

KALA- JA RIISTARAPORTTEJA nro 241

*Antti Lappalainen*

*Pekka Salmi*

*Riku Varjopuro*

## Management of Baltic Coastal Fisheries

A Background Report

Helsinki 2002

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*Published by*

Finnish Game and Fisheries Research Institute

*Date of Publication*January 2002

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*Author(s)*Antti Lappalainen, Pekka Salmi and Riku Varjopuro

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*Title of Publication***Management of Baltic coastal fisheries - a background report**

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*Type of Publication*

Report

*Commissioned by**Date of Research Contract*

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*Title and Number of Project*

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*Abstract*

This report presents the data collected for the project: "Management of Baltic coastal fisheries". The goal of the project was to analyse the state of coastal fisheries, their management structures and practices, and to discuss future ways of enhancing the sustainable development of small-scale coastal fisheries in Sweden, Finland, Åland and Estonia. The project also dealt with coastal aquaculture.

The project, which was conducted in 1999-2001, was financed by the Strategy for Environment and Fishery of the Nordic Council of Ministers'. The final report, "Förvaltningsmodeller för Östersjöns skärgårdsfiske och vattenbruk", will be published in 2002. It will present a synthesis of the report and draw conclusions.

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*Key words*

Coastal fishery, fishery management, aquaculture, Baltic Sea

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*Series (key title and no.)*

Kala- ja riistaraportteja 241

*ISBN*

951-776-354-9

*ISSN*1238-3325

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*Pages*

60 p.

*Language*

English

*Price**Confidentiality*Public

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*Distributed by*Finnish Game and Fisheries Research Institute  
Antti Lappalainen  
P.O. Box 6  
FIN-00721 Helsinki  
Tel +358 0205 7511*Publisher*Finnish Game and Fisheries Research Institute  
P.O. Box 6  
FIN-00721 Helsinki, Finland  
Tel +358 205 7511 Fax +358 205 751 201

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Finnish Environment Institute  
Riku Varjopuro  
P.O. Box 140  
FIN-00251 Helsinki  
Tel +358 9 403 000

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# 1. Introduction

This background report presents the data collected for the project: “Management of Baltic coastal fisheries”. The goal of the project was to analyse the state of coastal fisheries, the management structures and practises as well as to discuss future ways to enhance sustainable development of coastal fisheries in the Baltic Sea area. The project concentrated on coastal fisheries in Sweden, Finland, Åland and Estonia. In addition to coastal fishing, the project dealt also with coastal aquaculture. Environmental issues have also been discussed, since the healthy coastal ecosystem is the critical condition for sustainability of fisheries. Interactions between coastal fisheries and the Baltic Sea ecosystems has been more closely dealt with in a report that will be produced by the Estonian partners.

The project, which was conducted during the years 1999-2001, was financed by the Nordic Council of Ministers’ Strategy for Environment and Fishery. The final report, “Förvaltningsmodeller för Östersjöns skärgårdsfiske och vattenbruk”, will be published in 2002. It will present the synthesis and conclusions of the project.

The text is structured in five chapters. In the chapter two, we describe the administrative structures and the regulatory frameworks regarding coastal fisheries, aquaculture and environmental protection in Sweden, Finland, Åland and Estonia. The chapter three will describe the state of stocks of the most important coastal fish species. Socio-economic issues – fleet structure, economics of coastal fisheries as well as conflicts in coastal fisheries - will be dealt with in the chapter four. In the last chapter we will assess the reliability of the data.

## 2. Governance

In this chapter we will describe how fisheries and environmental administrations are organised in the four areas on which our project concentrates. We will also discuss about main management measures, property rights arrangements and decision-making procedures in each area. However, we start with international level issues before handling each of the four areas separately.

### 2.1. International framework

National fishery policies take into account the international levels of fisheries management. There are different kinds of international spheres that have relevance also in the Baltic Sea coastal fisheries. Most relevant are, of course, those that directly address fisheries and marine protection in the Baltic Sea area, but, in addition to these, the Nordic co-operation, EU policies and even global agreements affect fisheries in the Baltic Sea area.

The International Baltic Sea Fishery Commission was established pursuant to the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts (the Gdansk Convention) in 1973. There are now 6 Contracting Parties: the European Community (representing Denmark, Germany, Finland and Sweden), Estonia, Latvia, Lithuania, Poland and the Russian Federation. The coastal fisheries are under national jurisdiction and managed by national regulations. The IBSFC regulations – TACs and technical measures - apply also in these coastal fisheries. These regulations are however defined based on management needs in the open seas fisheries in conformity with the mandate of IBSFC and apply in the national zones because of the need for consistent management.

IBSFC establishes each year the following year's Total Allowable Catches (TACs), or catch limits for the main four commercially exploited species: cod, salmon, herring and sprat. These TACs take into account the status of the stocks as described by the ICES's Advisory Committee on Fishery Management (ACFM) and the economic needs of the fishing industry in the coastal states of the Baltic Sea. Already during the first IBSFC Session in 1974, Technical Regulatory Measures such as closed periods for fishing (a summer ban for cod fishery) and minimum landing-sizes and mesh-sizes were laid down in the "IBSFC Fishery Rules". They have been gradually expanded and fine-tuned (IBSFC 2000a).

Following the 1992 Rio Declaration the Council of Baltic Sea States (CBSS) adopted in 1996 the "Visby Declaration" starting the process for a "Baltic Agenda 21". The Baltic 21 programme promotes Sustainable Development in the Baltic Sea area. To achieve this action programmes for agriculture, energy, fishery, forestry, industry, tourism and transport are being developed. The International Baltic Sea Fishery Commission (IBSFC) was given the responsibility to draft the "Sector Report on Fisheries" (including coastal and inland waters).

According to the "Baltic Agenda 21" sustainable fisheries are achieved when a high probability of fish stocks being able to replenish themselves over a long period of time within a sound ecosystem is assured, while offering stable economic and social conditions for all those involved in the fishing activity. The goal for achieving sustainable development in Baltic Sea fisheries are thus means of development of economically and socially sustainable, environmentally safe and responsible fisheries by (IBSFC 2000b):

- maintaining biologically viable fish stocks, the marine and aquatic environment, and associated biodiversity;
- within these limits establishing maximum fishing possibilities and appropriate selective fishing techniques for harvesting stocks;
- distributing the direct and indirect benefits of open sea and coastal fishery resources between local communities in an equitable manner."

There is an international agreement on the protection of the Baltic Sea. The Convention on the Protection of the Marine Environment of the Baltic Sea Area was signed by the seven Baltic Sea States in 1974 and entered into force in 1980. A new Convention was signed by all the countries bordering the Baltic Sea and by the European Economic Community in 1992 (HELCOM 2001).

The governing body of the Convention is the Baltic Marine Environment Protection Commission- Helsinki Commission- since 1980. The Commission is known also as HELCOM. The decisions by the Commission are regarded as recommendations to the governments concerned, and to be incorporated into the national legislation of the Parties of the Convention. HELCOM works to achieve the long-term restoration of the ecological balance of the Baltic Sea through a series of preventive and curative actions to be undertaken within the entire drainage basin on a long-term basis.

Nordic countries co-operate in the field of fisheries policy under the organisations of the Nordic Council and the Nordic Council of Ministers. The overarching goal is to promote sustainable development in the Nordic countries' fisheries sectors, and the conservation of marine environments. In addition, consumers' opportunity to choose healthy and safe food of high quality is named as one of the key objectives (NMR 2001).

In the Nordic fisheries co-operation, there is not any binding agreement similar to the Gdansk Convention. Nordic co-operation on fisheries works through active networking for the exchange of experience and ideas on the sustainable development of the Nordic countries' fisheries sectors. In the management of resources, the greatest value of Nordic co-operation is the building of an active network for the exchange of data (on methods/results, etc.) and ideas on sustainable development in the Nordic countries' fisheries sectors. The integration of environmental considerations will continue to be prioritised. Joint initiatives and mutual briefing on typical fisheries policy issues between the countries – and between the EU countries and the others – are implemented as required. (NMR 2001.)

The European Union level fisheries policy is relevant in the Baltic Sea context in two ways. First, four Baltic Sea states are member states of the European Community (Germany, Denmark, Sweden and Finland). Second, EU is a contracting party of the Gdansk Convention (IBSFC).

The Common Fisheries Policy of the European Community is established under the Treaty of Rome and enshrined in Council Regulation (EC 3760/92) of 1992 establishing a Community system for fisheries and aquaculture.

The general objectives of the Common Fisheries Policy are to protect and conserve available and accessible living marine aquatic resources, and to provide for rational and responsible exploitation on a sustainable basis, in appropriate economic and social conditions for the sector, taking into account its implications for the marine ecosystem, and in particular taking into account the needs of both producers and consumers.

Sustainable use of the fish stocks and the protection of marine habitats are central guiding principles of the policy. Article 2 of the basic CFP regulation incorporates this objective:

"As concerns exploitation activities the general objectives of the common fisheries policy shall be to protect and conserve available and accessible living marine aquatic resources, and to provide for rational and responsible exploitation on a sustainable basis, in appropriate economic and social conditions for the sector, taking account of its implications for the marine ecosystem, and in particular taking account of the needs of both producers and consumers. To that end a Community system for the management of exploitation activities is established which must enable a balance to be achieved, on a permanent basis, between resources and exploitation in the various fishing areas."

The CFP takes into account the biological, economic and social dimension of fishing. It can be divided into four main areas dealing with conservation of fish stocks, structures (such as vessels, port facilities and fish processing plants), the common organisation of the market and an external fisheries policy which includes fishing agreements with non-Community members and negotiations in international organisations.

The Common Fisheries Policy is in a reform process. The process and the debate about the reform started already a couple of years ago, but the final stage - decisions about possible changes - has not yet started. The Council will decide by the end of 2002 about possible changes in the legislation. To fully achieve sustainability of commercially important fish stocks and their associated fisheries, and of other biota affected by fishing activities, will be a major objective when preparing proposals for reform of the CFP (COM (1999) 363 final).

On the Global level, several international agreements highlight the importance of environmental considerations in fisheries management. E.g. the Convention on Biological Diversity (CBD) and Jakarta mandate to implement CBD in the context of marine ecosystems, CITES, Bonn Convention on migratory stocks, UN Law of the Sea, UN Agreement on Straddling Stocks and Highly Migratory Fish Stocks and FAO Code of Conduct all highlight the importance of relationship between the environment and fisheries. In addition, in spite of being more related to purely environmental issues, agreements on protection of the marine environment, e.g. OSPAR and HELCOM, are relevant in the integration of environmental and fisheries decision making.

## 2.2. Governance issues in Sweden

Decision making regarding fisheries and marine protection issues are handled in two ministries in Sweden - fisheries issues under the ministry of Agriculture, Food and Fisheries and marine protection under the Ministry on the Environment.

### 2.2.1. Fisheries administration in Sweden

The Ministry of Agriculture, Food and Fisheries (Jordbruksdepartementet) is responsible of providing the Government with the basis for decisions within the areas of its responsibility, including agriculture, fishery, reindeer husbandry, hunting and game management etc. The Fisheries Division is one of the six specialist divisions in the Ministry. The Fisheries Division handles issues pertaining to the fishing industry, recreational fishery, aquaculture management of marine and fishery resources, market



regulation of fish and fishery products and structural aid to the fishery sector (Jordbruksdepartementet 2001).

The National Board of Fisheries (Fiskeriverket) is the central, governmental agency working with fisheries and fisheries conservation matters. It is accountable to the Ministry and is responsible for implementing government decisions and ensuring that they are complied with. It also provides specialist advice for the Fisheries Division of the Ministry. According to the Fishing Decree the National Board of Fisheries may set up rules in order to protect fish stocks. The National Board of Fisheries is the authority appointed to administrate directives from the CFP. Many commercially important species are common to both inshore and sea fishery in Sweden and therefore may be regulated by the EU. A typical example of this is the Baltic cod, which has a TAC, minimum size and fishing ban periods, all agreed within the International Baltic Sea Fishery Commission (IBSFC) and therefore within the competence of the EU. The species not regulated by the EU are subject to the competence of the National Board of Fisheries (Píríz 1998).

Changes of the fishery management are mostly initiated by local fishermen, water owners or by the biological expertise. When changes are proposed a qualified biological assessment is necessary. Normally no bio-economic studies are conducted. In the end the National Board of Fisheries takes decisions (Píríz 1998).

The third government organisation involved with fisheries is the county administration (länsstyrelse). As regional authorities they safeguard the interests of fishing and fishery conservation and informs about current rules of fishing. County administrations' main responsibility in fisheries is to grant loans and subsidies of EU and licenses for professional fishing and handle permits for recreational fishing and for fish farming.

The National Board of Fisheries' Institute of Coastal Research monitors and makes assessments for the most important freshwater species. The programs also involve eel, cod, turbot and flounder. Research on interconnected environmental and fisheries issues is also conducted by the institute (Píríz 1998). The most important parts of the fisheries monitoring system are the professional fishing vessel register, the professional fishermen register and the catch register. The National Board of Fisheries and the county administration maintain the registers, which have a central role in controlling and implementing the CFP in Sweden. Fishermen fishing with boats at most 12 meters long have to report their catches monthly to the county administration. The fishery with larger vessels – defined here as open sea fishery - is mainly trawling of herring, cod and sprat, and salmon fishery with drifting nets. They have to report their catches daily using a standardised logbook to the National Board of Fisheries.

Coastal waters in Sweden are divided into private and public waters. According to the Act on Private and Public waters (1955:595), all waters inside the 3 m depth curve or within 300 m from the shore (of mainland and island longer than 100 metres) are private. Fishing in public waters is managed by the authorities. The fishing rights in private waters belong to the owner of the water area. At the West Coast, in the Gulf of Bothnia, Gotland, Blekinge and Skåne fishing rights are almost the same in private and public waters, but owners can perform a commercial fishery without license having no obligations of keeping logbooks (Píríz 1998). In the other Swedish Baltic archipelagos, however, the owners are responsible for the fisheries management in private waters, but severe misuse of the fishing rights could render legal actions from the authorities. The most important role of the water owners in these archipelagos is to decide on access to all fishing, except angling, which is free.

There are many stakeholders in Swedish coastal fisheries. Many of them are relatively well organised. Private stakeholders and organisations are the Swedish Fishermen's

Federation (SFR), the Federation of Swedish Fish Industries and Trade, the First Buyers, the Swedish Aquaculture Association, the Swedish Fish Health Control Program, the Swedish Association of Fishing Waters Owners and the Swedish National Sportfishing Association. All bigger companies within trade and industry are organised in the Federation of Swedish Fish Industries and Trade. The owners of private water are organised in the Swedish Association of Fishing Waters Owners with 110,000 members (60% of total) (Píriz 1998). The most active parties involved in fisheries decision making is SFR and the sportfishing association. SFR is working closely with the ministry and the National Board of Fisheries. On the other hand, sportfishers have 'an alliance' with nature conservationist and they have been an active party as well. While the most active stakeholder organisations participate in decision-making both on formal and informal levels, the other organisations participate only in the formal policy forum provided by e.g. hearings and advisory bodies (Hasselberg 1997).

### 2.2.2. Policy and regulations of fisheries in Sweden

The professional fishing industry in Sweden is managed in accordance with the European Union's Common Fisheries Policy (CFP). This policy consists of resource, market and structural policies as well as a fisheries monitoring system. Fish stocks are regulated by the European Union's long-term fleet programme, fishing quotas, restrictions on the use of fishing nets and closed seasons (e.g. Commission Regulations No 3760/92, No 2847/93, No 88/98, No 2742/99). The fishing industry is supported by the EU's Financial Instrument for Fisheries Guidance, in accordance with a fishing industry plan and the PESCA Community initiative.

Goals and objectives regarding seas and coastal areas in Sweden state, e.g., that living resources of the sea are used in a way that preserves the water's long-term production capacity and biological diversity. The National Board of Fisheries is responsible for this target together with the Environmental Protection Agency. Fishing should be conducted in accordance with the Precautionary Principle (Rio Declaration 1992). This means that fisheries do not influence the natural areas of distribution for fish, crustaceans and molluscs and do not damage the marine archaeological heritage. Catches of young individuals of the target species, other unwanted incidental catches and the incidental catches of marine mammals and sea-birds are minimised (Naturvårdsverket 2001).

In April 1999 the government accepted 15 national environmental quality goals. The National Board of Fisheries was commissioned to produce a report on fisheries and environment related to the goals for fresh-water and marine habitats. In addition, the Government also proposed a Bill on Sustainable Fishery and Agriculture in the spring of 1998, which lays down the guiding principles and different measures to be taken in this field. Both the Environmental Protection Agency and the National Board of Fisheries have previously presented National Action Plans for Biological Diversity (Agenda 21 Oceans 2000a).

According to the Fishing Act, the professional fishing licence is needed for professional fishing in public waters. Licences are granted by the county administration. The licence is granted to a person if an essential part of his maintenance is received from fishing and fishing has a connection to the Swedish fishing industry. According to the Fishing Decree (1994:1716) this connection exists if at least half of the catch is landed in Sweden and at least half of the fishing journeys starts from a Swedish harbour or at least half of the crew is resident in Sweden. In legal usage annual fishing income of 20 000 crowns has been considered as an essential part of maintenance. There are certain implications of licences. Licensed

professional fishermen are, for instance, entitled to EU funds. In addition, number of fishing gears to be used by unlicensed fishermen is restricted and the use of stationary fishing gear in the public waters is allowed only for licensed fishermen. Licensed fishermen are obliged to provide catch statistic regarding fishing in public waters.

The National Board of Fisheries may set rules in order to protect fish stocks. Species falling within the national competence are not regulated by TACs, but with other kind of regulations. The most important rules are minimum landing-size, gear restrictions, time closures and area closures of fishing. Along the Swedish coast, especially in the Gulf of Bothnia time and area closures or gear restrictions are set regarding salmon, sea trout and herring fishing (e.g. FIFS (1993:31), FIFS (1997:3), (1998:4), (1998:22) and (1998:44)). E.g. seine fishing is totally forbidden and trawl fishing is, with some specified exceptions, forbidden in the inner territorial waters. In the Gulf of Bothnia salmon fishing with drift-nets and anchored lines is also forbidden. In general, the Baltic fresh-water species are less regulated than the diadromous salmon and sea trout. The important eel fishery is regulated by regional minimum size limits.

There are also certain regulations concerning recreational fishing. Since 1985 Swedish citizens and foreigners have had the right to fish with hand tackle in all coastal waters (frifiskerätt). According to the Fishing Act (1993:787) hand tackles are: jigging equipment, rod, reel and line with maximum of 10 hooks. Fishing with nets, fykes, traps and long line in coastal public waters is also part of the public right of access (frifiskerätt) of Swedish citizens and foreigners living permanently in Sweden. The number of gear is restricted, though. Trolling and other salmon fishing are not allowed in private waters without the permission of the fishing right's owner.

### 2.2.3. Regulation of fish farming in Sweden

Municipalities plan and regulate the use of water areas, which is co-ordinated at the regional level by the county administration (länsstyrelsen) and nationally by the Ministry of the environment. Municipalities may guide the use of water areas by producing master plans that include land use as well as use of water areas. Master plans are not, however, legally binding and only a few municipalities have made plans for water areas. Another tool available for municipalities is a local programme for nature protection. Planning as well as programmes of the municipalities are guided by national legislation (plan- och bygglagen (PBL) samt naturresurslagen (NRL)) and programmes. Municipalities may co-operate in water area planning on the county level (Svenskt vattenbruk 2000).

The regulation of fish farming is implemented by the permit system. In addition, the water area ownership has influence in the system. Normally the owner of a water area has a right to decide about the use of it. In case that a fish farmer wishes to establish a fish farm on a property owned by someone else, she/he must have the owners consent.

To farm fish one must have two permits. One that is granted on the basis of fisheries legislation by the county administration (fishery unit) and one that is based on environmental legislation - Miljöbalken (1998:808). It is a comprehensive environmental legislation in Sweden, according to which one must have a permit for operations that have impact on the environment or human health, unless the impact is insignificant in relation to the objectives set in legislation. The environmental permits are issued by municipalities or by the county administration (Miljöprövningsdelegationen vid länsstyrelsen) depending on the volume of the fish farm. If the farm produces more than 20 tonnes fish annually the permit is issued by the county administration. In case of smaller units, the municipality is

the permitting body. In addition, fish farms must be registered for veterinary monitoring and implement an obligatory veterinary programme.

In the permitting procedure, interested parties are given an opportunity to examine the application and express objections. In addition, the applicant has a right to appeal about the decision made by county administration or municipality. Appeals concerning the decisions of fishery units of the county administrations are made to the National Board of Fishery and further to County Administrative Courts. Appeal bodies in case of environmental permits are the Environmental Courts and the Environmental Court of Appeal.

The permit regulates the amount of fish allowed to be farmed. In addition, the permit may order how long the permit will be valid. Permitting bodies can order other permit-specific regulations and obligations, as well. However, allowable level of nutrient load is not regulated. One entrepreneur may own several licences (Svenskt vattenbruk 2000).

County administration is responsible for aquaculture monitoring. In practice, monitoring is delegated to municipalities while the county administration co-ordinates the work and keeps registers of fish farming. Fish farmers have a duty to make annual reports of their activities to county administration. Veterinary monitoring is the duty of municipalities (Ackefors 2000, Svenskt vattenbruk 2000).

According to HELCOM's Lead Country Progress Report on recommendations concerning measures aimed at the reduction of discharges from marine fish farming, total direct load to the Baltic Sea from Sweden in 1998 was 121 tonnes nitrogen and 14 tonnes phosphorous.

#### 2.2.4. Swedish environmental policy and administration

The policy on oceans is part of the National Sustainable Development Strategy. The Government Bill on Environmental Quality Objectives 1998 (Miljömål), states the ways in which the environmental policy should be conducted to achieve the overall objective of handing over to the next generation a society in which the main environmental problems have been solved. These quality goals together with the new Environmental Code 1999 aim to increase the scope for and stimulate interest in voluntary measures, particularly in industry for improving the environment. (Agenda 21 Oceans 2000a.)

One of the environmental quality objectives, "A balanced marine environment, flourishing coastal areas and archipelagos", addresses marine and coastal areas directly. It states that "The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos should be characterised by a high degree of biological diversity and recreational, ecological and cultural heritage assets. Industry, recreation and other usage of the seas, coasts and archipelagos must be compatible with promotion of sustainable development. Especially valuable areas must be protected against exploitation and other damaging activities" (Naturvårdsverket 2001).

There are many positive traits in the environmental situation in Swedish coastal waters. The national environmental monitoring programme shows a continuous reduction of levels of organic hazardous substances, e.g. DDT and PCB in herring, which have declined with 5-10% a year since the 1970's. The mercury levels in herring have been reduced to 1/3 since the beginning of the 1980's. Due to the formerly high levels of PCB in salmon and herring and the mercury contamination of freshwater fish the National Food Administration has made recommendations of maximal consumption directed towards certain consumer groups. The concentrations

in coastal fish today, however, have decreased to the level where this recommendation may be revised.

The environmental administration in Sweden is headed by the Ministry of Environment. The Ministry has seven administrative divisions each responsible for specific areas. The Division for Natural Resources and the Division for Environmental Quality are responsible for matters related to sea.

The Ministry of the Environment is the responsible body for integrated coastal zone management and sustainable development, marine environment protection, and for the conservation of marine living resources. The Ministry of Agriculture, Food and Fisheries is responsible for sustainable use of marine living resources. Co-ordination is ensured by consensus decisions in the Cabinet of the Government (Agenda 21 Oceans 2000a).

The Swedish Environmental Protection Agency (EPA) is a central environmental authority under the Swedish Government. The Agency's most important tasks are to promote ecologically sustainable development and contribute to achieving the objectives by taking on the role of co-ordinator and driving-force in environmental work both nationally and internationally. It co-operates with the sector authorities as well as regional and local authorities.

At the regional level, the county administration (länstyrelsen) e.g. grants, supervises and enforces permits under the Environmental Code (1998:808). At the local level, municipal environmental authorities have responsibilities in the environmental field e.g. inspecting notifications, monitoring and controlling the local activities.

#### 2.2.5. Co-operation between environmental and fisheries sectors

There is an official agreement on co-operation between the EPA and the National Board of Fisheries. The National Board of Fisheries assists the EPA in the national monitoring programme in inland and coastal waters. Meetings are often organised where fish and environment problems are discussed, as well as fisheries management e.g. in issues related to the National Environmental Quality Objectives. The purpose of the co-operation has often been to initiate research at the National Board of Fisheries on problems identified by the EPA. Most of the co-operation is unofficial.

The co-operation between the National Board of Fisheries and the regional authorities is both organised and more unofficial. Regular meetings are arranged for regional fishery officials by the board. A more unofficial co-operation is common when regional authorities start projects on fish and fisheries. The main problems have been how to increase interest in fish among environmental organisations and to solve local problems in fishery management.

### 2.3. Governance issues in Finland

Decision making regarding fisheries and marine protection issues are handled in two ministries in Finland. Fisheries issues are the responsibility of the ministry of Agriculture and Forestry. Responsible ministry for marine protection is the Ministry on the Environment.

### 2.3.1. Fisheries administration in Finland

The Ministry of Agriculture and Forestry creates the conditions for the sustainable and diversified use of renewable natural resources and for developing the economic and leisure-time activities of the country side. The Ministry also secures the quality of the commodities obtained from renewable natural resources.

Official tasks within the fisheries are handled by the ministry's Department of Fisheries and Game. The department safeguards conditions for the fisheries industry by promoting professional fishing, fish farming and the processing and marketing of fish products. It also develops conditions for recreational fishing, as well as fishing for household consumption, through the management, rehabilitation and stocking of fishing waters, and by encouraging research in the fisheries industry. Furthermore, it implements the European Union's Common Fisheries Policy in Finland (MMM 2001a).

The Finnish Game and Fisheries Research Institute (FGFRI) operates under the Ministry of Agriculture and Forestry. The Institute's role is to produce information about fisheries, game and reindeer for the sustainable use of resources and the maintenance of biodiversity. The basic functions of the FGFRI are assessment and prediction of fish and game resources, monitoring of reindeer pastures, compilation of statistics and preservation of endangered species. Core competence areas are built upon these basic functions. Scientific expertise is utilised in extensive research programmes, market-driven research and producing of the knowledge base. The research consists of disciplinary basic science, interdisciplinary applied science and trans-disciplinary mission-oriented science (RKTL 2001).

Employment and Economic Development Centres are joint regional service centres of three ministries - the Ministry of Trade and Industry, the Ministry of Agriculture and Forestry, and the Ministry of Labour. They provide services to business people, farmers and individuals in 15 regions. Their responsibilities include the administration and supervision of EU and national aid. Fisheries Units of the Centres are regional administration authorities of fisheries. Management of fisheries in state-owned public waters is delegated to the Centres. They deal with the structural aid granted to fisheries and are responsible for maintaining registers in this field. Centres issue licences for commercial salmon fishing with stationary gear (fykes and traps). Furthermore they advise on issues concerning water rights, appropriations for fisheries and the management of watercourses (TE-keskus 2001).

The most important parts of the fisheries monitoring system are the professional fishing vessels register, professional fishermen register and catch register. Vessels and boats practising commercial fishing in the maritime have to enter into the fishing vessel register. The registers are maintained by the regional Employment and Economic Development Centres (see eg. the Act on Implementing the Common Fisheries Policy of the European Union (1139/1994, amended by 1280/1995) and Decision of the Ministry of Agriculture and Forestry (1575/1994, amended by 179/97, 798/97)).

Fishermen fishing with boats at most 10 meters long have to report their catches monthly to the regional Employment and Economic Development Centres where they are registered. The fishery with larger vessels – defined here as open sea fishery - mainly consists of trawling of herring and sprat, and salmon fishery with drift-nets. They have to report their catches daily using a standardised log-book.

Fishing water ownership in coastal areas is based to a large extent on private ownership, similarly to the Swedish system. All coastal waters outside the line of 500 m from 2 m depth curve are state-owned public waters. The waters inside the 500 m

line are in private ownership. In archipelago areas, e.g. in the archipelago in South West Finland, most of the coastal waters are privately owned.

In Finland, fishing rights belong to the owners of the waters concerned. Waters are generally jointly owned by the households of a village, but the state, municipalities, parishes and individual owners can also own water areas. According to the Fishing Act (286/1982) the holder of fishing rights is responsible for taking care of his fishing waters and fish in such a way as to ensure the preservation of the fish. The shareholders of jointly owned waters form Statutory Fishery Associations (SFA), which organise the management of fishing and the fishing waters (Sipponen 1999).

The Fisheries Regions, organisations for larger water areas, were founded in the 1980s in order to enhance the management system. The supervisory board of the Fisheries Regions consists of representatives of SFA's of the area and of representatives of recreational and commercial fishermen's associations. In most of the issues the Fisheries Regions can only work on the authorisation of the Fishing Act or SFAs. The Fisheries Regions and SFAs can make their own local fishing rules stricter than legal regulations. Typical management measures of Fisheries Regions are minimum mesh-sizes, minimum landing-sizes of fish, and area and time closures. According to Sipponen (1999) management measures employed in SFAs prefer input controls (minimum mesh-sizes, area and time closures) to output controls (catch limits, minimum landing-size).

As a general rule, fishing in Finland is allowed for citizens of Nordic countries regardless of residence and for citizens of the EU living permanently in Finland. However, they have to buy fishing right owner's license and pay fishing management fee to the state. However, there are several exceptions to that rule, especially concerning recreational fishing (see below) and salmon fishing in public waters is not free (MMM 2001b).

The Fisheries Regions are organisations that provide a forum for stakeholder participation at local level. Private owners as well as organisations of commercial and recreational fisheries are represented in the meetings. However, interest groups without a direct connection to fishing (e.g. environmentalists and tourism business) are not represented (Sipponen 1999).

At the national level of decision making, professional fishermen are represented by their national association. There is also a national Federation of Finnish Fisheries Associations, which represents interests of water owners. These associations are consulted by the authorities, for instance by inviting their representatives into *ad hoc* working groups that deal with fisheries issues (Varjopuro and Salmi 1999).

### 2.3.2. Policy and regulations of fisheries in Finland

The guiding principle of fisheries policy in Finland is the sustainable use of natural resources. Fishing is scaled in accordance with fish stocks. The goal of the Fishing Act of 1982 can be seen to aim at optimum sustainable yield in fisheries, which promotes interests of commercial fishing (Sipponen 1999). The professional fishing industry in the sea areas is managed in accordance with the European Union's common fisheries policy (CFP).

Professional fishing and fishing gears are defined in the Fishing Act and in the Fishing Decree. A person is considered as a professional fisherman if at least 30%, or in some occasions at least 15% of his annual income is received from fishing. There is not an actual license system for professional fishermen, but professional fishermen as well as boats used in commercial fishing are registered. There are certain implications of the definition of a professional fisherman. Professional fishermen can apply for EU

fisheries funds. They can also use more and larger fishing gear than the non-professional fishermen. All professional fishermen must report their catches, including fishing in the private waters.

The Fish and Game Unit of the Ministry has delegated the regulatory power to fishery units of regional Centres of Employment and Economic Development. The fishery units regulate and monitor fisheries in the public waters. Minimum mesh-sizes have been set for gill-net fishing for vendace, herring, sprat and smelt. There are also minimum mesh-sizes set for salmon and sea-trout fishing with gill-nets and traps. Employment and Economic Development Centre can under specific circumstances grant exceptions to these rules, and local regulations are also possible (see below). Other regulations used in Finnish coastal fisheries are minimum landing-sizes for pikeperch, grayling, salmon and sea trout (Fishing Decree 1116/1982) and region-specific closed seasons in four regions in the Baltic Proper, Åland Sea and Gulf of Bothnia in order to protect salmon migration to spawning areas.

Salmon quota is the only catch quota that has implications in Finnish coastal fisheries. All commercial salmon catches must be included into the annual Finnish salmon quota, which is set by decisions of IBSFC and ordered in the Community law by the European Union. Coastal and open-sea catches have not been separated into distinct quotas. However, since 1997 the Province of Åland has been granted own salmon quota.

Fisheries regions and SFAs have a power to stipulate their own local regulations. Typical management measures are minimum mesh-sizes, minimum landing-sizes of fish and area and time closures. For instance, Fisheries Regions in Southwest Finland archipelago have set common mesh-size regulations for pikeperch fishing in their areas. Minimum mesh-size is from 1.1. 2001 in most regions 43 mm and in some 45 mm. Mesh-sizes apply to both recreational and commercial fishing.

Recreational fishers who fish with hand tackle have to buy a fishing right owner's licence and pay fishing management fee to the state. However, there are exceptions to that rule. (1) Persons over 65 years or under 18 years are not obliged to pay fishing management fee or lure fishing fee (see below). (2) Those fishing in one province with one rod, reel and lure are allowed to fish in private waters by paying provincial lure-fishing fee from the fisheries authorities. (3) Angling with rod and natural bait without reel and ice-fishing are part of the public right of access, which applies to both private and public waters. SFAs and the Fisheries regions grant permits also for recreational fishing. Their permits are needed if more gear than allowed in provincial lure permit is used. Recreational fishing in public water is not regulated, but a fishing management fee must be paid.

All persons residing in the village are entitled to purchase a licence for subsistence fishing in the village's waters within the limitations stipulated by the SFAs. In addition, a permanent resident of a village or a municipality has a right to fish vendace, herring, sprat and smelt with net in private waters of the outer archipelago.

### 2.3.3. Regulation of fish farming in Finland

The regulation of aquaculture operations in Finland is based to a large extent on environmental control measures. The Ministry of the Environment is the highest environmental authority. The implementation of environmental regulations and policies is delegated to regional environment centres and municipalities and to the independent Environmental Permit Authorities (before 1 March 2000 the Water Courts). The regulation is based on the Environmental Protection Act, which entered into force in March 2000. However, the new law does not substantially change the



principles of water protection that was stipulated in the old Water Act (about regulation of fish farming in Finland see Varjopuro *et al.* 2000).

Fisheries policy, veterinary disease and food safety issues are governed by the Ministry of Agriculture and Forestry. These regulations and policies are implemented by two bodies. The Fisheries Department at the Regional Employment and Economic Development Centres are responsible for the implementation of fisheries policy. Food safety and veterinary disease monitoring is the responsibility of the National Veterinary and Food Research Institute (EELA).

Environmental permit system is the most important regulatory instrument in the Finnish fish farming. The permit, which is issued by Environmental Permit Authorities, is a pollution and construction permit. Any activity (such as fish farming, industry, waste water treatment facilities) that has the potential to directly pollute water needs a permit with set limitations. A permit is needed for fish farms with annual production of 2 tonnes or more or if in the farm 2 tonnes or more (dry weight) of fish food will be consumed in a year.

Before one may apply for a permit one must have a right to use the site for fish farming. A fish farm may be established on one's own property or on consent of the owner of the water area. It is common that the site is rented. The permits are applied for from the Environmental Permit Authorities. Applications must include a description of the planned activity (the location, the annual production and amount used of feed). In addition, expected impacts on the recipient water area as well as to other activities near the planned fish farm must be assessed. The content of the Application is to some extent similar to an environmental impact statement (EIS), although the assessment included in the application is not an official environmental impact assessment, because that is not demanded for small projects such as the typical fish farms in Finland.

When the application is received in the Environmental Permit Authority, it is publicly announced so that interested parties may examine and express objections, or otherwise give their opinion. Also environmental and other non-governmental organisations (NGOs) that are active in the area have this right. Regional environment centres and fisheries departments at regional Employment and Economic Development Centres provide their statements regarding the application.

The permits usually set limits for the amount of nitrogen and phosphorus in dry fish feed that is allowed to use annually and for maximum annual production (may be exceeded provided that N and P limits are not exceeded). Also maximum N and P load per produced kg of fish per year is ordered. Permits are farm and site-specific and they are usually granted for periods of 5-7 years. The reason for this is that a change in the state of coastal waters may occur. In addition, the actual impacts of fish farming may also be difficult to reliably predict during the permitting process. By granting permits for a certain period only, authorities have the opportunity to check practices, should the state of coastal waters change or environmental protection standards change in the future (Sahivirta and Kärmeniemi 1998).

The effects of fish farming on the environment have been monitored since the 1970s. Monitoring is obligatory (ordered in a permit) and it is financed by fish farmers. Monitoring programme is usually planned case by case for each fish farm. In cases where there are several fish farms in a small water area fish farmers may run a joint monitoring programme. The programmes usually include measurements of one or more of the components of coastal ecosystems (e.g. nutrient levels, concentration of specific effluents, plankton and macroalgae, zooplankton, benthic macroinvertebrates and sediment). Monitoring results are reported to regional environmental centres, where the results are also accessible to the public.

In addition to environmental monitoring a farmer is obliged to keep a diary of daily operations at the farm. The amount and quality of fish feed that is used, the amount of fish brought to or taken from the farm, the use of medication, records on fish mortality and other information on operations must be documented in specified protocols. The protocols are needed when authorities inspect the farms and when farmers prepare their annual self-monitoring report.

According to official statistics in Finland in 1998 the total discharge from fish farming into the Baltic Sea area was 760 tonnes of nitrogen and 100 tonnes of phosphorous. Discharge in Åland was 275 tonnes nitrogen and 35 tonnes phosphorous. South West Finland (the Archipelago Sea and the Åland Sea) coastal areas are the most important fish farming areas in Finland – 70 % of nutrient load (both N and P) from fish farming is discharged in this area.

However, the official nutrient load statistics are not perfectly reliable, which was found when statistical reliability was assessed. The ‘official statistics’ that are based on fish farmers’ reports on use of fish feed were compared with the results of the feed market survey, which were about 30% to 50% higher than ‘official statistics’. Various factors have been considered as explanations for the deviation between the two statistics. The examination of possible reasons reveals that the most obvious alternative is that the control of farms is not reliable and that some of the farms are clearly, and highly, exceeding the amount of feed used as granted by their licence. In addition, non-comparativeness of the data sets used, as well as the further sale or storage of feed at the farm are possible reasons (see chapter 4.4.2. “Vertical conflicts”).

#### 2.3.4. The environmental administration in Finland

The Ministry of the Environment is responsible for issues related to marine environment protection in general. The Environmental Protection Department has a responsibility of marine protection, while the Land Use Department of the Ministry is the responsible body for coastal land use planning (Agenda 21 Oceans 2000b).

Much of the responsibility of the implementation of the environmental policy is delegated to a regional level administration. The Regional Environment Centres and municipal environmental authorities care for the environment in their charge by promoting and supervising waste management and noise abatement and the prevention of air, water and ground pollution. They grant environmental permits and supervise compliance with their terms. In addition to issuing permits themselves, the regional environmental centres also look after general interests and provide the Environmental Permit Authorities with statements, and monitor compliance with environmental legislation as well as the conditions of permits. They also grant subsidies, compile and disseminate environmental information and carry out management and restoration work related to the environment, including waterways and the water supply (MoE 2001).

The Finnish Environment Institute (SYKE) is a national environmental research and development centre. The Institute provides information on the state of the environment and its development, as well as factors affecting it. Assessments are made about alternative scenarios and measures to influence future development. The institute’s work is carried out in close co-operation with the users of environmental information. The Institute provides expert services for the Ministry of Environment, the Ministry of Agriculture and Forestry, the Regional Environment Centres and other bodies (SYKE 2001).

### 2.3.5. Co-operation between environmental and fisheries sectors

One forum for co-operation has been the Advisory Board for the Marine Environment, which works in connection with the Ministry of the Environment to find common understanding in marine environment matters. Members of the Board are nominated by the Council of State for a period of three years. The Board gives advice to the authorities in matters related to marine environment, mostly in the context of international co-operation. The Board has members from different ministries, central associations for different sectors and nature protection organisations of relevance to marine protection matters. In the past it had stronger influence in decision-making, but nowadays its role is mostly informative.

There is also more informal co-operation. Mostly this is project-based co-operation, but longer-term co-operation between fisheries and environmental sectors exists, as well. For instance, there is a national research and development programme that aims at reducing environmental impacts of fish farming. The programme was established in 1997. It co-ordinates and follows all research related to the programme's aim. The steering group is run by the South West Finland regional environmental agency and it consists of major stakeholders: environmental and fisheries authorities (both national and regional levels), fish farmers (national and Åland associations), environmental and fisheries research institutes and the national technology agency. However, universities, regional development agencies or environmental groups are not represented. The steering group is one forum where different stakeholders can discuss and debate about the research and knowledge related to environmental impacts of fish farming.

On the regional level, the regional environment centres co-operate closely with the local and regional authorities, the regional councils, and the residents, companies and other organisations in each region. One example of a regional co-operation is a large programme for protection of the Archipelago Sea in South West Finland ("Pro Saaristomeri/Pro Skärgårdshavet"). It was initiated by three regional authorities – the regional environmental centre, the regional centre for employment and economic development and the regional council. The programme aims at environmental protection, but objectives of regional economic development are high on the agenda. International and national policies and programmes (e.g. HELCOM, Baltic 21) are taken as a starting point for the programme. The programme incorporates the industry, NGOs as well as the public into the work.

## 2.4. Governance issues in Åland

Åland is an autonomous region of Finland. According to the Autonomy Act (1144/1991) the province possess the right to pass laws concerning its own internal matters and to exercise budgetary powers. The legislative assembly or parliament of Åland is called the Lagting. The Act on the Autonomy of Åland can only be altered by the Parliament of Finland with the consent of the Åland Lagting. The Autonomy Act specifies the spheres in which the Åland Lagting has the right to pass laws. One important sector is promotion of industry, agriculture and fishing. The Lagting appoints the Landskapsstyrelse, the Government of Åland.

### 2.4.1. Fisheries administration in Åland

The Government of Åland consists of six departments headed by politically appointed "ministers" and their offices. The Unit of Environment (miljöbyrån) and the Unit of

Fisheries (fiskeribyran) have a central role in environmental and fisheries management in Åland. The Government of Åland, through the unit of fisheries, has a right to issue local fishing regulations through a decree, it grants licences for commercial fishing and maintains the registers of the fishing monitoring system of CFP. According to the Act on Implementing the Common Fisheries Policy of the European Union (40/1995) and the Decree on the Registers of the Fishing Industry (51/1995) the government maintains the necessary registers on vessels, professional fishermen and the catch.

The fishing rights in Åland belong primarily to the owner of the water area. According to the Provincial Act on Fishing (39/1956) the holder of fishing rights is responsible for taking care of his fishing waters and fish stock in such a way as to ensure the preservation of the fish. Water areas in coastal waters are divided into private, jointly owned, the Government's private and the Government's public waters. The shareholders of jointly owned waters form SFAs, which organise the management of fishing and the fishing waters (see the Finland section). The formation of Fishery Regions in Åland is not compulsory according to the Act on Fishing.

According to the Act on Fishing all citizens of the Nordic countries have the right to recreational fishing in the sea outside the village boundaries (i.e. outside privately owned water areas) and in the water areas belonging to the Government. In the rest of Finland angling and ice fishing are part of the public right of access (i.e. also regarding private waters), but this is not the case in Åland.

Fishing with gear used in professional fishing in these areas is allowed only to the professional fishermen and fishermen to whom fishing is an essential part of maintenance. All persons residing in the village have the right to purchase a licence for subsistence fishing in the village's jointly owned waters within the limitations stipulated by the SFAs or Fishery Regions.

#### 2.4.2. Policy and Regulations of fisheries in Åland

Åland is bound by the regulation of EU's Common Fisheries Policy and adopts the international agreements ratified by Finland (e.g. in IBSFC). However, Finland has to consult with Åland before ratification. In addition, Åland has a right to stipulate fishing regulations that are applied in the regions's area.

According to the Act on Professional Fishing (44/1995) a person is a professional fisherman if at least 50% of his annual income comes from fishing and annual fishing income is at least 20 000 FIM (~3400 EUR). A person is a part-time professional fisherman, if at least 20% of his annual income comes from fishing and annual fishing income is at least 6000 FIM (~1000 EUR). Gears allowed only for professional fishing are: trapnets higher than 1,5 m, longline with more than 150 hooks or net longer than 525 m. Trapnets intended for catching salmon and sea trout may be used only with the special permission of the provincial government.

Minimum landing-sizes are applied for salmon, sea trout, pike, pikeperch, bream and whitefish. Special minimum mesh-size regulations are used in smelt, sprat and herring gill-net fisheries as well as in salmon and trout fisheries. There is also a general minimum mesh-size regulation for fishing that is targeting other species - 37 mm. For trapnets higher than 1 m the minimum mesh-size is 40 mm except 12 mm in Baltic herring fishing. The size of the hook in salmon long line must be at least 19 mm.

The total quota of Finnish salmon fishing in the Baltic Sea has been divided between Åland and the main land since 1997. Before that Åland salmon catches was treated as a part of the total national quota. According to the joint decision of the Ministry of Agriculture and Forestry and the Government of Åland in year 2000 the salmon quota

of Åland is 24% of the total Finnish salmon quota. The quota in Åland is further divided between fishing boats. There are also time and area limits for salmon fishery, seine fishing, trolling and fishing for bream in Åland.

According to the Act on Fishing the Government of Åland may issue local fishing regulations through a provincial decree for a water area forming a natural whole or a part thereof. Regulations may regard fishing gears, its use, close seasons, minimum landing-sizes and other provisions for the promotion of protection of the fish stock. The Government has also right, if there are exceptional reasons, to grant permission e.g. to use gears or fishing methods otherwise prohibited.

### 2.4.3. Regulation of fish farming in Åland

Åland has had its own Water act since early 1997. Before that applications for permits had to be submitted to the West Finland Water Court in mainland Finland. Permits are granted by the Åland Environmental Licensing Board and appeals have been issued at the Åland Administrative Board. The decisions can be appealed against in the Supreme Administrative Court of Finland. Monitoring is basically similar as in the rest of Finland. Fish farmers run monitoring programmes, which are supervised by the Government of Åland. In addition, fish farmers report annually about their activities.

In Åland, fish farms with an annual production of 25 tonnes or more must have an environmental permit. Smaller farms must be announced to the Government of Åland, which assesses need of a permit case by case. Permits in Åland have allowed greater production than in other areas of Finland. For example, in 1998 the average annual production level permitted to a single fish farm was 108 tonnes in Åland and 46 tonnes in the Archipelago Sea area.

Waters around Åland are more suitable for fish farming because of the stronger currents. There are also fewer summerhouses in the area than in the Archipelago Sea so that interactions and conflicts with recreational use of coastal waters are limited. Additionally, authorities in Åland seem to have had (till the beginning of the 1990's) a more positive attitude towards fish farming than in the rest of the country. For example, authorities have made fewer appeals and objections against fish farm permits in Åland than in other areas (Sahivirta and Kärmeniemi, 1998). Furthermore, authorities in Åland and South West Finland have not had similar perceptions of the significance of environmental impacts caused by fish farming in general (Saaristoasiain neuvottelukunta, 1987). However, today the opinion of the public and the authorities at Åland seems to be against fish farming akin to opinion on the mainland.

### 2.4.4. Environmental policy and administration in Åland

The Government of Åland consists of six departments and their units. The Unit of Environment (miljöbyrån) takes care of environmental management. Åland has had its own Water act since early 1997, and nature conservancy is fairly well developed. Åland has its own nature conservation law, and there are special regulations for protecting wild flora and fauna.

The general goal of water protection in Åland is to impede pollution of aquatic environments, to carry out activities to improve water quality and define water quality norms according to water protection legislation. The water quality norms stipulated in the Åland Water Act (1997) is an important difference when compared to water protection in mainland Finland (Westerlund 1998). Priority measures in achieving the objectives are wastewater treatment and reduction of discharges from fish farming

and agriculture. Monitoring is a central part of water protection in Åland because of the water quality norms in legislation. Water monitoring is mainly conducted in water laboratories in Gutterp and Husö (Åland Government 2000).

The Government of Åland co-operates in reducing effects of eutrophication on a national level with South West Finland's Regional Environmental Centre and the Ministry of the Environment. On an international level Åland co-operates with Stockholm county administration in Sweden, HELCOM and Baltic Seven Islands.

The Nordic Council has decided to award its Nature and Environment Prize for 1999 to the Agenda-21 office of the Nature and Environmental Association in Åland. The awarding committee said that the office had succeeded in creating a large range of activities and popular interest around the protection of the environment, with a minimum of administrative personnel and a maximum of popular involvement.

## 2.5. Governance issues in Estonia

In this chapter we concentrate on the fisheries and environmental administration in Estonia. There have been some recent changes in the administration, but here we concentrate on the year 1998.

### 2.5.1. Fisheries administration in Estonia

The official tasks within the fisheries are handled in the Ministry of the Environment. The Fisheries Department is a structural unit of the Ministry of Environment with the primary function of drafting and implementing the fisheries policy in the Republic of Estonia (Estonia MoE 2001).

In Estonia, the catch data of open sea fishery with large vessels – mainly trawling – is collected with daily log-books which are returned directly to the Department of Fishery in the Ministry of the Environment, Tallinn. In accordance with Estonian fisheries legislation the Estonian State Sea Inspection Office (ESSIO) is responsible for collecting and processing the primary fisheries statistics and for implementing quota control procedures. ESSIO is managing the quotas in respect of the species regulated by the International Baltic Sea Fisheries Commission. Collection, processing and reporting of the primary fisheries statistics for the coastal and inland water fisheries is the responsibility of County Governments. The catch data of commercial coastal fishery with gill nets, trap nets and fyke nets is collected from the fishermen monthly by local County Governments (Estonia Fish Policy 1998).

Under the 1995 Fishing Act a new body, the Estonian National Board of Fisheries was formed to develop and administer fisheries policy, maintain and protect fish stocks, co-ordinate research activities and issue regulations. It is under jurisdiction of the Ministry of the Environment.

The regulation of fish stocks, is carried out through the environmental departments of the county authorities. In inland waters and coastal waters within the area between the 20 m isopath and the shore, the exercise of fishing rights is delegated to county governors. Several Estonian counties have established a position of a fisheries counsellor whose competence includes issues relating to fisheries. In counties where the fishing industry is important, a special organ called the Fishery Council makes proposals how to manage fisheries (gear restrictions, closed seasons). Some of the fisheries management duties are further delegated to the municipalities.

Up to 20 meters isopath in the sea, any permanent resident of the coastal village has a right to apply for a household fishery licence to fish with a limited number of professional fishing equipment (like gill nets or small fyke nets). “Coastal village” is defined as a living area nearby sea. The Ministry decides the total number of household fishery licences (number of gill nets and small fyke nets) in each county. County Governors divide the number of licences granted to their county between municipalities. The Head of the municipality decides the final allocation between people living in the particular municipality. Also these fishers are obliged to report their catches to counties, but reporting of this kind of fishery has been poor.

Almost all waters in Estonia are open for public usage. According to the Fishing Act (RT I 1995), the Ministry of the Environment manages fishing activities issuing licences for recreational, subsistence and professional fishing. The Ministry of the Environment has given the right to manage fishing in state-owned coastal water bodies to the county government or to the local municipality. In water bodies owned by municipalities fishing is regulated by local municipalities; in private water bodies by private owners. According to the Fishing Act water bodies are divided into fishing areas, and the owner of the area is responsible of organising the fishing and protection of fish stocks in the area.

According to the Fishing Act, everyone has the right to catch fish in a public body of water owned by the State and the local government unit as well as in private owned body of water appointed for public use (see Water Act RT I (1994)) with a single fishing line and recreational fishing gear.

## 2.5.2. Policy and Regulations of fisheries in Estonia

The aim of the Estonian fisheries strategy is to create the framework for sustainable development of the Estonian fisheries sector proceeding from Estonian natural preconditions and national interests. The strategy is focused on how the sustainable contribution of the sector to economic welfare could be improved.

Taking into account international agreements and Estonian laws, fishing is regulated by national rules on catch quotas and effort. Fishing regulations are based on scientific advice and statistical data of catches. In case of danger to fish resources, the Ministry of the Environment shall act to restrict fishing by proposals of scientific and surveillance organisations. As a Contracting Party of the IBSFC Estonia has taken into consideration IBSFC’s Regulatory Measures in fisheries management and regulations, including mesh-sizes and closed seasons. Estonia is also bound by IBSFC’s quota measures.

The “professional fisherman” has no official definition in Estonian fisheries regulation. Professional fisherman is a fisherman who has received a licence to use professional gears, which are defined in the Fishing Rules (1999): gill nets, fyke, trap, seine, pound or trawl (using of trawl is not allowed in coastal fishing). Professional fishermen are registered into a special Commercial Register as entrepreneurs and they have to report their monthly catches to the county administration. The registered enterprises or their associations have a right to lease a fishing area and obtain a fishing licence for professional fishing.

The gears allowed for coastal fishery in different areas are regulated annually by the Ministry. Regulations concerning minimum mesh-sizes and time closures are set by Estonian Fishing Rule. Those regulations may differ by county. Minimum mesh-sizes are ruled for different gears (gill-nets, trap-nets and seines) and they vary according to the target species (e.g. herring, smelt, cod and salmon). Minimum landing-sizes are ruled in the Fishing Rules (1999) for many of the coastal fishery target species. The

minimum landing-sizes do not apply to fishing of Baltic herring, sprat, smelt, cod and flounder with a hand line.

According to the Fishing Rule (1999), there are several closed seasons and areas in Estonian water bodies. In coastal areas, fishing is usually forbidden closer than 500-1000 m from the mouth of the rivers. Trawl fishing is forbidden in coastal areas within the 20 m isobath. Closed seasons differ by areas - e.g. in the marked area in the Bay of Pärnu fishing is closed from 15 April to 15 July, in the Bay of Mullutu-Suurlahe fishing is closed from 1 April to 20 May. The Ministry of Environment may, in case the fish resources are endangered, on the proposal from fish protection and research institutions change the beginning and terminating dates of temporary fishing restrictions.

According to the Fishing Act permanent residents of coastal communities are allowed to use one to three gill nets, one fyke of the height up to one meter or long line with up to 250 hooks. Fishing with a single fishing line is a part of the Public Right of Access. Fishing with other recreational gears requires a licence purchased from the county administration. Recreational fishing gears are defined in the Fishing Rules: e.g. hand fishing pole, fly hook, pulling device and trolling line. Fishing in private waters, which are not appointed for public use, is permitted by the fishing right owner.

### 2.5.3. The environmental administration in Estonia

According to Article 53 of the Constitution of the Republic of Estonia, every citizen is obliged to preserve the human and natural environment and to compensate for damages they cause to the environment.

In 1989, the Supreme Council of Estonia adopted the Policy on Nature Conservation and Sustainable Use of Natural Resources, which provided an assessment of the state of the environment. The policy also formulated policy goals and identified environmental problems and possible ways of achieving the goals. The current situation and implementation of the ideas presented in the Policy of Nature Conservation and Sustainable Use of Natural Resources were analysed during the elaboration of the Estonian National Environmental Strategy (NES). The NES specifies the trends and priority goals of environmental management and protection in a new political and economic situation and sets the main short-term and long-term tasks to be achieved by 2000 and 2010 respectively.

The NES proceeds from the main traditional goal of environmental protection which is to provide people with a healthy environment and natural resources necessary to promote economic development without causing significant damage to nature, to preserve diversity of landscapes and biodiversity while taking into account the level of economic development. The Strategy is based on internationally accepted principles, the historical traditions of Estonia and takes into account the current socio-economic situation in the country (Estonia MoE 2001).

The Ministry of Environment is the highest executive body of Estonian environmental management system. It is responsible for regulating the questions concerning the protection of nature and environment, solving the tasks concerning the land-use and building, including co-ordination of the elaboration of regional plans, managing the use, protection and accounting of the natural resources, as well as surveillance over the use of environmentally hazardous compounds.

Through its various programmes, the Ministry of the Environment organises environmental monitoring, meteorological, geological, constructional and geodetic surveys and research in natural history and the marine environment. It arranges the



environmental impact assessments of the projects of national importance and co-ordinates international relations in environmental matters. The Ministry of the Environment formulates national policies in its field of activities and prepares the bills of respective legal acts.

The Estonian Environmental Inspection and Estonian State Sea Inspection are responsible for issues related to marine environmental protection. Responsible for the sustainable use and conservation of marine living resources are the Ministry of Environment (especially the Department of Fishery), the Estonian Marine Institute, the Estonian State Sea Inspection, and County Governments (Agenda 21 Oceans 2000c).

As of 1 August 1996, the following boards and inspectorates were under the jurisdiction of the Ministry of Environment: Land Board, Forest Board, Fisheries Board, Nature Conservation Inspectorate and Marine Inspectorate. County environmental departments, land boards, building and architecture departments and forest boards are dealing with environmental problems on county level. The Marine Inspectorate has six regional departments.

Regulation of environmental, landscape, biodiversity management, the use and protection of mineral and water resources as well as fish stock, is carried out through the environmental departments of the county authorities. These departments are also responsible for regional control of the use and protection of the environment and natural resources and co-ordination of environmental activities of the municipalities. (Estonia MoE 2001.)

#### 2.5.4. Co-operation between environmental and fisheries sectors

The organisation of fisheries in Estonia has been placed entirely within the area of administration of one ministry, which is the Ministry of the Environment. However, the need for co-operation between fisheries and environmental sectors as well as with other sectors is emphasised even in the fisheries legislation. In the performance of its functions the Fisheries Department of the ministry co-operates with other governmental agencies of the Republic, the bodies of the county governments and local governments, non-governmental organisations within the competence of the Department and the relevant scientific and supervisory bodies. Co-ordination is achieved through various means. All of the institutions regularly meet at the highest level at the Ministry of the Environment. The Fisheries Act requires co-operation between the Fisheries Department, the Sea Inspection and the Counties. The Estonian Fisheries Council also acts as a co-ordination body in the counties where fisheries have an important role in the local economy.

The application of structural measures is the only field in which the Ministry of the Environment is directly involved in the activities of fish processing enterprises or their associations.

## 2.6. Governance issues in comparison

When we compare the governance issues – e.g. management structures – in the countries that our project deals with, we can find a lot of aspects that are common, but also some interesting differences.

In Sweden and Finland, the highest level of administration has been organised in a similar way. The environmental issues and the fisheries issues are handled by different ministries. But there are certain differences also on the next level of

administration. In Sweden, the National Board of Fisheries (NBF) is responsible of fisheries monitoring and it also rules local or regional regulations. In addition to these administrative tasks, the NBF conducts research related to fisheries. County administration takes care of fisheries subsidies and loans as well as licences for commercial fishing. In Finland administrative duties are handled by a county administration, namely by the Fisheries Unit in the Employment and Economic Development Centre. Handling of issues related to structural funds in fisheries and commercial fishery licensing are also delegated to the Fisheries Units. There is a government research institute in Finland. The Finnish Game and Fisheries Research Institute (FGFRI) conducts research related to fisheries, but unlike the NBF in Sweden, it does not have administrative duties.

In Estonia, both fisheries issues and environmental issues are handled in the same ministry. In this respect, the decision-making structure is quite different from Sweden and Finland. In general, fisheries issues are handled directly by the ministry to a larger degree in the Estonia than in Sweden or Finland. There is, for instance, a National Board of Fisheries in Estonia, which has the same kind of duties as the NBF of Sweden, but it does not have regulatory power. Monitoring and licensing has been delegated to county level authorities. Fishing licences for the small-scale non-commercial net fishing are stipulated by the municipalities.

In Åland, because of its small size and the semi-autonomic status, environmental and fisheries issues are handled by the county level administration.

In Sweden, Finland and Åland, coastal waters in the archipelagos are mostly in private ownership, whereas in Estonia they are State property. In case of private ownership the owners (even private citizens) have a lot of decision-making power regarding fisheries in their water areas. Private ownership affects, therefore, the decision-making structures. In spite of the similar kind of coastal water tenure systems the decision-making structures are slightly different in Sweden, Finland and Åland. In Finland, in addition to the central and regional fisheries authorities, there exist two more levels of fisheries decision-making. In the latter two levels, namely Fisheries Regions and Statutory Fishery Associations (SFA), the private ownership is the cornerstone of the system.

In Åland, where private ownership is also an important factor in coastal resources management, SFAs are the most important management body regarding the private waters. Fisheries Regions can be established on a voluntary basis. Both in Åland and Finland there are also small water areas that are managed only by private owners. In other words, even SFAs have not been established. This is more common in Åland than in Finland, resulting in a rather mosaic-like water tenure system. Fisheries in private waters in Sweden are managed by water owners. In the Swedish system the individual owners are seldom organised into decision-making bodies similar to Finland (SFAs and Fisheries Regions).

There are differences between countries when we compare the environmental administration and decision making in each of the countries. The environmental and fisheries administrations are organised according to national conventions. In Sweden the environmental administration is run by the ministry of the environment. Under the ministry there is the Environmental Protection Agency, which has also administrative duties. Certain duties are delegated to the county administration in the regional level and also to municipalities in the local level. In Finland, environmental administration is regionalised as is the fisheries administration, too. The ministry of the environment is the highest level of administration, but implementation of environmental policy is delegated to the regional level to the regional environmental agencies. Also municipalities have certain duties. The Finnish Environment Institute's (SYKE) position in the Finnish Environmental administration is similar to the position of the Swedish EPA. SYKE is a part of central administration. However, compared to the

Swedish EPA SYKE has only very few administrative duties. These are delegated to the regional and local levels in Finland.

In the Estonian environmental administration the ministry of the environment is the highest administrative level. Under the ministry there are a few central institutes or boards, which take care of different sectors of environmental management. Some of these have regional offices. Some of the administrative duties are delegated also to the regional (county administration) and local (municipalities) levels. When compared to the Swedish and the Finnish systems some of the environmental issues are handled in a centralised manner as in Sweden, while other issues are delegated to regional authorities as in Finland.

Environmental as well as fisheries policies in each country are based on the internationally recognised and agreed principles. Especially sustainable development and use of natural resources has been adopted as a guiding principle. This can be seen for instance in wordings of fisheries policies' general goals as well as implementation of fisheries policies, which are aiming at sustainable exploitation of fish stocks.

What is interesting is that an explicit policy regarding coastal fishery is missing. There are certain aspects of fisheries policies that do affect coastal fishing in each country. For instance, ban on trawling in water areas less than 20 meters deep in Estonia, definition of a professional fisherman in Sweden, Åland and Finland, which has implication on receiving EU funds, and fisheries management of privately owned waters in Sweden, Åland and Finland. These all have positive or negative impacts on coastal commercial fisheries, but they do not seem to be outcomes of any comprehensive coastal fisheries policies.

An environmental permit system forms the core of aquaculture regulation in Sweden, Åland and Finland. Permits are based on environmental legislation in each of the jurisdictions and granted by environmental permitting authorities. Consequently, environmental issues and considerations have a prominent role in aquaculture development. Also the permitting procedure is basically similar in Sweden, Åland and Finland. Environmental impacts are assessed during the procedure and interested parties may affect the outcome.

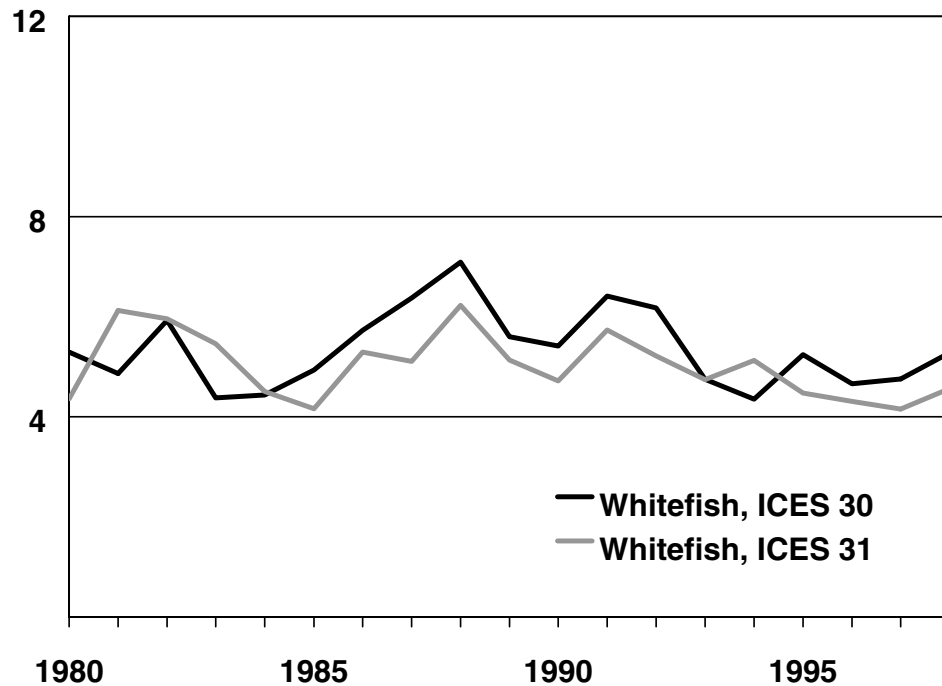
## 3. Stocks of the most important coastal species

### 3.1. Present state of stocks

**Cod, salmon and herring** are species, which are important for both coastal and open-sea fishery. These species and sprat are managed jointly by the countries around the Baltic Sea, TACs being the main tool for management. These four species all interact with each others, and the status of one stock depends on that of the others. In the latter 1990s, the Baltic cod stocks (and TACs) have been on a much lower level than in 1980s, mainly due to overfishing and low recruitment due to poor oxygen conditions in the spawning areas. The mortality of herring and sprat caused by predation of cod has decreased, and the stocks of sprat increased up to the end of the 1990's. Herring stocks have, although cod predation has been reduced, displayed a negative development during the last ten years. Another alarming observation is that growth rate as well as fat content of herring has been very much reduced. The decreased salinity of the Baltic Sea has been considered to be one factor contributing to the decreased growth and weight-length relation of herring due to changes in zooplankton communities (Flinkman et al. 1998). Baltic salmon stocks depend almost totally on stocking programs. The estimated natural production of smolts in 1998 was 480000 individuals whereas the total number of stocked smolts was 6.2 million (Erkinaro et al. 1999). The survival of stocked smolts and result of stockings have, however, decreased in the late 1990s.

There are two sympatric **whitefish** forms in the Baltic Sea, the sea spawning whitefish and river-spawning anadromous whitefish. Recruitment of the river-spawning whitefish is strongly dependent on stockings programs in Finland, while the Swedish stocks mainly rely on natural recruitment. The sea spawning whitefish reproduce naturally on the coast. The growth rate of sea spawning whitefish is lower than that of migratory whitefish, especially in the Gulf of Bothnia (Jokikokko and Heikinheimo 1999). Catches of these two stocks are mixed to some extent in the fisheries. According to the CPUE data of Finnish commercial fishery, clear trends do not exist in the Gulf of Bothnia which is the most important area for whitefish fishery (Fig. 1).

### Kg/ 10 gill nets



**Figure 1. The catch per unit effort (CPUE) of whitefish in Finnish commercial fishery in 1980-1998. ICES-subarea: 30=Bothnian Sea, 31=Bothnian Bay.**

Temperature is the most important controlling factor for the abundance of year classes of **pikeperch** (e.g. Lehtonen et al. 1996) and **perch** (e.g. Böhling et al. 1991). In general, these species have benefitted from the warm summers in the late 1980s and 1990s. Strong year classes of pikeperch have been formed in 1988, 1991 and 1994 (Wiik 1999), and the effects of strong year classes are seen in the high CPUEs during 1994-1997 in the Finnish Archipelago Sea (Fig. 2). The peak in CPUEs and also total catches was in 1997 when the year class 1988 was still abundant and the year class 1991 recruited to fishery. The fishing pressure in the late 1990s in the Archipelago Sea has become too heavy and the catches will decline during the next years (Wiik 1999). A bulk of the Finnish pikeperch catch is taken by gill nets with mesh-sizes less or equal to 45 mm (Lappalainen et al., manuscript). Thus, it is evident that a lot of pikeperch is caught as too small, even before they have matured. The pikeperch catches have fluctuated also in Estonia, but without any clear trend (Fig 3), although there is some evidence of too heavy fishing pressure (Ojaveer 1999). On the Swedish coast, the perch stocks have been strong and it is evident that the general fishing pressure on this species could be raised (Andersson 1998, Thoresson and Sandström 1998). On the Estonian west coast, however, the CPUEs of perch have collapsed (Fig. 4) and the stocks are at present strongly overfished as fishing in coastal areas was liberated after the break down of former Soviet Union (see also Ojaveer et al. 1999).

Kg/ 10 gill nets

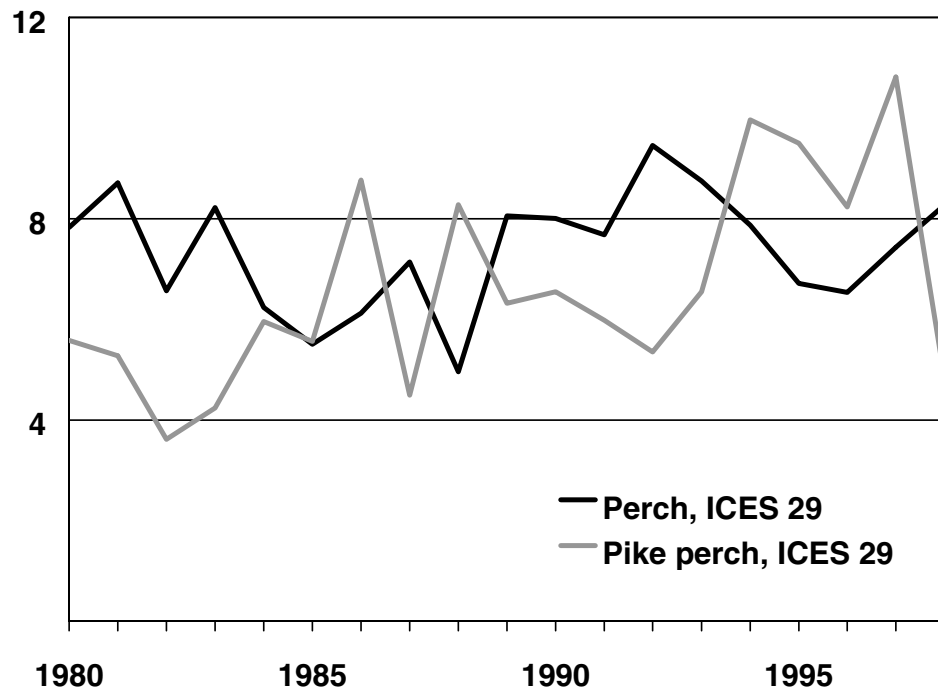


Figure 2. The catch per unit effort (CPUE) of perch and pikeperch in commercial fishery in the Finnish Archipelago Sea during 1980-1998.

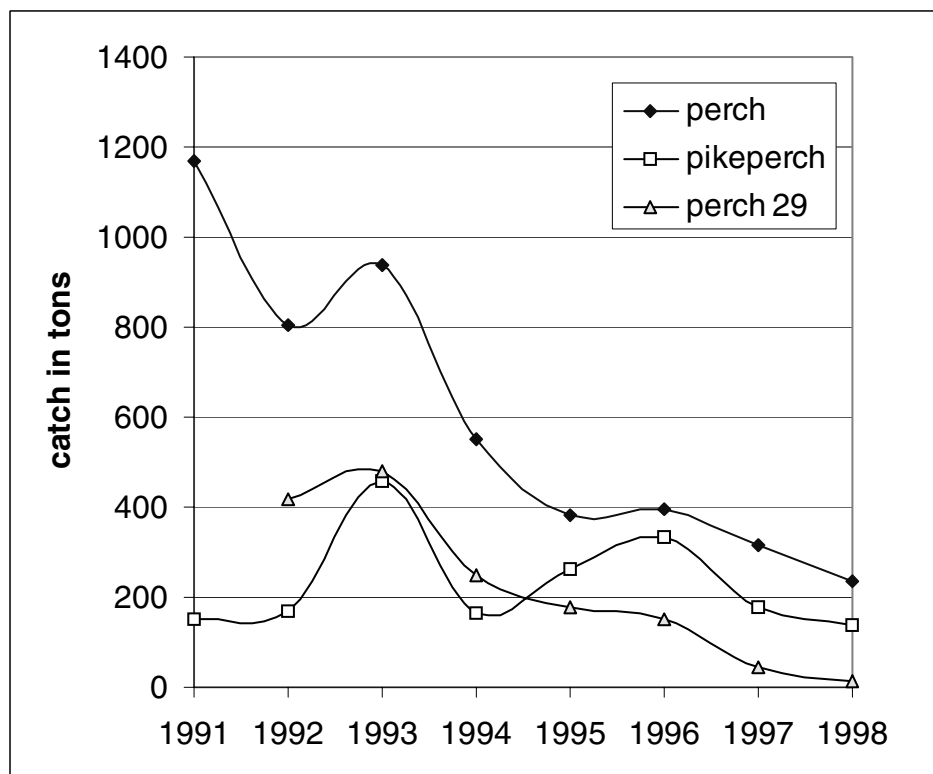
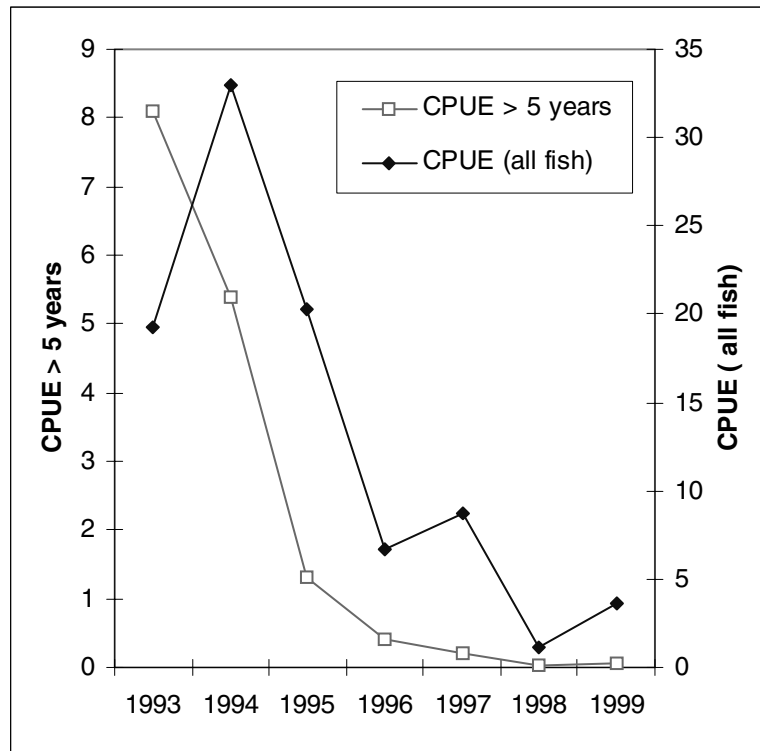


Figure 3. The commercial landings of perch and pikeperch in Estonia during 1991-1998. Triangle indicates landings of perch in the north-west coast of Estonia (ICES-subarea 29).



**Figure 4. The CPUE of perch in Matsalu Bay, western Estonia during 1993-1999.**

It is evident that the **vendace** stocks in the Bothnian Bay are overfished at present and the fishing pressure should be reduced (Thoresson and Sandström 1998). The adult stocks are very low. A strong year-class was born in 1999, but this resulted in high fishery of 0+ vendace. An attempt to regulate this fishery by closing some nursery areas failed. Catches of **eel** have decreased on the Swedish east coast during the 1990s, but it is not evident that this is caused by too intensive fishing. Main reason for the decreased catches is the strongly reduced recruitment of young eel to European waters since the 1970s.

### 3.2. Stocking programmes

Salmon and trout are the most important species used in stocking programmes (Table 1) although whitefish is a commonly used species in Finnish coastal areas. Salmon and trout are released mostly as smolts which means that the value of these stockings also in Finland is much higher than the value of other species, which are released mainly during the first year.

**Table 1. Fish stockings (1 000 ind.) in coastal marine areas and coastal rivers in 1998. Stockings of eel in 1000 kg. Finnish data from Anon. (1999) and Swedish data from Statistics Sweden.**

Species	Sweden	Finland	Åland	Estonia
Salmon (newly hatched)	1 437	894	0	
Salmon (older)	3 786	3 500	113	142
Trout (newly hatched)	703	200	0	
Trout (older)	1 227	2 116	285	58
Whitefish (newly hatched)	0	63 726	0	
Whitefish (one summer old)	0	9 768	198	123
Pikeperch	63	417	0	35
Pike	0	710	1 413	4
Eel	63	0	0	0

In Finland and Sweden, many of the salmon stocking programs are based on the decisions of water courts to compensate for recruitment losses caused by damming of spawning rivers. Over half of the salmon smolt stockings in 1998 were such obligatory stockings. In Finland, the rest of the salmon stockings were mainly funded from the state fish cultivation funds. The situation was quite similar for trout stockings. Approximately 25% of the total value of migrating whitefish stockings in coastal areas of Finland in 1998 (6.1 million FIM) were funded by water owners associations. Sea spawning whitefish and also pikeperch and pike are, in general, more sedentary than trout and salmon, and thus favoured stocking species by the local water owners. In Finland, it was assumed that the changes in Finnish fishing legislation in 1997 (a countywide license for spinning and trolling rod established) would reduce the interest of private water owners to continue stockings of pikeperch and pike. Nevertheless, privately funded stockings of these species have been on the same level as before the changes in legislation. In Estonia, all stockings are funded by the state, and the main goal is to improve catches of both recreational and commercial fishery.



## 4. Socio-economic issues

### 4.1. Coastal commercial fishery

This report deals only with coastal fishery. In all countries – Sweden, Finland and Estonia - the boundary between coastal fishery and open sea fishery is here derived from the catch data collection procedure. There are still some differences in the definition of (commercial) coastal fishery between these three countries.

In Estonia fishery with gill nets, trap nets and fyke nets is here defined as coastal fishery, and it takes place mainly in sea areas where the depth is less than 20 meters. Trawling is forbidden in that area. In Finland (Åland included) and Sweden the definition of coastal fishery is based on the length of fishing vessels. Fishing with boats at most 10 meters long (Finland) or 12 meters long (Sweden) is defined as coastal fishery. The fishery with larger vessels – defined here as open sea fishery - is mainly trawling of herring, sprat and cod, and salmon fishery with drifting nets. As an exception to this rule, the trawling of vendace in the northern Bothnian Bay is included in the coastal fishery independently on the vessel size.

#### 4.1.1. The number of commercial fishermen

In Sweden, the total number of full-time coastal fishermen in the Baltic Sea was 714 in 1998. The number of part-time fishermen is unknown. Cod and eel were the most common target species (Table 2).

In Finland, the total number of commercial fishermen on coastal fishery was 1996, of them 243 lives in Åland islands. A little over half of these coastal fishermen got less than 15% of their annual incomes from fishing and only one third got more than 30% of annual incomes from fishing. Hence, a majority of the coastal fishermen were “part time fishermen”. Whitefish was the most common target species for Finnish coastal fishermen (Table 2).

There is no official register in Estonia, but based on the information from Estonian Fishermen Association, the total number of commercial fishermen in Estonia is around 3600, from which around 2100 work in coastal fishery. However, it is not likely that the number of full-time coastal fishermen is more than 1000.

**Table 2. The proportions of coastal fishermen in Sweden and Finland in 1998 divided on the basis of the most valuable (amount\*national mean price paid to fishermen) catch species.**

Species	Sweden	Finland (tot)	Åland
Herring	5	6	3
Cod	50	0	0
Flatfishes	4	1	2
Pike	2	3	2
Vendace	6	1	0
Whitefish	8	53	65
Salmon	7	8	0
Trout	0	2	2
Rainbow trout	0	2	7
Smelt	0	1	0
Bream	0	1	0
Burbot	0	3	1
Perch	2	8	7
Pikeperch	2	13	10
Eel	14	0	0
Other	0	0	1
Total (%)	100	100	100
Total number of fishermen	714	1 996	243

#### 4.1.2. Fishing fleet

In Finland and Sweden, there is a central register of vessels used in commercial fishery, and the figures in table 3 are derived from these registers. In Estonia, the Department of Fisheries in Environmental Ministry has only a register of large vessels, which take part in the open-sea fishery. The basic data for smaller vessels could be obtained from counties by interviewing inspectors responsible for carrying out yearly technical observations of vessels, but the combining of that data has not yet been carried out. Based on the number of fishermen, the number of fishing vessels in Estonian coastal fishery is 500-1000.

**Table 3. Fishing vessels involved in the coastal fishery in 1998.**

	Sweden	Finland	Estonia
Number of vessels	844	3300	500-1000
Total machinery (kW)	48930	101600	

#### 4.1.3. Commercial catches of coastal fishery in 1998

Based on the combined total amount (Table 4) and value (Table 5) of the reported catch in 1998, the most important species for the commercial coastal fishery of Sweden, Finland and Estonia were cod, whitefish, herring, pikeperch, vendace, salmon, perch and eel. Cod, herring and salmon are more important for the open sea fishery as 64% of total cod catches, 95% of total herring catches and 54% of total salmon catches of these three countries were taken by open sea fishing. Almost all of the catches of the other important species were taken by coastal fishery.

**Table 4. Commercial catches (tonnes) of Estonian, Finnish and Swedish coastal fishery in 1998. “-“ means that the species is included in the group “other species” in the national data collection.**

	Sweden	Finland (tot)	Åland	Estonia	Total
Baltic herring	1 801	6 449	220	9 619	17 869
Cod	5 327	0	0	0	5 327
Flounder	176	69	11	252	497
Turbot	70	6	2	-	76
Pike	65	263	26	17	345
Vendace	421	91	0	0	512
Whitefish	291	1 289	226	20	1 600
Salmon	309	314	1	7	630
Trout	49	107	9	8	164
Rainbow trout	1	59	37	0	60
Smelt	0	586	0	11	597
Bream	7	122	2	7	136
Vimba	-	-	-	165	165
Ide	0	22	1	69	91
Roach	4	135	4		139
Roach+whitebream				321	321
Burbot	4	120	2	3	127
Perch	110	893	101	237	1 240
Pikeperch	43	487	43	141	671
Garfish	4	-	-	167	171
Eel	172	-	-	22	194
Other	68	103	2	42	213
<b>Total</b>	<b>8 922</b>	<b>11 115</b>	<b>688</b>	<b>11 108</b>	<b>31 145</b>

**Table 5. The proportion of each species of the total value of commercial coastal catches (1000 FIM) based on national mean prices paid to fishermen. Currency transformations made according to rates in December 1998.**

Species	Sweden	Finland (tot)	Åland	Estonia	Total
Baltic herring	2	12	4	64	12
Cod	59	0	0	0	31
Flounder	1	1	1	5	1
Turbot	3	0	0	0	1
Pike	1	4	3	1	2
Vendace	14	2	0	0	8
Whitefish	4	34	54	1	15
Salmon	5	10	0	1	7
Trout	1	3	2	1	2
Burbot	0	3	1	0	1
Perch	1	11	10	8	6
Pikeperch	2	17	15	9	8
Eel	8	0	0	5	5
Other	1	4	10	7	3
Total	100%	100%	100%	100%	100%
Total value (FIM)	73 594	51 848	5 272	14 602	140 044

**Cod:** Based on the value of catch, cod was the most important species for Swedish coastal fishery. Cod catch of coastal fishery was taken at the southern coast of Sweden. Cod is fished with gill nets mainly in the common waters outside the archipelago. In addition to cod, flounder, turbot and herring are often important additional species in this fishery (Andersson 1998).

**Whitefish:** The Gulf of Bothnia was the most important area for whitefish fishery. 70% of the total catch was caught with gill nets, and the rest with traps and fyke nets. Based on the value of catch, whitefish was the most important catch species for coastal fishery in Finland and Åland. Over half of the Finnish catch was taken during three months (August-October).

**Herring:** The most important areas for coastal herring fishery were the western coast of Estonia (9000 tonnes) and the Bothnian Sea (5000 tonnes). These two areas together accounted for 80% of the total herring catch of coastal fishery in Estonia, Finland and Sweden. The great majority (>90%) was taken by traps during the spawning time. On the Swedish coast of the southern Bothnian Sea, a spring fishery with nets (500-700 tonnes annually) is made for production of fermented herring 'syrströmming'. Herring was the most important species for the Estonian coastal fishery, as in Estonia many fishermen has turned to herring fishery after the local decline of perch and pikeperch catches.

**Pikeperch:** The most important areas for pikeperch fishery were the Finnish Archipelago Sea and the Åland archipelago (280 tonnes), the Finnish side of the Gulf of Finland (140 tonnes) and the southwestern coast of Estonia (140 tonnes). These

three areas together accounted for 82% of the reported total catch. The catch was taken mainly with gill nets.

**Vendace :** Vendace is common only in the Bothnian Bay and locally in the northern Bothnian Sea, and the whole catch was taken from these areas, mainly (80%) from the Swedish side. Almost 80% of the catch was taken by small trawlers. The roe of vendace formed a valuable part of the catch.

**Salmon:** The majority of the salmon catch of coastal fishery was taken from the Gulf of Bothnia (170 tonnes) and from the Finnish side of the Gulf of Finland (140 tonnes) mainly during the spawning migration in May-July. The third important area was the southern coast of Sweden (90 tonnes). On the Finnish coast, 95% of the salmon catch was taken by traps. On the Swedish coast, trap was also an important gear but half of the coastal catch was taken by drifting salmon nets and line. The higher importance of the drifting nets and line in Sweden than in Finland is partly explained by the fact that also the vessels with 10-12 meters length were included in coastal fishery in Sweden. Salmon fishery is managed jointly by the countries around the Baltic Sea and the annual TAC management and seasonal restrictions have effects on the distribution of catches.

**Perch:** The main areas for perch fishery were the Finnish Archipelago Sea and Åland archipelago (240 tonnes), the Finnish side of the Bothnian Sea (460 tonnes) and the South West coast of Estonia (200 tonnes). The bulk of the catch was taken by gill nets, although fyke nets are also commonly used in Estonia. The catches of perch showed a peak during spawning time. For example, over 60% of the Finnish catch was taken during April-June.

**Eel:** The most important area for silver eel fishery was the southern coast of Sweden (170 tonnes). Yellow eel is fished mainly with traps in the private waters inside the archipelago. Therefore it is not reported and included in the statistics. Other important species in this fishery in Sweden are often perch, pike, pikeperch, whitefish and flounder (Andersson 1998). The eel fishery and catches (20 tonnes) has also some local importance in the western coast of Estonia.

#### 4.1.4. Local significance of fishery employment

The regional significance of the fishery sector in Estonia and Finland was roughly viewed on the basis of employment statistics (Statistics Finland, Statistical Office of Estonia). Here, the fisheries included commercial fishing, aquaculture, fish processing and wholesale. The full-time employment by fishery was in Finland 0.15 % in 1997 and in Estonia 2.4 %. In Finland, the relative importance of fishery sector was highest in the Åland Islands and Turku archipelago, where even 20 % of the working population worked on the fisheries sector in some small municipalities. The overall proportion in the Åland Islands was 1.6 %.

In Estonia, the relative importance of fisheries was highest in the Hiiumaa and Saaremaa counties, where 16.8 and 9.1 % of the working populations had their jobs in fishery sector. At least in Finland, jobs in the fishery sector are often part-time or seasonal, thus these statistics based on full-time employment underestimate the employing effect of the fisheries sector. On the other hand, the open-sea fishery is also included in the figures.

#### 4.1.5. Income structure and social features of coastal commercial fisheries

##### Sweden

In an analysis of the economy of the Swedish small-scale coastal fishing in 1997 the data was collected from the logbooks of commercial licensed fishermen operating with vessels shorter than 12 m. Coastal fishing was divided into five groups according to the type of gear. Groups were: 1) salmon and whitefish traps, 2) herring and whitefish nets in the Gulf of Bothnia, 3) cod and flatfish nets, 4) eel pound nets and 5) other nets and fykes in the Baltic Proper. This definition of coastal fishing is not comprehensive, because there is also coastal fishing operated with vessels longer than 12 m (Gustavsson and Johnsson 2000).

Totally 635 of the 679 households engaged in coastal fishing were studied, 150 in the Gulf of Bothnia and 485 in the Baltic Proper. The largest group of fishermen was those who harvest cod and flatfish with gill nets (Table 4). Families in fisheries were divided into four age groups: -34, 35-49, 50-64 and 65- (Gustavsson and Johnsson 2000). Most of the fishermen in other fishing categories were in age group 50-64, except most of the cod and flatfish fishermen who were in age group 35-49 (Table 6). The mean age of fishermen in different fishery groups was not available in the data.

**Table 6. Numbers of fishing households and the most important age groups in 1997 (Gustavsson and Johnsson 2000).**

Type of fishery	Households	Most important age group
<i>The Gulf of Bothnia</i>		
Salmon and whitefish trap	68	50-64
Herring and whitefish net	82	50-64
<i>Baltic Proper</i>		
Cod and flatfish net	357	35-49
Eel net	65	50-64
Nets and fykes	63	50-64

Due to the nature of the material, 'fishing income' may include also other business income, e.g. from agriculture or forestry. Salaries from permanent employment or retirement allowances are not included (Gustavsson and Johnsson 2000). The average fishing revenues were highest in eel pound net fishery (59 400 SEK) and lowest in herring and whitefish gill net fishery (36 000 SEK) (Table 7).

Because of the age structure (see Table 6), retirement allowances are an important source of income for coastal fishermen. The most important source of household income is the woman's wage of permanent employment. In age group -34 fishing income is more important than other sources of income. In other age groups wages of permanent employment and retirement allowances especially in age group 65+ are more important than fishing income (Gustavsson and Johnsson 2000).

The share of fishing revenues from the total average income (incl. wages, retirement allowances and fishing income) was highest in the Baltic Proper fisheries (31-34 %). The importance of fishing revenues was lower for the households in the Gulf of Bothnia (21-22 %) (Table 7). If West Coast fisheries are included, total average household income of coastal fishing was 177 000 SEK and the share of fishing income was 33 % (Gustavsson and Johnsson 2000).

**Table 7. Total household income (from fisheries and other sources), fishing revenues and share of fishing income in 1997 (Gustavsson and Johnsson 2000).**

Type of fishery	Total household income (SEK)	Fishing revenues (SEK)	Share of fishing income (%)
<i>The Gulf of Bothnia</i>			
Salmon and whitefish trap	171 400	36 600	21
Herring and whitefish net	160 500	36 000	22
<i>Baltic Proper</i>			
Cod and flatfish net	173 700	59 400	34
Eel net	172 000	59 500	34
Nets and fykes	146 400	45 300	31

### **Finland**

The data on fishermen, fishing enterprises and their incomes were collected with structured and thematic interviews from October 1994 to January 1995 in connection with a large project (Salmi and Salmi 1997). The project revealed the difficulties of classifying the fishermen into coastal and open sea operators. There are numerous cases when both areas are equally important for the fisherman. In addition, fishermen commonly move their fishing strategy from coast to open sea and back to the coast.

In the project the fishing enterprises (mostly households) were divided into six categories according to fishing methods, areas and target species: 1) trawl fishery, 2) drift net and line salmon fishery, 3) stationary gear salmon fishery, 4) salmon fishery in the Gulf of Finland, 5) combination fishery and 6) other fishery. The first two categories represent open sea fisheries and others coastal fisheries. However, the categories 4) and 5) include fishermen harvesting also in open sea. Due to the multiplicity of coastal fisheries, most of the fishermen's households belonged to the group 'other fishery' (Table 8).



**Table 8. The number of fishing households and mean ages of fishermen in coastal and combined fisheries in 1993 (Salmi *et al.* 1996, Salmi *et al.* 2000).**

Type of fishery	Households	Mean age
Stationary gear salmon fishery	194	53
Salmon fishery in the Gulf of Finland	153	47
Combination fishery	319	50
Other fishery	865	50
Total / average	1531	49

In a further analysis the material was divided into three groups according to fishing area: open sea enterprises, coastal enterprises and those who use both areas (combination group). The coastal fishing was economically significant for 85 % of the fishermen. Fishermen who fish along the coast (60 %) use mostly gill nets for whitefish, pikeperch or herring. Also pound and fyke nets for salmon or whitefish are common fishing methods. The combination group of fishermen (33%) use open sea methods (trawls, drift nets and lines) together with coastal fishing methods (Salmi *et al.* 1998, Salmi and Salmi 1998).

In 1993 about 1810 enterprises with slightly over 3000 fishermen received incomes from commercial fisheries. The majority of coastal fishermen live in rural areas. The largest numbers of coastal fishermen are located along the Bothnian Sea and the Gulf of Bothnia, where the fishermen operate mostly on part-time basis. In the Gulf of Finland it is common to combine open sea and coastal fishing methods. The trawl fishery for Baltic herring is of substantial importance in the Archipelago Sea. The most professional coastal fisheries are located in the Archipelago Sea and southern coast area (Salmi and Salmi 1998).

The coastal fishermen are self-employed and operate alone or together with other household members. Wage is paid for fishing work chiefly in the open sea fisheries. The mean age of all marine fishermen was 49 years. In the group of salmon fishermen who use stationary gear the mean age was highest (53), while the mean age was lowest (47) among the salmon fishery in the Gulf of Finland (Table 8). Only 5% of the fishermen had acquired professional education in fishing.

In this study fishing was considered as the main occupation when more than one half of the annual income was received from fishing. Fishing was the main occupation for the majority (68 %) of open sea fishermen and also for the fishermen who combine open sea and coastal methods (55 %). Part-time fishing is typical among coastal fishermen (60 %), because they are engaged in fishing for only a period of three or four months. Tradition is important for coastal fishing, fishermen follow in the footsteps of their fathers and are rarely recruited from outside the fishing industry. Coastal fishermen also appreciate the opportunity to work in natural surroundings. The physical work of catching fish is an essential part of their mode of life and culture (Salmi and Salmi 1998).

Finnish part-time fishermen have several other sources of income besides fishing. The importance of a permanent waged employment (public post or other waged work) is highest in combination fisheries. Also agriculture and aquaculture were important sources of income (Table 9).

**Table 9. Sources of other income in coastal and combined fisheries in 1993. (The proportion of the informants who have received income from the source, %) (Salmi *et al.* 1996).**

Type of fishery	Permanent (public) post	Permanent waged work	Agriculture	Aquaculture	Other entrepreneurship
Stationary gear salmon fishery	24	18	17	19	10
Salmon fishery in the Gulf of Finland	3	26	3	19	23
Combination fishery	24	24	13	3	13
Other fishery	19	24	25	4	11

The fishing revenues for a household (before taxes) in 1993 were highest in the salmon fishery of the Gulf of Finland, 57 000 FIM. These revenues were considerably lower in all other coastal fisheries (Table 10). For comparison, in 1993 the average revenues of open sea trawl fisheries were 110 000 FIM (Salmi *et al.* 1996).

**Table 10. Average gross income (from fishing), expenditures and revenues (before taxes) of coastal and combined fisheries in 1993 (Salmi *et al.* 1996). The revenues cover the reward of the fishing related work by the household members, taxes and potential profit.**

Type of fishery	Gross income (FIM)	Expenditures (%)	Revenues (FIM)
Stationary gear salmon fishery	52 000	57	22 000
Salmon fishery in the Gulf of Finland	105 000	46	57 000
Combination fishery	46 000	51	23 000
Other fishery	62 000	49	32 000

Many coastal fishermen feel that they cannot influence the markets, particularly the liberation of fish markets and the growing competition among fishermen. This problem is represented in the low fish prices, which reduce the profitability of fishing. The fishermen explain that the price of fish is determined by many groups outside the reach of the commercial fishermen: fishery managers regulating the fishery, researchers predicting seasonal catches and occasional fishermen, brokers and wholesalers forcing down prices (Vesala *et al.* 2000). Commercial fishermen argue also, that fisheries governance at the state level does not take account of the perspectives and operational circumstances of the fishermen. Fishermen have not been able to participate in the decision making. They consider the management system too complicated and the regulations and policies unpredictable (Salmi and Salmi 1998).

### **Åland**

The commercial fishing in the province of Åland can be divided in three categories: 1) Baltic herring fishing with trawl, 2) salmon fishing with drift line and 3) coastal fishing for non-quota species, e.g. whitefish, perch, pikeperch, pike, flounder and gill net fishing for Baltic herring (Ålands Landskapsstyrelse 2001). In the 1980s cod and

salmon fishing were profitable. However, these species became less important in the 1990s due to the declined cod stocks and strict national and international restrictions in the salmon fishing. Also a reduction in salmon prices tightened the economic situation especially of the whole-time salmon fishermen in the 1990s (Halling 1997). In the late 1990s some fishing boats have started to fish for cod in the southern parts of the Baltic Sea.

## Estonia

The high profitability of Estonian fishing, which was reached during the first half of the 1990s, has dramatically declined. The combined gross income (volume from fishermen's diaries, prices according to fishermen's diaries) in the coastal fishery has decreased from 45 152 000 EEK in 1996 to 24 227 000 EEK in 1999. In 1999 the fish income most likely covered only running costs and the profitability was commonly negative. In the early 1990s the fishermen received nearly all of their income from fishery, but later the share of part-time fishermen has increased remarkably. As profitability of fishing was very high during the first half of the 1990s and probably satisfactory in 1996-97, fishermen were not interested in other incomes. It was a general way of thinking that during the periods when fishing is not possible fishermen were supposed to repair their equipment, e.g. vessels (Vetemaa *et al.* 2000, Markus Vetemaa, pers. comm.).

Statistics concerning gross incomes and expenditures of separate fishermen are lacking in Estonia. In table 11, the average gross incomes of fishermen are calculated using compiled catch statistics of all targeted species in different counties and average Estonian prices to the fishermen. The year-by-year worsening trend of the incomes is obvious in most of the counties and is opposite to the changes in the average annual gross wages in Estonia (Table 11) (Vetemaa *et al.* 2000).

**Table 11. Gross incomes of coastal fishermen by counties and average gross wages in Estonia 1996-1999 (Vetemaa *et al.* 2000).**

County	Number of fishermen	Average gross income per fisherman per year (EEK)			
		1996	1997	1998	1999
Saare	600	18 023	12 662	11 700	7 170
Lääne	400	8 187	7 791	6 000	3 317
Hiiu	300	6 608	5 093	6 400	3 034
Pärnu	500	52 914	59 322	48 000	32 112
Ida-Viru	200	1 328	6 870	5 300	2 818
Harju	50	36 450	31 653	23 300	27 153
Lääne-Viru	30	18 415	20 173	17 100	28 280
Average annual income per fisherman		<b>21 716</b>	<b>21 858</b>	<b>18 307</b>	<b>12 195</b>
Average annual gross wages in Estonia		<b>35 820</b>	<b>42 873</b>	<b>49 500</b>	<b>53 016</b>

Information concerning the social situation of commercial fishermen has been studied in the county of Saaremaa (Estonia Fish Policy 1998). The age of the average commercial fisherman is 46 years, 14 of which has he been working as a commercial

fisherman. The average household of Saaremaa fishermen includes 4.2 members. Most of the fishermen use their own fishing equipment (e.g. nets), but the boat is usually bought jointly by two or three men. Only about 10 % of the fishermen employ assistants. Most of the fishermen still use equipment purchased before the end of the collective fishing era. By now, this equipment is almost at the end of its useful life, and at the same time new equipment is often too expensive.

The vast majority of Saaremaa fishermen get their main income from fishing. Only 5 % have some additional job. At the same time, more than 90 % of fishermen are involved in some kind of agricultural production, mostly for the needs of their family. Only about ten percent of these sell part of their agricultural production. Other income sources for families are salaries of their spouses and/or from children still living together with their parents, and social security allowances. Most of the adult family members have their own income; only about one third of families have members with no income of their own.

Gross income from fishing in Saaremaa county ranged from 6 000 to 130 000 EEK for a commercial fisherman in 1995. During the first 9 months of 1996, the corresponding range was 4 000 to 115 000 EEK. Annual expenditures of a commercial fisherman were 32 400 EEK as an average. Comparing incomes and expenditures, every tenth fisherman thinks he cannot make ends meet, and a third of them have an annual income of less than 18 000 EEK. Fishermen in Saaremaa consider travelling around and selling the fish themselves to be unprofitable. The catch is commonly sold at the port to purchasing agents, following informal preliminary agreements. However, every second fisherman operates with a written agreement on selling the fish (Estonia Fish Policy 1998).

## 4.2. Recreational fisheries

There are large differences in the definition and importance of the recreational fishery, as well as in the data collection system between Estonia, Finland and Sweden. Thus, data of each country is reported separately.

### 4.2.1. Sweden

In Sweden, the number of recreational fishermen and catches was estimated in 1995. A postal questionnaire was sent to 6500 randomly selected citizens, and two more detailed regional studies were included. About 2.2 million (37.4% of total population) have been fishing at least once during 1995. Passive gears are commonly used in Sweden, as 4% used only passive gear and 28% used both active and passive gear. The fishing license system in Sweden is quite similar to the Finnish system. Fishing with angling rod, but also with one spinning rod, is a common right in all coastal areas, also in privately owned water areas where no fishing fee is paid. Fishing with gill nets and other passive gear, as well as trolling, in private waters requires a license from the water-owner. A restricted number of gill nets and small traps can be used without a special license outside of private waters (at least 300 meters from land). Unfortunately, there is no information available about the share of recreational catches from private and common waters.

**Table 12. The catches (1000 kg) of the Swedish recreational fishery in Baltic coastal areas in 1995.**

Group	Northern Baltic	Baltic Proper	Southern Baltic	Total
Salmonids <sup>1)</sup>	2 660	747	582	3 989
Gadoids		313	5 990	6 303
Flatfish		1 043	3 402	4 445
Predatory fish <sup>2)</sup>	2 264	6 706	1 425	10 395
Cyprinids	233	2 816	61	3 110
Herring	2 311	1 956	3 172	7 439
Total	7 468	13 581	14 632	35 681

<sup>1)</sup> inc. whitefish, vendace, smelt, trout, grayling, salmon and rainbow trout

<sup>2)</sup> inc. perch, pike, pikeperch, burbot and eel

As in Finland, the total catch of the recreational fishery in the Swedish coastal area in 1995 was much higher than the total catch of the coastal commercial fishery in 1998 (8 922 tonnes). The catch of “predatory fish” (Table 12) was even over 20 times higher than the commercial catch of same species (395 tonnes) in 1998. The total annual catch of Swedish recreational fishery in 1995 from Baltic coastal areas was over twice of the catch of recreational fishery in Finnish coastal areas, although the Swedish estimation might be an overestimation (see Andersson 1998).

#### 4.2.2. Finland

In Finland, all those who fish and use the catch for own consumption (or sell less than 50 kg annually) are defined as recreational fishermen. Recreational fishing is one of the most popular leisure activities in Finland with approximately 2.1 million Finns (44% of the whole population) fishing at least once during 1996. However, half of them fished not more than during ten days in a year and this half got only 5% of the total catch of recreational fishery (Anon. 1998a). Fishing is often an occasional activity, which takes place near summer cottages during holidays and weekends. The number of recreational fishermen and the catches are normally estimated every second year by a nationwide survey using random sampling from the central register of Finnish population. The sample size in the survey carried out in 1996 was around 10 000. In 1998, an extensive survey with a sample size of 40 000 was carried out. In this latter survey, inhabitants of Åland were not included in the sampling frame and assortment of catch species in the questionnaire form was more limited than usual. Thus, the results of the earlier survey are presented in this report. The total catches in the coastal area were, however, at the same level in both surveys (Anon. 1998a, 1998b).

The total catch of the recreational fishery in the Finnish coastal areas (14 860 tonnes) was higher than the total catch of commercial coastal fishery (11 115 tonnes). However, some species such as herring, sprat, smelt and salmon are mainly caught offshore and the catches of the open sea fishery are much higher than the catches of the coastal fishery (Table 13). For most other species the annual catches of recreational fishery exceeded the total catches of commercial fishery. Recreational fishery accounted over 80% of the total catches of perch, pike, roach, bream, ide and

flounder in 1996. The vendace and whitefish catches of the recreational fishery were a little less than half of the total catches, but a little over half of the total pikeperch catches were taken by recreational fishery.

**Table 13. The catches of the Finnish recreational fishery in the coastal areas in 1996, the share of gill net catches in the Finnish recreational fishery, and the proportion of catches of the recreational fishery in the Finnish total catches from sea areas (Anon. 1998a).**

Species	Catch (1000 kg)	By gill nets (%)	Proportion of total catch (%)
Perch	4 467	22	89
Pike	2 350	42	91
Roach	2 065	44	95
Vendace	57	95	40
Whitefish	804	90	39
Bream	707	77	87
Ide	241	74	92
Pikeperch	754	75	56
Burbot	309	63	74
Trout	520	45	77
Rainbow trout	63	12	61
Salmon	216	25	18
Smelt	117	81	9
Herring	1 210	93	1
Flounder	616	91	86
Other species	365	36	2
Total	14 860		11

Common, state owned waters are found only at the open sea outside the archipelago, and the importance of these areas for recreational fishery is very low. Fishing with passive gears in private waters needs always a permit from local water-owners and they can restrict the access to fishery. Passive gears, especially gill nets, are widely used in recreational fishing. The majority of annual catches of many important species eg. whitefish and pikeperch were taken by gill nets (Table 13). Fishing with angling rods everywhere has been a common right in Finland and since 1997 totally without any fee. In fact, a little over 50% of the perch catch of the recreational fishery in 1996 was taken with summer or winter angling rods. Until 1997, a fishing license was always needed for fishing with other active gears, such as spinning rods, fly rods and trolling, but since 1997, a countrywide license could be bought for fishing with all rod gears. This renewal of fishery legislation has not led to any dramatic changes in the distribution of catches for different types of gear (see Anon. 1998b).

### 4.2.3. Estonia

In Estonia, all coastal and open-sea waters are owned by the state and citizens have a common right to fish with one angling rod without any fishing license. All citizens also have a right to buy a personal fishing license for fishing with other rod gear (spinning rods, fly rods, trolling, etc.). In 1998, 20255 licenses, valid for a whole year or shorter time, were sold. The population of Estonia is 1.4 million, which means that the number of licenses was around 1.5% of the number of citizens. As it is rather likely that some recreational fishermen bought more than one license, the proportion of active recreational fishermen was around or less than 1% of the whole population. There are no data about catches of the recreational fishery in Estonia, but it is assumed that the catches are very low as compared to other fisheries.

In addition to this recreational fishing with rod gear, inhabitants of coastal municipalities has a right to buy a license to fish with a limited number (max 3) of professional gear like gill nets, small fyke nets and longlines. This right has been established in 1995 by the Estonian Fishery Law. The total catches of this “domestic fishery” are not known as an official data collection system does not yet exist. However, the total catches of this sector are assumed to be fairly high. It has even been suggested that the catches of domestic fishery can be at the same level as the catches of commercial fishery in the county of Saaremaa, where the share of domestic fishery is probably highest in Estonia.

## 4.3. Fish farming

We will concentrate on rainbow trout farming in mainland Finland, Åland Islands and Sweden. Estonian fish farming will not be dealt with, because the volume of coastal fish farming in Estonia is very small. In coastal areas of the Baltic Sea rainbow trout is in practice the only commercially significant species. Farming of other species (e.g. whitefish) in coastal waters is being developed. It is expected that in the future mass production of other species than rainbow trout will evolve.

### 4.3.1. Fish farming in Sweden

Almost half of the rainbow trout production in Sweden takes place in coastal waters of the Baltic Sea. Trout is farmed in net cages. Some of the farmers are specialised in producing smolts that are sold to farmers who produce large rainbow trout. Rainbow trout production is to a large extent – 95% - farming of large trout (Svenskt vattenbruk 2000).

There are three kinds of fish farms that produce fish for consumption. Some of the farmers have concentrated on farming of large fish. These farmers produce also large volumes and co-operate with large slaughterhouses, fish processors and wholesalers. Another production strategy in Swedish fish farming is to produce and process the fish within the company. This means that production volume is relatively small, but profitability is achieved by processing own special products. Finally there are a few very small farms that produce fish for own consumption.

The yield of Swedish aquaculture 1998 amounted to 4278 metric tons of fish for consumption (5040 tons in round fresh weight). Rainbow trout dominated (4457 tons). In contrast to the concentration of production to coastal areas in Finland, coastal production in Sweden was approximately half of the total national rainbow trout production. Less than 40 % of national production came from the Baltic Sea area

in 1998, the rest from the inland. The total value of aquaculture production amounted to 124 million SEK.

Regarding the whole aquaculture sector in Sweden, the number of firms engaged was 405 of which 286 produced fish for consumption and 10 in the west coast blue mussel. 146 establishments in inland area cultivated fry for stocking. The data is from a national survey, a postal questionnaire to 1000 farms. (Svenskt vattenbruk 2000).

In the Baltic Sea coastal areas in Sweden aquaculture is rather limited (table 14). The produced fish is exclusively rainbow trout. According to HELCOM's Lead Country Progress Report on recommendation concerning measures aimed at the reduction of discharges from marine fish farming in the Baltic Sea area there were 37 farms that produced rainbow trout.

**Table 14. Aquaculture production in the Baltic Sea coastal areas in Sweden in 1998.**

Part of Swedish Baltic coast	Regions	Farms	Production (t/a)
North	Bothnia Bay, Bothnia Sea	13	663
Central	Åland Sea, Northern Baltic Proper, Western Gotland Basin	19	1 007
South	Bornholm Basin, Arkona Basin, The Sound, Kattegatt, (Skagerrak)	5	356
Total		37	2 026

Aquaculture employs ca. 1000 persons in the whole country. Half of them are employed in farming of fish, crayfish or mussels for consumption. Nationally aquaculture plays a minor role – only 0,01% of the working force is employed in the sector. However, locally it may play an important role. Calculated from two recent reports made to the European Commission rainbow trout farming in coastal areas employed 341 persons in 1997. The number is estimated in full time equivalents (Forward Study 1999; Regional socio-economic studies 2000).

Most of the rainbow trout produced in Sweden is processed further, mostly smoked. Fresh fish is sold mostly to export markets. A small amount of the production is sold fresh in Sweden (Svenskt vattenbruk 2000).

In 1998, 13 fish farmers established a producers' organisation, "Matfiskodlarnas Producentorganisation ekonomisk förening" (MPO) that sells fish to clients that usually order larger quantities than single producers can provide. So far the PO has sold only large rainbow trout.

Swedish rainbow trout competes with Danish and Norwegian products, including salmon from Norway which is in fact cheaper than rainbow trout. Export of rainbow trout from Sweden to Japan is important. Export to Japan has been profitable. Demand of rainbow trout in Japanese markets has been high in recent years. In addition, the rate of the Japanese yen has been high. However, during the 1990's the rate has fluctuated a lot to an extent that export has not been constantly profitable (Svenskt vattenbruk 2000).



#### 4.3.2. Fish farming in Finland

In Finland, farming of rainbow trout mostly occurs in coastal areas. Over 80 per cent of the large rainbow trout is produced in net cages along the coast. Production is heavily concentrated to certain areas, especially in the Archipelago Sea and Åland Islands in South West Finland, where almost 70 % of large rainbow trout was produced in 1998 (RKTL 1999a).

In Finland, similar to Swedish fish farming, there are three production strategies: concentration to producing large fish in large companies, fish farming combined with processing and other occupations and fish farming for household consumption. However, regarding the second strategy, fish farming in Finland is not only combined with fish processing. It can also be combined with other occupations like fishing, tourism and transportation. When combined with other occupations, fish farmers sell large cut fish to wholesalers (Varjopuro and Furman 2000).

The production in Åland Islands – 36 per cent of the national total - was slightly higher than the production in the Archipelago Sea, where 32 % of the rainbow trout in Finland was produced. Central-Ostrobotnia with its share of almost 7 % of total national production is another significant production area. The total production in Finland in 1998 was ca. 16 million kg, of which as much as 99 % was rainbow trout. Other farmed species are white fish (91 000 kg), brown trout (24 000 kg) and arctic char (39 000 kg). The value of the fish farming production has dropped dramatically from 500 million FIM in 1988 to 232 million FIM in 1998 although the total production was almost the same as it was in 1988 (RKTL 1999a).

There were altogether 327 fish farms in Finland. 235 of these were located in coastal waters. The South West Archipelago is the main production area (Table 15).

**Table 15. Aquaculture production in the Baltic Sea coastal areas in Finland in 1998.**

Part of Finnish Baltic coast	Regions	Farms	Production (t/a)
West Coast	Bothnia Bay, Bothnia Sea	59	2 359
South West	Åland Sea, Archipelago Sea	130	9 006
South Coast	Gulf of Finland	24	838
Total		213	12 203

There were 44 farms in Åland, which indicates that the size of fish farms in Åland is considerably larger than in the Archipelago Sea area, since the production is almost the same in these areas.

Smolts are mostly produced in inland facilities. In 1998 there were 152 farms that produced smolts for stocking and fish farming. As much as 74 % of smolt farms were located inland. The smolt farms produced 24 million smolts. The value of smolt production in 1998 was 72 million (RKTL 1999a).

In 1997 marine fish farming employed 640 workers in Finland. When converted to full-time equivalents the number of employees is only 381 (Regional socio-economic studies 2000). The reduction is probably due to the seasonal nature of the work. Large number of workers is employed only during the slaughtering season in autumn.

In national scale fish farming is not a very important sector as an employer (only 0.04 % of the workforce in 1997) (Regional socio-economic studies 2000). In coastal areas it has much more importance. Some municipalities in South West Finland are relatively highly dependent on aquaculture, these being Houtskari (20.6%) and Iniö (17.2%) as well as Föglö (15.5%) and Brändö (13.7%) in Åland Islands (RKTL 1999a).

## **Market**

Fish farming in Finland developed rather rapidly until the early 1990s. In 1991 a turning point occurred, after which production decreased almost continuously. The reason for this decline was a growing pressure from highly competitive imports of fresh aquaculture products, mainly salmon and rainbow trout from Norway. Fish imports from Norway in 1998 reached a level of 6 million kg, of which about 1.3 million kg was fresh trout and 4.6 million kg was fresh salmon. The proportion of fish imports on the Finnish fresh salmon and trout market has thus increased from zero to almost 40% in less than 10 years (RKTL 1999b).

## **4.4. Conflicts in coastal areas**

### **4.4.1. Horizontal conflicts**

Horizontal conflict in this context is defined as a conflict among fishermen or between local fishermen (or fish farmers) and other user groups (for example tourists or industrial use of water resources). The grounds for horizontal conflicts are often different interests and values between user groups, which are connected with differences in culture and identity. In many cases there are tensions between modern (non-local) recreation-oriented interests and practices and those of the more traditional production-oriented, local ones.

## **Sweden**

The expert group on archipelago livelihoods has reported (Nordiska Ministerrådets Skärgårdssamarbete 1993), that free rod (hand tackle) fishing (see legislation section) has caused problems in the Stockholm archipelago. The conflicts have been partly related to misinterpretations of the public right of access (every man's rights) (Nordiska Ministerrådets Skärgårdssamarbete 1993). According to a development project for archipelago areas (Miljövärdsberedningen 2000), unregulated rod (hand tackle) fishing causes problems when combining the interests of commercial and recreational fishing and tourism in archipelagos.

One problem for the commercial fishermen in the Stockholm archipelago is similar to that of the Finnish coast: catches of intensive subsistence fishing, either used in households or sold in the market, may cut down the income of commercial fishing (Nordiska Ministerrådets Skärgårdssamarbete 1993). In addition, commercial fisheries are said to have a weak position in conflicts with recreational or environmental interests (Piriz 1998). Also the high taxes of land property in the Stockholm archipelago, for instance, are problematic to the local fishing livelihood (Neuman and Piriz 2000).

## Finland and Åland

According to a report by the expert group on livelihoods in the archipelago areas (Nordiska Ministerrådets Skärgårdssamarbete 1993), both in the Archipelago Sea and in the Åland islands the locals and commercial fishermen have been suspicious of recreational and subsistence fishing. Also fishermen who occasionally sell their catches are thought to cut down the market price of fish. This problem is highlighted also by Huhmarniemi and Salmi (1999) in the case of whitefish fisheries along the Finnish coast of the Gulf of Bothnia, where the commercial fishermen felt threatened by the high number of 'non-professional' fishermen. The amount of gill nets of the 'non-professionals' are equal to those of the professionals, who argued that the 'non-professionals' dump their excess whitefish on the market in summer and autumn and this reduces the price paid to professionals. Many fishermen were also worried about the state of the whitefish stocks affected by intensive fisheries (Huhmarniemi and Salmi 1999).

The commercial fishermen in the Archipelago Sea claim, that subsistence fishing by the non-locals reduces the demand for fish and recreational fishing can even prohibit commercial fishing by 'overcrowding' the fishing places. However, the subsistence fishing by the locals was said to cause no problems to the local commercial fishing. Tourists and summer cottage owners were also accused of being poachers (Nordiska Ministerrådets Skärgårdssamarbete 1993).

Fishing of pikeperch in the Archipelago Sea is one example of the multiplicity of user groups and their motivations in the coastal fisheries. Pikeperch is traditionally caught with gill nets by both commercial and recreational fishermen. It has been argued that there are too many under-sized pikeperch in the catches and consequently mesh-size limitations (43 and 45 mm) have been introduced (Saarinen 1999). This regulation applies both to recreational and commercial gill net fishing.

Trolling and jigging are more modern methods for catching pikeperch. In interviews conducted in 1994 and 1995, the commercial fishermen complained that the trollers (for pikeperch or trout) broke their nets. This problem has diminished due to new fishing areas and rules defined for the recreational fishermen and better marking of the gill nets. Jigging of pikeperch in their spawning areas started in the 1990s and has been opposed by groups of other fishermen and water owners. The main argument against this fishing strategy is that the amount of under-sized fish in the catch is high (J. Salmi, pers. comm.).

In Finland the adoption of the provincial lure fishing fee in 1997 (with the exception of the Åland islands) created an enthusiastic debate among different user groups of fishing waters. This dispute reflected general tensions between private ownership and use rights of the fishing waters, between local communities and 'outsiders' and between rural and urban perspectives (Pirhonen and Salmi 1998). The adoption of the lure fishing fee was strongly opposed by the Swedish speaking people along the coast. According to personal interviews in the Archipelago Sea, residents complained e.g. that rod fishermen (especially trollers) do not respect the way of life of coastal residents and they cause harm to the local commercial gill net fishing. It was also argued that the adoption of lure fishing fee system has diminished incentives for locals to manage fishing waters effectively and it has also cut down the preconditions of local fishing tourism (Salmi 2001).

Fisheries may compete with other uses of coastal areas. Especially fish farming seems to be such an activity (see e.g. Phyne 1999, Eklund 1996, Pillay 1992). Coastal areas in South West Finland are very popular for recreational activities - there are about 24 000 summer houses in the Archipelago Sea. In addition, it is also the most important fish farming area in Finland. Not surprisingly, conflicts have arisen between the two activities. Some of the summerhouse owners accuse fish farms for polluting the

waters, which lessens the recreational value of water areas and their property. In addition, fish farms change the landscape. A summerhouse owner has a legal standing in the permitting procedure, in cases when fish farm effluents are supposed to have an impact on quality of a water body that is owned by the summerhouse owner. Summerhouse owners have quite often used this right against fish farm permits. On the other hand, some of the fish farmers perceive summer dwellers as outsiders or visitors and think that they should not even have a right to intervene into the businesses of local people. They argue that archipelago waters should be used for production not just for leisure time activities (Eklund 1996, Bruun 1998, Varjopuro 2000).

#### 4.4.2. Vertical conflicts

A vertical conflict is here defined as a conflict between user groups and organizations in the decision-making regime. It is often connected to the question which organization has the power to manage fisheries, how is the participation of the user groups arranged and how different knowledge and values are incorporated in the decisions. The same conflicts have often both horizontal and vertical dimensions.

##### **Sweden**

In the Swedish archipelago access to fishing waters is often difficult for commercial fishermen. Hence large water areas are grossly under-utilised in economic terms. According to a survey in one county at the Baltic Proper in 1997, only 1/3 of all fishing waters were available for commercials partly due to the complicated structures of ownership. Archipelagos have become mostly privately owned recreational areas. Private owners of fishing rights seldom practice commercial fishing so they have no incentives to develop opportunities of commercial fishing. Mainly the problems of access apply to net and fyke net fishing (Neuman and Piriz 2000).

Traditionally coastal fishing in Sweden has been part-time fishing. Agriculture has often been fishermen's other source of income. Today Swedish part-time fishermen have had problems of receiving licenses for commercial fishing. Preconditions of receiving the license (see legislation section) are in favour of full-time fishing and so part-time fishing has become difficult for those without access to private waters (Neuman and Piriz 2000).

According to an official report on conservation and development of the Swedish archipelagos (Miljövårdsberedningen 2000), unregulated use of fish resources and the absence of local fisheries management are partly a threat to sustainable development of Swedish coastal fishing. The possibilities and incentives to manage fishing waters locally are poor because of free rod (hand tackle) fishing rights in sea areas (see legislation section). In order to improve local fisheries management in coastal areas the Kalmar county administration wants to limit the free fishing rights and channels the decision making to fisheries management areas (fiskevårdsområden, skötselområden). A fisheries management area would have similar type of duties and rights as the statutory fishery associations and Fisheries Regions in Finland, including e.g. license selling of hand tackle fishing, catch limiting and local mesh-size or closed season regulating (Länsstyrelsen i Kalmar län 1999). However, the proposed system would restrict the current free access for rod fishermen into the coastal areas and is thus very controversial. Sports fishermen are strictly against restrictions in the access to fishing waters (e.g. Fiskevård 2000).

## Finland

In principle the private water owners are responsible for the management of Finnish coastal fisheries. The local decision making is mostly in the hands of local land owners and modern recreation-oriented groups of fishermen have not largely gained opportunities for local participation even if they often are shareholders of the local fishery associations. However, along with changes in the management structure and fishing licence policy (e.g. Fisheries Regions, lure fishing fee system), the state level has promoted urban and recreational interests, often at the expense of local decision making by the water owners. This development has aroused both vertical and horizontal conflicts (Varjopuro and Salmi 1999).

In the Archipelago Sea the adoption of the provincial lure fishing fee reduced the motivation for local water owners to manage fishing and fish resources and changed their fish stocking policy. The local water owners criticized the distribution of the collected funds from the state to the water owners via the Fisheries Regions: a large proportion was accused to be lost in the bureaucratic system (Salmi 2001). Also the example of pikeperch fisheries in the Archipelago Sea, presented in the previous chapter, has vertical dimensions connected to different levels of decision making. The decisions of mesh-sizes in the gill net fishing was conducted by the Fisheries Regions and grounded by results from the fisheries research (Saarinen 1999). In the 1990s fisheries legislation has provided opportunities for jigging pikeperch (in the spawning areas) irrespective of the objections by local water owners. The local water owners have made initiatives to regulate this kind of fishing, but the provincial fisheries authorities have not agreed to the need for these restrictions (J. Salmi, pers. comm.).

In some parts of the coast, especially in the Archipelago Sea area, ownership of the fishing areas is divided in numerous private water areas and fishery associations. Commercial fishermen have had problems with acquiring fishing opportunities for these small and scattered water areas. The archipelago areas are often highly valued for recreational activities and many of the non-local owners have no motivation to support commercial fishermen's operational opportunities (Varjopuro and Salmi 1999). In 2000 a project was started in the Finnish speaking areas of the Archipelago Sea aiming at mediating between the water owners and the commercial fishermen. As result of the negotiations the project would reach agreements for renting water areas for commercial fishing and thus promote the livelihood of several fishermen. However, in the beginning phase of the project, thirteen fishermen and only six water owners have stated their willingness to negotiate the terms for commercial use of private water areas (Kyllönen 2000).

Although many of the more professional coastal fishermen are suspicious of the part-time fishermen who occasionally sell their catches, most of the more 'established' coastal commercial fishermen are also part-time fishermen in practice. As presented in the chapter 4.1, most of the coastal fishermen combine different incomes, e.g. wage work, tourism or fish processing, with fishing. Although fishing is often an important source of livelihood and a crucial factor for living in a rural area, the importance of fishing in monetary terms can be relatively small. Yet in order to receive fishery subsidies provided by the fishery authorities, the proportion from fishing must exceed 30 %. This situation has created problems between opportunities for employment combinations in the archipelago areas and the practices of the official fisheries management (Salmi *et al.* 2000).

Salmon fishing regulation (see legislation section) in the Gulf of Bothnia is also an example of the vertical conflicts between locals and the state administration. According to the local fishermen time closures of fishing are poorly informed, have changed too often and treat fishermen from different parts of the country unequally (Huhmarniemi and Salmi 1999).

There is also a vertical conflict in Finnish fish farming. A severe problem has occurred regarding consent compliance in reporting of nutrient load from fish farms. A study on the quality of nutrient load statistics in Finnish aquaculture began in 1997. Monitoring results from fish farmers and feed production statistics were collected and compared regarding the years 1996 and 1997. The comparison resulted in a finding that fish farmers has reported about 30 % to 50 % lower use of feed than was produced and sold in those years. The situation seems to be that all fish farmers are not complying with the conditions of their licences. Various other factors have, however, been considered as explanations for the deviation between the two statistics as well (Varjopuro *et al.* 2000).

A study was carried out in which fish farmers from two municipalities in the Archipelago Sea (Dragsfjärd and Kustavi). Fish farmers were interviewed to obtain their views on the current licence policy. According to the farmers' possible explanations for the difference in P and N loading statistics could be non-comparativeness of the data sets used, as well as the further sale or storage of feed at the farm. One year was seen to be too short a period for monitoring. However, most of the farmers believed that some fish farmers are giving false data - i.e. they have more fish than their permit entitles them to farm (Varjopuro and Furman 2000).

## **Estonia**

Under present Estonian environmental policy, the State has a right and obligation to license and control the rate of exploitation of natural resources, including fish stocks. Although the licensing policy is being formalised, in effect, fishermen now have a "historical license" to fish even if it does not take explicit form. Most families involved in coastal fishing are fairly poor. A solution to the problem of excess fishing capacity could start from the additional fact that the right of these families to fish in Estonian waters was implicitly recognised by policy many years ago, in some cases decades ago (Estonia Fish Policy 1998).

In some of the most fisheries-dependent areas in Estonia, the economic and social situation is so critical that special economic support and incentives should be provided through regional development programmes. In order to improve the effectiveness of county governments in fisheries management, it is necessary to increase the cooperation and exchange of information between the Fisheries Department of the Ministry of Environment and the county governments (Estonia Fish Policy 1998).

### **4.4.3. Conflicts with nature conservation goals**

Both cormorant and seal populations has been growing in recent years. Conflict between seals and fishing has been documented in Sweden and Finland (e.g. Carlberg 1998 and Ylimaunu 2000). Depending on how the conflict and responses to it will develop it may even undermine nature conservation goals. Fishermen claim that seals are causing considerable damages to their business by taking fish from their gear and breaking gears. Fishermen have insisted that limited seal hunting should be allowed and compensations paid. Hunting has been allowed in Finland since 1998 and compensations will be paid from 2001 onwards. In Sweden, restricted hunting was allowed in 2001.

Seals as one of the few species high in the Baltic Sea foodwebs are considered to have high conservation value. It can also be said to have high symbolic value for nature conservation in the Baltic Sea (Ylimaunu 2000). Therefore, shooting licences have been contested by environmental groups such as WWF. Seals are also killed in fishing gears. The conflict is even further complicated, because the state of the seal

population seems to be much better than it was still a decade ago, but reproductive problems caused by toxic contaminants in the Baltic Sea are not yet overcome. Some of the fishermen claim that culling of seal populations should be considered before their business is wrecked, but from environmental point of view it has been argued that protection of seals should be further enhanced for instance by establishing more protection areas. It may be premature to conclude that seal populations are not threatened anymore.

## 5. Availability and reliability of data on coastal fisheries

As a conclusion on chapters 3 and 4 we discuss shortly about the data on coastal fisheries. During the preparation of the chapters we collected different kind of data and also had an opportunity to assess its availability and reliability. We will first discuss about catch statistics and then about the knowledge of the coastal fish stocks. Finally we will go the socio-economic data.

### 5.1. Commercial catches

The main structure of the data collection system of commercial fishery is similar in Sweden, Finland and Estonia, as well as in Åland. The data compilation practice has been established within the framework of international agreements and later stipulated by EU regulation (No. 3880/91). The fishing data of the offshore fishery – mostly trawling and drift net fishery – is reported by daily logbooks to the fishery administration after each fishing trip. The fishing data of coastal fishery (vessels under 12 m long in Sweden and 10 m long in Finland, Åland included) is entered in a coastal fishery report form, which is returned to fishery administration after each month. In addition to monthly total catch by species, the fishing area, the type and amount of gear used in fishing and the number of fishing days during the month are reported. The coastal fishermen in Estonia are even obligated to record fishery data of each fishing attempt to a fishing diary, but the data is returned monthly to the fishery administration, like in Sweden and Finland.

The system for data reporting and compilation of commercial fishery seems simple, but some severe shortages and problems exist.

- In Sweden, commercial fishermen do not have to report catches if they are fishing only in private waters. The share of this kind of fishery of certain coastal species might be locally even 50% of the total catch. Because of this, the figures of total catches in Swedish coastal fishery are underestimated. Vendace fishery in the Bothnian bay is an exception as it takes place exclusively on common waters and there are only few vessels involved in vendace fishery.
- In Finland and Åland (and Estonia) all fishermen included in the register of commercial fishermen has to report their catches. The non-response loss was 8% in Finnish coastal fishery in 1998 (Anon. 1999), and the catch of these fishermen was estimated using a special method. On the whole, the catch statistics of Finnish commercial fishery are considered to be reliable, and even time series of catch per unit effort (CPUE) of typical coastal species can be roughly used to reflect general changes in fish abundance. The regional accuracy of the catch data is good as the origin of catches is reported using a fixed grid system (approximately 50\*50 km grids).
- The reported catches in Estonia are, however, used as one source of information to determine taxes for individual fishermen. As a result, the catches are usually underreported. The only exception is pound-net fishery of herring – this catch is sold to processing plants and therefore probably reported quite accurately. As the volumes of catches of other coastal species are much smaller, prices are higher and landing takes place in numerous small ports, it is quite easy to underreport the catches. According to Markus Vetemaa (pers. com.) it is possible that the share of unreported catches are less than 25% of the real total catches for most



species. The share of black market might be higher for eel, salmon and trout, as they are the most valuable species.

## 5.2. Recreational catches

The national total catches of recreational fishery are even higher than catches of commercial fishery for some coastal species (see chapter 4.2.). Thus, catch data of recreational fisheries is important to clarify the allocation of total catches between recreational and commercial fishery, and the catches of both sectors are needed if the goal is to carry out an analytical stock assessment. A mailed questionnaire and random sampling from the central register of citizens have been a common method in attempts to collect catch data for recreational fishery.

- In Sweden, the number of recreational fishermen and catches has been estimated nationwide only once, in 1995. The sample size used in this survey, 6 500, was not high, but it is reasonable to assume that the class of magnitude of the total coastal catches of recreational fishery was given correctly. The data given by this survey might also be soon too old, although the structural changes may happen more slowly in recreational fishery than in commercial fishery. Some local estimations of the catches or recreational fishery have been made later (see Andersson 1998).
- In Finland, the same has been done principally every second year during the 1990s. Advanced sampling methods have been used in recent surveys (Anon. 1998ab) and the sampling error has been minimized effectively. In 1997, an extensively large survey was carried out, in order to monitor the effects of changes in the fishery legislation. The sampling size was as high as 40 000 Finnish households, and where fishing took place were asked using a map of the fisheries regions. This extensive survey gave fairly reliable data of the total catches of recreational fishery in coastal area and the data could be viewed regionally. In other, less extensive nationwide surveys (e.g. 1994, 1996, 1998), the sample size has been 4 000 households. These surveys have produced only rough estimates of total catches in coastal areas. It has even not been reasonable to compare results between different years, as there have been some changes in the estimation procedures.
- Citizens of Åland were not included in the sample of the extensive Finnish survey conducted in 1997 (see Anon. 1998b), which means that the results are not valid in the Åland area. However, Åland has been fully included in the samples of those less extensive surveys, but the total catches taken in Åland area cannot be reliably separated from the total coastal catches.
- In Estonia, inhabitants of coastal municipalities has a right to buy a license to fish with limited number (max 3) of gill nets, fyke nets or long lines. The total catches of this “household fishery” are not known as properly data collection system does not exist. The catches (eg. perch and pikeperch) of this sector are assumed to be fairly high, even locally at the same level than the catches of commercial fishery. The catches of recreational fishery, based on common rights or special fees for rod gears, are totally unknown, but the catches of this fishery are also very low.

The gear used and the annual amount of catching efforts has been also asked in the Finnish surveys. However, these catch statistics of recreational fishery appeared to be incompetent for CPUE –calculations due to a very high variation between individual fishermen. One reason for this is evidently differences in skills between fishermen. Another basic reason is the fact that the catch data has been collected on the annual

basis, which makes it difficult to give accurate estimates of catches and efforts. In addition to this, the catchability of coastal fish varies a lot seasonally. Some fishermen might fish a certain species only when it is easily caught – e.g. spawning time – while others are less sensitive for the season, and effects of this cannot be taken into account when the data is collected on an annual basis.

### 5.3. The quality of present knowledge of coastal fish stocks

The main goals of the management of coastal fisheries are briefly: 1) to avoid permanent or long-term decline of fish stocks, and 2) to optimise the harvesting of fish stocks. In theory, the first goal means that recruitment overfishing should be avoided and the second goal means that growth overfishing should be avoided. In a broader way, the first goal implies also that the coastal habitats of the stocks, especially spawning and nursery areas, should be kept in a productive condition. In the same way, the second goal also implies that the production taken by fishery is allocated in a generally acceptable way, which takes also socio-economical and other relevant aspects into account. These two goals, although they are quite formal, are useful to notice, when evaluating the state of present knowledge of coastal fish stocks for the management purposes. Main emphasis here is put on the problematic of native fish stocks.

At present, the weak knowledge of the abundance and changes of the most important coastal species – like pikeperch, perch and whitefish stocks – is mainly based on catch statistics of commercial fishery (see more about the quality of these statistics in chapter 5.1). In addition to this, monitoring of coastal fish communities is carried out in six Baltic reference areas within an internationally established system covering Sweden, Finland, Åland and Estonia (see Ådjers et al. 2000). In this monitoring program, sampling is done in shallow waters during late summer, and thus the main target species of the monitoring are perch and roach. The main variables monitored are the catch per unit effort (CPUE), growth and relative year class strength. In few local monitoring programs, the same variables are measured also for some other species – like pikeperch and whitefish – mostly in samples taken from commercial catches. The data concerning changes in total commercial catches or changes in CPUEs is too rough to make management conclusions in “normal situations”. In extreme cases - like in the collapse of Estonian perch and pikeperch stocks - this information can, however, work as an effective indicator of severe recruitment overfishing or other serious problems like destruction of reproduction areas (see the main goal 1 in the first chapter). The strength of this type of information is the relatively low cost as the data is usually collected routinely. National catch statistics, if well collected and prepared, also give good information about the allocation of catches between regions and fishery sectors. This type of information, however, is not adequate for the optimisation of fishery.

A basic problem in the management of coastal fishery is that the concept of “stock” is mostly unclear, especially as most of natural stocks of river-migrating species have been destroyed. It is not well known how local the coastal “stocks” are and how much overlap there is during the reproduction period and the feeding period. Thus, it is difficult to predict how wide the impact area of a certain management action – e.g. a local mesh-size regulation – or a destruction of a certain area suitable for reproduction, might be. Another basic lack of knowledge, related to that above, is that the dynamics of the coastal fish stocks are generally poorly understood. The relationship between a certain species and the surrounding ecosystem are also usually poorly understood. In some cases, this had made it difficult do distinguish whether the observed changes in fish abundance are caused by fishery or by other changes in the ecosystem – like in the eel fishery in southern Sweden. The differences between

stocks and between geographical regions inside the Baltic Sea might further complicate the situation. In some cases – like in pikeperch fishery in the Archipelago Sea – there are quite clear symptoms of growth overfishing. In that kind of cases, even quite rough scientific knowledge about the effects of mesh-size regulations on the future total catches would be valuable for the management of fishery.

As shown in the previous section, the premises and tools for management of the coastal fish stocks could be further developed, by investing more to research and monitoring work and by improving the quality and regional resolution of fishery statistics. In an ideal situation, stock-specific spawning stock – recruitment relationships, growth rate and exploitation pattern would be available for the most important coastal species, offering a tool for fishery managers to optimise the harvesting of the stocks. However, some consideration and optimisation is needed also before we have the perfect knowledge, as the expected benefits of the developed new management practices should in long term be higher than the costs invested to research, management and enforcement.

## 5.4. Socio-economic information

Detailed data concerning the profitability of commercial fisheries was available from Swedish and Finnish coastal fisheries. In Estonia and Åland there exists some data about the gross incomes, but actual profitability could not be evaluated. Both Finnish and Swedish data revealed the structure and differences in economic and social conditions of several types of fisheries, including the coastal fishing strategies. Comparison between the Finnish and Swedish coastal fisheries was not always possible because of the different typology and indicators used. The Finnish data was collected with interviews from the fishermen and was more detailed. However, although the material collected from income declarations - as in the Swedish case - includes certain problems in accuracy, it offers better and more economical opportunities for monitoring the changes in profitability over years.

The collected material considering the conflicts in coastal fisheries was rather scarce, heterogeneous and random. There have been some social science research activities on fisheries conflicts in Finland and a little in Sweden (although concentrating on the Swedish West Coast), but none in Estonia. Addressing the vertical and horizontal conflicts in coastal fisheries would require versatile research, which would analyse e.g. written and interview material.

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