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The fish that did not get away –

Tales from Herring fishers about the decline of the Wester Ross herring fishery

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A social and political analysis of the historical changes in the Wester Ross herring fishery over the last 50 years.

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Abstract

The Wester Ross Fisheries Trust (WRFT) together with the Scottish Association for Marine Science (SAMS) are interested in evaluating the history of the local herring fishery and the possibility of rejuvenating the local fishery in the Wester Ross area in Scotland. Within the time limits of the project, my research focussed on providing background information for the Wester Ross Herring Rediscovery project. Fourteen interviews with local fishers were conducted by Sue Pomeroy in 2012. These were transcribed and, together with field work, a literature and archival research an answer on the research question: *What factors lay behind the historical changes in the herring fishery in Wester Ross, Scotland over the last 50 years ?*was formed. The research question was answered for two different aspects: ***Management*** and ***Social***. A third aspect, ***Ecological,*** was created to investigate the habits of the Herring (*Clupea harengus*) and spawning grounds (maerl), however this aspect was a relatively minor part of the research due to resource constraints.

A timeline was used to compare how events for each aspect were related to each other. The study showed that after WWII, local communities depended on herring for their living. The herring fishery was an important food and job source for local people up until the late 1960s. However, during the late 1960s bigger boats were introduced, then in 1972 after the United Kingdom joined the Common Market, international fleets came into coastal water and local herring stocks collapsed. The herring ban of 1977 was established to let the herring stocks recover. Unfortunately the herring never returned to the same stock levels in the West of Scotland. My research shows that, with a high certainty, overfishing by the bigger boats and international fleets led to the disappearance of the local herring fishery. However, this does not explain why the herring have possibly not recovered to former levels. Had the local herring stocks in coastal waters recovered during or after the ban, then the local fishery could have been restored. With the created timeline drivers can be indentified and used for other inshore fisheries as well. This research focused on political and social factors, but also shows that environmental changes and damage to seabed habitats in and around the lochs are potential reasons for the failure of stock recovery. More research is needed before a complete answer can be given to the research question of this study.

Acknowledgment

This paper could not have been written without the help of my Supervisors. I would like to thank the Wester Ross Fisheries Trust for giving me a place during my staying, especially Sue Pomeroy and Peter Cunningham. Also, I would like to thank both my supervisors Dr. Alison Gilbert, Vu University, and Dr. Clive Fox, Scottish Association for Marine Science for their support, trust and help with writing my thesis.

Abbreviations

CFP	Common Fisheries Policy
EU	European Union
EEC	European Economic Community
EEZ	Exclusive Economic Zones
MPA	Marine Protected Area
MSY	Maximum Sustainable Yield
NGO	Non Governmental organisation
SG	Scottish Government
SNH	Scottish Natural heritage
SSB	Spawning Stock Biomass
TAC	Total allowable catch
SAMS	Scottish Association for Marine Science
SEERAD	The Scottish Executive Environmental and Rural Affairs Department
UK	United Kingdom
WRFT	Wester Ross Fishery Trust
WWII	World War II

Abbreviations of the parties mentioned in chapter 3 can be found in Annex A.1

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Chapter 1: Research Project

1.1 Introduction

Scotland has a long history of commercial fishing. One of the oldest fisheries is for the herring (*Clupea harengus*). In the early times the herring fisheries followed the traditional Scottish pattern of small- family businesses or subsistence fishing (Thomson, 2001). Local communities along the coasts had easy access to the sea but relative inaccessibility to the land. During the 19th century herring fisheries became more commercialized on national and international levels. The fish began to be exported to inland areas (Thurstan & Roberts, 2010) and to East-Europe. Almost 75% of these landings were transported in one form or another, including 2.5 million barrels of salted herring. (Wood & Hopper, 1985). The fish export provided cash incomes for local communities and a lot of families began to depend fully on the fishery. Their dependence on fishing was forced by lack of capital, inadequate lands to grow crops and raise animals, and subjected to their cultural and religious lifestyle (Thomson, 2001). However after 1913 the herring fishery declined because of political and economical reasons in East- Europe (start of WWI) reasons and the development of herring fisheries by the import countries. (Wood & Hopper, 1985).

It was not until the end of World War II that the herring fishery re-established. The UK government supported local communities by giving out grants for fishing boats to boost employment. The catching methods changed from small boats with hand lines to bigger boats with drift and ring nets, which were able to go further into sea. By the beginning of the 1960s many local communities on the Scottish west coast depended on herring for their living again and daily herring markets became the norm. By the 1970s, fishing vessel power e.g. trawlers and purse seiners, fishing technology and incursions by non-local fleets led to greatly increased fish catches. Probably as early as the 1970s, many fish stocks in the inshore waters had been depleted and fishing effort began to switch to shellfish such as the prawn (*Nephrops norvegicus)*. In 1976 at national level, new management regimes were introduced in an attempt to restrain excessive fishing effort (Thurstan & Roberts, 2010). To recover the herring stocks a ban was imposed in 1977, and lasted until 1983 when the EU Common Fisheries Policy (CFP) was established. The CFP introduced a licenses and a landings quota system (European Union, 2013). Licenses were tradable and many small boats sold their fishing rights, resulting in the loss of access to local fish resources for the local communities (Thomson, 2001).

This loss of fish resources also occurred in the Wester Ross area of Scotland. Consolidation of licenses to fewer, larger fishing operations led to unintended, but damaging, social impacts. Around the beginning of the 1980s, local herring markets stopped and the number of smaller herring fishing vessels in the fleet declined strongly. Nowadays there is very limited small-scale local herring fishing.

As one of the older local fisherman, Neil Campbell, has stated – "*inshore fishing is dying out as there are no locals interested in it these days, and the young people do not want to do fishing*".

The Wester Ross Fishery Trust (WRFT) together with the Scottish Association for Marine Science (SAMS), established a project to analyse the history of the local herring fishery. The present status of the inshore stocks along with their associated spawning habitats and the identification of maerl beds as spawning grounds are part of the overall research project. With as goal to evaluate the possibility of rejuvenating the local fishery, perhaps as a mixed education/commercial venture. School projects and wild-life tourism boats could play a part in bringing the herring back to the roots of the local community. Due to the limit of time, this research project only contributed to the early stages of the social and management side of the overall project. It examined the changes over the last 50 years in order to distinguish the main causes and impacts of the disappearance of the herring in the local community. The bulk of the work was based on the analysis of interviews conducted with local fishers, many of whom fished for herring in the 1960s, 1970s and 1980s, and other members of the community associated with the inshore herring fisheries. Literature and archival research will play a key role in the policies and management changes affecting the herring fisheries over the last 50 years.

1.2 Research question

The purpose of this study was to look at the social and management history of the herring fishery in the Wester Ross area of Scotland over the last 50 years. The social aspects were addressed through interviews and discussions with remaining members of local fisher families. The main research question was:

- What factors lay behind the historical changes in the herring fishery in Wester Ross, Scotland over the last 50 years?

This study involved literature reviews and the analysis of interviews with relevant stakeholders. The study was structured by the following sub-questions:

Social aspects

- What was the importance of the herring fishery to the local community – *according to the fishers*- from 1945 until 1980?
- What happened to the herring fishery – *according to the fishers*- after the 1980s?

Management aspects

- What measures were taken during the last decades?
    - At EU level
    - At national level
    - And at local level

  What kind of influence did these measures have on the local fishing communities in Wester Ross?

1.3 Background information

Description of case study area: Wester Ross, Scotland.

Figure 1 Wester Ross area (Gairloch Heritage Museum, 2013)

The Wester Ross Area

Wester Ross (Figure 1) is located in the North West Highlands of Scotland (57°24′–58°00′N; 05°10′–05°54′W) (Fabela, Ballantyneb, & Xuc, 2012). The area extends from Inverpolly and Achiltibuie in the north to Applecross and Loch Carron in the south. It has relatively mild winters and cool summers. The low-pressure systems originating from the Atlantic and the hilly landscape results in the West Highlands be cloudier and wetter than other parts of Scotland. (Wester Ross biodiversity group, 2004) The coastal areas benefit from the influence of the North Atlantic Current (often miss-named as the Gulf Stream) which keeps temperatures higher than they should be, given the latitude. The coastal fringe also tends to have lower precipitation and a greater amount of dry and sunny weather than is found a few miles inland (Carter, 2013). The region had a resident population of around 5.986 people in 2001 and 6.154 in 2009, an increase of 2.8% during this period. Population numbers fluctuate strongly during the year due to the importance of tourism during the summer months as an economic activity (Fabela, Ballantyneb, & Xuc, 2012).

Wester Ross has a wide variety of marine and coastal habitats. Settlements tend to be focused along the coastlines, as people naturally make a living combining cultivation on the flatter land-parts with fishing and harvesting from the sea (Wester Ross biodiversity group, 2004). Over the years many crofting and fishing enterprises have grown and disappeared along the coastlines.

Fisheries

Fish has always been important for the local communities along the west coast of Scotland. Until the end of the 18th century, fish was vital as a source of food and employment (Thomson, 2001). In the mid-18th century commercial herring fishing began around Isle Martin and Tanera Mor, Wester Ross. In 1778 The British Fisheries Society found the herring fishing so successful that it led to the establishment of Ullapool. The local industry established: catching, processing, packing and exporting of herring (Atlantic coast project officer). The fishers developed individual communities largely separated from others due to the rugged terrain. Their farming neighbours and work was largely organized around the family unit (Gairloch Heritage Museum, 2013)

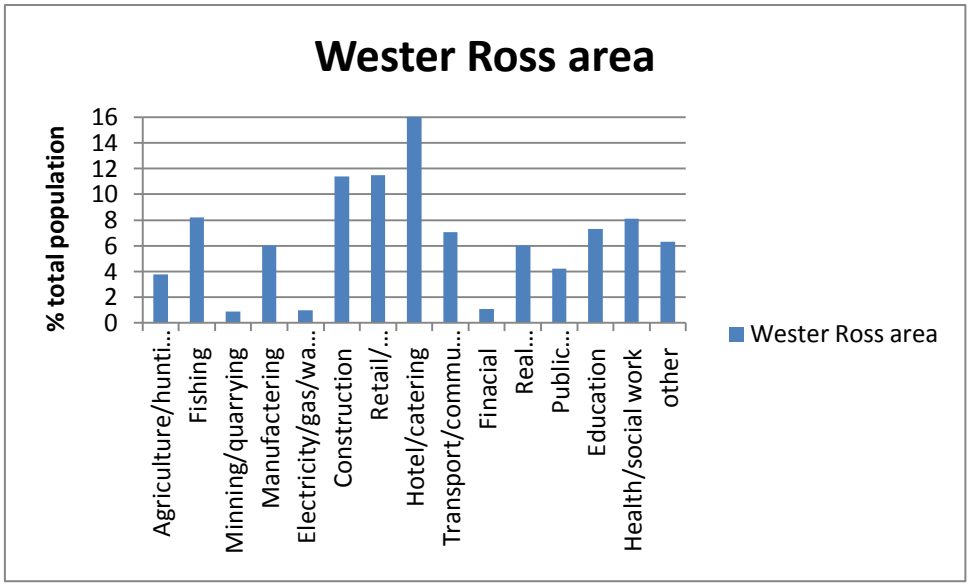

Figure 2 % of Total working population comparing the Wester Ross area and the Highlands (The Highland Council, 2001)

Nowadays economic activity in Wester Ross has switched to tourism with 16% of the working population employed in the tourist sector (Figure 2), including work in hotels, catering and distribution. Only 8% of the local people work in the fishing industry, mostly catching prawns. (The Highland Council, 2001; Highlands and islands enterprise, 2011)

1.4 Methodology

The research for this project was based on literature, policy documents, stakeholders' testimony and fieldtrips. The results of this research are divided into three different aspects: Ecological, Management and Social.

The stakeholder research focussed upon interviews conducted with fourteen fishers which were recorded by Sue Pomeroy in 2012, Wester Ross Fishery Trust as part of the larger project. The interviews contain background information and knowledge of local fishers. For these interviews a semi-structured interview approach was used. This approach is more structured than fully informal conversational styles but allows elasticity in its direction (Gall, Gall, & Borg, 2003) One of the obvious issues with this type of interview is the lack of consistency in the way the questions are asked, but it gives the respondents a degree of freedom and adaptability in answering questions and so can reveal interesting information which would not be uncovered using a more structured methodology.

The main purpose of the interviews was to add depth and insight into the social aspects of the local community regarding the herring fishery. The results of the interviews were used as a starting point for

the literature and archival studies. Dates given by the fishers and gathered from the field trips were checked, if possible, with scientific articles and records of the harbour of Ullapool

The literature was divided into primary and secondary sources. Articles and books related to herring and general fisheries were used. A range of literature was examined including current and past policies, management documents and websites, grey literature reports and peer reviewed scientific papers. The larger-scale changes in the industry have been well documented, particularly relating to the main collapses of the North Sea herring stock, and discussed in the peer review literature (e.g. Dickey-Collas *et al*. 2010) but the changes in the inshore areas have been less well documented. Due to lack of data for some aspects of the West Coast herring, particularly its ecology, I had to assume that the West Coast herring behaves similarly to the North sea herring

Analyzing the interviews:

To analyze the interviews the book: *Qualitative Data Analyses- by Miles & Huberman, 1994* was used as a guideline.

At the start of the research project a conceptual framework (Figure 3).

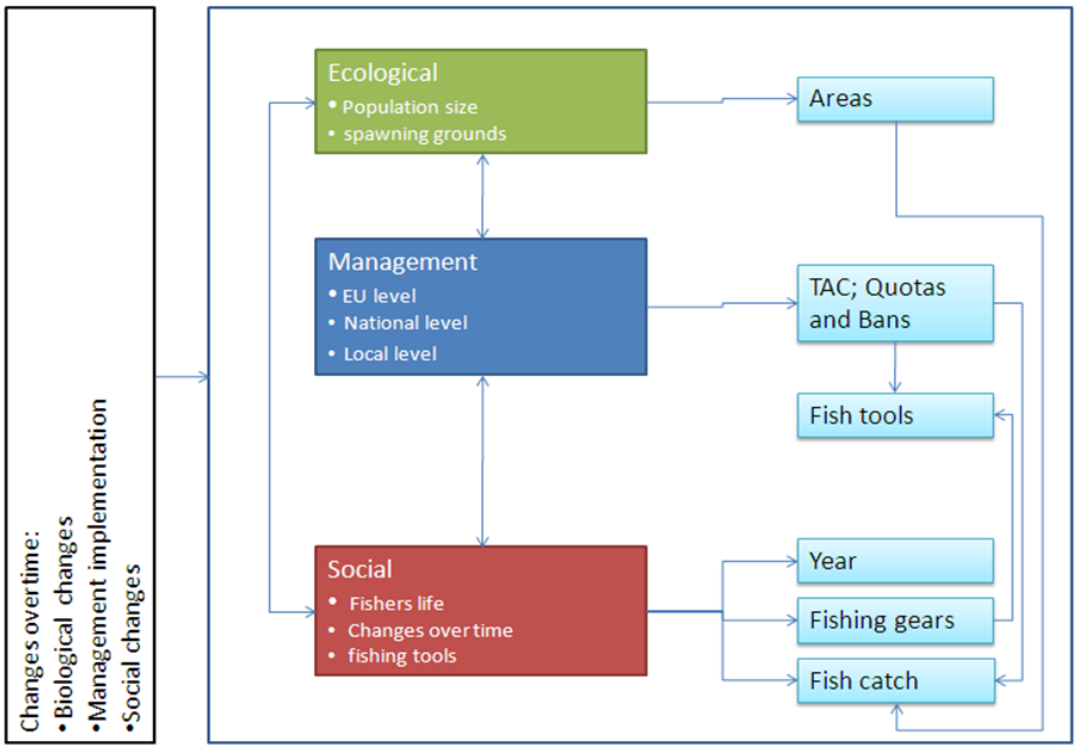

Figure 3 conceptual framework

The framework (Figure 3) was used to specify different focus points in the interviews (e.g. management measures, used fishing tools and information about herring stocks). Four tables (Annex

F), collating information of the three aspects, were created to get a clear view of the events associated with the disappearance of the local herring fisheries per aspect. The results were used as a starting point for the literature and archival studies. Interesting topics; as maerl beds associated with herring spawning grounds and ‘’Minch herring’’ mentioned in the interviews were examined in the literature and are shortly included in this report. An extra sub-chapter was added for the topic maerl beds as this is an interesting topic for future research.

A meeting with the former harbourmaster Donnie Macleod and harbourmaster Kevin Peach of Ullapool was arranged to check dates, given by the fishers, on relevance, as not all dates could be found back in the literature and archival studies. Archival studies have been done in the Gairloch Heritage museum and the website of the National Archives of Scotland. Unfortunately the planned Ullapool heritage museum trip was cancelled, due to renovations. However the museum have sent a couple of archival pictures to harbourmaster Kevin Peach, which could be used for this report.

At the end of the Research Project a timeline (Figure 16) was created to sum up the events. In this timeline, drivers of the herring collapse are shown which can be useful for different study areas.

1.5 Structure of the report

The report was set up in the following way. Chapter 2 provides a short overview of the ecological aspects. This part contains information about the characteristics of the herring (*Clupea harengus)*, its habits and its spawning grounds and includes a short paragraph about the importance of mearl beds. Chapter 3 discusses the policies and measurements taken at European, national and local levels over the last decades. Within a level, a short overview is firstly provided then followed by more detailed consideration of the most important measures affecting the herring fisheries. Chapter 3 presents the social aspect, and contains information gathered from the interviews, fieldtrips and books. The chapter is divided into two time periods: from 1945 until end 1970s and from 1980 and after. Within those two periods chronologically information is given about the fishers’ life. Text boxes with quotes from the fishers indicate the switch to a new decade. Every aspect summarised at the end of the chapter.

Chapter 5 presents an overall discussion and conclusion, complete with recommendations for future research. Also a discussion on some of the aspects of the experiment, such as unexpected difficulties and a reflection on the main research question will be given.

Chapter 2: Ecological Aspects

Overexploitation, habitat destruction and environmental changes threaten marine biodiversity all over the world (Rands, et al., 2010). The Atlantic herring (*Clupea harengus*) is dealing with these changes as well. Overexploitation and spawning habitat degradation (Dickey-Collas, 2010; Haegele & Schweigert, 1985) caused a decline in herring populations. Due to new management implementations herring stocks has fully recovered and is fluctuating around its sustainable yield.

This chapter is a small part of the report, as there is a lack of published information about the ecology of the herring in the West Coast of Scotland. However the North Sea herring is a well studied population so research articles about North Sea herring will be used with the assumption that West Coast herring share many of their characteristics. The chapter starts with a brief overview of the Atlantic Herring (*Clupea harengus*). Secondly the herring population in the West part of Scotland will be described. Subsequently, a detailed description of the possible spawning grounds including maerl beds will be given.

2.1 A short overview of the Clupea harengus

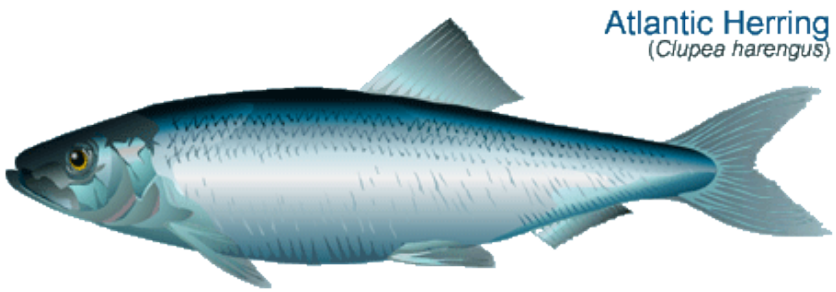

Figure 4 *Clupea harengus* (Gulf of Maine Research Institute, 2013)

Characteristics

The Atlantic herring (Figure 4), *Clupea harengus*, is a pelagic, shoaling fish which can be found on both sides of the Atlantic Ocean (Figure 5). They can reach a length of 45 centimeters and weigh more than 0.5 kg. They have silvery sides and belly and the greenish or grayish blue back which is a typical countershading in pelagic fish, probably evolved to reduce their visibility to potential predators. It provides a certain extent of camouflage in the open oceans and offshore banks, where they spend most of their lives (Gulf of Maine Research Institute, 2013).

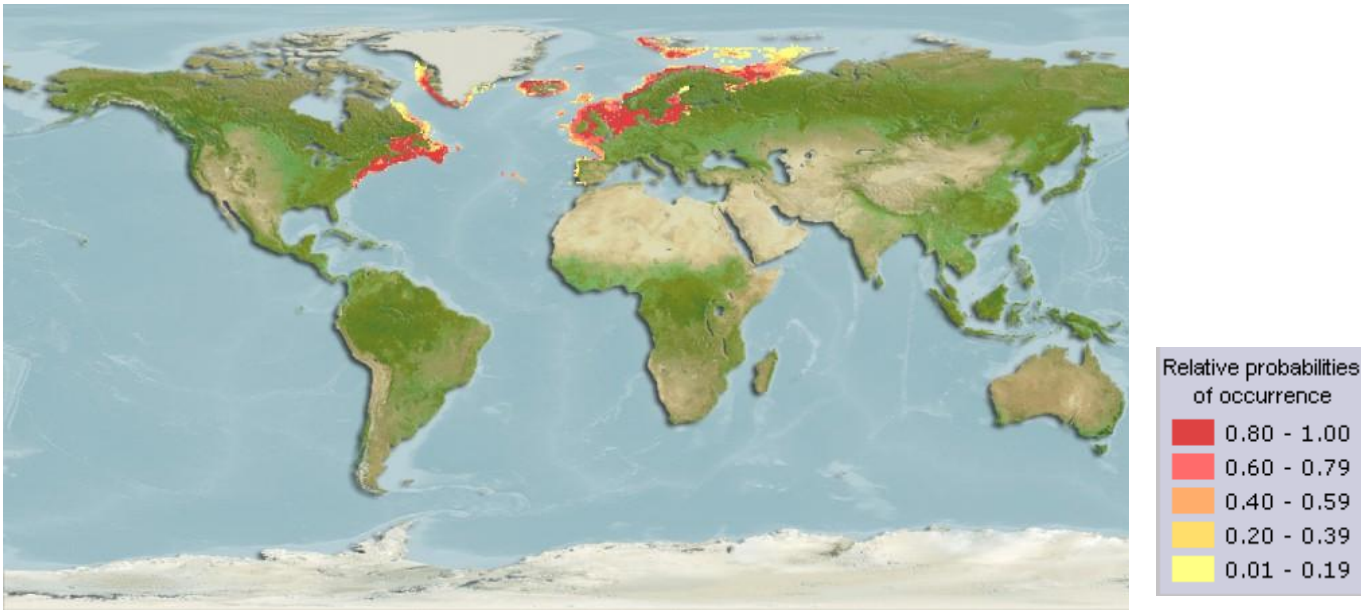

Figure 5 Aquatic herring distribution. Red areas are marking the herring areas. (Binohlan)

Behaviour

Juveniles and adults undergo inshore-ofshore and north-south migrations for feeding, spawning and overwintering (NOAA, 1999; Haegele & Schweigert, 1985). Herring typically form large shoals

consisting of similar sized fish. Juveniles tend to shoal together and not mix with larger adult herring born in earlier years. Herring also often exhibit vertical migrations, staying in deeper water during day and moving to the surface waters to feed at night. The diet consists primarily of small fish, phytoplankton, zooplankton and larvae (Checkley, 1982) They are known to be able to switch feeding modes from filter feeding to targeting individual prey and which mode is predominant depends on both prey availability and light levels (Batty, Blaxter, & Richard, 1990).

Herring stocks spawn in relation to the seasonal plankton blooms (Sinclair & Tremblay, 1984). Most stocks spawn once a year, but the timing can vary substantially. Some stocks are predominantly spring spawning while others spawn in the autumn. Although the west of Scotland herring is a single species, they also exhibit distinct spawning periods: Autumn spawning (from August to October) takes place around the Outer Hebrides and off Cape Wrath, in depths up to 100 m, while spring-spawning (February-April) takes place in the Clyde (Silva, 1973) and around Wester Ross.

Spawning grounds

Unlike many other fish species, Atlantic herring lay down layers of eggs on the seabed. After fertilisation, the eggs react with seawater activating a tough adhesive which ensures that the eggs are not swept away by currents. Herring tend to deposit eggs in high-energetic environments which ensure generally good oxygenation so that the eggs are not over-burdened with sediment (Haegele & Schweigert, 1985). Spawning normally occurs over coarse sand, gravel, small stones, rocks and sometimes maerl beds[1] and egg carpets can build up to several layers thick (Marine Scotland Science, 2013). In these cases the eggs in the lower levels may receive insufficient oxygen and be killed. The importance of oxygenation is also demonstrated by recorded cases where large algal blooms have smothered egg masses leading to mass mortality (Morrison, Napier, & Gamble, 1991). This is one reason why it is thought that when spawning stock biomass is very high, fewer than expected recruits may result (this is technically called the density-dependent effect). Other causes of egg mortality include predation by gadoid fish such as haddock (Richardson, Hare, Forgarty, & Link, 2011; Hoines & Bergstand, 1999) It takes the eggs approximately three weeks to hatch, depending on sea temperature (ICES, 2012).

2.2 The west coast herring of Scotland

On the West coast of Scotland, as elsewhere, herring play important roles in the marine food web. Declines in the stocks of herring are likely to have caused changes in the abundance of other predators (Overholtz & Link, 2007).

[1] 6 Out of the 14 interviews mentioned maerl beds as herring spawning grounds.

In the scientific literature there is much less information about herring on the West of Scotland compared with areas such as the North Sea. In my study I found that many fishers from the West coast of Scotland noticed differences between herring caught in different locations. Minch herring and herring from the Outer Hebrides were said to be different as the Minch herring didn't have to deal with the conditions in the open Atlantic Ocean. (Annex F; 6 out of 14 interviews). The so-called Minch herring is apparently smaller and tastier and does not migrate out of the Minch area(Figure 6) Herring from the Outer Hebrides are said to be larger. Some fishers assumed that the Minch herring was a sub-species while others thought it was smaller because it did not have to migrate into oceanic waters. However, King, Ferguson, & Moffet, 1987 concluded that the Minch herring is not a separate species and that the morphological differences are racial. Such complex sub-stock structuring is typical of herring and has recently been studied using modern genetic and otolith microchemistry approaches (Geffen, Nash, & Dickey-Collas, 2011)

Figure 6 Location of the Minch in the Wester Ross area. (Bradwell, Stoker, & Larter, 2007)

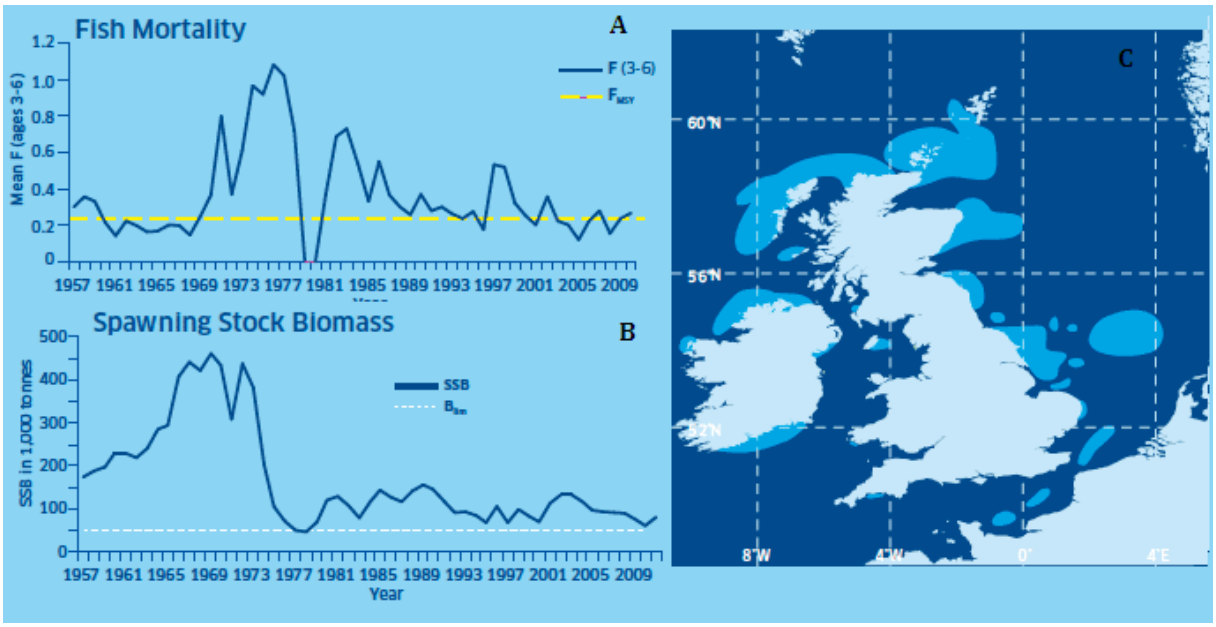

Figure 7 Population-dynamics for the west of Scotland herring, 1957-2012: (a) Fish Mortality and (b) Spawning- stock biomass. (c) Spawning grounds around UK 2012 (ICES, 2012)

In the early 1970s, the Spawning Stock Biomass (SSB) of herring on the West Coast declined substantially (Figure 7). However the ''natural'' stock level is unclear, as spawning stock biomass shows an increase in the late 1950s. Such fluctuations have also been observed in other areas such as the North Sea (Corten, 2013). Spawning stock biomass is presently estimated to be fluctuating around 81,000 tonnes. Fishing mortality is estimated to have declined from a high of over 1.0 in the 1970s to around the Maximum Sustainable Yield target. However, unlike in the North Sea (Dickey-Collas,

2010) the spawning stock biomass has not yet shown a strong recovery. The reasons for this may include loss of habitat, increased predation or environmental changes; e.g. water temperature, salinity and food availability may all have altered (Smith & Jamieson, 1986; Reid, Gordon, Maravelias, & Christos, 2000; Bailey, et al., 2011)

2.3 Maerl beds

Maerl beds have been relatively well studied in the last 40 years. Despite this rather little is known about the biodiversity associated with the beds (UK marine SACs, 2001). The term maerl is a collective name for several species calcified red seaweed including *Phymatolithon calcareum*, *Lithothamnion glaciale*, *Lithothamnion corallioides* and *Lithophyllum fasciculatum* which live unattached on coarse clean sediments (Lindegarth, 2006). Maerl beds are found from the lower shore to 30m water depth. They require light to photosynthesize so it cannot be found in turbid waters. Maerl beds are found as far north as Shetland and as far south as the Baltic. Mapping is incomplete and only a few locations have been discovered from grab and dredge sampling and surveys by divers. Scotland has abundant maerl beds and is recognised as an important location for this habitat in Europe (Figure 8). The coral- like red algae are mainly found in patches around Orkney, Shetland and throughout Scotland's west coast.

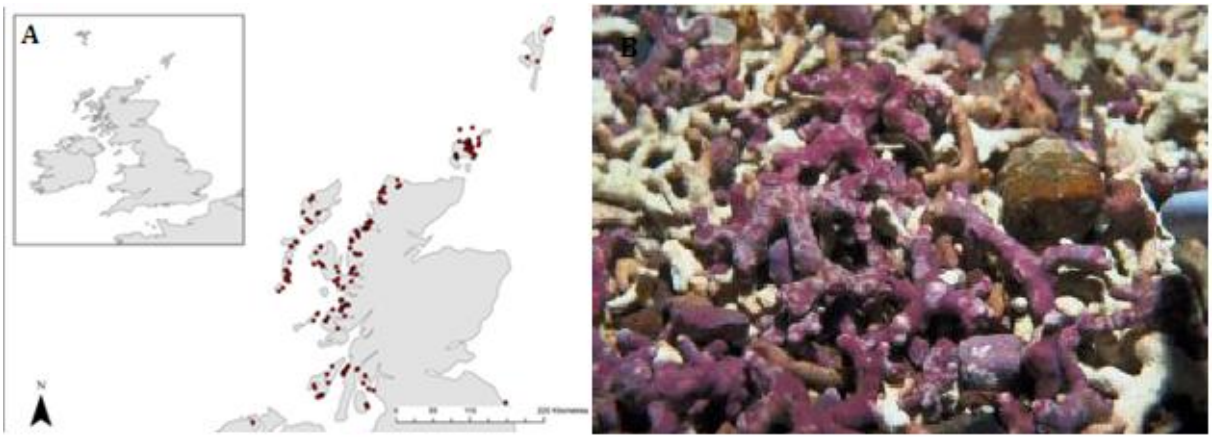

Figure 8 (A) Maerl beds in Scotland indicated with red dots. (B) Maerl beds (SNH, 2013)

Maerlbeds consists of both living which requires light to photosynthesize and a sub-bed of dead algae (Hall-Spencer, Kelly, & Maggs, 2010). The structurally complex habitats formed by the algae (living and dead) supports a rich biodiversity of other organisms. Many invertebrates are found in and on the maerl beds which also provide spawning and nursery habitats for species such as scallops (Barbera, et al., 2003).

Maerl beds are sensitive habitats which easily damaged by fish gears. Because of their very slow growth rate they can take many years to recover from damage (Barbera, et al., 2003).

Despite their ecological importance, maerl beds have declined over time. Maerl have traditionally been harvested on a small scale in Europe for use as soil conditioner or treatment for acid drinking water. In the UK, approximately 30,000 tonnes of maerl was harvested between 1975 and 1991 (UK marine SACs, 2001). Although harvesting in the UK is no longer a threat, maerl beds are still prone to damage from human activities as; scallop dredging (Hall-Spencer & Moore, 2000), demersal fishing gears, pollution from fish farms (Hughes & Nickell, 2009) and harbour and shipping channel dredging operations (Hall-Spencer & Moore, 2000). To counter the disappearance of maerl, they have been identified as a priority marine conservation feature as defined by the EU under the Habitats Directive and thus by Scottish Natural Heritage.

Maerl beds and herring

There is rather little in the scientific literature regarding the importance of maerl beds as herring spawning grounds. However, many of the interviews conducted in this study, as well as some other reports[2] do suggest that spawning did, or does, occur on maerl habitats.

2.4 Conclusion

Atlantic herring is a pelagic, shoaling fish which plays an important role in marine food webs. It has also historically been very important for commercial fisheries. However the spawning stock biomass of the main West Coast of Scotland stock is currently below its historical high and is fluctuating around 80,000 tons per year. Many factors may have contributed to the decline of the West of Scotland herring population including over-fishing and environmental changes and more research is required to identify why the stock has failed to rebuild. Herring lay benthic eggs on well oxygenated sea-beds such as course gravel, stones and maerl. Because maerl-beds in particular are vulnerable to damage by fishing gears, their conservation may also benefit rebuilding of inshore stocks of herring.

[2] E.g. (Morrison, Napier, & Gamble, 1991; Kamenos, Moore, & Hall-Spencer, 2004)

Chapter 3: Management aspects

Environmental concerns over ocean health have increased over the last decades. Over-exploitation of natural resources has become a common debate within the political agenda. Fisheries are a good example on this, 28% percent of the world fisheries are over exploited, depleted, or recovering from depletion while another 52% are fully exploited (FAO, 2012). Scientifically speaking it is clear that the only way to save these stocks from collapsing is to lower or ban fishing in certain areas. However, the loss of steady income and a vital food source would be disturbing to fishing communities (Chair, 2010). For stakeholders, the management of rights to exploit these resources is one of the most difficult aspects on which to reach agreement.

The management of fisheries occurs at multiple inter-acting levels, ranging from international to local. Legislation, management and policies are designed to allow sustainable fisheries to operate over multi-decadal timescales. However, it is widely recognised that many of these policies, such as the EU Common Fisheries Policy (CFP), have been fundamentally flawed and consequently have failed to deliver the objective of promoting sustainable fisheries and fishing communities (Lutchman, Grieve, DesClers, & De Santo, 2009). In this chapter EU level, national level and local level management and management actions affecting the west coast of Scotland will be discussed. This chapter is divided in three sub-chapters, starting with the outline of policies and measurements at the EU level. It will provide an overview of the managements since 1970 and will carry on with more detail about the CFP and herring legislations. The chapter continues with an outline of the herring policies taken on EU level. The second sub-chapter will be about measurements taken on national level and continuous with measurements on local level.

Annex E provides a simplified figure of the policy ranging from EU level to Local level.

3.1. EU marine policies.

3.1.1 A Short history of the establishment of the Common Fisheries Policy

The European Union is the second largest fishing power in the world. Within the EU, fleets from Denmark, Spain, France and the United Kingdom account for around 50% of the total fish catch. With volume catches of pelagic species especially important, including Atlantic herring, European sprat (*Sprattus sprattus*) and Atlantic mackerel (*Scomber scomber*) (European Commisson, 2012)

Over the last decades multiple policies and management measures have been developed with the aim of managing the shared fisheries. The first fisheries policy at EU level was established in the Treaty of Rome (1958). This policy was linked to agricultural policy, and only became a separate policy when the Member States adopted marine exclusive economic zones (EEZ) in 1970 (European Commisson, 2012).

The treaty of Rome led to the Establishment of the European Economic Community (EEC) in 1958. In 1970 a structural policy came in to force and in geographic terms, the EEC expanded as the EEZ had been established. Member states had exclusive right within 12 nautical miles offshore. The EEC had to deal with specific fisheries problems, such as common resources, stock conservation and structural actions for the fisheries fleet as well as international relations (European Union, 2013a). Fisheries remained a big issue on the political agenda as negotiations leading to the entrance of UK, Ireland and Denmark to the EEC took place in the years preceding 1972. With enlargement, the Community moved away from the fundamental principle of uncontrolled freedom of access. The 12 nautical mile EEZs were extended to 200 miles from the coast (Eurostat, 2011) in 1977. Member states agreed to leave the management of their offshore marine resources in the hands of the EEC and after years of negotiations, the Common fisheries Policy (CFP) was adopted by the council in 1983.

Figure 9. Spot print of equal access law (Wise, 1984)

3.1.2 The common fishery policy

The CFP is the EU's main policy instrument for managing commercial fishing. This instrument contains two types of conservation measures designed to protect fish stocks: Total Allowable Catches (TACs) and technical measures. TACS are limits on the total amount of fish which can be caught per area. This has led to a significant problem in that the figures recorded are usually landings at the ports, not fish caught. Catches often exceed landings due to discarding. This has become a major issue in the recent attempts to reform the CFP. Technical measures include gear regulations, seasons, catching areas and minimum (or maximum) allowable size for landing of different fish species. The CFP also

controls the capacity of the fleets (Daw & Grey, 2005). The policy is active in four different areas: conservation, structural, market and external area (Table 1).

Table 1 explanation of the policy areas

Policy area and explanation
Conservation area Stocks need to be able to restore themselves. The CFP attempts to regulate this by setting TACs – maximum quantities of fish that may be caught every year and national quotas per country- the aim is that sufficient young fish are able to survive to reproduce and to replenish the stock allowing for harvesting and natural mortality
Structural area CFP helps the fishing and aquaculture industries by developing their organisation and equipment responding to resource scarcity and market demand
Market area CFP matches supply and demand for the benefit of both producers and consumers.
External area Negotiates agreements with non-EU countries about deep-sea fishing.

The CFP has changed substantially over time. A number of reviews have been held (Table 2) to try and improve the policies, offering better protection for the fish stocks as well as for the marine environment. Recently moves towards an Ecosystem-based Approach to Fisheries Management have begun. Currently a major reform of the CFP is on-going.

Table 2 summary of the reviews of the CFP

Date	**Focus of the change**
1957 • The Treaty of Rome establishes the European Economic Community **1973** • UK, Denmark and Ireland join the EEC	
CFP 1983 • TACS and quotas. Every year, the European Commission suggests a TAC for each commercial species within the EU 200-mile limit. Once approved by the Council of Ministers, the TACs are divided between the member states according to the historical track records (Principle of Relative Stability). • A new community system for the conversation and management of fishery resources was created. Provision of stock assessment advice began to be provided by the International Commission for the Exploration of the Seas (ICES). Under the supervision of the European Commission an advisory scientific and technical committee (STECF) for fisheries was set up.	
CFP Review of 1992	

- A new concept of 'fishing effort' was introduced, with a view on restoring and maintaining the balance between available resources and fishing activities. This largely recognised that the catching capacity of the European fleets was far exceeding the natural capacity of the fish stocks to replenish themselves. The Multi-Annual Guidance Program (MAGP) was the first item that had to be changed. MAGP IV was established to reduce the total EC fishing capacity, especially those fishing over exploited stocks. A system of decommissioning of vessels was introduced
- Subsidies for fishers harmed by capacity reduction and restrictive quotas were created. Access to resources was regulated through a licensing system (European Union, 2013a)
- Change in TAC limits, as they were set too high. It was recognized that they were set higher than scientifically advice. TACs were set more in combination with the scientific results
- As part of the revision of the CFP, the EU created a fleet register at the Community level in 1994. The policy used subsidies to try and manipulate fleet capacity (Frost & Anderson, 2006).

Maastricht Treaty 1993

- European Economic Community (EEC) becomes the European Union (EU)

CFP Review 2002

- The major challenge of this reform was to tackle the problem of many collapsing stocks, the increasing awareness of the impact on marine ecosystems of fishing and the economic losses for the industry (European Union, 2013a). ICES advised the Commission of a need to reduce the overall catches by one-third to one-half depending on the type of fish to achieve recovery.
- The reform was adopted at the end of 2002 and came into force on 1th of January 2003.
- The revision of the Common Fisheries Policy of the European Union in 2003 was communicated in a 'Roadmap', including the opinion of the EU Commission on how to reform the fisheries policy (Frost & Anderson, 2006).
- A simpler system for limiting fishing capacity was introduced.
- More responsibility was given to the Member States to create a better balance between fishing capacity and available resource. A financial instrument for Fisheries Guidance was created for modernization of the fleets (Eurostat, 2011).
- Regional advisory councils were established to try and improve the level of involvement of stakeholders in fisheries policy. The RACs are however consultative and have no formal power in the decisions made by the Council of Ministers.

CFP Review 2011

- Sustainability was the main goal of the proposed policy and the reform should stop stock depletion and over-fishing. Sustainable fishing means fishing at a level that is not a threat for the long-term reproduction of the stocks. It should improve governance standards in the EU and worldwide (Europa direct, 2011). At present the reform is being debated between the Commission, Council and Parliament - a process termed "trilogue".
- Throughout the life of the CFP a major problem has been the management aspects as different member states seek maximum benefit for their own fleets and fishing communities. This has frequently led to decisions which run counter to stock conservation objectives e.g. the setting of TACs which exceeded the scientific advice on safe levels of exploitation.

3.1.3 CFP and herring fisheries

Since the establishment of the EEC in 1970, herring population start showing a decline up until the establishment of the herring ban in 1977. During this time member states could not agree upon herring catch reduction due to the economic consequences and lack of enforcement policies. Leading to the herring collapse in the North Sea. To reduce herring fisheries and to recover the stocks the EEC extended the EEZ from 12 to 200 nautical miles in 1977. As a response the UK government banned all herring fisheries within its EEZ. This ban together with scientific arguments convinced all other members by the end of June 1977 (Dickey-Collas, 2010) to close their herring fisheries as well. It was in 1983[3] when the European Union agreed on the Common Fisheries Policy and the ban on herring was released. The CFP was established to take responsibility for the management in all community waters, setting TACs, quotas and bans (EUMA , 2010)**Error! Reference source not found.** . Every year a new herring quota and TACs were set, which member states had to implement. The North Sea herring stock appears to have responded well to management measures and is currently assessed as being in good health with fishing mortality well below F_{msy} (Figure 10). In contrast, although fishing mortality for west of Scotland herring is around F_{msy}, the stock does not appear to have shown strong rebuilding (www.ices.dk).

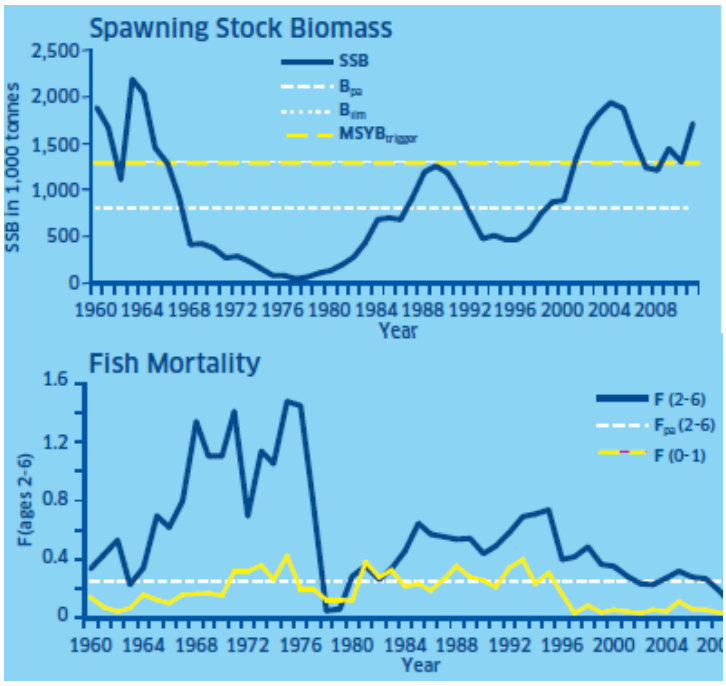

Figure 10 Recovery of the herring stocks in the North Sea. After 1983 you can see an increase in SSB and a decrease in Fishing Mortality. Redrawn of (Marine Scotland Science, 2012) supported by (Dickey-Collas, 2010)

In 2000, the EU began to switch from a top-down approach to a more bottom-up approach. In 2002 a Pelagic Regional Advisory Council was established. The council was created to involve fisheries

[3] 1979-1981 herring ban in the west of Scotland (Thomson, 2001)

representatives, NGOs and other stakeholders (Linke, Dreyer, & Sellke, 2011) to help with the policy decisions.

The EU established a multi- annual plan to exploit herring in the west of Scotland in 2008. At this time the stock appeared to be being fished at around estimated Fmsy (Figure 6). Inter-annual variation in the TACs for the herring stocks in the waters of the west of Scotland became limited as a result (more details visit: (The Council of the European Union, 2008)).

3.1.4 Conclusion

When the UK joined the EEC in 1973, the North Sea herring stocks had already declined to a low level. Shortly afterwards, the west of Scotland stock showed signs of decline as fishing mortality increased. With the herring ban of 1977 and the establishment of the CFP, Europe tried to overcome the total collapse of these two major Atlantic herring stocks. The CFP is an overarching policy for Member-states and became a major influence on the herring fisheries. In its early years, the CFP implemented a top-down approach. Herring TACs, and other policies, decided by the EEC/EU, needed to be implemented at national level. Following the review of 2002, more responsibility was given to the member states to create a better balance between fishing capacity and available resource.

3.2 National marine policies

For many centuries fishing has been a key element of the Scottish economy and culture. Nowadays Scotland's fishing industry is divided into three main sectors: a large-scale, offshore whitefish fleet located mainly in a few large harbours on the north east coast, a large-scale offshore industrial pelagic fleet, located mainly in Peterhead on the East coast and Lerwick in the Shetland Islands, and the small-scale inshore fleet located among many small harbours along the west coast and in the western isles (Symes & Ridgway, 2003).
These fleets land over 60% of the total fish caught in the UK. With the introduction of the common sea approach controlled by Brussels in 1970, international fleets entered the waters of Scotland and fish stocks started to decline more rapidly, which eventually resulted in a loss of almost 100,000 jobs and an annual loss of income of £1,500 million in Scotland. (Wilkie & Thomson, 2009).

Until very recently Scotland's fisheries have been controlled by a hierarchical, top down system of decision making. Many Scottish politicians have argued that the formation of the CFP between the member states of the European Economic Community (EEC) and the power of the UK parliament has disadvantaged Scottish fishing activities. The establishment of the Scottish Parliament in 1999 (when many powers were devolved from Westminster to Edinburgh) brought *de facto* control over its fishing activities within its own 200 mile limits and over its own fleets. Although negotiations at EU council level continued to be conducted on Scotland's behalf via Westminster. The Scottish Government has sought to improve the effectiveness of fisheries management by developing a stronger co-management approach with stakeholders (The Scottish Government, 2010b).

This chapter discusses the policies and management measurements introduced at the national (UK and Scottish) levels.

3.2.1 A short history about the national policies.

Before Devolution

With the UK joining the EEC, international fleets entered the Scottish waters. The fish stocks started to decline more rapidly, however nothing was done until 1977. It was then that the agreement on the common pool principle was revised and the member states got private access of 200 nautical miles around their coasts (Royal society of Edinburgh, 2004; Symes & Ridgway, 2003). Responding on this, the UK parliament implemented a North Sea herring ban in 1977, following a West coast herring ban in 1979. With the establishment of the CFP in 1983, the ban was released and TACs and quotas were

introduced, both to protect the fishing stocks and as a basis for allocation between nations (Wilkie & Thomson, 2009)

Although the Scottish fishing industry has been governed by international agreements and regulated largely through the European Community policy, the coastal waters within 12 nm of Scotland was the responsibility of the UK parliament itself (Symes & Ridgway, 2003). The Scottish Executive Environmental and Rural Affairs Department (SEERAD) and the UK Parliament were responsible for the integration process of the CFP and for ensuring that the fisheries were regulated in a sustainable manner (Symes & Ridgway, 2003). The UK parliament was responsible for the regulation of sea fishing around the UK. It had the ability to take non-discriminatory conservation measures, given that the EU had not already taken measurements in this area (The Scottish Government, 2013a). In 1984 they set up the Primary legislation- the Inshore Fishing Act (for more information go to: http://www.legislation.gov.uk/ukpga/1984/26/pdfs/ukpga_19840026_en.pdf)

SEERAD had the exclusive right over the regulation of Scottish inshore fisheries. It carried out a number of inspections each year to confirm that conditions, according to EU legislation, were met (SEERAD, 2004). In 1997 the Fishery Research Services (FRS) and The Scottish Fisheries Protection Agency (SFPA) were establish as an executive agencies of SEERAD (Fisheries Research Services, 2010a). FRS was responsible for providing advice based on scientific research while SFPA was responsible for deterring illegal fish activities.

Figure 11 cartoon of the devolution of Scotland redrawn of (Cartoonstock)

After devolution: a new government system.

Following devolution, the old-fashion system of top-down decision making was no longer appropriate (The Scottish Government, 2010b). Not only had devolution brought attention to environmental integration but also the review of the CFP in 2002 brought a chance to make changes in the management structure. These changes involved longer term planning, a more environmentally-focused approach and closer involvement of stakeholders (SNH, 2012).

After devolution, SEERAD established two groups with responsibility for the inshore fisheries. The Inshore fisheries branch – overseeing the inshore fishery Act of 1984, and the Scottish Inshore Fisheries Advisory Group (SIFAG) – containing a majority of fishing industries members (Symes & Ridgway, 2003).

In 2008, the Scottish Government established an independent panel to enquire into the future of fisheries management in Scotland. One of the first actions taken was the establishment of the Scottish Fisheries Council (SFC). This body was created to bring visions of stakeholders to the SG (The Scottish Government, 2010b; SNH, 2012). In 2009, the Marine Directorate (Marine Scotland), part of the core Scottish Government (SG), was established. Marine Scotland is currently the leading marine management organisation and is responsible for the SG Marine Directorate, the Fisheries Research Services (FRS) and the Scottish Fisheries Protection Agency (SFPA) (Directorate of Scottish Government, 2009) . Marine Scotland has the main job of planning, policy development, management and monitoring compliance for marine issues and develops management policies in-line with the EU e.g. the Marine Strategy Framework Directive.

In recent years there has been an increased focus on developing a precautionary approach including the establishment of Marine conservation zones, targets in line with Maximum Sustainable Yield and more attention to the environmental status of the waters around Scotland

3.2.2 The national policies and the herring fisheries

At the beginning of the 20th century there were a few legacy legislations e.g. the White Herring Fisheries Act of 1771 .This legislation was established to regulate the herring trade in a better way and preventing frauds at management levels (The Scottish Government, 2012a). Only small changes were made up until the 1940s. After World War II grants and loans were given and bigger boats began to be developed - *Men came back from the war and there were great grants to get new boats* – ***Faquahar MacRae.*** As there was a good market for herring, the UK parliament established the Fisheries Act of 1955 in order to increase the maximum amount of grants to promote the herring sales. In 1957 they acknowledged that the herring fishing was different from the white-fish fishery, the parliament gave out subsidies ranging from 3 to 22 pounds per day per boat, depending on the size of the boat. These

subsidies were given to the West coast of Scotland as there were only a few landing harbours (UK parliament, 1957). In 1962 the Sea Fish Industry Act provided extra financial assistance for fleets with special difficulties, development of landing ports received a good share of this assistance.

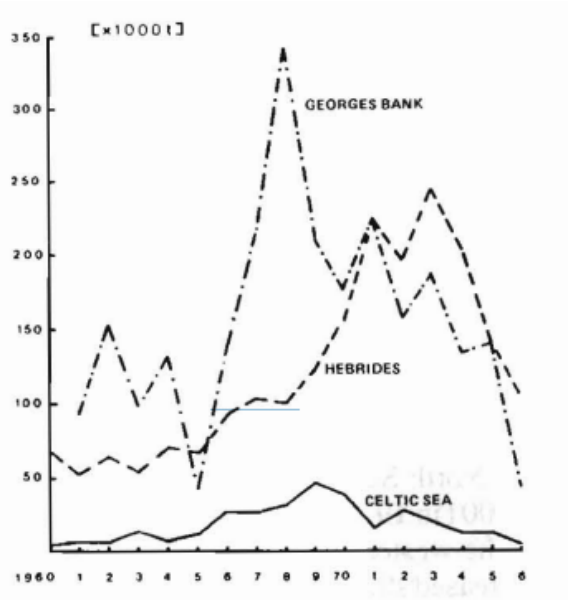

Figure 12 international herring catches (X 1,000 t) in the Celtic Sea, Hebrides area, and on Georges Bank during 1960-1976 (1976 values are preliminary). (Dornheim, 1978)

In 1972 the United Kingdom joined the EEC and international fleets came to the Scottish coasts. This increased the fishing mortality on the stock and catches rapidly began to decline (Figure 12). In 1974 the UK tried to recommend a TAC which was in excess with scientific advice, however member states did not agree with it, so it was only with the expansion of the nautical miles that a herring ban was implemented in the North Sea (Wood & Hopper, 1985). The ban was extended to the Scottish west coast in 1979 (Dickey-Collas, 2010).

With the formal establishment of the CFP the era of European legislation had begun. Quotas, TACs and bans were established to control the herring fisheries on a sustainable level. Member states had to implement the legislations of the EU, which led to many legislations made by the UK parliament. (Table 3)

Table 3 Legislations established by the UK and Scottish government (The National Archives, 2013)

Year and legislation
1977 North sea herring ban
1979 West coast herring ban (Dickey-Collas, 2010)
1983 Sea Fish licensing order of 1983; all the herring fishing boats need a license to fish in the British sea. This act was reviewed every year
1984 Inshore fishing Scotland act. Three miles limit was vanished.
1987 Sea fishing enforcement of community quota measures; implementation of herring fisheries legislations
1992 The food safety (fisheries products) (derogations) regulations; standards for herring processing were given
1993 (Specified sea areas) (Prohibition of fishing) order 1993; In was forbidden to fish in the areas IIa, IVa and IVb for herring (Annex D:) until 1994
1998 (Specified sea areas) (Prohibition of fishing) order 1998; herring fishing is prohibited in areas IVa and b (Annex D:) until 1999.
2008 (Control Procedures for Herring, Mackerel and Horse Mackerel) (Scotland) Order
2008 Sea Fishing 2008; landing and weighting procedures for herring, mackerel and horse mackerel. Set up to control fisheries.

3.2.3 Conclusion

Acts and controls derived from the EU common Fisheries Policy had to be implemented by the member states. The UK parliament and latterly the Scottish Government established many legislation

to implement rules and reach targets set by this Policy (figure 13). Legislation in relation to herring fishing has been set up to deal with fishers' rights, hygiene, environmental concerns and food security. After the devolution and the beginning of the 21th century stakeholders became more involved in policymaking decisions, however it was already too late to involve herring measurements on local level.

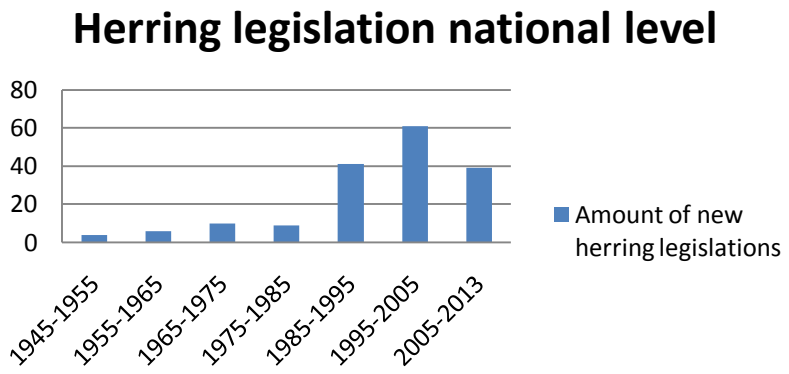

Figure 13 establishments of legislations by the UK Parliament (1945-1999) and the Scottish Government (from 1999 up until now) level which include the herring fisheries produced with the archive of (The National Archives, 2013

3.3 Management on Local level

Since 2000 the management of the inshore fisheries has seen large changes (SNH, 2012a). Devolution and the CFP review in 2002 caused a move away from the top-down approach and took measures to involve more stakeholders and local organizations. Many local fisheries groups have been established; however the SG is still the overarching authority.

This chapter describes the management involving local fisheries. I begin at the time of devolution as local stakeholders were only formally involved after this time.

3.3.1 A Short history of local fisheries groups.

Since 1984 inshore fisheries have been managed under the Inshore Fisheries Act (1984). It was not until 1999 that this changed as the Scottish Government (SG) realised there was an increasing need for improved inshore management (The Scottish Government, 2010).

The first Scottish Inshore Fisheries Advisory Group (SIFAG) was formed to improve stakeholder participation for inshore fisheries management. It has been a key element in the development of the strategic framework for Inshore Fisheries in Scotland (Royal society of Edinburgh, 2004)

In 2009 six pilot Inshore Fisheries Groups (IFG) were established. They served as a communication source between the SG and parties with an interest in commercial fishing. The hope was that the IFG groups (Annex B:) would improve the management of Scotland's inshore fisheries out to 6 nautical miles. (Inshore Fisheries groups, 2013a; SNH, 2012a). The main function of the groups is to agree upon Fisheries Management Plans (FMPs) for their area, providing consensus about how stakeholders would like their areas to be managed (The Scottish Government, 2010). However there were problems with engagement of sufficient stakeholders in many of the groups and in 2011 a new two-pronged plan, covering both fisheries management and seafood supply and marketing, was established with the aim of ensuring that all those involved in the fishing industry could work together to achieve the best results. This has led to the establishment of the Fisheries Management and Conservation Group (FMAC which replaces the old Scottish Fisheries Council) and the Scottish Seafood Partnership (Scottish Fisheries Council, 2012). The membership of FMAC includes Marine Scotland and representatives of the Fishing industry, Fish Producer Organisations and Environmental Organisations.

It is worth mentioning that there are many fishing associations under the IFGs as well as many fishers who are not members of associations (Annex). Fragmentation of the representation of the inshore sector remains a major problem with many fishers feeling that their views are not heard or taken into account (Table 4 and Ullapool Harbour; interviews)

Table 4 Some of the legislation which has influenced the local herring fishery.

Year	**Legislations/ actions taken by which have influence on the local fishery**	**Result of the implementation**
After war	Giving grants and loans for bigger boats	Bigger boats caused a move away from small-scale fishing
1972	Joining the EEZ	International fleets increased pressure on the stocks
1974	Loch ban[4]	-
1977	Total ban	Herring disappeared from the local fisheries, generally a loss of domestic markets for herring products, such as kippers (smoked herring), followed as seen in the North Sea
1983	CFP; TACs, Quotas, Bans and Licenses	Licenses became too expensive and TACs were sold to the bigger boats

[4] Many fishers are speaking of a Herring ban in the Lochs, however no documents can be found to support this assertion. It is possible that the fishers are referring to the TACs which were set by the UK to counter overfishing in period around 1974 (Wood & Hopper, 1985).

1984	3 miles limit was removed	Bigger trawlers came into the loch, this was the last step for local herring fishing

3.3.2 The local policies and the herring fisheries

Pelagic catches in the Wester Ross and other IFG areas are now very small, most of the herring catches are taken by bigger offshore boats operating in the Minch and more northern waters. In the Wester Ross area at present only two people are still fishing for herring with small catch quotas.

The IGFs of Moray, small Isles/Mull and the South East are considering to include herring quotas in their management proposal for the SG. (The Scottish Government, 2010).

3.4 Conclusion

The SG has taken steps to try and increase stakeholder involvement with inshore fisheries management. The SG has tried to establish Inshore Fisheries Groups but gaining sufficient participation and sustained funding have been problematic. Based on the interviews the overall mood seems to be that fishers still have little trust that their views will heard and taken into account. The establishment of the Inshore Fisheries Groups was too late for the local-scale herring fisheries. Longer term recovery and rebuilding of inshore fisheries for herring will need to overcome significant legalistic hurdles e.g. obtaining sufficient quota, as well as dealing with biological issues (for example the status of the inshore herring stocks is largely unknown).

Chapter 4: Social Aspects.

In the 19th century many people settled along the coast of western Scotland. This was because the small strips of land available inshore had become insufficient for growing crops or raising animals. In addition many landlords removed people from the inland glens to clear the way for more profitable sheep farming (a process known as the Highland Clearances). The sea thus became a major source of food and income in the following 200 years. In addition, communication inland was difficult due to the terrain and poor transport network, sea transport was especially important for moving goods around the west of Scotland and between the numerous islands. The fishing was subjected to religious patterns and lifestyle. The development of the fishing fleets was slow and so had little impact on the marine ecosystem. With the improvement of the rail network and the development of steam and oil power, market opportunities increased and the west coast of Scotland started to export their herring (Smith H. D., 2013). This lasted until the beginning of the 20th century when East- Europe was dealing with political difficulties. It was not until after WWII that the herring market re-established. Loans and grants were given to support the local fishers and built bigger boats. However with increasingly powerful boats and fishing technology and many other factors the coastal waters had little left but shellfish around the 1980s (Thomson, 2001).

In Wester Ross the herring fishery took place in combination with crofting. The main herring season was from October until March. Fishing took place at night and the best fishermen could locate the herring by listening for the sound of the shoals moving (Gairloch Heritage Museum, 2013).

This chapter describes the influences of the historical changes of the herring fishery on local communities- *as told by the fishermen*. As no research has been done related to this topic, this chapter is mainly based on interviews. Dates were checked where possible, but cannot be guaranteed as correct. This chapter is divided in two different time periods: 1945-1980 and 1980 until present. Chronological information will be given per time area, with quotes gathered from the interviews introducing a new decade. At the end of the chapter a short conclusion is given.

4.1 The life of a herring fisherman

4.1.1 What was the importance of the herring fishery to the local community 1945-1980?

1945-1950

We used to have great catches and people really depended on the fishery for their living – **Willie Matheson**

My father kept sheep and cattle but also fished for lobsters. Particularly in wintertime he would put a net out for herring, this was when herring were common in Loch Broom - **Alexander Macleod**

They would not be doing herring; they were far more seasonable than these guys today. They had crofts, so when men were needed on the croft he didn't go to catch fish – **Alistair Mcleod**

There was so much herring; all you had to do was set up some herring nets behind the house – **Ian**

I lived in a fishing and crofting community where we combined different tools – **Donald John MacDonald**

When they had a wee spare time off from the crofts they did a bit of lobsters, a bit of herring a bit of everything. - **John Murdo Mackcenzie**

After the WWII herring stocks were apparently abundant. To support the local communities and bring the herring fishery back to Scotland, the government issued grants and loans to stimulate fisheries. As a consequence bigger boats were built, which were able to go further into the sea and catch more fish.

At this time fishing was still a family business on the west coast of Scotland. While the men and boys worked at sea, woman and girls worked at home on the land. Preparing baiting and cleaning fish was done by the entire family. At that time many people owned a croft and went fishing when there was a break in other activities. Ground nets and long lines were used locally. Finding fish was based on local knowledge, and signs e.g. watching where the seagulls were feeding; other simple tools such as a weighted piano wire could be used to indicate the type of fish in a shoal (Moray Firth Partnership, 2003). The fish caught by the boats were landed in local harbours e.g. Gairloch, Ullapool or Stornoway. In the communities fishers shared the catches among the crew and exchanged knowledge of fishing places and skills with friends and neighbours.

Other boats would venture further afield. The pattern at the end of the 1940s was for local boats to go to sea during the week and land their fish before 8 o'clock at the market.

We sailed away from home on Monday morning to Stornoway, nets in the Minch until the next morning. Sometimes you caught a couple of hours a sleep before you went to the market, then you discharged the catch, had your dinner and would fall asleep, because you were up all night with just a few hours sleep - **Faquahar MacRae**

1950-1960

Single track road and very little space between the seats in the bus and we could pick up 6 maybe 12 hours up on that times with the roads being so bad – **Sandy Patience**

With the Auch boats we fished from Stornoway all summer and in the winter we went further up to Uista and Barra and then of course the famous Kessock herring went there, they are smaller. They taste better, lovely – **Facquahar MacRae**

There was a whole market which must have been the fish market and you also had the fishmeal market and there must have been a subsidies market were you got paid when they could not handle the fish – **Kenny Livingstone**

As there were few alternative jobs or trades, most young men went to sea to earn a living. Herring fishing was a well-paid job and living on the boats was a cheap way of life. With the entrance of bigger boats, fishing became a full time job and people stayed on the boats during the week. At the end of the week all the money earned was collected and split among the crew members. When the catches were less plentiful, incomes were augments by the herring subsidy established in 1957 (UK Government, 1961). This subsidy gave £6 to 12 a day clear on the catch. However, fishers had to save their money as they never knew how big the catches would be the next year. With long journeys, bad roads and no luxury on the boats, fishing was a tough life. Fishing was an honourable job and despite the lack of comfort many fishers enjoyed their life at sea.

I could give my mother three pounds for my keep; it was for my own pride – **Sandy Patience.**

During the 1950s, drift and ring nets were the common method used by the fisher boats. With the use of radars and echo sounders shoals of fish were spotted and indentified with a piano wire.

1960-1970

We went out in the evenings to pick up the herring which were dropped on the pier, no one bothered to pick them up during the day – ***Alan Bush***

Then the other said I want a week off as well, because I have been fishing continuously from Christmas without a break- ***Alexander Macleod***

I worked with the herring during the winter, and then I got away and fished locally. By that time, a couple of local men from Ullapool, started fishing with prawn. – ***Alexander Macleod***

After the Auchboats I gave up fishing, the big trawlers came in and fished away all the fish. That was basically the end of the local fishery - ***Facquahar MacRae***

The ring net was on his way out, it was superseded by a method called purse seine....we were able to tow and reach depths the ring nets could not reach- ***Sandy Patience***

They stayed there too long they just kept going and going and they never ever believed to stop the herring fishing. They overlapped with purse trawler, the bigger boats from the east coast – ***Alistair Macleod***

By the beginning of the 1960s herring landings started to decline all over Britain. However in Scotland, the local fishers were catching huge amounts of herring with their ring and drift net boats (Smylie, 2004). Small fisher boats still landed baskets full of herring in the harbours in the early morning (Harbour trust Ullapool). Samples of herring were brought to the auction where they were shown, so buyers could get an impression of the fish catch. Buyers from all over Scotland came and bought fish to send away to the East coast of Scotland. Lorries filled with ice came to collect the fish, as the West coast of Scotland did not have an ice factory itself. The lorries transported the fish via Inverness to the East coast (Figure 14). In the evening local people came to the market and collected the leftover herring.

Figure 14 Lorries filled with herring for transport to the East coast of Scotland (Ullapool harbour)

They all went over the main road in Inverness to the east coast and when they went up hill all the stuff went back over the street, as they didn't care to put a cork in the bottom, and the fish really did stink. – **Alan Bush**

In 1965 the Highlands and Island herring fishery boards made it financially easier for the local fishermen to obtain boats. The indigenous fleet grew in the late 1960s with new and second-hand vessels, including seine net boats (for herring), small (prawn) trawlers and creel boats. Electronic equipment began to play a major role as radar and navigation systems showed where the fish stocks were allocated. The first of the larger trawlers came into the lochs; DulVive and the Sarepta (Harbour trust Ullapool).

In the late 1960s herring stocks declined in the lochs, as there were too many fishing boats. Many local herring fishers switched to other species, or found jobs on shore.

1970-1980

The Avoch stopped here in the early 80s….that were the Klondykers with the contract fishing. There was no Avoch anymore, just the prawn trawlers and the rest went all away**. -** ***Neil Campbell***

Then the pair trawlers came in and they started, I heard someone say they break the shoals up, but what I think they meant was that they just caught the whole shoal – ***Alan Bush***

They were overfished; the catching power was just too large with purse netters and trawlers. They just wiped away everything. – ***Facquahar MacRae***

They brought up the trawler and it was full of spawning of herring – ***Willie Matheson***

They started clear trawling first for herring, and a fleet came into Loch Torridon and these boats were from then on in charge of the lochs. In the following night they caught 75 thousands grants of herring in the loch- ***Ian***

In 1972 the EEC was established in the UK. This caused a move away of the local herring market. The Scottish fishery became focused on the world market and international fleets came into the lochs to fish. Big trawlers and purse-seine netters used sonar's, which showed the location and size of the shoals, they largely fished out most of the lochs by 1974.

The local fishers with drift and ring nets could not compete with the trawlers and by 1977 the drift nets, following a year later with the ring nets, were no longer seen in the lochs. Local fishers sold their pelagic fishing rights/records to the bigger boats and started a job on land or switched to prawn pots and creels.

In 1977 the west coast herring stocks had reach a critical point of survival and a total herring ban was imposed. This added increased pressure for fishers to switch to prawns or mackerel. The local herring fisheries had disappeared and herring was no longer seen on the fish markets. Klondyker boats from the Soviet Union bought the fish straight from the English and Scottish fleets and took it away to Eastern European markets. This had the effect of forcing local distribution plants to close down. Although many distribution plants had to close, Ullapool had a golden decade. 8000 people, associated with the fisheries, were living on boats nearby the harbour and depended on food supplies of the citizens in Ullapool.

4.1.2 What happened to the Herring fishery after 1980?

1980-2000

They managed to get some sea lochs being closed from trawling and prawning, all except Loch Ewe- ***Willie Matheson***

We used to go for salmon in the morning; we were finished around 1 o'clock in the afternoon. The crew which were on the salmon boat, were mostly farmers like you know with sheep – ***Willie Matheson***

I stopped pelagic fishing in at 1987 that was my end of my contract record. I am legally not allowed to go to the sea and catch herring, which my family did for 4 generations. – ***Sandy Patience***

2000-now

There is nobody gone for landing fish out of here for 7 years. So that already shows a generation gap – ***Sandy Patience***

Now, you never see fish in Ullapool, they just come ashore and carry it in big boxes to go down to Wales – ***Alan Bush***

Nobody has been fishing for it ("herring") in Gairloch in 10-15 years – ***Derek Roxbrough***

I got a part-time job, I worked in the local hotel in front of our house, I worked there three days a week, and I fish 2-3 a week – ***Alistair Macleod***

We have a foreign crew now…. there is no interest in fishing anymore, it is too hard – ***Neil Campbell***

Keep the money in the small communities, to ban the big boat. The thing is, that would be great we should never have lost it. It is just, big guys have been given everything because they can pay for the boats. – ***Ian***

The herring ban of 1977 had a huge impact on the West coast communities. Most herring markets had closed by the start of the 1980s, herring processors sold their machines and local people lost their herring fishery skills. Households substituted other products in their diets and the local market for herring was lost.

In 1983, the fishery was re-opened but this did not lead to a new start for the local fishers. The loss of the local processors onshore led to 52% of the catch being sold to the Klondyker boats (Figure 15) (Wood & Hopper, 1985). However rather little money was made by the fishers as prices tended to be around the minima for the human consumption markets (Wood & Hopper, 1985).

Use	%
Home market	16
Klondyked	52
Meal and Oil	27
Other Non-Human Consumption	1
Landed Abroad	4

Figure 15 Percentage use for the herring catches in 1983 (Wood & Hopper, 1985)

The TACS and rules set by the CFP had other unintended consequences e.g. throwing of good (dead) fish overboard when catch limits were met. To many fishers discarding saleable fish was a disgrace and this led to, black landings where excess catches were landed undeclared, often during the night. However, as well as being illegal, this had the effect of distorting the catch-landing statistics, which formed the basis of scientific stock assessments.

In 1984 the Government abolished the three mile limit, as big trawlers already came into the lochs illegally. With this step, the last local fishers disappeared.

Nowadays, the commercial herring fishing occurs mainly outside the coastal areas. The large pelagic trawlers operate in the Minch and more northern waters (Marine Scotland Science, 2012) . Several locals interviewed felt that this meant that the herring were caught before they could enter the sealochs to spawn. There is little interest from local youngsters in herring fishing, because there is no inshore quota nor a career option. Older skippers are generally targeting other species, such as prawns, and fishing with foreign or part-time crews. With every older fisher who dies, a lifetime of skills and local knowledge is also lost.

4.2 Conclusion

The Wester Ross area has been known for its fishing for hundreds of years. In the pre-and post war period, herring stocks were abundant and local men enjoyed access to the fishing grounds without legislations and licenses. Herring fishing tended to be undertaken as an additional activity to crofting. There is now little of that style of fishing left as technology and vessel power increased in the 1960s, 70s and 80s, supported by Government grants. Bigger boats with new technology then entered the sea-lochs and “fished-out” most of the local waters. Rules deriving from the CFP were the last step in the disappearance of the local fishing activity for herring.

Chapter 5. Discussion

In this chapter the results of the study is evaluated. With a created timeline every aspect will be assessed and sums up their most important events. The sub- questions given at the beginning of the paper will be answered. Subsequently, future recommendations of research are provided and the scientific relevance of the results are shown. The chapter finishes with an overall conclusion, which answeres the main research question.

5.1 What factors lay behind historical changes in the herring fishery in Wester Ross, Scotland over the last 50 years?

5.1.1 Achieved results of the sub-questions

At the start of the study three aspects were shown in a conceptual framework and four sub-questions were asked.

1. Ecological aspects
2. Management aspects
    1. What was the importance of the herring fishery to the local community from 1945 until 1980?
    2. What happened with the herring fishery after the 1980s?
3. Social aspects
    3. What were the measures taken during the last decades?
    4. What kind of influences did these measures have on the local communities in Wester Ross?

The timeline (Figure 16) sums up the most important events happened over the last decades for the three aspects.

Social aspects:

What was the importance of the herring fishery to the local community from 1945 until the end of the 1980s?

The scale of herring fishery changed substantially at the local level over these years. During and immediately after WWII herring was an important food source for the crofting communities with fishing being combined with other crofting activities. Following this period grants and loans were given by the government to encourage the industry resulting in bigger boats being built. These boats tended to stay at sea during the week and herring fishing became a full-time, relatively well-paid, job. Good prices were given on the fish market and fishing for herring in the sealochs re-established. By the end of the 1960s herring stocks began to decline and many fishers changed jobs. In 1972, the UK joined the EEC, which caused a move away from the local herring market. Local boats could not compete with the big international fleets and more fishers quit their jobs. Stocks kept declining and a fishing ban, aimed to recover herring stocks, was established. During this herring ban, all the remaining local herring activities in the communities disappeared.

What happened with the herring fishery after the 1980s?

When the ban was lifted, hardly any interest in herring fishing was shown at the local level. Local markets had disappeared and the Klondykers from the Soviet Union bought herring straight from the fishing boats. Fishing licenses expired or became too expensive to maintain. This has resulted in an almost complete loss of the local industry, so that no-one has been out fishing for herring over the last 15 years.

When I stopped pelagic fishing in 1987, it was the end of my contract record. I was legally not allowed to catch herring in the sea anymore, while my family had done it for 4 generations. With even one herring I will break the law. - **Sandy Patience**

Political aspects:

What were the measures taken during the last decades?

After the founding of the EEC the CFP became the main policy driver affecting fisheries. The CFP aim was to manage fisheries, including for herring, in a sustainable manner. TACs and Quotas were created as a mechanism to control fishing mortality. A top-down approach was kept until the beginning of the 2000s when the importance of including stakeholders in resource management was widely recognised. After the CFP review of 2002 there was more focus on stakeholder participation, however by this time the local herring fishery was already gone.

What kind of influences did these measures have on the local communities in Wester Ross?

Many legislations set by the CFP and the SG have had a huge impact on the local communities. Under the Common Access rights of the CFP, bigger international boats came into the sealochs to fish.

Also the TACs and licenses system created by the CFP didn't make it easier for the local fishers as it became too expensive and licenses were sold to bigger operators (Chair, 2010).

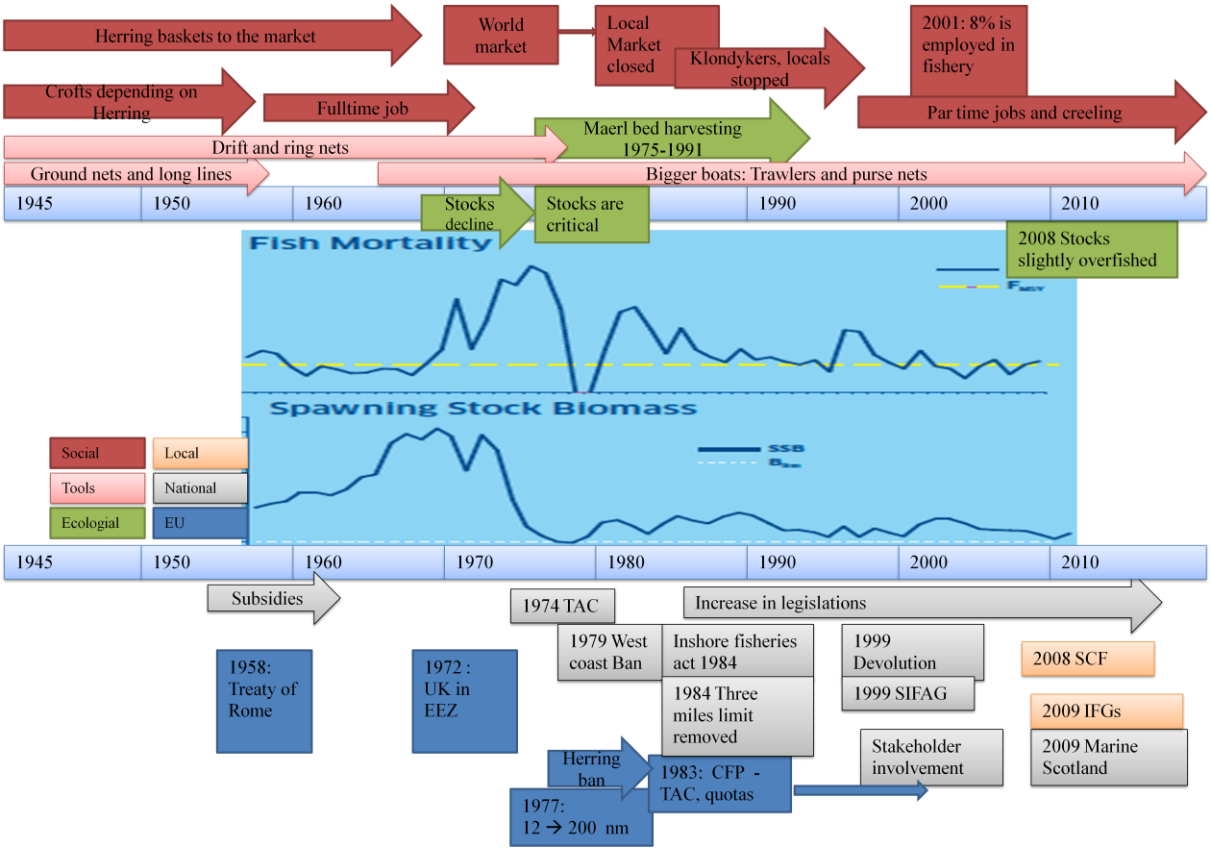

Figure 16 Timeline for social, political and ecological aspects and their effects on the herring fishery. The graph in the middle shows herring Fishing mortality and the Spawning Stock Biomass for the main West Coast of Scotland herring stock, representing the Ecological aspect. The yellow line represents the MSY as estimated by ICES (ICES, 2012). The social aspect is shown at the top of the time-line in red while the Policy aspect is shown at the bottom of the timeline (EU level blue; national level grey; local level orange).

5.1.2. Discussion of the results achieved on the research question

As the results in the previous chapters have shown, many social and political factors have played (Figure 16) a role in the disappearance of the local herring fishery. In the Wester Ross area herring fisheries started to decline around the late 1970s. The major changes were the introduction of bigger boats and joining the Common market. These two drivers led to increased fishing mortality and declining stock biomass resulting in the herring fishing ban in 1977. In 1983 the herring ban was lifted as the stocks had shown signs of recovery, however this did not lead to a revival of herring fishing in the local communities. Many reasons can be given for this; licences had become too expensive, local boats could not compete with the bigger boats, the culture of small-scale herring fishing had been lost or there was no longer a local market.

It is clear that overfishing has played a key role in the declines of the herring stocks and the subsequent loss of the local herring fishery. However it does not explain why the herring stocks have - according to the local fishers- not fully returned to the sea lochs. However as nobody has fished for herring in the sea lochs over the last 15 years, it cannot be concluded that herring stock did not

returned to the sea lochs in the Wester Ross area. Due to lack of scientific data relating to herring stocks in the Wester Ross area, the statement of the fishers can neither be proved nor disapproved.

According to the ICES and the Scottish Government the West Coast herring stocks are currently at a sustainable level with fishing mortality fluctuating around the Fmsy (Figure 7) (The Scottish Government, 2011) However this analysis is based mainly on the major offshore stock components and tells us little about the status of stocks inshore and in the sea lochs. If the SG includes the inshore stocks, it is possible that the Fmsy is set to low to restore the inshore stocks. Figure 6 shows that, although fishing mortality appears to be at sustainable yield, spawning stock biomass has not increased significantly (Dickey-Collas, 2010).

The study on the North Sea herring by Dicky-Collas et al. (2010) showed that when the SSB is below a critical threshold, new recruitment is impaired, better known as the Allee effect (Courchamp, Berec, & Gascoigne, 2009), and stocks will not fully recover. Assuming that this happened to the local herring stocks the West coast of Scotland can use this North Sea study as an example.

Another possibility which can lead to the possible not fully recovered herring stock in the inshore areas can be the TAC setting. From the 1983s up until the CFP review of 1992, TACs were set to high to appease certain member states (Chair, 2010), which led to the almost complete collapse of the herring fishing stocks a few years later (Dickey-Collas, 2010). It is possible that the SG has set its TACs for the West Coast herring to high, it is based on scientific data according to the herring stocks offshore This could be impairing the re-colonisation of herring into the sealochs to traditional spawning grounds, as the study of Dicky-Collas et al.,2010 had shown

Furthermore herring need suitable habitats where they can spawn. Environmental changes e.g. sea bed destructions (Haegele & Schweigert, 1985; Hall-Spencer & Moore, 2000) loss of maerl beds (Kamenos, Moore, & Hall-Spencer, 2004; Morrison, Napier, & Gamble, 1991) or other environmental changes could all play a key role in the failure of the herring to re-colonize the sealochs. The study of Haegele & Schweigert, 1985 shows a habitat destruction around the West coast of Scotland.

5.1.3 Research recommendation

The main question which needs addressing is whether the traditional herring spawning locations in the sea-lochs identified in the interviews in this report are still active. It must also be remembered that the ICES stock assessment for west of Scotland herring is driven almost completely by catch and survey data from the offshore areas. The status of the inshore herring is therefore unknown. Given this it is difficult to conclude whether the herring have actually failed to recolonize the sea-lochs, or are returning but are not being observed.

More research is also needed, on the condition of the spawning habitat (maerl) in and around the sealochs, before a complete answer can be given. Various marine laboratories have gathered information about the herring spawning grounds and environment in the past and this information can be used to compare future studies. One major problem is that research funding tends to follow the main commercial catches, which in this case are the offshore herring stocks. However, relatively small-scale studies of the maerl beds in combination with herring spawning could be conducted at reasonable cost.

The WRFT is trying to establish a Marine Protected Area (MPA) around the Wester Ross inshore waters to improve the habitat quality of many species and to give stronger protection to what remains within the sealochs. Such protection could ultimately help herring to recolonize the sealochs again.

5.2 Relevance of this Research Project

The WRFT, together with SAMS, have suggested that it might be possible to rejuvenate the local herring fishery. Given the disappearance of the herring out of the daily habits it is highly unlikely that this would be successful as a solely commercial venture. However, there could be scope to develop this as a mixed commercial/educational venture in association with local heritage activities. My research project is a start for bringing back the herring in the Wester Ross area. With the created background, an insight into the possible factors for the disappearance of the herring fishery has been given and shows were it went wrong

However this research project is also important in other areas. It has investigated the changes over time which resulted in identification of several drivers of change, such as bigger boats and wrong policy measures. These drivers can play a key role in other inshore fisheries. Therefore the timeline identified in the research is highly relevant for policymakers and local communities as they are able to see the development of the fishing sector to avoid similar negative consequences in other areas in future. Foreign and local policy makers can use it to manage their sector in a better way and to not make the same mistakes as in this case happened.

Besides, the findings are of a relevance to the scientific community which can use the timeline described in order to research deeper into the drivers I have highlighted. A further research is needed to prove the correlation between the drivers and the marine population stock declines. A better understanding of biological processes happening in the area, added to a timeline presented in the study, would allow for a broad and clear picture and understanding of why did the end of the herring fishery happened in the area.

The majority of the research on the decline of a fish stock population is focused more on the biological and economical side of the problem. With this study I have identified an importance to understand the socio-political side of the issue. A combination of biological and non-biological factors should be

taken into the account when we talk about a sector as important for a small local community as a fishery, something on which the whole society depended on for centuries long.

5.3 Conclusion

This paper has addressed the historical changes affecting the herring fishery in the Wester Ross area over the last 50 years. It is difficult to simply answer the research question: *What factors lay behind historical changes in the herring fishery in Wester Ross, Scotland over the last 50 years?* My research has un-covered a multitude of interacting factors which ultimately led to the loss of this local fishery. In this it is not atypical of the experience of many inshore fisheries around the world.

With a high certainty it can be said that overfishing by bigger boats and international fleets led to the decline of the local herring fishery. However it cannot yet be explained whether or why the herring have not came back to the sealochs. More research is needed on the local herring stock status and the environmental changes and condition of the traditional spawning grounds in and around the sealochs.

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Appendix

Annex A:

A.1 Description of the different parties as mentioned in chapter 3

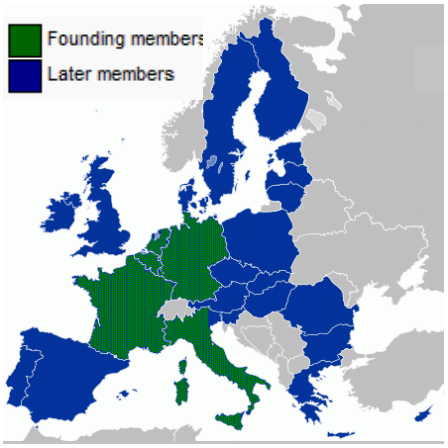


Figure 17 The EC; founding members and later members

European Economic Community (EEC)

The EEC was an international body created by the Treaty of Rome in 1957. The EEC was established to create a common market between the member states. In 1993 the body was renamed the European Union (EU) following the Maastricht Treaty (Figure 17) to show that it covered a wider range of policies. Following WWII, the main tasks of the EEC were to protect peace and liberty and to create a closer union among people in Europe, this was accomplished through:

- Common policies for agriculture, trade and transport
- Establishment of a free trade block
- A goal of expanding the EEC.

As the EU has evolved so have its policies but the Common Agricultural and Common Fisheries Policies remain key.

Fisheries Management and conservation groups (FMAC)

The FMAC replaces the SFC. It is a decision body concerned with all issues regarding to sea fisheries management. It will take notice of (FMAC, 2012):

- The development of objectives for international negotiations between a variety of fisheries, improving international partnership arrangements.
- The development of national policies and legislation of inshore fisheries. Earlier, this function belonged to the SIFAG.
- Make sure that the Scottish fishing industry is done in a sustainable way.
- Allocation and management of fishing opportunities available to fleets.

Fisheries Research Services (FRS).

FRS was an executive agency within SEERAD. It was in charge of providing scientific advice on the management of the Scottish fisheries. FRS had three main programmes related to marine Fisheries (Fisheries Research Services, 2010):

- The Marine ecosystem programme carries out research which is the scientific basis for an ecosystem approach. It delivers advice on specific issues relating to sustainable fisheries, conservation and impact of climate change on marine resources.
- Fisheries management programme gives advice on the management of marine fisheries based on research, monitoring and assessment of the marine resources around Scotland.
- The aquaculture and Aquatic Animal Health programme supports a sustainable and healthy aqua cultural industry and protect the health of fish stocks supported by scientific research.

In 2009 the FRS was brought under the Marine Scotland Directorate and is now known as Marine Scotland Science.

Inshore Fisheries Groups (IFG)

IFGs are bodies which improve the managements of inshore fisheries on local level out to 6 nautical miles from the coast. It gives the commercial fishermen a voice in the wider marine managements. Six IFGs were established in 2009. These IFGs cover the Outer Hebrides, the Clyde, the South-East of Scotland, the North West, Small Isles and Mull and Moray Firth and each developed an own fisheries management plan for their area (Inshore Fisheries Groups, 2013).

Regional Advisory Council (RAC)

The RACs are organisations led by stakeholders, established by the EU Commission in order to encourage stakeholder participation in fisheries management. The groups consist of management units based on biological criteria, which cover areas shared by at least two member states. Each RAC contains an executive committee and a general committee. Their role is to advise the commission on policy decisions based on their experiences within their member states. They are not involved in taking decisions on fisheries management; however they play a vital role in creating discussion with the Commission. Nowadays the RACs provide insights into fishing fleets and act as a forum to bring scientists and fishers more closely together (European Communities, 2009; RAC, 2010).The RACs can be viewed as a step-on-the road to full participatory fisheries management.

Scottish Inshore Fisheries Advisory Groups (SIFAG).

In September 1999 the SIFAG was formed with the aim of bringing all those with an interest in inshore fisheries together. They discussed issues of importance and provided the Minister with comments and recommendations. SIFAG included representation from SERAD, the fishing industry,

Scottish Natural Heritage, COSLA and the Fisheries Research Service (Rural Affairs Departement Fisheries Group, 2001)

The Inshore Fisheries Branch (IFB)

After Devolution, SEERAD was divided into two different units to handle inshore fisheries: IFB and the SIFAG. The IFB was established to oversee the working of the Inshore Act of 1984, the Sea Fisheries (Shellfish) Act 1967 and to manage the review process of the Inshore Fishing (Prohibition of Fishing and Fishing Methods) (SEERAD, 2004)

Marine Scotland (Act).

Marine Scotland is a directorate of the Scottish Government and was established in 2009 under this Act. Its function is to develop and protect Scotland's seas in a sustainable way. This includes for example:

- Biodiversity – Scotland Seas are estimated to contain at least 6,500 species of plants and animals
- Employment – Scottish Marine Industries are estimated to generate around 50,000 jobs. Significant industries include Oil and Gas, Offshore Renewable, Shipping, Fishing, Aquaculture and Tourism
- 61% of the UK sea areas fall within Scottish jurisdiction

By planning and giving Licenses, for example for offshore renewable developments, it works towards achieving and maintain good environmental status (as required under the EU Marine Strategy Framework Directive). Marine Scotland promotes sustainable economic growth by integrating and streamlining regulatory frameworks for different maritime industries. (Marine Scotland, 2010)

The Scottish Fisheries Council (SFC)

The SFC was a co-operation between the SG and stakeholders with a concern in commercial fishing. It was one of the biggest comprehensive fish industry/stakeholder group in Europe. Reform of this body took place in 2011. The fisheries management and seafood supply was established to make sure that all the stakeholders in the fishing industry worked together. The result of this was two new bodies

- The Fisheries Management and Conservation Group (FMAC)
- The Scottish Seafood Partnership

(Scottish Fisheries Council, 2012a):

The Scottish Fisheries Protection Agency (SFPA)

The SFPA was and Executive Agency of the SG. It was responsible for deterring illegal fishing activities as well as monitoring the agreements of the fisheries industry set up by the EU and Scottish

laws. In 2009, the SFPA was changed under the Marine Scotland Directorate and is now known as Marine Scotland Compliance (Marine Scotland, 2010)

A.2 Description of Gear types as mentioned in chapter 4

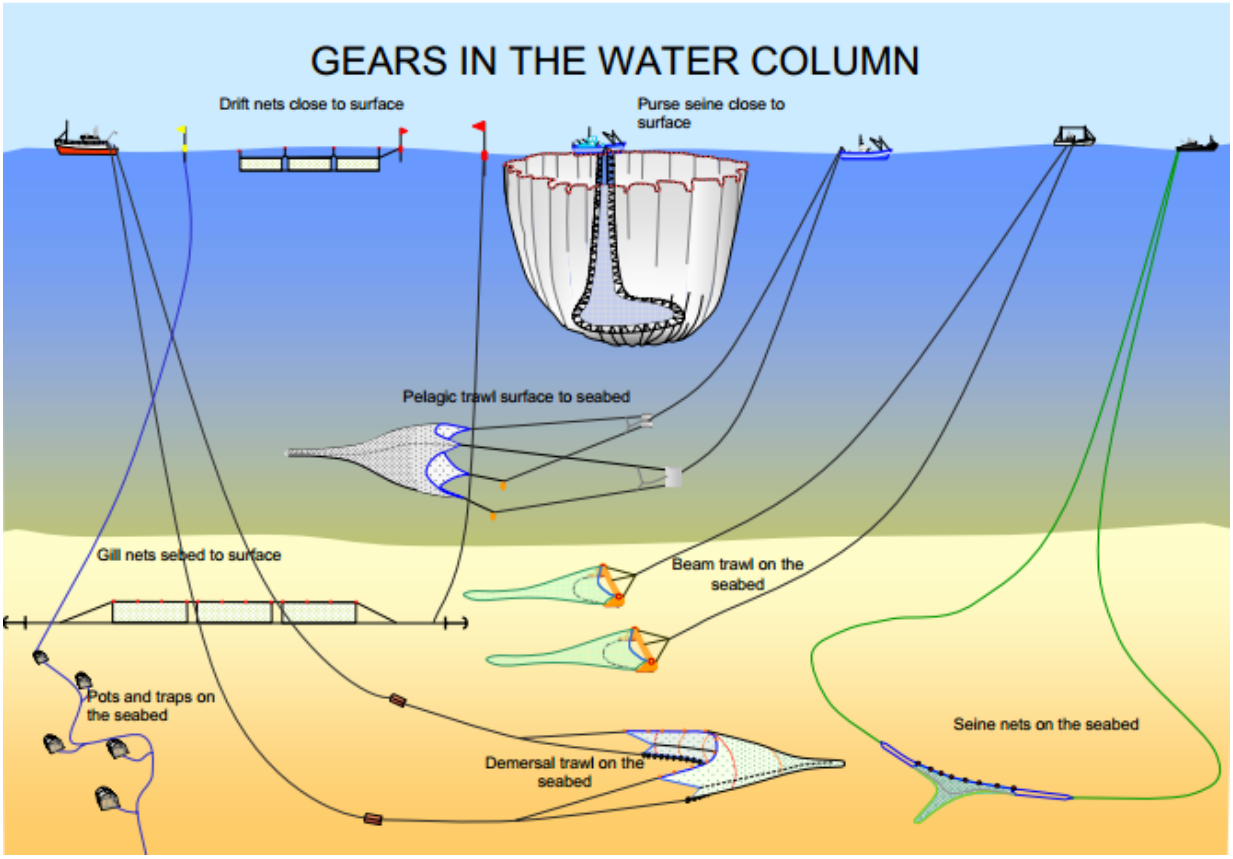


Figure 18 gears in the water column (Sea Fish, 2005)

Dredging- is a fishing method used to harvest scallops, oysters and clams. Dredges consist of a metal framed basket with a chain belly. The end of the net has a ranking bar, which lifts the target species off the seabed. The dredge is attached to a bar on the vessel.

Drift nets –are deployed from the boat and are allowed to drift with the tides/ currents. They are used to catch a range of different pelagic species e.g. sharks salmon and tuna. Traditionally drift nets were used to catch herring.

Gill or fixed nets – this is one of the oldest fishing methods. They are small nets set at the bottom of the sea or any other depth between bottom and surface. Gill nets catch one size of fish as smaller fish can swim through the meshes of the net. They typically are used to target benthic or demersal species such as sole or cod.

Hand line – fishing method with lines and hooks, used from an anchored or moving boat. It can be one of the most selective methods and can be used during spawning time, as only spawned fish bite

(herring, cod, and white fish). Because of its intense labour needs it is now only used in small-scale fisheries which tend to market their catch at a price premium e.g. in the south-west of England there is a hand-line mackerel fishery which is certified as sustainable by the Marine Stewardship Council.

Long lining – as much as 50- 100 km of line is set out, carrying baited hooks. They are set vertically in the water or along the bottom. It is an efficient method using different hook sizes and types of bait although by-catch of species such as shark can be a concern. Long-lines are not generally set for herring.

Pelagic Trawling – conducted from one or two boats. A net is set between the two boats (or two bars on the boat) and pelagic shoals of species such as herring, mackerel and pilchards are caught. It is a very effective method when shoals are located and can be quite selective.

Pots or creels- small baited traps set out by vessels on the seabed. The pots can attract and capture many different species of fish and shellfish but typically on the west of Scotland are used to target prawns, lobsters and crabs. It is a highly selective method as unwanted fish can generally be returned to the sea alive. Herring are often used as bait for creels so there is an interaction between the herring fisheries and the creel fisheries.

Purse seining - a method used to enclose shoals of fish with a large wall of net. The net is pursed under the fish, so they cannot escape and the fish often pumped on board the vessel. Purse-seining can be used to catch herring.

Ring nets – Is a surrounding net similar but smaller than the purse seining. This method is not used much now, although there is some interest in reviving it as it is thought to cause relatively little damage to the seabed. Traditionally ring nets were used to catch herring.

A.3 Other definitions

Allee effect - is a positive correlation between populations size and the mean individual fitness.

Black fishing- Fish catches which are illegally landed, often at night. Black fish includes for example catches caught over the TAC limit and fish species which are caught without a license. In the UK it is generally thought that the prevalence of black fish landings is now minimal following several high-profile court actions and the introduction of a stronger register of licensed fish traders.

Devolution – A partial process of Scottish independency. A referendum vote in 1997 resulted in a shift of powers from the central UK government (Westminster) to the Scottish Government (Edinburgh). Devolved countries have the power to make their own legislations for some, but not all areas of policy.

Exclusive Economic zone – An area up until 200 nautical miles from the coast over which a state has exclusive rights over the use and exploration of the marine environment. In the case of Europe however the EEZ is managed at a European level.

Nautical Miles – is a unit of length which is used to measure distance at sea. 1 Nautical mile is about one minute of arc of latitude measured along any meridian or approximately 1,852 meters or 6,067 feet

International Council for Exploration of the Sea (ICES) – is a global organization for ocean sustainability. It provides scientific information, including co-ordinating European fish stock assessments, for the CFP.

Scottish Association for Marine Science (SAMS) – Independent marine scientific association conducting research, consultancy and education in the marine environment.

Spawning Stock Biomass – Total biomass of fish in a shoal that are old enough to spawn.

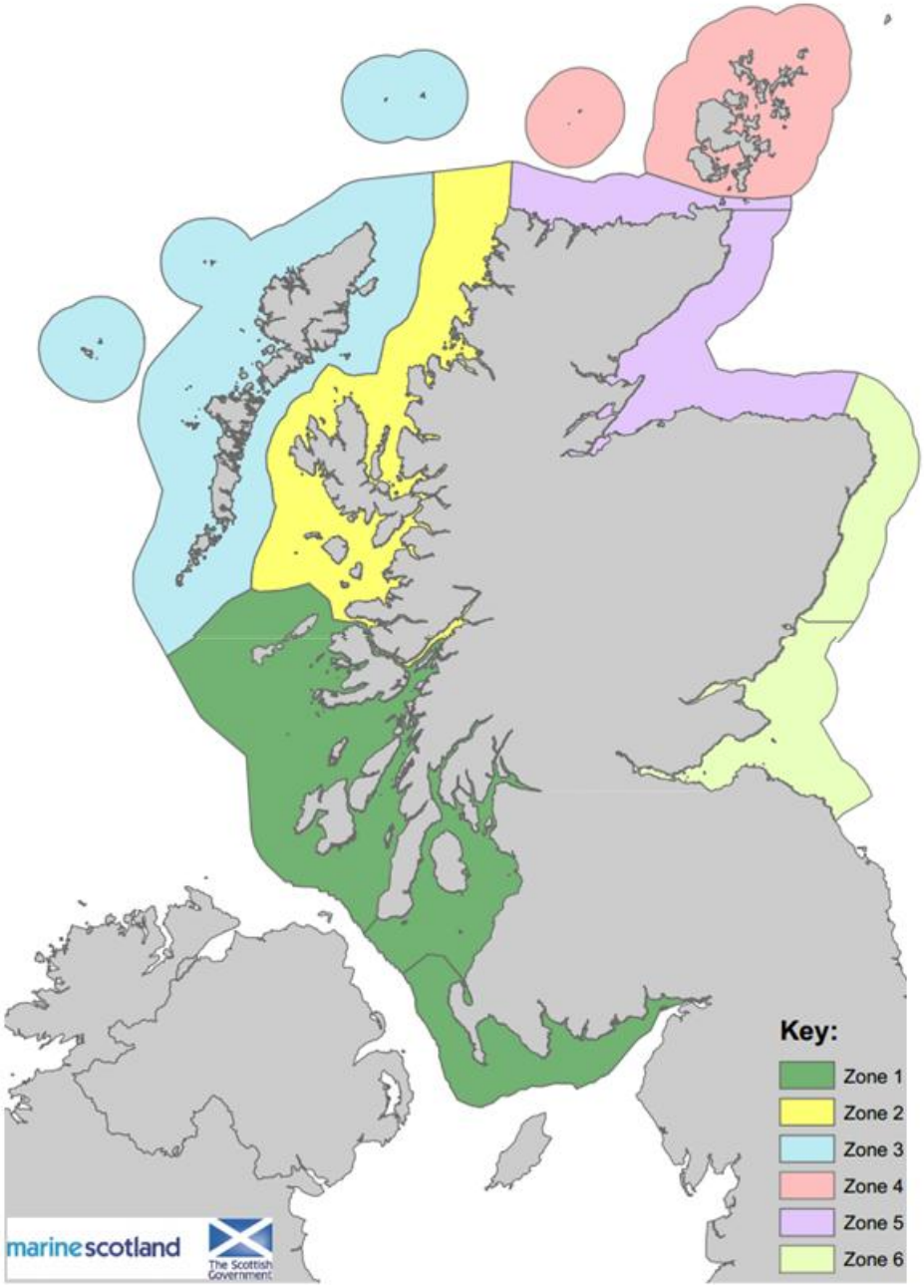
Stakeholders – In this report stakeholders refers to the involved parties in fisheries; e.g. Fisher associations, fishers, Fishing industry, Government etc.

Wester Ross Fisheries Trust (WRFT) - Established in 1996 to find a solutions to fisheries problems and to improve the wild fisheries. Their primary task is to develop science-based solutions to fisheries problems.

Annex B:

Proposed Inshore Fisheries Groups

The yellow zone contains the IFG of the Wester Ross area.



(IFG, 2013)

Annex C:

Fishing industry association membership of IFGs

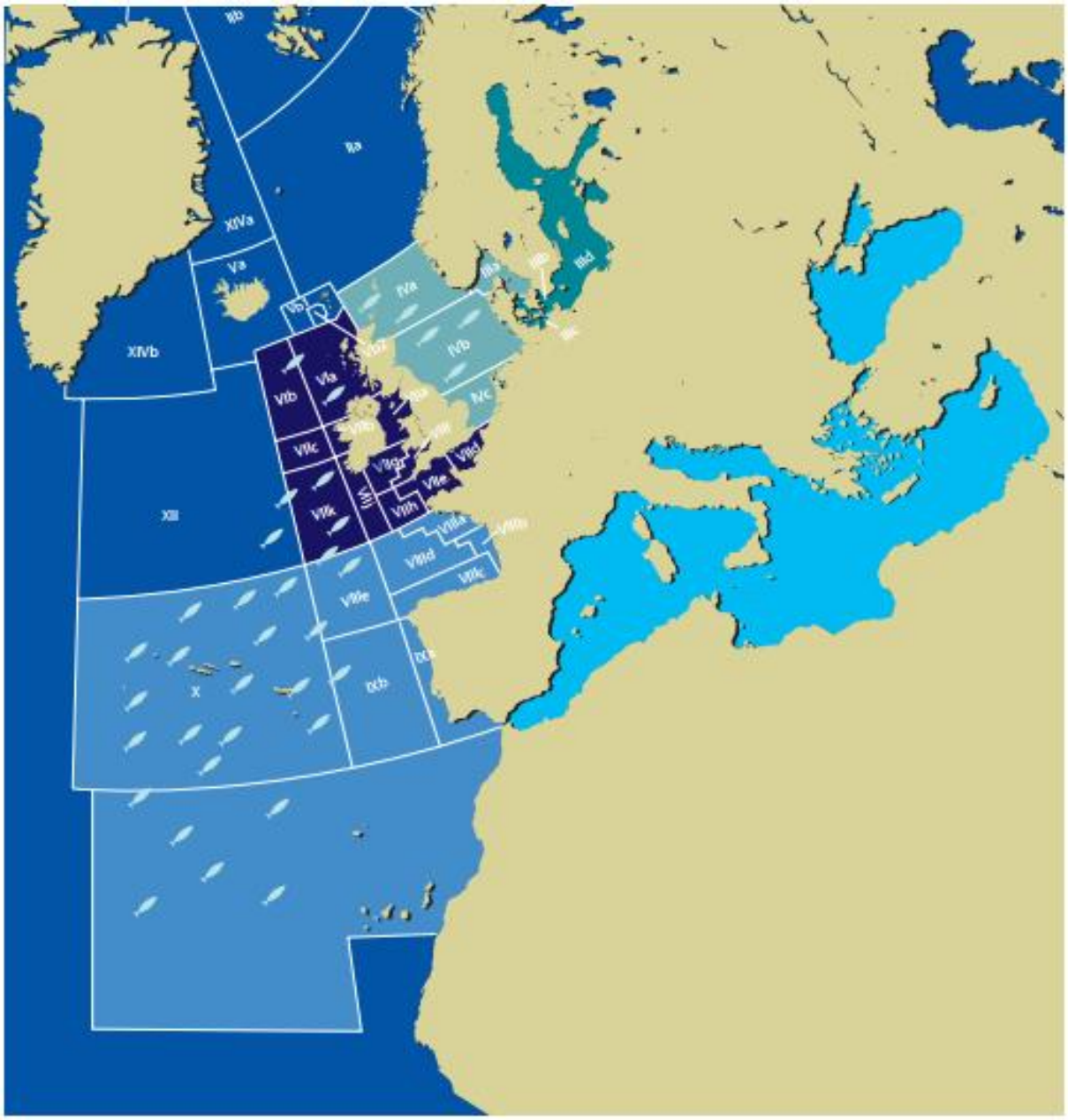
Association	**IFG**					
	Clyde	**Small Isles / Mull**	**North West**	**Outer Heb**	**Moray Firth**	**South East**
Anglo-Scottish FA	◆	◆		◆	◆	◆
Ayrshire & Clyde Static Gear FA	◆					
Clyde FA	◆	◆	◆	◆		
Galloway Static Gear FA	◆					
Isle of Man FA	◆					
Mallaig & NW FA	◆	◆	◆	◆	◆	◆
Northern Ireland FA	◆					
Scallop Association	◆	◆	◆	◆	◆	◆
Scottish White Fish Producers Assoc	◆	◆	◆	◆	◆	◆
Scottish Creelers & Divers	◆(1)	◆	◆			◆
Ardnamurchan FA		◆				
Mull Aquaculture and Fisheries Assoc		◆				
Western Isles FA		◆	◆	◆		
Tiree and Coll FA		◆				
Highlands and Islands FA			◆			
Orkney FA			◆	◆		
Scottish Pelagic FA			◆	◆	◆	
North Minch FA			◆			
Inshore FA			◆			

Caithness Static Gear FA					◆	
Fishermen's Association Ltd					◆	
East Coast Licensed Small Boat Assoc					◆	
Fife FA (Pittenweem)Ltd						◆
Fife Creel FA						◆
The 10 metre and under Assoc						◆
Cockenzie & Port Seton FA						◆
Arbroath & Montrose Static Gear Assoc						◆

Source: (IFG, 2013)

Annex D:

Fishing areas in the EU



(European Communities, 2009)

Annex E

Simplified government system ranging from EU level to Local level

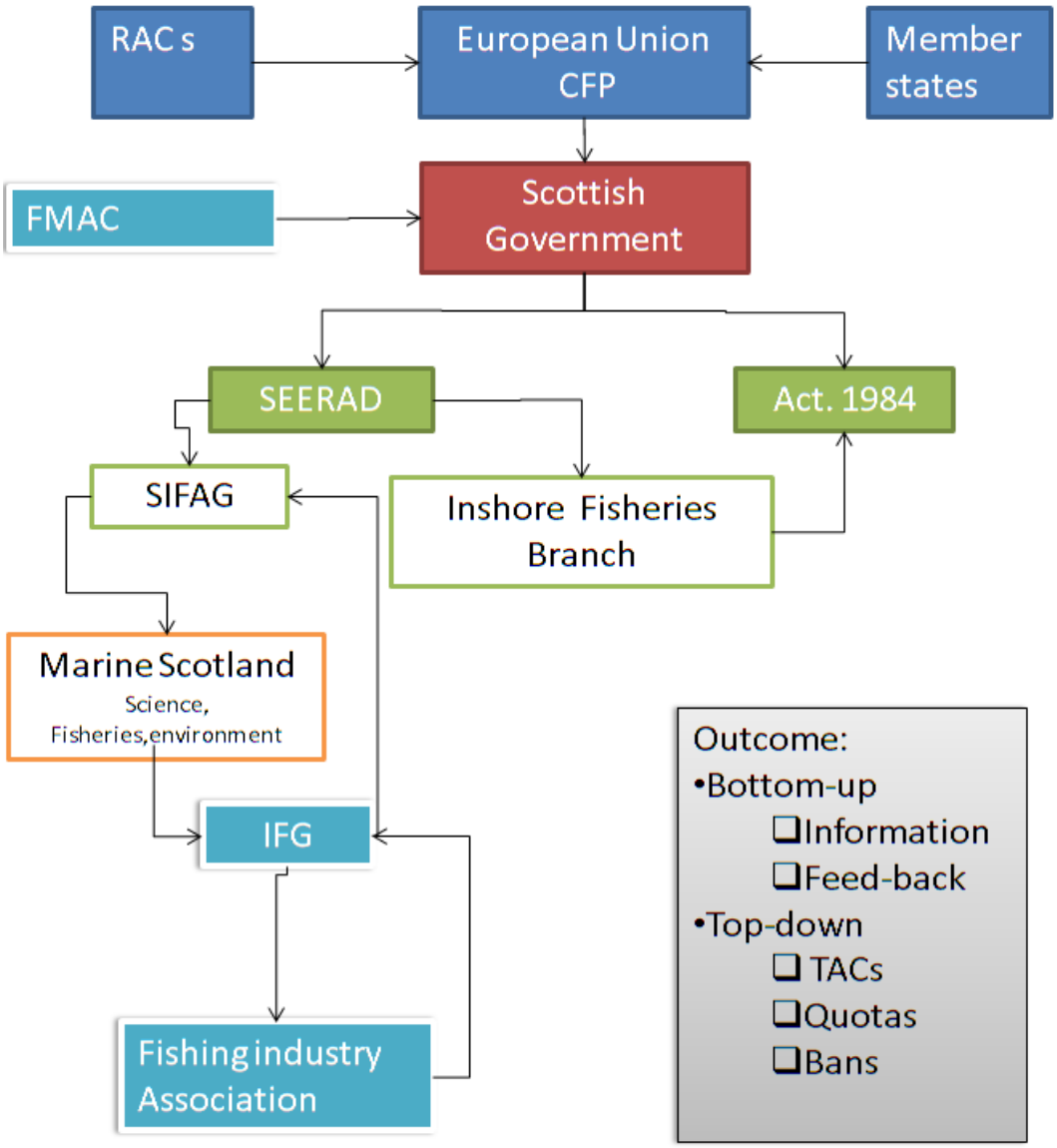


Figure 19 Simplified government system, produced with the use of the Policy chapter and the help of (The Scottish Government, 2010a)

Annex F

Results of the interviews

Table 5 Introduction

Who	When	Where	Boats	What	How	Other boats
Neil Campbell 19th April 2012	Around 1960-now	Summer Isles Harris and around	Buckie and Fraserbourgh Avoch boys-Rosehall Own boat 1979- other boat	Herring Prawns prawns	Drift nets Ring nets Creel fishing trawling	Partner the Mologna
Alistair Jack 6th March 2012 Alistair Jack's father	1952-1987 1940s	Gairloch Ullapool	True Love Rose Ochs 1970 Monadhlisadh	Herring	Ground nets and long lines Small ring nets	50s 170 drift net boats caught herring
Sandy Patience 6th March 2012	1959-1987	West coast	Rabin 1962- Integrity Constance	Herring	Ring nets	1950s Avoch boats: Migh na Mara, Constance, Mightian Ban and the Betty 1960s Constance; herring Ferry strike
John Grant MacDonald (Ian) + Bridget 8th May 2012	Around 1952- 1962-1964	Gairloch Badacro Clive and Barrag	dingy with his father 1962-1963 Maroon	Seasonal – herring	Gill nets	
Facquahar MacRae 11th of June 2012	1948-1960	Stornoway Uist and Barra	1948 Clan Maclay 1949/57 Sea Flower 1955 Auch	Herring and Cod	First ring net then drift nets	

			boats		Ring nets and drift nets	
Willie Matheson 24th January 2012	Before - 1985	Gairloch	Local fishing Mr. Powerie 1980/85 Buckie and Fleetwood	Herring, haddock, cod Lobster fishing Salmon Lobster	Great Lines Flipboard Trawling	
Alan Bush 22th of June 2012	1963? - 1968 (for several years	Little Loch Broom	Mr. Powerie; Norwegian boat	Salmon and Prawns	Bag nets	63-64 2 drifter fishing boat wrecked Klondykers until 1980s; herring 62-63 good herring; 60 boats
Donald John MacDonald 30th May 2012	1971-1974	Harris	Kathleen	herring	Drift nets and ring nets	Klondykers were around
Alistair McLeod 9th of November 2012 Alistairs father Alistairs grandfather	1978 - now 1963-1971 1951	Applecross West coast ; Kyle	Mariane True Love	prawns Herring Seasonal fish	creelfishing Ring nets (last of this area) Ground nets and long lines	Around 60s: Catherine and the Johann
Kenny Livingstone 9th of November 2012 Grandfather Kennys	1972-now - 1949?? -1987 ??	Loch Torridon Ullapool and around The Cley; Ullapool	Clan Maclay; Sea Flower	Prawn Seasonal herring	Ground nets Ring net and then drift nets	

father		Mellvaig				
John Murdo Mackenzie 17th of January 2012	Before-during and after war	Local lochs	7 or 8 local boats; just whoever was going	Herring Seasonal fishing	Hand lines	60s Marine lab boats
Roderick Maclever 17th of January 2012	now			Lobster crab and herring	Drift nets, lobsterpots	
Derek Roxbrough - Roxy	1969-1982	Loch Torridon	The Rely	Cod, line, haddock, herring Algae Lobster	Nets pots	1970s Achilles and the Sundry; herring
Alexander Macleod-Sandy	1963-	Cape wrath, Lewis side, Harris, the Minch	Finish and reed family 1970 Monadhlisadh	Herring herring	Ring nets driftnets	1966 prawn pot experiments Castle Moile sweet home gailach and Skye

Table 6 Introduction 2

Who	Methods	Work	Policies
Neil Campbell 19th April 2012	Echo sounder Sea gulls Piano wire	Left Monday afternoon and arrived on Thursday afternoon we laid at anchor. Thursday afternoon we start fishing it was just to calm down and beautiful night fishing.	The license started in the 80s Stopped herring in the late 1970s No licenses today
Alistair Jack 6th March 2012	Reading the sea; moon, Phosphorescence ultra sound Piano wire to indicate the shoal wooden hammer radar on the Spire	Came home every weekend; Alan Macgregors folks were the drivers We left Monday morning at 6 and stayed on the boat	
Sandy Patience 6th March 2012	Direction finder, compass, echo sounder	6 days started from Monday- Saturday; no stove Facilities were very basic	Until 70s we didn't deal with the world market Unemployment benefit subsidies Hygiene and temp of fish
John Grant MacDonald (Ian) + Bridget 8th May 2012	Echo sounder Smell of fish Gannets	Fished locally didn't have sleeping space on the boat Season fishing	Had to drive to Gairloch for the boat, so nobody could cheat Nowadays full remind
Facquahar MacRae 11th of June 2012	Sea flower: Seagulls, oil Piano wire, sea spotting Auchboys: Echo sounders	Went away on Monday came back 2 or 3 weeks later Worked the nights got some sleep went to the market	Limit amount you could catch, per man amount of crans Grants and loans for the boats
Willie Matheson 24th January 2012	Piano wire Father to son	Long days from 5 o'clock till midnight with the ground nets Salmon fishing till 1	After World War II: grants for boats 1970s some sealochs being closed from

	Modern: put it in a map	then back to lobster	trawling
Alan Bush 22th of June 2012	-	Went out Monday night and came back on Friday or Saturday.	-
Donald John MacDonald 30th May 2012	Pre echo sounders and Baskin sharks, sea birds, piano wire	I started in the herring when I was 16 it was all ring and drift nets	1978 Herring ban for 3 year Strict quotas now
Alistair McLeod 9th of November 2012 Alistairs father	Birds signs Modern boat Father to son	I got a part-time, I work in the local hotel in front of our house, I work there three days a week, and I fish 2-3 a week	83 when the three mile limit went away
Kenny Livingstone 9th of November 2012 Kennys father	Own modern boat; but still can use the skills of his dad Fishing from the head	For ten years in Marine lab- research about herring spawning grounds	1974 herring ban in the sea lochs Since 1974 ban on fishing with mobile gears
John Murdo Mackenzie 17th of January 2012		I was only just fishing not in a commercial way, just going out with some people. Fishing for lings and prawns, small lines	
Roderick Maclever 17th of January 2012	Sonar equipments	We pick them up 5 days a week and they pay a good price for it (about lobsters).	Life jackets for dogs
Derek Roxbrough - Roxy	Big boats had 180 pounds of electronic equipments in the 1970s Labour sonar's Sea gulls	Fished locally It was an up and down living sometimes, but a very good shopping in Rassverdeal they worked with a bill	Taken the 3 miles limit away Huge trawlers Fishermen's getting loans for big boats with technology
Alexander Macleod-Sandy			

Table 7 Ecological

Who	Sub-species herring	Spawning grounds	Where	Causes of Disappearance	Most herring
Neil Campbell 19th April 2012	Looked different; were bigger could be a separate species	Gravel	Mellvaig Green coast Minch	Not overfishing; just a quarter out now Can be sea temperature	500 cranes we had in one in Loch Maree 4 full boats, maybe there were 600.
Alistair Jack 6th March 2012	Inner stock in the Minch	Gravel and coral grounds (Maerl)	Outer Side of Harris Mellvaig Greenstone point Stoer and Ambulg North of Stoer	Following the food Sea temperature; Temperature needs to be correct for spawning	60s fold in 4 boats; intergrity, The Ochs, the Saga and the Mona lia – 1200 crans
Sandy Patience 6th March 2012	Inner stock	Gravel and coral	Outer Side of Harris Mellvaig Greenstone point Stoer and Ambulg North of Stoer	Food and temperature phytoplankton	1963 Loch Broom was full of herring
John Grant MacDonald (Ian) + Bridget 8th May 2012	No but the Minch herring is smaller	Coral beds	Gairloch Mellvaig Lonemore	Following the food; eastern wind was bad No food and Overfishing Weather affecting the fish	63-64 good herring year
Facquahar MacRae 11th of June 2012	Kessock herring/ Minch herring	Shingle Rough and deep	Off Whitby and the Minch Mellvaig Ruha Reidh	Overfishing by purse nets Drift nets caught one size	After the war we had very good years Until late 1960s a lot of herring
Willie Matheson 24th January 2012	Same herring, small herring stay in the Loch until they were	Attached on the bottom	Mellvaig Haris	Overfishing Scallop dredgers ruined the spawning grounds	

	fully grown			Big boats	
Alan Bush 22th of June 2012		-	-	Overfishing and pear trawlers	
Donald John MacDonald 30th May 2012	Stronger herring outside the Hebberdies	Sandy to shingle grounds	Mellvaig, Scora Bay, Muldunaich, Tiree and Goat bay, Minch Kilmaluag	Powerful boats Predators	1974, 38 pounds per cran in Stornoway for summer herring
Alistair McLeod 9th of November 2012 Alistairs father	Different streams of herring but same species	Maerl beds	Rassia shore Loch Shieldaigh Gairloch	Following the food, Not sustainable fishing Overfishing Temperature change	-
Kenny Livingstone 9th of November 2012 Kennys father grandfather	West coast seems to have a smaller type of herring. Getting smaller and smaller in the lochs	gravel	Gairloch/Mellvaig	Sea temperature rising	-
John Murdo Mackenzie 17th of January 2012	Loch herring medium sized	-	InverasDale jetty Gairloch Boor Rocks Mellvaig Greenstone point	Overfishing Nothing is going in anymore	1945 with Willie Matheson 290 herring on one line
Roderick Maclever 17th of January 2012	Difference between summer and winter herring	Kelp beds Gravel	InverasDale jetty Boor Rocks Mellvaig Greenstone point Cave up to Naiste	Extreme damage of the sea beds Seals Not the right seasons anymore, wind directions Fish moves a way	1962 lots of herring
Derek Roxbrough -	Kessing herring	Weed not on the bottom	Loch Tornaig Shieldaigh	Improvements in gear and	

Roxy				equipments	
Alexander Macleod - sandy	Different streams of herring, definitely the same	Gravel and coral beds	Rubha Reidh Skye and Stuffin	Trawlers scrape the bottom Following the plankton Temp rising	
Total	**6 different species** **1 not sure** **6 same species**	**13 know about spawning** **6 out of 13 say maerl bed**	**10 says Mellvaig** **3 says Minch &Greenstone point** **3 says Gairloch**	**6 says sea temp** **5 says following the food** **7 overfishing** **3 says bottom destruction**	**1960s was a decade period**

Table 8 time line. 1990 is left out the table, as nothing has mentioned about this time period

Who	1940s	1950s	1960s	1970s	1980s	2000 until now
Neil Campbell 19th April 2012			Avoch boys		Fish was sold on a market until 1980s	Fish in Ullapool and port Henderick because it is shorter. Foreign crew
Alistair Jack 6th March 2012		The disappointed thing was that we emptied the nets in the sea, the loch never recovered of the smell of the death fish. Boats became bigger again.	Technology start moving			Both or sons are fishers (Sandy and I) The last two summers they went to.... that's a long way from home
Sandy Patience 6th March 2012		Was building a new boat called with his cousin Sandy with a spoil? He wanted to have one with a stove on board because we didn't have one Single track roads	Technology start moving Little time for dancing and beers 1968 Gairloch was a herring forth	Ring net was on its way out; purse seine and pear trawling Until 70s we didn't deal with the world market	1987 end of pelagic fish contract	Generation gap Boats are space ships
John Grant MacDonald (Ian) + Bridget 8th May			Lots of herring Bought ice from suppliers-	Remembered when the kids were very young.... I got to go		Keep the money in the small communities, to ban the

2012			they bought the herring thick woolly socks big wellies, thick sock inside, wooden gloves and rubber gloves,	dear, why? Alex got the nets out and got herring		big boat. New plotter so you can see the fish No one is fishing
Facquahar MacRae 11th of June 2012		Auchboats – many superstitions	End of local fishing Bigger boats came in	Prices dropped		Nobody is fishing for herring
Willie Matheson 24th January 2012	great catches by that time, people really depended on the fishery for their living No trade you could learn No electricity No fridge Ring net boats in pairs		crofting with his dad after mum took ill		Lobster fishing until 1o'clock most of the man went to their sheep	Nowadays it is easy to find the fish. Prawn fishing is doing quite well
Alan Bush 22th of June 2012	Fish lorries going to Inverness		Fishers didn't have their own vehicles fish baskets emptied down on the pier	Pair trawlers came in Herring to Ullapool in ice boxes High street Inverness was the stink		No fish in Ullapool processed on the boat

				street		
Donald John MacDonald 30th May 2012	Fishing and crafting is a way of life		Drift and ring nets	The Icelander's had fished their own herring out so they came here, as many as 50		Sons are prawn trawling
Alistair McLeod 9th of November 2012 Alistairs father	Crofting community – sustainable way of living Presbyterian way of life; everything was an act of GOD.	Salted herring as lunch on Saturday	Overlap years with the big purse seine nets Many fishers went to prawns	Crofter		I got a part-time, I work in the local hotel in front of our house, I work there three days a week, and I fish 2-3 a week,
Kenny Livingstone 9th of November 2012 Kennys father Grandfather	Local community; day fishing	Traditional living, not fishing on Sundays Seasonal; went away during the week Fishing as a community you would have get it back	Went out on the East coast boats as scientist; they shared their catch as well			Historically you do not have to clean the fleets in the winter, but now you're cleaning the whole year around,
John Murdo Mackenzie 17th of January 2012	Crofting life No big boats during ww 2 local communities still fished.					Not much left for fishing – still crofts
Roderick Maclever 17th of			Caught herring just with a net,		Sold locally up until 1983	No further for commercial

January 2012			around brackish water			fishing and young people Still fishes for herring 10 fish in 2010
Derek Roxbrough - Roxy			Crofting live in Torridon Trawlers destroyed everything	End 1970s last market Herring put them away on the wagon and sent them away per box at that time	Worked for the Highlands fishermen association – they didn't really listen Lot of east coast boats	what you need to do it built up the market again nobody has been fishing for 10-15 years in Gairloch
Alexander Macleod - sandy		Nets in winter time	Prawns were an untapped source Stopped herring for prawns			