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FRAP- Development of a procedural framework for action plans to reconcile conflict between large vertebrate conservation and the use of biological resources: fisheries and fish-eating vertebrates as a model case

Work Package Six Deliverable Five: The Social Impact Assessment Report

By

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Chapter One: Introductory Remarks

1.1 Introduction

From the perspective of the overall goals of FRAP, the role of Work Package Six is to describe who the local stakeholders in the conflicts between fisheries and fish eating vertebrates are and what they want. Both the identity of the local stakeholders and their desires should be understood in the terms and categories the local stakeholders themselves are using. Such an understanding is critical if the participatory decision strategies and the framework of action plans are to respond meaningful to the political and social realities in which mitigation policies are created and implemented.

WP 6 uses two standard social science approaches to accomplish this. The first is a social impact assessment (SIA) of the conflict and potential mitigation strategies. This includes private and local strategies as well as public and governmental strategies. An SIA consists of describing stakeholders' perceptions of both the costs and benefits of the conflicts and mitigation strategies and, just as important, how these costs and benefits are distributed among stakeholders. These costs and benefits include but are not limited to quantitative and economic information, as both costs and benefits can take qualitative and non-economic forms.

The second approach is a qualitative analysis of local stakeholders' perceptions of and discourses about the conflict and mitigation strategies. This approach uses 'grounded theory'. This means that information generated by semi-structured interviews is used inductively to identify the categories that the local stakeholders themselves use to understand the conflict. WP6 requires a fairly complex balance between finding information that fits the goals of FRAP as a whole while staying sensitive to local nuances.

1.2 The Meaning of the Term "Local Stakeholder"

For the purposes of WP6 we define the category of "local stakeholder." This term is not meant to be precisely synonymous with the term "stakeholder" as it appears in other project documents and work packages. Rather "local stakeholder" is defined in a way that is meant to facilitate sociological analysis at a local level. A local stakeholder is a group of people that are likely to be able to influence the content or effectiveness of relevant policy. This includes government agencies at various levels, environmental groups, fishers, local businesses, such as those related to tourism, etc. Local stakeholders can wield such influence either by participating in the creation of the policy or by helping or hindering its actual implementation. In other words, if an environmental group or a local business group has the possibility of having influence on either how a policy is legally defined or on how a local enforcement agency is going to interpret that legal definition, then that group is a local stakeholder. Furthermore, if local fishers have a possibility of going out and shooting a vertebrate with a good chance at getting away with this, then they are local stakeholders by this definition because they can have a definite negative impact on the effective implementation of a policy, even if they don't have much influence on what the policy says in some document or how it is interpreted by a local agency.

1.3 The Purpose and Content of the Social Impact Assessment Reports

The initial analysis of the local stakeholder situation has been carried through using a Social Impact Assessment (SIA) of the local interactions and mitigation efforts. The purpose of the SIA is to provide an initial description of what the conflict is actually about in the eyes of the local stakeholders. This begins with their interests, usually expressed in economic terms, but also includes conflicts of values that emerge from the stakeholders perceptions of social costs and benefit. The SIA also begins the process of revealing where there are disagreements over facts. By carrying out this task the SIA provides a description of the basic parameters of the conflict which can be used for the next step: the Discourse Analysis that is the heart of Work Package Six.

This document reports on this initial analysis by pulling together these SIAs from each of FRAP's model regions. An SIA was carried out by each country partner by gathering information on costs, benefits and their distribution through interviews with local stakeholders. The most important part of the SIA was collating information on how the local stakeholders see these costs, benefits and their distribution. Information on costs and benefits and their distribution was mainly gathered through direct stakeholder interviews, however basic descriptions of the local areas and information to corroborate and compare stakeholders' perceptions was also gathered from documentary sources, such as libraries, government agencies, etc.

The SIA reports collated below include the following:

- 1) A brief description of the research site, covering: it's a) government jurisdictions and responsibilities related to FRAP issues; b) population (size, ethnic makeup, education, average income); c) basic economic characteristics, and; d) geographical characteristics.
- 2) A description of the perceived economic costs of the conflict, how these perceptions differ among local stakeholders, and how extensive these costs are the local economy.
- 3) A description of the perceived economic benefits of the fishing industry and the presence of the vertebrates, how these perceptions differ among local stakeholders, and how extensive these benefits are in terms of the overall local economy.
4. A description of the perceived social costs and benefits of the conflict, the fishing industry and the vertebrates in the life of the community.
5. A list of the potential mitigation strategies that are either being considered or implemented in the local area. Local stakeholder's perceptions of the economic and social costs and benefits of each of the these strategies are described, including how these things distribute among local stakeholders.

The following six chapters consist of the individual SIA reports from each of the partner countries. These reports are included are the unedited final drafts submitted by each partner after a process of discussion and review of earlier drafts with the work package coordinator. The reports are not collated in a substantively meaningful order, merely alphabetically by country name in English. The final chapter consists of some initial reflections by the work package coordinator about some patterns that are visible across various model regions that have implications for our understanding of the conflicts and the upcoming discourse analysis.

Chapter Two: The Social Impact Assessment from Denmark

2.1 Introduction	4
2.1.1 Socio-economic characteristics of the study region	4
2.1.1.1 Introduction to study areas	4
2.1.1.2 Governmental and administrative structures	4
2.1.1.2 Population Characteristics	5
2.1.1.2 Educational level	7
2.1.1.2 Economic Characteristics	9
2.1.1.2 Local taxes	10
2.1.1.2 Employment	11
2.1.2 Structure of fishery sector	13
2.1.2.1 Pound net fishery	2
2.1.2.2 Comparison of economic benefits from commercial and recreational fishery	5
2.1.2.3 Aquaculture	7
2.1.3 Tourism	7
2.2 Stakeholders	7
2.2.1 Fishermen	7
2.2.2 Environmentalist	10
2.2.3 Recreational fishers	12
2.2.4 Tourism	13
2.2.5 Authorities and public institutions	13
2.3 Summary and comparisons	15
2.3.1 Agreement among stakeholders	15
2.3.2 The implications of this agreement for policies and potential mitigation measures	16
2.3.3 Disagreement among the stakeholders	17
2.3.4 The implications of this disagreement for policies and potential mitigation measures	17

2.1 Introduction

The Danish study deals with the interactions between cormorants and fisheries in Denmark. The fisheries in question is the pound net fishery and recreational fisheries in inner and coastal waters. The issue investigated is the conflict that has arisen since the cormorants became protected in 1981. The population rose from 300 breeding couples in the beginning of the 80's to to approximately 40.000 couples in the end of the 90's. This significant increase was followed by protests from fishermen who wanted the population growth to be controlled as they experienced that cormorants also fed on the fish caught in their nets. These arguments were not acknowledged by other stakeholders for a decade but from 1992 and onwards management plans have been used to adress the conflics. Despite the management plans the conflicts as such have not been solved and instead new stakeholders have entered the scene in recent years arguing that cormorants constitute a problem. These stakeholders are the recreational fishermen.

2.1.1 *Socio-economic characteristics of the study region*

2.1.1.1 Introduction to study areas

The Danish study region is the whole country of Denmark. The two study areas selected are situated in the two counties: Ringkoebing County and Funen County. Within each county several municipalities are part of the study areas resulting in three administrative levels.

The study area in Ringkoebing County is Ringkoebing Fjord and the Skjern River system, that drains into the fjord. The fjord is a large estuary surrounded by four municipalities; Ringkoebing, Skjern, Egvad and Holmsland municipalities. Ringkoebing County consists of 18 municipalities

The study area in Funen is Lillebaelt and Baaring Vig. Lillebaelt is a narrow strait between Jutland and Funen and Baaring Vig is a baylike area in the Northwestern part of the Funen coast. The strait is bordering three counties but the county of Funen has been chosen as study area. In the study area two municipalities have been chosen: Middelfart municipality and Bogense municipality. Funen County contains 32 municipalities

2.1.1.2. Governmental and administrative structures

There are three main levels of administration in Denmark, which are the national level, the county- and municipal level.

National level: In general the legislation and the management of specific areas are often decided upon on basis of advice from advisory boards. The system of advisory boards is formalized user council participation through formalized hearings of interest groups. Ministries and government institutions/agencies make up law proposals. The actual implementation is most often decentralized to lower administrative levels but the different ministries and government agencies are responsible for the implementation of national legislation. Some areas of national interest such as state owned land e.g. nature reserves and state forests are administrated by government agencies.

In the case of the cormorant there are two Ministries of relevance, each representing a party in the conflict between fishers and cormorants. The Ministry of the Environment is in charge of the

management of the cormorant whereas the Ministry of Food, Agriculture and Fisheries manage fisheries and fish stocks.

The Ministry of the Environment is responsible for all legislation concerning protection of species and nature, spatial planning, and hunting and game management. The planning responsibilities and the management- and protection of nature are transferred to lower levels whereas, game and hunting legislation is a responsibility that is kept within the Ministry of Environment under the Forest and Nature Agency.

The Ministry of Food, Agriculture and Fisheries is responsible for the Fisheries Act. The Ministry is responsible for all regulation of fisheries as well as structural programs supporting fishing fleet changes and development activities.

County level: This level is a regional governance structure that is financed by a percentage of the total tax revenues. Law and the budget limitations decided by the parliament define the administrative powers of the counties. The counties are responsible for a range of areas e.g. healthcare, regional planning, nature and water resources, roads and public bus transportation, and regional development. Most relevant for this study is that they implement and enforce most environmental regulations in relation to the Protection of Nature Act, administrate certain types of nature reserves, plan regional development, and are responsible for Environmental Impact Assessments in relation to spatial planning. There are 14 counties.

Municipal level: The municipal level is the local level being responsible for administration of local issues, local planning, collection of income taxes, primary and secondary schools, providing a range of public services for elderly, day care programs, unemployment programs etc. In the same way as the counties each municipality determines its own level of municipal taxes below a maximum percentage decided by parliament. There are 269 municipalities.

2.1.1.2. Population Characteristics

Table 1. General descriptors of administrative units.

Administrative units			Area (km ²) 2002	Population (01.01.2003)	Population density (pers/km ²) 2002	Proportion of inhab. living in urban areas (%)
Study Region	Denmark		43,096	5,383,507	125	No data
Study Area Ringkoebing Fjord	County	Ringkoebing	4,854	275,044	57	No data
	Municipalities	Ringkoebing	401	17,903	44	73
		Egvad	377	9,624	25	58
		Skjern	327	13,109	40	69
		Holmsland	94	5,346	57	74
Study Area Lillebaelt & Baaring Vig	County	Funen	3,486	473,471	136	No data
	Municipalities	Middelfart	102	20,186	277	90
		Bogense	72	6,377	63	53

Source: Kommunedata, KMD 2003, www.netborger.dk)

The municipalities chosen differ a lot in size of area and population as well as degree of urbanisation. Middelfart is probably the municipality being most different from the others being the largest and most urbanised. Egvad is the most rural in term of population density and proportion of the population living in urban areas.

Funen county is much larger than Ringkoebing County and in terms of population size Middelfart again distinguishes it self with the highest population growth followed by Ringkoebing which is in line with the general development of urbanisation in Denmark.

Table 2. Population 2002

	Population development (%) 1981-2002	Projection 2002-2020 (%)
Study Region Denmark	+4,8	+1,2
Funen County	+4,2	-1,5
Bogense Municipality	+0,8	+3,8
Middelfart Municipality	+10,9	+6,7
Ringkoebing County	+4,1	-1,1
Egvad Municipality	-2,7	-4,3
Holmsland Municipality	+3,7	+0,8
Ringkoebing Municipality	+6,7	-0,3
Skjern Municipality	+3,4	+0,3

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

The process of some municipalities having a growing population also imply that part of this growth may come from other municipalities when people leave the rural areas to settle near or in urban areas. Egvad is an example of such a municipality where the population development is negative. On the county level the population development from 1981-2002 is close to the national level. There is no indication of population growth in areas that could have negative consequences for cormorants. In terms of proximity to cormorant colonies Egvad and Bogense are the two most interesting municipalities and they are the smallest (together with Holmsland) and the two municipalities with the lowest population growth.

The numbers for 2003 for the age group 18-29 for the municipalities indicate a migration to other areas as the number are lower than the national average. An explanation for this could be that education is concentrated in larger cities which is why Ringkoebing and Funen county is only little behind the national average. None of the municipalities are educational centers and in terms of higher educations the major educational cities are Aarhus and Copenhagen.

Table 3. Age structure of population 2003.

2003	Age groups (Years)				
	0-17	18-29	30-49	50-64	65 -
Study Region Denmark	22,1	14,6	29,1	19,4	14,8
Funen County	21,9	14,0	28,4	19,7	16,0
Bogense	21,9	10,4	28,7	20,7	18,3
Middelfart	22,7	10,6	29,0	21,8	15,7
Ringkoebing County	24,2	13,8	28,3	19,2	14,4
Egvad	24,8	11,7	26,9	19,6	17,0
Holmsland	24,5	12,9	27,4	22,1	13,1
Ringkoebing	25,3	12,7	28,4	19,0	14,6
Skjern	24,7	13,8	27,5	17,7	16,3

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

When comparing the 1981 (appendix) and 2003 data it is clear that the age patterns are developing towards a larger group of older people. From the population structure it is clear that the proportion of youngster 0-17 yrs. have decreased and instead the group 50-64 yrs. have increased considerably. It is difficult to assess what the relevance of the age structure is. On one hand the development in the age structure with a growing segment of elderly people could be an indication of fewer people going into fisheries, which could result in a reduction of the conflict. On the other hand the development in age structure indicates that there will a growing number of retirees during the next decade. This may result in a growing number of anglers, recreational fishers and other recreational users of nature, and this could result in an escalation of the conflict. Also because this age group have grown up when cormorants were perceived as pests.

2.1.1.3 Educational level

The compulsory education in Denmark is 9 years of primary and secondary school from age 7 to 15. Secondary school and vocational education comprise the largest part of the completed educations. When investigating the educational level on a municipal level there are clear differences between the different municipalities. Middelfart and Ringkoebing have a higher percentage of higher educated people, which is explained by the size of the towns Middelfart and Ringkoebing and the existence of administrative, educational, healthcare and service jobs in these towns.

Table 4. The highest completed education of the population (age 15-69) distributed on number of persons and percentage (2002).

	Funen County	Bogense	Middelfart	Ringkoebing County	Egvad	Holmsland	Ringkoebing	Skjern
8th - 10 th Grade Secondary School	36,15	42,66	33,45	40,40	43,82	44,28	37,44	41,39
Gymnasium (General upper secondary education)	5,31	2,70	3,50	3,82	2,87	2,66	2,99	3,08
Commercial Gymnasium (General upper secondary education)	2,16	0,99	1,72	2,43	1,52	1,44	2,12	1,98
Vocational Education	35,17	38,04	39,06	36,03	35,49	38,62	37,85	38,38
Short-cycle Higher Education	3,70	3,24	4,05	3,24	2,88	1,96	3,31	2,98
Medium-cycle Higher Education	11,18	8,23	12,68	9,51	9,19	6,48	10,13	8,54
Bachelor Education (University)	0,79	0,18	0,48	0,44	0,09	0,31	0,54	0,37
Long-cycle Higher Education (University)	3,23	1,59	3,14	2,12	2,09	1,51	3,77	1,60
No information on level of education	2,31	2,36	1,93	2,01	2,05	2,74	1,85	1,69
Total	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00

2.1.1.4 Economic Characteristics

Table 5. Gross domestic product (GDP) in study region and counties 2001.

	GDP per capita 2001 (1000 Euro ¹)	Development GDP 1995-2001 (%, 1995 prices)
Study Region Denmark	33.2 (DKK 247)	+12,6
Funen County	27.1 (DKK 201)	+11,4
Ringkoebing County	32 (DKK 238)	+14,4

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

It is only possible to extract the GDP data on municipality level, but they do show that Funen is lacking behind both in terms of actual GDP and economic growth whereas Ringkoebing is actually doing better than the national average in terms of growth.

Table 6. Gross value added (GVA) by main economic sectors 2001.

	GVA 2001 Mio. Euro	GVA by economic sectors (Distribution %)			Development of GVA by sectors 1995-2001 (1995 prices)		
		I	II	III	I	II	III
Study Region Denmark	158,275 (DKK 1,175,984 Mio.)	5,5	22,8	71,6	+34,5	+10,9	+18,3
Funen County	11,320 (DKK 84,115 Mio.)	5,0	26,3	68,7	+18,6	0,0	+19,0
Ringkoebing County	7,786 (DKK 57,856 Mio.)	7,2	34,5	58,3	+18,0	+18,4	+17,0

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

(note: I Agriculture, forestry, fishing mining and quarrying. II Industry, energy and construction. III Services)

In line with table 6 and the growth of GDP it can be seen from table 7 that the industrial sector in Ringkoebing county has a significantly higher GVA than Funen and the national average.

Income situation

Table 7. Distribution of yearly taxable incomes for 2001 (gross income).

	Distribution of yearly taxable income (Euro 1,000)						
	<3.4	3.4-13.5	13.5-20.2	20.2-26.9	26.9-40.4	40.4-53.8	53.8<
Study Region Denmark	0,3	8,4	19,3	20,3	29,2	10,3	12,3
Funen County	0,4	10,3	22,9	22,3	27,3	8,15	8,3
Bogense Municipality	0,3	11,1	27,2	25,6	24,35	6,15	5,3
Middelfart Municipality	0,3	7,9	19,2	22,1	29,15	9,9	11,5
Ringkoebing County	0,4	9,0	21,5	23,1	30,2	8,1	7,8
Egvad Municipality	0,4	10,0	22,2	23,5	30,6	7,5	5,7
Holmsland Municipality	0,3	8,3	19,7	20,3	31,9	9,2	10,3
Ringkoebing Municipality	0,3	8,0	19,0	22,2	32,1	9,1	9,2
Skjern Municipality	0,3	8,3	22,0	24,1	32,3	7,1	5,9

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

¹ Exchange rate Euro 100= DKK 743 was used in conversion from DKK to Euro

Table 7 show large differences in the municipalities. In terms of percent the difference is not significant but in the category Euro 3,400-13,500 (DKK 25,000-100,000) a 3% difference can be a severe financial burden for the municipality because persons with an income below Euro 13,500 (DKK 100,000) are most likely partly or entirely living of welfare which depending on the category of welfare is an expense of the municipality. From this table it is showing that Bogense municipality is a low income municipality. It has the highest percentage of low income Euro 3,400-13,500 (DKK 25,000-100,000) and the lowest percentage of incomes above Euro 40,400 (DKK 300,000).

2.1.1.5 Local taxes

Table 8. Municipality taxes and revenues per inhabitant (2002)

		Municipality tax percent	Income tax revenue (euro per inhab)	Company tax revenue (per inhab)	National subsidies and tax equalisation (euro per inhab)
Funen County	Bogense	22,1	3,047	94	1,289
	Middelfart	20,3	3,338	704	725
Ringkoebing County	Egvad	21,2	2,975	643	1,052
	Holmsland	17,0	2,812	375	293
	Ringkoebing	19,9	3,143	1,087	790
	Skjern	20,2	3,001	729	732

Source: Kommunedata, KMD 2003, www.netborger.dk

From the figures is visible that Bogense is a municipality that is under financial stress. The combination of low company tax revenues, low number of workplaces in the municipality, high municipal taxes and a high return in the national tax equalisation program are strong indicators of a municipality with a low level of economic activity. On the other hand there is Ringkøbing where the company tax revenue indicates that there is a lot of economic activity.

Table 9. County expenditures for development of business initiatives per inhabitant 2002 (Euro)

	Euro	Index (
Denmark (average of all counties)	4.6 (DKK 34)	100
Funen county	3.6 (DKK 27)	81
Ringkoebing county	5.9 (DKK 44)	130

Source: Amtsrådsforeningen, www.arf.dk. 2002

The county expenditures can only be taken as an indication of the effort done by the counties to develop business initiatives. The fact that Ringkoebing county seem to invest more can, however also be explained by co-funding possibilities from EU regional programs etc. so these figures can be interpreted in several ways. It is striking, however, that the higher county expenditures seem to match a higher activity in Ringkoebing.

2.1.1.6 Employment

Table 10. Unemployment rates 2002.

	Unemployment (31.12.2002)		
	Persons	(%)	Percentage women
Denmark	144732	5,2	52,4
Funen County	14119	6	51,6
Bogense	207	6,6	53,1
Middelfart	466	4,5	53,2
Ringkoebing County	5965	4,1	60,8
Egvad	186	3,8	58,6
Holmsland	118	3,8	55,1
Ringkoebing	347	3,6	64,0
Skjern	209	3	61,2

Source: Statistics

Denmark – www.statistikbanken.dk, own calculations

In line with the income situation in the table above Bogense has the highest unemployment rate which is part of the explanation for the low incomes. The percentage of women unemployed is higher than for men on all administrative levels.

Table 11. Size of work force 1981-2002.

Work force (16-66 yrs)	2002	Development (%) 1981-2002	Percentage of population 16-66 yrs. in workforce	
			1981	2002
Denmark	2803041	+6,4	78,8	77,8
Funen County	236748	+4,7	77,5	75,5
Bogense	3110	+2,8	78,0	76,3
Middelfart	10429	+16,4	78,9	79,1
Ringkoebing County	145653	+6,8	81,2	80,6
Egvad	4841	-3,4	81,0	80,4
Holmsland	3093	+17,6	81,3	85,2
Ringkoebing	9518	+11,5	82,6	82,6
Skjern	6867	+9,3	81,8	83,1

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

The differences between the different administrative levels are minor as well as between the years 1981 and 2002. Holmsland differs by having 85% of the population in the workforce, which is considerably higher percentage than the rest.

Table 12. Number of jobs per 100 inhabitants.

		Number of jobs per 100 inhabitants
Funen County	Bogense	37
	Middelfart	52
Ringkoebing County	Egvad	44
	Holmsland	55
	Ringkoebing	65
	Skjern	55

Source: Kommunedata, KMD 2003, www.netborger.dk

There are large differences in the number of jobs per 100 inhabitants. Ringkoebing rank the highest whereas Bogense again distinguishes it self by being in the worst situation.

Table 13. Workplaces grouped according to size (2002)

	Denmark	Funen County	Bogense	Middelfart	Ringkoebing County	Egvad	Holmsland	Ringkoebing	Skjern
1	121697	9832	180	370	6610	314	161	414	347
2-4	78631	6617	139	276	5065	212	180	366	252
5-9	41966	3746	64	166	2666	89	114	180	150
10-19	29012	2476	25	125	1680	58	59	109	84
20-49	17101	1402	11	76	1082	31	22	65	44
50-99	5592	470	8	25	312	4	9	28	18
100+	3707	289	1	12	185	5	0	21	8
Total	297706	24832	428	1050	17600	713	545	1183	903

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

The most frequent type of workplace is where one person is employed typically an independent person being one enterprise. The majority of the workplaces have 4 or less employees.

If retraining of fishermen and relocation were to be part of a reconciliation plan the employment structure would be relevant and could give an indication of the dynamics in a municipality and the ability to absorb unemployed. This is however very unlikely to happen, the number of people is very low (as will be shown in the following section on fisheries) and the figures do not say anything about the structure of skills needed in local work places.

Table 14. Change in numbers of employees by economic branches 1993-2002

	Agriculture, horticulture and forestry		Fishery sector		Industry, energy		Trade, transport		Finance, Business services		Public and privat services	
	Pers.	%	Pers.	%	Pers.	%	Pers.	%	Pers.	%	Pers.	%
Denmark	-35089	-27	-2064	-28	-699	0	+44132	+7	+96456	35	+69711	+8
Funen County	-3533	-22	-135	-32	-4155	-7	+1878	+4	+7607	+43	+6360	+8
Bogense	-85	-21	-10	-34	112	+16	-18	-3	+93	+51	+56	+6
Middelfart	-101	-37	-9	-47	-65	-2	+294	+13	+494	+68	+148	+4
Ringkoebing County	-3781	-28	-493	-30	338	+1	+1902	+6	+2738	+27	+2869	+7
Egvad	-277	-31	-16	-28	215	+15	+34	+4	+35	+13	+25	+2
Holmsland	-42	-19	-187	-37	199	+28	+35	+4	+33	+20	+86	+14
Ringkoebing	-211	-22	-19	-20	641	+24	-92	-5	+107	15	+241	+9
Skjern	-253	-29	-5	-20	386	+18	+50	+4	+34	+6	+40	+2

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

From table 14 it appears that the development in number of employees has been negative and quite significant for fisheries along with agriculture. This is the same development within all municipalities and on all levels. The largest growth is in the finance and business services sector especially in Funen county whereas the municipalities in Ringkoebing county have experienced growth as well in the industry and energy sector. In line with the development in agriculture the employment in fishery sector can not be expected to increase again due to the technological development replacing the need for manual labour even if fish stocks recovered

2.1.2 Structure of fishery sector

In relation to FRAP and the case of cormorants it is difficult to assess the importance of fisheries affected by cormorants. The reasons for this is that only a fragment of the Danish fisheries sector is of any relevance as the vast majority of the fishing is taking place at sea in large vessels out of range of cormorants both in terms of distance as well as depths. Cormorants live and feed in shallow coastal and inland waters and the type of fisheries taking place here is of another character than the fisheries taking place at sea. The type of fishery mostly affected is the pound net fishery and there are very few statistical data on that specific group of fisheries.

The importance of fisheries in general differs in the two study areas. In the study area in Funen the commercial fishery is not very important. It is dominated by a small number of small vessels operating in the inner waters whereas the municipality of Holmsland in Ringkoebing County hosts a large fleet of larger fishing vessels operating mainly in the North Sea and Skagerrak. However, in relation to the pound net fishery, which is, the fishery mostly affected by cormorants there are more pound net fishers in the Funen study area than in the Ringkoebing study area.

As the tables below show the importance of fisheries has been declining in all the municipalities in question during the last 6 years.

Table 15. Working places by size (number of employees) in fisheries sector (Ultimo November 1995, 2202)

Jobs	Denmark			Funen County			Bogense			Middelfart		
	2001	1995	Development	2001	1995	Development	2001	1995	Development	2001	1995	Development
1	1114	1441	-327	118	162	-44	4	8	-4	2	9	-7
2-4	815	1008	-193	52	71	-19	4	6	-2	1	0	1
5-9	293	330	-37	7	8	-1	1	1	0	0	0	0
10-19	67	60	7	1	1	0	0	1	-1	0	0	0
20-49	8	5	3	0	0	0	0	0	0	0	0	0
50-99	1	1	0	0	0	0	0	0	0	0	0	0
100+	0	0	0	0	0	0	0	0	0	0	0	0
Total	2298	2845	-547	178	242	-64	9	16	-7	3	9	-6

Workplaces by size (number of jobs) in fisheries sector (Ultimo November 1995, 2202)

Jobs	Ringkoebing County			Egvad			Holmsland			Ringkoebing			Skjern		
	2001	1995	Development	2001	1995	Development	2001	1995	Development	2001	1995	Development	2001	1995	Development
1	118	173	-55	4	5	-1	43	50	-7	13	17	-4	4	8	-4
2-4	164	230	-66	4	8	-4	53	85	-32	7	10	-3	2	1	1
5-9	105	108	-3	0	0	0	46	46	0	2	2	0	0	1	-1
10-19	23	25	-2	0	0	0	4	12	-8	0	0	0	0	0	0
20-49	3	0	3	0	0	0	0	0	0	1	0	1	0	0	0
50-99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	413	536	-123	8	13	-5	146	193	-47	23	29	-6	6	10	-4

Source: Statistics Denmark, Statistikbanken.dk

Table 16. Employees in the fisheries sector (2002)

Employees in the fisheries sector (2002)									
Age groups	Denmark	Funen County	Bogense	Middelfart	Ringkøbing County	Egvad	Holmsland	Ringkøbing	Skjern
-15 yrs.	38	4	1	0	12	1	3	1	0
16-24 yrs.	395	23	1	1	91	5	16	13	1
25-34 yrs.	862	44	4	2	190	5	41	8	6
35-44 yrs.	1353	52	5	3	334	14	95	20	6
45-54 yrs.	1392	76	6	3	285	5	91	22	3
55-66 yrs.	1069	66	1	0	213	7	56	11	4
67+ yrs.	273	28	1	1	47	4	19	2	0
Total	5382	293	19	10	1172	41	321	77	20

Source: Statistics Denmark, Statistikbanken.dk

When looking more in detail it is clear that fisheries is more important in Ringkøbing County than in Funen County. This is not related to Ringkøbing Fjord but the fact that the sea-going fleet is concentrated along the west coast of Jutland. Another thing that meets the eye is that the age group 16-24 is clearly underrepresented accounting for only 7% which is 3% less than in 1993. This is a strong indication of problems in fisheries when recruitment of labour is low.

The table below shows that the education level in fisheries is low.

Table 17. The highest completed education of the population (age 15-69) in fisheries (2002).

	Denmark	Funen County	Bogense	Middelfart	Ringkøbing County	Egvad	Holmsland	Ringkøbing	Skjern
Total number of employees	5176	273	18	9	1136	37	306	76	20
Distribution in percent (%)									
8th - 10 th Grade Secondary School	57,82	71,43	72,22	66,67	58,27	72,97	50,98	60,53	45,00
Gymnasium	1,24	0,00	0,00	0,00	1,23	2,70	0,98	3,95	5,00
Business Gymnasium	0,52	0,37	0,00	0,00	0,26	0,00	0,33	0,00	0,00
Vocational Education	30,45	23,08	22,22	22,22	33,71	16,22	42,16	30,26	40,00
Short-cycle Higher Education	3,48	2,56	5,56	0,00	1,41	0,00	0,98	2,63	0,00
Medium-cycle Higher Education	1,28	1,47	0,00	0,00	0,53	0,00	0,33	0,00	0,00
Bachelor Education	0,06	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-cycle Higher Education	0,41	0,00	0,00	0,00	0,44	2,70	0,33	0,00	0,00
No information on level of education	4,75	1,10	0,00	11,11	4,14	5,41	3,92	2,63	10,00

Source: Statistics Denmark, Statistikbanken.dk

2.1.2.1 Pound net fishery

From interviews with stakeholders there is no doubt that the number of pound net fishers has declined during the last three decades but it is very difficult to verify this by use of official statistics as no statistical records on pound net fishery are available. In the official statistics it is impossible to identify the number of pound net fishers, number of employees, vessels or the size of the catch.

The statistical category 'fishing area' is also useless as these areas are too large. In the case study site Lillebælt, the statistical area is much larger than where the pound net fishery takes place and in Ringkoebing Fjord it is possible to extract data on total fish catch in the fjord, but for all types of fishing gears. Basically the problem is that the type of fisheries mostly affected by cormorants, pound net fishery, is too small both in terms of active fishermen, landings and value to be identifiable in the official statistics.

Specific statistical data on pound net fishery collected by Statistics Denmark are few. The Danish fishing fleet is composed of 3,851 registered fishing vessels having a fishing license (Fiskeridirektoratet, 2002 Ultimo 2002). Of these 385 are registered as pound net boats.

Table 18. Number of pound net vessels 2002

	2002	2000	1997	Development 1997-2002
Fishing vessels	3,851	4,144	4,581	-16%
Pound net vessels	385	429	490	-21%

Source: Directorate of Fisheries, 2002)

The decline in number of registered pound net vessels from 1997-2002 is 21 %. This decline is only to be taken as an indication as there may not necessarily be a direct correlation between the number of active pound net fishers and the number of registered pound net vessels. It is however clear from these numbers that the numbers of pound net fishers is declining.

In 1997 the Danish Fisheries Association carried out a survey of the pound net fishery. The number of pound net fishing operations is a minimum estimate but the uncertainty is assessed by the authors to be no higher than 10%.

Table 19. Number of pound net fishing operators (1997)

	Denmark	Ringkoebing/Stadil Fjord	Lillebælt
Spring	41	3	7
Autumn	103	2	21
Total fish catch (ton)	2489,5	44,3	113,8

Source: (Danmarks Fiskeriforenings Bundgarnsundersoegelse. 1997)

In 2003 there was only one full-time pound net fisher in Ringkoebing Fjord and the pound net fishers in Lillebaelt are spread over three counties and several municipalities

A comparison of the pound net catches with the total Danish catches in the same areas indicates that the pound net fishery constitute a small segment of Danish fisheries.

Table 20. The proportion of the pound net catches out of the Danish fish catches in inner waters.

	Cod	Herring	Lumpsucker	Flounder	Silver Eel	Yellow Eel
Percentage of total fish catch (%)	1½	1	3	1	72	12

(Danmarks Fiskeriforenings Bundgarnsundersoegelse. 1997)

The average age of the pound net fishermen in the 1997 survey was 51 years, which was 6 years higher than the average in fisheries in general. There were not sufficient data to determine a trend but it was assessed that the average age was likely to increase when taking the conditions for pound net fishery in consideration.

Another estimation come from an interview with a pound net fisherman active in the association of pound net fishers who assessed the number of pound net fishermen in Denmark to be approximately 200. This figure included part-time commercial fishers and fishers mixing pound net fishing and other types of fishery. Another estimation given by a representative from the Danish Fishery Association was 150 pound net fishers. This number should be taken as a rough estimate and is probably in the top end. Following information from interviews the number of pound net fishers in the two study areas together is no more than 12 including part-time commercial fishermen.

Ringkoebing Fjord

Pound net fishers are, however, not the only fishers affected by cormorants indirectly and directly as cormorants do most probably impact fish stocks locally. For that reason it could be useful to investigate the local fisheries in more detail. The same statistical problems do arise though as the statistical areas are too large to draw any local picture. The character of the fisheries in Ringkoebing Fjord has been investigated as a survey of the social and the economic importance of the fjord fisheries ordered by the County of Ringkoebing was carried in 2001-02 by scholars from University of Southern Jutland, Denmark (Frank Jensen, Eva Munk-Madsen, Eva Roth, Niels Vestergaard).

Commercial fisheries taking place in Ringkoebing Fjord has experienced a decline in terms of number of fishers/vessels as well as in catches.

The structure of fishing fleet fishing in Rinkoebing Fjord is composed of small vessels and gill netters below 20 GT/GRT. The larger vessels including the gill netters only fish in the fjord occasionally. The following numbers include all vessels participating in the fisheries in Ringkoebing Fjord.

Table 21. Number of fishing vessels participating in fishery in Ringkoebing Fjord.

	1995	1996	1997	1998	1999	2000
Gill netters <20 BT	44	68	81	49	49	43
Fishing Vessel > 20 BT	5	4	3	3	4	2
Other vessels	355	398	334	199	109	91
Total	404	470	418	251	166	139

Source: Jensen et.al. 2002.

Ringkoebing has experienced a dramatic reduction in number of fishing vessels fishing in Ringkoebing Fjord, except for the year 1997 where the number of gill netters was quite high as a result of the sluice practice was changed altering the salinity in the Fjord and made the flounder gather in the deeper parts of the fjord making them easier to catch. Especially the category 'Other vessels' have declined.

In the survey it is estimated that only two full-time fishers live entirely of the fjord fishery.

It is clear that the number of fishers is declining. The number of active commercial fishers (both full-time and part-time) in Ringkoebing is uncertain and according to different informants varies considerably. The estimations range from 35 to 112. The number of 35 is considered to be the most reliable when it comes to active fishermen whereas the number of 112 were those being registered as fishermen by the fisheries authorities. In 2003 there is one full-time pound net fisher in Ringkoebing Fjord (Jensen et.al. 2002).

2.1.2.2 Recreational fishery and angling

Table 22. Number of recreational fishery- and angling licenses (1995,2002)

	Recreational licenses			Angling licenses		
	2002	1995	Develop (%)	2002	1995	Develop (%)
Denmark	150,925	131,605	+15	33,888	32,126	+5
Funen county	5,535	4,744	+17	15,526	13,826	+12
Ringkoebing county	1,340	1,555	-14	6,843	7,052	-3

Source: Jensen et.al. 2002.

For a clarification recreational fishers are different from anglers in this context as they are allowed to use passive standing fishing gear as gill nets and traps on a small-scale basis. Each recreational fisher is allowed to use 6 pieces of fishing gear but with the restrictions that only 3 gill nets and only one fixed trap per recreational fisherman are allowed. The numbers of both angling and recreational licenses have increased. The development in the two counties is not the same. Funen county has experienced a large increase 12-17% in both types of licenses and part of the explanation for this could be that Funen county has had massive restocking programs for sea trout and a very successful

marketing of Funen as a “Sea Trout Eldorado”. Even though this effort is targeted at anglers this might have some effects on recreational fishers as well. In Ringkoebing County it is the quite opposite development at least for recreational licenses. The explanation for this given by an interviewee was that there was nothing to fish for; people simply did not bother to put out fishing gear.

The revenues from licenses are used to improve fish habitats, research and stocking. The total revenue in 2002 was Euro 4,212 Mio. (DKK 31.3 Mio.). In the budget for 2002 Euro 2.7 Mio. (DKK 20 mio.) was assigned to improvements of habitats and stocking in fresh waters (of which 43% was used on salmon) and Euro 511,440 (DKK 3.8 mio.) was used for stocking in marine waters (Danish Institute for Fisheries Research, www.dfu.dk, Fiskeridirektoratet, www.fd.dk)

The most important angling water body in Ringkoebing is the Skjern Aa (a stream that runs into Ringkoebing Fjord). This stream hosts a protected salmon stock, and the stream has been subject to a nature restoration project worth 33.6 million Euro where the improvement of the salmon habitat was one of the reasons given for putting the stream back into its natural flow (it was made into a channel in the 60’s). The main reason was improvement of the water quality. Research is still on going but there are strong indications that cormorants do eat a substantial amount of juvenile salmon migrating out of the Skjern Å (stream). This is by anglers considered to be a problem and a cost. In addition to angling in lakes, streams and in the sea there are quite a few ‘put and take lakes’. It is angling on commercial basis. Owners of ponds and small lakes stock their water bodies with fish and then allow anglers to fish these stocks for a fee. In Ringkoebing county there are 59 ‘put and take lakes’ and in Funen county there are 16 ‘put and take lakes’ (Danmarks Sportsfiskerforbund). These numbers are from the Danish Sport Fisher’s Association and according to them the accuracy of this number is uncertain and the actual number is probably higher. According to one informant some ‘put and take lakes’ do have problems with the cormorants. An indication of this was that one owner of a ‘put and take’ had shot 17 cormorants last year.

2.1.2.3 Comparison of economic benefits from commercial and recreational fishery

The comparison of the three types of fishery in Ringkoebing Fjord clearly show that the economic value of angling is significant and higher than the commercial fishery whereas the economic value of recreational fishery is insignificant.

Table 23. Economic surplus of **commercial fishery** on Ringkoebing Fjord

Economic surplus incl. salaries	Euro
Surplus	67,155 (DKK 498,960)
Capital Value (Interest rate 5%)	1,343,095 (DKK 9,979,198)

Source: Jensen et.al. 2002.

Tabel 24. Economic value of **angling** in Euro in Ringkoebing Fjord and surrounding areas (2000).

	4,000 Anglers
Yearly number of fishing days	50,600
Total yearly expenses	910,363 (DKK 6,764,000)
Economic Surplus	478,869 (DKK 3,558,000)
Capital Value (Interest rate 5%)	9,577,389 (DKK 71,160,000)

Source: Jensen et.al. 2002.

Tabel 25. Economic value of **recreational fishing** in Euro in Ringkoebing Fjord and surrounding areas (2000).

	500 Recreational Fishermen
Yearly number of fishing days	14,200
Total yearly expenses	Euro 120,458 (DKK 895,000)
Economic Surplus	Euro 14,939 (DKK 111,000)
Capital Value (Interest rate 5%)	Euro 298,789 (DKK2,220,000)

Source: Jensen et.al. 2002.

It was estimated in the socio-economic study of the fishery in Ringkoebing Fjord that only two full-time fishers live entirely off the fjord fishery. In 2000 commercial fishers in Ringkoebing Fjord caught 344 ton of fish with a catch value of Euro 309,150 (DKK 2,297,018). The derived employment effects of the commercial fishery were calculated to be 5.5 full-time employments in the fishery and 7.15 full-time employees in the derived effect up-stream (service and goods) and 7.7 employments in the derived effect down-stream (fish products). As a comparison the calculated total expenditures of overnights/stays/tourism in relation to angling was estimated to be between Euro 3.1–3.77 mill (DKK 23-28 mill.) and employment effects ranging from direct jobs 21-34 and indirect employments 18-47 depending on the type of stay chosen (Jensen et.al. 2002:59). It is clear from the above description of the fisheries and derived effects that the commercial fishery in Ringkoebing Fjord is of marginal importance in economic and employment terms contrary to angling which has a considerable significance when compared to other type of fisheries.

In relation to the cormorants this also indicates that the effect of cormorant on angling (e.g. predation on salmon) is a bigger issue than the impact on the commercial fishery.

In line with the comparison from Ringkoebing calculations of the value of angling in Funen reached an estimated value of approx. Euro 4-8 mio. (DKK30-60 mio.). As comparison the commercial fishery in Lillebaelt of 400 tons is worth approx. Euro 538,000 (DKK 4 mio.) (www.ulnits.dk, Danmarks Sportsfiskerforbund,2000). The analysis was used to suggest that commercial fisheries should be banned in the area and instead a nature park would give room to angling tourism worth Euro 9.4 mio. (DKK 70 mio) The report was criticized by fishing authorities to be misleading and partly based on incorrect data and the plans never went further (Danmarks Sportsfiskerforbund,2000).

2.1.2.4 Aquaculture

Aquaculture is a large sector in Denmark but there are in contrast to Italy no conflicts involving cormorants because it is intensive aquaculture in small ponds, which are covered by net systems to prevent predation from cormorants and other birds.

2.1.3 Tourism

Locally cormorants can have a negative effect on angling tourism. It is important to mention though that the massive stocking programs and the following positive development for the 'Funen Sea Trout Eldorado' project has been possible at the same time as there has been large colonies of cormorants in the area.

A number of tourism organisations and agencies were asked about the effects of cormorants on the tourism sector and all replied that cormorants were not an issue in a neither positive nor negative manner. In relation to nature tourism/ ornithology tourism cormorants were considered to be too common to be an attraction.

2.2 Stakeholders

2.2.1 Commercial fishermen

The presentation of fishermen's perceptions is based on interviews with one full-time pound net fishermen from each of the study areas.

Fishery

In line with the statistical data presented both fishermen stated that the numbers of pound net fishers have declined for 2-3 decades. It was perceived by both fishers that the conditions for pound net fishery have never been as bad as now. According to one of the fishermen there is no future for this type of fishery:

"I believe this is the last generation of pound net fishers...it is too much work and it is not economically feasible anymore"

This development is considered to be also a social cost because of the long history of pound net fishing, which has often been passed on by generations. One of the informants expressed that this development was unfair because pound net fishery could be a sustainable fishery both ecologically and economically if it was not for the cormorants. In one study area the fishery is believed to be affected by a man-made change of salinity as particular one economic important fish stock apparently has collapsed or at least has been absent this year. This fact has diminished the economic importance of fisheries in this area to an all time low level.

According to one fisher the pound net fishing does not make any significant economic contribution anymore as the fishers have become so few and the fish resources so scarce. For the respondents personally the fishery provides them with a livelihood and is therefore a benefit.

Cormorants

The fishermen interviewed regarded the presence of the cormorant as mainly a cost. One of the fishers did not believe that the cormorant has any meaningful function in the Danish ecosystem. They both accepted that the cormorant should be part of the Danish ecosystem but they stated that the population need to be a lot smaller in order to make the presence acceptable from an economic point of view.

However, both fishermen seemed to be very impressed by the fishing and diving capabilities of the cormorant and despite their harsh feelings towards the cormorant their fascination indicate that the fishers in some occasions have personal benefits from their encounters with cormorants.

Conflict

According to the informants pound net fishermen clearly perceive the cormorant as a threat to the pound net fishery because of the predation on fish caught in the nets. The cormorant is blamed to be on of the most important causes why pound net fishing is not economically feasible anymore.

However, in one of the research areas, which is a fjord with brackish water, the issue of man made changes in salinity was considered the main problem and the reason behind a collapse in the flounder stock in the fjord.

Both fishermen stated that they were not against the cormorants as such it was only a matter of the size of the population. The argument was that with the current size of the population it is impossible to make a living from the pound net fishery, because the cormorants manage to get to the pound nets before the fisherman too often.

“We don’t mind the cormorants – we just need to the population down to a level where they do not do as much damage.”

Both fishermen stated that the cost of the cormorant were high. Mainly because cormorants are capable of emptying a pound net in a short period of time or to injure or stress the fish to death (herring). One fisher said that he had often experienced to have to throw out a ton of dead herring from on of his pound net because they had been stressed to death. But one of the fishermen also said that the extent of damages caused by cormorants is an area where scientists lack knowledge.

The fishermen regarded the cormorants’ predation on fish to be a large problem for the whole coastal fishery because of the cormorants’ predation on juvenile fish, which makes the cormorant a large cost to the whole fishery.

Both fishermen also expressed frustration over the fact that the conflict has been going on for decades and they feel that they have been ignored by everybody, even if they both felt that they knew more about the impacts than anybody else because of their daily encounters with the cormorant.

It was stated by a representative from an association of fishers that this aspect of the conflict is very much a psychological cost which have made many pound net fishers give up. A perception that corresponds with statements heard from fishers. So the fishermen have large social costs from the conflict.

From an economic point of view the commercial fishery potentially affected by cormorants is of little importance in neither of the two study areas. For the individual pound net fisher cormorants are a problem but not the only problem when it comes to the decline of the fishery. In a larger economical context this type of fishery is insignificant but the cormorants could be the determining factor for whether pound net fishery is feasible or not.

The fishermen very clearly see the conflict as a cost.

According to one fisherman the anglers were victims of the cormorants as well because of the predation of released juvenile fish in the spring restocking program inflicting costs on the anglers associations.

Mitigation Measures

Hunting

None of the fishers interviewed believed that hunting could be an effective mitigation measure because of difficulties in hunting cormorants because of their shyness. This counted as well for the possibility to kill cormorants within 1000 m of fixed fishing gears. This is considered to be of little use because the cormorants are so difficult to get within shooting range of. One of the fishers stated that he only occasionally killed cormorants near his fishing gear and only when the opportunity was obvious. None of the fishers ever went specifically with that purpose. The implication of this is that there are no cost or benefits related to hunting as a mitigation measure.

If hunting/killing of cormorants was to be used on a larger scale as a way of reducing the population one fisher expressed that it would be considered to be unacceptable from an ethical perspective and thereby a social cost.

Oiling of eggs

Both respondents expressed that they believe in population control on the nests oiling eggs even though that the current level of oiling is not sufficient from their point of view.

“I believe we have to get down to hatching of eggs in 50 nests.”

The oiling takes place at no costs for the fishermen; at the contrary it was perceived that this type of population control is very beneficial to them. In one area the size of the population had been declining the last year but it was not clear for the informant whether this was caused by the mitigation measures or food shortage.

Net coverings

The only technical mitigation measure of any significance is net coverings of the pound nets. But there is little belief in net coverings being effective and the general impression

expressed by one of the fishermen interviewed was that it was not worth the effort. The cormorant is still able to enter the pound net by the entrance. For this fisher there are no benefits or costs associated with coverings, as he did not use any. The other of the fishers has done much experimenting him self and he believed that coverings could help and that it would be beneficial to use them.

Both fishers saw the new management plan as a positive development but at the same time they stated that it came too late. The management plan does not address the question of regulating the size of the current population adequately.

Hunters

This information is based on two respondents who turned out to be hunters, but were interviewed for other reasons.

In one of the study areas experimental hunting is taking place and many hunters have applied for a license. The hunters appeared to be very eager to hunt and to help reduce the population and this possibility is perceived as a social benefit.

However, few of the hunters given a license have actually succeeded in shooting a cormorant and from those hunting only a few have shoot more than five. The explanation given for this by foresters was that the hunting was too difficult and time consuming implying that the costs of actually hunting cormorants is too high. Hunters would only hunt cormorants if hunters ran across cormorants on the hunt for other birds.

One of the informants said that hunting could not be mitigation measure unless cormorants were shot on the nests and that would be unethical.

In terms of economic benefits it is generally perceived by hunters to be a problem that there is little use of cormorants and to some hunters this fact makes it unethical to hunt cormorant. Cormorants are eatable and everyone has heard of that but few like to try it out.

Hunting is a social benefit.

2.2.2 Environmentalist

Environmentalist perspectives are based on two interviews.

Fishery

According to the respondents the role of pound net fisheries is having little importance. The type of fishery was described as outdated and insignificant in terms of economic importance. The importance of the fishery has been declining for decades even before the cormorant became an issue.

One of the informants was of the belief that the pound net fishery would be extinct in ten years.

Cormorants

The emergence of a large population of cormorants is perceived as a unique story of success and improving the value to the landscape.

It was stated by one of the respondents that in some local cases the presence of the cormorants could have economic costs for pound net fishers, but overall the presence of cormorants was said to be a benefit because they play an ecological role keeping fish stocks healthy by eating sick fish etc. Overall the presence of the cormorant is regarded as a benefit for the Danish public.

It was expressed by one informant that it is a conflict of cultures rather than an ecological or economical conflict and in that respect the case of the cormorant was beneficial to shed light on the difference between a utility-based perception of nature and a more romantic perception of nature.

One of the respondents was of the opinion that talking about the costs inflicted by cormorants was speculative because the economic cost had never been investigated. But regardless of a lack of such investigation he stated that cormorants primarily eat fish that are not for human consumption.

Conflict

The two respondents have no economic costs because of the conflict. But one of the respondents representing an environmental organisation had managed very much to influence the formulation of a cormorant policy and regarded this influence as a benefit.

Mitigation measures

The environmental organisations are not involved in mitigation activities and have no economic cost or benefits of the conflict. For both respondents it was however perceived as a benefit that the experimental hunting and the effectiveness of protective hunting near fishing gears is turning out to be very limited. One of the respondents expressed that an eventual large scale protective hunting and to some degree the experimental hunting taking place would have large social costs associated because the public in general would not accept killing cormorants for no purpose.

One of the respondents was in doubt whether development of mitigation measures as net coverings was an option. On one hand he was of the opinion that development of mitigation measures was important to alleviate the pound net fishers' problems here and now. On the other hand he saw it as a waste of resources in the long run because basically the fishery is outdated and doomed to die if no technological innovations are made soon.

The same respondent was of the opinion that the only justification for using resources for population control was that the cormorant issues could be seen as a learning example of different perception of nature. Both informants were of the belief that from an ecological perspective the costs of doing population control are unacceptable because the cormorants are not constituting any problem in the Danish nature and that the population will reach an equilibrium by itself.

One of the environmentalists saw the management plan as beneficial because it had the function of being a frame for discussions for the policy makers.

2.2.3 Recreational fishers

Fishery

It is important to distinguish between recreational fishers using passive gears as gill nets and traps and anglers. Recreational fishers benefit from their fishery. The benefits are social and personal more than economic because commercial activities (sale of fish etc.) are prohibited for the recreational fishery. However, some illegal sales do take place but it is very difficult to verify and quantify.

The anglers do provide significant economic input into local economies through the expenditures on fishing permits, gear and tackle and lodging.

In one of the areas one respondent said that the number of active recreational fishers fishing in the fjord was decreasing because of the collapsed flounders stock resulting in people not bothering to put in an effort to fish with passive gears.

Cormorants

According to one informant the presence of cormorants in that area, where the establishment of cormorants was something new, was an improvement of the fauna. However, the magnitude of the presence was a problem, but if the population could be reduced the cormorant could only be a benefit.

Conflict

The presence of cormorants is perceived by the respondents as inflicting costs on both the recreational fishers and the anglers because of cormorant predation on restocked fish, and the assumption that cormorants can be partly blamed for the declining fish stocks in the coastal areas. For the anglers the cormorants' predation on restocked constitutes a problem. The extent of the problem is unknown but is perceived as a serious problem. However, the conflict is mainly limited to the period of releasing juvenile fish in the early spring.

The recreational fishers using traps do experience the same kind of problems as pound net fishers meaning that they are in a direct conflict as the cormorant eat the fish caught in the gear but the extent of the problem is also unknown.

In general the conflict is seen as a cost to the recreational fishers and anglers because cormorants eat restocked fish in salt and fresh waters.

Mitigation measures

Anglers do have cost in relation to finding methods to release smolts and juvenile fish in ways that minimize the predation on them. This explorative approach to restocking is very new and the costs associated are low.

The recreational fishers and anglers benefit from the mitigation carried out by the authorities and one of the informants was of the opinion that the oiling of eggs was well worth the costs.

2.1.4 Tourism

Fishery

An economic side effect of the commercial pound net fishery is the positive effects the existence of a coastal fishery has on the coastal tourism, but this effect is difficult to quantify though. The presence of visible fishing gears, fishing vessels and harbours with activities are considered to a benefit for tourism. This counts for more or less all types of coastal fishery in inner waters.

The economic effect of the recreational fishery (fishing tourism) is significant. The expenditures on fishing permits, gear and tackle and lodging are more important inputs to local economies than pound net fishing.

Cormorants

There were no interest in cormorants from a tourist perspective according to the tourist organisations and the potential was considered to be small because of the abundance on the European level. A problem in relation to cormorants as object of tourism is that access to the colonies or the near proximity here of is closed to the public.

The only positive came from an informant who was confident that a museum exhibition about the cormorant and its history could be a potential tourist attraction. Otherwise there were no cost or benefits associated with the cormorants.

2.2.5 Authorities and public institutions

The authorities interviewed are two persons having management responsibilities for the management plan and one person in a county administration

Fishery

All were of the perception that the commercial fishery affected was of no large economic importance anymore as fishery in general in the inner Danish waters is very reduced and especially the numbers of fishermen living full time of pound net fishery is very limited.

The costs of cormorants were small but for some individuals they could be significant.

The person interviewed from the public administration in one of the study areas believed that it was rather the small harbour communities that could be considered important and that cost was related to the potential loss of these environments not the actual value of the fish landed.

There are no costs related to the fishery as long as no over fishing takes place, but the economic benefits are regarded as small.

Cormorant

The return of the cormorant in the Danish landscape was perceived to be a large benefit to the population of Denmark. They all saw the cormorant as a natural part of the ecosystem with a right to be here. They were all very impressed by the cormorants for its ability to fish and adapt to the environment.

At the same time one of the informants was of the opinion that the presence of cormorants in an area could affect some of the local residents' or users' perception of the natural qualities negatively.

The other respondents had the experience that everybody even fishermen recognised the cormorants' position as being a natural part of the Danish fauna.

Another respondent was of the opinion as well that the existence of a well thriving population of cormorants was an improvement for the Danish landscape in line with the swan. This person also believed that the cormorant could be of touristic value and was as well of the belief that there is a potential for bird tourism. However, the fact that the colonies are placed in protected areas hindering people from observing them was found to be a limiting factor.

The cormorant was overall seen as a benefit even though one of the informants was awaiting the results from ongoing cormorant diet analyses. This informant also believed that locals would perceive the presence of cormorant in some places as a social cost.

Conflict

The three interview persons all expressed that everybody has an opinion on the cormorant but as one of them put it:

“The cormorant as a species evokes many feelings. Everybody has an opinion about it but it is not always based on knowledge when people take up a position on the issue.”

This person believed it would be beneficial if people in general knew more about the problems and the extent of those. Two of the respondents were of the opinion that the cormorant is generally disliked in the public. Possible reasons stated for why the cormorants are so disliked is that they are very visible birds in nature and when nesting in trees the effects are quite visible and furthermore it has been easy to link the cormorant to the declining fish stocks. It was stated by one of the managers that it was a paradox that fishers often proclaimed that there is no fish left but that apparently there is enough fish to support a large population of fish eaters.

The three people's perception of the extent- and economic costs of the conflict differed a little.

As a starting point they all expressed something in line with one of the administrators:

“I do understand the problems in relation to the fishery and recognise that it (the cormorant) is a species that can create problems.”

This person believed that the pound net fishery could be affected negatively locally whereas another person

“Was inclined to believe that there might be something about it”

But that scientific evidence was missing. But they all were certain that the declining fish stocks and following economic hardship experienced by pound net fishers was not caused by cormorants alone. Therefore the economic costs of the conflicts were considered to be low.

It was acknowledged by two of the informants that the cormorant probably constitutes a problem for restocking programs but they were uncertain of the extent of the problem.

Mitigation measures

All three respondents were of the opinion that the management plan provided the necessary regulatory tools to manage the cormorants but they also questioned whether a thriving population of a protected species should be regulated.

Between the two managers there were disagreement on the costs of regulating the cormorants. One believed that the costs of regulating the cormorants were disproportionate high compared to other non-game species. This was to some degree contradicted by the other administrator who believed that cormorants should be compared to species inflicting damage on e.g. agriculture regardless of their being game or non-game and that the actual cost of oiling are low.

However all three expressed strong doubts that the mitigation efforts in terms of oiling eggs and experimental hunting was worth the costs when it came to long term effectiveness if the goal was to reduce the population. They saw regulation to be an international coordinated task rather than a national one.

The mitigation measures were seen as costly and maybe not that efficient from an ecological point of view but beneficial and effective as political tools in the sense that those in the public complaining about the cormorants became satisfied by the fact the issue was on the political agenda and that some kind of action was taken.

The informant from the county knew of a local angling association that would try to develop new ways of releasing juvenile fish in order to save them from being eaten by the cormorant.

2.3 Summary and comparisons

2.3.1 Agreement among stakeholders

There was agreement among stakeholders on several issues.

It was stated in varying degrees that the cormorant is a natural part of the Danish fauna and most perceived the return and presence of cormorant to be a benefit. However, it was

difficult for the commercial fishers to see any benefits from the presence of cormorants but they acknowledged the right of the cormorant to be in the Danish landscape. Recreational fishers and anglers to a much higher degree accepted the cormorant as a natural part of the Danish fauna.

All stakeholders agreed that cormorant predation on fish in pound nets can be a problem locally. But some stakeholders were sceptical of the magnitude of the problem though and they wanted scientific studies to be undertaken with the implication that they questioned the validity of the fishermen's complaints.

There was agreement among most stakeholders (except the environmentalists) that anglers do have a problem with the cormorant as well. The extent of the problem was uncertain though.

All stakeholders agreed that hunting, as a mitigation measure would be ineffective because of the difficulties of hunting cormorants. Apart from two persons (representatives from a fisheries- and an environmental organisation) there was also agreement that doing population control by killing cormorants on the nests would be ethically problematic and not an option. Even though it was expressed by several stakeholders that it probably would be the only way of reducing the population if such a strategy was decided upon. The two representatives in opposition to this both expressed that it was hypocritical to use the terms ethical in this context because oiling eggs is a way of concealing what is actually being done. At the same time as oiling eggs is not an efficient mitigation measure whereas shooting cormorants on the nests would be the most effective way of doing population control.

All stakeholders were of the opinion that pound net fishery is a type of fishery that is most likely to disappear within a not to distant future because of the multiple difficulties it is facing.

2.3.2 The implications of this agreement for policies and potential mitigation measures

Following the above hunting should not be part of further development of mitigation measures when the on going research on experimental hunting is ending because there is agreement among stakeholders that hunting is not a solution to anything.

There seem to be agreement between stakeholders on having doubts about the effectiveness of the mitigation measures used according to the plan if the fishermen's problems are to be reduced. In the present management plan there seem to be a discrepancy between the formulated policy of reducing the problems of the fishermen and the mitigation measures in place because the mitigation measures are not directly targeting what the fishermen perceive to be their problem – the actual size of the existing population. The fact that the population of cormorants with the plan is somehow controlled have a psychological influence but it is difficult to see how the plan can actually mitigate conflicts when even managers question the effectiveness of the

mitigation measures in place. This should influence the future objectives of the management plan.

2.3.3 Disagreement among the stakeholders

Despite that everyone agreed that cormorant predation on fish in pound net can be a problem locally there was reluctance to accept this as a fact without scientific evidence to back it up. As long as this evidence is lacking it will be difficult to have a constructive dialogue between stakeholders.

There was disagreement on the aspect of whether the population of cormorants needed to be controlled. The environmental stakeholders and to some degree the managers as well questioned the rationale behind the population control. Both groups saw it as a political act rather than an ecological one because the chosen mitigation measures to a large extent does not reduce the population (and thereby the problem of the fishermen) considerably but only give an impression thereof.

Underlying these two disagreements there is a fundamental disagreement on to what extent the cormorant can be said to do damage. Fishers believe that the cormorant is causing damage to not only them but to fish stocks in general whereas other stakeholders do not believe that the extent of damages that can justify interfering in ecological balances.

2.3.4 The implications of this disagreement for policies and potential mitigation measures

There seem to be a fundamental disagreement between stakeholders on whether management of cormorants is necessary at all. The most significant disagreement is caused by different perceptions of nature. But another important reason for this disagreement is the question of whether or to what degree cormorants inflict damage on the pound net fishery. As long as there is no scientific evidence supporting the fishermen's claims it will be difficult for the fishers to convince both environmental organisations and managers that cormorants constitute a problem. This is not only in terms of damage in relation to pound net fishing but also investigations of whether cormorants can have a significant negative effect on local fish stocks and the same counts for the recreational fishermen's complaints. The issue of knowledge on the magnitude of the damages done by the cormorant is critical for the future policy process.

Appendix

Age structure of population 1981.

1981	Age groups (Years)				
	0-17	18-29	30-49	50-64	65 -
Study Region	25,4	17,5	26,7	15,9	14,5
Denmark					
Funen	25,5	17,0	26,0	16,1	15,4
County					
Bogense	25,0	15,1	23,4	17,5	19,0
Middelfart	26,2	14,5	26,7	16,1	16,5
Ringkoebing	29,2	18,1	25,8	14,6	12,3
County					
Egvad	29,1	16,2	24,9	16,1	13,6
Holmsland	33,1	19,0	25,8	12,9	9,2
Ringkoebing	29,0	17,0	24,8	14,8	14,4
Skjern	28,8	16,1	23,6	15,6	15,9

Source: Statistics Denmark – www.statistikbanken.dk, own calculations

Chapter Three: Social Impact Assessment from Finland

3.1. Introduction.....	2
3.1.1. Research area	3
3.1.2 Socio-economic characteristics of the study region	4
3.1.2.1. Land use and population characteristics	5
3.1.2.2. Employment.....	5
3.1.2.3. Economic characteristics.....	6
3.1.2.4. Fisheries on the study area.....	6
3.1.2.5. Nature conservation	7
3.1.2.6. Tourism.....	7
3.1.3. Implications of the socio-economic characteristics to the model conflict	8
3.1.4. Decision-making structure and responsible authorities	8
3.2. The Stakeholders.....	9
3.2.1. Fishermen	10
3.2.1.1. Fishery.....	10
3.2.1.2. Seals	10
3.2.1.3. Conflict.....	11
3.2.1.4. Mitigation measures	12
3.2.2. Hunters	14
3.2.2.1. Fishery.....	14
3.2.2.2. Seals	14
3.2.2.3. Conflict.....	16
3.2.2.4. Mitigation measures	16
3.2.3. Environmentalists	18
3.2.3.1. Fishery.....	18
3.2.3.2. Seals	18
3.2.3.3. Conflict.....	19
3.2.3.4. Mitigation measures	19
3.2.4. Tourism	20
3.2.4.1. Fishery.....	20
3.2.4.2. Seals	20
3.2.4.3. Conflict.....	21
3.2.4.4. Mitigation measures	21
3.2.5. Additional sources of information	22
3.2.5.1. Newspaper.....	22
3.2.5.2. Seals damage estimates.....	23
3.3. Summary and comparisons	27
3.3.1. Agreement among the stakeholders	27
3.3.1.1. The implications of this agreement for policies and potential mitigation measures	27
3.3.2. Disagreement among the stakeholders	28
3.3.2.1. The implications of this disagreement for policies and potential mitigation measures	28
3.4. Final remarks.....	28

3.1. Introduction

This report is a contribution to a EU –funded RTD project named FRAP. The project aims at developing a procedural framework for action plans to reconcile conflicts between large vertebrate conservation and the use of biological resources, using fisheries and fish-eating vertebrates as a model case.

The Finnish study deals with interactions between grey seals and coastal fisheries in Finland. The Kvarken region in the Bothnian Bay is selected as an illustrative example of the interaction. On the Finnish side the region belongs to the county of Ostrobothnia. The problem that the regional actors are dealing with is the economic losses grey seals cause to fishing in a situation of rapidly growing seal populations. However, the number of grey seals in the Baltic Sea area has been very low and it is not certain that the population has recovered. Grey seals have had serious reproduction problems, probably as a result of contamination of the Baltic Sea.

This report is the first report of WP6 "Local mitigation efforts and stake-holder analysis". The report describes the social and economic impacts of the model conflict. The report is based on the stakeholders' perceptions on the impacts, which helps us to understand what different ways of seeing the conflict there are in the model region.

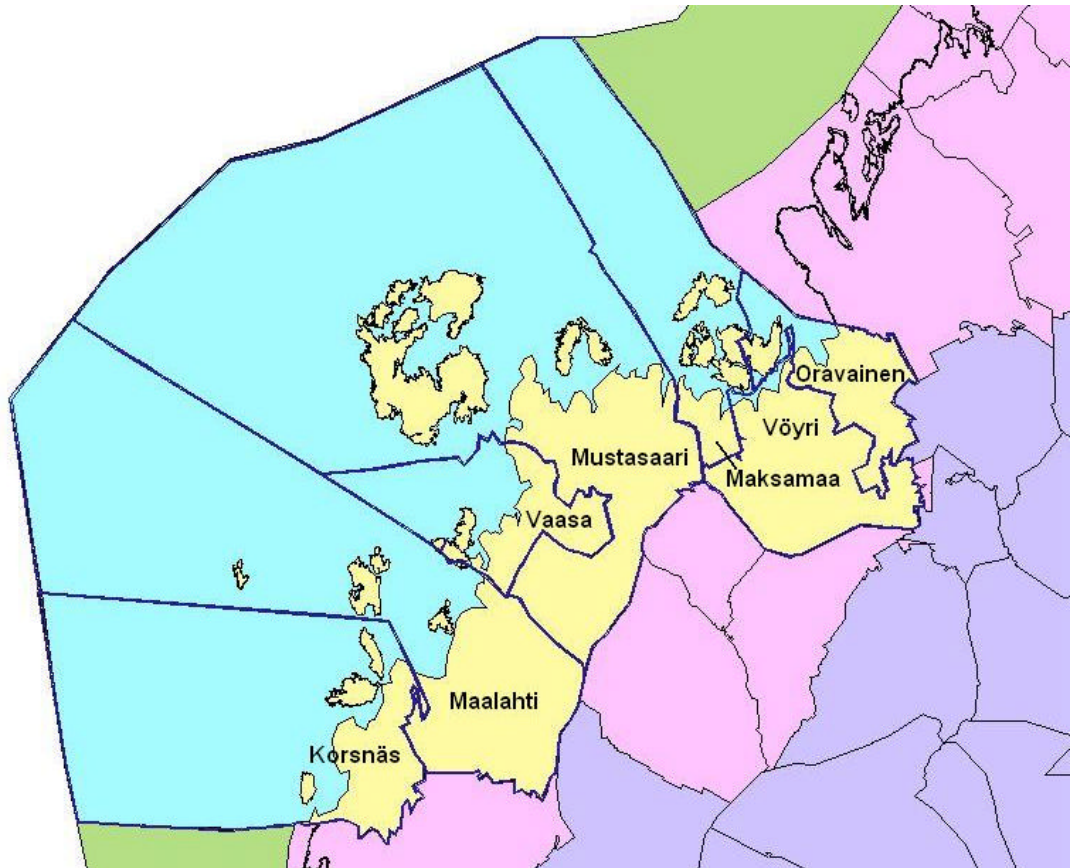
3.1.1 Research area

The model region in Finland is the Vaasa subregion, which is one of the four subregions in the county of Ostrobothnia. The research sites, that are studied more closely than the whole model region, are the municipalities of Mustasaari and Maalahti (see figure 2).

Figure 1. Kvarken in the Northern Baltic Sea



Figure 2. The model region (yellow) and the municipalities in the region



3.1.2 Socio-economic characteristics of the study region

The model region – Vaasa subregion – is in a sense Finland in miniature. Its economic basis, income rates, employment figures and population trends do not differ very much from the national averages. However, there are big regional differences within the study area.

The county council of Ostrobothnia describes the county as "an area of moderate economic growth and low level of social problems". Compared to Finland on average, unemployment rate is very low in Vaasa sub region as well as in the whole county of Ostrobothnia. This might be due to the strong tradition of entrepreneurship. When considering economic characteristics and education, Vaasa sub region is doing a bit

worse than Finland on average, but better than NUTS-levels 2 (Mid-Finland) and 3 (county of Ostrobothnia).

3.1.2.1 Land use and population characteristics

The land and sea use differ also greatly in the municipalities of Vaasa subregion. Sea and archipelago cover more than half of the total area of Korsnäs, Maalahti, Mustasaari and Maksamaa while Vöyri and Oravainen have a short coastline. The municipalities, Mustasaari and Maalahti, that are the research sites in the Finnish model region, are both located close to the sea, and more than half of the area of both is either sea or archipelago. The land use is also very similar: 75-80% of land area is covered by forest, 15-20% by agricultural land and 3-4% by artificial areas. However, the settlement structures differ. Maalahti is a typical rural municipality whereas Mustasaari is partly quite urban, which can be seen in the population density (table 1).

The population in Finland is ageing on average, which is also true for the municipalities of Maalahti and Mustasaari, but the population of Mustasaari is younger than in Maalahti. The proportion of people in active age – 15-64 years – is even a bit higher than on average in the county of Ostrobothnia. Another trend in Finland is that people are moving from rural to urban areas. In the more urban municipality, Mustasaari, the population is growing (table 1.), but in Maalahti it is getting smaller.

Some characteristics of population structure and economics in Maalahti and Mustasaari. The data is from 2002. Source: Statistics Finland.

	Area	Population	Change between 1995 and 2002	Population density	Population between 15 and 64 years	Swedish speaking %	Over 14-years old people with university degree %	Unemployed % of labour force	Average income euros/year	Proportion state subsidies municipal income %
Mustasaari	829	16 865	+3,4%	20,4	64,6	72,3	26,7	6,8	17 200	29
Maalahti	511	5 583	-4,1%	10,9	60,4	89,1	17,7	6,5	14 000	46

The proportion of Swedish speaking people is high in both Mustasaari and Maalahti (table 1.). The proportion is higher in Maalahti than in Mustasaari, but compared to the average in Finland, 6%, both figures are big. Differences in education between rural and urban areas are clear. The level of education is much higher in Mustasaari than in Maalahti.

3.1.2.2 Employment

Since 1995, employment has been increasing on all NUTS -levels, but a potential problem in the future is that industry's importance as an employer is decreasing while service sector is becoming more important. Unemployment rate has decreased also in both Mustasaari and Maalahti. In both municipalities, approximately 50% of the population belong to labour force, and 93-94% are employed. Services employ more than half of the labour force on all NUTS-levels, and its importance is growing. Industry is also an important employer in the model region. Primary production employs only 5% of the labour force in Vaasa subregion.

The structure of employment differs a little between Maalahti and Mustasaari. In both municipalities, services are the most important employing sector, but the importance is smaller in Maalahti than in Mustasaari. Also industries employ a greater proportion of people in Mustasaari than in Maalahti, while primary production is more important in Maalahti (15%) than in Mustasaari (6,9%).

3.1.2.3 Economic characteristics

No GDP -data was available for the municipalities, so we used the GDP-data of Vaasa sub region in the WP5 economical analysis. GDP has grown steadily in Finland since 1995, but the growth has been quite moderate in Vaasa sub region. The value added is also smaller in Vaasa sub region than in Finland on average.

The most important sectors from the GDP viewpoint are services and industry that provide 39 and 35% of the value added, respectively. Public sector provides 23% and primary production 3% of the value added. In the municipalities of Mustasaari and Maalahti, these figures are probably a bit different, because of the different structure of production.

The average income has grown by 23,6% in Finland since 1995, but the growth has been moderate in Vaasa sub region. The average income is remarkably smaller in Maalahti than in Mustasaari (table 1.), and in both municipalities smaller than in Finland on average (18 900 euros/year).

The municipal tax percentage is bigger in Maalahti than in Mustasaari, but the average taxes paid by an inhabitant are much smaller in Maalahti (1881 euros/year) than in Mustasaari (2188 euros/year). State subsidies for Maalahti (1624 euros/inhabitant/year) are bigger than for Mustasaari (897 euros/inhabitant/year), and the proportion of state subsidies of the municipality's income is greater in Maalahti than Mustasaari (table 1.).

3.1.2.4 Fisheries on the study area

Although Kvarken area is one of the three most important fishery areas in Finland, commercial fishery is not very important in the model regions economics. But seen from the perspective of fisheries in Finland in general, the model region is one of the few areas where marine fishing still is an occupation to relatively large group of people. In the model region the largest number of fishermen is occupied in coastal fishing. There are a few off-shore fishermen working on trawlers, too. When seen on smaller scale, for instance in the Kvarken archipelago scale, the importance of fishery is set in a very different perspective, since large proportion of fishermen are living in the archipelago.

In the Vaasa subregion the number of coastal fishermen is highest in the municipality of Mustasaari, where there were 82 costal fishermen in 2002. In the whole model region the number of coastal fishermen has decreased by 13% since 1996. The biggest proportional reduction has occurred in Korsnäs (-21%), followed by Maksamaa (-19%), Mustasaari (-15%) and Maalahti (-10%).

The most important fish species in weight is herring, followed by whitefish and smelt. Economically the most important species is whitefish. The economical importance of salmon is very small, but salmon fishery has a long tradition and it has a great symbolic value. The catches have decreased on the study area since 1995, although there is large year-to-year variation. The biggest reduction has occurred in herring catches.

If the weight of the total catch is considered, the most important gear type is herring trap. However, gill-nets, salmon and whitefish traps and other gear are important especially when fishing economically valuable species.

The use of different gear varies both temporally and locally. Trap fishing takes place mainly in the outer archipelago, whereas gill nets are used closer to the mainland. The inner archipelago area is very shallow, and this restricts the number of possible gill net sites. Nets are usually placed closer to mainland in autumn than in spring and summer.

According to the fishermen, seal damages have increased steadily since 1996, but this is not possible to prove with statistics because of lack of reporting. Most damages have been reported in whitefish and salmon fishery.

In coastal fishery, May, June and July are the most important fishing months. The catches have, however, decreased most during these months since 1995. Seal damages reported by the fishermen have been biggest in May-July, and were during this period much bigger in 2001 and 2002 than earlier.

3.1.2.5 Nature conservation

The nature of Kvarken region is very peculiar due to the shallow coastline, land upheaval, extensive archipelago and great salinity gradient. The bird and fish fauna are very rich, and there are several unique nature types. Especially the strong land upheaval had formed special habitats in the area. New land is rising from the sea and shallow bays are closed as little lakes and ponds. The archipelago is quite extensively protected.

About 30% of the sea and archipelago area is protected in the municipalities of Maalahti and Mustasaari. Most of the protected areas are part of Natura 2000-network, and national conservation programs protect the rest. There is also one seal reserve in the municipality of Mustasaari. The proportion of protected area is quite big, but usually the use of the areas is not restricted very much. Hunting and fishing are allowed on most protected areas with a permission of the owner and authorities. However, hunting is not allowed anywhere on the seal reserve, whereas fishing is forbidden in the core area. The place used to be a very profitable whitefish fishing area, and the all fishermen didn't agree on changing it into a seal reserve. There are few protected areas on the land.

3.1.2.6 Tourism

The economic importance of tourism is growing in Finland, but tourism's contribution to the employment and economy is smaller in Ostrobothnia than in Finland on average. The regional council of Ostrobothnia sees lots of growing potential in both recreational and business tourism, and has recently published a tourism strategy for the years 2003-2006.

Nature, culture, archipelago, fishing and sea are mentioned among the things that tourists are looking for and that should be starting points for the development of tourism on the area. The regional council of Kvarken area also mentions eco-certified tourism as one of the goals of the future development.

Due to good flight and train connections, Vaasa subregion is easy to reach. The accommodation capacity seems to be adequate, too. According to the regional council, the biggest deficiencies are in services and activities, and especially in marketing.

Nature tourism seems to be a growing sector in Vaasa sub region, but it also seems to be quite unorganised. Some kind of small-scale seal safaris have are available, but as there are no official companies responsible for them, we couldn't get any specific data about them.

Nowadays the most important tourist groups in the county of Ostrobothnia are families and business, but also public communities and associations. In future the target group is believed to include also more leisure activity groups, school classes, elderly people, foreigners and people interested in the local culture.

3.1.3 Implications of the socio-economic characteristics to the model conflict

Regarding the seal conservation and nature conservation in general one can conclude from the above description of the socio-economic that these issues are important in the region. There are a lot of protected areas. The seal reserve in the area is one of the seven grey seal reserves in Finland.

The demographics show that population in the rural areas is becoming older. This trend influences fishery in the region as well. Fishermen are mostly rather old and recruitment to the industry is weak. The number of fishermen is declining.

The economy in the area is growing and there are employment opportunities. Already now many of the fishermen have other jobs. Mostly these jobs are not in the archipelago area, but improved road connections to the mainland makes it possible to live in the archipelago. Living in the archipelago allows continuing part-time fishing.

3.1.4 Decision-making structure and responsible authorities

Management of the relevant issues in the conflict between grey conservation and coastal fishing in Finland fall under three administrations – fisheries, hunting and nature conservation. The structure of these administrations is presented below.

The Ministry of the Environment, which was established in 1983, is responsible for environmental protection and nature conservation policy. At regional level there are 13 Regional Environment Centres in the country. The regional centres have an important role in planning and implementing nature conservation in their areas. The Finnish

Environment Institute, which is a part of environmental administration, is a research institute. Nature conservation research is one of the main research areas of the institute. It has a responsibility of combining national environmental monitoring data. The Forest and Parks Service handles management of protected areas within their regional units (6 units in Finland).

The Ministry of Agriculture and Forestry is responsible for fisheries policy. The Ministry is also in charge of hunting. This is interesting for the conflict, because grey seal is classified as a game animal in Finland. This means that decisions on the hunting restrictions of grey seal are made under Hunting Act by the Ministry of Agriculture and Forestry. In the Ministry the same unit, i.e. the Fish and Game unit, is in charge of both fisheries and hunting policy.

Game management administration has also a regional structure. The ministry in charge of the policy that is implemented in 15 Game Management Districts. Under the districts there are 298 Game Management Associations. The districts and associations are hunter's organisations as well as game management authorities. In other words, implementation of hunting policy is delegated to hunters to a certain extent.

Finnish Game and Fisheries Research Institute (FGFRI) is a research institute of the fisheries administration. It conducts fisheries research and is responsible for monitoring the state of commercially exploited stocks. The Institute gets monitoring data from the regional authorities. It also monitors the stocks of game animals in Finland. The institute monitors grey seal populations.

At regional level fisheries policy is implemented by the Fishery Unit of the Employment and Economic Development Centre (so-called TE-centre). The Centres monitors and supervises fisheries in their regions and administers structural funds and other financial resources. There are 15 TE-centres in Finland.

Coastal waters up to 500m from the 2 m depth curve are privately owned in Finland. The ownership is based on the system that land property by or near shorelines includes a right to certain water area. Adjacent water areas are managed by statutory fishery associations (SFAs) in a sort of co-management arrangement. Associations give or sell fishing permits on their areas, which determines where fishermen can fish. Since 1982 the state introduced a new management system – Fishery Region – that aims at management of wider water bodies than the statutory fishery associations. Water areas of statutory fishery associations, water areas managed by individual owners and state's waters near the coast were combined into Fishery Regions. There are three fishery regions in Vaasa sub region, and they are illustrated in figure 3.

3.2. The Stakeholders

The most relevant stakeholders' perceptions on the conflict are presented below. Fishermen, hunters, environmentalists and tourism are the main stakeholders. Other

Chapter Five: The Social Impact Assessment from Italy

5.1. SOCIO ECONOMIC PROFILE OF THE STUDY AREA.....	3
5.1.1 Government jurisdictions and responsibilities related to FRAP issues	3
5.1.2 Population	4
5.1.2.1 <i>Size of population</i>	4
5.1.2.2 <i>Education</i>	4
5.1.2.3 <i>Ethnic makeup</i>	5
5.1.2.4 <i>Average income</i>	5
5.1.3 Basic economic characteristics	5
5.1.4 Geographical characteristics	6
5.2. DESCRIPTION OF MODEL REGION STAKEHOLDERS ITALY.....	7
5.2.1 Stakeholders identification and interviewing methodology	7
5.2.2 Table of identified stakeholders:	7
5.3. BRIEF PROFILES OF THE STAKEHOLDERS GROUPS AND OF THEIR CONFLICT PERCEPTIONS.....	9
5.3.1 STAKEHOLDER “PUBLIC INSTITUTIONS”	9
Costs and benefits of the fishery: social and economic.....	10
Costs and benefits of the conflict:.....	10
Costs and benefits of the presence of vertebrates.....	11
Prominent quotations from the public institutions.....	11
5.3.2 STAKEHOLDER ENVIRONMENTAL ASSOCIATIONS	11
Costs and benefits of the aquaculture activities.....	12
Costs and benefits of the conflict.....	12
Costs and benefits of the presence of vertebrates.....	12
Prominent quotations from environmentalist groups:.....	13
5.3.3 STAKEHOLDER “MEDIA” (JOURNALISTS)	14
Costs and benefits (in general).....	14
Prominent quotations from the media group.....	14
5.3.4 STAKEHOLDERS “HUNTING ASSOCIATIONS”	15
Costs and benefits (in general).....	15
Prominent quotations from hunting associations.....	16
5.3.5 STAKEHOLDER :AQUACULTURE PRODUCERS	16
Costs and benefits of the birds protection.....	17
Costs and benefits of the valliculture.....	17
Costs and benefits of the conflict.....	18
Prominent quotations from aquaculture producers.....	18
5.3.6 STAKEHOLDER: “TOUR OPERATORS”	19
5.4. FACTUAL INFORMATION.....	20
5.5. COMPARISONS: POINTS IN COMMON , POINTS OF DIVERGENCE IMPLICATIONS FOR FUTURE POLICIES.....	21
5.5.1 Points in common	21
5.5.2 Points of divergence	21
5.5.3 Conflict mitigation suggestions made during interviews that have not met specific opposition from opponents	22
5.5.4 Implications on conflict mitigation policies	22
5.5.4.3 <i>External factors influencing the conflict</i>	23
5.5.5 Current trends in cormorant conflict management	23
5.6. SUMMARY, POLICIES AND POTENTIAL MITIGATION MEASURES.....	25
5.6.1 Effective work with stakeholders – operational steps	26

5.1. SOCIO ECONOMIC PROFILE OF THE STUDY AREA

5.1.1 Government jurisdictions and responsibilities related to FRAP issues

Italy is subdivided in 20 administrative regions. The region of our interest is Region Emilia-Romagna, located in the Po area. This region is subdivided in 9 administrative provinces. Among them, there is the province of Ferrara, our model region. The province of Ferrara is located in the north-eastern part of the region Emilia-Romagna, and faces the Adriatic sea at East. The Region's numerous administrative competences were handed over to the Province for agriculture, education and professional training, roads and so on.

As for the administrative competences over fisheries, aquaculture and hunting and wildlife management – which is the key issue in our model region - the present situation can be summarised as follows:

- ?? **The key competence is over hunting and wildlife management** , since current regional legislation rules that any damage caused by wild animals in protected areas should be refunded by the Provincial Administrations, whereas in the areas under the jurisdiction of the Local Hunting Territories (ATCs) damages should be refunded by the ATC management itself (art. 17). Thus this regional law is central to the conflict management and mitigation in our model region. Damages that are compensated are normally direct damages to crops or aquaculture productions but there is no strict limitation in the adopted wording “any damage...”. The principle of “no evidence – no pay” is also in force and the assessment of evidence needs a consensus building process that is carried on in the Consulta Provinciale della Caccia, with a good degree of success until now.
- ?? As regards **maritime fisheries**: the Region delegated to the Province the administrative functions regarding concession, liquidation and distribution of the financial aid (EU, national and regional) and the control over it. The rest of the administrative functions (mostly enforcement and licensing) concerning maritime fisheries are entrusted to the Coast Guard, a national body. The central government also has sole responsibility over mobile stocks, socio economic issues and research.
- ?? As for **fisheries in internal waters**: many competences such as power of authorization, license granting and concession acts in general, have been delegated to the province from the Region. The municipalities issue fishing permissions in internal waters to professional fishermen and have competences related with few administrative functions.
- ?? As regards **aquaculture** in State property areas or in territorial sea: the concession of such areas for aquaculture activities is granted by the Maritime Compartment of the Coast Guard.
- ?? As regards **aquaculture and fish culture in fresh or brackish waters**: the authorizations are released by the province.

The Province of Ferrara is subdivided in 26 municipalities: only 3 of which, namely Codigoro, Comacchio and Goro, are located along the coastline and considered in the present report since they represent the totality of the fisheries and aquaculture sector of the Province of Ferrara and furthermore because the study sites that were selected for both ecological and SE criteria, fall within their physical and administrative territory.

5.1.2 Population

5.1.2.1 Size of population

The three coastal Municipalities (of the 26 that constitute the Province) of Codigoro, Comacchio and Goro, we have a total population, in 2001, of 38.865 inhabitants, against the 39.484 of 1991. We assist to a reduction of the population of 619 residents, equal to a -1,6%.

But among the Municipalities, a strong difference can be noticed: if in Codigoro and Goro we find a negative trend (with minus, respectively 843 and 398 units) in Comacchio we register an increase of 622 inhabitants in the ten years period considered (Annex 1 - Table 5).

Number of Inhabitants

AREA	1991(1)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001(2)
Province of Ferrara	360.763	361.544	359.284	357.161	355.338	353.724	351.887	350.219	348.651	347.558	344.323
Codigoro	13.985	13.799	13.756	13.704	13.591	13.523	13.414	13.308	13.205	13.129	13.057
Comacchio	21.179	21.620	21.681	21.681	21.679	21.722	21.807	21.822	21.812	21.778	21.801
Goro	4.410	4.408	4.378	4.338	4.325	4.291	4.250	4.212	4.160	4.127	4.092
Total	39.574	39.827	39.815	39.723	39.595	39.536	39.471	39.342	39.177	39.034	38.950

(1) Legal population - Decree dated 14/06/1993 of the President of the Council of Ministers

(2) Legal population - Decree dated 20/04/2003 of the President of the Council of Ministers

Source: "Censimento Generale delle Popolazioni e delle Abitazioni - ISTAT (Italian National Statistics Body)

1991-2001" and web site REGION EMILIA-ROMAGNA, section "Statistics on-line"

On the average, the old age ratio settles on a value of 207: the old component is globally less marked in comparison with other Municipalities of the Province and in particular in comparison with the main town, Ferrara.

Concerning the turnover ratio of the active population, in 2001 we go from the 129 of Goro to the 212 of Codigoro. Also this ratio, is obviously in significant growth in comparison with 1991, and it has different intensities in the three Municipalities.

5.1.2.2 Education

The schooling level of the population is measured and compared with the general situation in the whole Province of Ferrara.

The official data, in our hands, recorded during the official census of the population of 1991, shows a very low percentage of illiterates, equal to 0,9%. Therefore the regional schooling rate is very high: there are the 34,6% and the 28,4% of the population who have as a last study qualification, respectively the primary and secondary schools licenses. The secondary school diploma has been obtained by the 20,12% of the population, while only the 4,17% graduated.

5.1.2.3 *Ethnic makeup*

The population of the three municipalities is racially homogeneous, although from the beginning of the '90ies, in all the territory of Ferrara's Province there has been an increase in foreign migratory fluxes, following labour demand for jobs that have become unattractive to the local population.

In the three above mentioned Communes, such migratory fluxes are mostly from non EU member countries. However, in year 2000 the percentage of foreigners over the total resident population was very low and at less than 1% in the three Communes of our study. This datum is only partially true due to a high rate of illegal immigration not showing in the official statistics.

The great majority of the foreigners come from Africa (Morocco, Tunisia, Senegal) and from eastern European countries (Poland, Romania, Moldavia, Albania).

Some of the latter are employed in aquaculture facilities.

5.1.2.4 *Average income*

At a level of the three municipalities considered an average taxable of 10.466 euro is recorded, that is to say very much lower than both the provincial and regional ones. In detail the Municipality of Codigoro, among the three, is the one with the best situation with a taxable income of 11.627; Comacchio follows with 10.764 euro and least Goro with 9.007.

5.1.3 *Basic economic characteristics*

The census of working population in the principal sectors of economic activity (Source: Censimento Istat 1991) shows that the three analysed Communes have different features.

The municipalities of Codigoro and Comacchio mirror the situation in the Province, where great part of the employed belongs to the tertiary sector: 2,572 in Codigoro (43.9%) and 4,755 in Comacchio (53.78%).

As for Comacchio, this situation is mainly due to its tourist nature, which generates many activities linked to tourism, such as accommodating facilities (hotels and non-hotel accommodations), restaurants and many commercial activities.

The situation in Goro is really peculiar: only 25.3% of the population works in the tertiary sector and slightly more than 20% in the industrial sector. A very small percentage is employed in the primary sector, while 50.8% work in fishery: 980 of 1,927 workers.

The importance of aquaculture and fisheries in the Province of Ferrara is renown but it shows with even more strength in the analysed territorial district made up of the three Communes, where together with agriculture and tourism, they play a major role also in terms of employment.

Aquaculture and namely clam culture are particularly developed in Goro where it boosted in the past 20 years with the import of the exogenous species (*Tapes philippinarum*). Which spurred the creation of hundreds of micro enterprises in clam culture. But the extensive aquaculture in all the three Communes dates back several centuries and has reduced its importance only in the past century following extensive reclamation works.

The area of Comacchio – Porto Garibaldi is within the Province the most linked to **maritime fisheries** with a substantial fleet and a long lasting tradition.

5.1.4 Geographical characteristics

The three Municipalities are within the North Coast and Ferrara Reclamation landscape units. With reference to the North Coast area, the municipality of Goro is completely contained in it, while the municipalities of Comacchio and Codigoro and other Ferrara municipalities are only partially contained in it. From the standpoint of land use, great part of the land is devoted to agricultural purposes (53.4%): the wooded surface and the marginal areas are less extended, 10.7% and 21.5% respectively, while the urbanized land is extremely limited, 3.6%.

The small part of territory in the municipalities of Comacchio and Codigoro that is outside the North Coast area is in the Ferrara Reclamation area. These territories have been reclaimed from the Po delta with a number of reclamation operations performed in the years from 1850 through 1950ies. The farm land in this area is very large, corresponding to 98.5% of the whole surface. The small percentage left is wooded or urbanized.

All the three Municipalities of the district are part of *coast settlement system*, centred on the Codigoro-Comacchio territories and articulated in the specialist historical systems of the fishery ports of Goro and Portogaribaldi (a hamlet of Comacchio) and in those, which were formed recently, of the tourist economies of the Lidi di Comacchio coast. The system, typified by strong and peculiar environmental connotations which characterize it as a transition area between the sea and the inland, owes its development to lagoon and sea economies.

From a nature and environmental point of view, the three Municipalities of Goro, Comacchio and Codigoro, are characterized by a high percentage of territories with a high naturalistic and environmental value, falling for good portion in the perimeter of the Po Delta Regional Park, a complex system of natural environments that form the major wetland of Italy. It is over 113.000 hectares wide, and over 60.000 are in the Region Emilia-Romagna (the rest falls in the Region Veneto).

The Park of the Delta, as regards the sites of naturalistic importance in it, has been subdivided in six stations:

- | | | |
|-------------|--|---------------|
| - Station 1 | Volano Mesola Goro | |
| | 17411.11.00 ha | |
| - Station 2 | Historical centre of Comacchio | 4977.47.92 ha |
| - Station 3 | “Valli” of Comacchio | |
| | 15742.48.00 ha | |
| - Station 4 | Pine wood of San Vitale | 8400.63.76 ha |
| - Station 5 | Pine wood of Classe and salt-pit of Cervia | 8572.84.84 ha |
| - Station 6 | Campotto di Argenta | |
| | 3993.90.00 ha | |

A good part of the perimeter of the first three stations of the park of the Delta falls in the territorial district. In particular all the municipal territory of Goro and about the 71% and the 25% of the total territory of the Municipalities of Comacchio and Codigoro, belong to the perimeter of the Park of the Delta: on the whole we are talking about an area of 27.644,7 hectares, the 57% of the district considered.

Nevertheless, the territorial district, besides including territories of the Park of the Delta, presents bordering areas with strong features of ecological and morphological continuity, made mainly of vast rural zones with a predominant agricultural land use. Inside these rural areas you can find several naturalistic sites or large zones of naturalistic interest, which together with the water network, form significant ecological corridors in tight relation with the protected area.

5.2. DESCRIPTION OF MODEL REGION STAKEHOLDERS ITALY

5.2.1 Stakeholders identification and interviewing methodology

The set of profiles at national, regional and local level to be interviewed was agreed during the WP6 training session held in June 2003 with the WP6 coordinator Doug Wilson.

On that occasion also a grid of contents to extract from the interviews was agreed and was used as a non written pattern during interviews, with the flexibility that was provided for by the different backgrounds of our interlocutors.

5.2.2 Table of identified stakeholders:

<i>COMPANY OR PUBLIC BODY</i>	<i>NAME</i>	<i>FUNCTION</i>
Region E.-R.	Dott. Tasselli	Head of regional fisheries and aquaculture dept.
Region E.-R.	Dott.ssa Turra	Head of regional hunting and wildlife management services; deals with damage compensation schemes
Region E.-R.	Dott. Marchetti	Head of regional rural territory management services. Deals with hunting /productive fish-farms
Petrit Viaggi	Adriano Caselli	Tour Operator
WWF	Sig.Balboni	WWF Responsible for Ferrara Province
Legambiente	Dott. Poggi Alberto	LEGAMBIENTE Responsible for Ferrara Province (environmental NGO)
Parco Regionale del Delta Po	Dott. Agr. Ruggero Spadoni	Functionary in charge of fisheries and hunting activities within the park area.
Comune di Comacchio	Dott. Paiola	Functionary in charge of the environment and public works
LIPU	Dott. Lorenzo Borghi	LIPU Responsible for Ferrara Province (environmental NGO specialising in birds protection)
La Nuova Ferrara	Lucia Felletti	Journalist

Il Resto del Carlino	Paola Vancini	Journalist
Assessorato Turismo della Provincia di Ferrara	Roberto Ricci Mingani	Functionary
Comune di Comacchio - Turismo Comune di Goro	Elisa Beneventi Ilio Felisatti	Functionaries
Valle Cantone Fish breeding	Sig. Moreno Sig. Franceschini	General manager Owner
Valle Nuova Fish breeding	Sig. Tavani	General manager + member of board of association of fish breeders
Parco Delta del Po	Dott. Gianni Cavallini	Functionary – previous general manager of “Valli” di Comacchio
Provincia di Ferrara	Dott. Renato Finco	Functionary: hunting and wildlife management services; deals also with damage compensation schemes
Provincia di Ferrara	Dott.ssa Elisabetta Mantovani	Head of hunting and wildlife management services; deals also with damage compensation schemes
Provincia di Ferrara	Sig. Piva	Province country warden
ARCIcaccia	Sig. Danilo Treossi	Head of Province hunters association
Federcaccia	Sig. Roberto Sartini	Avv. Merighi Stefano: Head of Province hunters association
Ente Produttori Selvaggina	Dott. Gianni Natali	Head of game producers
INFS	Dott. Toso Silvano	Director of National Institute for wildlife management
INFS	Dott. Cocchi	Researcher of National Institute for wildlife management
Università Bologna	Prof. Paolo Boldreghini	Ornitologist – expert in cormorants
Università Ferrara	Prof. Remigio Rossi	Dean of science faculty. Aquaculture national expert

5.3. BRIEF PROFILES OF THE STAKEHOLDERS GROUPS AND OF THEIR CONFLICT PERCEPTIONS

It must be said that some stakeholders groups that were identified are very little informed about the conflict and that the major players, the ones who feel the on-going conflict in our model region, and have clear-cut ideas about it - are restricted to four groups:

- ?? Aquaculture producers (extensive in principal)
- ?? Public institutions dealing with hunting, territorial planning, wildlife management and fisheries
- ?? Hunters associations
- ?? Environmental associations

A brief profile is given for each stakeholder group, and then the conflict perceptions are grouped following the suggested reporting structure whenever possible.

The interviewing and text analysis is only halfway completed (due for beginning 2004) and the present reports reflects this situation, although we do not expect a great variation to be introduced from the completion of the interviews.

5.3.1 STAKEHOLDER “PUBLIC INSTITUTIONS”

In our model region the foremost stakeholder is the Province of Ferrara and the officers that deal with hunting within the agriculture “ministry” (at provincial level it is called “assessorato”).

The province actually decides about the damage claims, compensations funds and technical mitigation incentives and it does so through the “consulta caccia” – a permanent consultative institution within the frame of hunting and wild fauna management - in cooperation with all involved stakeholders.

Other relevant institutions are the equivalent region offices (Emilia-Romagna) and also the recently created offices dealing with aquaculture and fisheries³. The region provides the funds – handed over to the provinces – for damage compensation to agriculture and aquaculture, as well as regional, national and EU FIFG funds which also include funding for bird predation mitigation measures and improvement of environmental performance in aquaculture.

One large Commune, Comacchio owns still presently a “Valli”⁴ of over 10 000 hectares which in a recent past made the core of its economy, but after many changes in the past twenty years, the management is presently handed out to the Po delta park administration and the productive aspects of it have lost much of their previous importance to the local economy.

The Po Delta park management board is also a major player since the park entails many restrictions on economic activities and also strengthens the protection of protected species (adding on species

³ Until very recently aquaculture and fisheries were central government responsibilities.

⁴ Semi natural extensive brackish aquaculture

protection regulations, there is no hunting allowed in park areas, but in buffer zones it may be allowed with stringent limitations.

Finally, the INFS (national institute for wildlife fauna management) is a national body that can give a green light or oppose the derogation to art. 9 of EU birds directive (prohibition of hunting protected species) and national or regional subsequent legislation. It has done so on a very cautious and limited basis until now.

Their views on the requested main points are as follows (six were interviewed) :

Costs and benefits of the fishery: social and economic

Benefits:

As said in many occasions, we are speaking finfish aquaculture here and especially extensive ““Valli”” aquaculture. This activity is regarded as important for its capability of preserving a partially natural and partially man-made environment – now all enclosed in the park area - more than for its economic weight (the important portion of aquaculture is not finfish but the clam and mussel culture in lagoon and offshore) or direct social importance (very few people work in such companies and they are secondary activities to owners).

Several are ready to admit that the peculiarity of the brackish water management needed for the finfish rearing, and the maintenance of the islets, banks and sluice gates benefits the environment⁵ and the general public interested in the conservation of such wetland habitats and related biodiversity and cultural heritage.

Economic benefits of such aquaculture facilities are restricted to few employees and to the owners themselves but this did not come out during the discussion.

Costs:

Some of the interviewed civil servants pointed out that the conflict is a liability to the tax payer and to the public bodies as the representatives of all the population and added that the inherent risks of carrying out fish breeding activities in large uncontrollable ponds in an area subject to restrictions such as the park area, in which the fauna cannot be hunted nor disturbed, are apparent risks that should be taken into account as entrepreneurial risks and not discharged on the community.

Costs and benefits of the conflict:

Only costs were pointed out:

Most of them spoke of the fact that the social cost of conflict is a lose-lose situation beneficial to nobody and that public institutions lose credibility in their low profile attitude in tackling this conflict.

Also the risk of reducing attractiveness in investing in aquaculture and entailed maintenance of the environment, switching only to revenues from the hunting permits issued from these privately owned farms would greatly harm the overall environment and all social groups interested in it. Reversing conditions and restoring the environment would be a great cost later.

⁵ otherwise these shallow ponds would go to extremes of saltiness or almost freshwater thus entailing a great biodiversity reduction sine extreme habitats are populated only by few species

Costs and benefits of the presence of vertebrates

The mentioned costs include the conflict with aquaculture producers and the pressures of other groups of interest to avoid direct killing of cormorants (environmental groups).

We collected also an outstanding opinion from a high functionary that the cormorants are not a problem, and the problem to aquaculture facilities are in fact herons. He added he had factual information about this.

The presence of vertebrates is seen as a bonus for the overall population since cormorants for example were very rare in the area until the protection measures and started to be seen again only in the eighties. This benefit is often only a background to the focus point of the damage compensation which presently is what draws attention.

Prominent quotations from the public institutions

“Cormorants are not a problem, herons are! “

“It is clear that an increased food availability has favoured an increase in the presence of birds which did not direct themselves as they did before towards the coastal belt, but favour instead the wet zones in our territory because food availability is much higher than in the past. It must be said that the result is that fish production in extensive aquaculture has suffered a decline due to fish eating birds of 25-30%.”

“The concept of environmental protection and species conservation must be inverted giving priority to the defence of aquatic organisms and only subsequently of bird fauna, because the bird fauna is presently at the first step in the pyramid of fish predators while the fish are not at all protected as such or preserved.”

“Aquatic birds are part of natural phenomena just like thunderstorms or hail. It cannot be expected that aquaculture activities are started on extensive basis in several hectares of “valli” and if some birds - or many for this purpose feed on fish, the damage compensation be total.”

“the general community represented by the public institutions paying for damages, which suffers also pressure from below, and the community made up of the directly (more or less) damaged producers are amongst the damaged. Costs are well defined while the potential benefits of the present situation have not been highlighted yet.”

“Promoting research is important to understand the true size of populations- always announced by the thousands, and never seen in such numbers. Thus establishing true data is important: organising birds census but also understanding what is under the water in order to correctly assess damage that is caused by the birds”.

5.3.2 STAKEHOLDER ENVIRONMENTAL ASSOCIATIONS

Three major associations representatives were interviewed: WWF, Legambiente and LIPU. The latter specializes in birds protection while the first two are more “generalist”.

Following this description, only the LIPU representative seemed to have a good direct knowledge of the problem, one confessed of knowing it only marginally (knew the existence but not the details about it) and the other - WWF was something in between.

They participate in the “consulta caccia” but this conflict issue is not high on their agenda since it seems for them now of secondary importance since the creation of the Po park guarantees extra protection to the already protected bird species and they are confident that the public opinion would not allow setting the clock back to shooting birds as was until the late seventies.

Costs and benefits of the aquaculture activities

Loss of landscape features in the park and environmentally attractive scenarios.

One of the interviewed representatives claimed that it was demonstrated that in spite of concentrating in roosting areas along the “Valli” Bertuzzi before they were destroyed, these populations were feeding in natural habitats in the coastal belt and along the river Po. In Valle Bertuzzi now there is not a single cormorant left. And also in Valle Nuova which is not very distinct from Valle Bertuzzi (they were actually one same “Valli” in the past).

All the nests that were located on those trees have been destroyed and this is a pity because they were visible from the acciaroli road and were an impressive view, very attractive for people that came to this area for nature observation.

Nature observers are more attracted by abundance rather than from rare species which are difficult to detect even for experts living and working in the area.

The abundance and concentration of birds and nests in Valle Bertuzzi was impressive and it is now gone for good.

Costs and benefits of the conflict

No statements were made in this direction, however it was said (2 out of 3) that the cormorants predation is presently a false problem (see following point)

Costs and benefits of the presence of vertebrates

The presence of protected vertebrates is seen – very similarly to the views expressed by public officers - as an intangible benefit for the overall population since cormorants for example were very rare in the area until the protection measures and started to be seen again only in the eighties.

Cormorants do not cause real damages

Two have expressed the view that such damage is still in doubt. If this is proven true, then fish breeders should be in the lot of the damaged, since they complain that the damage is not fully refunded.

One explained that cormorants are no more a problem – if they ever were in the past - especially now that the populations have been reduced and their roosting areas destroyed and disturbance occurs to a wide scale.

A common position was that the damage - in a more general perspective - is an environmental damage, where populations that reproduce at levels which are not compatible with the carrying capacity of the environment, and why is this - because there are human activities (i.e.aquaculture)

that increase the food availability in relation to what the environment could offer if these were absent, thus causing disequilibria in the environment with some species that prevail over others.

Some stated that population control of some species such as those that are introduced or more flexible and opportunistic, may be necessary for the preservation of rarer and more significant scientifically species. This is the case for example of deers populations in the Mesola woods which are now being dominated by other species that have been introduced and that need to be controlled by direct killing unfortunately.

Benefits

Environmentalists say that the existence of the park and the protected area benefits the fauna and in this case the protected area that is meant to preserve the environmental value and also the fauna living in it. In general this was described as a collective benefit, in a very broad definition of this term.

However, it was stressed that the control of fauna populations is important in protected areas.

Perhaps also the fact that the Park is a strong reason of attractiveness of this area can be included in the list of benefits. Thus tourism related activities connected to this birds abundance and more in general to the environmental protection in the area, were also identified as probably benefited.

No benefits from the aquaculture extensive production were mentioned.

Prominent quotations from environmentalist groups:

“The damage in a more general acception is also an environmental damage, where populations that reproduce at levels which are not compatible with the carrying capacity of the environment, and why is this - because there are human activities (aquaculture) that increase the food availability in relation to what the environment could offer if these were absent, thus causing disequilibria in the environment with some species that prevail over others. These are the elements of damage”

“I believe that who loses is the credibility of the institutions. In a protected area that has many problems as the one of the Po delta Park, having an Institution that is seemingly very slow in taking decisions about such problems, makes it loose credibility vis a vis the population.”

“As an environmentalist I Could say that the existence of the park and the protected area benefits the fauna and in this case the protected area that is meant to preserve the environmental value and also the fauna living in it, I believe that in general this is a collective benefit, although this is seen from my perspective as a benefit in a very broad definition of this term”.

“In Valle Bertuzzi now there is not a single cormorant left. And also in Valle nuova which is not very distinct from Valle Bertuzzi (they were actually one same “valli” in the past). All the nests that were located on those trees have been destroyed and this is a pity because they were an impressive view very attractive for people that came to this area for nature observation.”

“The abundance and concentration of birds and nests was impressive and it looked as if this landscape pertained to another place, maybe a tropical country. This is now lost, although it was true that the concentration of the cormorants on those trees damaged the vegetation with their droppings , leading to the drying of the trees, but even then, it was a striking view.”

5.3.3 STAKEHOLDER “MEDIA” (JOURNALISTS)

The press working in the area – which is the countryside of Ferrara province - boils down to two newspapers: One is regional with some national distribution : “Il Resto del Carlino”, the other is the “Gazzettino di Ferrara”. The two local chronicle responsables are free-lance journalists born and living in the area. One of the two is also working as a press agent for the Po delta park.

Both have been interviewed but have shown very shallow knowledge of the conflict both in terms of when it originated and also of what could be done or has been done about it. Interviews were consequently much shorter than the others and many questions went unanswered since the journalists themselves felt little involved.

As said, the conflict seems rooted in four main stakeholders groups: public administrations, aquaculture producers, hunting associations and environmental groups.

Costs and benefits (in general)

The main points that we collected from the press representatives, were often echoing the views of the stakeholders more directly invested by the problem:

- ?? conflict is not beneficial to anybody
- ?? information and discussion on factual information are needed
- ?? consideration of the wider environmental policy is needed in assessing damage or compensation and also in environmental investment overall
- ?? the institutions lose credibility in this situation of only partial problem solution
- ?? the control of fauna populations is important but the birds populations reduction should possibly avoid direct killing
- ?? Mitigation measures should focus on potential modification of the behaviour of the birds by making feeding in the “Valli” less attractive to them.
- ?? Cultural heritage is also closely connected with aquaculture and the environmental preservation in the area.

Prominent quotations from the media group

“In respect to the problem we are talking about, a response could be the one of control of the species, of one species in particular that can be an element of disturbance for the protection of the other species: the humans, probably looking for systems that are not “radical” but that can act on what we may call the “psychology” of birds. I.e. if they find the conditions that enable them to become so invasive, it is because somebody lets this happen.”

“It is right to protect the species, but also right to control (contain) it. I am not thinking of killing them, but of dissuasive systems (...) So, if there is an adaptation of the species to the environment, I think that in a certain way it is possible to “educate” the birds - this is the concept – (chuckles) to an adequate behaviour .”

“A grim perspective could be perhaps one of an occupation of all the “valli” from the birds, but I don’t believe this is possible and that these grim scenarios can actually happen or that the presence of these birds can grow up to a level where it can be excessive, also keeping in mind that there is already a natural diminution of the presence of eel in the “valli” and this could truly jeopardize an

important aspect which is the identity of this territory. Because we are somehow speaking about a culture, the culture and civilisation of the wetlands that has no equals elsewhere, this is especially true for Comacchio that has always been an island in the province of Ferrara, isolated from the surrounding land by this large lagoon and developing a different culture than that of Ferrara which was based on agriculture which is very different from the gathering activities⁶ carried out in Comacchio. Our identity is founded on this: on water and what gifts the water can deliver, with the various degrees of salinity. There is a problem of identity: Comacchio without eels would not be Comacchio.”

“I believe that here nobody makes any gain. Not an environmental level nor at an economic level. As all problems this one does not benefit anybody.”

5.3.4 STAKEHOLDERS “HUNTING ASSOCIATIONS”

Although there is no hunting in the park area all privately owned wet areas are ruled as “buffer zones” since they were hunted for centuries before the park was instituted (hunting in park buffer zones is restricted but allowed, and these are located also as wetlands and islets in the middle of the park area).

Since the whole issue of damage compensation to agriculture and aquaculture is managed within the frame of hunting and wildlife management regulations and institutions, hunters are part of the important board of stakeholders called “Consulta caccia” of the province of Ferrara which participates in the territorial programming and also in damage compensation allocation.

The hunters association responsible interviewed⁷ – a retired agricultural entrepreneur in his early sixties - has shown great knowledge of this and other wildlife related conflicts together with a deep knowledge of the territory and its changes over time.

Costs and benefits (in general)

Benefits

There is a benefit in general terms from having a well maintained environment with the co-existence of protected areas and species and aquaculture productive activities. These were the objectives of the territorial hunting planning made already in the early seventies in Emilia Romagna, with one third of the territory as protected area.

This has resulted in a large increase in numbers of some populations including cormorants that are now in numbers no more compatible with the productive activities such as fish breeding in extensive ponds, and with the general environment conservation more in general.

Costs

⁶ NdT Extensive Aquaculture, fisheries and lagoon fisheries are here equated to gathering activities as opposed to agriculture which mandates different land use practices and work amount.

⁷ We had difficulties in getting hold of two of the three identified hunters associations representatives

Costs are social: the planning of environmental conservation and maintenance – which is still in a critical situation due to more industrialised agricultural practices - should not allow large financial resources to go in the direction of damage compensation.

The problem of environmental conservation - was reported - is not a problem of confrontation of different social groups but a matter of correct managing of public affair and financial resources. Public affairs should not allow environmental mismanagement practices in favour of private profit (such as the impact of intensive agriculture on landscape) since this comes at a cost for society.

Even park creation and management are a cost that has to be born by society after the environmental damage has already occurred.

Exceeding populations of few species : gulls, cormorants, nutrias etc. are detrimental to other rarer less opportunistic species. Environmental erosion reduces the chances for the latter. Many species are locally extinct now. Fish fauna in all wetlands and canals also suffer this large population of fish eaters.

Prominent quotations from hunting associations

“There is an urgency of finding a compatibility between cormorants and productive systems and financial resources available for environmental management.

We cannot think of millions of euros being spent on damage compensation to maintain a cormorants population beyond any possible need, since it has known a tremendous increase. This is an irrational approach and we want enhanced population control schemes.”

“In the past decades, in spite of more attention and money being spent on the environment, we had a negative change in environmental quality. Agricultural system having changed from small diversified plots owned by smallholders, to a more industrialised agriculture in the 60ies and 70ies that has determined habitat erosion and impact. Also technology has its own responsibilities in this. The change made from smallholders plots to the return of latifund and of intensive monoculture has eroded the typical environmental and landscape features of the traditional agriculture such as roadside tree plantations, farm houses, small ponds for hemp soaking and for irrigation needs.”

5.3.5 STAKEHOLDER :AQUACULTURE PRODUCERS

The large semi-natural, historical aquaculture facilities are the core of the conflict since they cannot do much – due to the size of the ponds - to protect themselves from predation. Very large in size – Comacchio “Valli” is 10.000 hectares (22 .000 acres) - all are more than hundreds of hectares, they are only less than a dozen in the Province, but represent an historical economic activity and the major landscape, cultural, and environmental feature in the model region.

“Valli” di Comacchio - publicly owned by the Commune of Comacchio - is now managed through the Po delta park together with few undisturbed portions of historical productive “valli” (such as Canneviè-Porticino, one of our study sites).

All the others are privately owned and managed as aquaculture facilities and country resorts for selected few, often including hunting fixed installations that are sold on a yearly basis at very high prices.

Only very recently we have heard that the five major producers have pulled together with others, to form an association to lobby the public administration and to jointly market their product. We were told that cormorants are high on their agenda.⁸

Among our interviewed stakeholders we had both owners and workers of the “Valli”.

Costs and benefits of the birds protection

a) Direct and indirect damages on fish production

One manager claimed that in 20 years of activity he had seen a constant reduction in fish breeding production terms and that the main responsible was the growth of the cormorants population and their great capability of adaptation.

The problem which has become increasingly serious since 1985 causes not only losses for direct predation but also losses of fish which are very sensitive and suffer or die from repeated attacks when they are already stressed from external environmental conditions (sea bream and eel especially). The birds are also very selective in choosing the easier targets shifting during the seasons.

b) increased personnel costs

Especially in early autumn the personnel is absorbed in other activities and cannot chase them away (disturbance actions) while during the winter – when large wintering populations arrive - two people are almost permanently occupied in chasing the birds away with motor boats. The need for installation of protective netting and of its periodic renewal is an added labour cost.

c) new production costs

The nets themselves and fuel for boat disturbance of the population are all new costs that were inexistent in “Valli” management before.

Who bears the social and economic costs of the damage

The economic costs listed above are in some cases supported by aquaculture producers since in some cases local entrepreneurs do not want to go through the hassle of filing requests for compensation schemes.

In general, it is acknowledged that large investments and contributions were utilised by the “Valli” since the mid eighties and that especially in Emilia Romagna the valliculture is constantly on the verge of becoming economically not viable and survives thanks to public contribution.

It was pointed out - though marginally - that the aquaculture worker profession has become unattractive to Italians. Not clear if because of the heavy work or because it is becoming marginal and less secure as perspective job (as other statements collected in the same interview suggest).

No benefits of the presence of the cormorants were listed. They were actually described as pests or “useless” birds and difference was made with gulls and herons.

Costs and benefits of the valliculture

Benefits

⁸ We have inserted them in the future interviews list

The Park authority benefits of the “Valli” in Emilia Romagna and is quite good at “selling” their environmental image.

However the aquaculture production is at risk and in a short future may become so economically unattractive as to veer the farms activities to the sole hunting fruition.

The general environment has benefited from the maintenance of a brackish water environment as opposed to non maintained environment in which extreme salinity had reduced by and large the number of species and individuals.

Costs

Same situation as described in “social and economic costs of the damage”, not explicitly stated (but one of the first interviews was not particularly aimed at assessing costs and benefits).

It was suggested that in order to accord permits for hunting in the “Valli”, the province could issue the obligation of seeding fish juveniles in the “Valli” making it compulsory to save also the aquaculture activities and related maintenance - beneficial for the environment, - as done in the Veneto region bordering province of Rovigo.

Costs and benefits of the conflict

Aside from the notion that at least some of the aquaculture producers are bearing the direct and indirect effects of birds predation, there was no discussion about who benefits from the present situation, and the costs are listed in the two previous items.

Off the records were reported rumours that other aquaculture producers had received about 200 thousand euros for damage compensation letting understand that somebody was taking advantage of this situation.

Such rumours were not possible to confirm through the payment records of the Province which for damage compensation show much lesser yearly figures.

Prominent quotations from aquaculture producers

“In twenty years of activity I have observed a constant reduction in terms of production results, in terms of harvested quantities. I see the cormorants as the principal responsables with their great population numbers settling in the “valli” and their great capacity of adaptation to environmental changes.”

“The damages that are caused are not limited only to the fish directly killed, but also to fish killed by stress and not eaten. This is to say indirect damages as well. My request for mitigation would be never to see cormorants any more.”

“In close by Rovigo (Veneto Region) they are allowed to shoot cormorants.”

“I have an identification ring from a cormorant caught and released in Poland: these are not autoctnous species”.

For a “Valli” doing both hunting and fish breeding the income from hunting has overgrown that of fish breeding. This pushes us to stop seeding fish in the valli and to reduce personnel costs aiming only at hunting revenues. This would be detrimental to the environment. “

“The public administration is scarcely respondent to our needs. When we ask authorisation to re-open a previously existing freshwater inlet, and they reply “what for”, the chance of understanding each other is truly hindered.”

“Many valli have largely relied upon public funding since the eighties. Many of them here in Emilia Romagna work for public incentives.”

5.3.6 STAKEHOLDER: “TOUR OPERATORS”

One tour operator specialising since 20 years in “incoming” environmental tourism in the area was interviewed. Although the interview was very interesting in terms of what public administrations do - or don't - to encourage the growth of environmentally oriented tourism, especially inland and out of season (in other words aside from the sun+beach tourism), it said very little in terms of our investigated conflict. The main purpose of the interview was to assess if some link could be made between the tourism sector as a potential beneficiary of the biodiversity protection, and the FRAP analysed conflict.

Although some weak linkage could be made with the general environmental quality, no apparent link could be established to the conflict.

The only statement in this respect that we obtained was that the creation of the Park had not increased the attractiveness of the area to environmental tourists, which came in the same small numbers also before that date.

5.4. FACTUAL INFORMATION

The socio-economic work did not allow collection of factual information other than the small - yet important portion - that was provided by the stakeholders themselves.

No libraries nor local or regional newspapers that were inquired had traceable records⁹ of the cormorant conflict which stays well within the social borders of the limited number of stakeholders involved and is more felt by public administrations (Region and Province) dealing with this problem and with fish breeders that are directly affected by predation.

As for the interviewed stakeholders we had planned a second round of data and factual information collection after the whole cycle of interviews is over which – to date – has not been completed and will be by the end of January 2004.

Some stakeholders did have material that could be taken as “factual information” but this was not handy or not readily available. Some had pictures showing the evolution of the local environment that needed scanning or reprinting. Other claimed to have film footage of large flocks of birds flying into the “Valli”.

This is the reason why we made an option to review all interviews and - in the process – search all statements made, and then try to make the stakeholders back those statements with some kind of data, image or other less subjective kind of information only after the interviewing process is over.

The very few bits of information that we collected immediately after the interviews, were given by stakeholders which are more involved in the conflict management, this is to say the producers and the functionaries of the province in charge of wildlife and fauna , which also deal with damage compensation to fish breeders. From the latter we got official papers such as the census for birds made in the past years and the population reduction plans authorised by the Institute for Wildlife Fauna management (INFS) which allow very limited direct killings and disturbance of cormorants in derogation with national, regional and EU legislation (birds directive derogations under art. 9)

It is important to point out that a great deal of “factual information” gathering is being done from the ecological working party, namely on diet composition, predation levels on commercial and non commercial fish, birds distribution, landscape features affecting such distribution and rates of predation on productive installations.

This work needs yet to be thoroughly analysed and the census of cormorants are yet to be made (wintering cormorants are the only large populations in Italy, so they just started) but will be of the utmost importance for future work in FRAP since there is a common point in stakeholders interviews, that more information is needed in order to make sound and more widely accepted decisions on this matter, as will be described in the chapter on points in common.

As a matter of fact we got the impression that a common set of shared data among people discussing this matter is badly needed since the few figures and the many perceptions deriving from it were wildly varying. One datum for all: people spoke of wintering cormorants populations in between 2.882 in 2003 for the province of Ferrara and 40.000 for the whole Po delta.

⁹ We ran searches on the electronic archives covering the most recent years, period in which the conflict actually emerged

5.5. COMPARISONS: POINTS IN COMMON , POINTS OF DIVERGENCE IMPLICATIONS FOR FUTURE POLICIES

5.5.1 Points in common

- ?? conflict is not beneficial to anybody
- ?? information and discussion on factual information are needed
- ?? the institutions lose credibility in this situation of only partial problem solution
- ?? Birds damages are only part of a more general vertebrate protection problem, since Nutria, gulls, pheasants, and even small deer were quoted as parallel problems to the environment and to agriculture production.
- ?? Different approaches taken in other Italian regions are likely to increase the level of conflict

5.5.2 Points of divergence

- ?? First point of divergence is that cormorants are not an issue or at least not anymore since the environmental disturbance (roosting and nesting areas in Valle Bertuzzi destroyed) and killings that widely occurs . This is probably the first point in divergence: the damage is denied or seen as over-rated by some environmentalists.

On the same line but expressed from other interlocutors we have somewhat similar positions:

- ?? consideration of the wider environmental policy is needed in assessing damage or compensation and also in environmental investment overall
- ?? Cormorants are not a problem: herons are...
- ?? The second main point of divergence is if the population reduction by direct killing and the conflict mitigation strategies may or not include direct killing of the birds, although it was admitted also by environmental groups that the control of fauna populations is important in protected areas.

Those who point out the population reduction as a potential conflict solution - some public officers but mostly aquaculture producers - ask for two very different things:

1) making the population reduction authorised by INFS in derogation to EU birds directive and regional legislation more substantial in terms of numbers, possibly through non cruel methods (public bodies, press and partially environmental groups if population reduction needs to be) ;

2) Introduce the cormorant among the huntable species is what is insistently asked from the aquaculture producers also on the wake of other regions in which the administrative decentralisation has made possible to derogate to the huntable species list in the birds directive and subsequent national Italian legislation. It must be added that killing cormorants in Emilia Romagna is presently a criminal offence.

This second option is strongly opposed from some of the environmental organisations which are ready to accept only non cruel mitigation schemes mostly based on passive deterrents (nets) or

ecological ones (warning cries ; air blast cannons etc). They also claim the public opinion is against a possible scenario of liberalisation of hunting of such species also on the ground of ethical views.

However some understand that population control of some species such as those that are introduced, or more flexible and opportunistic, may be necessary for the preservation of rarer and more significant scientifically species. This is the case for example of deers populations in the Mesola protected woods which are now being dominated by other species that have been introduced and that need to be controlled also by direct killing.

Another strong point in divergence is if the compensation should occur to a level in which it pays back 100% of the damage (as claimed by the aquaculture producers) or only a portion of it (as assessed by public institutions). This point sees mostly the aquaculture producers and the public administrations as opponents but also other groups of vested interest such as hunters and environmental groups which are concerned about how much money for environmental restoration goes into compensation funds thus being subtracted from other investments.

Following in the wake of this specific point, another point of divergence is if operating in park areas should be accepted as an inherent risk from aquaculture producers or instead some *ex ante* (pre-emption principle ?) compensation should be made available prior to damage as permanent lump sum acknowledging recognition of such damages.

5.5.3 Conflict mitigation suggestions made during interviews that have not met specific opposition from opponents

Link the hunting option in pre-park areas to continuing the extensive aquaculture as environmentally beneficial activity (maintenance of brackish water environments) (made by one producer).

Non financial compensation: compensate birds damage through increased revenues for hunting by allowing fixed capture installations, lowering the administrative threshold that is now set high for such permits. The hunting would also produce the side effect of increased disturbance although not directed at killing cormorants.

5.5.4 Implications on conflict mitigation policies

In other work packages we have discovered that already many mitigation approaches have been deployed.

The nature of mitigation tools that have been deployed until now include financial compensation, acoustic prevention measures (as gas cannons, blank shotguns, noise emission, recorded stress calls and radio frequencies), mechanical prevention measures (as metal perimetral fences, individual basin fences and netting “shelters” in plastic netting), scarecrows, habitat reduction (as suppressing birds roosting areas, or vegetation maintenance along the pond banks), technical measures for extensive aquaculture engineering (habitat maintenance and or construction), unauthorised shots (these are illegal), and allowed disturbing actions with laser beams, with flat bottomed speed motor boats and finally population reduction plans.

The conflict nevertheless seems to be potentially evolving due mostly to external factors (not originated in the model region), following also the political current orientations that allow very different approaches in different regions and also a strong inversion of trend in overall environmental management started by the current national government.

The implications on areas of agreement or disagreement thus fall at times in the background, if some of the stakeholders feel that they have a better chance now of not having to come to an agreement or are in positions to ask much more than they could do in a recent past.

Under these circumstances, there is a strong chance that conflict approach will continue to be a highly emotional rather than rational thing and that “factual information” may be appear less relevant to conflict resolution.

5.5.4.3 External factors influencing the conflict

Great pressure on the conflict in our model region is put by external factors:

- ?? large populations of migrant birds originating elsewhere,
- ?? the way this problem is tackled elsewhere - such as in bordering regions where hunting cormorants has been allowed¹⁰
- ?? amount of financial resources allocated for environmental protection in the next future depends also on reduced regional budgets due to sharp cuts from national money transfers;
- ?? Finally, the scale of problem solution for environmental issues few decades ago was set at trans-national level in many cases, but the concurrent subsidiarity principles and devolution in administrative management, bringing many environmental management issues to local decision levels, are in apparent clash with previous approaches.

5.5.5 Current trends in cormorant conflict management

What can be said is that the pendulum of priorities in a moment of high social and geopolitical uncertainty and also of harsh political confrontation in our country, seems to be swinging back to giving a strong priority to production needs. If not at general public opinion level – where the environment gains positions or stays stable as a priority – probably at regional and national political levels.

In moments of dwindling public finances, lesser costs solutions are likely to gain consensus in the public administration, and more costly ones will probably be discarded or be unpractical, but it is difficult to say how the conflict can be kept cooled down in the future (this is discussed in policy analysis and scenarios in wp4 and wp5) due to the fact that there is a risk of reduced financial resources for all mitigation approaches and that presently all known technical measures have already been deployed and compensation funds have probably found their upper limit.

The results of pending trials in the province of Ravenna may also spur an increased pressure on the public administration from recently associated extensive fish farmers in the province of Ferrara that are affluent people with good connections. These privately owned aquaculture facilities have always been in very affluent hands in the region and are a recognition also of social status and roots with local culture whilst they are by far secondary economic activities to all present owners (like ranches in Texas perhaps, but I am not sufficiently deep in Texan culture to be positive about it).

¹⁰ In region Emilia-Romagna it is a criminal offence.

In conclusion, conflict mitigation could presently well go through a process of social validation of the choices made by the public administration through the stakeholders greater involvement, rather than a thorough change in approach, since this is a result of decades of delicate social compromises made with the stakeholders themselves, and also because many technical and financial solutions have already been deployed.

However – as said - external factors put a high degree of uncertainty on the future scenario picture and may play a major role.

5.6. SUMMARY, POLICIES AND POTENTIAL MITIGATION MEASURES

There is a conflict between cormorants populations protection and aquaculture farms (not fishermen) in Ferrara province, which is not quite as sharp as in close-by Ravenna Province.

The level of present private investment aimed at nature-oriented high-end tourism, hunting and aquaculture, is only partially motivated by the return of economic interest on extensive aquaculture produce (as opposed to intensive produced seafood which is becoming increasingly a food commodity). Such large investments cannot be fully understood unless five centuries of history are taken into account¹¹.

Those farms which are intensive and in small basins can benefit from mitigation measures, while the more extensive ones can only protect few wintering basins.

With the same set of legislation and administrative structure, it is apparent that the difference has been made by the attitude of the Province of Ferrara administration in handling the stock of conflict (until 1992 funding requests were not taken into account) and setting up a procedure for compensation and mitigation efforts funding that proved effective and efficient (all stakeholders are involved in such process through an institution called “Consulta caccia”).

However, the perception from fish breeders that there is a growing population of migrant cormorants (may be wrong, but this is what producers perceive) and the insecure financial resources for compensation and funding for the next future are building fear that the conflict might step up, although not to the level of Ravenna where the large requested financial compensations make it drag in courts since years.

The public authority is therefore interested in the kind of “decision support” that can be taken within existing legislative framework and financial resources. This is namely:

- 1) exchange of information with other EU regions having similar problems and Best Available Practices;
- 2) learning about mitigation measures that proved effective and efficient in other areas
- 3) founding decision on data rather than on “perceptions”, thus
- 4) improved circulation of information (see suggestions for effective ways to work with stakeholders).

Their interest in informed decision-making goes beyond cormorants/fisheries and is extended in all cases in which protected vertebrates cause damage (nutria, gulls, and herons especially) so that they are interested in the wider objectives of FRAP.

The level of current funding issued by the Region and Province is not very high (about 40 thousand euros/year for damage compensation¹². Other relevant funding figures are to be assessed in future FRAP work under Wp5 (degree of application of regional policies).

¹¹ see Carpaccio’s painting : “Le dame veneziane” having cormorant hunting in a “Valli” on the background of two venetian ladies sitting in a Villa’s porch) in which the Venetian word “Casino” both meant a place for gambling (the present Casino word in French and English languages) and sexual intercourse (casino is a synonym in Italian of “brothel”).

¹² This figure needs confirmation by relevant offices

5.6.1 Effective work with stakeholders – operational steps

All stakeholders with no exceptions have demonstrated an interest in information circulation as a basis for decision making.

Several views that were expressed during the interviews suggested to us a step-by-step approach with stakeholders that should improve the decision making process by making it more transparent and legitimate through the increased participation of stakeholders since early stages.

- 1) collect all factual information after the “perceptions “ have been provided. Very few interlocutors were actually in the position to give such kind of information (data but also photographs or anything that would witness their expressed positions).
- 2) have a semi-public discussion (all stakeholders but not the general public) to present such information and scrap consequently all not solidly founded perceptions or erratic bits of unfounded information (one example: WWF responsible was convinced that in Denmark hunting cormorants was very liberally allowed and this is why cormorants populations tend to shift to our model region)
- 3) Bring into the discussion the findings of FRAP, for example the role of landscape features in cormorant local population or cormorant diet actual intake, or updated levels of population and visiting rates (REDCAFE input also needed).
- 4) Re-discuss in the institutional forum (consulta caccia) the whole issue of cormorant impact mitigation on such new basis.

Past experience in the fisheries management sector where local awareness was hindered by distorted and insufficient information have proved in a recent past to benefit from the opening of fora and discussion based on short presentations and organised as round tables in which all participant stakeholders had the word, eventually with a larger public attending but with no interventions allowed.

The feedback of such meetings made the backbone of local fisheries management planning gaining vast consensus and spurring major changes at local and regional levels and then climbing up to national levels.

In conclusion, conflict mitigation could presently well go through a process of social validation of the choices made by the public administration through the stakeholders greater involvement, rather than a thorough change in approach, since this is a result of decades of delicate social compromises made with the stakeholders themselves, and also because many technical and financial solutions have already been deployed.

Chapter Six: The Social Impact Assessment from Portugal

6.1 Objectives of the report	1
6.2 Description of the Research Site	2
6.2.1 Profile of Setúbal Municipality	2
6.2.1.1 Demographic and Economic Characteristics	3
6.2.1.2 Fisheries Characteristics	3
6.2.1.3 Nature Conservation Characteristics	3
6.2.1.4 <i>Setúbal</i> Parishes	3
6.2.2 Profile of Palmela Municipality	8
6.2.2.1 Demographic and Economic Characteristics	8
6.2.2.2 Fisheries Characteristics	9
6.2.2.3 <i>Palmela</i> Parishes	9
6.3 Stakeholders	12
6.3.1 Governmental	12
6.3.1.1 Economic costs of the conflict	13
6.3.1.2 Economic benefits of the fishing industry	14
6.3.1.3 Benefits of the presence of vertebrates	16
6.3.1.4 Social costs and benefits of the conflict, the fishing industry and the vertebrates	17
6.3.1.5 Potential mitigation strategies	18
6.3.2 Fishing Industry	22
6.3.2.1 Economic costs of the conflict	23
6.3.2.2 Economic benefits of the fishing industry	25
6.3.2.3 Benefits of the presence of vertebrates	30
6.3.2.4 Social costs and benefits of the conflict, the fishing industry and the vertebrates	30
6.3.2.5 Potential mitigation strategies	35
6.3.3 Environmentalists	39
6.3.3.1 Economic costs of the conflict	39
6.3.3.2 Economic benefits of the fishing industry	39
6.3.3.3 Benefits of the presence of vertebrates	39
6.3.3.4 Social costs and benefits of the conflict, the fishing industry and the vertebrates	39
6.3.3.5 Potential mitigation strategies	41
6.3.4 Other economic agents	42
6.3.4.1 Economic costs of the conflict	42
6.3.4.2 Economic benefits of the fishing industry	42
6.3.4.3 Benefits of the presence of vertebrates	43
6.3.4.4 Social costs and benefits of the conflict, the fishing industry and the vertebrates	43
6.3.4.5 Potential mitigation strategies	45
6.3.5 Summary and comparisons	46
6.3.6 Key aspects to be considered for the instruments design	54
6.3.6.1 Aquaculture	54
6.3.6.2 Alternative Economic activities	54
6.3.6.3 Administration	57
6.4 References	58

6.1 Objectives of the report

This report was prepared within the scope of the FRAP project (contract number EVK-CT-2002-00142), whose main objective is the development of a procedural framework for action plans to reconcile conflicts between large vertebrate conservation and the use of biological resources, using fisheries and fish-eating vertebrates as a model case.

This report contains a Social Impact Assessment (SIA) of the conflict and potential mitigation strategies, at the local level. The report focuses on how the costs and benefits of the conflicts and mitigation strategies are distributed among local stakeholders.

In order to create a detailed understanding of the relevant local stakeholder, the information generated by semi-structured interviews is used to identify the categories that the local stakeholders themselves use to understand the conflict.

6.2 Description of the Research Site

In the frame of FRAP, Portugal is mainly involved in research reconciliation of conflicts between otters (*Lutra lutra*) and fish farm owners. The *Sado* River Estuary study draws a picture of the situation. The study area selected is the *Setúbal* Peninsula that comprises the northern shore of the *Sado* River estuary. The type of aquaculture found in the area, is coastal aquaculture, in ponds built according to the features of old salt marshes and producing marine fish species.

The study area includes two municipalities, *Setúbal* and *Palmela*, both intersected by a protected area, *Sado* Estuary Natural Reserve (*RNES*). In this chapter we make a brief description of these two municipalities and the parishes selected for the study.

Since most of the fish farms from our study area, if not all, are inside the *RNES* we provide some information concerning the concept of a natural reserve. This is an area intended for the protection of flora and fauna habitats. The classification of natural reserve aims at the adoption of measures to guarantee the natural conditions needed for the stability or survival of species, groups of species, biotic communities or physical aspects of the environment, when they need human intervention for its perpetuation.

The natural reserve has a Board of Directors and an Advisory Council that report directly to the Nature Conservation Institute (ICN), the entity responsible for the Protected Areas at a national level. The Directive Commission is the executive body of the protected area nominated by the Ministry of Environment, Land Planning and Cities (MCOTA), following the feedback from the City Councils within the area. It comprises three members: one nominated by the MCOTA (the chairperson), one appointed by the ICN and the other by the City Councils within the area. The Advisory Council comprises representatives nominated by scientific institutions and specialists in the field of nature conservation as well as representatives nominated by services of the central administration, City Councils, parishes, Environmental NGOs and institutions representing socio-economic interests.

In Portugal the land-use management plans (POPA) and their regulation are mandatory for protected areas of national, regional or local interest. The management plan of protected areas defines the desired conservation policy, namely the land use purposes and the conditions for altering it. The management plan for the *RNES* is being developed dating the last draft plan from 1995.

6.2.1 Profile of Setúbal Municipality

This municipality is situated in the estuary of the *Sado* river, 50 km south of Lisbon and 100 km north of Évora, the closest districts to *Setúbal*. With a total surface of 193,6 km², it is divided into eight parishes – S. Lourenço, S. Simão, Nossa Senhora da Anunciada, São Julião, Santa Maria da Graça, *Sado*, S. Sebastião and *Gâmbia*-Pontes-Alto da Guerra.

From these eight parishes, the three last ones are the most important for the aquaculture activity and the ones that we have selected for the study conflict.

The municipality of *Setúbal* contains two protected areas, *Arrábida* Natural Park, created in 1976, with a total extension of 64,5 km² and the *Sado* Estuary Natural Reserve, created in 1980, with 40,7 km². This means that approximately 54% of the area from this

municipality is classified as protected area. These protected areas limited (bounded/confined) the *Setúbal* urban area, respectively to the West and the East.

6.2.1.1 Demographic and Economic Characteristics

In the 2001 Census the population of *Setúbal* Municipality accounted for 113 934 residents, 48.8% of which were men. This municipality has a density of 591.3 inhabitants/km². From 1991 to 2001 the resident population increased 9.9%. In terms of educational level, according to 2001 Census, 22% of the population was high school graduates and 14% had an education level above high school graduation. The illiteracy rate for residents with more than 10 years old is 7.6%, less 1.6% than it was in 1991.

In 2001, the unemployment rate in this municipality was 9.8% while in 1991 it was 12.2%. From the total employed population in 2001, 2.3% were in the primary sector, 31.9% in secondary sector and 65.8% in tertiary sector. From 1991 to 2001 population employed in primary sector decreased 22.8% while the secondary and tertiary sector reported an increase of 14.7% and 35.1% respectively. Workers average monthly earnings by economic sector for the year 2000 was 578 € in the primary sector, 1034 € for the secondary sector and 705 € for the tertiary sector.

6.2.1.2 Fisheries Characteristics

According to 2002 data from the Aquaculture and Fisheries General Agency (DGPA), the number of active fish farms in *Setúbal* was 41 (3% of total fish farms operating in Portugal) corresponding to 304,9 ha (19% of the total area from fish farms operating in Portugal). The total production for 2001 was 373 225 kg (12% of national production). The main species produced in this municipality are Seabream (*Sparus aurata*), Seabass (*Dicentrarchus labrax*) and Senegal Sole (*Solea senegalensis*), which accounted in 2001 for 90%, 6.5% and 1% of the overall production, respectively.

Until the eighties, the fishing activity was of great importance in this municipality, being *Setúbal*, one of the main ports of the region and even of the country. The industrialization of this area generated new jobs mostly not related to fishing activity and caused, simultaneously, the loss of some important economic species like oyster, spider crab and whelk. According to data from Statistic National Institute (*INE*), in 2001 the total amount of fish unloaded in *Setúbal* was 3 852 t¹³ (3% of the national production) corresponding to 8 665 thousands of euros.

6.2.1.3 Nature Conservation Characteristics

Setúbal is included in two different protected areas, *Arrábida* Natural Park, created in 1976, and the *Sado* Estuary Nature Reserve, created in 1980. Approximately 62% of the municipality territory is classified as protected area, including 64.5 km² of the Natural Park and 40.7 km² of the Nature Reserve.

6.2.1.4 *Setúbal* Parishes

We have selected three parishes for our local study, which are *Sado*, *S. Sebastião* and *Gâmbia-Pontes-Alto da Guerra*. Table 1 can give us an idea of the main demographic characteristics of these parishes.

Table 1 – Demographic characteristics of *Setúbal* Parishes selected for the SIA

¹³ Not including production from fish farms

2001 Census data	<i>Sado</i>	<i>S. Sebastião</i>	<i>Gâmbia-Pontes-Alto da Guerra</i>
Population	5457	52814	4076
Population density (inhab/km²)	142	2511	125.1
% of Men	50.6	49.1	51.2
Illiteracy rate (%)	10.7	7.6	14.8
High school level (%)	18	22	17
Post-high school level (%)	5.3	10.3	6.1
Unemployment rate (%)	9.5	11	10.9
Population employed in primary sector (%)	5.2	1.4	9.1

Source: INE (2001)

Figure 1 shows the localization of the parishes in the municipality and also the land use, according to the Corine Land Cover classification (1987, Portuguese Geographical Institute – IGP), for the three parishes studied. The *S. Sebastião* and *Gâmbia* parishes were strongly agricultural.

Table 2 – Corine Land Cover classification by parish

	<i>Sado</i>	<i>S. Sebastião</i>	<i>Gâmbia</i>
Artificial areas	14.1%	25.2%	2.0%
Agricultural areas	21.3%	55.7%	47.8%
Forest and semi-natural areas	11.8%	17.7%	17.4%
Salt marshes	23.2%	0.0%	12.0%
Water bodies	29.6%	1.4%	20.8%

Source: IGP (1987) and IA (n.d.)

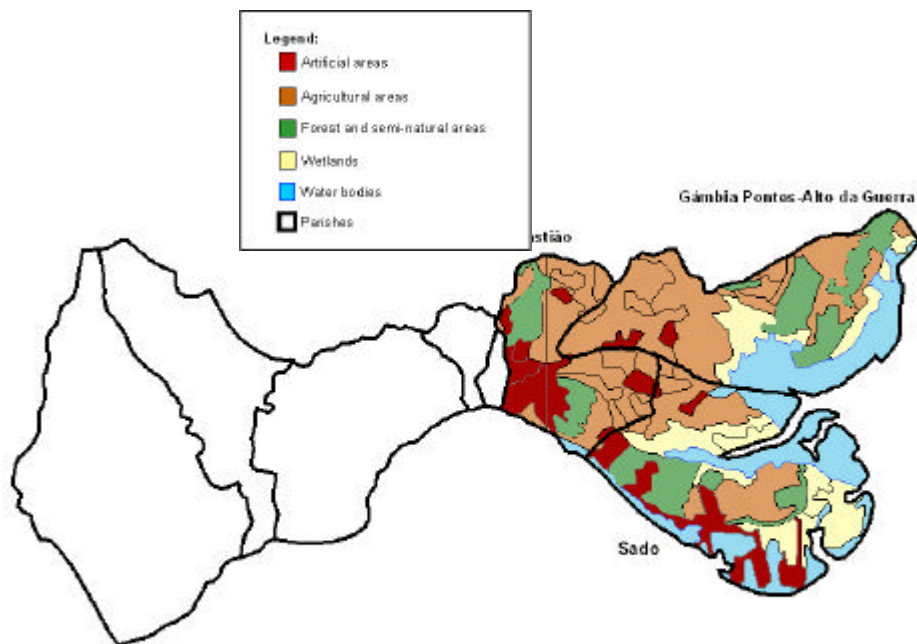


Figure 1 – Corine Land Cover and location of selected Parishes

Sado Parish

With a total area of 38.4 km², this is the most industrial area in the municipality. In 2001, the total population for this parish was 5457, 14.0% of which was under 14 years old, 16.0% was 15 to 24 years old, 57.6% was between 25 to 64 years old and 12.4% was more than 65 years old. Between 1991 and 2001 this parish recorded a decrease of 31.7% for the young population (less than 14 years old) and an increase of 64.5% of elderly population (with more than 64 years old). The population density is 145 inhabitants/km², lower than the average density for the municipality.

In terms of employment (2001), 5.2% of the employed population is in the primary sector, 42.4% in the secondary sector and 52.5% in the tertiary sector. Comparing this information to previous data (1991) we conclude that primary and secondary sector suffered a decrease of 8.3% and 9.6% respectively, whereas the tertiary sector increased 67.2%. In 2001 the unemployment rate for this parish was 9.5%. This value is lower than in 1991 (13.1%).



Figure 2 – Protected Area in Sado Parish

The figure above shows the protected area location in Sado parish. In this parish, 66% of the territory is classified as protected area, corresponding to 25.4 km² of the RNES.

S. Sebastião Parish

The total area of this parish is 21 km², being the most urbanized parish in the municipality. In 2001, the total population for this parish was 52814 of which 17.4% was under 14 years old, 15.2% was 15 to 24 years old, 55.3% was between 25 to 64 years old and 12% was more than 65 years old. Between 1991 and 2001 the population in this parish increased about 12%, decreasing 13.1% in terms of population with less than 14 years old and increasing 19.1% on population between 25 to 64 years old and 37% for population with more than 64 years old. The population density is 2511 inhabitants/km² much higher than the average density for the municipality.

Regarding employment, in 2001, 1.4% of the employed population was in the primary sector, 33.9% in the secondary sector and 64.7% in the tertiary sector. From 1991 to 2001 the employment in the primary sector decreased 19.3% but in the secondary and tertiary sector increased 21.3% and 39.0%, respectively. In 2001 the unemployment rate in this parish was 11%, lower than 1991 value (14.3%).



Figure 3 – Protected area in S. Sebastião parish

Observing Figure 3 we can see that only a small area of this parish is classified as protected area. It represents only 2% (0.5 km²) of the total area from this parish and it is associated to *RNES*.

Gâmbia-Pontes-Alto da Guerra Parish

With a total area of 32.6 km², *Gâmbia* is the most rural parish of the municipality. In 2001, the total population for this parish was 4076, 14.8% of which was under 14 years old, 14.9% was 15 to 24 years old, 54.9% was between 25 to 64 years old and 15.4% was more than 65 years old. Between 1991 and 2001 the population in this parish increased about 9.9%, decreasing 20.6% in terms of population with less than 14 years old and 26.1% on population between 15 to 24 years old and increasing 26.0% for population with 25-64 years old and 79.1% for population with more than 64 years old. The population density is 125.1 inhabitants/km² one of the lowest density rates in the municipality.

In terms of employment (2001), 9.1% of the employed population works in the primary sector, 37.3% in the secondary sector and 53.6% in the tertiary sector. Comparing this information to previous data (1991) we can conclude that employment in primary sector had a decrease of 23.3%, whereas the secondary and tertiary sector registered an increase of 10.2% and 60.1% respectively. In 2001 the unemployment rate for this parish was 10.9% lower than 1991 rate (16.1%).



Figure 4 – Protected Area in *Gâmbia* parish

From Figure 4 we can see that more than half of this parish is classified as protected area corresponding to 24.3 ha, representing 75% of *Gâmbia* total area.

6.2.2 Profile of Palmela Municipality

In all its extension *Palmela* (465.9 km²) presents distinctive territorial areas: urban areas, areas marked for the agrarian structure of large state, areas of dispersed housing associated to small or medium size properties and areas of mixing use. We can find five parishes in *Palmela* - *Pinhal Novo*, *Quinta do Anjo*, *Poçoirão*, *Marateca* and *Palmela*. It is essentially a rural municipality where the sectors of agriculture, forestry and cattle assume great importance. There is a clear asymmetry between the west, limited by the axis *Palmela/Pinhal Novo* (an area that benefits from the proximity of the urban areas *Setúbal*, *Barreiro*, *Almada e Lisboa (ou Lisbon)* and for that reason very appreciated by foreign populations and industrials for their residences?) and the remaining territory, on the east.

Arrábida Natural Park and RNES are also part of this municipality. The first one accounts for an extension of 21.1 km² in the municipality while the second occupies 17.9 km² of the municipal territory. This means that 9% of the total area of *Palmela* municipality is classified as protected area.

6.2.2.1 Demographic and Economic Characteristics

In 2001 *Palmela* had 53 353 inhabitants, being 49.1% men. The population density was 115 inhabitants/km². From 1991 to 2001 the population increased 21.7%.

Referring to education data of 2001, in *Palmela* 19.1% of the population was high school graduate and only 9.5% had an education level above high school graduated. The illiteracy rate for residents with more than 10 years old is 10.6%, less 4.8% than 1991 rate.

In 2001, the unemployment rate was 7.9% while in 1991 it grew to 9.1%. Of total population employed in 2001, 7.8% were in the primary sector, 34.2% in the secondary sector and 58.0% in tertiary sector. From 1991 to 2001 population employed in primary sector diminished 40.6% while secondary and tertiary sector suffered an increase of 28.6% and 73.3% respectively. Workers average monthly earnings by economic sector

were, in 2000, 451€for primary sector, 859€for secondary sector and 747€for tertiary sector.

6.2.2.2 Fisheries Characteristics

According to 2002 data from the Aquaculture and Fisheries General Agency (*DGPA*), the number of active fish farms in *Palmela* are 3 (0.2% of total fish farms operating in Portugal) corresponding to 53.7 ha (3.4% of the total area from fish farms operating in Portugal). The total production for 2001 was 4426 kg (0.14% of national production). The main species produced in this municipality are the Thin Lipped Mullet (*Lisa ramada*) with 40.4% of the total production for the year 2001, European Eel (*Anguilla anguilla*) with 24.6%, Seabass (*Dicentrachus labrax*) with 18.3% and Seabream (*Sparus aurata*) with 15.3%.

6.2.2.3 Palmela Parishes

The parishes of *Marateca* and *Palmela* were selected for this study. The main demographic characteristics for these parishes are presented in Table 3.

Table 3 - Demographic characteristics of *Setúbal* Parishes selected for the SIA

2001 Census data	<i>Marateca</i>	<i>Palmela</i>
Population	3586	16116
Population density (inhab/km ²)	27	214.3
% of Men	49.1	49.2
Illiteracy rate (%)	19.8	9.5
High school level (%)	10.1	21.0
Post-high school level (%)	3.2	13.5
Unemployment rate (%)	7.2	8.1
Population employed in primary sector (%)	23.8	4.8

Source: INE (2001)

Figure 5 shows the land use in the selected parishes according to the Corine Land Cover classification and their location in the municipality. Forest, semi-natural areas and agricultural areas are the predominant classes for these two parishes.

Table 4 - Corine Land Cover classification by parish

	<i>Marateca</i>	<i>Palmela</i>
Artificial areas	0.22%	0.8%
Agricultural areas	38.0%	77.3%
Forest and semi-natural areas	56.3%	21.5%

Salt marshes	1.6%	0.16%
Water bodies	3.8%	0.2%

Source: IGP (1987)

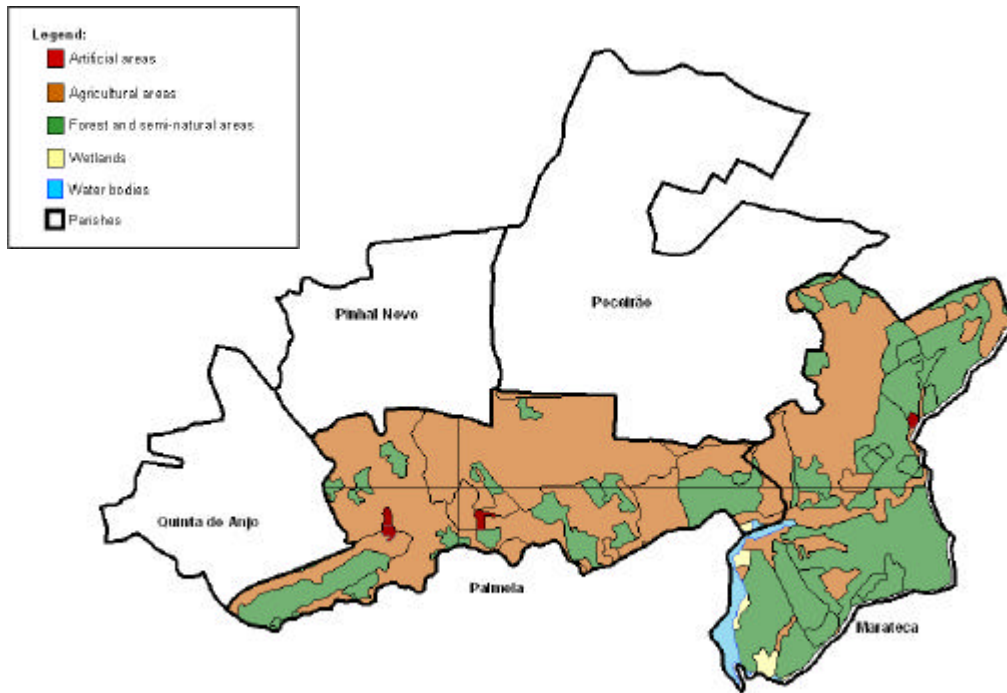


Figure 5 - Corine Land Cover and location of selected Parishes in *Palmela*

Marateca Parish

With a total area of 132.6 km², this is a predominant rural area. In 2001, the total population for this parish was 3586 of which 15.6% was under 14 years old, 13.6% was 15 to 24 years old, 54.6% was between 25 to 64 years old and 16.2% was more than 65 years old. Between 1991 and 2001 this parish suffered a decrease of 26.0% for the population with less than 14 years old and an increase of 40.0% in population with more than 64 years old. The population density is 27 inhabitants/km², representing the lowest value for the entire municipality.

In terms of employment (2001), 23.8% of the employed population is in the primary sector, 32.9% in the secondary sector and 43.3% in the tertiary sector. Comparing this information to previous data (1991) we conclude that population employed in the primary sector decreased 38.2% but secondary and tertiary sector increased 15.4% and 57.8%. In 2001 the unemployment rate for this parish was 7.2%, almost the same value that was registered in 1991 (7.3%).

From Figure 6 we can see that this parish also includes in the south part of *RNES*. It represents 17.6% of the parish which corresponds to 23.3 km².



Figure 6 – Protected area in *Marateca* parish

Palmela Parish

The total area of this parish is 75.2 km², being a more urbanized parish than *Marateca*. In 2001, the total population of *Palmela* was 16116 of which 14.6% was under 14 years old, 13.5% was 15 to 24 years old, 56.4% was between 25 to 64 years old and 15.5% was more than 65 years old. Between 1991 and 2001 the population in this parish increased about 16.2%, decreasing 8.2% in terms of population with less than 14 years old and increasing 19.9% on population between 25 to 64 years old and 55.3% for population with more than 64 years old. The population density was 214.3 inhabitants/km², the highest value in this municipality.

Referring to employment, in 2001, 4.8% of the employed population was in the primary sector, 31.2% in the secondary sector and 64.0% in the tertiary sector. From 1991 to 2001 the employment in the primary sector decreased 41.3% but in the secondary and tertiary sector increased 12.6% and 57.9%, respectively. In 2001 the unemployment rate in this parish was 8.1%, lower than 1991 value (9.2%).



Figure 7 - Protected area in *Marateca* parish

This parish includes two protected areas, *Arrábida* Natural Park and *Sado* Estuary Natural Reserve. The first one represents 13.3% (10 km²) of the territory and the second one accounts for 2.7% (2 km²).

6.3 Stakeholders

Several actors in the area were interviewed. Below a list of interviewees, their positions and main perceptions are summarized.

6.3.1 Governmental

G1

Nature Reserve of the Sado Estuary

Two technicians from *RNES*, a biologist and an environmental engineer were interviewed. The environmental engineer is currently coordinating a LIFE project for the restoration and support of *salines*.

G2

National Republican Guard – Nature Protection Service – Setúbal Division

The Nature Protection Service (*SEPNA*) is a recently formed group in the National Republican Guard (GNR), with the aim of responding to environmental threats. There is a green line established by a partnership between the MCOTA and *SEPNA*, to receive denounces from citizens.

SEPNA is organized in a central administration and regional divisions. *G2* is a coordination element of the *Setúbal* Division.

G3

Palmela Municipality – Environment Department

G3 is an environmental engineer responsible for the Environment Department of *Palmela* municipality. His perception about the influence of *RNES* over the municipality is that this protected area is a small area of *Palmela* and in economic terms, land is of more importance than salt marsh because of the key role assumed by agriculture in the municipality.

G4

Setúbal and Sesimbra Ports Administration (APSS)

G4 is the CEO of the *Setúbal* and Sesimbra Ports Administration. This company has public capitals and he was invited to this position one year and a half ago by the Minister. An environmental engineer, responsible for the coordination of the environmental management system of the APSS was interviewed together with *G4*.

"Q: Do you think that the lack of land use plans affects the work of the APSS? I do not think that. The Port is essential for the development of the region. If there are restrictions that impose conditions to the activities of the Port will have to explain why. Everything that conditions the Port is, in my view, bad."

G5

Alcácer do Sal Municipality – Environment Department

G5 is a biologist responsible for the Environment Department of the *Alcácer do Sal* municipality. She has made a work about fisheries in the *Sado* Estuary before coming to work in the municipality.

6.3.1.1 Economic costs of the conflict

From the governmental side, there is not, in general, a perception of the conflict between the vertebrates and fish farming. Only on the administration of the Natural Reserve this knowledge is present and it is recognized that both the cormorant and the otter predate on fish farms. This is referred in the studies, testimonials and from direct observation. In the more populated areas, the birds are the main predators, while in the lower population density areas, the otter is a more important predator. This perception is generalized among interviewees and it is confirmed by specialists. However, it is common for fish farmers to overemphasize the impact of the predators, as a result of an “influence chain” effect generated.

“There are scientific works that prove the predation by cormorants – there are complaints by the fish farmers and verification from us and from third elements, which reflect the truth of these complaints. Birds have since ever eat fish and in the less populated areas it is the otters. We also have the idea that when a fish farmer complains, the others also tend to complain, due to influence. (...) There is an obvious tendency to overemphasize, there are more fish dying due to other causes than because of the otter. (...) They do not come to complain about meteorological conditions, but because of the otter.” --G1 (Natural Reserve technicians)

There is even the possibility that some of the losses are caused by the high number of dogs that the fish farmers use to protect the aquaculture.

“Another thing they do is having dogs inside the tanks to detect predators. (...) The amount of domestic animals that exist here (...) [makes it difficult to know] where the effects of domestic animals end and where the effects of the otter starts.” --G1 (Natural Reserve technicians)

Fish farmer complaints about the otter do not happen on a regular basis. Rather, they are used as an argument to support the installation of fences.

“Fish farmers do not come to complain about the otter to the Reserve; they usually complain about the otter when they have to justify themselves for the fences they put up.” --G1 (Natural Reserve technicians)

Even though the otters show up as an economic cost to aquaculture, the biggest threat comes from the cormorants. G1 makes this deduction from informal talks with the fish farmers, where they only complain about the cormorants.

6.3.1.2 Economic benefits of the fishing industry

Activity's Potential

G1 doubts of the benefits of aquaculture, since the market is saturated with fish. Many of the attractiveness to fish farming comes from EC funds.

Note 1: The European Union made over EUR 280 million available to Portuguese authorities and businesses in the fisheries sector for the period 1994-99¹⁴. This financing has been allocated mainly through the FIGG (Financial Instrument for Fisheries Guidance) and covers the whole of Portugal's fisheries sector, from fleet modernization to port facilities, and from aquaculture to the processing and marketing of products. Besides, several projects were also approved for a substantial investment by the Portuguese authorities.

The investment in the development of aquaculture activity between 1996 and 2000 is summarised in the table below.

Table 5 - Investment in aquaculture development, 1996-2000

10 ⁶ EUR	Total Cost	Public Expenses			Private Sector
		Total	EU	National (State Budget)	
2000					
Portugal (mainland)					
Approved	-	-	-	-	-
Executed	626	546	458	88	80
LVT Region					
Approved	-	-	-	-	-
Executed	-	-	-	-	-
1999					
Portugal (mainland)					
Approved	2478	1725	1389	337	753
Executed	247	136	115	21	111
LVT Region					

¹⁴ European Union (<http://europa.eu.int>)

Approved	20	12	10	2	8
Executed	90	72	60	12	18
1998					
Portugal (mainland)					
Approved	817	490	408	82	327
Executed	469	284	239	45	185
LVT Region					
Approved	-	-	-	-	-
Executed	69	47	39	8	22
1997					
Portugal (mainland)					
Approved	163	163	122	41	-
Executed	35	35	26	9	-
LVT Region					
Approved	-	-	-	-	-
Executed	-	-	-	-	-
1996					
Portugal (mainland)					
Approved	209	209	157	52	-
Executed	-	-	-	-	-
LVT Region					
Approved	-	-	-	-	-
Executed	-	-	-	-	-

Source: *INE* and *DGPA*, Statistics on Fisheries 2000, 1999, 1998, 1997, 1996

Region's Potential

The three municipalities stakeholders interviewed have expressed the low importance of aquaculture for the economy of their municipalities. Agriculture, industry or traditional

fishing are more important activities than fish farming. This feeling is further substantiated by APSS data.

"We might have two fish farms in the municipality. I do not have that information updated but it is an important activity for the estuary and it would be good if it gets developed." -- G3 (Palmela Municipality environment technician)

Note 2: APSS 2003 report says that goods transportation in Setúbal port were (Mtons) 6578 in 1999, 6459 in 2000, 6741 in 2001, 6444 in 2002 and 6575 in 2003 (projection).

However, governmental stakeholders recognize the importance and the potential of aquaculture in the Sado Estuary, with a bet in quality that can be attained through the quality of the ecosystem. Aquaculture is also viewed as an alternative to the depletion of fish banks.

"Aquaculture shows up as a solution to that problem [depletion of fish banks] (...) They are quite productive and sheltered areas. Areas with some equilibrium and quality. (...) Here in Sado there is a high number of fish farms. Not a big amount, there is more quality than quantity. (...) Here it is produced around 6 thousand tons. 500 kg/ha/year. We are not sure, but Mr. Reinaldo Mendonça from SapalSado will tell you how much is produced here. And it is produced with very good quality." -- G4 (Ports Administration CEO)

G5 has pointed out that the activity is being halted by the RNES policy on aquacultures. There is even a generalized feeling among fish farmers that very often in case of doubt the RNES forbade the requests of fish farmers. The result is a growth of illegal fish farms.

"I think that area has a big potential in terms of development. There are other countries in Europe that have those areas very developed. The fish farms that we have in the municipality are all illegal. (...) The problem is that RNES does not allow the licensing of fish farms." --G5 (Álcacer do Sal Municipality environment technician)

6.3.1.3 Benefits of the presence of vertebrates

The benefits of the presence of vertebrates are not immediately pointed out by most of the governmental stakeholders. However, when asked about it, G3 pointed out the value of the otter conservation *per se*.

"Otter have a particular interest because as you know it is threatened all over Europe, almost disappearing. There is knowledge that she is much better here than in the rest of Europe." --G3 (Palmela Municipality environment technician)

The potential for tourism based on conservation is also pointed out by G5 as a benefit of the presence of otters.

"Our objective is to develop a tourism more connected to nature, bird watching. We intend to build an environmental interpretation centre. Our bet will be in quality tourism." -- G5 (Álcacer do Sal Municipality environment technician)

Vertebrates in general are also important in an educational perspective. The otter is used in environmental interpretation programs by schools and this further increases its' value as a species to preserve.

"During school visits we talk about all the animals in the reserve, otter, dolphins... The fact of this animals being here shows us that this system is not so bad. It is like a bio-indicator. So we are pleased of having those animals around here." --G3 (Palmela Municipality environment technician)

6.3.1.4 Social costs and benefits of the conflict, the fishing industry and the vertebrates

Nature Conservation

It is not known whether the population of otters is increasing or not, but it is known from a recent study that there are many otters. As pointed out by G1, fish farming has probably increased their numbers, by supplying them with more food. The same happens with some birds, like the cormorants. This increase should not be seen as a positive impact, but rather as an unnatural disequilibrium made by men.

"I even believe that the number of species has been increasing, because they have a lot of food. The cormorant is the first bird pointed out by the fish farmers." --G1 (Natural Reserve technicians)

Fish farms are not essential to keep the otter numbers high, because they have a much diversified diet. But as for cormorants, they would not be able to survive in very high numbers without the fish farms.

Note 3: *Fish farming has contributed to cormorant population recovery by providing a banquet of fin-to-fin fish in shallow ponds. (<http://www.montelis.com/satya/cormorants.html>)*

The presence of reasonable densities of fish in relatively shallow inland water bodies probably also represents an attractive food source for opportunistic predators such as the cormorant. (http://www.defra.gov.uk/corporate/regulat/forms/cons_man/vertpest/wm14.pdf). Cormorants clearly respond in a positive way to the presence of shallow-water ponds stocked with high densities of easy-to-capture prey fish. (<http://aquanic.org/newsletters/federal/fwsrule.htm>).

G1 points out that the two main environmental effects of the deployment of fish farms are the occupation of previously wild habitats and the predation by birds and mammals. There have been cases of killing of otters, but this is only known through denounces. G2 is not aware of problems with the otters, but he pointed out that there was a case of otter's skin being sold in another city.

"The main problem is the loss of habitats; the other problem has to do with the predation by the birdlife and the mammals, including the otter." --G1 (Natural Reserve technicians)

Pollution

Stakeholders G3 and G4 agree to the fact that aquaculture is a non polluting activity. However G3 considers that it is not relevant compared to industrial or agricultural

activities, while G4 thinks that none of these activities causes damage to the environment at all, as every discharge has to be controlled. G5 believes that even if it is true that aquaculture is a polluting activity, there are technologies that might mitigate that.

"The big threats in terms of pollution are agriculture and some industrial units that make direct or indirect discharges to water lines. Diffuse pollution is very difficult to control. The agriculture activity has a big weight in the municipality." --G3 (Palmela Municipality environment technician)

The belief of G4 is derived from his knowledge of the estuary hydrodynamics.

"We have tides, especially the tide that brings food and takes out waste, even if they follow the environmental criteria. The sea energy itself helps minimizing some environmental impacts." --G4 (Ports Administration CEO)

Employment

In terms of employment, aquaculture is seen as an important contribution, since G4 and G5 agree that it has the potential to employ non qualified labour in an area that suffers from big unemployment rates.

"These areas have some unemployment and those people do not have a high degree of education. So this kind of activities can employ these people." --G5 (Álcacer do Sal Municipality environment technician)

The amount of fish from normal fisheries has been decreasing, so aquaculture can be seen as a substitution activity.

"The amount of fish is much lower than what it used to be." --G5 (Álcacer do Sal Municipality environment technician)

Note 4: Total production of fisheries increased steadily between 1986 and 1992 but was followed by a downward trend until 2001. In 2002, this trend has changed, due to the increase of catches in the Azores and Madeira. Taking the period from 1998 to 2002, the Portuguese domestic production has decreased around 22% (24% in the LVT region). In the Lisbon and Tagus Valley (LVT) region the reduction was 24%, from 52,190 ton in 1998 to 39,547 ton. The declining trend of the sector, led by a decrease in fish catches, was partly due to the technical measures introduced to safeguard some species. The other major contribution was the reduction in the fishing fleet and the decrease in overseas fishing, which in turn led to a fall in long-range fishing. Adding to the reduction of captures in national waters, the end of some bilateral fishing agreements, namely with Morocco, has worsened the situation in more recent years (INE/DGPA, 1997).

6.3.1.5 Potential mitigation strategies

Physical strategies

The idea of mitigating the impact of the predators with fences, by putting them out of the aquacultures is seen by the RNES specialists as not compatible with nature conservation.

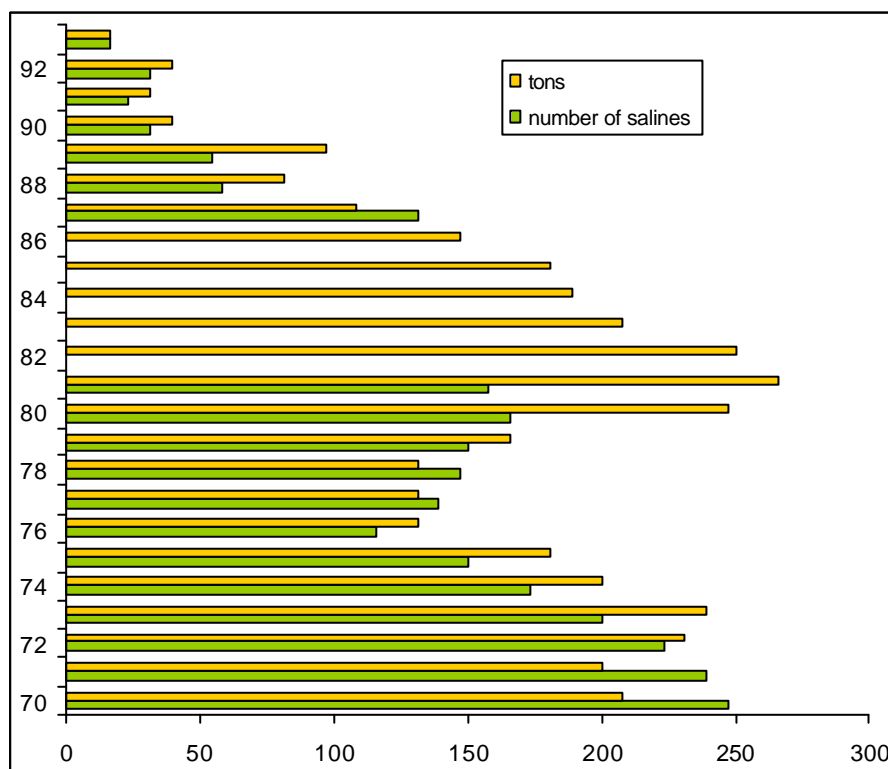
"Otters and vertebrates will always exist. (...) it is always difficult. (...) «We are going to scare away the wild animals» and we ask, to where, to outside the Reserve?" --G1 (Natural Reserve technicians)

Technical strategies

A LIFE project is being implemented to recover *salines*, which are valuable habitats for birds. *Salines* have been decreasing drastically as a result of the decrease of the price of salt. Some of them have even been transformed to fish farms.

"This LIFE project tries to consolidate the birds' habitats. (...) There are already few salines, so we have to conserve the ones that still exist." --G1 (Natural Reserve technicians)

Note 5: In the next graphic we have the evolution of salt production in terms of number of salines and volume of production for the Sado area (1970 to 1993).



Source: Sado Estuary characterization, RNES 1995.

Graphic 1 – Salt production and productive salines (1970-1993).

When the Community Structural Policy was applied in Portugal, aquaculture began to be seen as an alternative method for the production of animal protein for human consumption, and even complement traditional fishery production. As a result, many salinas in estuary areas were converted to commercial fish farms. In the LVT Region the reduction in the number of salinas was from 44 in 1998 to 12 in 2001. Salt production in the region

decreased sharply from 11,184 tonnes in 1994 to 534 tonnes in 2001.

Land planning instruments

One big gap in the development of strategies is the absence of a land management plan. There have been several attempts to do this plan that never went forward. This would ease the definition of areas compatible with fish farming. This plan is now under way and the characterization studies have already been completed.

"The Reserve might do a land management plan... in fact the Reserve's territory is not the same all over its area. So, that plan could take that into account and with that plan it would be possible to safeguard that important and significant areas would not see more fish farms growing, while in other areas the investment was kept, in the case that they were not natural reserve anymore." --G1 (Natural Reserve technicians)

This plan would also allow for the definition of what amount of fish farming would be acceptable or sustainable in the Reserve.

"If there was an area in the Reserve determined for fish farms, it could even be allowed for fish farmers to take measures to avoid the otters, thereby avoiding its' killing. The problem is that there is no roof. How much per cent can be transformed into aquaculture?" --G1 (Natural Reserve technicians)

Enforcement

The lack of means of the *SEPNA* and of *RNES* to supervise the area is seen as a main obstacle to nature conservation and to avoid the killing of fish predators. Action in collaboration with other entities in the *RNES* area and delivering the technical means to the *SEPNA* would improve the supervision in that area. There are only 2 guards from the *SEPNA* for the *RNES* and *Arrábida* Natural Park. Together with a few rangers from *RNES*, this is a major handicap for the development of any constructive work. G5 even thinks that an increase of means to supervise aquaculture activities would permit some mitigation measures that nowadays are forbidden due to the impossibility of *RNES* to supervise its correct implementation. *RNES* should have a role of supervision instead of only prohibiting the activities at first hand.

"There is a lot to do over there. I am thinking of making a report, acting among other entities."--G2 (Nature Protection Guard coordinator)

*"We are a bit limited for acting in *RNES*. There is a big lack of means. Promised means are still missing and they would be enough for an efficient supervision of that area."--G2 (Nature Protection Guard coordinator)*

*"We are a bit unprotected at *RNES* because of the lack of technical means."--G2 (Nature Protection Guard coordinator)*

*"I know that they only have 2 guards for *RNES* and *Arrábida* Natural Park. That is nothing. I think the problem is the lack of means."--G5 (Álcacer do Sal Municipality environment technician)*

"RNES should play a role of supervision and not only prohibit the activities at first hand. And it does not happen only with RNES. To what refers to other institutions when they do not have the possibility of supervise something they just do not allow it instead of trying to discuss the problem and think about the matter. They never came up with mitigation strategies to solve problems." --G5 (Álcacer do Sal Municipality environment technician)

6.3.2 Fishing Industry

P1

P1 is a big fish farmer in the *Setúbal* municipality and one of the oldest. He is very active in making the conflict with the Reserve visible and contacting different entities to get the perception of this problem.

P2

P2 is a fish farmer that owns a supposedly extensive aquaculture. He is illiterate, but talks very much about the skills he earned during a life long in his permanent work in the estuary. He claims to know more about the *Sado* estuary and doing aquaculture there than anyone else.

Some fish farmers laugh when we reference P2, pointing to him as someone that says more than he actually does. A quote from his interview:

"Let people work, with conditions also. Look, you cannot do this, do instead that, and provide the alternatives, what is better, but not! Nobody thinks? Have patient, this is the crib where I was born, it was my bed, it is where I had hunger, misery and lice, and my life today is a great life, but I do not like them to damage it, no, no!"

P3

P3 are two fish farmers, one of them quite new into the activity. He bought the fish farm from the other, as the initial owner got stuck with debts after the no return funds from the European Commission ended.

P4

This fish farmer P4 is managing an extensive aquaculture. He has been a fisherman for over 20 years. This year he started farming sea bream and sea bass. He considers that fish farms have to exist, as there is no other way to live anymore.

He is running a fish farm that is borrowed by another person from the state. It has an extension of about 80 ha.

P5

P5 owns two fish farms, one in *Alcácer do Sal* and the other in *Setúbal*.

P6

This fish farmer has a graduation in Zootechnical Engineering. She is part of the staff of a fish farm company owned by 3 brothers. During her studies she has always dreamed of returning to back to her homeland, *Setúbal*. Fish farming showed up as an activity that can be developed in coastal areas.

Another person from the staff of this fish farm company showed up in the middle of the interview by chance. He comes from a family with a strong connection with aquaculture in the region. Both his father and his uncle are fish farmers.

P7

Fish sales intermediary

P7 is a fish seller (intermediary); in its point of view the aquaculture has potential to grow in the *Setúbal*'s region. At this moment, although there is an economic crisis, its sales are two hundred tons per year.

P8

This fish farmer has the opinion that this activity does not have a big importance in Portugal.

"In Portugal we already produce 3 thousand tons of fish and that represents a few millions. But prostitution in Portugal has much more power than this activity."

P9

P9 is a fish farmer with an university degree and a large knowledge of the fish farming activity around Europe (he had a traineeship in Norway). He claims to be happy that his fish farm is part of the reserve, because among other circumstances, they have minimum water quality insurance.

"My personal opinion is that we are happy to be in a reserve area, because we know that someone besides us is concerned with the environmental quality in the area, because it is fundamental to have a good water quality, essentially a good water quality to develop aquaculture."

6.3.2.1 Economic costs of the conflict

Perception of the conflict

In general, all the fish farmers interviewed have a clear perception of the conflict and complain about predators in general. Some of them even add fish in advance to prevent losses. However, P3 also points to the fact that predators usually remove small fish, resulting in a smaller loss.

"Predators are a little bit prejudicial, but we already put high contingents counting with that. They eat when the fish is tiny/small/little/baby, and when it is small it is cheaper. (...) With the estimates that we have done, we can count always with less than 14/15%, so it is no use to count. And do you know what we do? We put more. As the tiny fish is not very expensive, we can put more." --P3 (Fish farmers)

Perception of the conflict with specific predators

There is perception of the conflict between fish farming and cormorants and otters. This perception comes mainly from direct observations, even though some fish farmers got to know it from the contact with the FRAP ecology team. Concerning the otters there is also an idea of the predation habits of this species.

"Cormorants dive and hunt any kind of fish. Otters are hunter animals and also hunt any kind of fish, but they prefer Golden Bream and Sole because those give them less fight." --P1 (Fish farmer)

The presence of the otter is not generalized. Most complaints about this species come from fish farmers installed on more rural areas. Fish farmers closer to the *Setúbal* urban or industrial area have almost no problems with otters.

"We have that [otters and birds]. Here not that much, but in the Alcácer area we have problems with the otters, because they are dozens there, only in our fish farm. After the rice harvest they start targeting the fish farm."--P5 (Fish farmer)

The damage inflicted by the otter comes not only from predation to eat, but also because this species likes to have fun with the fish, as P4 says.

"The otter eats, fills the belly and then kills, kills to play. She goes chasing and plays, even with her belly full, until she gets sleepy. It always damages, it damages a lot." --P4 (Fish farmer)

Otters are far from being considered the only or the biggest threat to fish farms. Several bird species are pointed out by most fish farmers. As for the cormorant it can be said that this species is on the target of the shotgun of any fish farmer. By some fish farmers, the cormorant is considered to be the only serious animal threat to the activity.

"And it is to everyone, no one should doubt of that. (...) That one is definitely to kill..." --P2 (Fish farmer)

Besides the direct killing, cormorants can also bring diseases that spread to the fishes, resulting in additional damage.

"And then it is not only what they kill, what they eat, it is what they damage. There is fish that is bitten and ends dying. Dies, gets diseases, can spread the diseases. (...) Until now we did not have that problem [with diseases]." --P4 (Fish farmer)

The egret is another bird that predaes on fish farms. However, since it can only eat small fish, the costs inflicted do not worry fish farmers.

"We have the little egrets that eat the small fish. (...) Egrets are only a problem while the fish is small." --P6 (Fish farmer)

Kittiwakes threat is no longer significant nowadays.

"The kittiwake eats Sea breams. Nowadays, this problem was reduced with the placement of props at the entrance of the water tank" --P7 (Fish sales intermediary)

Unspecified predator costs

There is not a consensual statement among fish farmers about the importance of predation to the activity. However, all the interviewed fish farmers have pointed out to losses around 10% to 20% due to the predators.

"In ten thousand fishes we estimate that one to two thousand will die, without giving much loss." --P2 (Fish farmer)

"If the fish does not die, we can afford the food for the predators. The aquaculture risk is precisely the deadness/massacre..." --P3 (Fish farmers)

P4 points out that total loss can be estimated in around 15%. This figure probably includes natural mortality, thefts, pollution or any other accidents.

"I know from a starting point that, from 100 thousand, 15 thousand are not ours. 15%. Mortality (...), killed by the predators." --P4 (Fish farmer)

Otter predation costs

There is a consensual figure of otter predation among fish farmers that points to 4 kg of fish being eaten by an otter everyday. This figure does not come from direct calculations, but rather from “indications” from some source or as something being “said” in the fish farmers community.

"I have indications that one otter eats about 4 kg of fish per day which means that she eats 20€/day. This is a big damage. (...) One otter gives more than 1000 contos [5000€] of damage per year." --P1 (Fish farmer)

Based on this number, some fish farmers have made their own calculations for the loss given by an otter a year round, with figures from 5000 € to 15000 €

"(...) it was usual before the otter was there, to make 300 to 400 kg of sole in that pond, the last year I had 3 kg and a half. If we multiply 400 kg of sole for 4 thousand escudos [20€], in this moment we are talking of about one million escudos [5000€], which is a big prejudice, is not it? ...therefore easily measurable." --P9 (Fish farmer)

In the *Alcácer do Sal* fish farm, losses assume really huge proportions, with more than half the production being lost due to otters predation.

"There [in Alcácer do Sal] they really affect the fish numbers. This year we have 50 thousand fishes and they are all still there. In the years in which we did not have fence, we expected 11 tons and we never took out more than 4 tons. This year we will see how it is going to be, but I expect almost all of it will be there." --P5 (Fish farmer)

Birds predation costs

The costs inflicted by the cormorant are mainly punctual, but massive. When they come in big groups, they can destroy most of the production in a few minutes. Each cormorant can take about 2 sea breams at once, with weights ranging from 200 to 400 g.

"Once I have one of that cormorants group acting (...) They where making noise, it lasted about 5 minutes. They took more than 200 kg of dead golden bream from the pond." --P1 (Fish farmer)

Seagulls are not a problem as a fish predator, because they mainly eat the less able small fish. However, they can come in big groups to feed on the fish food.

"As soon as the seagulls listen to the truck, they show up and eat the flour that he is carrying. (...) During the year they eat the flour. We have to count one and a half bag, instead of one, because half goes to the birds." --P6 (Fish farmer)

6.3.2.2 Economic benefits of the fishing industry

Activity's Potential

Aquaculture is seen as a very promising economic activity, even essential to the country. It is seen as a promising solution for the deficit between the fish fished and the fish that Portuguese people eat.

"This is an economic activity of interest to the nation (...) We are importing 2/3 of the aquaculture golden bream consumed

in our country when we could be exporters." --P1 (Fish farmer)

If the density limit in the *RNES* is raised and more area is authorized for aquaculture, huge economic benefits will be derived. Values pointed out by P1 go to 32 million euros with 5% of the Reserve dedicated to aquaculture, while P8 estimates a value of 100 million euros per year, reached within 10 years.

"Relevant fish farms in the estuary represent 0.93% of the area from this reserve. If we count fish farms that are abandoned because they are not allowed to get modernized, we have 2.3% of the reserve. If they authorize 5% of the reserve we could have around 1000 ha of ponds, producing 6000 tons of fish representing something like 32 millions of euros." --P1 (Fish farmer)

The proposal for an increase in fish densities seems to be influenced by the Spanish panorama.

"With a density of 950 g/m³ we could produce 10 tons of fish per ha. In Spain, they are producing 40 to 50 tons/ha. If we could produce here 10 tons/ha, it would correspond to a production of 20 thousand tons, only in Sado." --P8 (Fish farmer)

A different opportunity area, expressed by one fish farmer, is that of "aquaculture tourism". P4 has a plan to transform the fish farm into an area for sport fishing.

"I want to achieve an objective, I do not know if it is going to work, which is putting there a tourist park with people fishing. With 80 ha in the fish farm it is perfectly possible for people to come there and fish." --P4 (Fish farmer)

Region's Potential

Part of the potential for aquaculture is seen as the only viable alternative to the old ponds of salt production, increasingly abandoned as a result of the market devaluation of salt.

"Salines are abandoned because they just do not have any economic interest. (...) Salt is sold at 8\$00/kg [0,04 €/kg] and it is very hard to sell it. Fish is sold around 1000\$00/kg [5€/kg]. (...) Two fish farms are generating more profit than all the salines in the good old times." --P1 (Fish farmer)

The extremely good natural conditions that the *Sado* estuary offers for fish farming are constantly invoked. There is the widespread argument that the higher quality of the fish produced in this region is due to the food provided by itself, with some fish farmers pointing to 50% of the diet on a semi-intensive regime coming from natural sources.

However, there is also a substantial amount of regionalism in the speech.

"There is not in Spain or in any place in the world such a good place as Setúbal. Setúbal has the ability to do fish farming of the most beautiful there can be and of the best there can be and with low costs." --P2 (Fish farmer)

Due to the high quality of the fish raised, there are customers and markets that specifically try to get this fish, even in Spain, resulting in an added market value.

"This is a business with future. (...) There is a tendency to

for new fishes to show up. (...) The Spanish come here to get (...) because it has more quality." --P6 (Fish farmer)

Note 6: *No statistical data about the exports of fish from aquaculture is available.*

Parallel Benefits

Fish losses in aquaculture have had a side effect of increasing the fish stocks in the estuary. Fishermen have thus been fishing a big amount of aquaculture's fish.

"Nowadays, the fishermen are fishing a lot of fish, which came from the fish nursery, it runs lot of fish from here, and we cannot deprive from anything. (...) In some interviews to fishermen, they say that they catch a lot of fish from the fish nursery. Sea bass, Sea bream (...)" --P3 (Fish farmers)

Handicaps to economic viability

Prices/Concurrence/Profit margin

Fish prices have been going down. After salt production went down, aquaculture showed up as a very promising activity, in a region that had problems with famine. Sea bream was sold at very high prices, but in the last years prices have been coming down, as a result of low quality imported products from very intensive aquaculture that enter the Portuguese market. Fish farmers are convinced that prices should reflect the quality of the product. Current selling prices of sea bream range from 3.75 €(P2) to 4.5 €(P5) per kg.

"I used to sell the sea bream at 3 thousand escudos [15 €] per kg and today I sell it at 750 escudos [3.75 €] per kg. The price has no quality, it has no quality!" --P2 (Fish farmer)

The big number of intermediaries until the product reaches the final consumer is pointed as a main factor in the reduction of the profit margin, as the prices in the market stay at much the same level.

"If we want to win something we have to increase the density fish because the price per fish is decreasing. (...) But in the market it never goes down. There are many intermediaries. Over there it is 7€ to 7,5€." --P5 (Fish farmer)

On the other hand, a fish sales intermediary expressed that the importance of intermediaries to the activity, as the alternative of selling directly at fish docks is an economic disaster.

"When the aquaculture's fish arrives at the docks it is a disaster. They lose money in docks. They complain to earn less than they used to years ago. The profit margin diminished, but they also produce much more. In the docks the Sea bream arrives at 15 € and it is impossible to sell." --P7 (Fish sales intermediary)

Most imported fish comes from big producers like Spain or Greece. Fish farmers are convinced that a big part of this fish lacks quality, not only because it is produced under very intensive regimes, but also because when it arrives at the Portuguese market it is no

longer fresh. Even though this fish has very bad quality, consumers do not know or do not care about making the difference about it – they just go for the cheaper.

"We have the Greek fish. Portuguese consumers do not have the mentality of buying the best. They always go for the cheaper. That Greek fish takes about 5 to 6 days to come to Portugal and after that it goes to the big freezers. When that fish arrives at the market it has at least 7 to 8 days. It loses the quality." --P5 (Fish farmer)

Lack of source control further deepens this problem at the consumers' side.

"I buy a box of national Sea bream and 10 of Greek Sea bream and I mix everything. I present the invoice of the national one and receive the label. It is impossible to control." --P7 (Fish sales intermediary)

When the Portuguese fish farmers compare themselves with other countries, like Spain and Greece, they conclude that they are not in the same level of competition concerning aquacultures. This is attributed to the different policies and support fish farmers get from each government.

"We cannot compete with the Spanish, because they have much more privilege than us. The Setúbal's fisheries cannot compete with the Spanish. Formerly the government gave a subsidy to the fish farmers, but this later finished. But in Spain the subsidy is for production and here it was for baby fish. (...) The foreign fish is sold here at half of the price." --P7 (Fish sales intermediary)

Note 7: see Note 1

Conflict with the Reserve

There is a contrast between the overall idea of benefit of this activity and pessimistic view resulting from the restrictions imposed on the activity by the Reserve. One such restriction is the fish density limit of 350 g/m³.

"If we work legally, the men do not earn for the light. (...) The densities... but we do not step out too much anyway." --P6 (Fish farmer)

Project proposals are also continuously blocked by the administration of the Reserve which does not present any explanation to fish farmers. Fish farmers wish to invest in the development of aquaculture, but the Reserve constantly blocks new projects.

"They do not let me work, because I had a project to make a saline. I submitted the project and it was a good thing, pretty and I would waste between 60 thousand to 70 thousand contos [300000-350000 €] with my own money, without money from no load funds and they did not sign the project. I do not know why (...)" --P2 (Fish farmer)

Another policy from the RNES is to allow some fish farms to be explored under the condition that a part of the area is reserved to birds. This measure is seen as a major economic brake to fish farmers.

"We have a big tank, without fish, only for the birdlife, so

that they can stay with the birdlife, and other conditions we negotiate with the Reserve. (...) I am in favour of the birds and I think everyone is, but as long as they do not come into the pocket. (...) If the Reserve wants more space, they should buy it." --P6 (Fish farmer)

This conflict has been escalating to the point that all the dialogue has become impossible. According to the fish farmers the Reserve stands always on one side – of the animals - without looking at the other.

"It is the total mess. People cannot look at each other anymore. (...) The Reserve has the obligation to do, but wait a moment! Also to defend this... you are not going to do highways to cut a house by the middle. It cannot be. (...) Here there is a conflict animal-man. There is always some on one side, but always, all have the right to life." --P4 (Fish farmer)

Even after fish farms are built, the Reserve imposes severe restrictions on the building of infrastructures, some of them essential for the activity. Fish farmers frequently disobey these restrictions and penalties for non-compliance are frequent.

"This is a very important issue because RNES authorize the water tank's building but obstruct the fish farmer's work, with penalties. (...) How could RNES limit the use of technology by the fish farmers? For example, Liquid Oxygen. I heard to say that it was forbidden here. What is the problem to have one big stone bottle there? Because it is essential for the activity, if problems appear in the ventilator pipe, we can save all the production with that equipment." --P7 (Fish farmer)

Comparing with other protected areas in Portugal, like the Ria Formosa, this situation is seen as unfair. A stronger power of fish farmers in those areas prevents the protected area from overtaking the fish farming activity.

"They do not bend in anything; it is always at the cost of the fish farmer. Birds are in the first place. (...) Here in Setúbal, because in the Algarve it is not like this, in the North it is not either. (...) Because in the Algarve someone speaks about a Reserve and they eat them." --P6 (Fish farmer)

The conflict has assumed proportions where there is not even the slightest dialogue between most of the fish farmers and the Reserve. The Reserve is accused by fish farmers of not wanting to listen to anything.

"They do not listen anything. (...) They are against fish farming. Their problem is being against this activity. (...) A person from RNES once told me that when they have doubts about something they prefer to say no" --P5 (Fish farmer)

However, there are some fish farmers that keep good relationships with the Reserve. These fish farmers, as is the case of P9 are all members of another aquaculture association, Anaqua. They even have some joint projects with the Reserve.

6.3.2.3 Benefits of the presence of vertebrates

Non-use value

One of the benefits of the otters is aesthetic, referring to the beauty of an otter, fish farmers talk about the pleasure of looking at an otter.

"It is a very nice animal, but... it is really a pleasure looking at her." --P1 (Fish farmer)

This fondness for otters and other animals in the estuary assumes a pattern which can be said to be a cultural value.

"I do not touch the otters. I was raised with those animals. (...) We know with the animals, we should not kill them. The otters, even the cormorants, the seagulls, the [Egyptian] mongoose, the common moorhen, (...), the ducks, the gadwalls, everything. No one can destroy that!" --P4 (Fish farmer)

The amusement that otters provide to fish farmers is, however, limited by its predation actions.

"I can play with them in that night, absolutely no doubts for who wants to play with the otters during the night. But with my due respect and never abusing my respect... otters I let play, but with my respect. Every other night I am seeing them, I do not have any doubts." --P2 (Fish farmer)

Biological indicator

Besides being "nice companions", some of the animals help the activity by acting as predators of less fit fishes. The example of the seagull is quite consensual, but P2 goes even further and considers the action of all the animals, apart from the cormorant, to be beneficial, because "they help cleaning".

"The seagull is one of the biologic indicators very useful for this activity because when the fish is weak or sick it goes to the surface and on that time it is of my interest that the seagull takes it and eats it." --P1 (Fish farmer)

6.3.2.4 Social costs and benefits of the conflict, the fishing industry and the vertebrates

Nature conservation

Fish farmers consider that aquaculture is compatible with wildlife conservation, contrary to opinions expressed by other stakeholders groups. In fact, the replacement of abandoned salines by aquacultures is seen as benefiting the ecosystem.

"Now they [RNES] say that aquaculture is not compatible to birdlife and so we have to preserve the salines. This salines are a way of sterilizing the nature because if the salt was not sterilizing it would not be a preserver." --P1 (Fish farmer)

Aquacultures have had a positive impact on the otter populations. As aquaculture developed in the estuary, otter populations have been increasing, together with an increase of fish availability. Contrarily to some opinions, P6 expresses that birds also come more often since the fish farms appeared. The declarations of the Reserve on the impact of aquacultures on birds are not supported by any data.

"The Reserve should even be happy with the fish farmers, because since aquaculture started, there are more birds; there is more fish in the river, more otter, more everything! (...) they said that the flamingos would not come... now there is more every day! In the past, people from here say, there were not, but now they come around here. (...) To say that there are less [birds] they [RNES] should have numbers. But they do not show any numbers." --P6 (Fish farmer)

P9 even adds that in order to maintain the ecosystems created by man, fish farming is the only viable solution, as salt production is not economically viable anymore.

"In my opinion, fish farming is the only viable alternative, in order not to lose the ecosystems created hundred years ago which are the salines, therefore it is the only activity that can in a proper way, maintain the created ecosystems which are the salines.(...) salt production is not economically viable(...)." --P9 (Fish farmer)

Aquaculture also contributes to fish stocks preservation, acting as a substitution activity. It is also a more efficient activity than traditional fishing because there is no waste – fish is produced as needed.

"In Aquaculture we do not waste anything it is not like in regular fishing where they waste a lot. For example if sardine is in abundance, they fish it all and they throw it away to the sea because the market cannot imbibe it. They even receive a subsidy for that. In aquaculture that never happens. We only fish what is really necessary." --P8 (Fish farmer)

Pollution

Aquaculture is itself highly dependent on the estuary's water quality. The protection of the environment is vital to the proper development of this activity the first ones to complain about problems in water quality will be fish farmers.

"I am in favour of the environment like all the others fish farmers. We cannot work if we do not have good quality water. When there is any problem in the water of the estuary we are the first to suffer with that." --P5 (Fish farmer)

There is a general consensus among fish farmers that aquaculture does not affect the environment. In fact, P8 points out to a study that shows that the estuary has a deficit in organic matter and fish farming is taking on this, resulting in more fish in the estuary.

"A study from IPIMAR and Sciences Faculty concluded that this river has a lack of organic matter, because of chemical pollution. Because of this the fish do not have enough food. Where we have a fish farm we have more fish because we have more organic matter." --P8 (Fish farmer)

However, fish farmers recognise that aquaculture generates some pollution, but not in amounts that would have a big impact on the environment, or at least not more than other economic activities.

"All the fish farmers know that it is possible to do aquaculture without polluting but it is necessary to develop the country in a sustainable way. (...) This activity pollutes

as any other activity. Nature as itself also pollutes. An earthquake is terrible, a fire is also terrible." --P8 (Fish farmer)

P2 has a slightly different vision about aquaculture pollution. To him, the damage aquaculture might inflict on the environment is not from the activity itself. The problem is with the methods of fish farming, namely in more intensive productions where a lot of ration is used.

"Most of them use a big amounts of ration! There you have, men do not have, they do not have any intelligence, they do not! (...) I take 3 more months to make the fish, but I make the same fish, with very good conditions, and better, and healthier, and without damaging land." --P2 (Fish farmer)

A feeling on unfairness is felt among fish farmers, because they are constantly targeted as polluters when there are other much worse sources in or around the estuary, at the sight of everyone and where no action is taken at all. These sources, rice fields and industries, are even seen as enemies by the fish farmers, because once in a while some suffer with their discharges.

"Threats here end up being the pollution from agriculture or from agro-industrial units that discharge directly or indirectly to water courses. (...) Those guys of the gas pipeline are working there. (...) on the top of the sand, it is killing cockles, it is killing the razor clams, it is killing oysters, it is killing everything. That, no one sees." --P4 (Fish farmer)

Fish farmers also have a role in non compliances regarding discharges in the estuary.

"We have already found some discharges of that kind and given information to the Ministry of Environment." --P4 (Fish farmer)

Employment

Aquaculture employs some local people, but it has a very strong potential if increases in production, both in density and in area, are authorized. P4 points out 12 possible new workplaces with the development of his aquaculture, while P1 goes further ahead and estimates the creation of 600 direct jobs from aquaculture if 5% of the Reserve is authorized for aquaculture. According to P6, any fish farmer has at least two or three people, not only for helping with the fish farming working, but also to guard the fish farm.

"If they authorize 5% of the Reserve we could have around 1000 ha of ponds, producing 6000 tons of fish (...) One worker per 10 tons, we would have 600 direct jobs." --P1 (Fish farmer)

Comparing with salt production which the reserve is constantly promoting, aquaculture can provide much more jobs.

"Now they have the craze of the salt. (...) We have 5 people employed. With another similar area we would go to 10-15 people." --P6 (Fish farmer)

Besides employing local people, aquacultures can absorb young people with some level of specialization.

"We have young people that are getting out of university and need a job. These young people have a big capacity that could be harnessed, because a fish farm needs at least one individual with capacity to understand not only what is written, but also new technologies and also the indicators from nature." --P1 (Fish farmer)

P5 does not share the optimistic view of other fish farmers concerning employment and considers that local employment associated with the activity does not have a big importance. Most employment generated by the activity is temporary and corresponds to the fishing period.

"Although the production has been increasing in last years we cannot have employees. The ones that have employees are going to bankruptcy. (...) We hire people to catch the fish. We hire 2 persons for all the area (22ha). This fish catch takes more than 1 month. We have already taken almost a year but the normal is 3 to 4 months." --P5 (Fish farmer)

Note 8: DGPA (General Directorate for Fisheries and Aquaculture) and the INE (National Statistics Institute) do not produce specific data for employment in aquaculture. Nevertheless, it is recognised by the DGPA that the numbers involved in the activity are relatively small because a large number of units operate under a family system, particularly in the case of extensive production of clams. Small aquaculture units employ 3, 4 and 5 workers; others with larger dimension employ 20 to 50 workers. The number of workers employed in fish farms also varies according to the cycle of production. Production is seasonal, and there are substantial numbers of part-time and temporary workers particularly at peak periods.

Land use

The big damage to the environment comes from the abandonment of areas, whilst the Reserve tries to halt any development in those areas.

"The fish does not eat, nor do the birds eat. There is not anything here, everything is closed, and there is nothing any more." --P2 (Fish farmer)

When the ponds are not maintained, they are quickly overtaken by "Gramata" (*Sarcocornia sp.*, common name shrubby swampfire), a bush that grows very quickly in salty and moist soils. It is not good for birds and it kills fish. The Reserve is responsible for this destruction of the environment.

"While there is Gramata, there is no fish. (...) I told [the Reserve] that the Gramata had 2 years and that during 4 years it would double, and that during the 4 years everything would be full and it is. It did not need 4, it was only in 2. It is for them to see what they are killing; they do not move even a step! Everything is full of Gramata, but this is something crazy, crazy! That was a source of richness for birds and they have let all of that get killed! (...) You are murdering the environment! Do not kill it anymore, that it is a pity!" --P2

An expansion of the area occupied by fish farms in the estuary to about two thousand ha would not affect the estuary, because the activity is not intensive.

"Sado Estuary has 22 thousand ha of salt marsh. A few thousands of ha [2000 ha] transformed into fish farming is nothing. It does not have any negative impact. The aquaculture that we have here is not intensive." --P8 (Fish farmer)

Law disobedience

As a result of ICN's policy, otters have been shot from time to time. There are known cases of otter killings by fish farmers but the issue is encircled in a taboo. Killing an otter is a possibility to most of the fish farmers interviewed, with the clear exception of P2.

Until now, all of them have admitted that that has not happened.

"Of course there is [referring to the killing of otters], I just cannot prove it and I will not even tell who did it! The shooting of otters is real! And they are killed stupidly. It is just because they do not allow people to preserve their resources we would not need more than a fence with 1 meter high." --P1 (Fish farmer)

The conflict reaches the level of some fish farmers trying several ways of killing the otters, even if they have to wait to shoot them directly.

"I have knowledge of people (fish farmers), that have told me that have been killing (otters), and that set traps or wait for them in order to shoot them." --P9 (Fish farmer)

Shooting otters is seen by some as a solution to protect the fish tanks because fish farms inside the RNES are not allowed of putting fences around its property. RNES is against fences around fish farmer's properties, so they (fish farmers) have to kill the otters to protect their properties.

"I told to RNES director that I am very sorry, but here the choice is going to be yours. If you do not allow me to have a fence I will have to kill otters. If you want otters alive you have to allow the fence. It only has 1 meter height and you do not even notice it because of the small bushes. But they seem to prefer dead otters instead of a fence." --P5 (Fish farmer)

Frequently, works go on even without license from the RNES because there is no knowledge about any impacts from these activities.

"After 2 days I started the works, I got a letter in the mailbox, saying that the Reserve did not authorize it, under law 799 (...) and that it did not authorize the works. (...) That was a pretty thing, an important work. They told me to stop! But why?!" --P3 (Fish farmer)

Cormorants are an even bigger shooting target, due to the high damage that this species inflict on fish farms.

"[the cormorant] is really to kill, that one I also do not want." --P2 (Fish farmer)

Speaking about fish densities used in fish farms is something that some fish farmers do not want to talk and asked to turn off the recorder; others have abstained from commenting on it.

"Here is quality fish (...) the ecosystem himself aids a lot! To tell you the truth, I was going against myself, because (...)" --P3 (Fish farmer)

Some aquacultures licensed as extensive are not complying with the rules, by giving some ration to the fish.

"Here we are in an extensive system. But we have to feed them with something other way we will not survive. RNES cannot know anything about this because they are always looking on us." --P5 (Fish farmer)

6.3.2.5 Potential mitigation strategies

Physical Strategies

Otter

Fences around the ponds are pointed as a good and efficient mitigation measure for otters. Protection fences are harmless to the environment, because all the other species apart from the otter can cross and landscape impact is minimal. The otter does not cross any obstacle higher than its nose, according to P4. The fence can be electrified for increased effectiveness.

"I have a wall there that is easy to surround the otters. By those canes over there, to the other side is fresh water, to this side it is salt water. If I put a battery discharge there, with those two wires, or a fence 20 cm high, I am protected against the otters. (...) it does not harm anyone, nothing, not even bees, not even mice. Everything passes through there, except the otters, because if it is higher than the nose, they do not go there. (...) That is wood sticks. Wood sticks every 5 meters. (...) There are even better arrangements, without damaging anything, without shining, without affecting the landscape of the Reserve." --P4 (Fish farmer)

Since this measure carries a high cost, P4 argues that the state should be the one sponsoring the implementation of the fences, as it is the state's responsibility to preserve the species. This argument is further supported because he pays the state a rent to use the land.

"If I have the duty to pay the state, to pay a pre-established rent, why does not the state have the duty to find shelters for the animals, so that they are not harmed? Or else, give me the means to defend myself. (...) Now, if there were those structures in which people... lets see, it does not cost anything. Anything (...) Sticks and nets. They even give work to people. How much? It is X. Ok, lets go there. It is done? Yes. Lets see there, yes there is. You are going to receive. How much it costs?" --P4 (Fish farmer)

Human presence or dogs around the property are measure that scares away the otters.

"In these ponds we do not have so many otters because we have many workers and we also have dogs." --P8 (Fish farmer)

P9 has pointed to an orthodox measure, which is destroying the shelters of the otters, so that they move away.

"We could have made her (one specific otter) leave the surrounds, (...) withdraw the shelters she has to stay (...)" --P9 (Fish farmer)

Birds

Fish farmers are not consensual regarding the effectiveness of the mitigation measures to the cormorants' predation. Putting a net over the tanks would be effective, according to P1.

"Cormorants attack during daylight but they are easy to control. It is enough to put a net over the tank." --P1 (Fish farmer)

Nylon wires are commonly enunciated as a possible mitigation strategy and several fish farmers have them, even though it is forbidden by the Reserve. This measure does not affect other birds, contrarily to the net proposed by P1, but its' effectiveness is more dubious.

"Stretching some wires, we stretch a lot of wires and then they think there is a net in the bottom, underwater, but there is not. They are afraid to attack there (...) because they are used to attack out there by the coast (...) But some of them already make some «helicopters», do not doubt that I have seen in, do not doubt that I will show some day! (...) I have seen a lot of them hitting down. He goes, then comes back and attacks right there, they really look like helicopters. (...) These wires are only for the cormorants. If everything is covered with nets no one goes there, but if we have this area here with 200 spread wires, there is still an area of 15 to 20 meters where they can come down." --P2 (Fish farmer)

Both gun and gas shots are widely used, but they quickly lose the scare away effect on birds. Some fish farmers have them, but most of them are illegal.

"There are people who use that gas shots, but we have get to a point that they land over it." --P3 (Fish farmer)

P4 says that egrets are the easiest to avoid predation from. A simple scarecrow, plus some gun shots are enough to put them away. On the other hand, P6 and P8 argue that egrets get used to all the mitigation measures and they end up not being very effective.

"When we go around with the truck, we honk. (...) We used to have a machine with gas [gas cannon] that explodes and scares them, until they got used to the noise. (...) We put wires... and shots." --P6 (Fish farmer)

Technical measures

A widely used technique to overcome the effects of predation is to put fish in numbers that account for the losses.

"The predators are a little bit prejudicial, but we already put high contingents counting with that." --P3 (Fish farmer)

Finding other types of aquaculture production that do not have the conflict could also be explored. One such production could be oysters, which used to be a major activity in the *Sado* estuary.

"Yes, I think they could produce oyster here. For exportation, but for example in shellfish this is not possible. In relation to the oysters I do not know very well. But the shellfish I know that it is impossible. The Sea bream rummages the deep one all. Sea bass does not make this. In terms of oysters, it could be an activity to expand. For exportation..." --P7 (Fish sales intermediary)

A mitigation measure already used by P4 is giving food to the otters, feeding them with fish with low economic value.

"I catch catfish and put on the top of the wall. The otters eat that fish and do not go to the tank any more." --P4 (Fish farmer)

Reserving fractions of the aquaculture's area to birdlife is not well seen by the fish farmers, especially in small fish farms. However, this measure is being implemented by the *RNES*.

"In fish farms with 20 or 30 ha we could provide an area just for birdlife, but that is not reasonable in fish farms with less than 10 ha." --P8 (Fish farmer)

Fish tanks can be designed in ways that avoid the predation by cormorants and egrets, by taking into account wind directions, slopes and distance between the wires.

"In what concerns the cormorant,(...) we designed the ponds in order so that they can be orientated to the dominant winds, because cormorants always land against the wind, so that they cannot land in the ponds. We have also changed the distance between wires over ponds, progressively, from 20 meters, to 10 meters, and that last one, stops almost all the cormorants of landing. (...) For egret, we are also trying to design ponds with higher slopes, because they need low slopes to stay near the pond catching the fish. Although, with higher slopes ponds we have erosion, which causes damage to the floor of the ponds. To solve that we have to put rocks in the areas where there is more erosion." --P9 (Fish farmer)

Communication, technical support and educational strategies

Raising awareness and technical skills of fish farmers for this problem would play an important role in the mitigation of the conflict.

"We would support and give human resources in order to clarify fish farmers and raise their awareness for the protection of nature because it is compatible.(...) This is much better than take mandatory decisions or force upon something to fish farmers." --P1 (Fish farmer)

Technical support was also mentioned by the fish farmers as lacking considering it to be essential for the activity. Support structures for this end are lacking in the *Sado* area for fish farmers.

"We needed an office here in Sado, which could attend us closer. We should have an office and go there to receive some support." --P3 (Fish farmer)

The costs of implementation of mitigation measures could be reduced with the creation of a serious, honest, precise commission to study the area, the presence of the otter, and the places that have more heavily predated. This commission would coordinate the distribution of the materials to be applied for the mitigation of the otter predation.

"It would be enough if there was consensus. In the areas, go study the areas. That does not give any work. Send there a small commission to do the field work (...). How many fish farms are there? N, n, n. (...) According to the areas inside the land planning of fish farms, a serious, honest and precise commission would be created. It would be given [the fences]. I would not have any more problems of staying home resting, or I would stay resting here. And the animal would not be shot." --P4 (Fish farmer)

Communication between all the stakeholders seems to be essential. One clear measure to mitigate the conflict would be to improve communication between the Reserve and the fish farmers.

"It is essential that we work together. We have been defending that. Aquaculture is a fundamental activity and we want to preserve the nature." --P8 (Fish farmer)

Economic instruments

Paying for the losses would not be viable, because it would basically be impossible to assess how much predation there has been. Still, it would be acceptable if the state gave a compensation for the losses caused by the predators.

"It is not viable, no. For them to know how many otters I have here, I would have to show the heads... how? (...) I have 150 thousand fishes, I have the invoices, I have everything. The state says this, put there 5 thousand more, we pay. (...) Well, for us it was not a favour, it was a way to go and tell people not to mess with the animals." --P4 (Fish farmer)

The fishing intermediary argues that subsidies to fish farming are conveyed in the wrong way. Instead of receiving to purchase baby fish, they should receive for the invoiced volume of sales.

"Fish farmers must receive a subsidy for what they produce and not for what they purchase so that they are compelled to sell." --P7 (Fish sales intermediary)

6.3.3 Environmentalists

A1

Former environmental group

A1 is an environmentalist from the *Setúbal*. He has been more active in the past, when he founded an environmental group. This group has merged into *Quercus* and for some years A1 worked with this big environmental NGO.

A2

Delfim Project

A2 are two environmentalists/academics that work at the *Delfim* Project, which is dedicated to the studies and protection of cetaceans in the *Sado* Estuary.

6.3.3.1 Economic costs of the conflict

According to A1, economic costs do not exist because there is not a conflict between fish farming and otters.

"There is not any conflict between otters and aquaculture. Fish farmers can say that but only by ignorance." --A1 (Environmentalist)

On the other hand, A2 refers that there might not be such a conflict, as fish farmers say. Fish farmers tend to emphasize the quantity of food otters eat.

"[An otter eating 4 kg/day], that is ridiculous! An otter weighs 7-8 kg, she cannot eat 4 kg of fish on a single day!" -A2 (Environmentalists/researchers)

6.3.3.2 Economic benefits of the fishing industry

According to A1, the estuary has a big economic potential and aquaculture is one of the activities that could foster this potential. It is not, in any way, incompatible with its preservation, contrary to many of the industries around.

"This estuary is a nest full of life. The oyster production was of great economic importance for this region, but with pollution increasing as a consequence of the industrialization of that area, the oyster disappeared." --A1 (Environmentalist)

6.3.3.3 Benefits of the presence of vertebrates

Fish farmers do not realize about the benefits of having an otter in their property.

"It is important to say to fish farmers that having an otter in their area is a great natural richness." --A1 (Environmentalist)

6.3.3.4 Social costs and benefits of the conflict, the fishing industry and the vertebrates

Besides the environmental impacts, aquaculture is destroying the traditional fisheries sector.

"Traditional fishing is a ruined economic sector in the area

of Setúbal. (...) Traditional fishers are weakened and they cannot fight back against fish farmers and industries." --A2 (Environmentalists/researchers)

There is a major incompatibility between ecological tourism and economic activities like aquaculture or industries. People will not want to be tourists in areas where they see big industries when they look around.

"It is not possible to develop ecological tourism in an area with fish farms and industries. (...) There are millions of places in this planet where tourists can have contact with nature without a Secil [cement factory] in Arrábida and the industrial belt of Setúbal." --A2 (Environmentalists/researchers)

Aquaculture is a major threat to ecosystems. There are huge ecological costs in this activity that are not included in conventional cost-benefit analysis of this activity.

"We are letting a habitat degrade for a very doubtful economic value. (...) People talk about the benefits, but not about the environmental costs of these activities." --A2 (Environmentalists/researchers)

There might be a positive relation between the otter and fish farms, because there is more food available. However, by itself, this should not be considered an environmental benefit of aquacultures, as the otter is only a small fraction of the trophic chain.

"Do we want to have an estuary full of otters and fishes? (...) The system is not the otter and the otter food system, the system is the estuary." --A2 (Environmentalists/researchers)

Economic externalities are not being taken into account and this is developing an increasing pressure to establish aquacultures in the *Sado* estuary. The prices of land, instead of being higher to account for the environmental impacts, are lower in the Reserve area. Fish farmers do not pay an ecological tax to operate inside the Reserve. This activity cannot be profitable at the ecological level.

"What is out of reality is the price of the salt marsh! (...) The real price of fish should be analysed by incorporating environmental costs. You will see that the price of fish will increase from 100\$00 [0.5 ¢] or 200\$00 [1 €] to 100 contos [500 €] per kg! Look at this on a period of 5 years." --A2 (Environmentalists/researchers)

The transformation of a saline into a fish farm implies a big change in the habitat, with very negative effects on animals of the Reserve,

"Especially regarding birdlife." --A2 (Environmentalists/researchers)

For this reason, even the presence of aquacultures itself in the *Sado* estuary should be questioned.

"Before anything, the following question should be asked: should there be fish farms in the Sado, one of the most sensitive salt marshes in Europe?" --A2

(Environmentalists/researchers)

Most fish farms have generators to provide energy to water pumps and aeration systems. This is not desirable in these sensitive ecosystems.

*"A generator in a salt marsh?" --A2
(Environmentalists/researchers)*

Illegal activities to further reduce the costs of aquaculture are done all around the estuary. One accusation is the illegal capture of baby fishes.

*"There is a widespread corruption. Illegal activities like the catch of zooplankton, spawns, etc., proliferate in that area, at the sight of everyone, without anyone doing anything. (...) Where do fish farmers get the baby fish? To the fish farmers it is much cheaper to buy baby fish captured in the river by the means of illegal fishing gears." --A2
(Environmentalists/researchers)*

6.3.3.5 Potential mitigation strategies

Environmental awareness raising of fish farmers can be a mitigation measure.

"The RNES board should work near the fish farmers and talk to them about this (otters). It is essential to have teams visiting fish farms. They cannot license the activity and then start a conflict [RNES vs. fish farmers]. (...) Give importance to a fish farmer that has an otter and that does not try to kill it. They can even try to transform him in a hero, an example for others." --A1 (Environmentalist)

6.3.4 Other economic agents

E1

SONAE Tourism

E1 is working in the development of a major tourism resort in *Tróia*, right by the *Sado* Estuary Natural Reserve. *Tróia* Resort has a previewed investment of 350 million euros. This includes all costs ranging from environment and degraded areas restoration, badly planned and managed forests, etc.

E2

Ecotourism Company

E2 are a couple that created an ecotourism company in the *Sado* Estuary, especially dedicated to dolphin watching. She has a degree in tourism management and planning and he has been working in that area for some time, including in whalewatching activities in New Zealand and Australia. Before starting with this project in 1998, she has worked in the Natural Park of Arrabida, planning outdoor activities.

E3

Salt producer (also has an aquaculture)

E3 is one of the last salt producers in the *Sado* Estuary. In the last year he took about 300 tons of salt. In the old times they used to produce around 150 000 tons of salt. Now they do not produce more than 5 000 tons, since salt prices got very low.

"In the first year of activity (17 years ago) I have made 3 or 4 thousand tons. That was the year when I really won money in this activity. The cost of production was 1\$00 [0,005€] per ton. I have sold it all for 6 500\$00 (32,5€)."

He also owns a fish farm where he produces seabream and bass. He expects to get more than 200 thousands fishes in the end of the year.

6.3.4.1 Economic costs of the conflict

In the *salines* the conflict with otters does not exist and in fish farms the major problem are the cormorants.

"Otter? That is for fish farms. They go there to eat fish.(...)In my fish farm I used to have more problems with cormorants. But now they are less and the problem is not so big. They are a destroyer bird. They kill everything." --E3 (Salt producer and fish farmer)

6.3.4.2 Economic benefits of the fishing industry

Fish farming is more profitable than salt production.

"Fish farming is more developed. The fish is always sold and salt is not so. The end of salines is the conversion to fish ponds or the abandon." --E3 (Salt producer and fish farmer)

The price of fish is decreasing.

"In the beginning we use to sell seabream at 7,5€ and now we sell the same fish at 4,5€." --E3 (Salt producer and fish farmer)

6.3.4.3 Benefits of the presence of vertebrates

Vertebrates, apart from the dolphins, do not significantly benefit the ecological tourism in the area. However, with the development of the tourism in this area, they might get their role.

"I think [vertebrates] are one of the points, but not the only point. I think there are lots of possibilities in terms of nature tourism. (...) the birds, the salines, the traditions, (...)" --E2 (Ecotourism agent)

Birdwatching has a very big potential for ecological tourism, but it still has not been developed. One reason pointed out is the lack of support structures, the permanent state of abandon that those areas are subjected to.

"It has a big potential, but no... As a matter of fact we know that area well, of the salines, because we make photography there. And the nesting area, in April there are lots of birds that search those areas. It would be a product to bet on. But there it is, to bet in that product, we would bring people that are used to travel around the entire world, then they arrive here and I will show them what? Everything abandoned, I do not have an organized circuit, I do not have a birdwatching tower, I do not have anything. To give a bad impression then? It is better to stand still and the day this is organized..." --E2 (Ecotourism agent)

Note 9: According to a study produced by RNES in 1995 "...in the terrestrial area of RNES there are several paths with potential for nature watch circuits, enjoying of amazing landscapes over the river, salt marsh, agricultural areas and forests and also exceptional sites for birdwatching. (...) It is considered that these circuits can attract a bigger number of tourists in organized groups without interfering on the privacy and normal activities of different country houses. It could even contribute for the valorisation and promotion of several cultural and traditional aspects from the area with positive effects on resident population.

6.3.4.4 Social costs and benefits of the conflict, the fishing industry and the vertebrates

Wildlife Preservation

Salt production is friendlier for the environment than fish farming.

"Because of the ponds water level. When salines disappear the birds will have to go to some other place." --E3 (Salt producer and fish farmer)

Pollution

Stakeholder E2 considers that the biggest threats to water quality are mainly industries and rice crops, not referring aquacultures.

"How can they say that the Reserve is only from the industry onward, if when there are high tides the water takes the industry discharge waters up? (...)" "Every year is the same thing" [the spread of pesticides] --E2 (Ecotourism agent)

Employment

Stakeholder E1 considers that the kind of employment his enterprise will create is not compatible with the skills or wills of people that work in fisheries.

"I do not think that the kinds of people that are in fisheries are people dedicated to tourism activities. Younger people might have the ability, but it does not seem very probable to me. I think that fisheries will always have their place there. There are always going to be fisheries, I just do not know with which dimensions or in which patterns." --E1 (Tourism corporation technician)

E2 sees a great potential in tourism associated with the presence of the vertebrates, much bigger than any other activity that can be developed around the estuary, especially regarding industries.

"If we tell that there are otters in the Sado, that the dolphins are residents (...) that the flamingos come here for the winter that some birds come here to nest. (...) No one knows the beauty that there is here. (...) We have everything here. (...) Would not it give wealth? It would give wealth, health and culture to this people, that this is a bunch of gross people around there. Industry makes people gross and tourism does not. (...) Would not there be benefits to everyone? I guess there would." --E2 (Ecotourism agent)

For E3, although he is a salt producer, aquaculture is a good source of jobs for the region.

"I think it is much better, even for the birds, to have fish farms instead of abandon salines. At least something is produced and generates some jobs." --E3 (Salt producer and fish farmer)

Land Use

For E2 the conversion of *salines* to fish farms harms the ecological tourism in the region, but he also considers that on the other hand, the abandoned *salines* may also be a problem. Salt producer E3 agrees with him, arguing that abandoned ponds quickly get full of shrubby swamp fire and wildlife leaves those places.

"It is bad, it is over [with the conversion of salines to aquacultures]. If it is better to have the salines abandoned? I do not know anymore... to the birds it might be better. But leaving something abandoned instead of doing something better... it is a pity that we are losing this heritage and someday it might be irreversible. (...) If we want to do birdwatching or something, it [the aquacultures] affects. Concerning animals I do not know. (...) The biggest danger is that. It is the destruction of salines." --E2 (Ecotourism agent)

Law disobedience

E2 refers that it is widely spoken that the fish farmers catch the fish in the river to put inside their fish farms.

"Some people say that they go to the river maternities to catch eggs to... and they steal from the estuary to put in the fish farms. That is much spoken, but none of them admits

that." --E2 (Ecotourism agent)

6.3.4.5 Potential mitigation strategies

According to E2, the fences are a viable mitigation strategy; it does not make sense that the Reserve stops the fish farmers to apply this measure, opening the ground to killings.

"They are some aberrant. They prefer that the men are there killing the animals. I do not understand that people. If the guys will end up killing, it is better to put the fence. Why do not they let them put up the fence?" --E2 (Ecotourism agent)

E3 has not the same opinion as E2, as he considers that electric wire, fences or crossed wires over the ponds do not seem to be perfect mitigation strategies for otters and cormorants.

"They can put over there whatever they want that she will manage to get into the pond anyway. With electric wire otters can catch an electric shock, but when they are hungry they pass everywhere. (...) It is like cormorants and crossed wires over ponds. It can avoid it but they will go there anyway." --E3 (Salt producer and fish farmer)

E3 believes that the conflict with birds could be mitigated if salt production was supported by the Government.

"If the government gave at least some support to this activity [salt production] I think that there would be more people working on this. The birds are the ones that will suffer with this." --E3 (Salt producer and fish farmer)

6.3.5 Summary and comparisons

In this chapter we draw a picture of the perception of the groups of stakeholders in areas of substantial agreement and disagreement in different essential aspects for the SIA. As there is a clear evidence of a conflict between the fish farmers and the Reserve, it was decided to make also an assessment of this situation and present the mitigation measures which pointed out for it.

Tables Table 6 to Table 9 sum up the main arguments for each topic we analyse in this chapter. Each argument has a three character key associated. The first character identifies the topic, the second identifies the group of stakeholders and the third is the argument number.

Table 6 – Arguments about the conflict otter/aquaculture

C.G.1	<i>Fish farmers' complaints about the otter are an argument to support the installation of fences.</i>
C.P.1	<i>Predators usually remove small fish, resulting in a smaller loss.</i>
C.P.2	<i>High contingents are put to prevent fish losses.</i>
C.P.3	<i>Otters are hunter animals and they hunt any kind of fish, but they prefer Golden Bream and Sole because those give them less fight.</i>
C.P.4	<i>The damage inflicted by the otter comes not only from predation to eat, but also because this species likes to have fun with the fish.</i>
C.P.5	<i>Total predatory losses are about 15%.</i>
C.P.6	<i>An otter eats 4 kg of fish a day.</i>
C.P.7	<i>Otter gives losses from 5000 € to 15000 € by year.</i>
C.A.1	<i>There is no conflict, fish farmers say that there is by ignorance.</i>
C.A.2	<i>An otter weights 7-8 kg, she cannot eat 4 kg a day.</i>

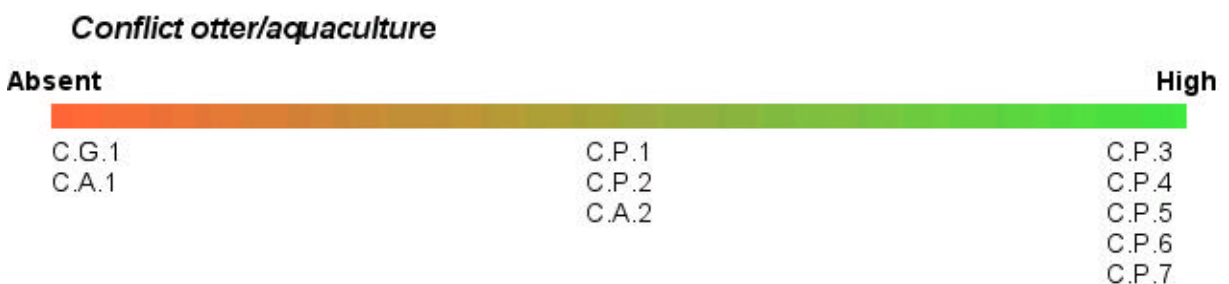


Figure 8 – Perceived conflict between the otter predation and aquaculture

Most of the stakeholders have the perception that the conflict between otter and fish farming exists, resulting in the killing of some of these animals by fish farmers. Fish farmers refer that this conflict only exists because they are not allowed to implement some mitigation measures like fences. Some fish farmers even refer that an otter is able to eat 4kg of fish per day, representing a cost of 20€/day. The losses of value presented by fish farmers are not very different from each others (around 15%). Some stakeholders

(governmental and environmental) classify these costs as being wrong and over calculated.

There is a clear separation between the stakeholders groups concerning the perception of the conflict between otters and aquaculture. Among the arguments that support that the conflict is high, there are only fish farmer's arguments, while only government's and environmentalist's arguments stand to the fact that there is no conflict.

Table 7 – Arguments about the reserve management

R.G.1	<i>Activity is being halted by the RNES policy on aquacultures, resulting in a growth of illegal fish farms.</i>
R.P.1	<i>"If we work legally, the men do not earn for the light" with the low fish densities limit imposed by the RNES (350 g/m3).</i>
R.P.2	<i>Project proposals are also continuously blocked by the administration of the Reserve which does not present any explanation to fish farmers.</i>
R.P.3	<i>Dialogue has become impossible.</i>
R.P.4	<i>Even after fish farms are built, the Reserve imposes severe restrictions on the building of infrastructures, some of them essential for the activity.</i>
R.P.5	<i>Comparing with other protected areas in Portugal this situation is unfair.</i>
R.P.6	<i>The Reserve does not want to listen to anything.</i>
R.P.7	<i>Some fish farmers keep good relationships with the Reserve.</i>
R.P.8	<i>The declarations of the Reserve on the impact of aquacultures on birds are not supported by any data.</i>
R.P.9	<i>RNES is against fences around fish farmer's properties, so fish farmers have to kill the otters to protect their properties.</i>
R.P.10	<i>The Reserve sometimes puts obstacles with no foundation (...) depending on the humour..</i>
R.A.1	<i>Fish farmers do not pay an ecological tax to operate inside the Reserve.</i>
R.E.1	<i>It does not make sense that the Reserve stops the fish farmers from installing fences, opening the ground to killings.</i>

Reserve Management

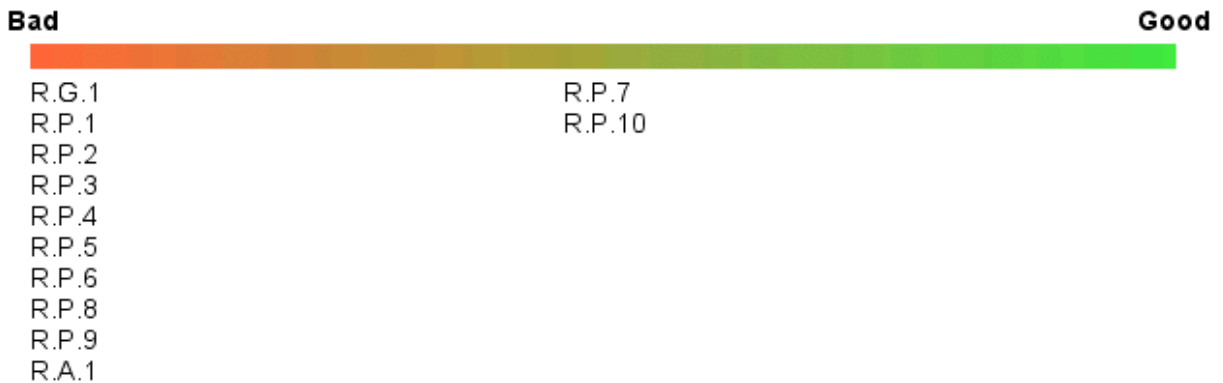


Figure 9 – Evaluation of the Reserve management

Almost all the fish farmers share the opinion that the actual procedures in the management of the reserve are not good mentioning that the actual directive commission of *RNES* is against this activity.

Figure 9 shows an almost absolute consensus in what concerns the Reserve management: except for two arguments that show classify the reserve management as average, all the arguments stand for that the Reserve does a bad management. This opinion is also shared by environmentalists and governmental stakeholders, even though for substantially different. The only exception is comes from a fish farmer that belongs to a recently formed aquaculture association, who has a good relation with the *RNES*.

Most of the fish farmers state that the *RNES* has a lack of technical resources thus affecting the management effectiveness of the reserve.

Table 8 – Arguments about the environmental and socio-economic benefits

S.G.1	<i>The market is saturated with fish</i>
S.G.2	<i>Aquaculture has a low importance when compared with the other economic activities in the region, such as industry, agriculture or traditional fishing.</i>
S.G.3	<i>Sado's estuary is a productive and sheltered area for aquaculture.</i>
S.G.4	<i>Aquaculture has a potential to employ non qualified labour in an area that suffers from big unemployment rates.</i>
S.P.1	<i>Aquaculture is a promising solution for the deficit between the fish fished and the fish that Portuguese people eat.</i>
S.P.2	<i>If the density limit in the <i>RNES</i> is raised and more area is authorized for aquaculture, huge economic benefits will be derived.</i>
S.P.3	<i>Aquaculture is the only viable alternative to the old ponds of salt production, increasingly abandoned as a result of the market devaluation of salt.</i>
S.P.4	<i>Fish produced in Sado's fish farms is of higher quality.</i>
S.P.5	<i>Fish losses in aquaculture increase the fish stocks in the estuary.</i>
S.P.6	<i>Aquaculture employs some local people, but it has a very strong potential if increases in production, both in density and in area, are authorized.</i>

S.P.7	Besides employing local people, aquacultures can absorb young people with some level of specialization.
S.P.8	Local employment associated with the activity does not have a big importance.
S.P.9	When the ponds are not maintained, they are quickly overtaken by “Gramata” a bush that grows very quickly in salty and moist soils. It is not good for birds and it kills fish. Fish farms prevent this from happening.
S.A.1	The estuary has a big economic potential and aquaculture is one of the activities that could foster this potential.
S.A.2	Besides the environmental impacts, aquaculture is destroying the artisanal fisheries sector.
S.A.3	There is a major incompatibility between ecological tourism and economic activities like aquaculture or industries.
S.A.4	There are huge ecological costs in this activity that are not included in conventional cost-benefit analysis of this activity.
S.E.1	Fish farming is more profitable than salt production.
S.E.2	The price of fish is decreasing.
S.E.3	Aquaculture is positive because it generates jobs.
S.E.4	The conversion of salines to fish farms harms the ecological tourism in the region

Environmental and socio-economic benefits of aquaculture

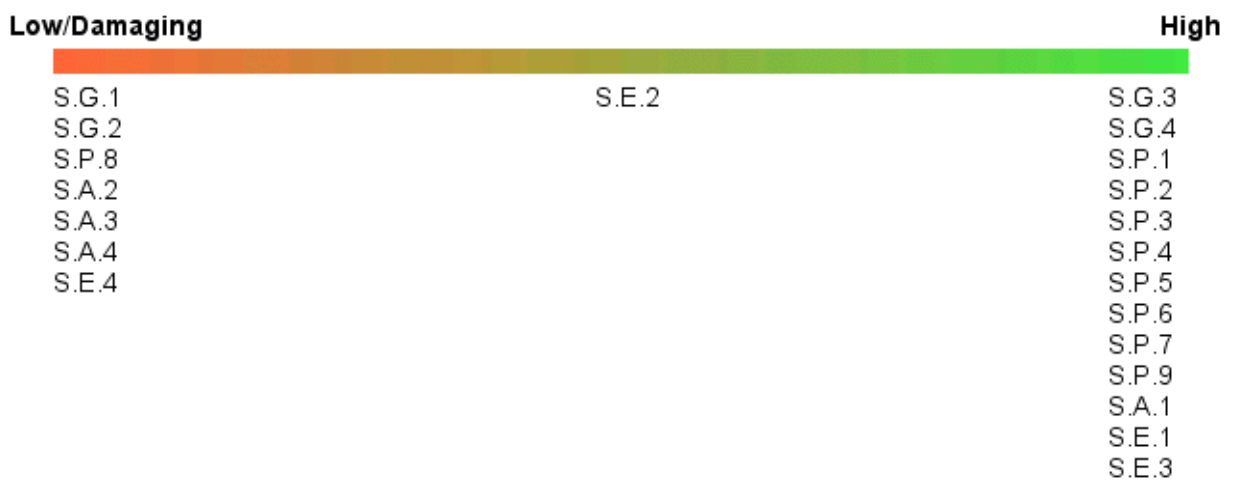


Figure 10 – Perceived environmental and socio-economic benefits of aquaculture

Except for one argument from a fish farmer that stands for the low benefits of aquaculture, all others fish farmer's arguments exalt the virtues of fish farming. However, several stakeholders on other groups classify the benefits of aquaculture low or that aquaculture is damaging to the environment.

It is important to note that some of the socio-economic benefits will only be achieved on a medium or long term time scale.

"It is expected that around year 2050, more than 50% of what

we eat comes from aquaculture. So this activity is a strategic activity for the XXI century.” --P8

The main benefit attributed by the interviewees to the aquaculture is the generation of jobs in an area where the unemployment is high and the educational level is low. Another benefit is also the fulfilment of a gap in the market fish in terms of some species like seabream.

Table 9 – Arguments about the benefits of the otter conservation

O.G.1	<i>Otter has a conservation value per se.</i>
O.G.2	<i>The potential for tourism based on conservation is a benefit of the presence of otters.</i>
O.G.3	<i>The otter is used in environmental interpretation programs by schools and this further increases its' value as a species to preserve.</i>
O.P.1	<i>It is a pleasure to look at otters.</i>
O.A.1	<i>Having a otter in the area is a great richness.</i>
O.E.1	<i>Vertebrates, apart from the dolphins, do not significantly benefit the ecological tourism in the area. However, with the development of the tourism in this area, they might get their role.</i>

Benefits of the otter conservation



Figure 11 – Perceived benefits of the otter conservation

Several stakeholders did not refer anything about the benefits of the otter conservation. The ones that did it have a positive opinion about the conservation of this animal saying that it is a very pretty animal. Some of them are even convinced that the aquacultures contributed to expansion of this species.

Except for one argument from an Economic agent that places the benefits of the otter conservation between low and high, all the other stakeholders arguments, mainly from governmental stakeholders, stand for that the benefit of the otter conservation is high, even one fish farmer's argument.

The following tables sum up the mitigation measures pointed out during the stakeholders' interviews, including a qualitative assessment of its effectiveness.

Table 10 – Mitigation measures suggested for the conflict with the otters

Mitigation measures	E2	E3	G1	G6	P1	P2	P3	P4	P5	P7	P8	P9
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Mitigation measures	E2	E3	G1	G6	P1	P2	P3	P4	P5	P7	P8	P9
Fences around fish pounds (for otters)	G	B	B	G	G	B	G	G	G	G	G	B
Electric fences around fish pounds (for otters)	G	B	B		G	B	G	G	G	G	G	G
To include more fish in the ponds, counting with animal predation							A					
State sponsoring to implement mitigation measures								G				
The creation of a local commission to study the conflict and the application of mitigation measures								G				
Payment to compensate fish losses								A				B
To feed otters with fish with no economic value								G				
Dogs in the property											G	

G – good ; A – average ; B – bad

According to P4 and P9, paying for the losses would not be viable, because it would basically be impossible to assess how much predation has been caused by otter or cormorants. Still, it would be better than doing nothing related to this.

Some fish farmers have pointed out that even the widely used conventional and electric fences, are not effective, because the animal quickly gets used to the obstacle and finds ways to get over it. Despite that, most fish farmers want to install fences around their fish farm and some of them even did it already, though there is a Reserve prohibition. Several fish farms refer to the use of fences in other areas of aquaculture as a innocuous device to the otters, and a positive measure to the business.

Table 11 – Mitigation measures suggested for the conflict with birds

Mitigation measures	E3	P1	P2	P3	P4	P6	P8	P9
Nets/wires over fish ponds for cormorant	B	G	B			A		G
Gunshots				B	G			
Gas shots				B		B	A	
Scarecrow for egrets					G			

Mitigation measures	E3	P1	P2	P3	P4	P6	P8	P9
To design the ponds orientated to the dominant winds (for cormorants)								G
To design the ponds with higher scopes (for egret)								G
Imposition by the Reserve of a fraction of non-productive area in the fish farm for birdlife						B	A	

Nets or wires over the fish ponds, to protect the attack of cormorants, are considered by some fish farmers as being ineffective, as the birds get used to it and find a way around it. This opinion is not shared by all the interviewed stakeholders. Some of them point out the effectiveness of this measure, while complaining that the Reserve does not allow them to use it. The same happens with gunshots and gas shots, even though they still have a widespread use.

In some cases, the Reserve has demanded to some newly installed fish farms, the allocation of a fraction of its area to birdlife. This measure is not well seen by the affected fish farmers, who complain that the area demanded is way above the reasonable, especially in smaller fish farms.

Table 12 – Mitigation measures suggested for the conflict with the Reserve

Mitigation measures	G1	G2	G6	P5	P6
Land Management Plan for the <i>RNES</i>	G				
Improvement of technical means for supervision purposes		G	G		
Joining efforts among the responsible entities to conserve nature		G			
Improvement of communication between fish farmers and <i>RNES</i> direction				G	G

Lack of communication between fish farmers and *RNES* is a major blocker for the application of most mitigation measures and further deepens the conflict with the otter. Almost all fish farmers pointed out this situation and some of them have a clear perception that establishing communication between both sides would be a very good help for the minimisation of the conflict.

Table 13 – Other suggested mitigation measures

Mitigation measures	A1	E3	P1	P3	P4
Raising awareness of fish farmers	G		G		
To use analytical equipment to ensure better quality in the <i>Sado</i> Estuary.				G	
Installation of gates to avoid people circulation					A
To forbade rice fields at no more than 30 km from the sea					G
State support to salt production		G			

Other mitigation measures include the support for salt production. This activity is almost considered a sanctuary for birdlife and both the Reserve and municipalities are actively involved in projects to recover *salines*. However, some fish farmers consider that there are no conditions for its implementation due to the lack of know how – most of the ones knowing this craft are old or gone – and to the low market price when compared to the required investment.

"Only old men used to produce salt and now they are all dead. Young people do not want to produce salt because it is not profitable. In Algarve it is easier to produce salt because of the land that is more compact."... "The only salt producer in this area still have six year salt do sell."--P5

A lack of awareness concerning nature conservation is patent amongst most fish farmers. This was both stated by an environmentalist (A1) and a fish farmer itself (P1).

6.3.6 Key aspects to be considered for the instruments design

6.3.6.1 Aquaculture

Product quality

The high quality of the fish products coming from aquacultures in the *Sado* estuary has improved due to the natural conditions. Several stakeholders pointed out this characteristic as a possibility for increasing incomes and development of fish farming in the Reserve.

"I think we have here the potential to produce something with quality, not in quantity. Anyway, it is not worthy doing fish like Greece, very cheap but not eatable. Here it is produced with very good quality. I tasted it and I liked very much. It even tastes like the ones from the sea. It is a pity that there is no promotion of that quality we have here." --G5

"Our country has all the natural conditions to produce fish of high quality. Greece does not have these conditions. They produce 100 thousands tons but they are produced in an intensive system. Their fish is not like ours in terms of quality, taste (...) Our fish has muscle. The ponds are very big and they eat more than fish flour. 40% of what they eat is natural. With the advantage that our fish does not have heavy metals." --P8

Internalization of environmental costs

Environmental externalities are not being taken into account in the price of land inside the Reserve. This is creating an increasing pressure to implement aquacultures in the *Sado* estuary. Fish farmers do not pay an ecological tax to operate inside the Reserve so, the prices of land, instead of being higher to account for the environmental impacts, are lower in the Reserve area. This situation also encourages the fish farmers to press the authorities to have support facilities inside the *RNES*, instead of locating them close to the urban perimeter.

"What is out of reality is the price of the salt marsh! (...) The real price of fish should be analysed by incorporating environmental costs. You will see that the price of fish will increase from 100\$00 [0.5 ¤] or 200\$00 [1 €] to 100 contos [500 €] per kg! Look at this on a period of 5 years." --A2

6.3.6.2 Alternative Economic activities

Oyster production

Oyster production used to be a very important economic activity in the *Sado* estuary, but it was destroyed by the industrial pollution in the eighties. Oysters could operate as a complement to aquaculture, but probably not as a main activity, because it has a non-harvest period of 3 to 4 months a year.

Recently, some attempts have been made to restart producing oysters in the *Sado* estuary, but there are several difficulties that still need to be overcome.

One complain from the environmentalists is that most of the oysters raised now in aquacultures are not local species, but an imported one. Some fish farmers are convinced

that the oyster quality improves when they are taken from the polluted areas of the estuary to the good waters of the aquaculture.

"Sado used to be a big exporter of oysters to France (...) I got those polluted oysters from the river. After six months in our ponds they grew up 6 cm and with a thinner shell (...) About one or two years ago we asked for a license to produce carped shell. Several state agencies said yes but RNES said that was necessary an Environmental Impact Assessment (this costs more than 1000 contos [5000 €] and it takes a long period of time). We were surprised with that and so we wrote a letter to RNES asking why would be necessary to have an EIA but we did not get any answer." --P1

"I have tried ten years ago. They grow up very fast and where huge. A guy said that would buy the oysters but he never come back. There is a man that produces oysters and he sells 1 to 2 tons every week. And it is well paid. (...)The problem is that we do not have seeds, it gives lots of work and it is not compatible to fish farming." --P5

Ecotourism

Tourism, namely nature related, is seen by many non-fishing industry stakeholders as an activity of great importance for the development of the area. This ranges from the traditional dolphin watching in the *Sado* estuary to birdwatching in the salt marshes or *salines*.

"This area has a great tourist potential. Tourism specialized on bird watching, ecotourism. People come from Lisbon for bird watching." --G4

"The existence of RNES can be a big attraction for tourism (...) There are many tourists that come here looking for things related to salt production, salines and we do not have anything." --G6

Vertebrates, apart from the dolphins, do not significantly benefit the ecological tourism in the area. However, with the development of the tourism in this area, they might get their role.

"I think [vertebrates] are one of the points, but not the only point. I think there are lots of possibilities in terms of nature tourism. (...) the birds, the salt ponds, the traditions, (...)" --E2

The *salines* can also operate as eco museum of traditional techniques, as an ecotourism operator suggested mentioning his visit to France.

"They have the salines, they have the eco museums, they have there birdwtaching(..)"--E2

Salt production

Salt is seen as a decreasing activity that has absolutely no future. This vision has been shared by many fish farmers, which refuse to consider salt production as an alternative to

aquaculture. Even an environmentalist and a salt producer pointed out that salines are not economic viable anymore.

"Only old men used to produce salt and now they are all dead. Young people do not want to produce salt because it is not profitable. In Algarve it is easier to produce salt because of the land that is more compact. The only salt producer in this area still have six year salt do sell." --P5

"The production of salt does not have any future. Salt does not have the same importance that it used to have. It was used for conservation of food, the process of salting fish, etc." --P8

"No one invests in new salines. Only crazy people like me stays around here. My son already told me that he does not want to work with salt. (...) The construction of a boxing central would not develop the production of salt. We have one big boxing central, Salmex. My son went there to offer salt and they did not accept it. Their suppliers are from Tagus Estuary." --E3

"If you pretend to create an incentive to salt production it would be essential to subsidize this activity." --A1

Despite recognising the decrease to an almost extinction of *salines*, there is a will on the governmental side to preserve the existing *salines* and reconvert some of the abandoned ones.

"We only have one saline in the municipality and it is very hard to reach it. That is why the RNES project of reconverting salines comes in our interest." --G6

One fish farmer referred that in other areas of the country there has been a bet for the production of biological salt mentioning that this could invert the trend of being non profitable.

Another fish farmer mentioned that salt production generates some temporary employment, which could be a good asset for an area with a high unemployment rate.

"I have here some people paid by hour. They make around 5 hour per day during the 4 months of production. I pay 5€ per hour." --E3

Conversion of *salines* into fish farms involves a big investment, so it is possible that many of the converted ones in the *Sado* estuary were a result of communitarian subsidies.

"If this was a fish farm I would get more profit but this conversion would involve a big investment and I would have lots of work. The tractor to modify this would take me around 20 thousand contos [100 thousand euros]." --E3

6.3.6.3 Administration

Services

The Reserve could offer services to fish farmers regarding water quality. This type of support measures could be used as a synergy and help mitigating the conflict between both sides.

"there was a day that there was a rumour that there were problems with the quality of water. I called the Reserve but nobody could tell me anything (...) can you see the problems of water quality, only looking at the river" --P6

Communication, technical support and educational strategies

It was frequently mentioned the lack of technical support from the public administration and the need felt by fish farmers. Therefore, several public administration services could develop efficient ways to give technical advice to the fish farmers.

"However, the Reserve has great difficulty in finding arguments to respond to the statements of the fish farmers. On the other side, data about aquaculture production are confidential and it is Aquaculture and Fisheries General Department (DGPA)" --G1

Despite the latent conflict between the fish farmers and the *RNES*, it seems that there is room for creating negotiation spaces and develop collaborative and more adequate policy strategies. A part of the key issues were already identified at this stage and will provide the basis for future developments. To make the most of it, it is important to assure the involvement of key stakeholders that have been identified along these interviews and the phasing and structuring of an effective interaction process among them. This has the potential to contribute to the enhancement of communication and it will operate as an educational tool to, namely, raise the environmental awareness of the participants. It will also provide space for negotiation and joint development of strategies. Policies collaboratively constructed will have a greater potential to be more robust.

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Chapter Seven: The Social Impact Assessment from Sweden

Introductory remarks

7.1 Description of the research site	3	
7.1.1 Governmental jurisdictions and responsibilities related to FRAP issues		4
7.1.2 Population		5
7.1.3 Basic economic characteristics		6
7.1.4 Geographical characteristics		7
7.1.5 Brief description of conflict and stakeholders involved		8
7.2 Perceived economic costs of the conflict	10	
7.3 Perceived economic benefits of fishing industry and perceived economic benefits of the presence of vertebrates	13	
7.4 Social costs and benefits of the conflict in the local community	14	
7.5 Mitigation strategies being considered or implemented in the local area	15	
7.5.1 Stakeholders perceptions of costs/benefits of the strategies		15
7.5.1.1 Compensation for seal damage on catch and gear	15	
7.5.1.2 Development of seal safe gear	18	
7.5.1.3 Protective seal hunting/game management.....	21	

References

Appendix

Introductory remarks

The situation at regional and local levels in the Swedish model region is characterised by the fact that there is already an established framework for the mitigation of the seal conflict, the National Grey Seal Management Plan, which is implemented for the period 2001 – 2005. As a consequence of this there is no longer among the stakeholders a basic debate about the scope, dimensions, costs and benefits through the conflict and no longer an active debate about alternative strategies to solve the conflict (the presently implemented mitigation measures have not proven yet their insufficiency to cause a new debate about alternative solutions). That there is a management plan in implementation has several important consequences for the present situation, the orientation and behaviour of the stakeholders. These consequences need to be kept in mind in the following SIA-report:

1. The conflict arena is closed: no new stakeholders come in and articulate their interests and positions with regard to the conflict. The only “open front” is, that the conflict moves to where the seals and the fishermen interact, and this is presently a southward movement along the Swedish East coast (the growing seal population migrates to southern parts of the Baltic Sea). When the conflict emerges anew in an area, there may again be a more open situation in which the stakeholders position their arguments and interests, but every new conflict area is quickly subsumed under the national management plan and becomes thus also a closed or administered conflict.
2. The roles of the stakeholders in the conflict mitigation are defined and formalised: only a small group of stakeholders and a limited number of persons is involved at regional and local levels.
3. The political controversies (about alternatives to solve the conflict) have changed into administrative debates (about acceptance, effectiveness and efficiency of measures carried out)
4. At the local level no longer an active confrontation between stakeholders of nature /seal protection and fishery are taking place (if such have happened at all in earlier phases of the unregulated conflict, which was not necessarily the case). The only stakeholder group that is acting at the local level are the coastal fishermen.
5. At the local level there are no written sources and documents about the conflict or its costs and benefits, neither for fishery nor for species and nature protection. This is a consequence of the fact that the local conflict is managed regionally and the individual fishermen involved in the conflict do not communicate or report to the local or municipal administration, but to regional administrative institutions.

The premises under which WP 6 and the SIA have been conceptualised and planned are not targeted for such a situation where conflict mitigation is already at an advanced stage nationally, regionally and locally, but for an earlier phase of the conflict and for an “open” situation, where no decisions about mitigation strategies have been made yet, costs and benefits are unknown or not quantified yet, quantitative cost and benefit information is not available yet – so that the original information about these themes has

to be asked from the stakeholders. All these presuppositions are not valid in the Swedish seal conflict and the conflict in the model region.

The formalised mitigation framework that defines the situation for the actors, the Swedish grey seal management plan, includes a combination of measures to mitigate the conflict – all these have been described in detail in the reports for WP 4 and WP 5. Summarising these measures the following five ones are important (of which the first three are regulatory measures in the sense of legal and governmental regulation):

- regulation through protection: seal protection areas,
- regulation through financial compensation: payments to fishermen for damaged gear,
- regulation through special hunting permits: protective hunting of seals,
- technical solutions: development of new “seal-safe” gear,
- knowledge based management: scientific research and monitoring of the seals population and evaluation of the effectiveness of measures.

Seen from this combination of solution-generating mechanisms, the present grey seal management plan can be seen as a rather conventional system which hardly includes innovative instruments that have been developed and discussed during the past decades mainly in the field of environmental policy, that is, informal approaches, mediation, locally-specific, negotiation and participation based approaches (in short: all the approaches which are not using governmental regulatory power or legislation and monetary compensation). The element of long-term solution (technical measures) in the management plan is of species-specific type and therefore limited. The element of flexibility (given by research, monitoring and evaluation) is providing flexible and adaptive responses in terms of temporal and spatial solutions, but may also be limited through its concentration on one target species only.

The stakeholder’s perception and discussion of the conflict is no longer dominated by the search of a “best strategy” but follows the presently implemented policy and measures in terms of effectiveness and efficiency of these measures. Rarely alternatives to the present management plan are thought of.

7.1 Description of the research site

The Swedish research site includes the model region with four coastal communes (for detailed descriptions see Swedish report for WP5). The model region (120 km coastline) is part of an extensive archipelago with about 11600 islands. Political and administrative responsibilities within the model region are divided between two counties (NUTS 3) and four coastal communes (NUTS 5) within these counties:

- (a) **County Södermanland (“Södermanlands län”) with municipalities Nyköping and Öxelösund adjacent to the coast;**
- (b) **County Östergötland (“Östergötlands län”) with municipalities Norrköping and Valdemarsvik adjacent to the coast.**

The specific problem with the definition of a conflict area in this case is that it does not fit into land-based definitions of regional and municipal territories because the conflict goes on in coastal waters. The spatial definition of the model region with the local case study area in four municipalities does not allow sufficiently well to mark the boundaries of the conflict area. Therefore, the model region and study area are defined in ecological, not in geographical terms, that is, with regard to the specific habitat and the mobility of the living resources (fish) and animals (seals) included. *Although the four coastal communes together are used to define the local case study area, the conflict is not on land, but in the coastal waters of these communes and the archipelago islands in these waters.* The conflict is located in coastal waters (and land based activities or land use in the coastal zone have nearly no influence on the conflict). The further components defining the conflict, location of fishing grounds and fishing behaviour of coastal fishermen, are also not land based. The conflict zone (where seals catch fish and damage fishermen's gear; where fishermen catch fish and shoot seals) is a water area.

7.1.1 Governmental jurisdictions and responsibilities related to FRAP issues

All institutions important for the implementation of the conflict management strategy in the National Grey Seal Management Plan can be found at regional levels (county administrations) and local levels (municipalities; for detailed description see Swedish report for WP 4; see appendix to this report for a summary of the responsibilities within the national management plan). The core institutions for regional decision-making are the ones described below. The actors representing the interests of nature and species protection in the seals conflict are not mainly active at regional levels - here it is only the **department for nature protection within the regional administration** that is actively involved - but as governmental and non-governmental organisations at national level (located in the capital Stockholm: the **Swedish Nature Protection Agency**, the Swedish Association for Nature Protection (SNF) and **WWF Sweden**).

The regional or county administration ("länsstyrelse") is organised as a unified institution with specialised units responsible for the implementation of all governmental policies, programmes and laws at regional and local levels. For the management of the seals conflict the most important units within the regional administration are the ones for hunting, fishery and nature protection. Very often the responsibility of hunting and fishery are placed at the same unit. The tasks of these units with regard to the conflict can be summarised as follows:

- (a) **All relevant units** (hunting, fishery and nature protection) are asked to contribute to the county-specific reflection on the seal management plan proposed by the Swedish Environmental Protection Agency. This is part of the Swedish strategy of hearings ("remissförhållande") to guarantee openness in the public administration and to enable different stakeholders to express their views. The process even includes stakeholder advisory boards and hearings before, during and after the proposal. However the selection of stakeholders and experts is often limited and

the representatives of, for instance, NGOs, run the risk of becoming professional policy makers and losing their quality of a social movement.

(b) Fishery and hunting unit:

- *Implementation of the parts of national grey seal management plan for Sweden.* This includes distributing compensation payments for seal damage on catch or gear; co-financing of seal safe gear; opening and calling off the seal hunt; and producing a report on the regional results of the seal hunt to the Environmental Protection Agency no later than 1st of March each year. The preparation of the regional implementation even involves cooperating with the nature protection unit to propose suitable areas for seal hunting within the region.
- *Management of fishery in the region.* For instance issuing licences for professional fishermen, and monitoring the local fish populations.

(c) Nature protection unit:

- *Management of seal protection areas and nature protection areas.* Suitable areas for protective seal hunt are recommended by the nature protection unit. This is done in cooperation with the fishery and hunting unit. The nature protection unit bears the responsibility of ensuring that regulations are followed concerning the protected areas.

7.1.2 Population

In comparison to the Swedish territory the counties Södermanland and Östergötland are densely populated (statistical population density about double of Swedish average). The population is growing slowly between 1995 and 2002; it is unevenly distributed over the territory, with a concentration in the coastal municipalities. The changes in the age structure of the population are more significant as indicator of demographic changes than the total population growth – they indicate an ageing regional population in which only one age class is rapidly growing over the period of analysis: that of people who are between 55 and 64 years old, that is, close to the age of retirement.

The slow population growth is mainly a consequence of immigration, that in the model region also a consequence of inner-Swedish migration between the regions. The migration balance for Södermanland is rather stable for the period 1997-2002: until 1999 there is nearly a balanced in-/outmigration ratio, from 2000 onwards the numbers for people moving into the region (between 9000-10.000 a year) are higher than the numbers for people leaving the county (in 2002: 9935 people moving into the county, 7856 leaving the county). The trend for Östergötland is similar: from 1997-1999 there are more people moving out than in, from 2000 onwards the trend is reverse – in 2002 12074 people have moved into the county and 10719 people have left the county.

The dominant trend in Swedish coastal regions and in the model region is: coastal areas are attractive places for living, although they can often not provide for sufficient work places, so that large parts of the working population are commuting. *The population*

group directly involved in the seals conflict at regional and local levels, the coastal fishermen and their families, represent a very small part of the population only with a very peculiar forms of work and employment; it is not their number or economic influence that makes them powerful but their specific social and economic roles for the maintenance of “living coastal communities”. The coastal fishermen are also specific with regard to their demographic structure as a group: the fishing is done exclusively by men and most of the fishermen are of higher age; the number of coastal fishermen is rapidly decreasing all along Swedish coasts and there is a recruitment crisis.

7.1.3 Basic economic characteristics

Regional level: The gross regional product in the region is below the Swedish average which is a consequence of the high commuting rate, especially in the Northern county of Södermanland, adjacent to Stockholm county: The net commuting balance between Södermanland and other counties, mainly Stockholm County, was in 2000 about –10.100 persons (that is an important part of the population works contributes to the gross regional product in other counties where their work place is located), Södermanlands gross regional product was - mainly because of the lack of work places in the region that leads to commuting - 21% below the national average of gross regional products which was 248 000 SEK per capita (ca. 27 555 Euro) in 2000 and one of the lowest in Sweden (see Länsstyrelsen Södermanlands län & Regionförbundet Sörmland 2004, p. 52).

Income: The average income for the population from 16 years onwards in Södermanland has grown from 154 000 SEK to 175 200 SEK (ca. 19 466 Euro) between 1998 and 2001, in Östergötland from 151 800 to 174 100 SEK (ca. 19 344 Euro).

The average income levels in both countries are rather close to each other, with the Northern region Östergötland being a little higher. Both average income levels are close to that at municipal levels in the four coastal communes (only Öxelösund, with a small number of inhabitants, has a somewhat higher average income level). The average income for women is significantly lower than that of men (about 1/3) in both counties.

Employment: The number of employed in Södermanland was 100 750 in 1995, for Östergötland 174 760, and for Sweden totally 3 836 920 in this year. The number of employees and employment structure in both counties Södermanland and Östergötland indicates three dominant sectors and these are also the sectors that have mostly grown in number of employees between 1995 and 2002, but none of these sectors is of significance for the model conflict:

- extractive and producing industries, incl. energy and water services (slow reduction)
- trade transport and communication services (growing sector)
- health and social services (growing sector).

Institutionally seen, this sector structure can be summarised as: counties and municipalities (public institutions are the most important employers in the model region, followed by industry and private services.

The primary production sector (agriculture, forestry, hunting and fishery) creates the smallest number of employment in both counties, and this sector is rapidly decreasing in economic significance over the period 1995-2002; in Södermanland the employment has gone down from 4700 jobs (3.2%) to 2600, in Östergötland from 6800 (2,9%) to 4900 during these years.

The proportions of employment and the trends for the regional level are very similar to the ones for the coastal municipalities in the model region.

Compared with the employment structure at national level there are no significant differences in the model region: the quantitatively dominant employment sector is public administration and other services, followed by “trade and banking” and “mining and production” at nearly the same levels; much less important is construction industry and transport, and still less economically significant is the primary production sector. Within this economically insignificant sub-sector counts coastal fishery very little in terms of employment or work places – the number of coastal fishermen is far below 1% of the occupation figures in the primary sector.

7.1.4 Geographical characteristics

The landscape in the counties Östergötland and Södermanland is dominated by agricultural use and at the coast by archipelagos. Both counties are located South of Stockholm County (which covers the metropolitan and industrial area of Stockholm) and both counties have high number of commuters to the metropolitan region.

County Södermanland 1995: 6062,4 km² + 518,9 km² water = 6581,3 km² total, with 258 700 inhabitants (population density 43 persons per km²)

County Östergötland 1995: 10 552,0 km² + 1066,8 km² water area = 11 628,8 km² total, with 416 443 inhabitants (39 inhabitants per km²)

Sweden 1995: 410 943,2 km² + 39 029,3 km² water areas = 449 963,5 km² total with 8 837 496 inhabitants (22 inhabitants per km²). In 2002 the number of inhabitants of Sweden has been 8 940 788, that is, there has been only a small growth of the population in the period 1995-2002 of ca. 100 000 inhabitants.

The sector-specific land use:

- *in Södermanland:* 157 733 ha agricultural land (24%), 323 500 ha forests (49,2 %), 33 250 ha built land (5,1%), 120 570 ha mountains and other land in non-productive use (11,4%), 51 890 ha water (7,9%), totally 658 130 ha (these figures have hardly changed in the reporting period: for more recent data see Länsstyrelsen Södermanlands län & Regionförbundet Sörmland 2003, p.4). The striking difference to the national level statistics is the high percentage of agricultural land: 24% in Södermanland, 8% nationwide);

- *in Östergötland:* 265 635 ha agricultural land (22,8%), 601 500 ha forests (51,7%), 45 950 ha built land (4%), 120 570 ha mountains and other land (10,4%), 106 680 ha water (9,2%), total area 1 162 880 ha. Also here the striking difference to the national average is the high percentage of agricultural land;

- in Sweden: 3 563 333 ha agricultural land (7,9%), forests 23 423 500 ha (52,1%), built land 1 121 900 ha (2,5%), mountains and other areas 8 004 690 ha (17,9%), water 3 902 930 ha (8,7%). All data from: Statistiska centralbyran 1998, p.17f.

7.1.5 Brief description of conflict and stakeholders involved

The Swedish conflict originates in the rivalry between coastal fishermen and grey seal to gain access to the same resource: the fish. The grey seal population was diminishing during the sixties throughout the eighties, primarily because of toxic pollution. The conflict between fishery and seal has increased as the grey seal population has re-established itself along the coast. The small scale fishermen that experience the seal damage on gear and catch are at the same time a marginalised and diminishing group. The average age amongst the fishermen in the model region is high: most fishermen are more than 45 years old and no young people are starting as fishermen. Many of the fishermen combine fishery with refinement (smoking of eel etc.) or with part time jobs elsewhere. Generally the fishermen perceive the future prospects for small scale coastal fishery as rather grim. Market prices have gone down, the species that were the traditional target species are rare, and the seals¹⁵ are harvesting the scarce resources and damaging the gear.

The conflict seems to be quite “stable” but tense for the time being, but one should be aware that the conflict status could easily and rapidly change. For instance this could be induced by changes that are perceived as negative to the fishermen (mainly economically) or if the seal population should diminish again due to sickness or environmental impacts.

Not all conflicting interests are present at local level. One side, fishery, is clearly represented by the local fishermen. The other side, the protected seal, is often not seen as a stakeholder since it is not a human agent. (Whether it could be meaningful to include the seal as a stakeholder or not is an issue that should be discussed more: The theme will re-emerge during the next part of WP6 when reconciliation strategies from the stakeholders are presented.) Who is representing the grey seal on the nature conservation side at the local level? The groups that are expected to take such responsibility, the local NGOs and action groups, do not exist or do not pay any interest to the conflict at this level. There are no local stakeholders that use seals as part of their marketing of tourism etc. Rather it is the “living archipelago” in a cultural sense that is being marketed in tourist pamphlets and descriptions of the coastal area, meaning that the traditional coastal fishery is part of the cultural landscape and the idea of life in the archipelago.

Since there are no visible stakeholders on the nature conservation side of the conflict at the local level, the conflict unfolds at regional and national levels, and very often within the public sector. The units of the regional administration manage the implementation of

¹⁵ Even the cormorant is considered to be a threat to the small scale fishery – however the cormorants do not cause damage to the fishing gear but only eat the fish.

different policy areas and thereby even specific interests connected to specific groups or areas. The fishery unit gets to know coastal fishermen, their situation and problems; and the nature protection unit tries to create the best conditions for flora, fauna and especially protected species. The policies that are created at national level do not necessarily guide what should be prioritised in practice, at regional level, and the policies are not backed by the same economic or legislative incentives. As a result of this the actual conflicts unfolded at the regional level where different sectors meet to plan and implement the concrete work.

At a national level the conflict unfolds in a similar way as presented at the regional level. The Swedish Environmental Protection Agency is responsible for implementing and managing governmental decisions on nature protection policies, and the Swedish Board of Fishery is responsible for implementing and managing the fishery related policies. It is evident that the interests sometimes collide when the same resources are at stake. One could say that the Environmental Protection Agency generally advocates the perspective of the protected species, and that the Board of Fishery advocates the perspective of the human resource users. Still the division of perspectives is obviously not crystal clear: the Board of Fisheries even monitors the marine resources and preconditions – hence they can even be interested in protection of resources and species to support the aim of future sustainability. The Environmental Protection Agency shares this ambiguity: the management of species is organised in proportion to the size of the population, the damage caused by the species, international agreements to protect the species etc. Hence the Environmental Protection Agency might even at times advocate hunting in some form or other mitigation measures to relieve conflicts or manage populations. Below follows a table of the stakeholders presently involved in the conflict in the model region.

Description of the stakeholders involved in the conflict between fishery and seal in the Swedish model region.

	Fishery	Nature conservation (seal)
Local level	Fishermen	Seals
Regional level	<i>NGOs:</i> Coastal Fishery Organisation Swedish Hunters Association <i>Public sector:</i> Fishery unit (regional administration)	<i>Public sector:</i> Nature protection unit (regional administration)
National level	<i>NGOs:</i> Coastal fishery organisation Swedish Hunters Association <i>Public sector:</i> Swedish Board of Fisheries	<i>NGOs:</i> WWF, Sweden Swedish Society for Nature Conservation (SNF) <i>Public sector:</i> Swedish Environmental Protection Agency

“Floating” stakeholders that influence policy processes but are not homogenous or easily placed on either side of the conflict.	Scientists involved in projects such as: ”Sålar & Fiske” FRAP Naturhistoriska Riksmuseet
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Source: own compilation

7.2 Perceived economic costs of the conflict

Because of the advanced regulation of the conflict, the few stakeholders involved at regional and local levels, and the dominance of institutional (governmental) stakeholders in the conflict management strategy (= the national grey seal management plan), there is no remarkable discussion about economic costs of the conflict beyond the costs that are part of the management plan. For the stakeholders the costs of the conflict (direct costs in

terms of damaged gear, compensation payments etc. and indirect costs such as research and development of seal-safe gear) are not a priority in their perception and discussion about the conflict: One does no longer have to argue with costs when there exists already a widely accepted mitigation strategy where main direct costs are already regulated. The fishermen are the only one that experience the cost factor “seal damage” that is dominant in conflict management. They are also the experience and discuss the less exactly calculable cost factors such as “reduced catch because of seals eating fish”. They have to discuss the loss mainly with bureaucrats who have clear rules to compensate fishermen and can argument well with the fishermen (see below, part 5). All stakeholders, the governmental ones included, have limited knowledge about the total costs or the different cost factors of the conflict at regional levels. Neither is there a controversial debate (based on differing perceptions or assessments of the costs and expert controversies about the “real costs”) about costs for the fishermen through damages, nor is there a debate about the costs and benefits of seal protection. This lack of “instrumentalising” economic arguments in the conflict for defining interests and positions by stakeholders may be partly explained by (a) the advanced stage of conflict regulation and (b) the general argument that protection of endangered species is a political and societal activity in the interest of all, but should not lead to an economic discussion about costs or benefits of the protection decision and its consequences (that is, potential conflicts arising from the protection decision). The value of species and biodiversity is not mainly an economic factor but includes other value components. Also the model calculations (by environmental economists) of costs and benefits of ecosystem services or biodiversity may not allow to convert into real economic costs the ones that are only expressed in monetary terms but not prized, not marketable, not paid by present society or individuals or resource users (remain externalities).

Within the framework of the mitigation strategy, the national management plan, the discussion about economic costs is rather limited (see part 5). There is no comparison of costs of alternative solution strategies although such an element goes into the arguments for preferring protective measures such as seal safe gear (this is seen as the effective and recommended method) to compensation payments. The individual fishermen talk about the problem of reduced catch, but this has more reasons than the appearance of seals and is not yet discussed by other stakeholders in the conflict. The only important stakeholder that has dealt with or deals with trying to estimate and calculate the costs of the seal conflict are the scientists involved (from the project “Seal and Fishery”). The only trial so far to calculate the total damage to fishery through seals was done by this “floating” stakeholder, the scientists (who represent also the governmental agencies involved, Board of Fishery and of Nature Protection); it was done only once (1997), in form of model calculations with very inexact results, since then not repeated. No one of the stakeholders, governmental or not, has since then initiated a discussion about the costs for fishery, for seal protection, or for the management of the conflict. All important debates happen within the implementation of the grey seal management plan, and this is the dominant area for cost or benefit discussion (reported below, part 5). The conflict is bureaucratically managed and mitigated and the mitigation plan confirms for all stakeholders that the costs that are causing the conflict (for example, gear damage) are socialised or taken over by government and society. These costs appear in state budgets,

not as cost factors of individuals or stakeholders involved. As well direct costs are administered by public agencies (payments for damages) as indirect costs (for research and development of seal safe gear, for management of the conflict by public institutions). As a consequence of the facts that the costs for fishermen with regard to their losses are compensated (at least partly) and the costs for protective measures (seal safe gear) are subsidized, the discussion about perceived costs is de-intensified and in practice reduced to the question of adequate compensation for damage. For the quantification of damages in the individual cases the administrative agencies do not need calculations of the total seal damages (see public statistics reported in Swedish WP 5 report and Swedish WP 7 report “Measures to Minimise Seal damages in Coastal Fisheries” for model calculations of damages to fishing gear by seals). Also the institutional actors at regional levels (the ones assessing and paying for damages to individual fishermen) do not urge for a more detailed or more exact analysis of costs – which may be astonishing, but needs to be taken as a fact first (see part 5 for further analysis). *All important cost discussions between the stakeholders are involved in the debate about the implementation of the grey seal management plan and – therefore – reported together with the data about mitigation strategies in part 5 of this report. In the Swedish seal conflict mitigation is not a future option but a policy already implemented since several years. This has also contributed to “freeze” the debates about perceived costs and benefits of the conflict.* What happens in terms of the “economics of the conflict” at local level is reduced to debates about the adequacy and efficiency of measures taken in the national management plan.

As a consequence of the situation described with regard to costs we have concentrated cost debates to the level of implementation of the mitigation strategy which we consider to be the important area in the Swedish model conflict. The Swedish seal conflict is no longer in a phase where the controversies unfold between experts with each side presenting own and different cost-calculations or cost-benefit analyses of the conflict. Questions about the impact of the conflict on the regional or local economy have to be answered with the figures given in the Swedish WP 5-report and from there – as from the interviews ongoing for WP 6 – it can be concluded:

The economic impacts of the conflict in terms of quantified economic costs are – because of the low number of fishermen involved not significant at the level of regional economic statistics where they appear as a “quantité négligable”. The local fishermen’s economic losses or gains, costs or benefits are not identifiable in the economic statistics and difficult to quantify also at individual levels. At best they can approximately be discussed in estimation of direct costs from damages, compensation payments and seal safe gear, and from more inexact estimations of income losses through changed fishing places and methods (see below). With regard to damages there exist inexact model calculations only, not specified at regional levels. Such calculations have been done only once (in 1997).

The important economic consequences of the seal conflict for the fishermen involved can be (better than in direct costs categories) discussed in terms of their reflections and attitudes about their future as individual fishermen and the future chances of coastal fishery. Most of the local coastal fishermen do not see a future for their business because of many more problems than seal damages. Some fishermen already think of ending their

fishery because of the many problems they face - among these problems the seal damages may only be the final one that evoked such concluding thoughts, but not the only or main cause for the decline of coastal fishery.

7.3 Perceived economic benefits of fishing industry and perceived economic benefits of the presence of vertebrates

The “fishing industry” in case of the seal conflict in the Swedish model region is represented by some dozens of coastal fishermen that operate their business as “one man firms” and that are dependent from other income sources than coastal fishery to make a living (see study about “the economy of fishing households” reported in Swedish WP 5 report). For the fishermen there are no benefits visible from the conflict or the measures to support them – these are only measure that allow them to continue fishing, otherwise they would have to give up individually more often. Also the improved efficiency of fishing as a side-effect of new seal-safe gear (see below) is not a clear benefit from the conflict and its management, but only a measure that helps the fishermen for a certain time to continue with their profession.

The maintenance and value of biological diversity and of the presence of vertebrates is not an actual debate in this conflict. To a large degree the arguments presented in point 2 above could be similarly applied for the discussion about economic benefits for fishing as for nature or species protection – they are a non-issue in the regional and local debates between the stakeholders as far as they are not framed through the mitigation strategy of the National Grey Seal Management Plan. Even the new international policy of the Convention on Biological Diversity (that has to be implemented nationally in Sweden too) has not created up to now a general debate or one in the specific case of seals about benefits from protecting nature and species. In the case of the seals there is a lack of organised stakeholders at local and regional levels in the model region who could argue with the benefits and make them part of their interests (environmental NGOs, tourists). For the stakeholders representing the interests of nature protection (NGOs and governmental agencies) the need to argue in the conflict with economic benefits of the presence or protection of vertebrates has not come up so far – it was enough that at a certain time seals have been perceived as endangered species by some governmental and intergovernmental agencies (HELCOM) to make their protection possible. The legitimacy of this decision can be questioned in future, when the seals can no longer be seen as an endangered species (because of their rapid population growth). This discussion has already started in the debates about the conflict, but has not yet led to a consensus that seals are no longer to be seen as an endangered species.

7.4 Social costs and benefits of the conflict in the local community

As the intention of this SIA is to make visible direct and indirect costs and benefits of the conflict at the level of the local community the introductory remarks about the specific situation in the Swedish seal conflict should be referred to the discussion of social costs and benefits too. What has been said before is important for the discussion of social costs and benefits:

- lower catch rates are discussed by the individual fishermen, but not in quantitative forms, and not as a problem of the local community;
- increased tourism because of the presence of protected seals has not been observed in the study area.

The “role of the conflict in the overall life of the local community” (one of the aims of the SIA) is difficult to describe in a situation where the conflict is managed in a way to bypass the local municipal administration, the local social community, and the local public. Locality needs to be redefined in this case as the interaction, negotiation, cooperation between local stakeholders (fishermen) and regional institutions. Only in this “diagonal” interaction something of the local dynamics of the conflict becomes visible. The conflict is characterised by a lack of local publicity and action (as has been quickly visible the only stakeholder that could produce a local public conflict and make the conflict to open political controversies and confrontations at local levels are the environmental movements and environmental NGOs – but they are absent or inactive at local levels with regard to the seal conflict. The other stakeholders seem to have a silent common understanding that it is neither good nor efficient to articulate the conflict in local political forums or in the media, but to negotiate conflict solutions directly between the groups touched.

When the local community is defined as that within the four coastal communes of the local study area than, it can be said: Because of the nationally adopted mitigation strategy social costs as well as benefits are not emerging at local levels in this conflict, not for the local groups and not for the coastal communes where the conflict happens. Social costs as costs borne by the society as a whole not by the fishermen or other stakeholder groups (and in analogy : social benefits as benefits in the sense of being benefits accrued not to the stakeholder involved in fishery or nature protection directly but to the society as a whole, in terms of increasing welfare) are not attributed to the local society or community at the coast. Especially for the benefits of protection of seals there are not (yet) stakeholders to articulate these benefits and make use of it. The social costs of the conflict are articulated partly through the defensive measures and costs within national environmental policy, but these are not formulated and not defended at local levels. It is the society “at large”, through governmental decisions that takes the responsibility for the management of the conflict - also in cases where local communities or regions decide about the designation of new protected areas. For the time being:

- social costs of preservation of vertebrates are not an issue in the conflict;

- social costs of fishing industry are not an issue in the conflict (only a small part of the fishing industry is touched).

7.5 Mitigation strategies being considered or implemented in the local area

The mitigation strategies that are implemented in the model region are determined by the national grey seal management plan (Naturvårdsverket, 2001). The plan outlines the management of grey seals during the five year period 2001-2005, and was formulated by the Swedish Environmental Protection Agency with the advice of the Swedish Board of Fisheries. The scientific background on grey seal population development and health status was primarily supplied by the Swedish Museum of Natural History. The mitigation strategies include compensation for seal damage on catch and gear; development of seal safe gear; and protective seal hunting. The costs/benefits of these strategies will be discussed below.

There are no other mitigation strategies being implemented in the model region at this point. The fishery and game units at the regional administrative level might be interested in starting a course for hunters to learn how to hunt seal more successfully. This could possibly be done in cooperation with the Swedish Hunters Association, but there are no concrete plans on when or how this could be done.

The stakeholders do not express interest in other mitigation strategies than the ones included in the management plan (neither do they propose concrete alternatives). The already existing measures can be altered/developed and improved according to the stakeholder interests.

7.5.1 Stakeholders perceptions of costs/benefits of the strategies

Naturally, the stakeholders' perceptions of the costs/benefits of the implemented strategies vary according to their perspective and interests. For the fishermen in the model region the success of the strategies determines their future as fishermen; for the bureaucrats at various levels the strategies are used as vehicles to deliver policies from the nature protection perspective as well as from fishery perspective. Other involved actors might see the strategies from yet another perspective. Here follows a brief description of the perceived costs/benefits of the implemented strategies.

7.5.1.1 Compensation for seal damage on catch and gear

***Fishermen:
(Individual fishermen and Coastal Fishermen's Association)***

The fishermen in the model region find that the economic compensation for seal damage on catch and gear is vital to their survival. The compensation normally covers 50% of the costs asked for by the fishermen, but still they seem quite content with the outcome. So far there has not been any general national guideline as for how to distribute the compensation, but this has not been a complaint of the fishermen. There seems to be some concern as to how such a general distribution plan would affect the compensation. As the practice is now the compensation depends very much on the relationship between the fishery unit at the regional administration and the fishermen. The fishery unit has much knowledge of the fishermen, their income situation and problems with seal damage, so they can rather informally and personally assess the situation of the individual fishermen – and this seems to make any further, more formal and more exact quantification and assessment of costs to become superfluous. The fishermen seem content with this more personal way of how their applications for compensation are managed by the bureaucrats.

The main complaint about the compensation scheme from the fishermen is that it does not take into account the “invisible” and indirect costs of seal damage. These costs include both forced abandonment (due to frequent seal damages) of fishing places that were once very important; abandonment of traditional fishing gear and some kinds of species-specific fishery; the scaring away of fish from traps that are frequently visited by seal; the fish “harvested” by seal in trap openings; and finally the fish that is taken out of the nets without a trace (if some parts of the fish is left, compensation can be granted since the damage can be documented). The fishermen would like these costs to be compensated as well, and they are very interested in scientific evidence of such effects of seal presence.

Regional administration:

- ***Fishery and game unit***

The fishery units in the model region are responsible for distributing compensation for seal damage on gear and catch. Every year a certain amount is allotted to each county from the Environmental Protection Agency. The fishery units evaluate the applications from the fishermen according to their prior knowledge of the fishermen, their income, reports of seal damage in logbooks etc. The new general guidelines that are being developed are more welcomed in counties where there are more active coastal fishermen left than in the counties with a small number of marginalised coastal fishermen. In the counties in the model region there seem to be some worries as for what impact the new guidelines would have on the distribution of compensation.

The two counties in the model region use different strategies to investigate the claimed seal damage. In Södermanland county the applications for seal damage compensation are judged based on prior knowledge of the fishermen and their logbooks only. In Östergötland county, on the other hand, the reported seal damage is investigated randomly by the fishery unit. This is done by inspections of gear.

The compensation for seal damage should not only cover actual damage, but is even meant to be a means for acquiring seal safe gear. Since seal safe gear is a strategy that

differs from the pure compensation payments, this will be discussed further in detail below. The fishery units prioritise the purchase of seal safe gear over pure compensation payments. Not only is this recommended from the Environmental Protection Agency and the Board of Fishery, but this is even seen as a preventive and “pro-active” strategy. Representatives from the fishery units suggest that the compensation payments will not include the pure compensations of damage on gear and catch in the future, but only the financial help to invest in seal safe gear.

- *Nature Protection unit*

The nature protection units in the model region have nothing to do with the distribution of compensation for seal damage. Economic compensation is a vital part of relieving the conflict and the nature protection units seem to appreciate this.

Swedish Environmental Protection Agency:

The Swedish Environmental Protection Agency distributes compensation payments for all kinds of game damage to the counties each year, including seal damage. The amount allotted to each coastal county depends upon reported seal damage, reported seal population and number of active fishermen.

The compensation distributed to the counties in the model region from the Nature Protection Agency during 2002 and 2003 is described in the table below.

Compensation for seal damage in the model region during 2002 and 2003:
Counties: Södermanland and Östergötland

County in model region	2002 Compensation distributed in (SEK)	2003 Compensation to be distributed (SEK)	2003 Funds for co-financing seal safe gear (SEK)	2003 Compensation for seal damage on gear and catch (SEK)
Södermanland	780 000	940 000	420 000	520 000
Östergötland	450 000	465 000	95 000	370 000
Total/all counties in Sweden	18 900 000	17 430 000	4 800 000	12 630 000

Source: Own compilation based on Naturvårdsverket 2003: protokoll 26/03

As can be deduced from the table above there has been a slight reduction of total distributed compensation for seal damage in 2003. The counties that have been allotted less money for seal damage compensation in 2003 are mainly the ones north of the model region. The counties in the model region have received slightly more finances, Södermanland more than Östergötland, and Södermanland has a larger part of the financed allocated to co-funding of seal safe gear than Östergötland has.

The Environmental Protection Agency considers the compensation for game-induced damages (including the co-financing of game-safe gear to reduce future damages) as a vital part of the mitigation strategies. However an increasing number of game-induced damage of all kinds (bear, wolf, deer etc.) has led to some concern for future compensation schemes. The Environmental Protection Agency has not received more funding from the government in next year's budget; hence, the damage must be prioritized. Future compensation schemes might very well rely even more on co-funding of damage reducing gear, and other game damages might require some of the funds now compensating the seal damages.

Swedish Board of Fisheries:

The Swedish Board of Fisheries is only involved in the compensation payments for seal safe gear as an advisory partner of the Environmental Protective Agency (when planning for the distribution etc.). Since the compensation schemes relieves the conflict and (somewhat) compensates the coastal fishermen for their losses, the compensation schemes are considered to be of great importance. The funding for development and purchasing of seal safe gear is seen as an important part of the efforts to mitigate the conflict in the future.

Scientists involved in research on seal, seal safe gear etc.:

Scientists play no part in the pure compensation payments for seal damage. In this group the compensation payments are not considered to be an effective means of mitigation in the future, since the problem will be constant. The parts of the compensation payments directed towards development and purchasing of seal safe gear are seen as a more promising and sustainable means of reducing the conflict in the future.

Environmental NGO's at national levels:

- **WWF**
- **SNF** (Swedish Society for Nature Conservation)

The two main environmental NGOs in Sweden, WWF and SNF are not directly involved in or affected by the compensation payments for seal damage. As other stakeholders they consider all mitigation measures that reduce the conflict to be of great importance. Until now there are no reports of specific perceptions of costs/benefits of compensation payments from these stakeholders.

7.5.1.2 Development of seal safe gear

The development of seal safe gear has been of great importance in the conflict between fishery and seal in Sweden. The fishermen in the northern parts of the Baltic were the ones to experience seal damage first as the seal population re-established itself after the decrease caused by toxic pollution in the seventies and eighties. The development of a stronger and more durable yarn (Dyneema yarn) was the first initial step towards

protection of gear. Later on the development of a pontoon-trap (push-up trap) was based on the fishing methods and species traditionally used in the northern parts of the Baltic, mainly salmon. For this purpose the pontoon-trap has been very successful in reducing seal damage. The re-establishment of seal populations in the southern parts of the Baltic, here including the FRAP model region, has brought some new problems with the development of seal safe gear. The traditional methods and target species vary from north to south, and in the model region and south of this, eel and other high value fish (aborre, pike, and pike-perch) are traditionally caught. Some of the fishing methods used are well suited for Dyneema yarn, but this does seldom solve the problem entirely. The pontoon-trap was developed for trapping salmon and the preconditions vary when this is to be adapted to other methods and species.

The compensation schemes grant funding for development of seal safe gear for instance for putting Dyneema yarn in gear, or for the purchase of a pontoon-trap. The trap costs approximately 100 000 SEK, and 80% of this is co-financed by the compensation funds when purchasing the first trap. When the fisherman decides to buy more traps the co-funding is reduced to 60%.

Fishermen:

(Individual fishermen and Coastal Fishermen's Association)

The fishermen in the model region adopted the use of Dyneema yarn early on. This has decreased some of the direct damages on the fish house in the eel trap, but still there are many seal-induced damages and problems. When fishing with nets, the Dyneema yarn does not yield much protection: the seals take fish without difficulty from the yarn.

The introduction of the pontoon-trap has not been as successful in the model region as further north. The fishermen are sceptical as to how the trap will work with other species, and they find that there are no pontoon alternatives that will help with eel trapping. Since eel is a vital part of the income, this is most important to the fishermen.

The fishermen that have tried the pontoon traps in the model region (for pike-perch, öring) have experienced pros and cons. On the one hand, the trap is quite large and difficult to put out (the fish house is quite large and must be dragged floating after the boat, and the catching arms are 60-100 meters long. This makes the trap a bit hard to move according to weather and season – when it is put out it is often left there for a while. The positioning of the trap is quite important to the catches: since it is not easy to move, some of the mobility and flexibility that exist with traditional methods is lost. On the other hand is the manoeuvring of the fish house quite easy: the pontoons are filled with air from the boat, and the fish house rises above the surface. The fish can easily be emptied into the boat without the traditional physical effort needed. For the fishermen that endure very hard strains on their bodies, this is a very important side-effect. The fishermen that have found attractive positions for the trap (the water can not be too shallow, and the position must be sheltered from hard wind) find that the trap is very positive. Some are even interested in acquiring one more trap.

The fishermen that have not found the right position for the trap, or the ones that target species that are not suited for pontoon-trapping are more sceptical towards the trap. They

find that the trap has not been tested sufficiently in the southern coastal areas of the Baltic, and that some improvements and alterations need to be done in order to fulfil the local needs.

Some conflicts between fishermen with pontoon-traps and neighbours have been reported. This is mainly due to the fact that the fish house on the pontoon-trap looks rather big and all-consuming. The neighbours fear that the pontoon-trap will harvest all fish in the area, and they feel that it blocks the way for their boats. This conflict will appear especially in archipelago areas such as the model region where summer residents and professional fishermen are competing for the fishing waters.

Regional administration:

- ***Fishery and game unit***

The fishery unit of the regional administration often tries to advocate the new gear to the fishermen, and they prioritize the co-funding of seal safe gear over pure compensation. This is done according to recommendations from the Environmental Protection Agency, the Board of Fishery and scientists connected to project “Sälar & Fiske” (Seals & Fishery). As mentioned above the seal safe gear is even seen as a future investment to protect gear and catch; and it is implied that this will be stressed even more in the allocation of compensation funds in the future. The fishery units often struggle with some conservatism amongst the fishermen that are not always willing to try out new methods and gear. At the same time the fishery units are well informed of the practical problems connected to the new methods.

- ***Nature Protection unit***

The nature protection units in the model region have nothing to do with co-funding of seal safe gear. As mentioned above all mitigating efforts that reduce the conflict without harming the seal population are welcomed by the nature protection unit. Since the nature protection unit are first and foremost advocating the preservation and development of the seal population, the development of seal safe gear is seen as an important and (for the seal) harmless way of enabling fishermen and seals to carry out their resource use alongside each other.

Swedish Environmental Protection Agency:

In the management plan for grey seal it is pointed out that the development of seal safe gear should indeed be a priority. As mentioned above it is likely that this mitigation strategy will be even more important in the future. The funding of pure compensation for damage on gear and catch might not be as generous in the future and more economically sustainable and long-term solutions are being sought.

Swedish Board of Fishery:

The Swedish Board of Fishery is very much involved in the development of seal safe gear. The project “Sälar & Fiske” (Seals & Fishery) is funded by the Board of Fishery; it aims at developing seal safe gear such as traps, acoustic seal scare etc. as well as researching seal behaviour changes and its consequences. The project has a budget of

about 2.5 million SEK for 2004. The project is seen to have great importance for future efforts to reduce seal damage mechanically or by making use of behavioural knowledge about grey seals.

Scientists involved in research on seal, seal safe gear etc.:

The scientists involved in some sort of seal research in Sweden are relatively limited. Many of the researchers have at some point been connected to the project “Sälar & Fiske”. The project lends an opportunity to study grey seal behaviour as well as the construction and impact of different types of gear. From a scientist’s perspective this is of great value, and the importance of the project as a means of financing research should not be underestimated.

The long-term sustainability of the development of seal safe gear is of great importance here, especially since the encounters between grey seal and human activity will not be reducing as long as there is a healthy grey seal population.

Environmental NGO’s at national levels:

- WWF
- SNF (Swedish Society for Nature Conservation)

The two main environmental NGOs in Sweden, WWF and SNF are not directly involved in or affected by the development of seal safe gear. As other stakeholders they consider all mitigation measures that reduce the conflict to be of great importance. Until now there are no reports of specific perceptions of costs/benefits of the development of seal safe gear from these stakeholders.

7.5.1.3 Protective seal hunting/game management

The grey seal has been a protected species at the West coast of Sweden since 1967. The general hunting season for grey seal was abolished 1975 at the East coast, but the possibility for local fishermen to hunting seal to protect gear was not abolished until 1988. The grey seal has been fully protected since then with the following derogations.

In 1997 the Swedish Environmental Protection agency granted permission to the project “Seals and Fishery” (“Sälar&Fiske”¹⁶) to carry out hunting of 30 seals for scientific purposes. The Environmental Protection Agency issued 3 permits to hunt a total of 5 seals that were causing great damage in fish farms during the year 2000. These permits were issued in accordance with the Hunting and Game Management Act (“Jaktförordningen” 1987:905, §27) as well as with the decision from HELCOM (March 1996) to grant permission for restricted seal hunting.

The possibility to carry out protective hunting is restricted by the management plan and during 2001 and 2002 the Environmental Protection Agency decided that protective game management should not be carried out south of latitude 59 degrees north and sets a limit of 180 seals in total. For the counties Södermanland and Östergötland in the model region

¹⁶ The project was instigated by the Environmental Protection Board and was carried out in co-operation with the Swedish Board of Fisheries, WWF Sweden, the National Swedish Fishery Organisation, Swedish Society for Nature Conservation and researchers from the Swedish Museum of Natural History.

this meant that protective game management of seal could not be carried out. However the county administration for fishery and hunting could issue special personal permits for fishermen that had been troubled especially by seal damage. Several permits were issued in each county during this time, but not many seals were in fact killed.

In 2003 the regulation for protective game management of seal was changed that protective hunting could now be carried out in the model region as well, but not south of this. Södermanland was allotted a quota of 10 seals, and Östergötland 15. Until now only 4 seals have been shot in Södermanland and 1 in Östergötland. The low number of seals shot can be explained by the special difficulties that exist when hunting for seal. The regulations stipulate that seal must be hunted from land (with a class 1 weapon) adjacent to the fishing gear. The seal must then be landed. Some of the difficulties are: the time consuming aspect in waiting for seals by the trap; the difficulties in getting ashore from the boat to get a safe shot when the seal is close to the gear; danger of ricochet of bullets on water close to summer cottages etc.; difficulties with landing the seal; and finally relearning old knowledge about seal hunting.

Seal quota allotted to counties at the Swedish East coast during hunting season 2003 and actual number of seals shot in these counties during 2003

County	Number of seals allotted	Number of seals shot until 3/12 2003
Norrbottnens län	36	34
Västerbottnens län	18	8
Västernorrlands län	14	2
Gävleborgs län	34	25
Uppsala län	20	2
Stockholms län	23	0
Södermanlands län	10	4
Östergötlands län	15	1
Total	170	76

Source: Naturvårdsverket, Skydds jakt efter gråsäl år 2003, 2003-04-03
Coastguard information, 3/12 2003, own compilation

***Fishermen:
(Individual fishermen and Coastal Fishermen's Association)***

The protective hunting of grey seal is of great importance to the fishermen. This may seem strange when taken into account that the quota is rarely reached. Still the right to shoot seals that visit the gear is psychologically important. The fishermen compare this right to the right of defending themselves if someone is stealing or destroying their property and livelihood.

Having said this, there are several obstacles to obtaining an effective protective seal hunt according to the fishermen. The most common complaint is on the rule of having to shoot seal from land. The fishermen perceive the rule to be impractical and restraining, since the opportunity often is given when sitting in the boat. From the moment that the fisherman spots a seal and the time when he has reached land to make a safe shot the seal has often disappeared.

The second complaint is that the weapon required (a class 1 weapon) is not the best and safest weapon. The bullet from a class 1 weapon could ricochet on the water and thereby moving on for a kilometre (risking the lives of people on land and on surrounding boats). The third complaint is that the hunting of seal is very time consuming and difficult. In former times the seal hunting was often carried out on the ice or on the cliffs where seals rest, but the last few years there has been no ice in the model region, and the hunting on cliffs is further restricted by the rule that the seal should be shot adjacent to the fishing gear. Finally, it is stressed by the management plan that the seal should be landed. Since seals sink quite quickly this is seen as yet another difficulty.

Though the protective seal hunting determined by quota is appreciated by the fishermen as such, there are some thoughts as to issuing a more general seal hunt (like the one already existing for moose, deer etc.). This, the fishermen say, would make the seals return to the outer archipelago “where they belong”.

Regional administration:

- Fishery and game unit

Fishery and game is often managed at the same unit at the regional administration. Since the fishery unit is very familiar with the problems the fishermen face they have often tried to negotiate a high number of seals in the quota for the county when talking to the Environmental Protection Board. This was even the case for the counties in the model region, where the protective hunting started from this year. The fishery units were not necessarily aware of the problems related to seal hunting and expected a higher share of the quota to be used. Still as the fishery units are aware of the psychological importance of the seal hunting, the high quota can even be seen as a means of demonstrating the understanding of the problem in the administrative structure to the fishermen.

The fishery unit do not think of the protective game management as a means of reducing the seal population, neither do they necessarily believe that it will have any impact on seal behaviour; it is rather seen as a means for the individual fisherman to act when frustrated by seal damage. Several of the fishermen’s complaints on the hunting rules for seal are well understood by representatives for the fishery units, and as a consequence of this they express the wish to enable the fishermen to carry out more effective hunting. The fishery units have expressed interest in arranging courses in seal hunting to make it more effective. This could be done in cooperation with the Swedish Hunting Association, but it is still an idea only.

- Nature Protection unit

The nature protection units have generally accepted the restricted protective hunting of seal. This is often done with reference to the Environmental Protection Agency and the

management plan issued by the agency. The protection units do not perceive the protective seal hunting as a threat to the seal population; neither do they think that it will result in behavioural changes for the seal.

The thoughts expressed by some fishermen and parts of the fishery units to issue a more general hunting on seal is frowned upon. This follows the perception of the Environmental Protection Agency.

Swedish Environmental Protection Agency:

The Environmental Protection Agency is responsible for the management plan were the possibility to seal hunting was presented. This was done to relieve the conflict tension on the fishery side without reducing the grey seal population.

The rules concerning the hunting methods for seal have been thoroughly discussed and tested at the agency and the complaints from the fishermen are understood but not accepted. It is not considered to be safe to shoot a seal from a boat since it is in motion and the risk of damaging the animal is high. The request to be allowed to use shotgun instead of class 1 weapons is not granted since the risk of damaging the animal is very high. There are efforts however to find types of ammunition that does not move as far as class 1 weapons. Still there are no results that grant this in the nearby future. The complaint as to restrictions concerning hunting on cliffs etc. is not accepted. The hunting should be carried out in a protective manner only, thereby restricted to the vicinity of the gear.

Swedish Board of Fishery:

The Swedish Board of Fishery was advisory partner to the Environmental Protection Agency when the management plan was developed. The Board of Fishery sees the protective hunting as a strategy for the individual fisherman to protect his gear and catch – still the hunting is not meant to affect the population size at this point.

Scientists involved in research on seal, seal safe gear etc.:

The perceptions of the seal hunting differ among scientists involved in seal related research. Some see the protective hunting of seal as a mitigation measure with great psychological impact that relieves the conflict by lending the individual fisherman the opportunity to defend his property. However the hunting should be limited to the marginal number of seals described in the action plan since the population is still not able to endure a more general hunting pressure. Again others think that the seal should be treated as a resource and not as a pest that must be shot protectively. Following this they feel that the hunting of seal should slowly be directed towards a more general hunt (like the one that exists for deer, moose etc.).

Environmental NGO's at national levels:

- ***WWF***

WWF is critical towards the protective seal hunting proposed in the national management plan for grey seal. In a press statement on the management plan 11th of June 2001 WWF opposes the protective hunting of more than 180 animals. WWF argues that the Swedish commitment to HELCOM is violated by the protective hunting of grey seal. WWF fears that the hunting of grey seal will undermine the Swedish position internationally, and that

the international approach to solving common issues is furthermore devaluated. WWF believes that Sweden should await the work from HELCOM before deciding on a protective seal hunt as the one proposed in the national management plan.

- **SNF** (Swedish Society for Nature Conservation)

The Swedish Society for Nature Conservation (SNF) is critical towards the protective seal hunting proposed in the national management plan. In comments directed towards the Environmental Protection Agency (dated 11th of May 2001) it is stated that SNF opposes the protective hunting of 180 seals. According to HELCOM recommendation 9/1 1988 no hunting of grey seal can be accepted. In 1996 HELCOM added that hunting for scientific reasons could be accepted in special cases, and that single permits on a very limited number of individuals could be issued to prevent damages. SNF argues that the total of 180 grey seals mentioned in the management plan can not be considered "a limited number of individuals". SNF further argues that specific permits have been issued in the past and that this will suffice.

SNF stresses that the estimates of the grey seal populations are not accurate and that this another reason for being restrictive towards protective hunting of seal. Finally, it is pointed out that the risk of damaging the animal without killing it makes the landing of the seal even more vital. SNF wants this to be stressed further in the management plan.

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Mitigation measure	Objective	Activity	Responsible administration	Legal foundation	Cost (thousand/SEK)
Protection of grey seal	Protection of wildlife and endangered species		<p>Planning and monitoring: NVV*</p> <p>Management: (<i>Guidelines and regulations:</i>)</p> <p>NVV</p> <p>(<i>Implementation and management:</i>)</p> <p>Regional administrations Municipalities</p>	<p>International programmes and conventions:</p> <ul style="list-style-type: none"> - Agenda 21 - Convention on biodiversity - Ramsar Convention - Bonn Convention - Helsinki Convention <p>National programmes, laws, ordinances and regulations:</p> <ul style="list-style-type: none"> - National environm. quality objects - National strategy for sustainable developm. - Environmental code (1998:808) - Swedish hunting Law (1987:259) - Ordinance for Hunting (1987:905) - Ordinance: Species Protection (1998:179) - Ordinance: Damage through Wild Animals (2001:724) 	
Grey seal management plan	Monitor and manage grey seal population	<p>Monitor population:</p> <p>Inventory Photo-id Pup-count Population size Growth rate Pathology</p> <p>Management:</p> <p>Fishery-technique & statistics Seal protection areas HELCOM Hunting Information</p> <p>Total</p>	<p><i>Planning:</i> NBF & NVV</p> <p><i>Management:</i> NRM</p> <p>NBF & NVV</p> <p>NVV & regional adm.</p> <p>NBF & NVV NBF & NVV NBF & NVV</p>	<p>HELCOM recommendations</p> <p>Habitat Directive 92/43/EEG</p> <p>”Artskyddsförordning” SFS 1998:1305</p>	<p>Period: 2001-2005</p> <p>1 200 2 200 800 500 800 3 000 17 500 200 500 250 1 050 28 000</p>
Economic compensation for seal damage	Reduce conflict fishery/seal	Compensation for damaged gear and catch, development of	<p>Planning: NVV</p> <p>Management:</p>	<p>”Viltskadeförordning” SFS 2001:724, § 11, § 12</p>	26

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Appendix

From Swedish WP 4-report:

Table 1: Synopsis – Seal management and seal hunting

* NBF: Fiskeriverket (National Board of Fisheries)

NVV: Naturvårdsverket (Swedish Environmental Protection Agency)

NRM: Naturhistoriska Riksmuseet (Swedish Museum of Natural History)

Sources: own compilation

Chapter Eight: Concluding Remarks

Several patterns have emerged from the SIA reports that point to similarities and differences among the conflict cases. There are certainly species-related differences even on the social side of the equation. Cormorants are experienced as more problematic than both seals and otters, even in Germany and Portugal where otter are the original focus of FRAP. There are different reasons for these perceptions, though. Cormorants simply do a lot more damage than otters do. Seals, on the other hand, are not so much perceived of as doing less damage to the fishery than the cormorants, rather many or most stakeholders, including the fishers, seem to think of them as more of an environmental given than stakeholders perceive the cormorants.

A second pattern is the importance in the conflict of declining v expanding economic activities. Where fishing activities are expanding, conflicts are noticeably sharper. These are the Danish recreational fishery, and the Portuguese and Italian aquaculture fisheries. Where the fisheries are seen as stagnant or even on the decline, as in Finland, Sweden, Germany and the Danish commercial fishery, existing institutions seem to be able to contain and manage the conflict better.

The original design of FRAP recognized that scale is a critical variable for understanding environmental conflicts. Work Packages were organized to address the same issues at the local, regional and national levels. What we have discovered with our work on the ground, however, has been cross scale interactions that qualify the usefulness of focusing our gaze on a single level at a time. For one thing, from the point of view of both local and regional governments, all our conflicts are 'small scale,' meaning that they involve so few people that the interests of these governments are limited to a small number of specialized agencies. These agencies, in turn, mainly operate on regional levels. As a result, the conflicts tend to be addressed regionally with the main actors being local fishers interacting with regional authorities, on the one hand, and regionally organized conservationists, fishers and authorities interacting regionally on the other hand. The work package research so far suggests that problems with cormorants, in particular, do not lend themselves easily to small-scale solutions.

The fisheries have a suite of technical, conflict mitigation measures available. These measures are of varying technical effectiveness. There is also disagreement about the measures. The measures as the fishers are, as would be expected, much more sensitive to the problems and costs associated with the measures than are other stakeholders, particularly conservationists. In fact, the most common pattern that the conflicts assume among our FRAP cases is disagreement over, sometimes quite detailed, aspects of mitigation measures. The various forms of hunting and other lethal mitigation measures are the most controversial.

Another pattern of interest is the importance of the existing conflict management institutions in shaping the forms that the conflicts take. Once management institutions

begin to be formed they become the focus of the disagreements and begin to more strictly define background assumptions about what is and what is not possible. Two factors suggest themselves as being important here. The first is the small scale of the conflict. The fisheries are currently not large enough to be able to mobilize as a strong political interest group at the local and regional government levels. As a result the main concern of the local and regional governments is to make sure that there are functioning conflict management institutions in place, while the shape of those institutions is not so much in play.

The second factor, closely related to the first, is that the institutions that are working well are a) inclusive of and reflect the concerns of the important stakeholders and b) characterized by the authorities being familiar with the details of the fishery and by open communications between the stakeholders. This open communication has shown itself to be particularly important between the regional authorities and the local fishers. This is a fairly clear contrast that helps illuminate why the conflict management institutions, in spite of some real disagreements, are working fairly well in Sweden and Germany and working less well in the Sado Estuary reserve in Portugal, where fishers have difficulty getting responses from the authorities. Even where the conflict management institutions are fairly inclusive, however, there can be problems. Anglers in both Germany and Denmark, for example, are more difficult to include in conflict management than the commercial fishers because they are a more diffuse population.

Some of the different conflict patterns that are emerging suggest that we should be careful that we do not limit the possibilities we see by focussing on conflict. It is not impossible that there are ways that the fishing industry and vertebrate conservation efforts may cooperate to the benefit of both the economy and the environment. In Finland, the Kvarken Council is already promoting stakeholder involvement in the conflict and stakeholders agree on most issues, with the minor disagreements that do exist being about degree rather than kind. One thing that is interesting from FRAP's perspective here is that the interviews have discovered potentials for stakeholders (particularly the tourist industry and the fishers) working together for mutual benefit in ways that involve both seals and fish. We may need to make sure that our imagination about what 'conflict' means does not prevent us from seeing ways for stakeholder cooperation to move beyond just resolving disagreements to embarking on new initiatives that could improve the use and management of both the vertebrates and the fisheries.

As some initial thoughts about general analysis, as we move toward the discourse analysis, the SIA reports suggest that it might be helpful to distinguish between disagreements (or agreements) about facts, values, and economic interests. On the side of 'facts' what seems to be critical is what things are seen to be the key drivers in both the social and ecological systems. We could specify a continuum of opinion from seeing a particular driver as being an inevitable given, through being a driver which it is possible to manipulate as a management tool, to a denial that the driver is even important. On the side of values we could specify a continuum between values that are peripheral to a particular stakeholder group to values that are central to that group's identity, and hence not open for negotiation. On the side of interests the main question becomes

'bargaining space,' i.e., whether or not there is potential for compromise or if the conflict is a zero-sum game in which one side must lose if the other is to win.

These distinctions should not be too strongly drawn. Values, facts and interests are not independent, but rather strongly influence one another. These things cannot be used directly as categories for the discourse analysis, discourses, on the contrary, consists of different ways of linking values, facts and interests. It is, in fact, often the case that someone will, for example, raise a claim that is based in values and another person will seek to rebut that claim with reference to a fact. However, the distinction between values, facts and interests is potentially useful in understanding the conflict and the roles that economic and natural science analyses can play in conflict management.

If we take this model as an initial way to understand what we are finding in FRAP, conflicts of fact do not seem to play a very strong role. Within each conflict, most stakeholders seem to agree more than disagree about what is true. One exception to this is disagreements over the broader ecological role and importance of aquaculture that has come up in Portugal and Germany. Another exception is disagreements over the relative importance of cormorants v. herons as sources of damage in Italy. Conflicts of interest seem to be more or less resolvable by the compensation schemes, and to a lesser extent, by technical mitigation measures. Conflicts of values, however, seem to be central to the more difficult disagreements to resolve. One good example of this is in Sweden where the importance of avoiding the wounding seals seems to leave the stakeholders with no good middle ground.

The purpose of the SIA is to provide an initial description of what is going on in our conflict situations in preparation for the full discourse analysis. This chapter offers some initial thoughts about what kinds of things seem to be important. As we move into the discourse analysis we will need to intensify our discussions of where we see common patterns as well as exceptional situations in our various conflicts.