland (Subdivision 32) feeding migrations extend about 70 km from the river mouths (Ikonen, 1980, 1982). The feeding migration starts in May and in June–July the whitefish are in their feeding areas often situated fairly far from the coast in the vicinity of small islands (Ikonen, 1982). The spawning migration starts in August. In the southern Baltic whitefish leave the coastal shallows and return to the sea after spawning, dispersing along the coast (Gaygalas, 1972). The sea-spawning whitefish does not migrate so much. It feeds near the spawning grounds and feeding migrations are directed mainly towards the coastline (Lehtonen, 1981a). In October the mature fish are to be found near the shallow spawning grounds (Sormus, 1976; Segerstråle, 1983). The short spawning migrations are directed to spawning reefs and shallows (Lindroth, 1957). The sea spawning whitefish probably winter near the spawning places and also feeding the same areas (Lehtonen, 1981a).

The pike *Esox lucius*

In its distribution area pike is very local and it has a territorial behaviour (Ekman, 1915; Segerstråle, 1951, 1953; Halme, 1957; Halme and Korhonen, 1960; Strandman, 1964; Lehtonen, 1973). It spawns in May and early June in the shallow bays, inlets and river mouths with reeds (*Phragmites* sp.) and shallow sheltered areas in the inner and outer archipelago (Lehtonen, 1986). The feeding areas are in the vicinity of the spawning grounds (Lehtonen *et al.*, 1983). The home range of pike is usually a couple of square kilometres and when displaced it attempts to return to its original home range (Halme and Korhonen, 1960). There is also some evidence, that the home range of pike may be larger (Johnson and Müller, 1978) and a clear spawning migration pattern has also been observed (Hudd *et al.*, 1984). In the pike populations station keeping and re-distributive behaviour is preferred to migrations.

The perch *Perca fluviatilis*

Perch is one of the commonest fresh-water species in the Baltic archipelagos. The perch form more or less separate local stocks along the Baltic Sea coasts (Böhling and Lehtonen, 1985), but these populations are not discrete units, because perch spawn all along the coast and the mixing of neighbouring stocks are likely. Perch is a spring spawner and the main spawning grounds are in shallow waters in the archipelagos, bays, inlets and river mouths. The spawning time is May-June. After spawning the feeding migration takes place to deeper areas along the coasts, inside the archipelagos and usually long migrations are not common, but in some cases noted (Henking, 1923; Lind *et al.*, 1975; Johnson, 1978; Koli *et al.*, 1978). During the feeding migration, which do not have any special pattern, the distribution of different populations overlap (Böhling and Lehtonen, 1985) The feeding migration may, however be very limited and in such case no mixing of neighbouring stocks are evident (Ekman, 1915) and the feeding and wintering areas are near the spawning grounds (Johnson, 1978). The range of feeding migrations is affected by the distribution of food resources, optimum temperature and the abundance of neighbouring stocks as well as the morphology of the archipelago (Böhling and Lehtonen, 1985). The perch winter in deeper waters and the spawning migration to shallow waters occurs in April-May (Neuman, 1982). The homing has been shown in some cases (Koli *et al.*, 1978, Johnson, 1978), but in some cases it has not been so clear (Böhling and Lehtonen, 1985).

The smelt *Osmerus eperlanus eperlanus*

The recent overview paper by Shpilev *et al.* (in press) suggests that smelt forms several local populations in the Baltic Sea. The areas of abundant smelt populations are confined to the large estuaries and lagoons: Gulf of Bothnia, Gulf of Riga, eastern Gulf of Finland and Curonian Lagoon. Individuals of these identified smelt populations differ from each other in the growth rate, maturation, reproduction conditions, abundance dynamics and also morphological characteristics. In certain features (spawning time and growth rate) clinal variation throughout the Baltic Sea can be assumed. The stocks also differ by their role in the ecological subsystems (Shpilev *et al.,* in press).

The bream *Abramis brama*

The bream stocks, spawning in spring, have similar migration patterns to pikeperch, but they do not necessarily winter in deeper waters (Lehtonen, 1977). In general bream form quite local stocks with only a few specimens migrating out from the population's home range (Hildén, 1986). The spawning takes place in May-June in shallow bays and inlets. Although bream is a stationary fish species, it usually has a distinct seasonal migration pattern (Backiel and Zawisza, 1968). The spawning migrations are rather short, a few kilometres at most, from deeper waters to those shallow spawning grounds (Hildén, 1980; Hildén and Lehtonen, 1982). Some part of the spawning bream evidently stay in the spawning grounds, which serve as feeding and wintering areas, too. Some of the bream migrate to deeper waters and winter there (Hildén and Lehtonen, 1982). The rate of migration out from the spawning grounds and the extent of the feeding migration seem to be dependent on food resources available, the size of the stock and the morphology of the coastline and the archipelago (Hildén, 1986). Thus the homing ability between the stocks also varies.

The burbot *Lota lota*

The burbot stocks along the Baltic Sea coasts are rather local, but the mixing of neighbouring stocks during feeding is obvious (Hudd *et al.*, 1984). The migration pattern of burbot differs from the other fresh-water species. It migrates into the shallow waters in the archipelagoes, bays, inlets, river mouths and even into the rivers during the autumn and early winter to spawn (Lehtonen and Toivonen, 1981; Johnson, 1982; Hudd *et al.*, 1984; Hudd and Lehtonen, 1987).

The spawning time is in January-February and after spawning burbot migrates to the deeper waters to feed (Hudd and Lehtonen, 1987). The feeding migrations into the deeper waters are directed in the Quark area on the Finnish coast mainly north-wards (Hudd and Lehtonen, 1987) and in the Bothnian Bay on the Swedish coast to southeast (Hedin, 1983). This has been explained by the main current hypothesis. In general the home range of burbot stocks is not very large and they usually do not migrate outside the archipelagos and migrations seldom exceed 20 km (Hudd and Lehtonen, 1987). The burbot seems to have clear homing behaviour.

The vimba *Vimba vimba*

Vimba shows strong seasonal migration pattern in the Gulf of Riga: wintering aggregations occur mostly in the NE part of the basin and spawning takes place in rivers of the southern Gulf. Some fish may also migrate out of the basin. These studies were performed in the 1960s where over 3000 fish were tagged (Erm, 1966). Extensive tagging of vimba was taken place in Lithuania during 1965–1980, mainly in 1974–1978. The investigation showed that vimba from the Nemunas River basin migrates into the Baltic Sea to Ventspils in the north and to the Polish border in the south (Volskis *et al.*, 1970, 1976). Genetic investigations of the fish were performed in the Nemunas River basin and Curonian Lagoon (Volskis *et al.*, 1976). Extensive morphometric investigations of the fish carried out in Curonian Lagoon and the Nemunas River basin were published in the 1970s (Volskis *et al.*, 1970; Mileriene and Sinderyte, 1976).

The flounder *Platichthys flesus*

Tagging experiments have been performed for flounder in the northern part of the Baltic Sea already in the 1940s and repeated in the same region in the 1960s. The results show that migrations of the fish were substantially longer during the first study period (from the near-coastal areas to the Gotland Deep) than during the 1960s when most of the recaptures took place relatively close to the tagging sites in the coastal sea (Schukina, 1964). The fish was studied by means of conventional tags (2000 fish in 1975) and tetracycline injections (669 fish in 1976 and 1159 fish in 1981) in the Latvian waters. For the first experiment, the main objective was to investigate the survival difference when using different types of tags. The fish were recaptured during the following two-year period. The fish were found to migrate maximally 42 miles from the tagging site (Vitinsh 1980, 1986). Tagging experiments have been also carried out with turbot in Lithuanian coastal zone in 1999–2003 (Stankus, 2003).

Several other species like bream *Abramis brama*, asp *Aspius aspius* (Mileriene, 1992) and sea trout *Salmo trutta* (Repecka, 2003) have been studied for morphometric characteristics in Curonian Lagoon.

5.2.2 Ongoing research

Genetics structure of flounder and perch in the coastal zone of the Baltic Sea was studied within the finished EC financed BEEP (Baltic Sea Environmental Effects of Pollution) project. The results will be published in the nearest future.

Migration and genetics of perch, pikeperch and eel is studied within the international cooperative project between Latvia, Lithuania and Taiwan. For example, at least 120 perch, 60 pikeperch and 60 eel from various coastal regions of Gulf of Riga will be sampled. Microsatellite analyses will be performed in order to reveal genetic differences, i.e., to identify separate populations in the Gulf of Riga. Additionally otoliths will be tested for Sr/Ca ratio to reveal freshwater – sea or opposite migration patterns for these three fish species. In case of eel, these analyses will help to reveal the proportion of naturally recruited and stocked specimens in Latvian coastal waters. About the same amounts of perch, pikeperch and eel will be investigated in the Curonian Lagoon and the Lithuanian coastal zone.

Based on rake counts and spawning habitat, three different forms of the European whitefish, *Coregonus lavaretus*, have been identified in the NE Baltic Sea: sparsely-rakered sea-spawning whitefish, sparsely-rakered anadromous whitefish and higher raker count whitefish of the eastern Baltic Sea (Sormus and Turovski, 2003). Ongoing genetic analyses within are aimed at clarifying the natural stock units of whitefish in this region.

Ongoing national tagging experiments of vimba and sea trout are taking place in the Nemunas River basin and Curonian Lagoon and morphometric investigations on twaite shad Alosa fallax in Curonian Lagoon.

5.2.3 Ongoing stock assessments of coastal species

In addition to cod, herring and sprat, stocks of altogether eight fish species are currently being assessed in the Baltic Sea (Table 5.2.1.). The longest ongoing stock assessment dates back to 1987 (flounder in ICES Subdivisions 24–26) by Poland. In addition to the presented information, assessments of some other fish stocks have been performed in earlier times. Amongst others, these include, smelt stock assessments in the Gulf of Bothnia (Hudd, 1985) and the Gulf of Riga and pikeperch assessment in Pärnu Bay (Eero, 2004). Bream and pikeperch stock assessments have also been performed in Curonian Lagoon during the years of 1980–1993 (Gaigalas, 2001). At present, stock assessments of these fish species are performed by Kaliningrad AtlantNIRO scientists by using also Lithuanian data.

Table 5.2.1: Summary information on ongoing stock assessment of other species than cod herring and sprat in the Baltic Sea by countries and sub-regions.

Country	Species	Latin name	Sub-region	Since	Method
Denmark	Sole	*Solea solea*	IIIa	1985	VPA
Estonia	None				
Finland	Pikeperch	*Sander lucioperca*	ICES SD 29 and 32	1975	VPA
	Flounder	*Platichthys flesus*	ICES SD 29 and 32	1990	VPA
Germany	Flounder	*Platichthys flesus*	ICES SD 24	1990s	VPA
Latvia	None				
Lithuania	None				
Poland	Pikeperch	*Sander lucioperca*	ICES 24, Szczecin lagoon	1993	VPA
	Bream	*Abramis brama*	ICES 24, Szczecin lagoon	1993	VPA
	Pikeperch	*Sander lucioperca*	ICES SD 26, Vistula lagoon	1993	VPA
	Flounder	*Platichthys flesus*	ICES SD 24, 25, 26	1987	VPA
	Bream	*Abramis brama*	ICES SD 26, Vistula lagoon	1993	VPA
Russia	Pikeperch	*Sander lucioperca*	ICES SD 26, Vistula lagoon	1995	VPA
	Bream	*Abramis brama*	ICES SD 26, Vistula lagoon	1995	VPA
	Eel	*Anguilla anguilla*	ICES SD 26, Vistula lagoon	1995	VPA
	Pikeperch	*Sander lucioperca*	ICES SD 26, Curonian lagoon	1995	VPA
	Bream	*Abramis brama*	ICES SD 26, Curonian lagoon	1995	VPA
	Roach	*Rutilus rutilus*	ICES SD 26, Curonian lagoon	1995	VPA
	Ruffe	*Gymnocephalus cernuus*	ICES SD 26, Curonian lagoon	1995	VPA
Sweden	Vendace	*Coregonus albula*	ICES 31, Bothnian Bay	1993	VPA
	Turbot	*Psetta maxima*	ICES SD 28, Gotland	2004	VPA

5.2.4 Gaps in knowledge

From all above mentioned we can draw a conclusion, that the best-studied fish stocks are those of the biggest commercial value like pikeperch, flounder and vimba. Despite of significant role of other coastal fish species like perch, roach, eel in the coastal environment and fishery, relevant research activities of those species have been weak in the past. The gaps in knowledge for species like eel, perch, European whitefish and twaite shad will be improved by currently ongoing activities in several regions in the Baltic. Results of these studies will be available in coming years. Most of the information available for the group was from eastern coast of the Baltic Sea. However, it is likely that similar studies have also been performed in the western part of the Baltic Sea.

5.3 Investigation of herring spawning grounds in the Baltic Sea

The spawning grounds of Baltic spring spawning herring are located in the coastal areas mainly till the depth of 10–12 m and are associated with stony grounds covered with seaweeds. The spawning starts as early as March in the western Baltic and gradually shifts to north-eastern parts of the Baltic Sea where the spawn continues till the end of July. The studies of herring spawning grounds have been started in 1940–1950s, but the peak of investigations has taken place in 1980s when the signs of the eutrophication of the Baltic Sea were most evident and the research was aimed at discovering the situation at the spawning grounds and the influence of pollution on them and on the survival of herring eggs. Below some summary of these investigations is given by country.

Estonia

The investigations of herring spawning grounds in Estonian waters were performed to identify the location of spawning grounds, larval production and mortality in different spawning areas, and effect of different spawning substrates on egg mortality.

Location of spawning grounds by using catch information and distribution of larvae was studied in Väinameri area in 1940–1950s by L. Rannak. The distribution pattern of larvae was investigated for the location of spawning grounds in the Gulf of Finland in the 1980s and in Väinameri area - western Gulf of Finland in the 1990s.

Larval production and mortality at different spawning areas was investigated in the Gulf of Finland in the early 1980s (using the results of larvae sampling).

Effect of different spawning substrates on egg mortality was studied at the west coast of Hiiumaa Island and Pärnu Bay with the help of Scuba-divers (Ojaveer, 1981). Transects were located crosswise to the shore (from shore to 10 m depth). Bottom vegetation and upper layer of sediments was collected along transects using the 0.25 m^2 or smaller counting frame (random samples). The samples were examined immediately; the found eggs were transported to laboratory for further examination; the spawning ground was marked. In case of finding eggs, additional sampling of eggs was performed every second day. Temperature and Secchi depth were measured every time. The egg mortality was higher in thick egg aggregations (more that 2 layers). Eggs spawned on Ceramium and Furcellaria showed the lowest mortality. Egg mortality increased with the increase of temperature, particularly in case of spawning directly on ground.

Herring spawning behaviour and deposition of eggs on different spawning grounds differ from year to year, depending on temperature and wind conditions. The probability of finding of herring eggs was the highest at depth range 2–4 m.

Finland

The herring spawning grounds have been studied in the Gulf of Finland, the Archipelago Sea and the Bothnian Sea since the 1970s with the help of SCUBA divers. It was stated that herring uses certain, spatially limited localities for spawning. It has been confirmed by diving surveys in some major spawning areas, mainly in the 1970s and 1980s. The studies revealed the location of spawning grounds, temperatures of the spawning, duration of egg development, the distribution of the spawn by depth and the mortality level during embryonal development and its dependence from water temperature (Oulasvirta *et al.*, 1983). The development of the embryo lasts about 2–3 weeks at low temperatures (<10ºC) in spring, but only a few days in higher temperatures (18–20ºC) later in summer. Over this period, eggs are exposed to the environmental conditions at the spawning site.

With exception of the Archipelago Sea, the present state of the spawning grounds is unknown due to lack of regular monitoring. It is therefore not known whether herring still spawns in the same locations as earlier and whether spawning is still successful in the locations used. In the recent years diving surveys indicated that in some areas, all eggs are lost before hatching, for an unknown reason. As a consequence of this, the number of newly hatched larvae has collapsed. Monitoring of the state of the spawning grounds and egg mortality is needed in order to understand the reasons for the variation of herring stock and also, in order to develop measures for the prevention of extensive reproductive failures in the Baltic Sea.

Germany

Herring spawning grounds have been investigated in the area of Rügen island in the 1980s (Scabell and Jonsson, 1988). The investigations covered the location of spawning grounds, the substrate in these places, the dependence of the spawning activity from the seaweed species and their biomass. The surface of the spawning grounds and the abundance of spawned eggs was estimated. The predation of herring eggs, especially by seabirds, was also studied (Scabell and Jonsson, 1988).

Latvia

The investigations in the coastal zone of the Baltic Proper were carried out in 1976–1991 and in 1998–2003. They were mainly connected with the studies on distribution and biomass of *Furcellaria lumbricalis* that is considered as the most important substrate for herring spawning as well as used for agar-agar production. The collection of herring eggs was rare and incidental.

After the large accidents with oil tankers “Antonio Gramshi” near Ventspils in 1979 and “Globe Asime” near Klaipeda in 1981 the total area of distribution of seaweeds considerably decreased and in several locations Furcellaria disappeared at all. The recovery of seaweeds was very slow and only in 1998 it was stated that the biomass of *F. lumbricalis* has significantly increased in comparison with 1990. In several locations seaweeds have appeared again. The investigations were repeated in 2003 and they revealed a decrease of *F. lumbricalis* biomass that could be connected with the operation of Butinge sea oil terminal that is located close to Latvian southern border and where regular oil spills have been recorded.

In the Gulf of Riga the investigations of herring spawning grounds were started in the 1950s by L. Lisivnenko. The spawning grounds were studied using dredge. The distribution map of herring spawning grounds was created. The spawning grounds were situated at depths from 4 to 14–15 m and a shift to deeper places during the spawn was stated. The embryonic mortality was low 2–5%.

In the 1980s the spawning grounds were investigated by G. Kornilovs with the help of SCUBA divers (Kornilovs, 1993). In 1983–1984 the whole Latvian coastal zone of the Gulf was studied. The spawning grounds were found at the same places as in 1950s, some new were found. Herring eggs were found in places with underwater vegetation (macrophytes). The areas of the spawning grounds have decreased due to disappearance of seaweeds deeper than 6–7 m. The embryonic mortality had significantly increased and was the highest in the southern part of the Gulf which was regarded as the most polluted area and the smallest in the western part. In 1985–1991 studies were mainly performed on 2 spawning grounds in the south eastern part of the Gulf covering all the spawning period (Kornilovs, 1997). The spawning grounds were regularly examined for herring eggs and when they were found the surface of the patch was determined and the samples of seaweeds were taken to calculate the amount of the spawned eggs, the stage of embryonic development and mortality. According to the stage of development and the ambient water temperatures the possible hatching time was predicted and samples were taken again. The length of the spawning period was determined: 36–75 days long. The surface of a separate spawn was till 300 000 m^2. The annual amount of spawned eggs was calculated. It was stated that herring eggs have high degree of fertilization. The amount of eggs per $1m^2$ could reach 2.56 millions eggs. The average annual embryonic mortality in 1985–1991 was in the range of 42–90.8% and for each separate spawn in the range of 4.7–100%. Egg mortality was usually lower in April–May and increased till July. The spawning took place at water temperature in range of 3.5–19ºC. The average depth of spawning was bigger in years with higher average water temperature. In years after mild winters spawning started at higher water temperature: 5-6ºC. The spawning evidently took place at night time, but twice spawning during daytime was recorded. Cases of repeated spawning on places where eggs were already located were rare. Since 1992 the investigations of herring spawning grounds in the Gulf of Riga have not been carried out due to high expenses.

Lithuania

Information about herring spawning ground research in Lithuania is presented in accordance with Klaipėda University reports, based on WWF (World Wildlife Fund) project "Biodiversity and conservation values of hard bottom areas in Lithuanian coastal zone of the Baltic Sea" (1992–1994) and also Lithuanian Fishery Research Laboratory reports (1994–1996). The head of this research was Prof. S. Olenin. Research was carried out using underwater camera and SCUBA divers.

Southward of Klaipeda there are no potential herring spawning grounds because there are only sandy bottoms, that is why potential spawning grounds were sought and explored northwards of Klaipeda in the coastal zone. In 1997 sea floor of the coastal zone was fully mapped. Total sublitoral area potentially suitable for herring spawning is 5300 ha, 3000 ha of them is sand, so only 2300 ha are really suitable for herring spawning. The most favourable substrata for herring spawning are stones with furcellaria (*Furcelaria lumbricalis*) and green algae. Such substrata cover about 1800 ha (34% total area). 10–12 km northwards of Klaipeda port entrance *Furcelaria lumbricalis* can not survive, so herring can spawn on green algae. The main spawning grounds with furcellaria are in the north latitude of 55º 47'–55º 55'. Herring spawning starts when water temperature reaches 7ºC.

It should be emphasized that the most intensive herring spawning is being observed on artificial substrata – southern pier of Klaipeda harbour (total area ~1 ha). There were found 2–4 cm thick egg layers of spawn. In order to better understand this process, an artificial experimental reef (area ~170 m^2) was built in 8 m depth, in 2003.

Sweden

The herring spawning grounds have been studied in the coastal areas of Sweden, mainly in the Äsko-Landsort area northern Baltic Proper, with the help of SCUBA divers mainly in the 1970s and 1980s. Special attention was paid to investigations and underwater observations of herring spawning behaviour (Aneer *et al.*, 1983). The studies revealed the location of spawning grounds, temperatures of the spawning, duration of egg development, the distribution of the spawn by depth and the mortality level during embryonal development. The influence of pollution on success of embryonal development was investigated and it was stated that pollution significantly increases the embryonal mortality (till 100%) as well as the fact that herring tries to escape polluted areas (Aneer and Nellbring, 1982).

6 Regional integrated assessment and research organisation in the Baltic Sea within and outside ICES

This document is a result of the joint meeting of SGMAB and SGBFFI in Riga, June 2005. While reviewing TORs h) of SGBBFI in 2005 dealing mainly with the future of the SG, the coordination with other SGs (especially those related to the BSRP and Baltic Committee and contributions to the 2006 Theme Session on Regional Integrated Assessments, the need to re-organise the Baltic Sea research within ICES was discussed. The main arguments for re-organising the WG/SG-structure were:

1) the need for advancing towards an Integrated Assessment (IA) of the Baltic Sea ecosystem similar as initiated for the North Sea (i.e. REGNS), as a basis for implementing the Ecosystem Approach to Fisheries Management (EAF) in the Baltic;

2) the need to react on the changing advisory requests after the replacement of IBSFC by bilateral negotiations between the EU and Russia.

3) the need for an improvement of co-ordination of the WG/SG-work with other environmental organisations (e.g. HELCOM, EU Marine Strategy);

4) the need for an improvement of co-ordination of the WG/SG-work with the multitude of activities/research projects outside ICES (e.g. EU-funded projects such as EFIMAS, BECAUSE, PROTECT).

Presently the research in the Baltic Sea is conducted within a variety of fora ranging from ICES WGs and SGs, EU-funded research projects and STECF WGs, to HELCOM WGs and projects (see Appendix 2). Between these different working frames, tasks and duties are either partly overlapping, although often conducted by the same institutions and/or scientists (e.g. ICES vs. STECF), or a tight connection on the working level is yet to be established (ICES vs. HELCOM). Even within the ICES Baltic community, activities are diversified in several sub-groups either overlapping in themes or being widely separated, thus hampering an integrated view on the ecosystem.

ICES presently faces the challenge to implement an EAF for which an IA of the ecosystem is needed as a basis. Consequently a regional ecosystem SG has been implemented North Sea (REGNS). In the Baltic Sea community a step towards this goal was made by implementing the GEF Baltic Sea Regional Project (BSRP). The project and its affiliated ICES SGs (SGBFFI, SGPROD, SGBEH and SGBEM) made considerable improvements in widening the perspective within the ICES Baltic community from rather "fish and physical environment - focused" to a more integrated view including lower trophic levels, ecosystem health issues and alternative approaches to ecosystem modelling. The project further initiated the development of indicator sets for assessing the state of the ecosystem and initiated progressive initiatives which should be templates for the future work, e.g. a combined ecosystem hydroacoustic open-sea survey. BSRP has further strengthened the communication and cooperation with HELCOM.

Despite of these successes, the present approach of implementing an IA using BSRP as a vehicle, has several shortcomings: (i) the participation of non-funded "western" countries is limited and decreasing, which has the risk of separating communities, (ii) the different "discipline groups" work still largely separated hampering an IA, and (iii) as the future funding of BSRP is unclear; there is a risk to loose the first steps towards an IA when not implemented in the broader community.

The above discussed challenges the present organisation of the work within the ICES Baltic science community. A new structure should consequently be developed providing the following:

1) a platform for conducting an IA;

2) a concentration of the work in a reduced number of WGs/SGs;

3) a better "outside communication/cooperation" with the EU-commission (i.e. STECF, JRC and EU-funded projects), as well as HELCOM and other international initiatives (e.g. BALTEX, BOOS, GLOBEC);

4) flexible tools to react on "hot topics" or "short-notice tasks".

In Figure 6.1 a suggestion for a new ICES working group structure in the Baltic is sketched. This structure is suggested as a basic discussion frame which needs involvement of the different WG/SGs, the Baltic Committee as well as the three ICES advisory committees.

The structure is centred around two assessment groups, one for fish stocks and fisheries (FA WG) and one for the IA (IAWG). Both groups will be supported by observational data from an "Ecosystem Survey Group" (ESWG). This group will be central in implementing the IA and the EAF as it should develop in cooperation with HELCOM the present trawl and hydroacoustic surveys into ecosystem surveys which provide both "tuning" and "ecosystem" data.

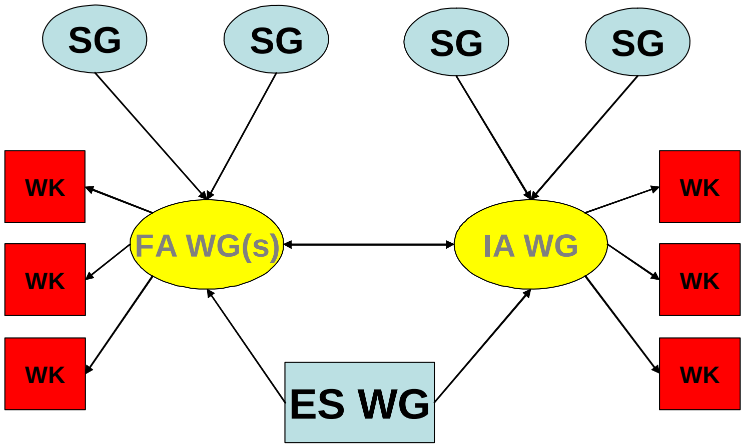

Figure 6.1: Suggestion of a new structure for the ICES Baltic Sea assessment and scientific activities. [SG-Study Group, WK-Workshop, FA-Fish stock assessment, IA-Integrated assessment, ES-Ecosystem survey]

Both assessment groups will be supported by a limited number of SGs providing them with additional knowledge and information. On the "fish-side" this should include assessments and related issues, like multispecies modelling and age-determination. For the "ecosystem-side" this should include physical, chemical, lower trophic level (phyto- and zooplankton) and ecosystem modelling expertise, thus integrating the present BSRP-groups. A major task of these groups will be to facilitate the communication to scientific activities outside ICES, e.g. to EU-funded projects (from the "fish-side") and to HELCOM (from the "ecosystem-side").

An important part of this suggested structure should be the increased use of workshops (WK). These should be vehicles to tackle "hot topics" or "short-notice tasks" coming up in various groups and should be solved in common, avoiding diversification and doubled work.

The most important change in this structure is the implementation of an IAWG. This will (i) assure the conservation, further development and the integration of the work done within BSRP in the broader scientific community, (ii) fulfil the request for an IA, which (iii) enables ICES to react on the new requirements in terms of advice which is due to the change in the management system of the Baltic and European waters.

A second important issue will be the development of a common monitoring programme combining all available resources to effectively survey the whole ecosystem as a basis for an IA.

A table listing the different groups presently involved in the Baltic Sea within ICES, the EU and HELCOM.

ICES	ICES	EU	EU	HELCOM
Scientific side	**Advisory side**	**STECF**	**Research Projects**	**Groups and projects**
Baltic Committee Study Group on Multispecies Assessment in the Baltic ICES-IOC-SCOR Study Group on GEOHAB Implementation in the Baltic	**ACFM** Baltic Fisheries Assessment Working Group Baltic Salmon and Trout Assessment Working Group Study Group on Ageing Issues in Baltic Cod	**STECF** Sub-group on Research Needs and Data Collection: Regional Co-ordination Meeting (RCM) for the Baltic Sea Area	**EFIMAS:** Operational Evaluation Tools for Fisheries Management Options. **COMMIT:** Creation of multiannual management plans for commitment **SAFMAMS:** Scientific Advice for Fisheries Management at Multiple Scales	**Groups:** Working programme for the Monitoring and Assessment Group (HELCOM MONAS) Nature Protection and Biodiversity Group (HELCOM HABITAT)
BSRP Study Group on Baltic Sea Productivity Issues Study Group on Baltic Ecosystem Health Issues Study Group on Baltic Ecosystem Model Issues Study Group on Baltic Fish and Fisheries Issues	**ACME** ICES/HELCOM Study Group on Quality Assurance of Chemical Measurements in the Baltic Sea ICES/HELCOM Steering Group on Quality Assurance of Biological Measurements in the Baltic Sea	**STECF** Sub group on review of stocks.	**BECAUSE:** Critical Interactions Between Species and their Implications for a Precautionary Fisheries Management in a variable Environment - a Modelling Approach **PROTECT**: Marine Protected areas as a tool for ecosystem conservation and fisheries management **INCOFISH:** Integrated Multiple Demands on Coastal Zones with Emphasis on Aquatic Ecosystem and Fisheries	**Projects** Development of tools for a thematic eutrophication assessment (HELCOM EUTRO) Zooplankton Expert Network Project for preparation of the Fifth Baltic Sea Pollution Load Compilation
Fishing Technology Committee Study Group on Target Strength Estimation in the Baltic Sea	**ACE** Working Group on Marine Mammal Ecology Working Group on Ecosystem Effects of Fishing Activities	**STECF** Sub-group on Fisheries and Environment	**EU Sampling Directive:** Comission Regulation establishing the minimum and extended programmes for the collection of data in the fisheries sector	Review the HELCOM monitoring and assessment programmes (HELCOM MON-PRO) Development of Ecological Quality Objectives within the Baltic Sea (HELCOM EcoQO)
Living Resources Committee Baltic International Fish Survey Working Group				Implementation of the Joint HELCOM/OSPAR Work Programme on Marine Protected areas (HELCOM-BSPA) Developing a harmonized reporting form for ICZM (Integrated Coastal Zone Management) (HELCOM ICZM)

7 Evaluation of first joint SGMAB and SGBFFI meeting

One of the main tasks of the BSRP in relation to fish stocks is to progress from single to multi-species assessments. To facilitate this process, a joint meeting of SGMAB and SGBFFI was planned during the ICES Annual Science Conference in Vigo 2004. A joint meeting seemed to be appropriate as SGBFFI has i) initiated several data compilation initiatives, e.g. mean weight-at-age of Baltic herring and sprat, cod otolith weight, ii) started a revision of the cod stomach database, and iii) performs or plans several activities in relation to the update of assessment databases including environmental data sets. These data are of prime importance for multispecies assessments and forecasts conducted by SGMAB.

Taking into account the close link between SGMAB and SGBFFI the joint meeting allowed:

1) a verification of progress made in SGBFFI and BSRP towards multispecies assessments;
2) adjustments and modifications of SGBFFI future activities within the BSRP;
3) the coordination of Baltic Sea ecosystem related data collections;
4) the participation of and an increased number of participants and expertise in both meetings.

However, taking into account the SGBFFI terms of reference, it is clear that they can be separated into two groups: related to coastal and open sea activities. The link between open sea and costal work is relatively weak and international coordination is done on different levels. Open sea activities directed to the main internationally assessed and managed Baltic commercial fish species (cod, herring and sprat) have a significantly higher international coordination via ICES Working/Study Groups and EU research projects (e.g. BECAUSE, PROTECT, UNCOVER). International cooperation in the field of research and monitoring of other fish, both commercial and non-commercial (often also called as ‘coastal fish’) is less advanced. Coastal fish data collection and research depends on national interests and is almost exclusively based on national funding. Only for some countries coastal fish is integrated into monitoring programmes coordinated by HELCOM. It can be stressed that SGBFFI may serve as an essential forum for international coordination of coastal fish activities in the Baltic Sea. In addition, HELCOM is also interested in the outcome of coastal fish assessments and there exists an agreed sampling format for coastal fish within HELCOM. However, based on the currently rather weak international cooperation and in some countries very low national funding, it is very problematic to form self-standing, effective and in a long-run operating ‘coastal fish’ study group.

Above mentioned considerations raised a discussion during the joint meeting about the future role of both groups in the framework of ICES and the Baltic Committee. The result of discussions, how we see the future is presented in chapter “Regional integrated assessment and research organization in the Baltic sea within and outside ICES” (see chapter 6).

A shortcoming of the joint meeting of SGMAB and SGBFFI to be mentioned was the significant time problem for several members participating in both groups. Taking into account the high work load of Baltic scientist involved, related to other ICES activities, EU funded research projects and ad hoc groups, this lead to the situation that some members were able to participate only part time in the meetings.

8 Conclusions and recommendations

1) The different possibilities of constructing growth models for herring should be further explored and preliminary models should be constructed for herring.
2) The sprat mean weight-at-age data from commercial fishery sampling and hydro-acoustic surveys should be compiled intersessionally in order to develop the growth models

3) Taking into account above mentioned during SGBFFI meeting was decided:

a) For commercial fishery data (2001–2004): It is necessary by national laboratories to prepare and upload otolith weight data in FishFrame database. Deadline – November 2005. Due to problems for some national laboratories the upload procedure can be done during BSRP planned FishFrame workshop in Poland, November 2005.

b) For research survey data (2001–2004): It is necessary to prepare a haul based size distribution of cod from research surveys in March and November BITS surveys.

4) The study group recommends compilation of cod stomach data for 1990'ies from ATLANTNIRO and LATFRA surveys. The data compilation should be done on single stomach basis.

5) The study-group recommends sampling of cod stomachs on all standard surveys in the Eastern Baltic Sea starting from autumn 2005. The standard surveys include the BITS survey in March and November and the hydroacoustic surveys in May and Sept. /Oct.. All stomachs sampled are preserved and transported to LATFRA.

6) During the coastal fish sampling, to carry out fish analysis always by different mesh sizes used.

7) Several different sampling methodologies of coastal fish were employed in different localities and during different time-periods. It is inevitable to perform an analysis of actual comparability of these data.

8) To consider starting of systematic sampling and analysis of coastal fish stomachs. As a starting point, the most widespread and locally abundant commercial fish should be selected.

9) To consider starting of employment of methodologies which ensure representative sampling of small-sized fish in the coastal fish monitoring.

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Annex 2: Coastal fish data meta-file

1) Experimental surveys on warm-water fish

Experimental surveys on warm-water fish

Country	ICES SD	Sub-region	Coordinate: Lat	Coordinate: Long	Depth (range)	Period (years)	Fishing gear/method	Sampling time	Species analysed	Purpose of the study	Parameters measured	Stomach analysis performed	Indices calculated	Contact person (name, e-mail)
Estonia	28	Gulf of Riga, Kihnu Island	5805	2401	2-5 m	1997-	gillnet mes-sizes: 17, 21,5, 25, 30, 33, 38 mm	July	All	coastal fish monitoring	Length, weight, sex, age (selected species: gonad weight and stage)	Perch, whitefish	CPUE, year-class strength, no.of species, heterogeneity, mortality	Redik Eschbaum redik.eschbaum@ut.ee
Estonia	28	Baltic Proper, Vilsandi	5822	2152	2-15 m	1993-	gillnet mesh sizes: 17, 21,5, 25, 30, 33, 38, 42, 45, 50, 55, 60 mm	July	All	coastal fish monitoring	Length, weight, sex, age (selected species: gonad weight and stage)	Perch, whitefish	CPUE, year-class strength, no.of species, heterogeneity, mortality	Redik Eschbaum redik.eschbaum@ut.ee
Estonia	39	Väinameri region, Matsalu	5845	2335	2-5 m	1993-	gillnet mes-sizes: 17, 21,5, 25, 30, 33, 38 mm	July-August	All	coastal fish monitoring	Length, weight, sex, age (selected species: gonad weight and stage)	Perch, whitefish	CPUE, year-class strength, no.of species, heterogeneity, mortality	Redik Eschbaum redik.eschbaum@ut.ee
Estonia	29	Väinameri region, Saarnaki	5848	2259	2-5 m	1991-	gillnet mes-sizes: 17, 21,5, 25, 30, 33, 38 mm	August	All	coastal fish monitoring	Length, weight, sex, age (selected species: gonad weight and stage)	Perch, whitefish	CPUE, year-class strength, no.of species, heterogeneity, mortality	Redik Eschbaum redik.eschbaum@ut.ee
Estonia	32	Gulf of Finland, Käsmu	5937	2553	2-15 m	1997-	gillnet mesh sizes: 17, 21,5, 25, 30, 33, 38, 42, 45, 50, 55, 60 mm	August	All	coastal fish monitoring	Length, weight, sex, age (selected species: gonad weight and stage)	Perch, whitefish	CPUE, year-class strength, no.of species, heterogeneity, mortality	Redik Eschbaum redik.eschbaum@ut.ee
Estonia	32	Gulf of Finland, Vaindloo	5949	2621	2-15 m	1997-	gillnet mesh sizes: 17, 21,5, 25, 30, 33, 38, 42, 45, 50, 55, 60 mm	August	All	coastal fish monitoring	Length, weight, sex, age (selected species: gonad weight and stage)	Perch, whitefish	CPUE, year-class strength, no.of species, heterogeneity, mortality	Redik Eschbaum redik.eschbaum@ut.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 1 site	58 22	24 28	4 m	1999-	trapnet (cod-end mesh size 12mm)	spring	All	coastal fish monitoring	length, weight, sex, gonad maturation stage, age	non-systematically pikeperch	mean weight at age, mean length at age, age structure	Heli Shpilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 1 site	58 22	24 28	4 m	1999-	trapnet (cod-end mesh size 8 mm)	autumn	All	coastal fish monitoring	length, weight, sex, gonad maturation stage, age	non-systematically pikeperch	mean weight at age, mean length at age, age structure	Heli Shpilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 1 site	58 22	24 30	4 m	1999-	trapnet (cod-end mesh size 16 (18) mm)	spring	All	coastal fish monitoring	length, weight, sex, gonad maturation stage, age	non-systematically pikeperch, perch	mean weight at age, mean length at age, age structure	Heli Shpilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 1 site	58 22	24 30	4 m	1999-	trapnet (cod-end mesh size 20-25 mm)	May-June	Pikeperch	pikeperch monitoring	length, weight, sex, gonad maturation stage, age	non-systematically	mean weight at age, mean length at age, age structure	Heli Shpilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 7-12 sites				1999-	gillnets: 16, 25, 30, 38, 45, 48, 50, 60	Oct-Nov	All	gillnet monitoring	length, weight, sex, gonad maturation stage, age (not for all species)	non-systematically (pikeperch, perch, vimba)	CPUE (weight and abundance) by gears and species, mean weight at age, mean length at age, age structure	Heli Shpilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 3 sites				2001-	gillnets: 16, 25, 30, 38, 45, 48, 50, 60	May-June	All	gillnet monitoring	length, weight, sex, gonad maturation stage, age (not for all species)	non-systematically (pikeperch, perch, vimba)	CPUE (weight and abundance) by gears and species, mean weight at age, mean length at age, age structure	Heli Shpilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, over 10 stations			6-50 m	1974-1986, 1994-1998	bottom trawl	May-November	All	fish community monitoring	abundance/biomass by species (length, weight, sex, gonad maturation stage, age for selected species)	pikeperch, sticklebacks, cyprinids for 1990s	CPUE, annual abundance index (model estimate)	Henn Ojaveer henn.ojaveer@ut.ee
Finland		Southern Bothnian Sea, Finbo				1976-1986	Different nets, methods changed during the period	Ice-free period	Perch, fish community	Monitoring	Length distribution of all species, age distribution of perch	No	CPUE, year-class strength of perch, catch-per-unit-effort	Kaj Adjers kaj.adjers@ls.aland.fi
Finland		Southern Bothnian Sea, Finbo				1987-	Coastal survey nets	August	Perch, fish community	Monitoring	Length distribution of all species, age distribution of perch	No	CPUE, year-class strength of perch, catch-per-unit-effort	Kaj Adjers kaj.adjers@ls.aland.fi
Finland		Southern Bothnian Sea, Finbo				2002 -	Nordic survey nets	August	Perch, fish community	Monitoring	Length distribution of all species, age distribution of perch	No	CPUE, year-class strength of perch, catch-per-unit-effort	Kaj Adjers kaj.adjers@ls.aland.fi
Finland		Archipelago Sea, Kumlinge				2003 -	Nordic survey nets	August	Perch, fish community	Monitoring	Length distribution of all species, age distribution of perch	No	CPUE, year-class strength of perch, catch-per-unit-effort	Kaj Adjers kaj.adjers@ls.aland.fi
Finland		Archipelago Sea, Lumparn				1999 -	Net series	October	Pikeperch, fish community	Monitoring, pikeperch stock management	Length distribution of all species, age distribution of pikeperch	No	CPUE, year-class strength of pikeperch, catch-per-unit-effort	Kaj Adjers kaj.adjers@ls.aland.fi
Finland		Southern Bothnian Sea, Ivarskärsfjärden				1999 -	Net series	October	Pikeperch, fish community	Monitoring, pikeperch stock management	Length distribution of all species, age distribution of pikeperch	No	CPUE, year-class strength of pikeperch, catch-per-unit-effort	Kaj Adjers kaj.adjers@ls.aland.fi
Finland		Southern Bothnian Sea, Emskär				1996-2003	Fyke nets	October	Viviparous blenny	Monitoring, reproduction	Reproduction success of blenny	No	Catch-per-unit-effort of blenny	Kaj Adjers kaj.adjers@ls.aland.fi
Finland		Archipelago Sea, Brunskär				1991-	Multimesh gillnet	week 31	All	Environmental monitoring	Catch, age structure of perch	No	CPUE	Antti Lappalainen antti.lappalainen@rktl.fi
Finland	32	Gulf of Finland, Tvärminne				1998	Multimesh gillnet	July-August (60 gill net nights)	All	Case study	Catch, length distribution	No	CPUE	Antti Lappalainen antti.lappalainen@rktl.fi
Finland	32	Gulf of Finland, Helsinki				1998	Multimesh gillnet	July-August (60 gill net nights)	All	Case study	Catch, length distribution	No	CPUE	Antti Lappalainen antti.lappalainen@rktl.fi
Finland	32	Gulf of Finland, Kotka				1998	Multimesh gillnet	July-August (60 gill net nights)	All	Case study	Catch, length distribution	No	CPUE	Antti Lappalainen antti.lappalainen@rktl.fi
Finland	32	Gulf of Finland, inner bays of Helsinki				1997	Multimesh gillnet	July-August (39 gill net nights)	All	Case study	Catch, length distribution	No	CPUE	Antti Lappalainen antti.lappalainen@rktl.fi
Finland	32	Gulf of Finland, Tvärminne				1997	Multimesh gillnet	May-October (72 gill net nights)	All	Case study	Catch, length distribution, growth od perch and roach	Perch and roach	CPUE	Antti Lappalainen antti.lappalainen@rktl.fi
Latvia	28	Southern Gulf of Riga, Daugavgrīva				1992-	Gillnets	August	Perch, pikeperch, vimba	Fish monitoring	Length, weight, sex, maturity, age	No	CPUE	Atis Minde atis.minde@latzra.lv
Latvia	28	Open Baltic, Jūrkalne				1998-	Gillnets	July	Perch, pikeperch, vimba	Fish monitoring	Length, weight, sex, maturity, age	No	CPUE	Atis Minde atis.minde@latzra.lv
Latvia	28	Southern Gulf of Riga, Lapmežciems				1999, 2000, 2002-	Gillnets	June-August	Perch	Coastal fish survey	Length, weight, sex, maturity, age	No	CPUE, % ecol.groups	Atis Minde atis.minde@latzra.lv
Latvia	28	Western Gulf of Riga, Irbe strait, Kolka				1986-	Beach seine	July	All	Coastal fish survey, flounder juveniles	Lenth, weight	Yes	CPUE, fish abundance, ecol. groups	Atis Minde atis.minde@latzra.lv
Latvia	26	Open Baltic, Southern part, Pape				1998-	Beach seine/Gillnets	July	All	Coastal fish survey, flounder juveniles	Lenth, weight	Yes (for beach seine catches)	CPUE, fish abundance, ecol. groups	Atis Minde atis.minde@latzra.lv
Latvia	28	Northern Gulf of Riga, various sites				1994,1995, 2000, 2003-	Gillnets	June-July	All	Coastal fish survey	Length, weight (perch: sex, maturity, age)	No	CPUE, % ecol.groups	Atis Minde atis.minde@latzra.lv
Latvia	28	Southern Gulf of Riga, various sites				1994-1996, 1998-2000, 2002, 2004	Gillnets	June-August	All	Coastal fish survey	Length, weight (perch: sex, maturity, age)	No	CPUE, % ecol.groups	Atis Minde atis.minde@latzra.lv
Latvia	28	Western Gulf of Riga, Irbe strait, various sites				1994-1996, 1998-1999, 2002, 2004	Gillnets	June-August	All	Coastal fish survey	Lenth, weight	No	CPUE, % ecol.groups	Atis Minde atis.minde@latzra.lv
Latvia	28	Open Baltic, Northern part, various sites				1996, 1998, 2002, 2003	Gillnets	June-August	All	Coastal fish survey	Length, weight (perch: sex, maturity, age)	No	CPUE, % ecol.groups	Atis Minde atis.minde@latzra.lv
Latvia	26	Open Baltic, Southern part, various sites				1998-	Gillnets	June-August	All	Coastal fish survey	Length, weight (perch: sex, maturity, age)	No	CPUE, % ecol.groups	Atis Minde atis.minde@latzra.lv

1) Experimental surveys on warm-water fish cont.

Lithuania	26	Curonian Lagoon, central part, Atmata (2-6 stations)			3.5-4 m	1992-	Multi-meshsize gill nets	July-August	Perch, roach, silver bream, bream, pikeperch, vimba and etc. (23 species)	Coastal monitoring, data are used for state monitoring and for international monitoring (COBRA)	Length, weight, age	For different fish species, but not every year	CPUE, gonad weigth	Rimantas Repecka, repecka@ekoi.lt
Lithuania	26	Curonian Lagoon, northern part, Dreverna (2-6 stations)			1.8-2 m	1992-	Multi-meshsize gill nets	July-August	Perch, roach, silver bream, bream, pikeperch, vimba and etc. (23 species)	Coastal monitoring, data are used for state monitoring and for international monitoring (COBRA)	Length, weight, age	For different fish species, but not every year	CPUE, gonad weigth	Rimantas Repecka, repecka@ekoi.lt
Lithuania	26	Curonian Lagoon, central part, Preila (2 stations)			3-3.5 m	2004	Multi-meshsize gill nets	July-August	Perch, roach, silver bream, bream, pikeperch, vimba and etc. (23 species)	Coastal monitoring, data are used for state monitoring and for international monitoring (COBRA)	Length, weight, age	For different fish species, but not every year	CPUE, gonad weigth	Rimantas Repecka, repecka@ekoi.lt
Lithuania	26	Curonian Lagoon, different stations			0.5-1.5 m	1993-	Beach seine	April-November	Perch, roach, silver bream, bream, pikeperch, vimba and etc. (about 30 species)	Coastal monitoring, fish stock assessment	Length, weight	For different fish species, but not every year	Shannon,s species diversity	Rimantas Repecka, repecka@ekoi.lt
Lithuania	26	Curonian Lagoon, different stations				1993-	Gill nets	March-December	Bream, pikeperch, perch, roach and etc. (about 25 species)	Fish biology, fish stock assessment	Length, weight, age	For different fish species, but not every year	CPUE, gonad weigth	Rimantas Repecka, repecka@ekoi.lt
Lithuania	26	Baltic Sea, northern part, Sventoji (2-3 stations)			3-5 m	1993-	Multi-meshsize gill nets	August	Vimba, Baltic herring, river flounder, cod, turbot, perch, pikeperch etc. (about 30 species)	Coastal monitoring, data are used for state monitoring	Length, weight, age	For different fish species, but not every year	CPUE, gonad weigth	Rimantas Repecka, repecka@ekoi.lt
Lithuania	26	Baltic Sea, northern part, Sventoji (2-3 stations)			3-8 m	1993-	Gill nets	February-December	Herring, river flounder, cod, turbot, vimba, perch, pikeperch etc. (about 30 species)	Fish biology, fish stock assessment	Length, weight, age	For different fish species, but not every year	CPUE, gonad weigth	Rimantas Repecka, repecka@ekoi.lt
Lithuania	26	Baltic Sea, northern part, Sventoji			0-2.5 m	1993-	Beach seine	May-October	Smelt, river flounder,baltic herring, sprat, vimba and etc. (about 20 species)	Coastal monitoring, fish stock assessment	Length, weight	For different fish species, but not every year	CPUE	Rimantas Repecka, repecka@ekoi.lt
Lithuania	26	Baltic Sea, northern part, Monciskes			0-2.5 m	2000-	Beach seine	May-October	Smelt, river flounder,baltic herring, sprat, vimba and etc. (about 20 species)	Butinge Oil terminal monitoring	Length, weight	For different fish species, but not every year	CPUE	Rimantas Repecka, repecka@ekoi.lt
Poland	24-26	Along Polish coast 1-14 stations annually			20-90	1996-	Bottom trawl	January-April	Pikeperch, perch, stickleback, ruffe, pike	Experimental survey	Weight (for some years and species length)	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	25	Four stations at Chlopy, Dabki, Jarosławiec, Rowy			20-87	1997	Bottom trawl	August	Pikeperch, vimba, ide, perch, ruffe	Experimental survey	Length	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Baltic Proper	5426	1915	66	1997	Pelagic trawl	October	Stickleback	Hydroacoustic survey	Weight	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24-26	Along Polish coast 2-8 stations annually			31-101	1997-2000, 2002-2003	Pelagic trawl	October	Stickleback	Hydroacoustic survey	Weight	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24-26	Along Polish coast 2-6 stations annually			18-30	2001-2003	Bottom trawl	November	Pikeperch, ruffe	Experimental survey	Weight (length for pikeperch)	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Open coast, Reda mouth			up 5	1998	Gillnet	May-June	Bream, pikeperch, roach, silver bream, perch, tench	Experimental survey	Length, weight, age, sex, gonad maturity	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	25	Rowy, Jarosławiec			up 3	1998	Beach trawl	June-September	Flounder, turbot, sandeel, greater sandeel, smelt, herring, sprat, bream, perch, pikeperch	Experimental survey	Length	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Russia	26	Curonian Lagoon	5497-5532	2055-2108	2-4 m	1961-	bottom trawl (mesh-size, min=18 mm)	October-November	Bream, pike perch, sichel, roach, perch and other	fish community monitoring; bream, pike perch, sichel stock assessment	All fishes - abundance,biomass;bulk of fishes - individual length ; selected species:length, weight, age, gonad maturation stage	pikeperch, perch	CPUE (weight and abundance) - all species; length distribution - bulk species; mean weight at age, mean length at age, age structure, year-class strength - bream, pike perch,sichel; food composition - pike perch, perch	Mikhail Khlopnikov, khlopnikov@atlant.baltnet.ru, Tatiana Golubkova, golubkova@atlant.baltnet.ru
Russia	26	Curonian Lagoon	5497-5532	2055-2108	2-4 m	1968	bottom trawl (mesh-size, min=5 mm)	October-November	Ruff, bream, pikeperch, sichel, roach, perch and other	fish community monitoring; ruffe stock assessment, bream stock-recruitment	All fishes - abundance,biomass;bulk of fishes - length distribution; ruff : length, weight, age, gonad maturation stage	No	CPUE (weight and abundance) - all species; length distribution - bulk species; mean weight at age, mean length at age, age structure, year-class strength - ruff.	Mikhail Khlopnikov, khlopnikov@atlant.baltnet.ru, Tatiana Golubkova, golubkova@atlant.baltnet.ru
Russia	26	Curonian Lagoon	5497-5532	2055-2108	2-4 m	1967-	Pelagic (fry) trawl (mesh-size, min=5 mm)	September-October	Smelt, bream, pikeperch, sticleback and other	fish community monitoring; smelt stock assessment; bream and pikeperch stock-recruitment	All fishes - abundance,biomass;bulk of fishes - length distribution; smelt : length, weight, gonad maturation stage.	No	CPUE (weight and abundance) - all species; length distribution - bulk species; mean weight, mean length, index of stock recruitment - smelt.	Mikhail Khlopnikov, khlopnikov@atlant.baltnet.ru, Tatiana Golubkova, golubkova@atlant.baltnet.ru
Russia	26	Vistula Lagoon	5448-5469	1908-2028	2-4 m	1959-	bottom trawl (mesh-size, min=18 mm)	October-December	Bream, pikeperch, sichel, roach, perch and other	fish community monitoring; bream, pike perch, sichel - fish stock assessment	All fishes - abundance,biomass;bulk of fishes - individual length ; selected species:length, weight, age, gonad maturation stage.	pikeperch, perch	CPUE (weight and abundance) - all species; length distribution - bulk species; mean weight at age, mean length at age, age structure, year-class strength - bream, pike perch,sichel; food composition - pike perch, perch.	Mikhail Khlopnikov, khlopnikov@atlant.baltnet.ru, Tatiana Golubkova, golubkova@atlant.baltnet.ru
Russia	26	Vistula Lagoon	5448-5469	1908-2028	2-4 m	1979-	Pelagic (fry) trawl (mesh-size, min=5 mm)	October-November	Smelt, sticleback and other	fish community monitoring; - smelt - fish stock assessment.	All fishes - abundance,biomass	No	CPUE (weight and abundance) - all species; index of stock recruitment - smelt.	Mikhail Khlopnikov, khlopnikov@atlant.baltnet.ru, Tatiana Golubkova, golubkova@atlant.baltnet.ru
Russia	26	Vistula Lagoon	5448-5469	1908-2028	2-4 m	1979-	Pelagic (fry) trawl (mesh-size, min=5 mm) with extra 500 µm bag on the cod end	May-July	Herring, smelt, pikeperch, sticleback, perch and other	fish community monitoring; herring - stock recruitment	All fishes - abundance,biomass; herring:length, weight.	No	CPUE (weight and abundance) - all species; herring: length distribution ; mean weight, mean length, index of stock recruitment	Mikhail Khlopnikov, khlopnikov@atlant.baltnet.ru, Tatiana Golubkova, golubkova@atlant.baltnet.ru

1) Experimental surveys on warm-water fish cont.

Sweden	27	Aspöja	5824	1658	1999 -	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	Gotska Sandön	5822	1910	2000	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	September	Flounder, perch etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	25	Hasslö	5608	1525	1995	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	Herrvik	5726	1856	1994	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Flounder, perch etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Kvädöfjärden	5800	1644	1962 -	Multi mesh-size nets of various combinations, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Muskö	5900	1809	1991 -	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Mönsterås	5703	1635	1995 -	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Industrial site	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Simpevarp	5725	1642	1962 -	Multi mesh-size nets of various combinations, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Industrial site	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	25	Torhamn	5605	1545	2002 -	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, pike, roach, silver-bream etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Vinö	5730	1642	1995 -	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Reference area	Number and size per species	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	NE Gotland	5743	1849	2000	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Flounder, perch etc	Inventory	Number and size per species, age (perch)	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	25	Hasslö	5608	1525	2001	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	Herrvik	5726	1856	2000	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Flounder, perch etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Södra Kalmarsund	5939	1618	1998	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Oskarshamn	5711	1629	1998	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	25	Skillinge	5526	1415	1994	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Flounder, turbot etc.	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Skäggenäs, Öland	5646	1625	1998	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Torsås	5620	1605	1998	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	NE Öland	5658	1653	1998	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, pike, roach, silver-bream etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Biotestsjön, Forsmark	60 25,69	18 11,82	1987 -	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	October	Perch, roach, silver-bream, ruffe, rudd etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Biotestsjön, Forsmark	60 25,69	18 11,82	2004	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	June-December	Perch, roach, silver-bream, ruffe, rudd etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Forsmark	60 26,03	18 09,73	2001 -	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, roach, ruffe, silver-bream etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Forsmark	60 26,03	18 09,73	2004	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, roach, herring, silver-bream etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se

1) Experimental surveys on warm-water fish cont.

Sweden	29	Forsmark	60 26,03	18 09,73	1983 -	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August	Perch, roach, silver-bream, ruffe, sander, herring etc	Inventory	Number and size per species, age (perch)	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Galtfjärden	60 10,43	18 35,75	1996	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	September	Perch, roach, silver-bream, ruffe, sander, herring etc	Industrial site	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	30	Gaviksfjärden	62 51,80	18 16,55	2004	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, roach etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Holmön	63 40,89	20 52,52	2002 -	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, roach, herring, ruffe, three-spined stickleback etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Holmön	63 40,89	20 52,52	1989-1994	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August	Perch, roach, ruffe, herring, whitefish etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Holmön	63 40,89	20 52,52	1995 -	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August	Perch, roach, ruffe, herring, whitefish etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Holmön	63 40,89	20 52,52	2001-2002	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August	Perch, roach, ruffe, herring, whitefish etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	30	Husum	63 18,88	19 08,98	1994 -	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August	Perch, roach, ruffe, herring, whitefish etc	Industrial site	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	30	Iggesund	61 37,72	17 09,17	1996	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August-September	Perch, roach, ruffe, herring etc	Industrial site	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Kinnbäcksfjärden	65 02,80	21 31,10	2004	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, ruffe, three-spined stickleback etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Lagnö	59 33,94	18 50,38	2002 -	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, roach, ruffe, herring, smelt etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	30	Långvindsfjärden	61 27,37	17 09,94	2002 -	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, roach, ruffe, herring, etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Muskö	58 58,01	18 06,74	1991-1994	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, roach, ruffe, herring, silver-bream etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Muskö	58 58,01	18 06,74	1995 -	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, roach, ruffe, herring, silver-bream etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Nassa skärgård	59 26,44	19 12,60	1997	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, herring, sculpin etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Norrbyn	63 32,02	19 50,05	2002 -	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, roach, ruffe, herring, smelt, whitefish, dace etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	30	Norrsundet	60 58,72	17 11,38	1998	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August	Perch, roach, ruffe, herring etc	Industrial site	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Obbola	63 39,80	20 14,78	1994	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	July	Perch, roach, ruffe etc	Industrial site	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Ornö	59 00,39	18 26,06	2000	Mesh-sizes 17, 22, 25, 30 mm, standardized test-fishing	August	Perch, roach, herring, flounder etc	Inventory	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Råneå	65 49,97	22 25,57	2002 -	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	August	Perch, roach, ruffe, bream, etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Råneå	65 49,97	22 25,57	1994 -	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August	Perch, roach, ruffe, bream etc	Reference area	Number and size per species, age (perch)	No	Rel abundance, size at age (perch), year class strength (perch)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	30	Örnsköldsvik	63 14,21	18 54,46	1995	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	August	Perch, roach, ruffe etc	Industrial site	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se

2) Experimental surveys on cold-water fish

Country	ICES SD	Sub-region	Coordinate: Lat	Coordinate: Long	Depth (range)	Period (years)	Fishing gear/method	Sampling time	Species analysed	Purpose of the study	Parameters measured	Stomach analysis performed	Indices calculated	Contact person (name, e-mail)
Estonia	29	Baltic Proper, Küdema	5832	2213		1992-97, 2000-	gillnet mesh sixe: 21,5, 30, 38, 50, 60mm	October-November	All	coastal fish monitoring	Length, weight, sex (selected species: weight and developmental stage of gonads)	Whitefish	CPUE, year class strength, no. of species, heterogeneity, mortality	Redik Eschbaum (redik.eschbaum@ut.ee)
Estonia	28	Gulf of Riga				1961-1997	trawl	spring-autumn	smelt	smelt stock	length, weight, age	Non-systematically	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 1 site	58 22	24 29	4 m	1999-	trapnet (cod-end mesh size 12mm)	spring	smelt	coastal fish monitoring	length, weight (sex, gonad maturation stage & age when appliccable))	No	mean lenght and weight of 0-group	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 1 site	58 22	24 29	4 m	1999-	trapnet (cod-end mesh size 8 mm)	autumn	smelt	coastal fish monitoring	length, weight (sex, gonad maturation stage & age when appliccable))	No	mean lenght and weight of 0-group	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 1 site	58 22	24 30	4 m	1999-	trapnet (cod-end mesh size 16 (18) mm)	spring	smelt	coastal fish monitoring	length, weight (sex, gonad maturation stage & age when appliccable))	No	mean lenght and weight of 0-group	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay, 1 site	58 22	24 30	4 m	2001-	trapnet (cod-end mesh size 32 mm)	winter	smelt	smelt stock	length, weight, age, sex, gonad maturation stage	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga over 10 stations			6-50 m	1974-1986, 1994-1998	bottom trawl	May-November	All	fish community monitoring	abundance/biomass by species (length, weight, sex, gonad maturation stage, age for selected species)	eelpout, smelt, herring for the 1990s	CPUE, annual abundance index (model estimate)	Henn Ojaveer henn.ojaveer@ut.ee
Finland		Archipelago Sea, Seglinge				1989-1997	Coastal survey nets	October	Cod, fish community	Monitoring of cod	CPUE, length distribution of all species, age distribution of cod	No	year-class strength of cod, catch-per-unit-effort	Kaj Adjers kaj.adjers@ls.aland.fi
Latvia	28	Western Gulf of Riga, Irbe strait, Kolka				1986-	Beach seine	May	All	Coastal fish survey, juvenile flounder	Length, weight	Yes	CPUE, fish abundance, ecol. groups	Atis Minde atis.minde@latzra.lv
Latvia	26	Open Baltic, Southern part, Pape				1998-	Beach seine/gillnets	May	All	Coastal fish survey, juvenile flounder	Length, weight	Beach seine catches	CPUE, fish abundance, ecol. groups	Atis Minde atis.minde@latzra.lv
Latvia	28	Gulf of Riga, Irbe strait				1970s-	Bottom trawl	May, October	Herring, sprat, eelpout	Fish survey	Catch composition	Eelpout	CPUE, fish abundance	Atis Minde atis.minde@latzra.lv
Lithuania	26	Open Baltic, northern part, Sventoji (4 stations)			10-15 m	2000-	Multi-meshsize gill nets	before 2004 - only August, latter - February, May, August, October	Herring, river flounder, vimba, cod, turbot, perch, pikeperch etc. (about 25 species)	coastal fish monitoring	Length, weight, age	No	CPUE, gonad weigth	Rimantas Repecka, repecka@ekoi.lt
Poland	25-26	Baltic Proper,29 stations			20-100	1996	Bottom trawl	January	Eelpout, smelt, lumpsucker, sculpin, bullhead, whiting	Young fish survey,	Weight	No	CPUE	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24-26	Baltic Proper, 41 stations			12-87	1996	Bottom trawl	March-April	Smelt, sculpin, four-bearded rockling, lumpsucker, whiting, bullhead, eelpout	Fish community monitoring	Length and weight (at least one of them measured),	No	CPUE	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	25	4 stations at: Chlopy, Dabki, Jarosławiec, Rowy			0-10	1997	Beach trawl	August	Smelt	Fish community monitoring	Length	No		Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Baltic Proper, 3 stations			80-106	1997	Pelagic trawl	October	Smelt, sculpin,	Hydroacoustic survey	Weight	No	CPUE	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24-26	Baltic Proper, 10-22 stations annually			12-89	1999 - 2000	Pelagic trawl	October	Lumpsucker, eelpout, four-bearded rockling,whiting	Hydroacoustic survey	Weight	No	CPUE	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24-26	Baltic Proper, 4 - 6 stations annually			31-108	2002-	Pelagic trawl	October	Lumpsucker, sculpin, whiting	Hydroacoustic survey	Weight	No	CPUE	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24-26	Baltic Proper, 35 - 101 stations annually			18-100	1997-	Bottom trawl	January-March, October, November	Smelt, eelpout, sculpin, four-breaded rockling, whiting, bullhead, seasnail, lumpsucker,	Fish community monitoring	Length and weight (at least one of them measured per species)	No	CPUE	Wojtek Pelczarski, wpelczar@mir.gdynia.pl

2) Experimental surveys on cold-water fish cont.

Sweden	27	Kvädöfjärden	5800	1644	1962 -	Mesh sizes 22, 30, 38, 50, 60 mm, standardized test-fishing	October	White-fish, cod, flounder, sculpins, perch etc	Reference area	Number and size per species, age (flounder)	No	Rel abundance, size at age (flounder)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Muskö	5956	1803	1994 -	Mesh sizes 22, 30, 38, 50, 60 mm, standardized test-fishing	October	White-fish, cod, flounder, sculpins, perch etc	Reference area	Number and size per species, age (flounder)	No	Rel abundance, size at age (flounder)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	Herrvik	5726	1856	1994	Mesh sizes 22, 30, 38, 50, 60 mm, standardized test-fishing	October	Cod, flounder, sculpins etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	25	Hasslö	5608	1525	1994	Mesh sizes 22, 30, 38, 50, 60 mm, standardized test-fishing	October	Cod, flounder, sculpins etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	25	Skillinge	5526	1415	1994	Mesh sizes 22, 30, 38, 50, 60 mm, standardized test-fishing	October	Cod, flounder, sculpins etc	Inventory	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	Gotska Sandön	5822	1910	1999-2003	Mesh sizes 22, 30, 38, 50, 60 mm, standardized test-fishing	October-December	Cod, flounder, sculpins etc	Reference area (pilot study)	Number and size per species	No	Rel abundance	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	Gotska Sandön	5822	1910	2000-2003	Mesh sizes 85, 100, 110, 120	September-October	Turbot	Reference area (pilot study)	Number and size per species, age (turbot)	No	Rel abundance, size at age (turbot)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	Gotska Sandön	5822	1910	2003 -	Mesh sizes 25 - 120 mm	June	Cod, flounder, sculpins, turbot etc	Reference area (pilot study)	Number and size per species, age (flounder, turbot)	No	Rel abundance, size at age (flounder, turbot)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Forsmark	60 26,03	18 09,73	1989-2002	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	October	Whitefish, zander, herring, perch, roach, ruffe	Inventory	Number and size per species	No	Rel abundance, size at age (whitefish)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Galtfjärden	60 10,43	18 35,75	1993-1998	Mesh sizes 25, 30, 38, 50, 60 mm	October	Zander, perch, roach, sculpin, smelt	Inventory	Number and size per species	No	Rel abundance, size at age (zander)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Galtfjärden	60 10,43	18 35,75	1999 -	Mesh sizes 25, 30, 38, 45, 50, 60 mm, standardized test-fishing	October	Zander, perch, roach, sculpin, smelt	Inventory	Number and size per species	No	Rel abundance, size at age (zander)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Galtfjärden	60 10,43	18 35,75	2002 -	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	October	Zander, perch, roach, ruffe, silver bream	Inventory	Number and size per species	No	Rel abundance, size at age (zander)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Gräsö	60 24,51	18 38,63	1989-2001	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	October	Whitefish, herring, sprat, smelt, sculpin, perch, roach	Inventory	Number and size per species	No	Rel abundance, size at age (whitefish)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	29	Gräsö	60 24,51	18 38,63	2001	Multi mesh-size nets, Coastal Nordics, mesh sizes 10, 12, 15, 19, 24, 30, 38, 47, 60 mm	October	Whitefish, herring, sprat, smelt	Inventory	Number and size per species	No	Rel abundance, size at age (whitefish)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Muskö	58 58,01	18 06,74	1994-	Mesh sizes 21, 30, 38, 50, 60 mm, standardized test-fishing	October	Flounder, herring, perch, roach, sculpin	Reference area	Number and size per species, age (flounder)	No	Rel abundance, size at age (flounder)	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	31	Norrbyn	63 32,02	19 50,05	1990-1999	Multi mesh-size nets, mesh sizes 17, 22, 25, 33, 50 mm, standardized test-fishing	October	Whitefish, herring, smelt, sculpin, perch, ruffe	Inventory	Number and size per species	No	Rel abundance, size at age (whitefish)	Jan Andersson jan.andersson@fiskeriverket.se

3) Sampling from commercial catch

Sampling from commercial catch

Country	ICES SD	Sub-region	Coordinate: Lat	Coordinate: Long	Depth (range)	Period (years)	Fishing gear/method	Sampling time	Species analysed	Purpose of the study	Parameters measured	Stomach analysis performed	Indices calculated	Contact person (name, e-mail)
Estonia	28	Gulf of Riga, Pärnu Bay				1993-	gillnet	winter	pikeperch	pikeperch stock	length, weight, age	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1997- 1999, 2002-	gillnet	autumn	pikeperch	pikeperch stock	length, weight, age	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1998, 2000, 2001	gillnet	autumn	vimba	vimba stock	length, weight	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1992- 1999, 2003-	trapnet	spring	pikeperch	pikeperch stock	length, weight, age (sex non-systematically)	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1998-1999, 2002, 2003	trapnet	autumn	pikeperch	pikeperch stock	length, weight, age	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1998-	trapnet	spring	vimba	vimba stock	length, weight	No		Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1998- 2001, 2003-	trapnet	autumn	vimba	vimba stock	length, weight	No		Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1997, 1999-	gillnet	winter	perch	perch stock	length, weight, age (sex non-systematically)	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1998, 2000-	gillnet	autumn	perch	perch stock	length, weight, age (sex non-systematically)	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1994-	trapnet	spring	perch	perch stock	length, weight, age, sex	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga, Pärnu Bay				1998-	trapnet	autumn	perch	perch stock	length, weight, age	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga				1957-	trapnet, gillnet, trawl	December-May	smelt	smelt stock	length, weight, age, sex, gonad maturation stage	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	28	Gulf of Riga				1963-1998	trapnet, gillnet, trawl	December-May	smelt	smelt stock	length, weight, age, sex, gonad maturation stage	No	mean weight at age, mean length at age, age structure	Heli Spilev heli@solo.delfi.ee
Estonia	29	Väinamari region, Matsalu	5845	2339		2001-	commercial trapnet	April-October	all,especially pike	monitoring, stock assessment	catch per species (weight), length of pike, perch etc.	Pike	CPUE, year-class strength, no.of species, heterogeneity, mortality	Markus Vetemaa (markus.vetemaa@ ut.ee)
Finland	29-32					1998-	gill nets, trap nets	Q1-Q4	pikeperch, perch, European whitefish, sea trout	IBSSP, EU data collection	catch composition	No	Recruitment, growth, year class strength	Jari Raitaniemi jari.raitaniemi@rktl.fi
Finland	29-30, 32					1975-	gill nets, trawl, trap-nets	Q2-Q4	flounder	Stock assessment, IBSSP, EU data collection	catch composition	No	Recruitment, growth, year class strength	Jari Raitaniemi jari.raitaniemi@rktl.fi
Finland	30					1998-2001			smelt	IBSSP	catch composition	No		Jari Raitaniemi jari.raitaniemi@rktl.fi
Finland	29					1980-99,2001-03	gill nets, lures	Q1-Q4	pike		catch composition	No	Recruitment, growth, year class strength	Jari Raitaniemi jari.raitaniemi@rktl.fi

3) Sampling from commercial catch cont.

Latvia	28	Southern Gulf of Riga, Daugavgrīva		1974-	Fykenets		Vimba	Size composition	Length, weight, maturity, age	No	Length at age	Atis Minde atis.minde@latzra.lv
Latvia	28	Southern Gulf of Riga, Daugavgrīva		1992-	Fykenets		Pikeperch	Size composition	Length, weight, maturity, age	No	Length at age	Atis Minde atis.minde@latzra.lv
Latvia	28	Southern Gulf of Riga, Daugavgrīva		1982-	Fykenets	spring	Salmon	Size composition	Length, weight, maturity, age	No	Length at age	Atis Minde atis.minde@latzra.lv
Latvia	28	Southern Gulf of Riga, Daugavgrīva		1982-	Fykenets	autumn	Salmon	Size composition	Length, weight, maturity, age	No	Length at age	Atis Minde atis.minde@latzra.lv
Latvia	28	Southern Gulf of Riga, Daugavgrīva		2000-	Fykenets		Perch	Size composition	Length, weight, maturity, age	No	Length at age	Atis Minde atis.minde@latzra.lv
Latvia	28	Gulf of Riga, various sites		1976-	Fykenets		Eelpout	Size composition	Length, weight, maturity, age	No	Length at age	Atis Minde atis.minde@latzra.lv
Latvia		Open Baltic, various sites		2002-	Gillnets		Cod	Size composition	Length, weight, maturity, age	No	Length at age	Atis Minde atis.minde@latzra.lv
Lithuania	26	Open Baltic, various stations	3-20 m	1991-	Gill nets, trawls	February-December	Smelt, herring, cod, turbot, pikeperch, flounder etc.	Fish biology, fish stock assessment	Length, weight, age	Vimba, pikeperch	mean weight at age, mean length at age, age structure	Rimantas Repecka, repecka@ekoi.lt, Tomas Zolubas ztl@is.lt,
Lithuania	26	Curonian Lagoon, various stations	2-5 m	1993-	Gill nets, trap nets, drift nets	March-December	Bream, pikeperch, perch, roach and etc. (about 25 species)	Fish biology, fish stock assessment	Length, weight, age	pike, pikeperch, burbot, perch, eel	mean weight at age, mean length at age, age structure	Rimantas Repecka, repecka@ekoi.lt
Poland	26	Vistula Lagoon, Tolkmicko	0.5-3 m	1993-2003	Driftnet/Fykenet	January-November different fish sampled in various months	Bream, pikeperch, vimba, stickleback, sichel, ruffe, crucian carp, gudgeon, silver bream, brook lamprey, perch, roach, herring, flounder, smelt, bleak, eel, rudd, burbot, asp, lumpfish, ide, twaite shad, carp, tench, sprat	Monitoring of commercial fish	Length for all species; weight, sex, gonad maturity stage and age selectively for species and years, CPUE	No	Length/weight, age/sex, age/length, age/weight ratio and stomach fullness calculated for selected species and years	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Gulf of Gdansk, Puck Bay	4-12 m	1995	Driftnet/gillnet	May-October	Roach, bream	Monitoring of commercial fish	Length, age, sex,	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Gulf of Gdansk, Sopot	4-12 m	1995	Driftnet	May-September	Pikeperch	Monitoring of commercial fish	Length, age, sex,	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Vistula Lagoon, Suchacz	0.5-3 m	1995	Fykenet	June-August	Perch	Monitoring of commercial fish	Length, age, sex,	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Gulf of Gdansk, Puck Bay	6-20 m	1996	Gillnet, longlines	May-June	Garfish	Monitoring of commercial fish	Length, age, sex,	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Gulf of Gdansk, Puck Bay	4-6m	1996-1997	Gillnet	March-November	Perch, roach, pikeperch	Monitoring of commercial fish	Length, age (weight), CPUE	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Gulf of Gdansk, Puck Bay	1-6 m	1996-1997	Fykenet	April-September	Eel	Monitoring of commercial fish	Length, weight (age), CPUE	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Gulf of Gdansk, Puck Bay	4-18 m	1997-1998	Gillnet, hooks, pelagic trawl, pelagic pair trawl	May-June	Garfish	Tagging	Length for all surveys; weight, age and sex selectively, CPUE	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	26	Gulf of Gdansk, Sopot	6-10 m	1997	Gillnet	April-May	Pikeperch	Monitoring of commercial fish	Length, weight, age, CPUE	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24	Open coast at Trzebież	1-3 m	1999, 2001, 2002	Fykenet/driftnet	March-October	Pikeperch, perch, roach, bream	Monitoring of commercial fish	Length, weight, age for all catches, gonad maturity, gonad weight and stomach fullness for selected species/catches, CPUE	No	Age/length, length/weight ratio and gonad index for selected species/catches and years	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24	Szczecin Lagoon, Lubina	1-6 m	2002	Fykenet	March-October	Pikeperch, perch, bream, roach	Monitoring of commercial fish	Length, weight, age, sex, gonad maturity, stomach fullness, CPUE	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl
Poland	24	Szczecin Lagoon, Lubina	1-6 m	2003	Fykenet/driftnet	April-November	Pikeperch, bream, perch, roach, ruffe	Monitoring of commercial fish	Length, weight, age, sex, CPUE	No	None	Wojtek Pelczarski, wpelczar@mir.gdynia.pl

Sampling from commercial catch cont.

Russia	26	Curonian Lagoon	5497-5532	2055-2108	2-4 m	1959-	gillnets, trapnets, poundnets	April - December weekly	Bream, pikeperch, sichel, roach, perch, ruff, smelt, eel.	Commercial fish monitoring, stock assessment and management	All fishes - individual length, weight, age; smelt, ruffe gonad maturation stage.	No		All species: mean weight at age, mean length at age, length - age structure, year-class strength; stock size (VPA): bream, pike perch, ruff, roach.	Mikhail Khlopnikov, khlopnikov@atlant.baltnet.ru, Tatiana Golubkova, golubkova@atlant.baltnet.ru
Russia	26	Vistula Lagoon	5448-5469	1908-2028	2-4 m	1960-	gillnets, trapnets, poundnets	April - December weekly	Bream, pikeperch, sichel, roach, perch, eel, herring	Commercial fish monitoring, stock assessment and management	All fishes - individual length, weight, age; herring gonad maturation stage.	No		All species: mean weight at age, mean length at age, length - age structure, year-class strength; stock size (VPA): bream, pike perch, eel, herring.	Mikhail Khlopnikov, khlopnikov@atlant.baltnet.ru, Tatiana Golubkova, golubkova@atlant.baltnet.ru
Sweden	27	Aspöja	5824	1658		1997 -	Poundnet	April-December	Pike	Stock assessment	Length, weight, sex, age	No		stock size, growth, mortality year-class strength	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Marsö	5728	1645		1997 -	Poundnet	April-May	Pike	Stock assessment	Length, weight, sex, age	No		stock size, growth, mortality year-class strength	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Aspöja	5824	1658		1999 -	Gillnet, poundnet	April-September	Perch	Stock assessment	Length, weight, sex, age	No		stock size, growth, mortality year-class strength	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Aspöja	5824	1658		2002 -	Gillnet, poundnet	April-September	White-fish	Stock assessment	Length, weight, sex, age	No		stock size, growth, mortality year-class strength	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Marsö	5728	1645		2002 -	Poundnet	October-November	White-fish	Stock assessment	Length, weight, sex, age	No		stock size, growth, mortality year-class strength	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	28	NE Gotland	5732	1857		1998 -	Gillnet	April-September	Turbot	Stock assessment	Length, weight, sex, age	No		stock size, growth, mortality year-class strength	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Kvädöfjärden	5800	1644		1996 -	Fykenet	April-September	Yellow eel	Stock assessment	Length, weight, sex, age	No		rel abundance, growth, mortality	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Marsö	5728	1645		1999 -	Fykenet	April-September	Yellow eel	Stock assessment	Length, weight, sex, age	No		rel abundance, growth, mortality	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	25	Karlskrona arch. East	5605	1545		1999 -	Fykenet	April-September	Yellow eel	Stock assessment	Length, weight, sex, age	No		rel abundance, growth, mortality	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	25	Valjeviken	5602	1432		1996 -	Fykenet	April-September	Yellow eel	Stock assessment	Length, weight, sex, age	No		rel abundance, growth, mortality	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	Kvädöfjärden	5800	1644		2002 -	Gillnet	July-September	Flounder	Stock assessment	Length, weight, sex, age	No		stock size, growth, mortality year-class strength	Jan Andersson jan.andersson@fiskeriverket.se
Sweden	27	NE Öland	5700	1704		2002 -	Gillnet	July-September	Flounder	Stock assessment	Length, weight, sex, age	No		stock size, growth, mortality year-class strength	Jan Andersson jan.andersson@fiskeriverket.se

Annex 3: Draft 2005 Resolution (Category 2)

A Study Group on Baltic Fish and Fisheries Issues in the BSRP [SGBFFI] (Co-Chairs: Maris Plikshs, Latvia and Henn Ojaveer, Estonia) will meet in ….., Latvia, from …. February 2006 to:

a) finalize the databases on herring and sprat growth data and environmental variables;

b) finalize meta –analyses of growth changes of Baltic herring and sprat, and conduct growth modeling for stock development forecasts;

c) review knowledge on population structure of flounder stocks in the Baltic and propose possible stock assessment units;

d) determine environmental factors including open sea - coastal interactions and their influence on fish recruitment, especially for herring and flounder;

e) Search possibility and attempt to apply the coastal fish database for calculation of the slope of the size spectra for some selected coastal commercial fish species and try to relate these changes to fishing effort-related indices;

f) update the Baltic sea overview taking into account open sea and coastal interactions.

SGBFFI will report by ……… for the attention of the Baltic Committee.

Supporting Information

Priority:	A GEF-World Bank funded project ("Baltic Sea Regional Project" BSRP) on improving the marine ecosystem research infrastructure of eastern Baltic countries started in March 2003 with the ICES Secretariat responsible for hosting Component 1, the Large Marine Ecosystem Activities of the project. In order to support these mechanisms, procedures must be put in place in order to incorporate and integrate these new activities into the ICES structure, and provide an interface with existing ICES activities. This Group is one of the main activities in the Baltic, working most directly with development and implementation of ecosystem effects on fish populations and vice-versa.
Scientific Justification and relation to Action Plan:	Action Plan 1.2 – f, g , 1.3 – e 1.5 – b 1.6 – b 1.12 – a, c, d 5.6 – all An improved linkage between scientific activities within physical, chemical and biological oceanography, as well as fish stock assessment is a pre-requisite for the ICES Strategic Plan and BSRP goals of developing and implementing a holistic approach to ecosystem and fisheries management in the Baltic. This Group provides an essential interface with the Study Group on Multispecies Assessments in the Baltic. Its terms of reference are specifically part of the Implementation Plan for Component 1 of the BSRP. The initiated historic data compilations, revisions and reviews addresses needs of data improvement for Baltic fish stock assessment and prediction purposes. One of the main goals of the Group is also to develop and implement the environmental information in the fish stock assessment and prediction tools. A joint or partially overlapping meeting with SGMAB will stimulate exchange of results and ideas and further cooperation among study groups. This will promote development of integrated ecosystem assessments.
Resource Requirements:	For the 2006 meeting (February) computer and printing facilities as well as copy machine should be made available from organising institute (Riga, LATFRA). It is necessary to have the meeting before the SGMAB meeting in MAy 2006.
Participants:	The Group is normally attended by some 10-15 members and guests. Specifically all Baltic countries should provide relevant experts, and also participants from outside of the Baltic region.
Secretariat Facilities:	None
Financial:	BSRP will pay participations costs of 3 members for each of the eastern Baltic states. No financial implications fo western baltic countrie specialists
Linkages To	ACE, ACFM, The quality of stock assessments and management advice of Baltic

Advisory Committees:	herring, sprat and cod stocks.
Linkages To other Committees or Groups:	SGMAB, WGBIFS, WGBFAS, the other BSRP Study groups
Linkages to other Organisations:	HELCOM
Secretariat Marginal Cost Share:	BSRP 100%