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**Book**

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Nordic Council of Ministers

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# Preface

Fisheries reforms have been discussed and implemented over the last half century focusing at reducing overexploitation of fish stocks and overcapacity of fishing vessels, to ensure the economic outcome to society, while at the same time avoiding large negative social effects on employment and local fishing communities in remote regions.

In these reforms, biological, economic, social and environmental/ecosystem effects are central for the design of the reforms. While consideration of these effects often forms a basis for deciding fisheries reforms, analyses of social effects are often limited to counting fishing vessels that leave the sector and, assuming an average crew size, thereby identifying the potential reform-induced unemployment.

Although this measure provides a rough estimate of employment effects, this is not precise. The reason is that many, especially small coastal, vessels are not fishing full-time and that some fishermen are therefore only working part-time with income from other sectors, that crew size on fishing vessel might vary over time, and that large vessels might be at sea for many days with fishermen working on-board 24 hours a day. Hence, a more reliable measure of possible employment effects of fisheries reforms is desirable.

However, qualitative identification of social effects do not inform about why fishermen leave their occupation, nor do they provide information on whether the exit from fishing is due to the analysed policy reform or would have happened anyway. Employment effects is also connected to salary levels, since the salary in one sector will be compared to salaries in other sectors, and therefore becomes important for a person's choice of job. In fisheries, salary is often determined as a collectively agreed minimum level plus crew shares of earning/profit. Thus, fisheries remain one of the few sectors with profit sharing. Reforms that reduce fishing fleets, typically lead to increased earning/profit per fishing vessel, which, all other things being equal, will increase crew shares and thereby salary. On the other hand, a reduced fleet also demands less labor, inducing a downward pressure on salary levels. Knowledge on salary levels in fisheries is sparse in the scientific literature, with knowledge on salary during fisheries reforms being largely non-existent.

While there is a general demand for knowledge on actual employment and salary in the fishing sector as a whole, this is even more needed for the small-scale coastal fishery. The reason is that coastal vessels often use less days at sea in a year than large vessels and that many coastal fishermen only work part-time, with a larger share of their income originating from other sectors, which may make information of average employment and income inaccurate.

In this report, real employment and salary in the four Nordic countries Sweden, Denmark, Norway and Iceland is identified, based on unique datasets that merge data on income, disaggregated down to employment sectors, of individual fishermen with individual vessel data regarding catch and economy. Focus is on the whole fishery in

each of the four Nordic countries with special emphasis on coastal fisheries. Reasons why fishermen leave the fishing trade are also identified. The aim of the report is to provide knowledge on the role of employment and salary, identify reasons why fishermen leave the trade, and to improve the knowledge base for fisheries reforms. The intended readers are central or regional civil servants and politicians, researchers and stakeholders with an interest in fisheries.

This report is part of the project Salary and employment in Nordic coastal fisheries, funded by the Nordic Council of Ministers. It consists of four country case studies and a comparison of the results between countries. The Swedish case study is written by Staffan Waldo and Johan Blomquist, AgriFood Economics Centre, Swedish University of Agricultural Sciences and Lund University, where the Danish case study is written by Ayoe Hoff, Max Nielsen and Rasmus Nielsen, Institute of Food and Resource Economics, University of Copenhagen. The Norwegian case is written by Frank Asche and Ole Bergesen, University of Stavanger, where the Icelandic case study is written by Jónas R. Viðarsson, Sigridur Sigurðardóttir and Ragnheiður Sveinþórsdóttir, Matís Limited. The project was coordinated by Max Nielsen, who has also edited the report and written the cross-country chapter.

The authors hope that the report on salary and employment in Nordic coastal and other fisheries will contribute with knowledge on the social sustainability of the sector. It is also their hope that the identification of reasons why fishermen leave the trade can be used as guidelines in the debate of fishery policy reforms.

# Summary

## Introduction

This report identifies employment and salary of Nordic coastal fishermen, and analyses why Nordic coastal fishermen leave the sector. The focus is on Sweden, Denmark, Norway and Iceland, applying unique datasets from each country. The datasets merge vessel, catch, sale and account statistics from the fishery responsible ministries for the individual vessels, with taxable income statistics from the national statistical bureaus for individual persons owning/hired at a fishing vessel. The report contains four country-specific case studies and a comparison of the findings of these case studies.

## Sweden

A total of 1,525 persons were employed with salary from Swedish fishing vessels in 2012. While full-time employment is not known, it is known that on average 65% of the salary of these fishermen comes from fishing, implying that most must be full-time fishermen. 463 persons (30%) of the employed fishermen are coastal fishermen, in the Swedish case meaning that they perform marine fisheries with passive gears. The coastal fishermen had 55% of their salary from fisheries.

The average salary of Swedish fishermen was EUR 31,000 in 2012 and consisted of salary from fisheries and other sectors, as well as from social security (e.g. pensions, sickness leave, parental leave, etc.). Large-scale fishermen earn the highest salary followed by fishermen in fresh water and coastal fishermen. The average salary of coastal fishermen was EUR 28,100. Fishermen on the west coast have the highest salary while those on the south-east coast have lowest. Regional differences might be due both to different target species and different management systems. Higher education is related to higher salary in the large-scale fishery, but in the marine fisheries with passive gear and the fresh water fisheries the relation is more complex. In these cases fishermen with secondary education have the highest salary, i.e. fishermen in the highest educational category have lower salary. In the analysis we include non-licensed fishermen, which is not done in the official statistics. The non-licensed fishermen are less dependent on the fishing sector than those with a fishing license, but they had lower total salary on average.

Fishermen earned salary from other sectors, with the most common being technology/law/business, public administration/education/health, transport (including marine transport). Young fishermen are less dependent on fisheries for their total salary than old, and fishermen with high education are less dependent than those with low.

Over the period 2002–2012, the average fishermen salary increased 27% in real terms, with salary from other sectors being largely constant.

Many fishermen live in households with more than one person. Fisheries contribute with about 50% of the combined salary for the fisherman and spouse. This share is stable over different regions and over trawling, passive gear, and fresh water fisheries.

The analysis on why fishermen leave the sector shows that salary from fisheries is indeed an important factor for the decision to stay or leave the sector. If fisheries salary increases with 30%, the probability of exit decreases by about 2%, which may be compared to the overall exit-rate of 10% in our sample. We also find that an increase in total family income lowers the probability of exit (holding salary from fisheries constant). This result goes in line with the idea that high family income makes it possible for fishermen to remain in the sector even if their salary from fisheries is low. Another finding is that fishermen who own their fishing company is much less likely to exit the sector; the difference in probability of exit between owners and employed is about 20%. Holding salary from fisheries constant, we find that fishermen in the coastal fishery with passive gear have the same probability of exit as fishermen in other types of fisheries.

Fishermen who leave the sector receive higher salary after exit; the average difference before and after exit is about 25%. We find that over 20% of the former fishermen end up working in Marine transport, which is a sector where salary are significantly higher than in fisheries.

## Denmark

1,687 persons were employed on active Danish fishing vessels (understood as having an annual turnover of more than EUR 6,700) in 2012 of which 1,181 could be classified as full-time employed (understood as that more than 60% of their salary is from a fishing vessel). 1,043 or 62% of the employed fishermen are working at vessels below 17 m length and 700 of these are full-time employed.

Danish coastal fishermen can enter a coastal scheme that is open to vessels below 17 m of length. This is voluntary and many fishermen have chosen not to take part in the scheme, as it comprises both benefits and limitations. The numbers presented in this report includes fishermen working at vessels below 17 m length, no matter whether they are part of the scheme or not. Hence, the Danish results are a measure of all fishermen working on active small-scale vessels.

The average total salary (including unemployment benefits, retirement pensions and other social transfers) for all full-time Danish fishermen was EUR 57,600 in 2012, while it was EUR 49,100 for full-time coastal fishermen. Compared with this, the average total salary for the Danish work force was EUR 34,100 in 2012. Thus, Danish fishermen on the average have considerably higher total salaries than the average worker in Denmark. The average salary from fishery alone in 2012 was EUR 49,600 for all full-time fishermen and EUR 42,600 for full-time coastal fishermen. Compared with this, the average salary for full-time employed in 2012 were (i) EUR 48,700 in Danish

Agriculture, (ii) EUR 54,100 in the craftsmen sector, (iii) EUR 58,200 in the process and machine-operator sector, (iv) EUR 48,500 in the sales and service sector, and (v) EUR 51,100 in the office sector. Thus, on the average people employed in fisheries earn more or the same as people employed in "comparable" sectors. In 2012, 233 full-time fishermen took additional salary from other branches while 144 of the full-time coastal fishermen had salary from other branches. The fulltime fishermen had an average salary of EUR 3,200 from other branches (6% of their average total salary) and the full-time costal fishermen had an average salary from other branches of EUR 2,500 (5% of their average total salary).

Over the period 2002–2012, in which individual transferable quotas were introduced in the pelagic fishery from 2003 and the vessel quota share regulation in the remaining fishery in 2007, the average fishermen salary fell 5% in real terms. Hence, while the new regulation has induced larger company profits, the salary of fishermen have not grown.

The results from the analyses of reasons why coastal fishermen left the fishery during the period 2004–2009 show that the major incentives for coastal fishermen to leave the fishery are that they have salaries from other branches. Thus, if the fishermen have other job opportunities the decision of leaving the fisheries seems much easier. Moreover, there is a positive correlation between high salaries from the fishery itself, for fishermen owning their own vessel, and the probability of leaving around the introduction of ITQ regulation in 2006–2007. Salary from pensions has a small but positive and steady influence on the probability to leave throughout the period, which makes perfect sense as older fishermen starting to receive pension in most cases are expected to leave the fishery.

## Norway

12,380 persons were registered as fishermen (with a fishermen having at least an annual salary on EUR 13,400, with time spend on fishing being at least one-third and with salaries in other sectors being below EUR 40,100) in 2012. Of these 10,108 or 82% are registered as full-time employed fishermen. 7,130 persons owns a fishing vessel in 2012 and 2,389, corresponding to 34%, are classified as a coastal fisherman, in the Norwegian case defined as fishermen working on vessels fishing demersal species using passive gears.

Registered and active Norwegian fishermen earned on average EUR 51,500 in 2012. The share of salary from other branches in this number is not known, while salary of full-time versus part-time fishermen is also unknown. The salary of hired fishermen and owners is on average the same. Among the owners of vessels, the average salary for owners of coastal vessels was EUR 61,300, as compared to EUR 39,100 on vessels without licence and up to EUR 192,400 on purse seines. Hence, the owners of coastal fishing vessels targeting mainly cod, haddock and saithe with passive gears earned 20% more than the average of Norwegian fishermen.

The average salary for all occupations in Norway in 2012 was EUR 35,800. That implies that even the lowest paid fishermen without license earns more than the Norwegian average.

The results from the analysis of why fishermen leave the fishery show that salary is an important variable in explaining fishermen exit. If salary increases 10%, the probability of leaving the sector falls 4.7% in the fisheries sector as a whole. For owners of coastal vessels this result is more pronounced, with the probability of leaving being reduced 19% when salary increases 10%. Hence, the salary is more important for the stay or leave decision for owners of coastal fishermen than for other owners of fishing vessels.

## Iceland

4,848 persons were employed on active Icelandic fishing vessels (understood as with more than 50 days at sea a year) in 2012 of which 985 could be classified as full-time employed (understood as that more than 90% of their salary is from a fishing vessel). 1,208 or 25% of the employed fishermen are classified as coastal fishermen (understood as working on fishing vessels below 15 m length). When defining full-time employment as having more than 90% of salary from fishery, only 36 of the coastal fishermen are full-time employed, while if using a 60% limit instead, it counts 551 persons.
Full-time employed Icelandic fishermen earned on average EUR 90,300 in 2012 from working in fisheries and other sectors, which is more than the double of salary in most other professions. Fishermen on the largest vessels i.e. over 50 meters in length, earned the highest salaries on average, followed by fishermen on intermediate size vessels. Full-time fishermen on coastal vessels earned significantly less, on average EUR 47,400. Fishermen on the west coast and in the west Fiords have substantially lower salary than fishermen in other parts of the country. These regional differences are primarily explained by the composition of the fleets, as both of these low-income regions have high proportion of coastal vessels and very few large/pelagic vessels.

A relatively small proportion of Icelandic fishermen have salaries only from fisheries. In 2012 the average fishermen had 82% of his/her salary from fisheries, while the average coastal fishermen obtained 78% of his salary from fishing. It must be noted that 16% of fishermen were less than 50 days at sea in 2012, but many of these took part in the coastal jigging system that is only open during the summer months. There is little/none correlation between average salary and the fishermen's age, except that the youngest age groups (< 25 years) have lower salary than the other age groups, which is most likely explained by that part of the youngest age groups are only working at sea during school brakes.

Icelandic coastal fishermen that are working full-time have on average 40% lower salaries than full-time fishermen in the whole Icelandic fleet. The Icelandic coastal sector is characterised by the fact that catches are unequally allocated between vessels. The remaining fleet has gone through large-scale optimisation processes, where quotas have been concentrated on few and well-equipped vessels, with the rest being

decommissioned. The implication is that largely all fishermen working on the large vessels have high salaries, with fishermen on the largest vessels and in the pelagic fleet having extremely high salaries. Hence, incentives for fishermen to leave the coastal sector and move over to other sectors exist. The individual transferable quota system is a major obstacle for new entry into the coastal sector, as many of the younger fishermen that would potentially like to start their own business with a small coastal vessel, are unable to do so, due to the high investment in quotas.

## Cross-country comparison

While coastal fishery is considered to be performed with small vessels fishing close to shore, no internationally agreed understanding exists. Coastal fishery is rather defined by the vessels included in special schemes in the legislation, that provide economic support or protect particular vessels from being taken over by larger, and typically more efficient, vessels. These schemes differ among countries and change over time. The legislation in the Nordic countries uses vessel length, gear, time of fishing trips and closeness to shore as criteria for special treatment. Some arrangements are mandatory, others voluntary.

In this report, a simple country-specific approach is chosen, considering fishing in Iceland and Denmark as coastal when performed with vessels below 15 m and 17 m, respectively. In Norway, coastal fisheries include vessels targeting demersal species using passive gears, while in Sweden coastal fisheries include marine fisheries with passive gears (excluding lake fishing). Hence, coastal fisheries in Norway and Sweden include larger vessels using passive gears, while only smaller vessels are considered coastal in Denmark and Iceland. Most vessels are, however, small also in Norway and Sweden.

Norway and Iceland have the largest fishing sectors in the Nordic countries, with 12,380 and 4,848 persons having a salary from fisheries, respectively. Denmark and Sweden follows with 1,687 and 1,525 persons. The same pattern appears for the coastal fishery. In Sweden, Norway and Iceland, between 25 to 34% are working in the coastal fisher. In Denmark, 62% of the fishermen are working at vessels below 17 m, with substantial less taking part of the voluntary costa arrangement.

The salary level for fishermen is by far the highest in Iceland with EUR 90,300 (for an average full-time fisherman) on average in 2012, followed by Denmark with EUR 57,600 for an average full-time fishermen and EUR 56,500 for an average person with salary from fisheries, Norway with EUR 51,500 (all registered fishermen) and Sweden with EUR 26,000 (all persons with salary from fishery). Hence, the two countries using individual transferable quotas in fisheries management have the highest salary levels. For coastal fisheries, the pattern differs. The salary is highest in Norway with EUR 61,300, followed by Denmark with EUR 49,100 for full-time fishermen and EUR 45,800 for all persons with salary from fishing, Iceland with EUR 47,400 (full-time fishermen) and Sweden with EUR 28,100 (all persons with salary from fishing). However, the Norwegian salary only includes owners of fishing vessels and not hired labor earning

less than owners. Furthermore, the Norwegian understanding of coastal fisheries includes larger vessels, which can lead to an overestimation of the salary level.

While these numbers indicate that salaries are highest in Iceland and lowest in Sweden, they are gross incomes, of which the purchasing power is not directly comparable. This indication is, however, confirmed by the fact that the salary of Icelandic fishermen is almost the double of the average salary in the country, while the salary of Swedish fishermen is below the national average salary. The salary of both Danish and Norwegian fishermen is above the national averages. For coastal fishermen, salary is above the national average in all the countries except Sweden.

The reasons behind these patterns remain speculation, but might include the following: Differences in income taxes; differences in the richness of the fish stocks and catch rates with Iceland and Norway having an advantage compared to countries fishing on Baltic Sea fish stocks; differences in the country dependency of the fisheries sector measured as the sectors contribution to GDP; differences in fisheries management where countries using individual transferable quotas, Iceland and Denmark, having an advantage; differences in labor demand for fishermen following differences in the speed of fleet reduction and with macroeconomic differences.

Results from the regression analysis show that salary from fisheries is an important factor for the decision to stay or leave the sector. In Norway and Sweden, it is found that when salary increases, the probability of exit falls. In Denmark, the opposite result is obtained, which, however, is due to that fisherman salary increase substantially in the year of exit, since they receive a large payment in capital income when selling their permanent quota shares. The result confirms that fishermen salary is an important determinant in fishermen's choice of staying or leaving.

The analysis indicates that fishermen on large vessels receive high salary, but also that coastal fishermen receive higher salary than national averages in Iceland, Denmark and Norway. In Sweden it is lower. The analysis further finds that since salary affect fishermen's chance of staying active, special advantageous arrangements for coastal fishermen may work depending on country specific regulations and salary levels.

# 1. Introduction

The future of the coastal fishery is currently debated in the Nordic countries. The debate appears after decades of continued reductions in employment, following technological development, regulation aiming at reducing overexploitation/ overcapacity, reductions in some fish stocks and reduced subsidies. This development has led to increased focus on special advantageous regulatory schemes for coastal fisheries, available e.g. through allocation of larger quotas than historical catches justify. The special treatment is justified by the desire to maintain commercial small-scale fisheries, which help to maintain life and activity in small ports in remote areas. With the special treatment, limitations in trading fish quotas typically follow. Coastal vessels can in some of the Nordic countries only trade quotas with other coastal vessels, not with the larger and typically more efficient vessels. However, in other countries the trade is less restricted.

Maintaining coastal fishery is a political choice, motivated by the fishery being a unique activity that must be maintained at all costs. It is argued that coastal fishery helps to maintain life and activity in small harbors; that coastal fishery affects settlement and employment in remote areas positively; that coastal fishery create tourism in small ports; that coastal fishermen achieve higher sales prices for their fish via local marketing and that coastal fishery is more environmental friendly than other fisheries, i.e. that coastal fishery is a sustainable activity that creates social cohesion in remote areas.

Is this an accurate description of the coastal fisheries? Or is it rather the case that coastal fishermen land where they get the highest price, in large harbors with fish auctions since local markets cannot absorb their catches; that coastal fishermen could earn substantially more and by that contribute more to local communities in alternative employment, since the salary of coastal fishermen is small; that coastal fishery has no major effect on attracting tourists; and that environmental friendliness of a kilo of fish is the same as in other fisheries? In other words, that coastal fishery is an economic activity in remote areas that works exactly the same way as other industries.

The debate on the future of coastal fisheries seems to be guided by emotions and inconsistent arguments both for and against. A need for a knowledge-based debate exists.

While this report doesn't provide full knowledge on the situation for the Nordic coastal fisheries, it contributes with knowledge on some aspects. The purpose is to identify employment and salary of Nordic coastal fishermen and to identify why Nordic coastal fishermen choose to leave the sector. Iceland, Norway, Denmark and Sweden are analysed separately with different definitions and choice of statistical analysis tools. While this methodological choice provides more details, it also makes comparison more difficult. However, lessons to be learned from comparison remain. Unique datasets from each of these countries are used. The datasets merge catch, sale and account

statistics at vessel level from the fishery responsible ministries, with taxable income statistics from the national statistical bureaus for individual persons owning/hired at a coastal fishing vessel. Hence, while earlier studies have focused at the vessels, this report focuses at people working at the vessels. The analysis, that identifies reasons of the exit of coastal fishermen, is performed with logit or probit regression. This analysis is, despite using a very detailed dataset, also limited by few observations since few coastal fishermen leave the sector in some years. Therefore, the regression analysis is made for all fishermen and not only for the coastal fishermen for some of the countries.

While no general applicable understanding of coastal fishing exists, it is often understood as fishing close to shore using small vessels at sea for a limited period. Between the Nordic countries, the accurate understanding varies between countries, and even within the single country between years. In this report, an approach is chosen that fits with the possibilities/limitations of the obtained data. Thus the approach may depart in some parts from the national understanding of what coastal fishing is at the time of writing. Hence, although the intention is to follow the national understanding, some deviations exist between the vessels included in this analysis, and vessels considered coastal fishing vessels in the legislation. Nevertheless, the included vessels are a reliable representation of the vessels that forms part of the regulatory framework for coastal vessels. This point of departure implies that some differences exist between the Nordic countries. For Denmark, all vessels below 17 m length are included, while the limit for Iceland is 15 m. For Sweden, coastal fisheries include marine fisheries using passive gears (i.e. not freshwater fishery) and for Norway coastal fisheries include demersal fisheries using passive gears.

Fishery employment can be measured in different ways. In this report, employment in coastal fisheries is identified based on the share of fishing salary in relation to total salary. Thus, the threshold value can vary between countries.

The report is also expected to provide new knowledge on salary and employment levels in Nordic coastal fisheries. Such knowledge is important, since published statistics do not provide accurate information. Fishing vessel registers exist, with employment being calculated from a fixed number of fishermen working on each vessel. To the extent that coastal fishermen have part-time jobs in other sectors, this is not an accurate measure of employment. Moreover, many coastal vessels are not active year-round and some are completely inactive. Another measure of employment is based on questions to companies, at a given point in time a year, on the number of employed. To the extent that seasonality exists, this is not an accurate measure of employment. Finally, fishery account statistics in some of the countries include full-time employment, but this measure is typically only for a sample and calculated based on fishing days. This induces statistical uncertainty and does not allow disaggregation of data. Thus, significant limitations exist in the opportunity of providing accurate information on the sector's employment and salary. Since this project identifies employment in the coastal fishery based on the share of total salary earned in coastal fishery, a more accurate picture of the employment than earlier is obtained.

Knowledge on why coastal fishermen leave is also important in the debate on the future of Nordic coastal fisheries, in particular for policy consideration on the possible

need for special advantageous schemes for small scale/coastal fishermen. Such schemes work by ensuring that the current coastal fishermen continue in business. Hence, if age and salary earned in other sectors are the main determinants of why fishermen leave, such special arrangement might not change much for the current fishermen, since they would have left anyway. If, however, low fishery salary is the most important reason for leaving, special arrangement that leads to improved salary may keep more coastal fishermen active. Moreover, special schemes may also form the basis for improved conditions for future coastal fishermen. As such, information on whether low fishing salary versus high salary from other branches are the most important reasons for leaving are important factors when deciding whether there is a need for special advantageous schemes for small scale/coastal fishermen. This is also the case if age does not affect the probability of leaving.

The report is organized as follows: Chapter 2–5 presents the case studies on salary and employment in fisheries, in particular in coastal fisheries, respectively in Sweden, Denmark, Norway and Iceland. Chapter 6 first presents a cross-country comparison of the salary levels relative to other national sectors, followed by a cross-country comparison of why coastal fishermen leave the sector.

# 2. Salary and employment in Swedish coastal fisheries

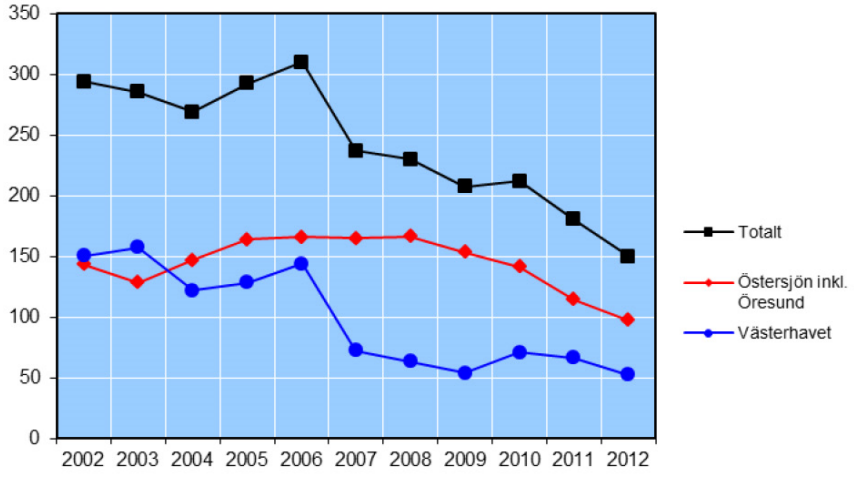
## 2.1 Introduction

This chapter contains seven sections. Following the introduction, the framework conditions for the Swedish coastal fisheries are presented, followed by a discussion of the data underlying all indicators and analyses in the Swedish case study in section 3. The fourth section contains a presentation of socio-economic indicators for the Swedish fishery. In the fifth section, differences between coastal and large-scale fisheries are analysed. Since Sweden has a large fresh water fishery, this is presented separately from the marine fisheries. Section six contains an econometric analysis of why Swedish fishermen exit the fishing sector, while the last section sums up the conclusions of the chapter.

## 2.2 Framework conditions for the Swedish coastal fisheries

Swedish fisheries consist of both marine and fresh water fisheries. The Swedish fisheries in marine water landed 150,000 tons of fish and crustaceans in 2012. Figure 1 shows the development since 2002 in total and for the North Sea (including Kattegat and Skagerrak) and the Baltic Sea separately.

**Figure 1: Catch per sea area. 1000 tons**

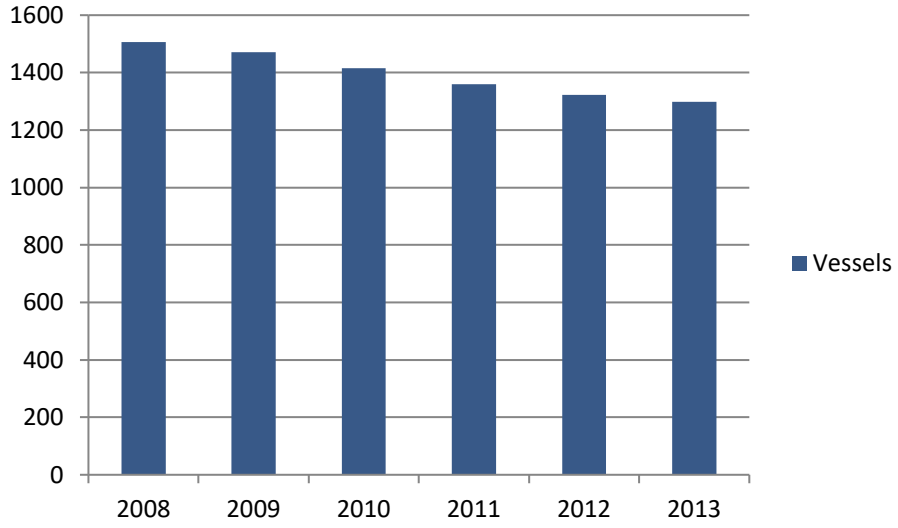



Source: Swedish Agency for Marine and Water Management, SwAM (2013a).

The economically most important species are herring, sprat, cod, Norwegian lobster, and North Sea shrimp. The total catch value was EUR 90 million in 2012 which is a substantial reduction from about EUR 115 million in 2011. The fresh water fishery landed 1,484 tons in 2012 at a total value of EUR 11 million. The most economically important species in the fresh water fishery are pike-perch, vendace, and crayfish (SwAM, 2013b).

In 2012 the Swedish fishing fleet contained 1,322 vessels. The number of vessels has been declining continuously for a number of years, and figure 2 shows the development since 2008 (SwAM, 2014a). Similar trends are found for total engine power and gross tonnage.

**Figure 2: Number of vessels in the Swedish fleet 2008–2013**




The Swedish fishery is part of the European Union's common fisheries policy (CFP) which sets the basic framework for fisheries management. Most marine stocks are shared with other countries, including the important Baltic cod and herring stocks as well as Norwegian lobster and North Sea shrimp in the Kattegat and Skagerrak. In the CFP many economically important management choices are delegated to the member states, for example how the national quota is allocated among fishermen. Swedish management has not adopted a single system for fisheries regulation and quota allocations, which thus varies considerably over different fisheries. Of special interest for the results in this report is the system with Individual Transferable Quotas (ITQ) in the large-scale fishery for pelagic species (herring, sprat, and mackerel) which is expected to increase the economic viability in this segment. The effects of the ITQ system is not analysed separately in the present context, but these fishermen will appear in the analysis as fishermen based on the Swedish west coast fishing with marine trawls.

Many Swedish fishermen own their own company. Thus, the salary and the profit from the company are dependent on each other. A high salary will reduce the profit and vice versa. The income statistics used in this report includes both salary and profit from

own companies. For vessels with more than one fisherman it is common with a system where the salary of employed fishermen consists of a fixed part and a part that depends on the revenues from the fishing operation.

## 2.3 The dataset

The database used in the Swedish case study combines two datasets with administrative data from Statistics Sweden; the Longitudinal Integration Database for Health Insurance and Labour Market Studies (LISA) and the Multigenerational Register. The LISA database includes a broad range of indicators on demographics, labour market outcomes and level of education for the Swedish population (16 years and older) living in Sweden. In this study, the sample consists of: i) individuals receiving their income from work or business classified as fisheries according to the Swedish Standard Industrial Classification (SNI) code[1] and ii) their spouses. The data covers the period 2002 to 2012.

Basing the sample on the SNI code differs from the standard definition of Swedish fishermen. The official definition is based on fishing licenses permitted by the Swedish Marine and Water Management Agency (SwAM). A fishing license is necessary for fishing in public waters, but it is possible to be employed at a fishing vessel without a license (Swedish; *lottkarl*). It is also allowed to fish in private waters without a fishing license. Thus, the number of fishing licenses does not cover the entire population performing fishing activities in Sweden. Basing the sample on SNI codes solves this issue, but the sample will suffer from missing data due to missing SNI codes. This problem is more severe in the beginning of the period as the number of missing codes decreases over the years. Because of this, the number of fishermen in the sample increases during the period which is the opposite trend as the number of licensed fishermen in official statistics which is decreasing. Due to this, the number of fishermen is not compared over time in this study. Further, the sample only includes fishermen with at least some income from fisheries, i.e. individuals with missing income or income equal to zero are not included. This also differs from counting fishing licenses since a fishing license is permitted for a couple of years, and it is not necessary for a licensed fisherman to actually fish (although not doing so will reduce the possibility for a renewed license).

In the following section a number of statistics on the income of Swedish fishermen are provided. Several indicators of income are used in the tables:

[1] The SNI code is identical to the classification of economic activities in the European Community (NACE).

- *Income from fisheries*. This is income earned from working in the fishing sector, excluding all social benefits such as unemployment support, support for absence due to illness, etc.
- *Total earned income*. This is the combined income earned from working in the fishing sector and from working in other sectors.
- *Income from social security* systems including retirement funds, unemployment benefits, absence due to illness, support for parental leave, etc.
- *Total income*. This is the sum of incomes from 1–3 above.
- *Fish/Total earned income*. This is the share (%) of total earned income that comes from the fishing sector.
- *Fish/total income*. This is the share of total income (i.e. including social security) that comes from the fishing sector.

## 2.4 Salary and employment in Swedish fisheries

Table 1 contains income for the 1,525 fishermen included in this study. Of these, 972 had a fishing license.[2]

As shown in table 1, the average total earned income for a fisherman in 2012 was EUR 26,000. This could be compared to the Swedish average income in 2012 of about EUR 41,000 (Statistics Sweden, 2016a), and to the average income in agriculture, EUR 30,000 (Statistics Sweden, 2016b). These income figures are defined for full-time employment, and are thus not directly comparable to the fishermen for whom we have actual incomes.

About EUR 20,000 or 80% of the fishermen's income is generated from fisheries. In addition to this, the average Swedish fisherman receives social benefits due to retirement, sickness leave, parental leave, etc. of about EUR 5.000 per year. In all, the total income (not including capital income) is on average about EUR 31,000.

**Table 1: Income for fishermen 2012, EUR**

| | Obs | Income, Fisheries | Income, Total earned | Income, Social Security | Income, total | Fish/Total earned | Fish/Total income |
|---|---|---|---|---|---|---|---|
| All | 1,525 | 20,116 | 26,002 | 5,017 | 31,019 | 80% | 63% |
| **Sub categories** | | | | | | | |
| Not retired | 1,194 | 22,529 | 29,469 | 1,781 | 31,250 | 77% | 71% |
| License | 972 | 23,294 | 27,066 | 5,091 | 32,157 | 89% | 71% |
| No license | 551 | 14,567 | 24,188 | 4,902 | 29,090 | 65% | 48% |

[2] This corresponds to about 60% of the 1606 licensed fishermen in Sweden in 2012.

Excluding fishermen that have received retirement payments from the sample, the average earned income increases to about EUR 29,000. Licensed fishermen do on average have higher incomes than fishermen without a license both from fisheries and total earned income. The licensed fishermen are more dependent on income from fisheries than those without a license.

Table 2 shows the income for fishermen categorized as either employed, having their own company, or having their own limited company (Ltd company). The earned income is considerably larger for fishermen with Ltd companies, almost twice the income compared to having another own company. Taking the social income into account the differences are reduced. Interestingly, fishermen who are employed, i.e. they do not have a company of their own, earn a considerably lower share of their income from fisheries than other fishermen, 56% compared to 92% of total earned income.

**Table 2: Income (EUR) for fishermen, 2012. Employment or own company**

| | Obs | Income, Fisheries | Income, Total earned | Income, Social Security | Income, total | Fish/Total earned | Fish/Total income |
|---|---|---|---|---|---|---|---|
| Employed | 517 | 15,433 | 28,450 | 3,697 | 32,147 | 56% | 45% |
| Own company | 838 | 19,631 | 21,650 | 6,048 | 27,698 | 92% | 69% |
| Own company, Ltd | 170 | 36,750 | 40,007 | 3,949 | 43,956 | 92% | 83% |

In 2012 about 60% of the Swedish fishermen only had income from the fishing sector, while about 40% had income from other sectors as well. These shares are relatively stable in the period 2002 to 2012. Table 3 shows the income from other sectors than fisheries categorized by sector. If a fisherman has at least some income from another sector, he/she is categorized into that sector. Thus, if a fisherman has income from two other sectors, he/she will be included in both.

The most common other sectors are technology/law/business, public administration/education/ health services, and transport. Transport to a large extent consists of fishermen involved in marine transport, which is directly linked to the human capital expected to be achieved in fisheries. Only few fishermen are involved in sectors that are related to fishing, such as fish processing and fish retailing. As can be seen in the rightmost column, income from other sectors constitutes a considerable share of total earned income (22–53%). Total earned income is largest in marine transport followed by fish processing. On average, fishermen that have income from another sector have about 20% higher earned income than those who do not.

**Table 3: Fishermen's income (EUR) from other sectors, 2012**

| | Obs | Income, other sector | Income, Total earned | Other/Total earned |
|---|---|---|---|---|
| Agriculture and forestry | 15 | 4,837 | 17,621 | 38% |
| Manufacturing | 90 | 13,655 | 30,703 | 47% |
| *Fish processing* | *36* | *7,713* | *31,874* | *28%* |
| Construction | 43 | 15,552 | 29,288 | 53% |
| Retail and wholesale trade | 81 | 9,298 | 25,729 | 34% |
| *Fish retailer* | *10* | *6,761* | *26,723* | *33%* |
| Transport | 113 | 18,210 | 38,376 | 45% |
| *Marine transport* | *101* | *19,213* | *40,455* | *46%* |
| Hotel and restaurant | 32 | 5,411 | 17,252 | 40% |
| Technology, law, business | 165 | 6,843 | 28,581 | 24% |
| Public admin, education, health | 117 | 12,215 | 26,128 | 44% |
| Other services | 63 | 4,628 | 28,425 | 22% |

Income from fisheries and total earned income are presented in table 4 by age group. The group > 60 contains retired fishermen, and thus the discussion will be focused on the groups 17–30, 31–45 and 46–60 years.

A first observation is that the number of fishermen is lower in the groups with younger fishermen (observe that all groups have the same age intervals except the first group which is short by one). This indicates that the recruitment of young fishermen is low.

**Table 4: Income (EUR) and age, 2012**

| Age Group | Obs | Income, fisheries | Income,Total earned | Fish/ Total earned |
|---|---|---|---|---|
| 17–30 | 248 | 16,128 | 21,991 | 66% |
| 31–45 | 342 | 26,402 | 35,069 | 77% |
| 46–60 | 545 | 23,536 | 29,838 | 82% |
| > 60 | 390 | 12,363 | 15,239 | 89% |

The income from fisheries is largest for fishermen between 31 and 45 indicating a peak in fisheries income at these ages. Turning to the importance of fisheries income, a pattern appears that the younger the fisherman, the less important are fisheries income; 66% for 17–30 while above 80% for 46–60. Thus, younger fishermen to a larger extent have income from other sectors. However, the youngest fishermen have lower income than the other groups also when comparing total earned income.

Income differs significantly between educational levels as shown in table 5. Fishermen with only primary education (less than 10 years) have lower incomes both from fisheries and combined with incomes from other sectors. Fishermen with higher education (>12 years) have the highest incomes. Interestingly, the fishermen with low educational level are more dependent on fisheries for their income (86% from fisheries) than those with higher educational levels (77% and 74% for secondary and higher education respectively). Combining the findings on age (table 4) and education (table 5) shows that old fishermen and fishermen with low education are more dependent on income from fisheries than young or well educated individuals.

**Table 5: Income (EUR) and education, 2012**

| | Obs. | Income, fisheries | Income, Total earned | Fish/Total earned |
|---|---|---|---|---|
| Primary education | 605 | 18,264 | 21,859 | 86% |
| Secondary education | 682 | 20,191 | 27,188 | 77% |
| Higher education | 238 | 24,612 | 33,135 | 74% |

Turning to regional differences, table 6 shows the income for fishermen in five Swedish regions (based on municipality of residence). These do not correspond to NUTS regions, but follow a classification based on coastal regions. The first is inland regions where fishing takes place in the numerous lakes and rivers (although some marine fishermen might live in the inland). The marine coastline is divided into the northern east coast which is the coastal line north of Stockholm, the southern east coast which reaches from Stockholm down to the South coast. The south coast is defined as the counties Skåne and Blekinge, while the west coast is defined from Halland to the Norwegian border. Observe that fisheries in the coastal regions might take place in fresh water (e.g. in rivers). A discussion on fresh and marine water fisheries are provided below.

**Table 6: Income (EUR), by region from fisheries and other sectors, 2012**

| | Obs. | Income, fisheries | Income, Total earned | Fish/Total earned |
|---|---|---|---|---|
| Inland | 80 | 20,586 | 26,476 | 82% |
| North East coast | 216 | 13,470 | 20,980 | 70% |
| South East coast | 192 | 12,999 | 17,336 | 81% |
| South coast | 265 | 16,225 | 21,751 | 81% |
| West coast | 772 | 25,033 | 30,972 | 82% |

The largest region by number of fishermen is the Swedish west coast with 772 fishermen. This is also the region with the highest incomes. Inland fishermen have the second largest income followed by fishermen on the south and east coast. There are several possible reasons for the income differences as both species caught and management systems differ among regions. For example, the south coast is heavily dependent on Baltic cod which has had problems with small fish sizes in recent years. The west coast contains the Swedish shrimp and Nephrops fisheries, as well as the large-scale pelagic fleet which is the only ITQ managed fishery in Sweden. Notably, the fishermen at the northern east coast are considerably less dependent on the fishing sector than those in other regions. A possible explanation is that this part of the sea is covered in ice during winter which shortens the season.

In table 7 the real income from fisheries (2012 year prices) from 2002 to 2012 is presented. The real income from fisheries has increased by 25% over the period, which is approximately the same development as for the rest of the economy (Statistics Sweden, 2015). The development is similar for the total earned income. Notably, the share of income earned in fisheries is stable around 80% for the entire period.

**Table 7: Real income (EUR) 2002–2012. Price level and exchange rate from 2012**

| Year | Income, fisheries | Income, Total earned | Fish/Total earned |
|---|---|---|---|
| 2002 | 16,095 | 20,457 | 81% |
| 2003 | 15,427 | 19,838 | 80% |
| 2004 | 15,228 | 20,279 | 79% |
| 2005 | 15,616 | 20,441 | 81% |
| 2006 | 17,565 | 22,961 | 80% |
| 2007 | 17,850 | 22,816 | 82% |
| 2008 | 17,398 | 22,835 | 82% |
| 2009 | 19,687 | 24,732 | 83% |
| 2010 | 19,833 | 25,288 | 81% |
| 2011 | 20,178 | 25,382 | 82% |
| 2012 | 20,116 | 26,002 | 80% |

The indicators presented above all relate to the individual's income, but many fishermen live in households with more than one person. On average, 53% of the total earned income for the fisherman and his spouse is coming from fisheries.[3] This is only calculated for fishermen living in households with more than one person. Thus, the income from the fishing sector is an important contributor. This holds for all regions as presented in table 8.

**Table 8: Share of earned income from fisheries for fisherman and spouse, by region**

| | Obs. | Share of earned income |
|---|---|---|
| Inland | 33 | 49% |
| North East coast | 72 | 56% |
| South East coast | 79 | 52% |
| South coast | 125 | 46% |
| West coast | 420 | 54% |

## 2.5 Salary and employment in Swedish coastal versus large-scale fisheries

In this section, the economic and social indicators presented above are split into fresh water fisheries, marine fisheries using trawl and marine fisheries using passive gear. Marine trawling represents large-scale fisheries, while marine fisheries with passive gear represent coastal fisheries. Fresh water fisheries are performed in inland waters and are thus not coastal, but have many features similar to the coastal fisheries since they use passive gears. Fishermen in fresh water fisheries do not necessarily reside in the inland region (i.e. the definition differs from "inland" used in the tables above). The regional classification used in the sections above is based on the fisherman's region of residence (an inland county has no marine coast), while fresh water fisheries used in this

[3] The variable is defined as the fisherman's income from fisheries divided by total earned income for both the fisherman and spouse. If the spouse has income from fisheries this is not included in the share. This is not considered a major problem.

section is defined based on in which water the fishery takes place (fresh or marine). The socio-economic indicators are the same as in the tables above.

As shown in table 9, the combined income from fisheries and other sectors differs between types of fisheries. Marine trawling has the highest income with about EUR 28,800 followed by fresh water fisheries (EUR 23,600) and marine fisheries with passive gear (EUR 22,200). However, marine fisheries with passive gear have somewhat higher social security income. About 80% of the total earned income is generated from fisheries for all three types of fisheries.

**Table 9: Income (EUR) for fishermen 2012, by fishery**

| | Obs. | Income, Fisheries | Income, Total earned | Income, Social Security | Income, total | Fish/Total earned | Fish/Total income |
|---|---|---|---|---|---|---|---|
| Fresh water | 235 | 18,558 | 23,639 | 4,185 | 27,825 | 81% | 65% |
| Marine, passive | 463 | 15,485 | 22,184 | 5,916 | 28,100 | 77% | 55% |
| Marine, trawl | 827 | 23,152 | 28,810 | 4,750 | 33,561 | 81% | 66% |

Table 10 shows the income by fishery for fishermen categorized as either employed, having their own company, or having their own limited company (Ltd). The total earned income is considerably larger for fishermen with Ltd companies for all three types of fisheries. The difference is large, almost twice the income compared to having another own company for all types of fisheries. Taking the social income into account the differences are reduced. For all three types of fisheries, fishermen who are employed, i.e. they do not have a company of their own, earn a considerably lower share of their income from fisheries than other fishermen.

**Table 10: Income (EUR) for fishermen. Employment or own company by fishery**

| | Obs. | Income, Fisheries | Income, Total earned | Income, Social Security | Income, total | Fish/Total earned | Fish/Total income |
|---|---|---|---|---|---|---|---|
| **Fresh water** | | | | | | | |
| Employed | 100 | 14,422 | 23,126 | 3,294 | 26,419 | 67% | 54% |
| Own company | 121 | 19,888 | 21,776 | 5,034 | 26,810 | 91% | 73% |
| Own company, Ltd | 14 | 36,602 | 43,419 | 3,216 | 46,635 | 84% | 80% |
| **Marine, passive** | | | | | | | |
| Employed | 154 | 10,837 | 27,709 | 2,969 | 30,678 | 42% | 34% |
| Own company | 278 | 16,517 | 18,026 | 7,517 | 25,543 | 94% | 65% |
| Own company, Ltd | 31 | 29,313 | 32,030 | 6,192 | 38,223 | 92% | 76% |
| **Marine, trawl** | | | | | | | |
| Employed | 263 | 18,509 | 30,909 | 4,277 | 35,186 | 60% | 48% |
| Own company | 439 | 21,533 | 23,910 | 5,397 | 29,307 | 91% | 72% |
| Own company, Ltd | 125 | 38,611 | 41,604 | 3,474 | 45,078 | 93% | 85% |

Table 11 shows the total earned income categorized by sector for each type of fishery. Sectors with less than 5 individuals are not presented. If a fisherman has at least some income from another sector, he/she is categorized into this sector. Thus, if a fisherman has income from two other sectors, he/she will be included in both.

Common other sectors for all types of fisheries are technology/law/business, public administration/education/health services, transport, and manufacturing. Thus, the additional employments fishermen are engaged in seem not to be highly variable depending type of fishery, although there of course are differences. The exception is marine transport which is common for marine water fishermen, but not for fresh water fishermen.

**Table 11: Income (EUR) from other sectors, by fishery**

| | Obs. | Income, other sector | Income, Total earned | Share, other sector of total earned income |
|---|---|---|---|---|
| **Fresh water** | | | | |
| Agriculture and forestry | 6 | 5,839 | 17,631 | 39% |
| Manufacturing | 15 | 17,602 | 26,496 | 62% |
| *Fish processing* | - | - | - | - |
| Construction | - | - | - | - |
| Retail and wholesale trade | 7 | 11,174 | 19,532 | 49% |
| *Fish retailer* | - | - | - | - |
| Transport | 5 | 15,448 | 25,901 | 51% |
| *Marine transport* | - | - | - | - |
| Hotel and restaurant | 7 | 2,514 | 15,505 | 33% |
| Technology, law, business, etc. | 33 | 6,853 | 27,468 | 25% |
| Public admin, education, health | 31 | 8,347 | 26,408 | 28% |
| Other services | 9 | 2,836 | 31,647 | 12% |
| **Marine, passive** | | | | |
| Agriculture and forestry | - | - | - | - |
| Manufacturing | 33 | 17,320 | 29,931 | 58% |
| *Fish processing* | *9* | *12,587* | *28,573* | *45%* |
| Construction | 13 | 22,054 | 32,668 | 72% |
| Retail and wholesale trade | 24 | 10,878 | 25,197 | 49% |
| *Fish retailer* | *5* | *10,191* | *26,625* | *53%* |
| Transport | 30 | 21,071 | 38567 | 53% |
| *Marine transport* | *27* | *22,305* | *41,081* | *54%* |
| Hotel and restaurant | 13 | 6,660 | 19,178 | 48% |
| Technology, law, economics, etc. | 46 | 9,788 | 25,985 | 34% |
| Public admin, education, health | 35 | 13,934 | 24,259 | 48% |
| Other services | 16 | 7,113 | 20,272 | 34% |
| **Marine, trawl** | | | | |
| Agriculture and forestry | 6 | 5,751 | 20,790 | 50% |
| Manufacturing | 42 | 9,366 | 32,812 | 32% |
| *Fish processing* | *24* | *4,747* | *32,801* | *17%* |
| Construction | 26 | 12,290 | 26,804 | 45% |
| Retail and wholesale trade | 50 | 8,277 | 26,853 | 25% |
| *Fish retailer* | - | - | - | - |
| Transport | 78 | 17,287 | 39,102 | 42% |
| *Marine transport* | *72* | *17,944* | *40,195* | *43%* |
| Hotel and restaurant | 12 | 5,748 | 16,186 | 37% |
| Technology, law, economics, etc. | 86 | 5,265 | 30,396 | 19% |
| Public admin, education, health | 51 | 13,387 | 27,240 | 50% |
| Other services | 38 | 4,005 | 31,095 | 20% |

The total earned income by age group is presented in table 12. The group > 60 contains retired fishermen, and thus the discussion will be focused on the groups 17–30, 31–45 and 46–60 years.

A first observation is that the number of fishermen is largest in the age group 46–60 and that this holds true for all three types of fisheries (observe that all groups have

the same age intervals except the first group which is short by one). The younger fishermen are on average less dependent on the fishing sector than the older. For marine fisheries, the category with the youngest fishermen have a lower dependency, while for fresh water also the second youngest group (31–45 years) has a lower fisheries dependency than their older colleagues.

**Table 12: Income (EUR) and age, by fishery**

| Age Group | Obs. | Income, fisheries | Income, Total earned | Fish/Total earned |
|---|---|---|---|---|
| **Fresh water** | | | | |
| 17–30 | 58 | 13,014 | 18,362 | 72% |
| 31–45 | 52 | 19,681 | 28,770 | 70% |
| 46–60 | 79 | 23,883 | 28,863 | 83% |
| > 60 | 46 | 15,133 | 15,524 | 98% |
| **Marine, passive** | | | | |
| 17–30 | 70 | 13,893 | 20,999 | 60% |
| 31–45 | 83 | 22,402 | 33,062 | 70% |
| 46–60 | 161 | 17,677 | 26,050 | 75% |
| > 60 | 149 | 10,010 | 12,505 | 90% |
| **Marine, trawl** | | | | |
| 17–30 | 120 | 18,936 | 24,325 | 67% |
| 31–45 | 207 | 29,694 | 37,456 | 81% |
| 46–60 | 305 | 26,538 | 32,091 | 85% |
| > 60 | 195 | 13,507 | 17,262 | 85% |

Comparing the income level between age groups shows a somewhat different pattern between fresh and marine water fisheries. For fresh water fisheries, the income increases with age until the age of retirement (group >60 years). However, for marine fisheries, the income peaks between 31 and 45.

It was shown above that average income increases with the level of education when not splitting the sample by type of fishery. However, an additional level of education does not increase income for all fisheries and educational levels as shown in table 13. For both fresh water fisheries and marine fisheries with passive gear a major increase in income occurs between primary and secondary education while the income level from fisheries is lower for individuals with higher education. This result also holds when including income from other sectors than fisheries. For marine trawling, on the other hand, the income is very similar between fishermen with primary and secondary education, while the additional income from higher education is substantial. This result indicates that the return to education is highest in the trawl fishery.

For all three types of fisheries, the fishermen with low educational level are more dependent on fisheries for their income than those with higher educational levels.

**Table 13: Income (EUR) and education, by fishery**

| | Obs. | Income, fisheries | Income, Total earned | Fish/Total earned |
|---|---|---|---|---|
| **Fresh water** | | | | |
| Primary education | 64 | 15,717 | 19,161 | 88% |
| Secondary education | 132 | 20,358 | 25,435 | 79% |
| Higher education | 39 | 17,128 | 24,912 | 74% |
| **Marine, passive** | | | | |
| Primary education | 207 | 14,628 | 18,952 | 83% |
| Secondary education | 208 | 16,760 | 25,132 | 73% |
| Higher education | 48 | 13,653 | 23,348 | 67% |
| **Marine, trawl** | | | | |
| Primary education | 334 | 21,006 | 24,178 | 87% |
| Secondary education | 342 | 22,213 | 29,114 | 78% |
| Higher education | 151 | 30,029 | 38,369 | 77% |

The regional differences are presented in table 14. Starting with fresh water fisheries, this could be performed both in inland regions and coastal regions. As we can see, almost all fishermen that reside in the inland region are engaged in the fresh water fishery. Fresh water fishery in a coastal region is performed in a region that has a coastline, but the fishery itself is not in marine waters. Notably, the income from fresh water fishery is highest in inland regions and in the northern part of Sweden. The incomes from marine fisheries are highest on the west coast for both passive gear and trawlers. Marine trawling has the lowest income on the north-east coast, which is surprising given that the profitable vendace fishery takes place here. In the northern parts of Sweden marine fishermen are less dependent on the fishing income compared to other regions.

**Table 14: Income (EUR), by region and fishery**

| | Obs. | Income, fisheries | Income, Total earned | Fish/Total earned |
|---|---|---|---|---|
| **Fresh water** | | | | |
| Inland | 76 | 21,109 | 26,215 | 83% |
| North East coast | 25 | 23,236 | 27,164 | 85% |
| South East coast | 54 | 15,593 | 20,770 | 81% |
| South coast | 19 | 17,461 | 27,556 | 66% |
| West coast | 61 | 16,429 | 20,307 | 81% |
| **Marine, passive** | | | | |
| Inland | <5 | - | - | - |
| North East coast | 93 | 11,959 | 19,725 | 68% |
| South East coast | 87 | 10,340 | 14,753 | 81% |
| South coast | 113 | 13,586 | 19,617 | 79% |
| West coast | 170 | 21,308 | 29,039 | 77% |
| **Marine, trawl** | | | | |
| Inland | <5 | - | - | - |
| North East coast | 98 | 12,412 | 20,592 | 67% |
| South East coast | 51 | 14,788 | 18,108 | 82% |
| South coast | 133 | 18,290 | 22,735 | 85% |
| West coast | 541 | 27,174 | 32,782 | 83% |

As discussed above, fisheries contribute on average with somewhat more than 50% of total earned income for the fisherman and spouse. This is true for trawlers, passive gear and fresh water fishermen as shown in table 15.

**Table 15: Share of earned income from fisheries for fisherman and spouse, by fishery**

| | Obs. | Share of earned income |
|---|---|---|
| Fresh water | 82 | 51% |
| Marine, passive gear | 216 | 54% |
| Marine, trawl | 431 | 52% |

The result is also stable for each of the regions although some variation is present, see table 16. The fresh water fishery in the South-east coast region is an exception with higher dependency on fisheries, but this region only contains 14 fishermen.

**Table 16: Share of earned income from fisheries for fisherman and spouse, by region and fishery**

| | Obs. | Share of earned income |
|---|---|---|
| **Fresh water** | | |
| Inland | 31 | 51% |
| North East coast | 6 | 50% |
| South East coast | 14 | 65% |
| South coast | - | - |
| West coast | 27 | 48% |
| **Marine, passive** | | |
| Inland | - | - |
| North East coast | 32 | 58% |
| South East coast | 42 | 49% |
| South coast | 47 | 54% |
| West coast | 95 | 55% |
| **Marine, trawl** | | |
| Inland | - | - |
| North East coast | 34 | 56% |
| South East coast | 23 | 50% |
| South coast | 74 | 43% |
| West coast | 298 | 54% |

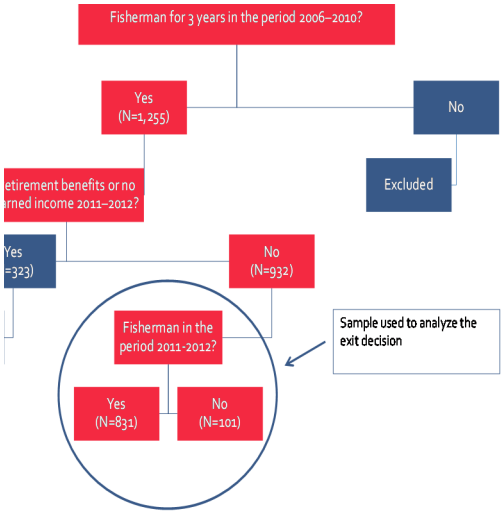
## 2.6 Why do fishermen exit?

In this section, we examine why fishermen stop fishing and leave the sector for another job. In the analysis all fishermen are included, not only the coastal fishermen. The reason for this is that thereby a reasonable sample size is obtained. We think of the exit-decision as a long-term decision that applies to individuals that have been dependent on incomes from fisheries for some time. This implies that we exclude individuals that only occasionally participate in the fishery (see more on this below). Furthermore, we make a distinction between exit to another job and exit because of other reasons (e.g. retirement). For example, it seems likely that the decision to exit for another job is affected by different factors than the retirement decision (which is highly dependent on age).

Our starting point is the data described in Section 1, which include all individuals that have earned incomes from fisheries during the period 2002–2012. Information on which years during this period individuals have earned income from fisheries is used to define exit. However, as discussed before, one problem with the data is that the precision of the SNI classification system improves over time and codes are missing for many individuals in the beginning of the time period. Therefore, we focus on the later period (2006–2012) where fewer SNI codes are missing. Furthermore, we impose some restrictions on the data. First, we define an individual as a fisherman if he/she has incomes from fisheries for at least three years in a row in the period 2006–2010. This restriction is imposed to exclude individuals that only occasionally participate in fisheries, which leaves us with 1,255 individuals. Furthermore, we want to make a distinction between exit to another job and exit because of other reasons. Therefore, we also exclude individuals who have received retirement benefits in 2011–2012 (*N=298*) and individuals without retirement benefits but with no earned income (*N=25*). The remaining sample, which consists of 932 individuals, is the starting point of the analysis.

We say that an individual has "exited fisheries" if he/she has no income from fisheries in the period 2011–2012. Thus, we require at least two consecutive years without fisheries income in order to qualify as an "exiter". From the restrictions above, we also know that all individuals have incomes from fisheries for at least three consecutive years between 2006 and 2010, which implies that the year of exit (last year with income from fisheries) is 2008, 2009 or 2010. Figure 3 illustrates the restriction described above.

**Figure 3: Restrictions imposed to obtain the sample of interest**



As can be seen from the figure, around 10% (101/932) of the fishermen exited the sector to another job before 2011.[4] The next step is to examine what factors explain this decision. A useful way to analyse the exit decision is to specify a statistical model, where observed factors such as age, education etc., are used to explain the probability of exit. From the statistical model, it is then possible to estimate and test whether the observed factors affect the probability of leaving fisheries. More specifically, we use a binary regression model where the dependent variable $Exit_i$ is defined as follows:

$$Exit_i = \begin{cases} 0 & \text{if fisherman in the period } 2011-2012 \\ 1 & \text{otherwise.} \end{cases} \quad (1)$$

In other words, the variable $Exit_i$ indicates, for each fisherman, whether he/she has left the sector. We believe that a set of factors, such as age, education, income etc., gathered in a vector, $\boldsymbol{X}_i$, can explain the exit decision. The statistical model is written as:

$$Prob(Exit_i = 1|\boldsymbol{X}_i) = F(\boldsymbol{X}_i\boldsymbol{\beta}). \quad (2)$$

In equation (2) the probability of exit is affected by the explanatory variables through the parameters in $\boldsymbol{\beta}$. To estimate the model, we assume $F$ to be the normal distribution (probit model).[5]

Regarding the explanatory variables, we include two measures of income: 1) Average income from fisheries between 2006 and 2010 (*Fish_inc)* and 2) Average total family disposable income between 2006 and 2010 (*Fam_inc*). Both variables are measured in thousand euros and the average is taken over years with fishing income (not all years).[6] When it comes to the first variable, the reason for this is obvious; we are only interested in incomes from fisheries for periods when individuals do actually participate in the fishery. We expect that the probability of exit is negatively related to incomes from fisheries. Regarding the second variable, it is interesting to examine if total family income affects the probability of exit (holding incomes from fisheries constant).[7] We hypothesize that high family income can compensate for low fishing income and therefore allow fishermen to remain in the sector, i.e. the probability of exit is negatively related to family income. The total family income during years not participating in the fishery is less relevant for such an analysis.

We also include a dummy variable (*Owner*) taking the value one if the individual owns the fishing company. Three dummy variables are included to measure the level of

[4] More specifically, 27, 34 and 40 individuals exited in 2008, 2009 and 2010, respectively. In the end of this section we present some descriptive statistics of those who exited.

[5] Standard binary choice models such as logit and probit models have been extensively used to model exit decisions in fisheries economics (see for example van Putten et al. 2012 and the reference therein). See e.g. Green (2003) for details on these models.

[6] When calculating average incomes, we exclude the last year with fishing income (for individuals that have exited fisheries) in order to rule out reversed causality. Note that we have no information when (during the year) the individual exit fisheries. If exit occurs in the beginning of the year, income from fisheries will be low because of exit (and not the other way around).

[7] Total family disposable income is the sum of (net) incomes (wages, capital incomes etc.) and transfers for all members in the family. A family is defined as all individuals living at the same address (max two generations). For more information, see Statistics Sweden (2011).

education (primary, secondary, and post-secondary education). We expect that fishers with higher education are more inclined to exit as they are likely to be more employable outside the fishing industry.[8] We also include a dummy variable (*Coastal*=1) indicating if the individual has been active in the coastal fisheries (marine fisheries with passive gear). Finally, age in 2010 is included. Some descriptive statistics of the explanatory variables are given in table 17.

**Table 17: Definition and averages of explanatory variables**

| Variable | Definition | Averages | | |
|---|---|---|---|---|
| | | Overall | Exit=0 | Exit=1 |
| Fish_inc | Average income from fisheries (EUR 1,000) | 18.46 | 19.27 | 11.79 |
| Fam_inc | Average total family disposable income (EUR 1,000) | 43.28 | 43.31 | 43.01 |
| Owner | = 1 owner of fishing company; 0 otherwise | 0.74 | 0.79 | 0.36 |
| Coastal | = 1 if coastal fisher; 0 otherwise | 0.32 | 0.31 | 0.37 |
| Primary | = 1 if primary education; 0 otherwise | 0.37 | 0.38 | 0.26 |
| Secondary | = 1 if secondary education; 0 otherwise | 0.47 | 0.46 | 0.54 |
| Post-secondary | = 1 if post-secondary education; 0 otherwise | 0.16 | 0.16 | 0.20 |
| Age | Age in 2010 | 45.31 | 45.47 | 44.02 |
| Number of observations | | 932 | 831 | 101 |

The results from the probit regression model are presented in table 18, where the second and third columns show the marginal effects and the corresponding standard errors.[9] The first thing to notice is that the marginal effect of fisheries income (Fish_inc) is negative and significantly different from zero. An increase by EUR 1,000 in average fishing income decreases the probability of exit by 0.3%. At first sight, this effect seems rather small. However, one should keep in mind that few individuals in our sample actually leave fisheries; the overall probability of exit (according to figure 3) is 10%. For example, if income from fisheries increases from EUR 18,460 (the average in our sample) to, say, EUR 24,000 (an increase by 30%), it reduces the probability of exit by 1.4%. In the probit model, the marginal effects depend on the values of the explanatory variables. To get a closer look at this relationship, the probability of exiting fisheries as a function of average fishing income is plotted in figure 4. Interestingly, we see some evidence that the effect decreases at higher income levels. For example, an increase in fisheries income, from EUR 10,000 to EUR 20,000, decreases the probability of exit by 3.0%. This may be compared to the effect of an increase from EUR 30,000 to EUR 40,000, which decreases the probability of exit by 1.7%.

[8] The education variables correspond to the level of education attained three years after the year that the individual first appears in the dataset. This definition is used to ensure that the educational level is not measured after exit from fisheries, which is necessary in order to rule out reversed causality.

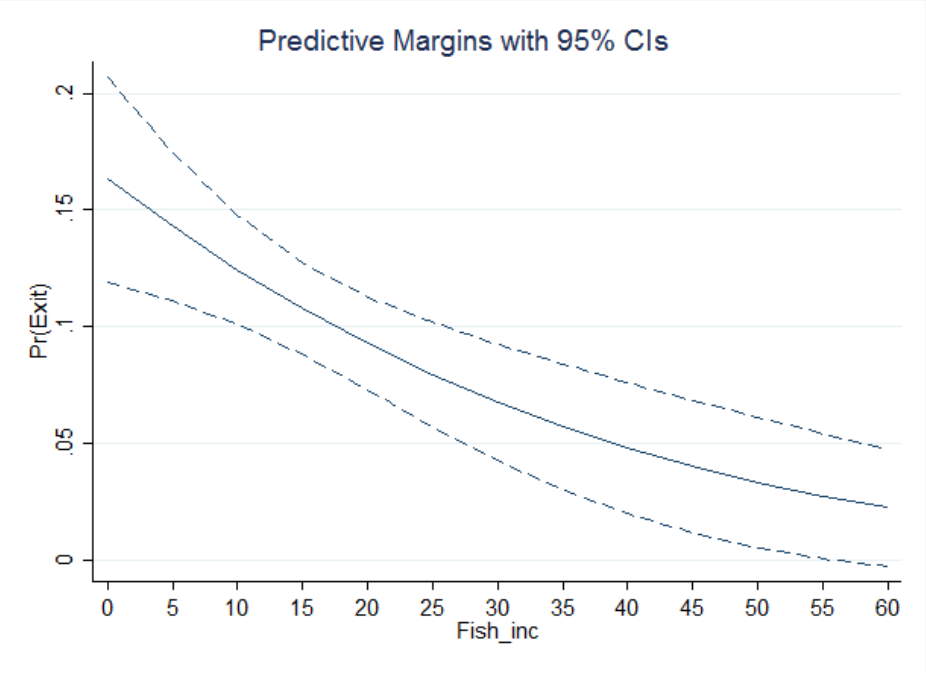
[9] The coefficients of the probit model are not shown here as they are difficult to interpret (the coefficients give the change in the z-score for a unit change in the explanatory variables). Instead, the table shows the effect of a marginal change in the explanatory variable on the (predicted) probability of exit (which can be derived using the properties of the distribution function). As discussed in the text, the marginal effects depend on the values of the explanatory variables. In the tables below, the effects are calculated holding other variables constant at their mean values.

**Table 18: Probit Regression. Marginal effects on the probability of exiting the fishery**

| Variable | Marginal effect | Standard error |
|---|---|---|
| Fish_inc | -0.003*** | 0.001 |
| Fam_inc | -0.001* | 0.000 |
| Owner | -0.202*** | 0.034 |
| Coastal | 0.005 | 0.019 |
| Secondary | 0.013 | 0.020 |
| Post-secondary | 0.017 | 0.028 |
| Age | 0.001 | 0.001 |
| Number of observations | 932 | |

Note: *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. The covariance matrix and, correspondingly, the standard errors are computed using the delta method. The estimations are performed using the commands probit and margins in STATA 12.

**Figure 4: Marginal effects of increasing income from fisheries**




It is also interesting to note the marginal effect of the variable Fam_inc, which measures the effect of total family disposable income (during years of fishing). We see that the effect is statistically significant (at the 10% level) and negative, which indicates that an increase in family income lowers the probability of exit (holding incomes from fisheries constant). This result goes in line with the reasoning above that high family income makes it possible for fishermen to remain in the sector even if their income from fisheries is low. However, this effect is not large. For example, an increase in Fam_inc, from EUR 20,000 to EUR 30,000, decreases the probability of exit with 0.8%. Regarding the other explanatory variables, we see that only the variable Owner turns out statistically significant. Using equation (2) to obtain predicted probabilities, we find that the probability of exit for owners and non-owners are 4.6% and 24.8%, respectively

(holding other variables constant at their means values). The variable Coastal is insignificant indicating that fishermen in the coastal fishery with passive gear have the same probability of exit holding the other variables constant. Somewhat surprisingly we find no effects of higher education. The marginal effects are positive (as expected) but statistically insignificant.

We continue with some sensitivity analysis. As discussed above, we want to exclude individuals that have only marginal involvement in fisheries. To do this we have omitted individuals with less than 3 years of fishing in the period 2006–2010. However, we have not put any restrictions on the level of fishing income in relation to total earned income. In table 19 we report the marginal effects from three regressions where we have excluded individuals whose fishing incomes make up only a small share of their total earned income. In column one, we have excluded individuals if their income from fisheries (in the period 2006–2010) constitutes less than 25% of the total earned income (for the years active in fisheries). Column three and four show the corresponding results when this restriction is set to 50% and 75%, respectively.

**Table 19: Probit Regression. Marginal effects on the probability of exiting (sensitivity analysis 1)**

| | Restriction: Fisheries income (share of total earned income) | | |
|---|---|---|---|
| Variable | >0.25<br>Marginal Effects | >0.50<br>Marginal Effects | >0.75<br>Marginal Effects |
| Fish_inc | -0.0027*** | -0.0030*** | -0.0025*** |
| Fam_inc | -0.0006 | -0.0002 | -0.0002 |
| Owner | -0.2169*** | -0.1415*** | -0.1184*** |
| Coastal | 0.0089 | 0.0070 | -0.0033 |
| Secondary | 0.0122 | 0.0207 | 0.0179 |
| Post-secondary | 0.0225 | 0.0172 | 0.0099 |
| Age | 0.0010 | 0.0013* | 0.0008 |
| Number of observations | 855 | 799 | 720 |

Note: *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Column two shows the regression results (marginal effects) when we exclude individuals whose fishing income constitutes less than 25% of the total earned income. Column three and four show the corresponding results when this restriction is set to 50% and 75%, respectively. The covariance matrix and, correspondingly, the standard errors are computed using the delta method. The estimations are performed using the commands probit and margins in STATA 12.

As we can see, the marginal effects of fisheries income are similar in the three regressions. The variable *Owner* drops considerably when the restriction is set to 50% and higher, which indicates that the difference in probability of exit between owners and employed is smaller for individuals who are more dependent on fisheries income. We also see that the coefficient on *Fam_inc* drops in magnitude and becomes insignificant.

One factor that may influence the results is scrapping subsidies. In the period 2007–2013, 30 Swedish vessels received scrapping subsidies from the European Fisheries Fund (EFF). The subsidies may affect both income and the probability of exit. Income derived from scrapping subsidies is not, however, related to fisheries activities (which is what we aim to measure with the variable *Fish_inc*). This issue should not be a source of major concern since, as discussed above, we exclude the last year with fishing income

when calculating the variable *Fish_inc* (see footnote 6). However, to tests whether these subsidies affect the results, we exclude all individuals holding a license for a vessel that has received scrapping subsidies from the EFF.[10] The marginal effects from this estimation are presented in column two of table 20. As we can see, the results are very similar to table 18.

Another factor that may affect the results is the introduction of the ITQ system in the pelagic fisheries. In November 2009, around 80 vessels were granted transferable quotas and the first transfers took place in 2010 (SwAM 2014b). One implication of the new system was that some fishermen sold their entire quota and left the fisheries. To check whether the introduction of the ITQ system influence the results, we re-estimate the model excluding all individuals that, during 2006–2010, have held a license for a vessel that were granted ITQs. The restriction implies that the sample size further decreases from 920 to 894. The marginal effects from this estimation are presented in column 3 of table 20. As can be seen, the results are very similar to those of column 2.

**Table 20: Probit Regression. Marginal effects on the probability of exiting (sensitivity analysis 2)**

| Variable | Excl. scrapping subsidies | Excl. scrapping and ITQ |
|---|---|---|
| Fish_inc | -0.003*** | -0.003*** |
| Fam_inc | -0.001* | -0.001 |
| Owner | -0.206*** | -0.203*** |
| Coastal | 0.006 | 0.007 |
| Secondary | 0.016 | 0.014 |
| Post-secondary | 0.019 | 0.019 |
| Age | 0.001 | 0.001 |
| Number of observations | 920 | 884 |

Note: *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. The covariance matrix and, correspondingly, the standard errors are computed using the delta method. The estimations are performed using the commands probit and margins in STATA 12.

We close this section with some descriptive statistics of the individuals who stop fishing and leave the sector. Thus, the statistics below are based on the 101 individuals that have no earned incomes from fisheries in the period 2011–2012 (see figure 3). In table 21 we look at total earned incomes and total family incomes before and after exit. We see that average earned income is 23% higher in the period after exit. This may be compared to the incomes of fishermen who stayed in fisheries; their total earned income increased from EUR 22,960 (2006–2009) to EUR 25,140 (2010–2012), which is an increase by 9%.[11]

[10] Information on which vessels received scrapping support is provided by the Swedish Agency for Marine and Water Management. It should be noted that not all crew members are excluded from the sample, since it is only possible to identify the license holder.

[11] It should be noted that total earned income might include other incomes, such as, for example, revenues from selling quotas or vessels. In a sensitivity check we excluded all individuals that received scrapping subsidies or ITQs, but with no changes in the results.

**Table 21: Incomes (EUR 1,000) before and after exit**

| Variable | Before exit | After exit |
|---|---|---|
| Average earned income (EUR 1,000) | 20.29 | 25.05 |
| Average total family income (EUR 1,000) | 43.22 | 51.62 |

Note: When calculating average incomes before and after exit we exclude the last year with fishing income since we have no information when (during the year) the individual exited. Incomes are measured in thousand euros (CPI deflated, base year 2012).

It is also interesting to examine in which sectors former fishermen end up working. Table 22 presents some statistics on the number of former fishermen in different sectors in 2012 (based on main income), as well as the average earned income for the individuals in each sector. It is worth noting that Marine Transport, which must be considered as a narrowly defined sector, employs the largest number of former fishermen (22). Notably, this is also a sector where total earned income is high.

**Table 22: Main occupation of former fishermen in 2012**

| Sector | Number of individuals | Total earned income (EUR 1,000) |
|---|---|---|
| Manufacturing | 12 | 36.70 |
| Construction | 13 | 31.72 |
| Retail and wholesale trade | 10 | 21.22 |
| Transport | 25 | 33.20 |
| *Marine transport* | 22 | *36.26* |
| Technology, law business | 11 | 28.91 |
| Public admin, education, health | 20 | 20.56 |
| Other services | 4 | 13.06 |

Note: Incomes are measured in thousand euros (year 2012). Individual are categorized according to their main income. Sectors with less than three individuals are not included in the table.

## 2.7 Conclusions

Swedish fishermen earned on average EUR 26,000 in 2012 from working in fisheries and other sectors. Fishing constitutes an important part of the total income both for the individual fisherman (80% on average) and for the total family income (about 53%). Thus, changes in fisheries management affecting the fishing fleet will have a substantial impact on the household budget. Notably, we observe income differences based on regions, on fishing gear used, and on type of water (marine/fresh). This is not further analysed in the report, but reasons could include differences in species, management and efficiency of the gear. As shown in the regression analysis, income from fisheries is an important determinant of the exit decision. Thus, differences in income between different categories of fishermen are important for how the Swedish fishing sector will evolve in the future. For example, high incomes for large-scale marine fishermen on the west coast may be seen as an indicator that the west coast fisheries will continue to have a strong development compared to the Baltic fisheries.

# 3. Salary and employment in Danish coastal fisheries

## 3.1 Introduction

This chapter contains five sections after this introduction. In section two the framework conditions for the Danish coastal fisheries are presented with key numbers and a description of the Danish fisheries management. In section three, the data underlying all indicators and analyses in the Danish case study is presented and discussed. Section four goes through salary and employment figures for the Danish coastal fishermen and compare them to other Danish fisheries. Section five contains an econometric analysis of why Danish coastal fishermen leave the fishing sector. Section six concludes the Danish case study.

## 3.2 Framework conditions for the Danish coastal fisheries

The transition in Denmark towards using Individual Transferable Quotas (ITQs) began with a parliament decision (V117) on the 16 May 2001. The aim was to establish a management system that provided for the possibility of longer term economic viability and stability in the fishery and for a structural development to reduce fleet capacity.

ITQs were implemented for the pelagic and reduction fleets on the 1 January 2003 and four years later, in 2007, rights based management was implemented in the demersal fishery in form of individual vessel quota shares covering the 28 most important quotas for this fishery. The ITQs were given to the fishermen free of charge (i.e. the grandfathering method), and each vessel was allocated a share based on their landings in the reference period 2003–2005, provided they had a level of activity generating more than EUR 30,800 (DKK 230,000) in landings value each year in that period. Prior to 2007, the vessels included in the ITQ system were governed by a series of regulatory measures, which could be divided into four main groups: (1) Quota restrictions, (2) Effort restrictions, (3) Technical measures, and (4) Capacity restrictions. The demersal fleet was therefore not characterised as an open access fishery before the transition towards a right's based management system, but instead from a command-and-control system.

The functioning of the ITQ management system can briefly be described as follows. By the start of each year, Denmark is allocated a quota for each species and management area based on the agreed TACs at the EU level. Minor amounts of these quotas are set aside to support the development in the fishery in the form of a Fish Fund, where for instance young fishermen can apply for extra allocations. The remaining quota is then distributed to the vessels that have the right to a percentage share based on the official registration. The absolute amount of quota (weight) allocated to each vessel then determines the initial level this vessel can land during a year. During a year, a vessel can then change the amount it is allowed to land by trading with other vessels owning the respective quotas. Transferability may take two forms: 1) as a permanent transfer of quota shares between vessels, or 2) as an in-year transfer (lease) between vessels.

The majority of Danish fishing vessels land demersal species. The demersal fishery is of high economic importance for especially the vessels below 24 meters. Various gear types are used to catch demersal species including gill nets, Danish seines and various types of trawl.

The Danish demersal fishery targets a wide range of species for human consumption; the most important being Atlantic cod (Gadus morhua), Norway lobster (Nephorps norvegieus), European plaice (Pleuronectes platesca), Saithe (Pollachius virens) and Northern deep water shrimp (Pandalus borealis). The landings are sold as fresh fish to consumers in Denmark or other countries or processed into high quality products. The demersal species are primarily caught in the fishing waters located close to Denmark, i.e. the Baltic Sea (ICES area 3BCD), the North Sea (ICES area 4ABC), Skagerrak (ICES area 3AN) and Kattegat (ICES area 3AS).

The demersal segment also includes a quota premium allowance for coastal vessels (below 17 m). Participating vessels must be less than 17 meters, and 80% of their fishing trips have to be less than 2 days. In order to get a premium of cod, plaice and sole, they also have to land at least 50% of the fish that is available through their vessel quotas. A new introduction is an extra premium for vessels fishing with the most sustainable gear, such as gill nets. These vessels receive a larger premium than vessels fishing with trawl gear that impact the ocean floor.

The activities of the fishing fleet in Denmark account for 0.1% of the Gross Domestic Product, whereas the entire fisheries sector including also aquaculture, fish processing, wholesale and retail branches accounts for 0.3% (2010). Economic performance of the Danish fishing fleet is shown in table 23.

**Table 23: Economic performance of the Danish fishing fleet, 2007–20121[1]**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|
| No. of registered vessels | 2,957 | 2,888 | 2,830 | 2,820 | 2,787 | 2,744 |
| No. of commercially active vessels[2] | 848 | 807 | 757 | 700 | 648 | 641 |
| No. of full-time employed[3] | 1,376 | 1,251 | 1,204 | 1,158 | 1 066 | 1,023 |
| Total landing value (EUR Million) | 364 | 343 | 297 | 403 | 428 | 392 |
| **Average per commercially active vessel** | | | | | | |
| Landing value (EUR 1,000) | 414 | 414 | 376 | 567 | 602 | 599 |
| Earning (EUR 1,000) | 190 | 181 | 164 | 178 | 309 | 282 |
| Operating profit (EUR 1,000) | 92 | 87 | 77 | 66 | 182 | 173 |
| Operating profit (% of assets)[4] | 13% | 13% | 11% | 8% | 24% | 22% |

Note: 1. All data in the period 2007–2012 shown in the table are comparable over time without data breaks. However, some data in the table is not comparable with numbers in tables in earlier versions of the Review of Fisheries. 2. A vessel is considered active if it has an annual catch value of more than EUR 36,400 (2011). 3. Full-time employment is defined as the total number of work days divided by 220. 4. Assets are without the value of fishing rights.

Source: Statistics Denmark, Account Statistics for Fisheries, 2007-2012. The Danish AgriFish Agency, Yearbook of Fishery Statistics, 2007–2012.

In 2012, 641 fishing vessels are commercially active and about 2,000 vessels are either inactive or less active with a turnover of less than EUR 36,400. The less active vessels account for less than 2% of the catch value. The number of commercially active vessels in the Danish fleet fell with one-fourth over the period 2007–2012. Employment also fell substantially, where the landing value fell until 2009, after which it stabilised at a high level. The economic performance for the remaining commercially active vessels peaks in 2011. New regulation has had a considerable positive effect on the economic performance of the remaining vessels, although fluctuating quotas for fish for reduction also affects economic performance.

This development is due to normal variations in fishing quotas and prices, to the financial crisis from 2008 and a beginning economic recovery in the end of the period, as well as to the introduction of new regulation. As result of individual transferable quotas, several vessels have been taken out of the fishery.

The economic performance measured as operating profit in percentage of assets (without the assets of fishing rights) was at a stable level 11–13% until a bad year in 2010. In 2011–2012 the economic performance stabilised at a high level on 22–24%. Hence, since the introduction of new regulation in Danish fisheries in 2003 and 2007, the commercially active fleet have been reduced substantially, thereby inducing a better economic performance of the vessels that remains active.

## 3.3 The dataset

The Danish dataset, obtained from Statistics Denmark, covers individual data throughout the period 2002–2012 for everyone holding a Danish Civil Registration (CPR) number that has at some point during the period obtained income (salaries from own enterprise/vessel) in the Danish fishing sector. The latter is defined as the "sea fishery" sector, i.e. any activity on a fishing vessel (but not in other fishing industries, such as, fish processing, fish wholesale fish mongers and aquaculture) that has an annual turnover of more than EUR 6,700 (DKK 50,000). Information is available for each individual in all years 2002–2012, even though a person might only have obtained income from the fishery in some, but not all, of these years. Foreigners working on Danish fishing vessels are only included in the dataset if they hold a Danish CPR number, which is granted (i) if the person holds a dwelling in Denmark, (ii) the person is staying in Denmark for more than three months, and (iii) the person has a residence permit/registration certificate from the immigration authorities if he/she is not a Nordic national. As such, it is expected that foreigners included in the Dataset do not represent the true number working on Danish fishing vessels.

The socio-economic data comprises individual person information (age, gender, family status, family income, location of residence), and income information (salary from own enterprise and wage incomes, both specified down on branch codes, pension incomes, social benefit incomes, and incomes from stocks and interests). Table 24 displays a detailed overview of the income information and shows how the various income components are aggregated for the tables and analyses presented in this report.

**Table 24: Income information included in the dataset, together with an overview over how the information has been aggregated**

| Short name | Long name | Description |
|---|---|---|
| Wages | Salaries | A-income, i.e. all forms of payment in monetary units for employed work. |
| IndpInc | Independent income | Surplus from own enterprise (positive as well as negative) taken out of the enterprise in a given year. |
| WagesFishery | Salaries from fishery | A-income from fishery. |
| IndpIncFishery | Independent income from fishery | Independent income from own fishing vessel. |
| WagesOth | Salaries from other branches | A-income from other branches than fishery. |
| IndpIncOth | Independent income from other branches | Independent income from own enterprise in other branches than fishery. |
| SocBen | Social benefits and unemployment insurance | The sum of unemployment insurance and social benefits, including unemployment benefits, benefits paid in connection with maternity leave, education and sabbatical. |
| FamInc | Income of other persons in family | Gross income of fisherman's family excluding him/her-self. |
| Pens | Pensions and early retirement payment | Sum of all pensions plus early retirement payment (efterløn). |
| CapInc | Capital income | Sum of income from shares and capital income from assets in banks and private firms. |
| IncAbroad | Income from abroad | Salaries and other income obtained outside Denmark. |
| TotIncFishery | Total income from fishery | WagesFishery+IndpIncFishery |
| TotIncOth | Total income from other branches | WagesOth+IndpIncOth |
| TotInc | Total income | TotIncFishery+TotIncOth+SocBen+Pens+CapInc+IncAbroad |
| FracFish | % that fishery income constitutes of total income | WagesFiserhy/TotInc |

The socio-economic dataset has been coupled to the Danish fishing vessel register, the statistics on landings and first sales, and the account statistics for fisheries. Thus, for each year, the persons from the socio-economic dataset are coupled to the specific fishing vessels where his or her income originates from. As such, it is possible to identify persons working on small and large vessels, the fishing pattern of the vessel, the home port of the vessel and where it is operating, landings data, and economic account data for the vessel.

In the analyses presented in this report, a full-time fisherman is defined as a person that is at least 18 years old for whom more than 60% of his total income (TotInc) comes from fishery (i.e. for whom FracFish is larger than 0.6). A coastal full-time fisherman is defined as a fisherman for whom more than 50% of his income from fisheries has been earned on vessels of length less than 17 meters, irrespectively of whether he owns the vessel or just works on it as an employee. Thus, a full-time coastal fisherman has FracFish>0.6 and takes more than 50% of his fishery income from vessels less than 17 meters.

## 3.4 Salary and employment for Danish coastal fishermen

This section explores basic salary and employment statistics for Danish coastal fishermen. Since data are also available for all fishermen, these are also presented and compared to salary and employment of coastal fishermen.

### 3.4.1 *Employment and salary for all fishermen and coastal fishermen in Denmark*

Table 25 displays the average total income (TotInc) together with the average total salary from fisheries (WagesFishery) for all persons employed on board a Danish fishing vessels (i.e. both hired on or owing a fishing enterprise) with a turnover of more than EUR 6,700 (DKK 50,000 in 2012. Table 26 displays the same parameters for all coastal fishermen. Both tables display average incomes for all persons of 18 or more years of age, together with average incomes of persons for which their income from the fishery constitutes 60%, 75% and 90% of their total incomes. Moreover, the average income share from fishery (FracFish) is displayed together with the number of persons employed in each group.

**Table 25: Income components and employment for all employed at Danish fishing vessels, 2012**

| | Average TotInc (EUR/person) | Average WagesFishery (EUR/person) | Average FracFish | Number of employed |
|---|---|---|---|---|
| All employed (older than 18 years) | 56,457 | 38,753 | 0.69 | 1,687 |
| - with fisheries salary > 90% of total salary | 58,165 | 54,792 | 0.92 | 625 |
| - with fisheries salary > 75% of total salary | 59,083 | 52,935 | 0.90 | 965 |
| - with fisheries salary > 60% of total salary | 57,614 | 49,614 | 0.86 | 1,181 |

**Table 26: Income components and employment for all Danish coastal fishermen, 2012**

| | Average TotInc (EUR/person) | Average WagesFishery (EUR/person) | Average FracFish | Number of employed |
|---|---|---|---|---|
| All employed (older than 18 years) | 45,780 | 32,132 | 0.70 | 1043 |
| - with fisheries salary > 90% of total salary | 49,490 | 46,533 | 0.94 | 310 |
| - with fisheries salary > 75% of total salary | 50,423 | 45,018 | 0.82 | 556 |
| - with fisheries salary > 60% of total salary | 49,075 | 42,559 | 0.87 | 700 |

Table 25 and 26 firstly show that 1,687 persons were employed on Danish fishing vessels in 2012, while table 26 shows that of these 1,043 (~62%) were coastal fishermen. Likewise ~59% with fishery income share larger than 60% and ~51% with fishery income share larger than 90% are coastal fishermen. I.e. generally the number of coastal fishermen constitutes a considerable fraction of all Danish fishermen. Secondly it is seen that people employed on small scale vessels on the average have lover incomes, both with regards to total and to fisheries incomes, when compared to the total fishing sector. A full-time coastal fisherman on the average have a total income that is ~86% of the income of all full-time fishermen, and a fishery income that is ~85% of the fishery income of all fulltime fishermen. Thus, generally it must be concluded that fulltime fishermen working on large scale vessels (>17meters) have higher incomes than coastal fishermen. Using the above numbers the estimated average total income of a fulltime fisherman working on a vessel >17 meters is EUR 70,040 (43% larger than for coastal fishermen) while his average income from fisheries is EUR 59,881 (41% higher than for coastal fishermen).

### *3.4.2 Fishermen salary compared to salaries from other branches*

The average total income in 2012 was EUR 34,048[12] in Denmark in 2012. The average total income for all employed in the Danish fishery was EUR 56,457 in 2012 while the average total income for persons working in the Danish coastal fishery was 45,780, cf. tables 25 and 26. I.e. both Danish coastal fishermen and all fishermen have considerably higher total incomes than the average in Denmark, and this tendency is even more pronounced for full-time employed fishermen and coastal fishermen. Comparing with the salaries from fishery the average yearly salary of full-time employed in other sectors in 2012 were (i) EUR 48,662 in Danish Agriculture, (ii) EUR 54,093 in the craftsmen sector, (iii) EUR 58,160 in the process and machine-operator sector, (iv) EUR 48,495 in the sales and service sector, and (v) EUR 51,113 in the office sector.[13] Thus, generally all fishermen on the average earn the same as someone employed in agriculture or sales and service, while a Danish coastal fisherman on the average could earn more by re-locating to other sectors or large-scale fishery.

### *3.4.3 Other sources of salary for Danish fishermen*

Tables 27 below shows that even though full-time fishermen on the average take the majority of their income from fishery, other sources contribute too. I.e. income from other branches, social benefits and pensions.

Table 27 display the number and average incomes (salaries as well as independent incomes) of full-time fishermen respectively full-time coastal fishermen that have incomes from other branches. The table moreover displays the average incomes from

[12] "Nyt fra Danmarks Statistik" no 192, April 15 2013 (http://www.dst.dk/pukora/epub/Nyt/2013/NR192.pdf).
[13] "Indkomster" 2012, Statistic Denmark (http://www.dst.dk/Site/Dst/Udgivelser/GetPubFile.aspx?id=18672&sid=indk).

other branches for part-time fishermen and coastal fishermen, i.e. fishermen for whom less than 60% of their total income comes from fishery.

Table 27 firstly shows that of the 1,181 full-time fishermen 233 (19.7%) take additional income from other branches while 144 of the 700 full-time coastal fishermen (20.6%) have income from other branches. The full-time fishermen have an average income of EUR 3,191 from other branches (5.5% of their average total income) and the full-time costal fishermen have an average income from other branches of EUR 2,486 (5.1% of their average total income). Both the full-time fishermen and full-time coastal fishermen work in many different branches, with the majority working in Technology, law and business and Retail and wholesale. The highest average income from other sectors comes from Construction and district maintenance for the full-time fishermen and from Manufacturing for the full-time coastal fishermen.

Table 27 moreover shows that 363 of the 506 part-time fishermen (72%) have incomes from other branches, while 198 of the 343 part-time coastal fishermen (56%) have income from other branches. Thus, on the average less coastal part-time fishermen have other work, compared to all fishermen. Hence, coastal fishermen are more specialised than other fishermen. The average salary from other branches are considerably higher for part-time fishermen compared to full-time fishermen. This holds for all fishermen, as well as for coastal fishermen, i.e. it is clear that part-time fishermen to a larger degree rely on incomes from other branches, compared to full-time fishermen.

**Table 27: Average total income (EUR/person) from other branches than fishery for full-time and part-time fishermen and coastal fishermen, 2012**

| Other branches | Number of Employed | Average TotIncOth (EUR/person) | Number of Employed | Avearage TotIncOth (EUR/person) |
|---|---|---|---|---|
| **Full-time fishermen** | | | | |
| Agriculture and forestry | 7 | 5,187 | 5 | 2,542 |
| Manufacturing | 28 | 5,341 | 14 | 4,482 |
| Construction and district maintenance | 13 | 8,321 | 7 | 3,952 |
| Retail and wholesale trade | 41 | 1,741 | 24 | 1,445 |
| Transport and cargo handling | 21 | 3,290 | 8 | 3,644 |
| Hotel and restaurant | 4 | 2,883 | 2 | 3,388 |
| Technology, law, business | 60 | 2,313 | 47 | 1,918 |
| Public admin, education, health | 25 | 3,784 | 14 | 3,152 |
| Other services | 34 | 1,888 | 23 | 2,171 |
| *Total Full-time* | *233* | *3,191* | *144* | *2,486* |
| | | | | |
| **Part-time fishermen** | | | | |
| Agriculture and forestry | 15 | 2,570 | 6 | -8,224 |
| Manufacturing | 53 | 17,364 | 25 | 17,117 |
| Construction and district maintenance | 30 | 13,510 | 18 | 9,323 |
| Retail and wholesale trade | 47 | 11,050 | 31 | 12,691 |
| Transport and cargo handling | 63 | 18,223 | 33 | 12,812 |
| Hotel and restaurant | 10 | 9,308 | 7 | 10,906 |
| Technology, law, business | 58 | 10,448 | 20 | 17,947 |
| Public admin, education, health | 40 | 15,026 | 32 | 14,902 |
| Other services | 47 | 12,533 | 26 | 11,788 |
| *Total part-time* | *363* | *13,556* | *198* | *13,037* |

Tables 28 and 29 display the number of full-time employed fishermen respectively coastal fishermen that obtain social benefits (unemployment benefits and cash transfers), early retirement benefits, or pensions. The tables display their average income from these sources, their total income and their fishery income in 2012.

Tables 28 and 29 show that a relatively large fraction of the full-time fishermen (35% of all and 33% of the coastal fishermen) obtained social benefits in 2012. On the average, the social benefits constituted ~8% of the total income for both all fishermen and for the coastal fishermen. Of the older full-time fishermen (average age 61–62 years) a small fraction received pensions and early retirement benefits alongside their fishery income, where their pensions on the average constituted 14% of the total income for all fishermen and 19% for the coastal fishermen, thus indicating that pensions may be fractionally more important for full-time coastal fishermen compared to all full-time fishermen.

It must of course be expected that a larger fraction of part-time fishermen and coastal fishermen receives social benefits and pensions and that these factors also constitute a larger part of their income.

**Table 28: Income & employment of full-time fishermen allocated on non-working income components, 2012**

| | Aver-age Age | Average TotInc (EUR/person) | Average SocBen (EUR/person) | Average WagesFisher (EUR/person) | Average FracFish | Number employed |
|---|---|---|---|---|---|---|
| Unemployment benefits and cash transfers[1] | 45 | 52,998 | 4,279 | 43,980 | 0.83 | 417 |
| Early retirement benefits | 62 | 59,123 | 5,847 | 47,984 | 0.81 | 6 |
| Pension (other than early retirement benefits) | 61 | 54,585 | 8,121 | 38,777 | 0.71 | 47 |

Note: 1. Unemployment benefits (private and from the state), educational benefits, and other public benefits.

**Table 29: Income and employment of full-time coastal fishermen, allocated on non-working income components, 2012**

| | Aver-age Age | Average TotInc (EUR/person) | Average SocBen (EUR/person) | Average WagesFisher (EUR/person) | Average FracFish | Number employed |
|---|---|---|---|---|---|---|
| Unemployment benefits and cash transfers[1] | 46 | 46,661 | 3,835 | 38,244 | 0.82 | 234 |
| Early retirement benefits | 61 | 53,596 | 6,043 | 40,516 | 0.76 | 4 |
| Pension (other than early retirement benefits) | 61 | 40,068 | 8,274 | 26,663 | 0.67 | 28 |

Note: 1. Unemployment benefits (private and from the state), educational benefits, and other public benefits

In the following section focus will be on full-time coastal fishermen only.

### 3.4.4 *Influence of socio-economic variables on income for full-time coastal fishermen*

Table 30 displays average total and fishery income for full-time coastal fishermen allocated on socio-economic indicators. It is firstly seen that the majority (78%) of the full-time coastal fishermen are between 30 and 60 years. The group between 31 and 45 years has the highest incomes, both overall and from fisheries.

It is, moreover, seen that the highest educational level for 367 of the 700 (52%) of the coastal fishermen is high school. This group at the same time has the lowest average salary from fishery, together with the coastal fishermen that have a gardener, cook, green certificate or dairyman education and fishermen that have medium to higher education. Very few of the full-time coastal fishermen have an actual fishing skipper education, and having this does not lead to higher average incomes. The highest average incomes from fishery are taken by persons with an "other craftsmanship" education, followed by persons with an education within fishery craftsmanship.

Finally, table 30 shows that a large part of the small scale fishermen comes from northern Jutland (229 corresponding to 32%), followed by central Jutland (178 corresponding to 25%). A smaller part comes from the capital region (115 corresponding to 16%), i.e. operate from harbours in northern Zealand and at the island of Bornholm. The largest average salaries from fishery are also taken by coastal fishermen from these three areas.

**Table 30: Income and employment of full-time coastal fishermen allocated on socio-economic characteristic, 2012**

| | Average TotInc, (EUR/person) | Average WagesFishery (EUR/person) | Average FracFish | Number of employed |
|---|---|---|---|---|
| **Allocated on person age** | | | | |
| 18–30 years | 41,414 | 37,528 | 0.91 | 79 |
| 31–45 years | 54,433 | 47,862 | 0.88 | 200 |
| 46–60 years | 49,205 | 41,403 | 0.84 | 348 |
| > 60 years | 42,063 | 32,556 | 0.77 | 73 |
| **Allocated on persons highest education** | | | | |
| Up to High School Education | 44,083 | 37,347 | 0.85 | 367 |
| Fishing Skipper of 1st grade | 51,308 | 47,100 | 0.92 | 4 |
| Fishing Skipper of 3rd grade | - | - | - | 0 |
| Fishing skipper without grade | - | - | - | 0 |
| Craftsmanship connected to fishery | 66,282 | 56,690 | 0.86 | 26 |
| Other craftsmanship | 75,279 | 64,906 | 0.86 | 74 |
| Trade, retail | 40,363 | 35,172 | 0.87 | 59 |
| Gardener, cook, green certificate, dairyman | 44,976 | 36,304 | 0.81 | 18 |
| Medium and higher education | 42,786 | 35,535 | 0.83 | 73 |
| Missing educational information | 62,742 | 58,213 | 0.93 | 4 |
| **Allocated on region** | | | | |
| Capital | 48,510 | 42,645 | 0.88 | 115 |
| Zealand | 41,213 | 33,027 | 0.80 | 84 |
| Southern Denmark | 43,545 | 36,929 | 0.85 | 94 |
| Central Jutland | 54,052 | 46,126 | 0.85 | 178 |
| Northern Jutland | 50,644 | 43,501 | 0.86 | 229 |

Table 31 displays the average incomes for full-time coastal fishermen in 2012, where the persons are divided into three groups: (i) persons only receiving salaries (hired fishermen), which includes salaries from fisheries but for many also income from other branches, (ii) persons who own their own enterprise (a fishing vessel) and do not receive income from other sources, and (iii) persons who both receive salary and own their own enterprise. For the latter group their own enterprise need not necessarily be a fishing vessel, and the salary may not come from fishery, as long as one source of income is from fishery.

**Table 31: Income for full-time coastal fishermen, 2012, divided on hired fishermen, people who only have their own enterprise and people who both receive salaries and have their own enterprise**

| | Average TotInc (EUR/person) | Average WagesFishery (EUR/person) | Average FracFish | Number of employed |
|---|---|---|---|---|
| Hired fishermen | 55,185 | 48,921 | 0.88 | 257 |
| Only having own fishing enterprise | 38,930 | 32,226 | 0.83 | 304 |
| Obtaining salaries and having own enterprise | 59,963 | 50,017 | 0.83 | 139 |

Table 31 shows that the highest income, both in total and from fisheries is obtained by persons who both own their own enterprise and receive salaries. The lowest average income is obtained by person only having their own enterprise. The latter may seem surprising, but is caused by the fact that a person owning an enterprise may not take out the total surplus in a given year to pay his own salaries.

Furthermore, persons having their own enterprise may end up with a negative surplus in a given year, which means that the average presented in table 31 also covers enterprises with a negative income. For comparison 281 of the 304 full-time fishermen owning their own enterprise took out a positive surplus from their fishing boat. These 281 fishermen had an average total income of EUR 44,570 and an average income from the fishery of EUR 37,880 in 2012. Thus, still lower than for the other two income groups, reflecting that full-time independent coastal fishermen have higher costs than coastal fishermen receiving salary, and probably still leaves a relatively high fraction of the capital in the firm each year to cover possible future cots.

Table 31 finally shows that full-time coastal fishermen owning their own vessel but not receiving other salary constitute the largest group (43%) while only relatively few (19%) both have their own enterprise and receive salary.

### *3.4.5 Full-time coastal fishermen's contribution to the family income*

The average total income for the rest of the family for full-time coastal fishermen is EUR 29,614. This compared with the average total income of the fishermen themselves, which is EUR 49,075 (cf. table 26). It must be assumed that the remaining family income comes from a spouse/partner, and it is thus seen that the full-time coastal fisherman on the average contributes the majority, corresponding to 62%, of

the full family income. As such, the average Danish full-time fisherman is the primary earner in the family.

### 3.4.6 *Salary development for full-time coastal fishermen over the period 2002–2012*

Table 32 displays the development in salary for full-time coastal fishermen during the period 2002–2012, adjusted for inflation (taking 2002 as the base year). The table only displays salary for persons employed at the vessels, and does not reflect the incomes of the persons owning the vessels. The table firstly shows that the salary increases towards 2006, i.e. the year before the vessel quota share (VQS) system was introduced in Denmark.[14] Then decreases a small amount in the period 2006–2008, i.e. during the years around 2007 where VQS regulation was introduced. The salary then drops sharply in 2009, which is believed to be connected to the financial crisis that induced fish price reductions and thereby lower crew shares. And finally increases again towards 2010–2011. It can be speculated if the small-scale vessel salary would not have increased more after 2007 if the financial crisis had not occurred.

Table 32 secondly shows that the number of full-time employed (not owning a vessel) coastal fishermen decreases by more than 50% from 499 to 257 persons over the period 2002–2012. The decrease is quite steady with no major sudden drops. I.e. the introduction of VQS regulation did not cause a sudden higher decrease in number of employees in the coastal fleet. This continuous reduction of both the numbers of employees and vessels has been ongoing since the middle of the 1990 as the fishing quotas has been declining and can as such not be related to the introduction of a new management system.

**Table 32: Development in average total income, average fishery salary, average fishery salary share of total salaries and employment for full-time coastal fishermen employed at, but not owning, fishing vessels 2002–2012. Salaries are adjusted for inflation, using 2002 as the base year**

| Year | Average TotInc (EUR/person) | Average WagesFishery (EUR/person) | Average FracFish | Number of employed |
|---|---|---|---|---|
| 2002 | 47,248 | 42,932 | 0.91 | 499 |
| 2003 | 39,145 | 35,140 | 0.90 | 477 |
| 2004 | 39,863 | 35,529 | 0.89 | 456 |
| 2005 | 43,123 | 38,885 | 0.90 | 468 |
| 2006 | 51,024 | 46,771 | 0.92 | 430 |
| 2007 | 49,504 | 44,511 | 0.90 | 395 |
| 2008 | 47,521 | 42,529 | 0.89 | 350 |
| 2009 | 41,130 | 36,519 | 0.89 | 344 |
| 2010 | 49,426 | 44,291 | 0.90 | 310 |
| 2011 | 49,857 | 44,510 | 0.89 | 266 |
| 2012 | 44,856 | 39,764 | 0.89 | 257 |

[14] The Danish VQS regulation system allocates quotas to individual quotas to active Danish vessels and the vessels are allowed to trade these quotas.

## 3.5 Why do coastal fishermen exit?

Using logit regression, with the two options "stay" or "leave" as the dependent variable, it has been investigated which factors influence why coastal fishermen exit the fishery. The analysis has been performed on a year by year basis for the period 2004–2009. A person is included in the analysis in a given year if he has been defined as being a full-time coastal fisherman for the year analysed and the two preceding years, i.e. for 3 years in all. Or in other words he must have been an active full-time coastal fisherman for at least three consecutive years. A person is moreover defined as having *left* the coastal fishery in a given year if he *does not* fulfil the requirements for being a full-time coastal fisherman for that year and the two following years, i.e. for three consecutive years. Contrary to this a person is defined as *staying* in the coastal fishery if he is not out of it for three consecutive years.

Given these definitions table 33 shows the number of persons staying in the coastal fishery in a given year and leaving the coastal fishery in the year after. E.g. in 2004, 1107 persons were acting as full-time coastal fishermen, and of these 42 persons left the coastal fishery in 2005. A general decline in the number of full-time coastal fishermen is observed. It is further seen that the fraction leaving the fishery increases towards 2007 and then decreases again. This tendency is believed to be caused by the introduction of VQS management in the Danish fishery in 2007, which has been stated to be an incentive for small scale fishermen to sell their quotas to larger vessels.

**Table 33: Number of full-time coastal fishermen in each of the years (t) 2004–2009, and number leaving the fishery in year t+1 for each of the years 2004–2009**

| Year (t) | Full-time coastal fishermen in year=t | Number leaving the coastal fishery in year=t+1 |
|---|---|---|
| 2004 | 1,107 | 42 (3.7%) |
| 2005 | 1,095 | 57 (5.2%) |
| 2006 | 1,030 | 102 (9.9%) |
| 2007 | 943 | 69 (7.3%) |
| 2008 | 862 | 58 (6.7%) |
| 2009 | 789 | 60 (7.6%) |

As mentioned above the dependent variable in the analyses is a binary choice, either to *stay* (=0) or *leave (=1)* the fishery after the analysis year. The probability of leaving is assessed by logit analysis, which is a technique that assesses the probability $\pi$ of a given event (in this case to leave the coastal fishery) given a number of explanatory variables $\bar{x} = (x_1, x_2, x_3, \ldots, x_N)$. The formula for the logit probability is given by:

$$\pi_{Leave}(\bar{x}) = \frac{\exp(\alpha + \bar{\beta} \cdot \bar{x})}{1 + \exp(\alpha + \bar{\beta} \cdot \bar{x})} \qquad (1)$$

In this equation α and $\bar{\beta} = (\beta_1, \beta_2, \beta_3, \ldots, \beta_N)$ are parameters that determine to what degree the probability to leave depend on the explanatory variables. The special form of the right-hand side of the probability given in equation (1) arises because the equation is based on the assumption that the fraction between the probability to leave and the probability to stay (equal to 1 minus the probability to stay), i.e. the odds of leaving, is given by the odds equation:

$$\Pi(\bar{x}) = \frac{\pi_{Leave}(\bar{x})}{1 - \pi_{Leave}(\bar{x})} = \exp\left(\alpha + \bar{\beta} \cdot \bar{x}\right) \qquad (2)$$

The exponential function ensures that the odds $\Pi$ are always positive. The odds may be seen as the number of coastal fishermen leaving for each person staying. The change in odds (the "odds ratio") when a given element $x_i$ of the vector $\bar{x}$ is increased by 1 (i.e. $\Pi(\bar{x} \mid x_i = x_i^0 + 1) / \Pi(\bar{x} \mid x_i = x_i^0)$) is equal to $\exp(\beta_i)$. If this is greater than unity the odds of leaving (and thus the probability of leaving) goes up, while the odds (and thus probability of leaving) goes down when $\exp(\beta_i)$ is less than unity.

In the present context, the continuous variables (income variables) are included in the model in logarithmic form, i.e. as $\tilde{x} = \log(x)$. In this case the model given in (2) takes on the form:

$$\log\left(\Pi(\bar{x})\right) = \alpha + \sum_i \beta_i \cdot \log(x_i) \qquad (3)$$

Thus, if $x_i$ is changed by *1%*, $\Pi$ will change by $(1.01^{\beta}-1)\cdot 100\%$. Thus, it is clear that the larger (or smaller) the coefficient $\beta$ the larger (or smaller) will be the percentage increase in the odds given a *1%* change in the income variables.

The explanatory variables included in the logit model are outlined and explained in table 34. One variable is a classification variable ("Occupational status") while the remaining are continuous. For the latter, the natural logarithm of the variable has been used to reduce differences in orders of magnitude that may bias the results. Moreover, the salaries from fishery, the salaries from other sources, and the family income have been normalized with regards to the overall minimum (over all persons and years) of the variable plus 1, thus avoiding taking logarithm of negative numbers (as these income variables can become negative due to negative surplus from own enterprises).

The minimum observed salary can be seen as the minimum opportunity income that can be obtained in the best alternative use of the fishery labour, and as such the log of the salary less the minimum observed salary corresponds to the log of what can be earned in excess of the minimum opportunity income. Thus e.g. "WagesFishery" in table 34 stands for:

> (Fishery income for the person in question)+Minimum(Fishery income over all coastal fishermen in all years)+1.

Thus, for the salary and family income $\Pi$ will change by $(1.01^{\beta}-1)\cdot 100$ when the salaries and family income, less the opportunity incomes, change by 1%.

**Table 34: Explanatory variables applied in the logit analysis of factors that affect coastal fishermen's decision to leave the fishery**

| Parameter | Explanation |
|---|---|
| Occupational status | Classification variable (3 levels), dividing the fishermen in (i) hired fishermen, (ii) fishermen not receiving salaries but having their own firm (fishing boat), and (iii) fishermen both having their own enterprise and receiving salaries, where at least one of these (own enterprise and/or salaries) comes from the fishery. |
| $\text{Log(WagesFishery}_t\text{)}$ | The logarithm of the fisherman's total income (above the minimum opportunity salary) from fisheries in the year, *t*, before leaving the fishery. |
| $\text{Log(WagesOther}_t\text{)}$ | The logarithm of the fisherman's total income (above the minimum opportunity salary) from other sources than fisheries in the year, *t*, before leaving the fishery. |
| $\text{Log(SocialBenefit}_t\text{)}$ | The logarithm of the income from public services in the year, *t*, before leaving the fishery. |
| $\text{Log(Pensions}_t\text{)}$ | The logarithm of all pension income in the year, *t*, before leaving the fishery. |
| $\text{Log(FamilyIncome}_t\text{)}$ | The logarithm of the income of the rest of the fisherman's family (i.e. excluding his own income) in the year, *t*, before leaving the fishery (above the minimum opportunity income). |

The explanatory variable "Occupational status" is a classification variable, which is treated as a dummy variable in the logit analyses. The base case is a person owning a fishing vessel and not having salaries from other sources. Table 35 shows the distribution of full-time active coastal fishermen in each year 2004–2009 on each of the occupational levels, together with the number leaving the fishery in the consecutive year.

**Table 35: Number of full-time coastal fishermen in each of the years (t) 2004–2009 divided into occupational groups, and number leaving the fishery in year t+1 for each of the years 2004–2009**

| Year (t) | | Total (t) | Leave (t+1) |
|---|---|---|---|
| 2004 | Hired | 277 | 18 (6.50%) |
| | Own enterprise | 656 | 11 (1.68%) |
| | Hired + own enterprise | 174 | 13 (7.47%) |
| 2005 | Hired | 265 | 25 (9.43%) |
| | Own enterprise | 638 | 21 (3.29%) |
| | Hired + own enterprise | 192 | 11 (5.73%) |
| 2006 | Hired | 246 | 30 (12.20%) |
| | Own enterprise | 593 | 43 (7.25%) |
| | Hired + own enterprise | 191 | 29 (15.18%) |
| 2007 | Hired | 257 | 35 (13.62%) |
| | Own enterprise | 499 | 22 (4.41%) |
| | Hired + own enterprise | 187 | 12 (6.42%) |
| 2008 | Hired | 240 | 22 (9.17%) |
| | Own enterprise | 469 | 23 (4.90%) |
| | Hired + own enterprise | 153 | 13 (8.50%) |
| 2009 | Hired | 233 | 31 (13.30%) |
| | Own enterprise | 431 | 18 (4.18%) |
| | Hired + own enterprise | 125 | 11 (8.80%) |

Table 35 shows that in most years hired coastal fishermen have the highest leaving frequency. The frequency of leaving for coastal fishermen owning their own enterprise increases towards 2007 and then flattens out, indicating that they to a higher degree sold their quotas towards the introduction of VQS regulation. Fishermen both owning their own enterprise and having other income experience a sharp increase in the fraction leaving in 2007, and then a decrease again, indicating that persons in this group sold their quotas after the VQS regulation was introduced.

Table 36 displays averages of the continuous explanatory variables for each of the analysed years. The averages over all full-time coastal fishermen included in the analyses are displayed, together with the averages for the coastal fishermen staying respectively leaving the fishery in the consecutive year. E.g. the full-time coastal fishermen in 2004 had an average income from fishery of EUR 34,088. The fishermen that continued as coastal fishermen in 2005 had an average income from the fishery of EUR 34,338 in 2004, while the persons that left the coastal fishery in 2005 had an average income from fishery of EUR 27,767 in 2004. The reasons, the persons leaving the coastal fishery, still have fishery salaries can be twofold: firstly, they can continue in the fishery, but at large scale vessels. Secondly, they can have income from fisheries related to sale of quotas and vessels.

Table 36 displays an interesting tendency, namely that fishery income of the persons *leaving* the coastal fishery increases considerably towards 2006–2007 and exceeds the fishery income from the persons staying in the fishery. This indicates that the persons leaving the fishery may have sold out of quotas in the years leading up to the introduction of VQS regulation and thereby increased their income considerably in the last year before leaving and/or in the year of leaving.

**Table 36: Average of the continuous explanatory variables in each of the analysed years. The averages over all full-time coastal fishermen are shown, together with the averages over the full-time fishermen staying respectively leaving the fishery the following year. All values are in euros**

| | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| WagesFishery(t) | All | 34,088 | 36,696 | 48,869 | 51,204 | 42,346 | 33,229 |
| | Stay(t+1) | 34,338 | 36,331 | 44775 | 48,994 | 41,337 | 31,208 |
| | Leave(t+1) | 27,767 | 43,342 | 86,,115 | 79,206 | 56,338 | 57,776 |
| WagesOther(t) | All | 389 | 533 | 803 | 752 | 678 | 461 |
| | Stay(t+1) | 336 | 410 | 572 | 550 | 615 | 371 |
| | Leave(t+1) | 1734 | 2770 | 2,903 | 3318 | 1,558 | 1557 |
| SocialBenefit(t) | All | 533 | 444 | 466 | 436 | 353 | 447 |
| | Stay(t+1) | 489 | 416 | 417 | 392 | 319 | 411 |
| | Leave(t+1) | 1655 | 960 | 906 | 999 | 821 | 879 |
| Pensions(t) | All | 116 | 236 | 431 | 362 | 260 | 384 |
| | Stay(t+1) | 89 | 198 | 281 | 295 | 222 | 256 |
| | Leave(t+1) | 785 | 929 | 1,799 | 1,208 | 793 | 1,942 |
| FamilyIncome(t) | All | 22,039 | 22,971 | 23,844 | 25,057 | 27,275 | 27,386 |
| | Stay(t+1) | 22,156 | 23,160 | 24,213 | 25,403 | 27,639 | 27,470 |
| | Leave(t+1) | 19,048 | 19,519 | 20,486 | 20,667 | 22,231 | 26,365 |

Table 37 presents the parameter estimates from the logit regressions (i.e. the parameters $\alpha$ and $\beta$ from equations (1) and (2)) and table 38 displays the corresponding odds ratios for the categorical variables. Table 39 presents the percentage changes in the odds when the continuous (income) variables change by 1%. A number of interesting effects are observed. Firstly, the fisheries income parameter is negative and significant in 2004, changing to being positive over the rest of the period, and significantly so from 2006. Table 39 shows that in 2006 the odds of leaving increases by 6.78% when the fisheries salary (above minimum opportunity salary) increase by 1% while the corresponding odds increase in 2007–2009 is on the average 2.78%. Thus, especially in 2006 the probability of leaving the coastal fishery in 2007 is strongly correlated with the income from fisheries. These results support the hypothesis that when the new opportunities for buying and selling quotas where introduced with the new regulation, fishermen increased their income selling their quota shares and then left the fishery the following year.

Tables 37 and 39 moreover show that the income from other branches is strongly and positively correlated with the probability of leaving the fishery in 2004–2007. Thus, the higher income from other branches in the year before leaving, the higher is the probability of leaving, suggesting that the fishermen that are leaving might already have established other working possibilities before leaving. Table 39 shows that the odds of leaving increase with between 9.07 and 14.74% when the income from other branches (above minimum opportunity income) than fisheries increases by 1% during this period. These effects are confirmed by the averages displayed in table 36.

Income from pensions in the year before leaving is also positively correlated with the probability of leaving, again indicating that some fishermen may be planning to retire after leaving the coastal fishery. This is also confirmed by table 36 where the pension incomes in the year before leaving of persons leaving are considerably higher than the average pension incomes from persons staying.[15] Inspecting table 38 it is seen that this effect is not as pronounced with regards to percentage change in odds of leaving, as the corresponding effects from fishery income and other income. On the other hand, the effects of pensions incomes on the probability and odds of leaving is to some degree unchanged during the period, with an average increase in odds of leaving of 0.20% when the pension income increases by 1%.

Social benefit payments have a positive but small influence on the probability of leaving the coastal fishery in some years. Likewise, income from the rest of the family has a negative but small influence on the probability of leaving. This may indicate that if a coastal fisherman has a family with a high income he may stay in the coastal fishery, because the family income is more robust when it does not depend solely on the income from fisheries, which can postpone the decision of leaving the fishery.

Finally, tables 37 and 38 show that compared with coastal fishermen having their own enterprise and not having other salaries, hired fishermen have a higher probability of leaving the coastal fishery in 2007 and 2009. However, as this effect is not significant in all years this is not a general tendency.

All in all, it can be concluded that income from other branches has the strongest influence on the probability to leave the coastal fishery, followed by the income from fishery in the years around introduction of VQS in Denmark. Income from pensions has a small but positive and steady influence on the probability to leave, which make perfect sense as older fishermen starting to receive pension in most cases are expected to leave the fishery.

**Table 37: Parameter estimates from the logit regression**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| Intercept | -33.5880 | -147.3*** | -171.7*** | -134.1*** | -70.1166** | -142.6*** |
| Hired | 0.6597 | 0.6036 | 0.4338 | 1.0297*** | 0.5375 | 1.2180*** |
| Salaries and own entp. | 1.0723** | -0.1159 | 0.0366 | -0.2005 | 0.3771 | 0.4571 |
| Log(Wages-Fishery$_t$) | -6.7090** | 0.4374 | 6.5956*** | 3.2613*** | 1.9385* | 3.0623** |
| Log(Wages-Other$_t$) | 10.8873*** | 13.8220*** | 8.7231*** | 9.6905*** | 3.1951 | 9.0616*** |
| Log(Social-Benefit$_t$) | 0.1898*** | 0.0836 | 0.08621** | 0.0768* | 0.0522 | 0.0581 |
| Log(Pen-sions$_t$) | 0.2310*** | 0.2146*** | 0.1916*** | 0.1778*** | 0.1550*** | 0.2494*** |
| Log(Family-Income$_t$) | -0.5025 | -1.3136 | -1.0792* | -1.6070** | -0.1045 | -0.0407 |

Note: ***=Significant at 1% level.
**=Significant at 5% level.
*=Significant at 10% level.

[15] The age of the fishermen was originally included in the model, but was not significant in any of the years. Thus age was left out in the final model.

**Table 38: Estimation of odds ratios corresponding to the categorical variables displayed in table 35**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| Hired | 1.93 | 1.82 | 1.54 | 2.80 | 1.71 | 3.38 |
| Wages and own entp. | 2.92 | 0.89 | 1.03 | 0.81 | 1.46 | 1.58 |

**Table 39: Percentage change in odds when the continuous variables changes by 1%[1]**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| Log(Wages-Fishery$_t$) | -6.46 | 0.44 | 6.78 | 3.30 | 1.95 | 3.09 |
| Log(Wages-Other$_t$) | 11.44 | 14.74 | 9.07 | 10.12 | 3.23 | 9.44 |
| Log(Social-Benefit$_t$) | 0.19 | 0.08 | 0.09 | 0.07 | 0.05 | 0.06 |
| Log(Pen-sions$_t$) | 0.23 | 0.21 | 0.19 | 0.18 | 0.15 | 0.25 |
| Log(Family-Income$_t$) | -0.50 | -1.30 | -1.07 | -1.59 | -0.10 | -0.04 |

Note: 1 Cf. the discussion above, the salaries from fishery, from other branches and the family income represents the income less the minimum opportunity income.

VQS regulation was introduced in 2007, however it was already decided on and announced publicly in December 2005, and the above results indicate that the coastal fishermen acted on the possibility to sell out of quotas and leave the trade. However, it must be expected that the fishermen owning a fishing vessel acted differently than hired fishermen, or fishermen both owning an enterprise (not necessarily a fishing vessel) and obtaining salaries. This distinction is included as dummies in the above logit analyses, but this approach may not catch the deeper differences between the 3 groups in the critical years around the introduction of VQS regulation. Thus, separate logit analyses have been performed for the three income groups regarding the decision to stay in or leave the coastal fishery in 2007.

Table 40 shows the averages of the continuous explanatory variables (see table 35) in 2006, divided on income groups. The averages are shown for all persons in 2006 and for the two groups that are staying respectively leaving the coastal fishery in 2007. A very interesting effect is observed for the persons only owning their own enterprises and persons owning their own enterprise and receiving salaries. Namely that the average fishery salaries in 2006 of the persons leaving in 2007 when VQS regulation is introduced, are approximately double the fishery salaries of the persons staying in the coastal fishery. This supports the conclusions made above, that the coastal fishermen that left the fishery in 2007 did so by selling out of their quotas, thus receiving very high fishery incomes just before leaving. The same effect is not seen for the hired fishermen, i.e. this group have left the fishery because of the reduced job opportunities in the sector and not because they were able to sell quotas.

**Table 40: Average of the continuous explanatory variables in 2006 over the three income groups. The averages over all full-time coastal fishermen are shown, together with the averages in 2006 over the fishermen staying respectively leaving the fishery in 2007. All values are in euros**

| | | Hired | Only own enterprise | Salaries and own enterprise |
|---|---|---|---|---|
| WagesFishery(2006) | All | 48,373 | 45,430 | 60,183 |
| | Stay(2007) | 48,543 | 41,088 | 52,267 |
| | Leave(2007) | 47,147 | 100,970 | 10,4398 |
| WagesOther(2006) | All | 772 | 0 | 3337 |
| | Stay(2007) | 808 | 0 | 2,200 |
| | Leave(2007) | 509 | 0 | 9,684 |
| SocialBenefit(2006) | All | 1,355 | 65 | 567 |
| | Stay(2007) | 1,410 | 22 | 425 |
| | Leave(2007) | 889 | 616 | 1,356 |
| Pensions(2006) | All | 99 | 637 | 223 |
| | Stay(2007) | 112 | 391 | 135 |
| | Leave(2007) | 0 | 3,787 | 714 |
| FamilyIncome(2006) | All | 21,531 | 24,240 | 25,591 |
| | Stay(2007) | 22,190 | 24,788 | 24,958 |
| | Leave(2007) | 16,784 | 17,241 | 29,126 |

Table 41 displays the results of the logit analyses performed separately for the three income groups concerning their decision to stay in or leave the coastal fishery in 2007. Table 42 displays the corresponding percentage changes in odds of leaving given 1% changes in the continuous (income) variables. I.e. as above, the decision to stay or leave in 2007 has been modelled against the income variables in 2006, i.e. the last year where the fisherman is still in the coastal fishery. For the "Hired" group the Log (Pensions) variable has been left out as all in this group had pensions equal to zero in 2006. Likewise, the variable Log (Wages-Other) has been left out for the group "Only own enterprise" as these do not have other salaries.

Tables 41 and 42 firstly show that the fishery salaries strongly influence the probability to leave in 2007 for the persons only owning an enterprise, i.e. the higher the salaries from fishery the higher the probability to leave in 2007 in this group. The percentage increase in the odds of leaving is 8.66% when the fishery salaries (above minimum opportunity salary) increase by 1% in this group, compared to a decrease of -1.88% in the group of hired fishermen (i.e. the higher salaries these have from fishery in 2006 the lower is the probability that they leave in 2007), and 4.37% for persons both having salaries and their own enterprise. This supports that especially the fishermen only owning their own enterprise and not receiving other income used the introduction of VQS regulation to sell their quotas.

Furthermore, the two tables show that for the group having both their own enterprise and receiving other income the decision to leave is affected to a much higher degree by the level of their other income in 2006 than the group of hired fishermen, for which this effect is not significant. Thus, the probability that a person having both their own enterprise and other salaries leaves the coastal fishery in 2007 increases both as a function of the fishery income (probably by selling out of quotas) and by their other income, indicating that these persons may have known they could get reasonable incomes from other sources if they sold out of their quotas and left the coastal fishery.

Finally, the two tables show that the influence of social benefits, pensions and family income on the decision to leave the coastal fishery in 2007 does not differ much between the three groups, but that these three factors are all significant for the group only owning their own enterprise, thus indicating that these factors may also have had some influence on the decision to leave for this group.

**Table 41: Parameter estimates from the logit regression for the decision to stay or leave in 2006, divided out on income groups**

| | Hired | Only own enterprise | Salaries and own enterprise |
|---|---|---|---|
| Intercept | 79.3860 | -82.8928*** | -209.5*** |
| Log(Wages-Fishery$_{2006}$) | -1.9040 | 8.3423*** | 4.2951** |
| Log(Wages-Other$_{2006}$) | -3.8611 | - | 12.0639*** |
| Log(Social-Benefit$_{2006}$) | -0.0441 | 0.3641*** | 0.2041*** |
| Log(Pen-sions$_{2006}$) | - | 0.2303*** | 0.1499 |
| Log(Family-Income$_{2006}$) | -1.2143 | -2.3567** | 1.5059 |

Note: ***=Significant at 1% level.
**=Significant at 5% level.

**Table 42: Percentage change in the odds of leaving the coastal fishery when the continuous variables changes by 1%[1]**

| | Hired | Only own enterprise | Salaries and own enterprise |
|---|---|---|---|
| Log(Wages-Fishery$_{2006}$) | -1.88 | 8.66 | 4.37 |
| Log(Wages-Other$_{2006}$) | -3.80 | - | 12.75 |
| Log(Social-Benefit$_{2006}$) | -0,04 | 0.36 | 0.20 |
| Log(Pen-sions$_{2006}$) | - | 0.23 | 0.15 |
| Log(Family-Income$_{2006}$) | -0,20 | -2.32 | 1.51 |

Note: [1] Cf. the discussion above, the salaries from fishery, from other branches and the family income represents the income less the minimum opportunity income.

## 3.6 Conclusions

In this chapter, the salary structure for Danish coastal fishermen in 2012 have been investigated. Moreover, the salary development during the period 2002–2012 has been outlined. And finally, reasons for Danish coastal fishermen to leave the trade during the period 2004–2009 have been analysed using logit regression.

Full-time employed (60% or more of their salaries coming from the fishery) Danish fishermen and coastal fishermen obtain higher incomes than the Danish average salary in 2012. For full-time employed coastal fishermen their incomes from fisheries are >25% higher than the average Danish income, while all full-time employed fishermen (coastal and large scale) have >46% higher incomes from fishery than the Danish average. As such alternative employment for coastal fishermen may not always be as profitable as staying in the trade.

Compared with this, full-time employed coastal fishermen on the average have a fishery income that is 86% of the income from fisheries for all full-time employed

fishermen in Denmark. Thus, there may be an incentive to shift away from the coastal to larger scale fishery, while still staying in the fishery trade.

Among the coastal fishermen the most profitable are of age 31–45 years and are educated within craftsmanship. Moreover, the most profitable operate from Central Jutland, where the fishing opportunities are better than for coastal fishermen operating in the Baltic Sea.

Full-time employed coastal fishermen only to a limited degree receive unemployment benefits and pensions. However, the possibility to receive pensions increases the probability of leaving the coastal fishery, which is shown in the logit analysis. This make sense since most fishermen receiving pensions are most often about to be retired.

For employed fishermen (not owning coastal vessels), the salaries increased towards 2006, dipped in 2009 and then increased a bit again towards 2011, thus both reflecting the introduction of VQS regulation but also the financial crisis in 2009.

The major incentives (defined as increased probability) for coastal fishermen to leave the fishery are that they have incomes from other branches. Thus, if the fishermen have other job opportunities the decision of leaving the fisheries seems much easier. Moreover, there is a strong positive correlation between high incomes from the fishery itself, for fishermen owning their own vessel, and the probability of leaving around the introduction of VQS regulation in 2006–2007. The interpreted of this relationship is that the income increases because the fishermen sell their quota shares and not because the general income opportunities increased in the Danish fisheries in the years around the introduction of the new management system. As such, there is a quite reasonable explanation of this peculiar relationship of increasing income and increasing possibilities of fishermen leaving the coastal fisheries.

# 4. Salary and employment in Norwegian fisheries

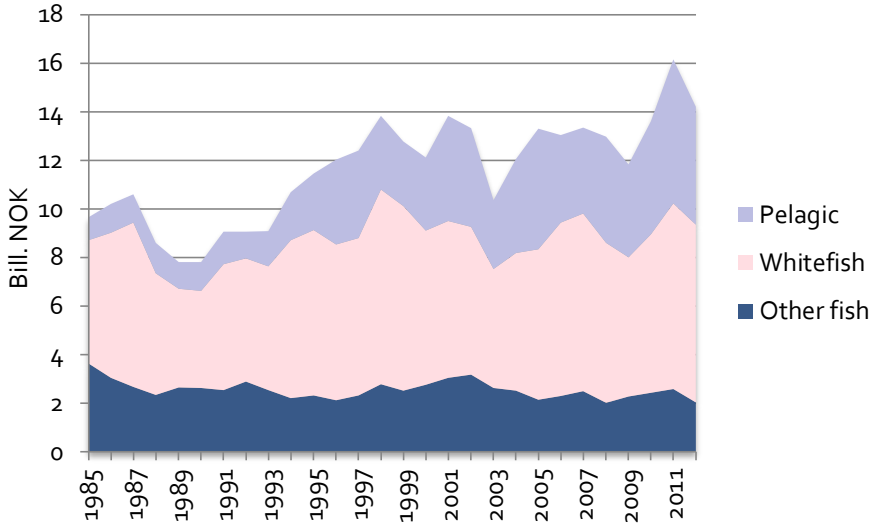
## 4.1 Introduction

This chapter contains 4 sections after this introduction. In the next section, an overview of the Norwegian fisheries and management system is provided, followed by a discussion of the data underlying all indicators and analyses in the Norwegian case study. The fourth section contains a presentation of the income distribution by various indicators for the Norwegian fishery. The fifth section presents an econometric analysis of why fishermen exit the fishing sector, while the last section concludes the chapter.

## 4.2 Framework conditions for the Norwegian fisheries

Norwegian fisheries have two main sectors: 1) A pelagic sector targets small pelagic species such as herring and mackerel together with low value whitefish like blue whiting, and 2) the cod or whitefish sector that primarily harvest cod, haddock, saithe and other higher valued whitefish. In addition, there are some much smaller specialized fisheries targeting shrimp, or reduction species. Total landings in million NOK are shown in figure 5, while quantities are shown in figure 6.

**Figure 5: Norwegian fisheries landings by real value (2012=1), 1985–2012**



Total landed value peaked in 2011 at about NOK 16 billion or about EUR 2 billion. The values for whitefish and other fish are relatively stable, while there is a strong increase in the landed value for pelagic fish. Comparison of figure 5 and figure 6 indicates that other fish is relatively low in value as the quantity share is substantially higher than the value share. Figure 6 shows that the landed quantity of other fish is variable with a declining trend, whitefish is stable and the landings of pelagic species increased, primarily due to strong year classes of Spring Spawning herring coming into the fishery in the early 1990s. Table 43 provides more detail by showing average annual landings by species for the period 2002 to 2012 as well as the landings in 2012.

**Figure 6: Norwegian fisheries landings by quantity, 1985–2012**

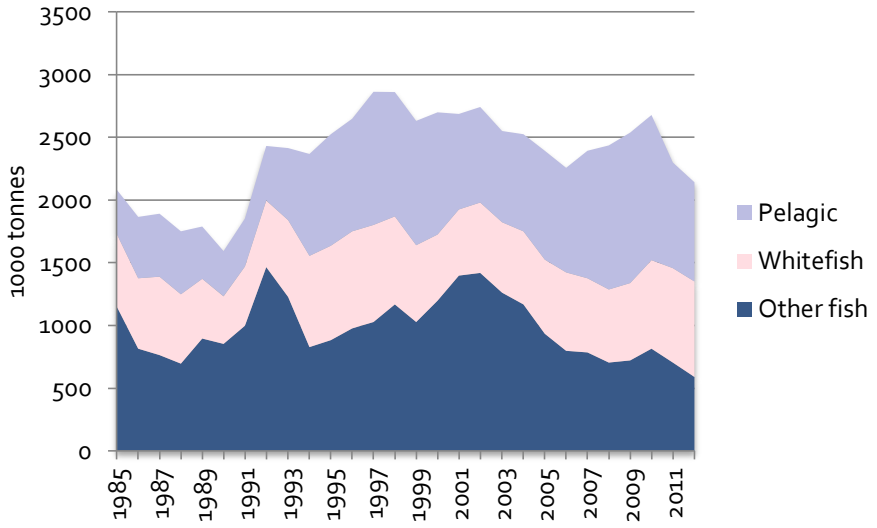



**Table 43: Norwegian annual average landings by species 2002–2012**

| | Annual average, 2002-2012 | | 2012 | |
|---|---|---|---|---|
| | Value Mill. EUR | Quantity 1,000 mt | Value Mill. EUR | Quantity 1,000 mt |
| Cod | 395,7 | 250,7 | 477,8 | 356,0 |
| Herring | 317,1 | 760,0 | 445,1 | 610,7 |
| Mackerel | 170,9 | 157,9 | 161,0 | 176,0 |
| Saithe | 149,7 | 213,3 | 168,7 | 175,5 |
| Haddock | 98,9 | 91,8 | 164,5 | 160,8 |
| Shrimp | 81,7 | 40,0 | 63,7 | 18,7 |
| Blue whiting | 64,0 | 478,6 | 34,6 | 118,2 |
| Other | 226,3 | 450,4 | 257,5 | 520,7 |

Modern fisheries management in Norway commenced when a total allowable quota (TAC) was set for mackerel in 1972 (Hersoug, 2005; Årland and Bjørndal, 2002). This was followed by TACs for the other main fisheries in the pelagic sector, and then, as the Exclusive Economic Zone (EEZ) was extended to 200 miles in 1977, quotas were set first for cod and then other demersal species. The introduction of TACs also transformed

most fisheries to regulated access, as a license was required for most vessels longer than 11 meters, while the smallest vessels has remained unlicensed or open.

Regulation with individual vessel quotas started as early as 1978 in the capelin fishery. However, the first major fisheries that were regulated by individual vessel quotas were herring and mackerel in 1986. In the cod fisheries, individual vessel quotas were introduced in the following years. For coastal vessels, the individual vessel quotas were in fact a maximum quota until 2005, as the sum of the individual vessel quota was substantially larger than the TAC for the vessel groups. It is also worthwhile to note that differences in fleet structure in the cod and the pelagic fisheries make these variations in regulatory structure significant. In the pelagic fisheries, the larger vessels, primarily the purse seiners, land most of the fish as they have about 80% of the total quota. In the cod fisheries, on the other hand, the coastal fleet controls about 70% of the quota.

When introduced, the vessel quotas were not transferable. In the 1990s, a desire to reduce capacity and inefficiencies led to different schemes first in the form of buyback programs and then allowing some long-run transferability, as quota could be transferred from a vessel that was taken out of the fishery to other remaining vessels (Standal and Aarset, 2008; Asche, 2009; Guttormsen and Roll, 2011). By 2007, long-run transferability had been introduced in all licensed vessel groups, and there are also trials with short term leases.

In 2012, the Norwegian fleet consisted of 6,169 vessels, down from 10,543 in 2002. The number of vessels has been steadily declining in all vessel groups, as shown in figure 7. As one can see, the reduction is strongest for unlicensed vessels, as the numbers here declined from 7,232 in 2002 to 3,776 in 2012. For the licensed group, the reduction was from 3311 vessels in 2002 to 2,393 in 2012. It is worthwhile to note that the reduction in the number of vessels is as large as in several full-fledged ITQ systems (Asche, Bjørndal and Bjørndal, 2014). It is also generally acknowledged that capacity reduction even with fully transferable quotas takes time (Grafton, Squires and Fox, 2000; Asche, Bjørndal and Bjørndal, 2014). It is also worthwhile to note that except for the pelagic sector, there is no resource rent being realized in any of the Norwegian fisheries (Steinshamn, 2010). Moreover, the main reason for the realized rents in the pelagic sector is obvious from figure 6. The strong increase in the landing is due to recovering stocks. Hence, the stocks adopted to the fleet's capacity more than the fleet adapting to the stocks.

Figure 7 shows that the unlicensed vessels make up the largest number of vessels. However, it is a very different story when it comes to landings as shown in table 44. By quantity, the purse seiners are the most important part of the fleet, covering 48.2% of the landed quantity. But as a large part of the catch has low value, their value share is 28.8%. The licensed coastal fleet is the vessel group with the highest value share at 30.8%. The unlicensed vessels are not very important neither with respect to quantity, with a quantity share of 1.6% or value, nor with respect to value, with a value share of 3.9%. Hence, for all practical purposes, the Norwegian fishing fleet equals the licensed vessels. Moreover, while the licensed coastal vessels are the most important vessel group by value it is also the most numerous group. The three ocean going groups

combined makes up 61.9% of the landed value, and an even higher share of the landed quantity, but comprises only 166 vessels.

**Figure 7: Number of fishing vessels, 2002-2012**

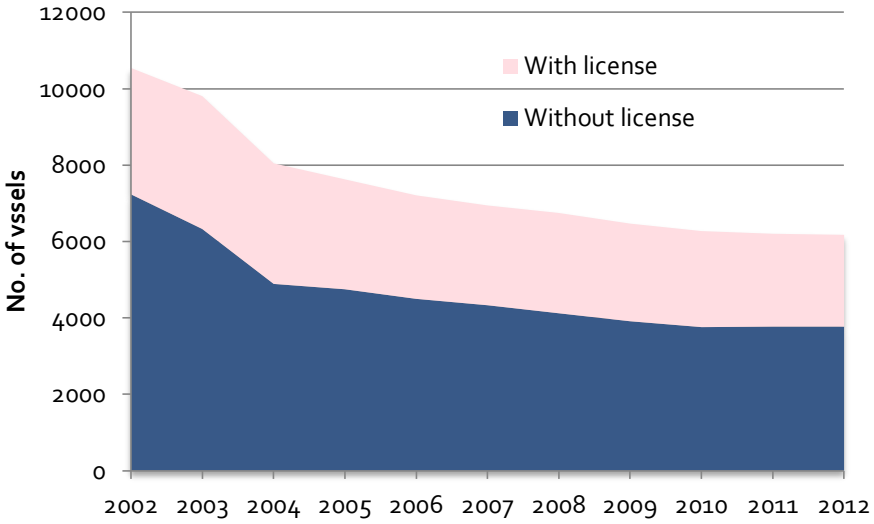


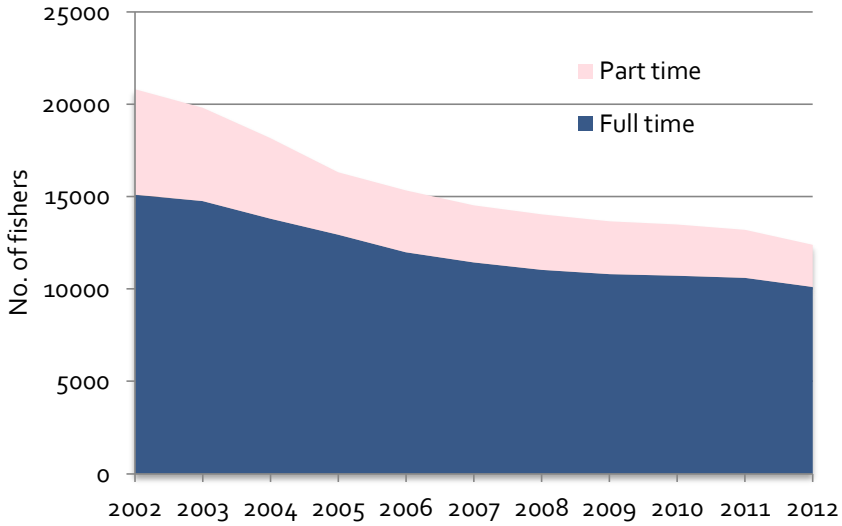

**Table 44: Norwegian annual average landings by vessel group 2002–2012**

| | Value (Mill. EUR) | Share | Quantity (Metric tons) | Share | No. of vessels in 2012 |
|---|---|---|---|---|---|
| Vessels without license | 54.5 | 3.9% | 36.3 | 1.6% | 3,776 |
| Coastal vessels with license | 433.1 | 30.8% | 520.0 | 22.9% | 2,144 |
| Shrimp trawl | 48.9 | 3.5% | 24.3 | 1.1% | 83 |
| Ocean other | 205.4 | 14.6% | 379.4 | 16.7% | 58 |
| Purse seine | 405.4 | 28.8% | 1,093.3 | 48.2% | 74 |
| Cod trawl | 259.6 | 18.5% | 214.4 | 9.5% | 34 |
| *Total* | *1,407.0* | | *2,267.8* | | *6,169* |

The number of fishermen displays a similar development as the number of vessels.[16] The fishermen are registered as part-time or full-time. As shown in figure 8, the total number of fishermen has been reduced from 2013 in 2002, of which 15,093 were full-time, to 12,380 in 2012, of which 10,108 were full-time. However, the number of part-time fishermen has been reduced much faster than the full-time fishermen, giving some support to the results of Abbott, Garber-Yonts and Wilen (2010) showing that a better managed fishery reduce part-time jobs much more than full-time jobs.

[16] It is worthwhile to note that this development is not obvious. For instance, Abbott, Garber-Yonts and Wilen (2010) show that most over-capacity in two Alaskan fisheries were due to fleeting steel, and that while the number of fishermen employed declined following restructuring, the number of full-time equivalent man years did not.

**Figure 8: Number of fishermen, 2002–2012**




## 4.3 The dataset

Data for the Norwegian analysis was delivered by Statistics Norway and the Directorate of Fisheries. Statistics Norway is the government agency responsible for official statistics in Norway. The Directorate of Fisheries manages fishery policy and collects statistics on fisheries.

*Population:* The data set for the Norwegian analysis contains everyone registered as a fisherman at any time during the years 2002–2012. Each individual was assigned a unique serial number that was used as identifier for all person-level data. The data is organized by calendar year. The full dataset contains 27,962 unique fishermen and a total of 171,785 observations. The different data sources and providers, as well as the level of the data are shown in table 45.

*Register of Norwegian Fishermen*: The register of fishermen is a complete register of all fishermen in Norway, as registration is a requirement for professional fishing. Fishermen are listed as either full-time or part-time fishermen. To stay listed as a full-time fisherman one must earn at least EUR 13,400 (NOK 100,000) in gross income from fisheries. Time spent on employment outside fisheries must be less than 2/3 of full working time and income earned from other sources must be less than EUR 40,100 (NOK 300,000).[17] Part-time fishermen must earn at least EUR 6,700 (NOK 50,000) from fisheries with maximum NOK 400,000 from other sources. For parts of northern Norway, the maximum income from other sources is increased to EUR 53,500 (NOK 400,000) for full-time and EUR 66,800 (NOK 500,000) for part-time employment.

[17] Strictly speaking, this means that it is possible to be a full-time fisherman and just receive 25% of your income from the fishing activity. While this is possible, it is highly unlikely to be a significant issue.

Requirements for full-time status are waived for fishermen on disability or above 60 years of age who has been registered for at least 10 years.

**Table 45: Data sources and providers used in the analysis**

| Source | Provider | Level |
|---|---|---|
| Register of Norwegian Fishermen | Directorate of Fisheries | Person |
| Register of Norwegian Fishing Vessels | Directorate of Fisheries | Vessel |
| Table of ownership | Directorate of Fisheries | Person |
| Register of Landings | Directorate of Fisheries | Vessel |
| Income data | Statistics Norway | Person |
| The Tax Register for Personal Tax Payers | Statistics Norway | Person |
| Register-based Employment Statistics | Statistics Norway | Person |

*Register of Norwegian Fishing Vessels:* All fishing vessels must be registered in the vessel register to qualify for quotas. Vessels are registered with information like length, size, year built, age of engine and owner.

*Table of ownership:* A vessel is always owned 100% by either a fisherman or a company. Those companies can be owned by fishermen or by other companies, but the last level owner is always a fisher. The Directorate of Fisheries tracks last level ownership in vessels. The table of ownership lists vessel, last level owner and ownership share.

*Register of Landings:* All fish landed is registered in the landings register by species, quantity and value.

*Tax and income data:* Personal income and taxes are recorded by the Norwegian Tax Authority. Statistics Norway collates the data. There is a separate category for fishermen, but this includes only the ownership part of the income. It does not include salary, lot or revenue shares. Hence, it is not known how much of a person's income is from the fisheries. Moreover, it is not known whether a person has retired, or for those persons who are partly retired what share of their income is from pensions. The requirements for full-time fishermen, which are the majority of the fisheries in the sample, however, indicate that most full-time fishermen have the fishery as their main source of income.

Vessel-level data were connected to fishermen person-level data through ownership shares in fishing vessels listed in the table of ownership. Fishermen without ownership could not be allocated to a specific vessel and are considered crew in the analysis. Where the same fishermen had shares in multiple vessels a primary vessel was determined based on highest percentage share.

**Table 46: List of variables from all data sources**

| Variable | Level | Description |
|---|---|---|
| Age-group | Person | Divided into 15–30, 31–45 and 46–60 |
| Catch quantity | Vessel | Aggregated catch quantity |
| Catch value | Vessel | Aggregated catch value |
| Crew | Person | Dummy for fishermen without ownership |
| Exit reason | Person | Reason for removal or change of status in the register |
| Income | Person | Income from all sources for the previous year |
| Register status | Person | Indicator for full-time or part-time status |
| Motor age | Vessel and person | Age of the vessels motor |
| Northern Norway | Person | Regional dummy for the three northernmost counties (Nordland, Troms and Finnmark) |
| Ownership | Person | Ownership share in primary vessel |
| Sex | Person | Male or female |
| Vessel age | Person | Age of vessel since construction |
| Vessel_crew | Person | Consolidated variable of vessel type and crew |
| Vessel type | Vessel and person | Type of vessel |

## 4.4 Salaries and employment in the Norwegian fisheries

As noted above, the fishermen register does not provide specific information about which fishermen are crew members. We combine the register with data on ownership to provide information on which fishermen have any ownership share. In table 47, this is shown together with ownership split into three categories. A bit more than half the registered fishermen, 54.3%, have no ownership and will be classified as crew. The second largest category has more than 90% ownership, which mostly is 100%. Finally, relatively few fishermen own less than 90% of vessels.

**Table 47: Annual average Norwegian fishermen by ownership share 2002–2012**

| | Number | Percent |
|---|---|---|
| No ownership | 8,487 | 54.3% |
| Below 34% | 563 | 3.6% |
| 34% to 89,9% | 878 | 5.6% |
| More than 90% | 5,689 | 36,4% |
| *Total* | *15,617* | |

In table 48 shows the age distribution disaggregated into crew and owners. There is a relatively equal number of fishermen in the age groups older than 31 years, but fewer in the youngest group. In the youngest group there are few owners, but with increasing age the share of owners increase. However, in all age groups a substantial fraction of the fishermen is crew.

**Table 48: Annual average Norwegian fishermen by ownership share 2002–2012**

| Age/ownership | 15–30 | 31–45 | 46–60 | 61+ | Total |
|---|---|---|---|---|---|
| Owner | 461 | 1,638 | 2,452 | 2,580 | 7,130 |
| Crew | 2,149 | 2,619 | 2,146 | 1,573 | 8,487 |
| *Total* | *2,610* | *4,257* | *4,597* | *4,153* | *15,617* |

In table 49 the number of owners is shown by vessel group. One can here see a clear trend that for the smaller vessels, there tend to be one majority owner, while for the larger ocean-going vessels, ownership is much more spread. In table 50, the same data is broken down by age. The vessels with no license are dominated by fishermen older than 61 years. There are also relatively few owners in this group among the youngest age groups, indicating that the recruitment purpose of this group does not work very well. It is also of interest to note that the two age groups from 31–60 dominate ownership in the coastal fleet with license, indicating that this is where the active coastal fishermen operate, while the vessels with no license seems to be more of a retirement group. Also for the ocean-going vessels do these two age groups dominate.

**Table 49: Annual average number of Norwegian fishermen by ownership share and vessel type 2002–2012**

| | No license | Coastal | Shrimp trawl | Ocean other | Purse seine | Cod trawl |
|---|---|---|---|---|---|---|
| Below 34% ownership | 44 | 238 | 20 | 129 | 104 | 27 |
| 34% to 89,9% ownership | 215 | 525 | 44 | 51 | 36 | 7 |
| 90%+ ownership | 4,007 | 1626 | 46 | 3 | 5 | 2 |
| | **Shares** | | | | | |
| Below 34% ownership | 1,0% | 10,0% | 17,8% | 70,3% | 71,8% | 75,5% |
| 34% to 89,9% ownership | 5,0% | 22,0% | 40,4% | 28,0% | 24,5% | 19,8% |
| 90%+ ownership | 93,9% | 68,1% | 41,8% | 1,7% | 3,6% | 4,8% |

**Table 50: Annual average number of Norwegian fishermen by ownership share and age 2002–2012**

| Age/vessel type | No license | Coastal | Shrimp trawl | Ocean other | Purse seine | Cod trawl |
|---|---|---|---|---|---|---|
| 15–30 | 281 | 148 | 9 | 10 | 11 | 1 |
| 31–45 | 761 | 703 | 40 | 70 | 52 | 13 |
| 46–60 | 1,213 | 1053 | 43 | 73 | 56 | 13 |
| 61+ | 2,011 | 486 | 18 | 30 | 27 | 9 |
| | **Share** | | | | | |
| 15–30 | 6,6% | 6,2% | 8,5% | 5,7% | 7,3% | 4,0% |
| 31–45 | 17,8% | 29,4% | 36,0% | 38,4% | 35,6% | 35,0% |
| 46–60 | 28,4% | 44,1% | 39,1% | 39,8% | 38,6% | 37,0% |
| 61+ | 47,1% | 20,3% | 16,4% | 16,1% | 18,4% | 24,0% |

For the income data, we will report four numbers, the average annual income for the period 2002–2012 as well as the income in 2012 for all fishermen and the average annual income for those who report a positive income. In table 51, we report income by ownership group. The total income is lowest for the group with majority ownership

followed by crews. Income is much higher for those with the lower ownership shares. This is not entirely unexpected given the distribution of ownership by vessel type, as shown in table 52. As one can see, there is large income variation by vessel group. Income is lowest for the vessels with no license, and then for crews. There is a clear jump up to income for owners of costal vessels with a license and shrimp trawl, and a much larger jump to the fishermen with ownership shares in the ocean going fleet. Those with an ownership share in a purse seiner do very well with an income of about EUR 200,000 as an annual average. The fishermen with ownership in a purse seiner had a somewhat bad year in 2012, with income of "only" EUR 190,000, which also serve to illustrate that fishing income is highly volatile. Owners of cod trawlers also do well with an income of over EUR 110,000, and with a very good year in 2012. The other ocean-going vessels makes about EUR 80,000 per year, which is still substantially above the Norwegian average income of EUR 35,750 in 2012. In fact, all groups of fishermen have a higher average income than the Norwegian average income, although the difference is not very large for the owners of vessels without a license.

**Table 51: Income in EUR for Norwegian fishermen by ownership group**

| | Annual average, 2002–2012 | | 2012 | |
|---|---|---|---|---|
| | All fishermen | Fishermen with a reported positive income | All fishermen | Fishermen with a reported positive income |
| Crew | 36,865 | 37,636 | 50,163 | 51,406 |
| Ownership<34% | 84,717 | 86,831 | 96,007 | 96,822 |
| 34%<Ownership<89% | 63,511 | 65,721 | 77,652 | 78,704 |
| Ownership>89% | 31,091 | 32,331 | 41,002 | 42,877 |

**Table 52: Income in EUR for Norwegian fishermen by vessel group**

| | Annual average, 2002–2012 | | 2012 | |
|---|---|---|---|---|
| | All fishermen | Fishermen with a reported positive income | All fishermen | Fishermen with a reported positive income |
| Crew | 36,865 | 37,636 | 50,163 | 51,406 |
| No license | 28,343 | 29,440 | 37,402 | 39,094 |
| Coastal | 44,721 | 46,367 | 59,608 | 61,311 |
| Shrimp trawl | 47,680 | 50,782 | 45,932 | 50,413 |
| Ocean other | 77,821 | 80,833 | 102,852 | 103,695 |
| Purse seine | 199,053 | 203,548 | 190,832 | 192,383 |
| Cod trawl | 117,852 | 120,572 | 157,292 | 157,292 |

**Table 53: Income in EUR for Norwegian fishermen by age group**

| | Annual average, 2002–2012 | | 2012 | |
|---|---|---|---|---|
| | All fishermen | Fishermen with a reported positive income | All fishermen | Fishermen with a reported positive income |
| 15–30 | 30,082 | 31,005 | 36,906 | 38,155 |
| 31–45 | 42,992 | 44,437 | 54,214 | 56,248 |
| 46–60 | 44,529 | 46,131 | 58,233 | 60,578 |
| 61+ | 30,633 | 31,078 | 45,688 | 46,405 |

## 4.5 Why do fishermen exit?

Why do people with long-time employment in fisheries exit the industry? In this section, this question will be analysed using a discrete choice model. In the analyses persons registered as full-time fishermen for at least three consecutive years during the period 2002–2011 are included. Data for 2012 is used to define who exited in 2011, but are otherwise not used. Fishermen registered as dead during 2002–2012 are excluded from the analysis. To differentiate between retirement and exit for other reasons, fishermen of age 60 or more in 2012 or the last year they are registered are excluded. As discussed in section 4.3, requirements for listing in the registry are relaxed after age 60.

A fisherman is defined as having exited the fishery in a given year if they are not listed as a full-time fisherman in the consecutive year. I.e. fishermen have exit = 1 the last year they are registered as full-time fishermen. As such there is not exit in 2002 and 2003, given that fishermen are only included in the analysis if they have been registered as full-time fishermen for at least 3 consecutive years.

This leaves us with a dataset of 66,514 observations for use in the exit analysis. Each observation is one fisherman in one given year. As such the dataset includes 11,910 unique fishermen. Almost 50% or 5,520 of these exit from fishing in the period 2004–2011. Fishermen are primarily male. 1,968 observations and 375 fishermen are female.

There is also substantial recruitment to the Norwegian fisheries. While entry is not investigated, it is noted that, 2,565 of the fishermen included in the exit-analysis enter the fishery after 2002. Hence, the net exit of fishermen is substantially lower than the gross exit. 1,032 of the entrants exit fisheries before 2012.

The number of exits and entrants by age is shown in table 54, and by vessel group in table 55. There are most exits in the 31–45 age group, while the number of exits is very similar for the younger and older age group. However, as shown in table 48, there are fewer fishermen in the youngest age group, so the exit rate is highest for this age group. It is less surprising that there are by far most entrants in the youngest age group, and in fact, there is basically as many young fishermen recruited as there are exiting. Table 55 shows that most entry and exit dynamics are related to the crews, or the fishermen with no ownership. For the owners, there is most activity in the group for vessels without license. The numbers indicate that most fishermen enter the profession

young and leave middle aged. Crews, that is fishermen who do not become vessel owners, dominate both entries and exits.

**Table 54: : Exits and entrants by age group**

| Age group | Exits | Entrants |
|---|---|---|
| 15–30 | 1,633 | 1,558 |
| 31–45 | 2,247 | 673 |
| 46–60 | 1,640 | 334 |
| *Total* | *5,520* | *2,565* |

**Table 55: Exits and entrants by vessel group and crew**

| Vessel group | Exits | Entrants |
|---|---|---|
| No license | 389 | 265 |
| Coastal | 55 | 54 |
| Shrimp trawl | 13 | 7 |
| Ocean going | 20 | 8 |
| Crew | 5,043 | 2,231 |
| *Total* | *5,520* | *2,565* |

### *4.5.1 Model specification*

To investigate the factors leading to exit, we use a model where the probability for exit is a function of income in the previous year, vessel type or crew and age. Controls are region (north or south), year and sex. Since the dependent variable is a discrete choice variable, a logit model is used. The equation to be estimated is given by:

$$\text{Logit}(\pi i) = \beta 0 + \beta 1 \ln(\text{income prev}) + \beta 2\ \text{vessel\_group} + \beta 3\ \text{agegroup} + \beta 4\ \text{northern\_norway} + \beta 5\ \text{year} + \beta 6\ \text{sex} + \varepsilon i \quad (1)$$

Income is expected to be an important variable in explaining why fishermen choose to exit. Due to regulation, low income from fisheries can result in automatic removal from the register. For this reason, we choose to use income from the previous year in our model. As it is not possible to use income only from only fishing and we therefore make no distinction between income from salary and capital. As 4,890 observations were excluded due to missing income data, the total number of observations used in the regression was 61,624. The vessel group variable specifies which vessel group an owner holds ownership in and includes the category crew for fishermen without any ownership. Northern Norway is a regional dummy for the three northernmost counties, which is traditionally regarded as more fishery dependent as there are fewer alternative employment opportunities. In total 54.5% of the owners and 43.5% of the crews are located in Northern Norway. There are few female fishermen and most of them are crew, but it is believed that it is worthwhile to single them out.

It could have been interesting to specify a model where the vessel group variable was replaced by an ownership variable. However, the fact that there are relatively few owners with a share less than 90% made multi-collinearity a serious problem, and thus this was not possible.

To further explore the importance of age an additional model was specified allowing for interaction between age and vessel type or crew. This is given by:

$$\text{Logit}(\pi_i) = \beta_0 + \beta_1 \log(\text{income prev}) + \beta_2 \text{ vessel\_group} + \beta_3 \text{ agegroup} + \beta_4 \text{ northern\_norway} + \beta_5 \text{ year} + \beta_6 \text{ sex} + \beta_7 \text{ vessel\_group*agegroup} + \varepsilon_i \quad (2)$$

### *4.5.2 Empirical results*

Equation (4.1) is estimated using as baseline a male fisherman owning a vessel with no license in age-group 15–30 and located in Northern Norway in 2004.

The results for the model without interactions are reported in table 56. As expected, a higher income reduces the probability of exit. Crew members have a higher probability of exit than fishermen without a license. On the other hand, there is a negative coefficient indicating a reduced probability of exit for all other vessel groups, although the parameter is not statistically significant for cod and shrimp trawlers. Fishermen aged 46–60 have a significantly higher probability of exit compared to fishermen aged 15–30. For fishermen aged 31–45 the coefficient is positive, but the result is not significant. This is interesting as it indicates that the high number of exits reported in table 54 is primarily due to young fishermen not becoming owners. Northern fishermen have lower probability of exit which probably can be explained by fewer alternative occupations. In an occupation that is dominated by males, it is also noticeable that female fishermen have increased probability of exit.

Some, but not all annual dummies are statistically significant. Squires and Kirkely (1991) indicates that annual dummies in a fishery normally will be a good representation of quota changes. For the entry decision, the dummies will rather represent the income opportunities. However, they tend to follow the quota and the prices. It is of particular interest to note that when the quota started to increase after 2008, but with substantially lower prices, the probability of exit was reduced, but the probability of exit increased again in 2011.

**Table 56: Probability of exit without interaction**

| Variables | Coefficient | SE |
|---|---|---|
| Ln(income previous year) | -0.474*** | 0.017 |
| | (0.000) | |
| Vessel_group = Coastal | -1.935*** | 0.151 |
| | (0.000) | |
| Vessel_group = Shrimp trawl | -0.296 | 0.288 |
| | (0.303) | |
| Vessel_group = Ocean other | -0.804*** | 0.309 |
| | (0.009) | |
| Vessel_group = Purse seine | -1.233** | 0.506 |
| | (0.015) | |
| Vessel_group = Cod trawl | -0.358 | 0.592 |
| | (0.545) | |
| Vessel_group = Crew | 1.456*** | 0.059 |
| | (0.000) | |
| Age = 31–45 | 0.038 | 0.037 |
| | (0.300) | |
| Age = 46–60 | 0.213*** | 0.040 |
| | (0.000) | |
| Northern Norway = 1 | -0.097*** | 0.031 |
| | (0.001) | |
| Year = 2005 | 0.280*** | 0.053 |
| | (0.000) | |
| Year = 2006 | 0.270*** | 0.056 |
| | (0.000) | |
| Year = 2007 | 0.038 | 0.060 |
| | (0.521) | |
| Year = 2008 | 0.079 | 0.061 |
| | (0.191) | |
| Year = 2009 | -0.177*** | 0.064 |
| | (0.006) | |
| Year = 2010 | -0.002 | 0.061 |
| | (0.976) | |
| Year = 2011 | 0.661*** | 0.057 |
| | (0.000) | |
| Sex = Female | 0.274*** | 0.076 |
| | (0.000) | |
| Constant | 2.199*** | 0.202 |
| | (0.000) | |
| Observations | 61,624 | 61,624 |

Note: : p-value in parentheses.
*** p<0.01. ** p<0.05. * p<0.1.

**Table 57: Probability of exit with interaction**

| Variables | Coefficient | SE |
|---|---|---|
| Log(income previous year) | -0.472*** | 0.017 |
| | (0.000) | |
| Northern Norway = 1 | -0.094*** | 0.031 |
| | (0.002) | |
| Year = 2005 | 0.281*** | 0.053 |
| | (0.000) | |
| Year = 2006 | 0.270*** | 0.056 |
| | (0.000) | |
| Year = 2007 | 0.037 | 0.060 |
| | (0.535) | |
| Year = 2008 | 0.078 | 0.061 |
| | (0.199) | |
| Year = 2009 | -0.178*** | 0.064 |
| | (0.006) | |
| Year = 2010 | -0.003 | 0.061 |
| | (0.965) | |
| Year = 2011 | 0.659*** | 0.057 |
| | (0.000) | |
| Sex = Female | 0.276*** | 0.076 |
| | (0.000) | |
| Vessel_group = Coastal | -0.523 | 0.324 |
| | (0.107) | |
| Vessel_group = Shrimp trawl | 1.286*** | 0.465 |
| | (0.006) | |
| Vessel_group = Ocean other | 0.502 | 0.738 |
| | (0.496) | |
| Vessel_group = Purse seine | 0.491 | 0.741 |
| | (0.508) | |
| Vessel_group = Cod trawl | 1.766* | 1.064 |
| | (0.097) | |
| Vessel_group = Crew | 1.824*** | 0.166 |
| | (0.000) | |
| Age = 31–45 | 0.381** | 0.185 |
| | (0.040) | |
| Age = 46–60 | 0.711*** | 0.181 |
| | (0.000) | |
| Vessel_group = Coastal & Age = 31–45 | -1.646*** | 0.415 |
| | (0.000) | |
| Vessel_group = Coastal & Age = 46–60 | -1.692*** | 0.399 |
| | (0.000) | |
| Vessel_group = Shrimp trawl & Age = 31–45 | -1.801*** | 0.655 |
| | (0.006) | |
| Vessel_group = Shrimp trawl & Age = 46–60 | -2.584*** | 0.854 |
| | (0.002) | |
| Vessel_group = Ocean other & Age = 31–45 | -1.859** | 0.942 |
| | (0.048) | |
| Vessel_group = Ocean other & Age = 46–60 | -1.229 | 0.848 |
| | (0.147) | |
| Vessel_group = Purse seine & Age = 46–60 | -1.453 | 1.030 |
| | (0.158) | |
| Vessel_crew = Cod trawl & Age = 46–60 | -1.754 | 1.287 |
| | (0.173) | |
| Vessel_crew = Crew & Age = 31–45 | -0.335* | 0.189 |
| | (0.076) | |
| Vessel_crew = Crew & Age = 46–60 | -0.513*** | 0.186 |
| | (0.006) | |
| Constant | 1.806*** | 0.255 |
| | (0.000) | |
| Observations | 61,118 | 61,118 |

Note: p-value in parentheses.
*** p<0.01. ** p<0.05. * p<0.1.
Pseudo R2 = 0.1011.

The results for the model with interaction terms for age are reported in table 57. As expected, there are few important changes for the other variables. The age terms are now both positive and statistically significant, indicating that the youngest age group has the lowest probability of leaving the fishery when being the owner of a vessel without a license. It is also of interest to note that several of the negative parameters associated with vessel group change sign and is not significant, and for cod trawlers it becomes statistically significant. Hence, ownership group is not so important for the youngest fishermen. For all other age groups, all other forms of ownership reduce the likelihood of exiting the fishery. Somewhat surprising, this is also true for crew members in that crew members in the older age groups also have a lower probability of exiting. While we do not have information to investigate this hypothesis, it is tempting to speculate that these crew members have a lower probability of exiting because they have they have established themselves in this occupation and have a long track record. The higher turnover rate for the youngest age group supports this.

## 4.6 Conclusions

Income for Norwegian fishermen varies significantly with ownership and vessel type, and between years. Crew in the Norwegian fishing fleet can expect an income slightly above the national average. Income for owners varies with vessel type. Owners of vessels without a license on average have a lower income than the national average. Owners in the ocean-going fleet earn an income comparable to or more than skilled professionals and in the case of the purse seiners substantially more.

The number of vessels and number of fishermen has declined in the period 2002–2012. Income is an important variable in explaining fisherman exit from the sector, but the ownership status seems to the most important variable, as most who exit at crews. This also underscores the results of Nøstbakken (2012) with respect to investment behaviour. It is of interest to note that recruitment in the youngest age group is basically the same as exit from this age group. Hence, fishing seems to be a relatively attractive occupation.

# 5. Salary and employment in Icelandic coastal fisheries

## 5.1 Introduction

This chapter contains five sections after this introduction. In section two, the framework conditions for the Icelandic coastal fisheries are presented with key numbers and a description of the Icelandic fisheries management. In section three, the data underlying all indicators and analyses in the Icelandic case study is presented and discussed. Section four goes through salary and employment figures for the Icelandic coastal fishermen and compare them to fishermen in other fleet segments and other professions. In section five is a reflection on why Icelandic coastal fishermen leave the fishing sector. Section six concludes the Icelandic case study.

## 5.2 Framework conditions for the Icelandic coastal fisheries

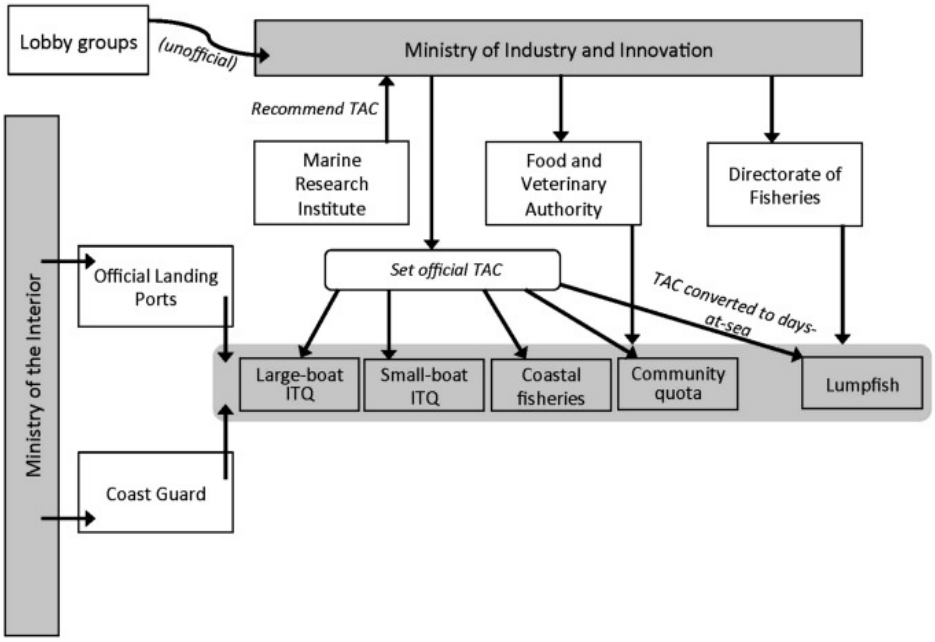
According to Fisheries Management Act No 38/1990 no one can catch fish inside the Icelandic economic zone without permission from the Ministry of Fisheries, and licences are allocated for one year at a time. Due to this law, all major fisheries inside the Icelandic economic zone operate according to a uniform system with transferable quotas in all species and fisheries. Hence, nearly all fishing vessels have individual transferable quotas (ITQ), allowing ship owners to buy, sell or rent quotas between ships.

The ITQ system comprises of two main branches i.e. the general ITQ system that includes all allowable fishing gears and the jig & line system that is restricted for small vessels using hooks and lines. Small coastal vessels are operated in both systems, but the majority of them are however working within the jig & line system where the size limits are 15 meters and 30 gross tonnage (GT). Price of quota in the general ITQ system is higher than in the jig & line system, which indicates that fisheries under the general system are more profitable. Transferring quotas from the larger system to the jig & line system is allowed, but it is prohibited to transfer jig & line quota into the larger system.

There is a third system, especially designed for small coastal vessels, where recreational- and new entry fishermen have a chance in starting out without investing in quotas. This is the coastal jigging system that allows small scale fishermen to catch predetermined amounts of fish per day during the summer months, May–August, in an Olympic fishery. The fishery is divided into four geographical areas where a total allowable catch (TAC) is set for each of the four months. Each vessel can then catch 650 kg per day until the monthly TAC has been reached. Total catches in this system

have amounted to approximately 8,500 tons a year since 2010. This is however not a very lucrative fishery and most of the fishermen working within this system can hardly be regarded as professional fishermen, as they are only out at sea for 20–40 days a year.

**Figure 9: Schematic overview of Icelandic fisheries governance (Ref: Chambers & Carothers, 2016)**




The Icelandic fisheries management system has many supporting measures designed for specific fisheries. There are extensive nursery areas permanently closed for fishing. Spawning areas of cod are closed for a few weeks in late winter during the spawning period and the Directorate of fisheries as well as the Marine Research Institute has the right to set emergency temporary closure of areas with excess rate of juveniles. There is a 12 mile from shore limit for large trawlers in most areas and there are several selectivity measures, such as a minimum mesh size of 135 mm or equivalent in trawl nets. A sorting grid is mandatory to avoid by-catch of juvenile fish in the shrimp fisheries and devices for excluding juveniles in the ground fish fisheries are also mandatory in certain areas.

The harvest control rule for cod is also a very important landmark in the precautionary approach to cod stock management. This rule, based on scientific recommendations, was adopted by a government decision and became effective in 1995. It states that the annual TAC for cod is to be set at 25% of the fishable biomass. This implies that the TAC is automatically set after the annual stock assessment. Following the recommendations of the Marine Research Institute, the government decided in July 2007 that the TAC for cod in the fishing year 2007/08 should be set at 20% of the fishable biomass, and this harvest control rule has been followed ever since. Similar harvest control rules have now been implemented for many other commercial stocks.

There are requirements that small fish, i.e. cod and saithe less than 50 cm and redfish shorter than 33 cm must be kept separate from other catch and must not exceed 10% of the cod, saithe, haddock and redfish catch, the equivalent numbers for haddock are 41 cm and 25%. As compensation, and since this fish has rather low value, it does not count fully in calculations of the vessels' used quota.

There are also strict requirements for the keeping of logbooks on-board all fishing vessels and they must be made available for fishery inspectors. Furthermore, the logbooks are important for scientific assessment purposes.

## 5.3 The dataset

Examining employment and salaries within the Icelandic fishing sector is quite complicated. Fishermen are often working on more than one vessel over the year, many have other sources of income, some do not even have fisheries as their primary income and documentation is inaccurate. In addition, the available data is hard to come by because of data protection legislations.

During the preparation of this document the researchers were able to negotiate with the Data protection authorities and Statistics Iceland, so that data from the vessel register and tax returns could be extracted and compiled into groups. The data was however to be restricted so that individual groups would not contain less than five persons. This did have considerable effect on the dataset, which may affect the results to some point.

The best available data was for the year 2012, which is therefore the year that is focused on in this report. The available data for the years 2005–2013 does indicate that 2012 was fairly representative for the last 5–10 years. The results from analysing that data provided the following information about the salaries of fishermen in Iceland.

The statistics in this report are produced from data on salaries that could be aggregated by the parameters described in table 58.

**Table 58: Description of parameters in data set**

| Parameter | Description |
|---|---|
| Year | 2010–2013 |
| Status on board | Captain, Mariner/mate, Engineer, Nets, processing, Deckhand, Cook. |
| Length of vessel | 15m or less, 16–29 m, 30–50 m, 50+m |
| Area | Residence region: Reykjavík, Reykjavík metropolitan area, Southern peninsula, West Iceland, West fjords, Northwest Iceland, Northeast Iceland, East Iceland, South Iceland. |
| Age | 19 and younger, 20 –24, 25–29, 55–59, 60+ |
| Tax days (days at sea) | 50 days or less, 51–100 days, 100+ |
| Salary from fisheries | The salary (earned income) from fisheries, declared in tax returns. |
| Total salary | Total salary (earned income), declared in tax returns. |
| Other income | Income, other than earned or working income. |
| Total income | Total salary + other income. |
| Share of fisheries salary from total income | Salary from fisheries / total income. |

## 5.4 Salary and employment in Icelandic fisheries

This section explores basic salary and employment statistics for Icelandic coastal fishermen. According to official numbers published by Statistics Iceland (2016) for the year 2012, there were 5,200 professional fishermen in the Icelandic fleet that year, 4,800 men and 400 women. Many of them are though not full-time fishermen and have therefore other means of income as well. The data used for the following analysis included all individuals that declared salaries from fisheries in their tax return for 2012, which were 5,792 persons in total. The difference between these numbers is mainly recreational fishermen with low portion of their total income originating from fisheries.

### *5.4.1 Employment and salary for all fishermen in Iceland*

Table 59 shows the average total income of all employed at Icelandic fishing vessels for more than 50 days in 2012, the average salary coming from fisheries and the share of the fisheries' income of the total income.

Average total income of Icelandic fishermen in 2012 was EUR 71,948[18] and 82% of that income came as salaries from fisheries.

The values in the following data tables show weighted averages so the salary share (% of total salary coming from fisheries) is therefore not same as simply the average from fisheries divided by the average total salary.

**Table 59: Average total income for all employed at Icelandic fishing vessels, 2012, with more than 50 days at sea**

| | Average total income (thousand EUR/person) | Average salary from fisheries (thousand EUR/person) | Average fisheries salary share (% of total income) | Number of employed |
|---|---|---|---|---|
| All employed (older than 18 years) | 71,948 | 62,727 | 0.82 | 4848 |
| with fisheries salary > 90% | 90,335 | 85,528 | 0.94 | 985 |
| with fisheries salary > 75% | 77,925 | 71,329 | 0.90 | 1,686 |
| with fisheries salary > 60% | 73,907 | 66,702 | 0.88 | 1,888 |

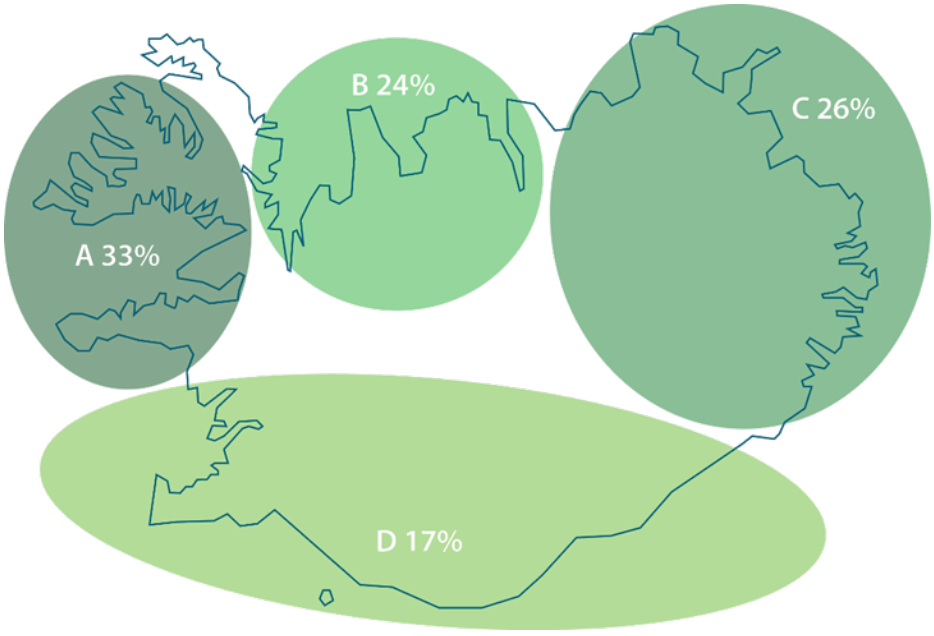
The table 59 shows that those who have more than 90% of their income coming from fisheries salaries have higher total income and there is a positive correlation between this ratio and total income.

### *5.4.2 Employment and salary for coastal fishermen in Iceland*

Coastal vessels in this document are defined in line with the limits set for the jig & line system, which is 15 meters and 30 GT. Vessels of that size are however also operated within the general ITQ system and the coastal jig system. In 2012 there were 760 boats that took part in the coastal jigging system, catching in total 8,600 tonnes during the four-month season in the four areas, which are shown in the following figure.

[18] 2012 exchange rates (170 ISK/EUR).

**Figure 10: The division of regions within the coastal jigging system**




These coastal jigging fisheries are aimed at new entry and recreational fishermen, which have limited income from fisheries. Their income does therefore have significant impact on the average salaries within the coastal sector. Efforts have been made to try to take that into consideration in the following analysis on salaries within the coastal sector by limiting the analysis to fishermen that had at least 50 registered fishing days in 2012.

The average total income of fishermen operating in small-scaled coastal fisheries in 2012 was EUR 36,735 and 48% of their income was salaries from fisheries. Fishermen that reported salaries within this vessel group in 2012 amounted to 1,960 individuals, but when Statistics Iceland had excluded numbers within groups of less than five individuals (because of privacy legislations) the dataset included 1,208 individuals.

The datasets on the Icelandic small-scale coastal fisheries is not ideal, as it originates in information from tax returns and a flexibility in book-keeping can hide possible profit from the enterprises. For instance, the system is built in such a way that it encourages people to deduct all kinds of costs from their revenue in order to pay lower taxes. This is a well-known fact that however cannot be calculated or confirmed.

Table 60 shows the average total income of all coastal fishermen at Icelandic fishing vessels that had more than 50 registered fishing days in 2012. It also shows the average salary coming from fisheries and the share of the fisheries' income of the total income.

**Table 60: Total average income and salaries from fisheries of coastal fishermen with more than 50 days-at-sea in 2012**

| | Average total income (EUR) | Average salaries from fisheries (EUR) | Average fisheries salary share (% of total income) | Number of employed |
|---|---|---|---|---|
| All employed (older than 18 years) | 36,735 | 19,573 | 0.48 | 1,208 |
| with fisheries salary > 90% | 47,363 | 44,418 | 0.93 | 36 |
| with fisheries salary > 75% | 45,671 | 37,981 | 0.83 | 365 |
| with fisheries salary > 60% | 44,050 | 34,826 | 0.78 | 551 |

Those who have more than 90% of their salaries coming from fisheries have higher average salaries and marginally higher total income than fishermen with more than 75% and more than 60% of their income coming as salaries from fisheries. Interestingly there are only 36 (3%) coastal fishermen in Iceland that have more than 90% of their total income coming as salaries for fisheries and 365 (30%) that have more than 75% of their total income as salaries for fisheries. There are a number of explanations for this, e.g. that coastal fishermen have secondary jobs to attend to during parts of the year or when the weather does not allow them to go out at sea, and that coastal fishermen choose to pay themselves low salaries and take the profit out as dividend payments to minimize tax payments.

### *5.4.3 Fishermen incomes compared to incomes from other branches*

Statistics Iceland regularly compares salaries across sectors in their Survey on Salaries, Earnings and Labour Cost which is a sample survey. Total earnings are defined as the total remuneration per month including piecework, irregular bonuses and various other irregular payments. The numbers are then scaled over a year. The value for fishing is based on previous data set, presented in tables 59 and 60. The number obtained for fishermen who get 90% or more of their salary from fisheries is used as they probably best represent full-time fishermen. When comparing salaries of fishermen to salaries in other branches, it can be seen that average salaries within the fishing sector are relatively high. This is however not the case in the coastal fisheries. The average salaries in the coastal fishery are 70% lower than the entire fleet's average. Also, when looking at full-time employment >90% the salaries in the coastal sector average is EUR 44,000 a year, compared to EUR 85,000 in the entire fleet.

**Table 61: Earnings by economic activity**

| Branch | Mean year. EUR/year |
|---|---|
| Manufacturing | 37,714 |
| Electricity, gas, steam, and air conditioning supply | 48,522 |
| Water supply; sewerage, waste management etc. | 34,584 |
| Construction | 40,248 |
| Wholesale and retail trade; repair of motor vehicles | 32,720 |
| Transportation and storage | 35,031 |
| Information and communication | 39,503 |
| Financial and insurance activities | 46,882 |
| Public administration and defence; compulsory social sec. | 40,398 |
| Education | 29,739 |
| Human health and social work activities | 36,224 |
| Fishing in the whole Icelandic fishery | 85,528 |
| Fishing in the Icelandic coastal fishery | 44,418 |

The table 61 shows that fishermen that have fisheries as their only/primary source of income have on average more than double the average salaries of people working in e.g. construction.

As noted before, it should be kept in mind that many coastal fishermen are working on their own vessels and may not be "paying" themselves as high salaries as they maybe should. They are instead putting more of the income back into the business, paying off loans and building up for the future, as well as deducting costs that they would otherwise have to pay from their salaries or taking profits out as dividend payments.

### *5.4.4 Influence of socio-economic variables on income for full-time fishermen*

Salaries by age group of those having more than 60% of their income from fisheries can be seen in table 62. As previously explained, the dataset that is the basis for the analysis was supplied by Statistics Iceland and originates from tax returns. The entire dataset includes 5,792 individuals, but due to privacy laws, all groups containing less than five individuals have been excluded. When classifying groups by age, vessel size, status on-board and region, quite many data points that are lost because of the above-mentioned privacy constrains. About 60% of the data points are therefore excluded when addressing this question. Looking at average total income and salaries from fisheries within the group of fishermen with more than 60% of their income coming from fisheries it is clear that salaries and total income are to some extent age dependent.

**Table 62: Total average Income and salaries from fisheries by age groups for fishermen with more than 60% of their total income originating as salaries from fisheries**

| | Average total income (EUR) | Average salaries from fisheries (EUR) | Average fisheries salary share (% of total income) | Number of employed |
|---|---|---|---|---|
| **Total** | | | | |
| with fisheries salary > 60% | 73,907 | 66,702 | 0.88 | 1,888 |
| **By person age** | | | | |
| 19 and younger | 12,677 | 8,043 | 0.63 | 6 |
| 20–24 | 48,335 | 42,497 | 0.86 | 204 |
| 25–29 | 64,155 | 57,217 | 0.88 | 238 |
| 30–34 | 70,596 | 64,112 | 0.90 | 253 |
| 35–39 | 73,025 | 66,460 | 0.90 | 243 |
| 40–44 | 81,298 | 74,130 | 0.89 | 253 |
| 45–49 | 83,888 | 75,671 | 0.87 | 300 |
| 50–54 | 80,733 | 73,391 | 0.87 | 234 |
| 55–59 | 84,012 | 74,845 | 0.85 | 103 |
| 60 and older | 100,770 | 90,671 | 0.87 | 54 |

This comparison is interesting, as it shows a correlation between age and income, and that the highest salaries are in the age group, 60+. The younger fishermen have lower income, but there is not a big difference between age groups 35 to 60 years old. However, it needs to be kept in mind that groups containing less than five individuals have been removed, which for example means that those six fishermen in the youngest age group are all in the same geographical region and operating in the same fleet.

When looking at various comparisons and statistics, Iceland is often divided into the eight regions showed in the following figure.

**Figure 11: The eight regions of Iceland**

**Table 63: Total average income and salaries from fisheries by residence region for fishermen with more than 60% of their total income originating as salaries from fisheries**

| | Average total income (EUR) | Average salaries from fisheries (EUR) | Average fisheries salary share (% of total income) | Number of employed |
|---|---|---|---|---|
| **Total** | | | | |
| with fisheries salary > 60% | 73,907 | 66,702 | 0.88 | 1,888 |
| **By residence region** | | | | |
| Reykjavík | 79,752 | 73,665 | 0.92 | 213 |
| Reykjavík metropolitan area | 83,627 | 76,037 | 0.90 | 226 |
| Southern peninsula | 57,584 | 51,124 | 0.87 | 149 |
| West Iceland | 53,348 | 45,211 | 0.83 | 243 |
| West fjords | 46,509 | 39,665 | 0.85 | 161 |
| Northwest Iceland | 78,950 | 74,124 | 0.94 | 34 |
| Northeast Iceland | 86,733 | 78,578 | 0.87 | 476 |
| East Iceland | 72,963 | 64,621 | 0.84 | 150 |
| South Iceland | 83,497 | 78,205 | 0.93 | 236 |

The average income of fishermen in the Westfjords is only 50% of the highest average income area, which is in Northeast Iceland, followed closely by South Iceland and the Capital area.

The position that the fisherman holds on-board the vessel is also a deciding factor when it comes to salaries. Table 64 shows average income by main on-board job titles.

**Table 64: Total average income and salaries from fisheries by on-board job title for fishermen with more than 60% of their total income originating as salaries from fisheries**

| | Average total income (EUR) | Average salaries from fisheries (EUR) | Average fisheries salary share (% of total income) | Number of employed |
|---|---|---|---|---|
| **Total** | | | | |
| with fisheries salary > 60% | 73,907 | 66,702 | 0.88 | 1,888 |
| **Status on-board:** | | | | |
| Captain | 51,168 | 40,807 | 0.78 | 381 |
| Mariner / mate | 137,497 | 128,776 | 0.94 | 50 |
| Engineer | 115,491 | 108,559 | 0.94 | 202 |
| Nets, processing | 111,292 | 101,870 | 0.92 | 32 |
| Deckhand | 70,205 | 64,062 | 0.90 | 1,217 |
| Cook | 138,944 | 133,000 | 0.96 | 6 |

The salary comparison by on-board job title gives the surprising results, that the captains get the lowest average salaries. This can however be explained by the fact that majority of captains, that are not excluded from the dataset because of data protection legislations, are on small-scale coastal vessels. This can be clearly seen, as 360 out of 381 captains in the dataset are on small-scale coastal vessels getting much lower salaries than captains in the other fleet groups. In addition, average salaries of the cooks are only based on six individuals, whilst the original database consists of 287 cooks. The vast majority was filtered out due to previously mentioned privacy laws. Drawing conclusions from this does therefore have to be done with care.

**Table 65: Total average income and salaries from fisheries by on-board job title and vessel size for fishermen with more than 60% of their total income originating as salaries from fisheries**

| Status on-board / fleet type | Average total income (EUR) | Average salaries from fisheries (EUR) | Average fisheries salary share (% of total income) | Number of employed |
|---|---|---|---|---|
| Captain | 51,166 | 40,809 | 0.78 | 381 |
| < 15 m | 46,227 | 35,838 | 0.77 | 360 |
| 16–29 m | 11,3375 | 105,294 | 0.93 | 7 |
| 30–50 m | 110,655 | 101,372 | 0.92 | 6 |
| 50+ m | 174,352 | 162,646 | 0.93 | 8 |
| Mariner / mate | 137,498 | 128,778 | 0.94 | 50 |
| 30– 50 m | 94,512 | 90,521 | 0.96 | 7 |
| 50+ m | 144,495 | 135,006 | 0.94 | 43 |
| Engineer | 115,490 | 108,556 | 0.94 | 202 |
| 16–29 m | 76,644 | 69,976 | 0.91 | 12 |
| 30–50 m | 86,328 | 79,812 | 0.93 | 41 |
| 50+ m | 126,642 | 119,573 | 0.94 | 149 |
| Nets, processing | 111,294 | 101,872 | 0.92 | 32 |
| 50+ m | 111,294 | 101,872 | 0.92 | 32 |
| Deckhand | 70,563 | 64,430 | 0.90 | 1208 |
| < 15 m | 39,946 | 32,915 | 0.81 | 191 |
| 16–29 m | 51788 | 47,631 | 0.92 | 54 |
| 30–50 m | 57,572 | 51,682 | 0.90 | 397 |
| 50+ m | 91,798 | 85,609 | 0.93 | 566 |
| Cook | 138,945 | 133,002 | 0.96 | 6 |
| 50+ m | 138945 | 133,002 | 0.96 | 6 |

The table shows how much variation is in salaries between vessel groups, where for example by far the lowest salaries are paid to captains and deckhands on small-scale coastal vessels whilst captains on the largest vessel group have the highest salaries.

A big part of the fishermen, particularly on the smallest vessels, can hardly be classified as professional fishermen as they are only working out at sea for relatively few days a year. Even though the majority of their income comes from fisheries it is not fair to up them into the same class as fishermen that are working out at sea for much longer periods. Table 66 shows the total income and employment of fishermen by vessel size and number of days-at-sea. It clearly shows that those working on larger vessels have higher salaries than those on the smaller ones and that number of days-at-sea also have a major effect on salaries.

**Table 66: Total average income and salaries from fisheries by vessel size and number of days-at-sea for fishermen with more than 60% of their total income originating as salaries from fisheries**

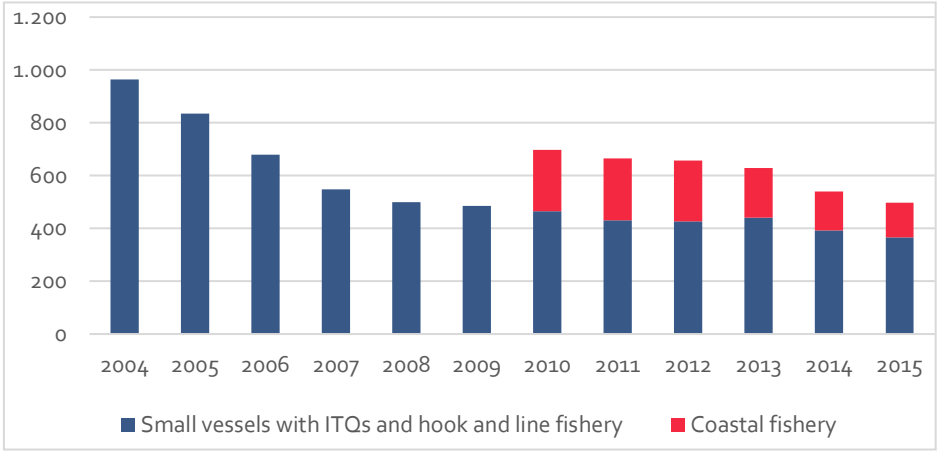
| Vessel size | Average total income (EUR) | Average salaries from fisheries (EUR) | Average fisheries salary share (% of total income) | Number of employed |
|---|---|---|---|---|
| < 15 m | 44,050 | 34,825 | 0.78 | 551 |
| 51–100 days-at-sea | 12,679 | 8,041 | 0.63 | 6 |
| 100+ days-at-sea | 44,395 | 35,120 | 0.79 | 545 |
| 16–29 m | 61,780 | 56,834 | 0.92 | 73 |
| 100+ days-at-sea | 61,780 | 56,834 | 0.92 | 73 |
| 30–50 m | 61,465 | 55,503 | 0.90 | 451 |
| 100+ days-at-sea | 61,465 | 55,503 | 0.90 | 451 |
| 50+ m | 103,023 | 96,313 | 0.93 | 804 |
| 51–100 days-at-sea | 48,949 | 30,869 | 0.63 | 7 |
| 100+ days-at-sea | 103,498 | 96,887 | 0.94 | 797 |

Table 66 above reveals that average salaries are highest on the largest vessels and that fishermen on the smallest vessels have relatively low salaries. The fact that small-scale fishermen that are out-at-sea for more than 100 days a year do get 40% lower salaries on average than fishermen in the next vessel size group raises issues for concerns.

## 5.5 Entry and exit of coastal fishermen?

As figure 12 shows, the number of small vessels steadily decreased from 2004 to 2009, but with the introduction of an Olympic coastal jigging fishery in 2009 an increase was seen again.

**Figure 12: The number of small vessels from 2004 and 2015. The orange bar**




A common aspect of ITQ systems is the decreased access for newcomers to enter fisheries as original quota holders stay in the system and access for newcomers is limited. This is the case in small-boat fisheries as well (Chambers and Carothers, 2016) as the cost of quota has become prohibitive to small-boat fishermen. A survey amongst

small-boat fishermen that was published in 2016 revealed that ten out of 164 respondents had been fishing for less than 5 years and only 3 were under the age of 30. Fishermen were on average 58 years old with an average experience of over 30 years. In the coastal fishery, the average age of fishermen was 60 years old with 30 years of experience on average.

There are a number of reasons why coastal fishermen stop fishing and get out of the sector. Quota possession is an important factor, i.e. older vessel owners sell their quota to larger companies and retire. New entry fishermen cannot afford buying vessels and quota. Salaries and on-board facilities are not competitive with other fleet sectors etc.

## 5.6 Conclusion

There is a great contrast in income of small-boat fishermen and fishermen on larger vessels. Fishermen in the Icelandic coastal fishery earn on average EUR 44,418 per year which is competitive to other professions, but less than half of the average in the whole fishery. On average, fisheries constitute only 48% on the average of the total income of coastal fishermen, but 82% for all employed in Icelandic fisheries. A difference is noted in income based on residence area, status on board and the size of vessels. Finally, the fleet is "greying" as there are evident barriers to entering the fishery and small-boat fishermen are around 60 years old on average.

# 6. Cross-country comparison of salary, employment and reasons for fishermen exit

## 6.1 Introduction

Based on the country analyses in chapter 2–5, the purpose of this chapter is to provide a cross-country comparison of salary and employment in fisheries in the four countries, with a special emphasis on the coastal fishery. Furthermore, the purpose is to compare the reasons for why fishermen exit the fishery in the four countries and through this draw wider conclusions on the behaviour of fishermen. In section 6.2, salary and employment are compared between the countries, while section 6.3 provides a cross-country comparison of reasons for why fishermen in general and specifically coastal fishermen chose to leave fishing. Section 6.4 concludes the chapter.

## 6.2 Salary and employment

While coastal fishery is generally considered to be performed with small vessels fishing close to shore using passive gears, no internationally agreed understanding exists. Coastal fishery is often rather defined by the vessels included in special arrangements in the legislation, that provide economic support or protect specific vessels from being taken over by larger, and typically more efficient, vessels. Such legislations differ among countries and change over time. The legislations applied in the Nordic countries uses vessel length, gear, time of fishing trips and closeness to shore as criteria for special treatment. Some arrangements are mandatory, others voluntary.

In this paper, a simple country-specific approach is chosen, defining fishery in Iceland and Denmark as being coastal when performed with vessels below 15 m and 17 m, respectively. In Norway, coastal fisheries include vessels targeting demersal species using passive gears, while in Sweden coastal fisheries include marine fisheries with passive gears (excluding lake fishing). Hence, coastal fisheries in Norway and Sweden include, on top of small vessels also larger vessels using passive gears. Most vessels are, however, small.

Norway and Iceland have the largest fishing sectors in the Nordic countries, with 12,380 and 4,848 person having salaries from fisheries, respectively. Denmark and Sweden follows with 1,687 and 1,525 persons. In relative terms 25–34% of all fishermen are employed at or own a coastal vessel in Iceland, Norway and Sweden. In contrast, 62% of all Danish fishermen are working at vessel below 17 m. However, the coastal

fishery arrangement in Denmark is voluntary, and since many small vessels choose not to be a part of this special arrangement, the actual share is substantially lower.

Salary of fishermen in the Nordic countries is difficult to compare, since income statistics in the countries differs. Table 67 presents salary levels in the four countries for all fishermen and for coastal fishermen, together with definitions of what makes a coastal fisherman in each country, and the national average and salary in occupations in other sectors. It must be emphasized that the salary levels must be compared with caution given the difference of definitions.

**Table 67: Salary of Nordic fishermen in comparison with other occupations, 2012**

| | Sweden | Denmark | Norway | Iceland |
|---|---|---|---|---|
| **Definitions:** | | | | |
| What is a fisherman? | A person with salary from fisheries. | A person >18 years old, working at or owning a fishing vessel with turnover >EUR 6,667 per year. | A person with annual salary >EUR 13,400 with time spend fishing being >33% and with salary earned in other sectors being <EUR 40,100. | . |
| What is a FT fisherman | . | A person with more than 60% of salary from fishing. | . | A person working at sea >50 days per year with more than 90% of salary from fishing. |
| What is a coastal fisherman? | A person working at or owning a marine fishing vessel using passive gears. | A person working at or owning a fishing vessel <17 m length. | A person owning a fishing vessel that target demersal species using passive gears.[1] | A person working on-board a fishing vessel <15 m length. |
| **Fishermen Salary (EUR/person/year)** | | | | |
| All | 31,000 | 56,500 | 51,500 | . |
| - of this from fishing | 20,100 | 38,800 | . | . |
| Full-time | . | 57,600 | . | 90,300 |
| - of this from fishing | . | 54,400 | . | 85,500 |
| **Salary coastal fishermen ((EUR/person/year)** | | | | |
| All | 28,100 | 45,800 | Coastal owners 61,300<br>Other owners2 46,600<br>Crew all vessels 51,500 | . |
| - of this from coastal fishing | 25,500 | 32,100 | . | . |
| Full-time | . | 49,100 | . | 47,400 |
| - of this from coastal fishing | . | 46,600 | . | 44,400 |
| **Salary other (EUR/person/year)** | | | | |
| National average | FT employed 41,000 | 34,100 | 35,800 | 37,000 |
| Other sectors | Agriculture 30,000 | Agriculture 48,700<br>Craftsmen 54,100<br>Manufacture 58,200 | . | Transport/storage 35,000<br>Craftsmen 40,300<br>Manufacture 37,700 |

Note: 1. Crew on these vessels is not known separately from crew at other fishing vessels.
2. Include non-coastal vessel owners, i.e. both owners of large vessels and of small non-licensed vessels.

When comparing average salaries, Icelandic fishermen have highest salary, followed by Danish and Norwegian fishermen and with Swedish fishermen having the lowest salary.

Direct comparison of the fishermen salary level across the four countries is, however, a comparison of gross salary, and not of net salary, of which the latter provides actual purchasing power. To access this for the fishermen in each country, average fishermen salaries have been compared to the national average. In Iceland, fishermen earn more than the double of the national average, while in Sweden fishermen salary is substantially below the national average of full-time employed. In Denmark and Norway salary levels are two-third and two-fifth above the national average, respectively. Hence, Icelandic fishermen are very well paid, where Danish and Norwegian fishermen are relatively well paid. The salary level of Swedish fishermen is low.

Salary levels for coastal fishermen are more difficult to compare, due to the different definition of coastal fisheries. The Norwegian salary data are divided on vessel owners and crew, and while salaries of owners of coastal vessels are known separately, salary of crew are only known for all vessels. The salary of coastal fishermen is lower than for the remaining fishery in Denmark, Sweden and Iceland. In Iceland, the coastal salaries are close to half of the average of all fishermen. In Sweden and Denmark, it is 15% and 20% lower. The picture remains unclear in Norway, where the salary of owners of coastal vessels is higher than for owners of the remaining vessels. One reason for this could be that the non-coastal vessels also include small vessels without license, mostly characterized by low turnovers.

A cross country comparison of the salary levels of coastal fishermen firstly reveals that Norwegian fishermen have the highest salary closely followed by Denmark and Island. The Swedish salary is only half of the Danish. For coastal fishermen the salary levels in Norway, Denmark and Iceland are relative alike and vary less than for all fishermen. Sweden also falls behind regarding the coastal salary. Comparing salary of coastal fishermen with the national average reveals the same pattern as for all fishermen, i.e. that coastal fishermen in Norway, Denmark and Iceland earn a higher salary than the national average. Coastal fishermen moreover earn a larger share of their salary in other sector than the remaining fishermen. Hence, coastal fishermen are less specialized than the remaining fishery.

In general, Danish fishermen earn a higher salary than in the agriculture sector, where coastal fishermen achieve the same level. Fishermen salary is at a level close to the level in manufacturing and the craftsmen sector, while salary of coastal fishermen is below. In Iceland both the total fishery and the coastal fishery have higher salaries compared to manufacturing, the craftsmen sector and the transport/storage sector. In Sweden, the salary of both all fishermen and coastal fishermen is around the same level as in the agriculture sector.

Salary levels in fisheries are formed in national labour markets, although labour mobility across countries does happen to some extent, in particular for crew on large vessels. As on every market, the price on labour (fishermen salary) is determined by supply and demand, in this case for fishing labour (fishermen). Remuneration systems in the Nordic countries are typically organized with a minimum salary level, combined with crew shares that differ in relation to the role a person have on board. The crew shares

often also differ from vessel to vessel. Salary is further affected by the fact that the owner often works on-board the vessel himself and, therefore, both receive salary from his labour effort and in the end of the year also capital income, i.e. profits. Finally, salary is affected by alternative employment opportunities and salary levels in other sectors.

Several factors are important in explaining the identified salary pattern of fishermen. With many fishermen owning their own vessel and earning salary from working in their own company, and with the crew shares often forming the core element in remuneration system, the vessel economy is decisive in determining salary levels. The more the vessel earns, the larger is the salary. Thus, fishermen salary increases with developments that improve vessel earnings, such as improvement in fish stocks, higher fish prices, reduced input prices like on fuel and more efficient production.

Fisheries management is also a decisive determinant for vessel economy and thereby for fishermen salary. Fisheries reforms in some of the Nordic countries have reduced demand for fishing labour substantially through fleet reduction, leading to a pronounced reduction in fisheries employment. That induces a downward pressure on salary. Fisheries reforms, however, will under the presence of crew share remuneration, also induce an upward pressure on salary, since earnings become higher and there are fewer fishermen to have vessel earning allocated. Increased earnings will, however, only lead to higher crew shares when not capitalized in the purchase of fishing quotas. The effect on salary following fishery reforms is, therefore, not *a priory* known. The low salary of Swedish fishermen can be explained by the poor state of the main fish stocks in the Baltic Sea, inducing low vessel earning.

Salary levels are furthermore affected by the length of the fishing trips. If it last for several days the payment is higher than when fishing close to shore, which is seen by the fact that salary increases with vessel size.

Finally, peaks and lows in the economy are affecting salary, with the presence of alternative jobs also for fishermen during peaks putting an upward pressure on fishing salaries. For example, the peak of the Danish economy from introduction of individual transferable quotas in 2003–2007 until the financial crisis started in August 2008 made it easier for fishermen to find jobs in other sectors.

From the national case studies, a number of interesting points are observed. In Sweden, fishermen who leave the sector receive higher salary after exit, with the average being 25% higher after exit. In Denmark, average salary has not increased during 2002–2012 after the introduction of individual transferable quotas in the pelagic fishery from 2003 and the vessel quota share regulation in the remaining fishery in 2007. Measured in real terms, it has fallen 5%, despite a substantial improved economy of the fleet. Hence, while the new regulation has induced larger company profits, the salary of individual fishermen has not grown. At the large vessels in Iceland and Norway, and probably also in Denmark, very high salaries are observed. The salary of an average owner of a Norwegian purse seine is EUR 199,000, corresponding to more than five times higher than the average salary in Norway.

Information on fishermen salary is important to improve the knowledge base of fisheries reforms. Over the last three decades, individual transferable quotas have been introduced in the Nordic countries, starting in Iceland in the 1980s, followed by Denmark in 2003–2007 and the Swedish pelagic fishery in 2009. In Norway, individual quota management remains with limited options of transferability. In Iceland, the individual transferable quota management has been combined with fishing taxes to reallocate earning from the fisheries sector to the whole society.

Information on fishermen salary is important when considering policy measures to avoid or reduce negative social effects, for example in the form of special advantageous arrangements for coastal/small scale fisheries. In the introduction of such reforms, knowledge on biological/environmental, economic and social sustainability is necessary. While biological/ environmental and economic effects of reforms typically are analysed in great detail, social sustainability effects are often limited to identifying the expected vessels to leave the fishery and multiply it with an average number of crew members, which is insufficient. This report makes detailed considerations regarding employment and salary effect possible, and as such provides a decision foundation that can support future reforms. For example, the report point towards that Nordic fishermen and coastal fishermen are in general not poor, but receive a high salary, some fishermen an extremely high salary.

## 6.3 Reasons for fishermen exit

Reasons for fishermen leaving the fishery is identified in the country-specific chapter 2–5, with logit and probit regression models estimated based on individual person data. The regression analyses are made for Sweden, Denmark and Norway, while it was not possible to have access to individual personal data for fishermen salary in Iceland. The estimation for Norway and Sweden includes all fishermen, while the Danish regression includes only coastal fishermen. Results for the three countries are reported and compared below.

*Sweden:* Salary from fisheries is found to be an important factor for the decision to stay or leave the sector. If fisheries salary increases with 30%, the probability of exit decreases by about 2%, which may be compared to the overall exit-rate of 10% in the sample. It is also found that an increase in total family income reduce the probability of exit. This result is in line with the idea that high family income makes it possible for fishermen to remain in the sector even if their salary from fisheries is low. Another finding is that fishermen who own their fishing company is much less likely to leave the sector, the difference in probability of exit between owners and employed being about 20%. Fishermen in the coastal fishery with passive gear have the same probability of exit as fishermen in other types of fisheries.

*Denmark:* The major reasons for coastal fishermen to leave the fishery are salary from other branches. Thus, if the coastal fishermen have other job opportunities, the decision of leaving the fisheries seems easier. Moreover, there is a strong positive correlation between high salary from the fishery itself, for fishermen owning their own vessel, and the probability of leaving around the introduction of ITQ regulation in 2006–2007. The interpretation of this relationship is that the salary increases, because the fishermen sell their permanent quota shares and have income from that, not because the general income opportunities increased in the Danish fisheries in the years around the introduction of the new management system. As such, there is a quite reasonable explanation of the relationship of increasing fishery salary and increasing possibilities of fishermen leaving the coastal fisheries. Income from pensions has a small but positive and steady influence on the probability to leave throughout the period, which makes sense, since older fishermen starting to receive pension in most cases are expected to leave the fishery.

*Norway:* Salary is found to be an important reason for explaining fishermen's exit. If salary increases with 10%, the probability of leaving the sector falls with 4.7% in the fisheries sector as a whole. For owners of coastal vessels this is even more pronounced, with the probability of leaving being reduced with 19% when salary increases with 10%. Hence, salary is more important for the stay or leave decision for owners of coastal fishing vessels, than for owners of other fishing vessels.

Comparing across countries, it appears that the probability of leaving is higher for the crew than for the owners in all countries. For Sweden and Norway, it is also as expected found that the higher the fishery salary, the smaller the probability of exit. For Denmark, the results are affected by the introduction of the new fisheries management in the middle of the data period, implying that many vessel owners that leave receive extra capital income from the sale of permanent for the quota shares. For Denmark, it is further found that the higher the salary from other sectors and the higher the transfers (pensions and social benefits), the larger probability of exit. Higher family income is also found to reduce the probability of exit, both in Denmark and Sweden. While fishermen age was sought included in the model in all countries, it was not significant for Danish fishermen. In Sweden and Norway, however, increasing age increase the probability of exit.

Results from the regression analysis show that salary from fisheries is an important factor for the decision to stay or leave the sector, where higher salary reduce the probability of exit. The result confirms that fishermen salary is an important determinant in fishermen's choice of staying or leaving.

## 6.4 Conclusions

The salary information indicates that fishermen on large vessels receive the highest salary in fishery, but also that coastal fishermen receive higher salary than national averages in Iceland, Denmark and Norway. Hence, evidence suggests that fishermen and coastal fishermen in these countries are well paid and cannot be considered poor, which is often claimed of especially coastal fishermen. In Sweden, the average salary of fishermen and coastal fishermen is below the national average. The need for special advantageous schemes for coastal fishermen thus differs.

Results from the regression analysis show that salary from fisheries is an important factor for the decision to stay in or leave the sector. Therefore, special advantageous schemes for coastal fishermen may work, however, depending on national regulation and salary levels.

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# Dansk resume

## Introduktion

I denne rapport identificeres løn og beskæftigelse for fiskere i Norden. Endvidere analyseres hvorfor nordiske kystfiskere forlader sektoren. Der fokuseres på Sverige, Danmark, Norge og Island, hvorfra der anvendes en række unikke datasæt. Fartøjs-, fangst-, salgs- og regnskabsstatistik for hvert enkelt fartøj fra de fiskeriansvarlige ministerier sammenkøres med statistik over skattepligtig indkomst fra de nationale statistikkontorer for enkeltpersoner, der ejer eller er ansat på fiskerfartøjer. Rapporten indeholder fire separate casestudier fra hvert af de fire nordiske lande, samt en sammenligning mellem lande.

## Sverige

1.525 personer var i 2012 beskæftiget på svenske fiskerfartøjer som ejer eller ansat. Fuldtidsbeskæftigelsen kendes ikke, men det vides at 65% af disse fiskeres løn stammer fra fiskeri. Dette indebærer at de fleste er fuldtidsfiskere. 463 personer (30%) er kystfiskere, forstået som havfiskeri med passive redskaber. 55% af kystfiskernes løn stammer fra fiskeri.

Gennemsnitslønnen for svenske fiskere var 31.000 EUR i 2012, bestående af løn fra fiskeri og andre sektorer, samt af overførselsindkomster (pension, sygeorlov, forældreorlov osv.). Fiskerne på de store fartøjer opnår den højeste løn, efterfulgt af ferskvandsfiskere og kystfiskere. Gennemsnitslønnen for kystfiskere var 28.100 EUR. Fiskerne på vestkysten opnår den højeste løn, hvor fiskerne i den sydøstlige del af Sverige opnår lavest løn. Disse regionale forskelle er forårsaget både af at fiskeriet er målrettet forskellige fiskearter og at de forvaltes på forskelig vis. Fiskere med en videregående uddannelse som arbejder på de store fartøjer opnår en højere løn end fiskere med kortere uddannelse. For havfiskeri med passive redskaber og for ferskvandsfiskeri er det omvendt. I analysen indgår ikke-licenserede fiskere, hvilket ikke er tilfældet i den officielle statistik. Fiskere uden licens er mindre afhængige af fiskeriet end fiskere med licens, fiskere uden licens har dog en lavere løn.

Fiskerne modtager også løn fra andre sektorer, vigtigst er teknik, handel, offentlig administration, uddannelse, sundhedsvæsen og transport (herunder transport på havet). Unge fiskere er mindre afhængige af fiskeriet end ældre, og fiskere med høj uddannelse er mindre afhængige end fiskere med kortere uddannelse.

I perioden 2002–2012 steg den gennemsnitlige fiskers løn med 27% (i faste priser), hvor løn fra andre sektorer var nogenlunde konstant.

Mange fiskere lever i husholdninger med mere end en person. Fiskeriet bidrager med ca. 50% af den samlede indkomst for fisker og ægtefælle. Denne andel er stabil over forskellige regioner og fartøjsgrupper.

Resultaterne fra regressionsanalysen viser, at løn fra fiskeri er en vigtig faktor for beslutningen om at blive i fiskeriet eller forlade sektoren. Hvis løn fra fiskeri stiger 30%, falder sandsynligheden for at forlade fiskeriet med omkring 2%. Dette kan sammenlignes med en gennemsnitlig sandsynlighed for at forlade fiskeriet på 10% i vores stikprøve. Det findes endvidere, at en stigning i den samlede families indkomst reducerer sandsynligheden for at forlade fiskeriet. Dette resultat kan formodentligt forklares ved at høj familieindkomst gør det muligt for fiskerne at forblive i sektoren på trods af lav indkomst fra fiskeri. En anden konklusion er, at fiskere, der ejer deres fartøjer, er langt mindre tilbøjelige til at forlade sektoren. Forskellen i sandsynligheden for at forlade fiskeriet mellem ejere og ansatte er omkring 20%. Givet konstant løn fra fiskeriet findes endelig at fiskere der anvender passive redskaber har samme sandsynlighed for at forlade sektoren som andre fiskere.

De fiskere, der forlader sektoren, modtager højere løn efter de er stoppet i fiskeriet. Den gennemsnitlige forskel før og efter er 25%. Over 20% af de tidligere fiskere ender med at arbejde inden for søtransport, hvor lønnen er betydeligt højere end i fiskeriet.

## Danmark

1.687 personer var i 2012 beskæftiget på aktive danske fiskerfartøjer (inkluderende fartøjer med en årlig omsætning på mindst EUR 6.700), hvoraf 1.181 var fuldtidsansatte (inkluderende fiskere der opnår mindst 60% af deres løn er fra et fiskefartøj). 1.043 svarende til 62% af de beskæftigede fiskere arbejder på fartøjer under 17 m længde, 700 af disse var fuldtidsansatte.

Særordningen for kystfiskere i Danmark er åben for fartøjer under 17 m længde, men den er frivillig, og mange fiskere har valgt ikke at deltage i ordningen. Statistik for kystfiskere i denne rapport indeholder imidlertid alle fiskere der arbejder på fartøjer under 17 m, uanset om de er tilmeldt ordningen. Den her præsenterede statistik for dansk kystfiskeri repræsenter således alle aktive fartøjer der er mindre end 17 m, og ikke alene fartøjer tilmeldt kystfiskerordningen.

Den samlede gennemsnitlige løn (som ud over lønindkomst fra fiskeri og andre erhverv også inkluderer arbejdsløshedsunderstøttelse, efterløn, pension og andre sociale overførsler) for alle fuldtidsansatte danske fiskere var 57.600 EUR i 2012, mens den var 49.100 EUR for fuldtidskystfiskere. Til sammenligning udgjorde den gennemsnitlige løn for hele den danske arbejdsstyrke 34.100 EUR. Danske fiskere opnår således i gennemsnit væsentligt højere total løn end den gennemsnitlige arbejdstager i Danmark. Den gennemsnitlige løn fra fiskeri alene udgjorde hhv. 49.600 EUR for alle fuldtidsfiskere og 42.600 EUR for fuldtidskystfiskere. Til sammenligning udgjorde den gennemsnitlige løn for fuldtidsansatte samme år: a) 48,700 EUR i landbruget, b) 54,100 EUR for håndværkere, c) 58,200 EUR i industrien og d) 48.500 EUR i salgs- og servicesektoren. Beskæftigede i fiskeriet opnår således

mere eller det samme som i sammenlignelige sektorer. I 2012 opnåede 233 af fuldtidsfiskerne ekstra løn fra andre brancher. For fuldtidskystfiskerne var det 144. Fuldtidsfiskerne opnåede i gennemsnit 3.200 EUR fra andre brancher (svarende til 6% af deres samlede løn), hvor fuldtidskystfiskerne tjente 2.500 EUR i andre brancher (5% af deres samlede løn).

I perioden 2002–2012, hvor individuelt omsættelige kvoter blev indført først i pelagiske fiskeri i 2004 efterfulgt af fartøjskvoteandele i det resterende fiskeri i 2007, faldt fiskernes realløn med 5%. På trods af stigende indtjeningen i fiskeriet i perioden, er fiskernes løn ikke vokset.

Regressionsanalysen af hvorfor fiskerne stopper i kystfiskeriet i 2004–2009 viser, at indkomst fra andre brancher er vigtigst til at forklare udtræden af fiskeri. Såfremt fiskerne har mulighed for at få arbejde i andre erhverv, forekommer det således lettere at tage beslutning om at forlade fiskeriet. Endvidere findes der omkring indførslen af fartøjskvoteandele i 2006–2007 en positiv sammenhæng mellem løn fra fiskeri og sandsynligheden for at forlade fiskeriet for de fiskere der ejer deres fartøj. Efterløn og pension har en lille og stabilt positiv effekt på sandsynligheden for at forlade fiskeriet i hele perioden, hvilket skyldes at når ældre fiskere begynder at modtage pension, vil de ofte forlade fiskeriet.

## Norge

12.380 personer var i 2012 registreret som fiskere (inkluderende personer der opnår en årsløn på mindst 13.400 EUR, modtager mindre løn fra andre sektorer end 40.100 EUR og som anvender mindst en tredjedel af sin tid på fiskeri). Af disse er 82% registreret som fuldtidsfiskere. 7.130 personer ejede et fiskerfartøj i 2012. 34% af disse klassificeres som kystfiskere i forståelsen at de ejer eller er ansat på fartøjer som fisker demersale arter med passive redskaber.

Registrerede aktive fiskere tjente i 2012 i gennemsnit 51.500 EUR. Lønandelen fra andre erhverv kendes ikke, såvel som lønnen for fuldtidsfiskere og deltidsfiskere heller ikke kendes separat. Det vides derimod at lønnen hos ansatte fiskere og ejere i gennemsnit er den samme. Blandt fartøjsejerne udgjorde gennemsnitslønnen for kystfiskerne 61.300 EUR, hvilket kan sammenlignes med 39.100 EUR for ejere af fartøjer uden licens og op til 192.400 EUR for ejere af notfartøjer. Ejerne af kystfiskerfartøjer, forstået som fartøjer der anvender passive redskaber målrettet torsk, kuller og sej, tjener således 20% mere end gennemsnitslønnen for en norsk fisker.

Gennemsnitlig løn for alle erhverv i Norge i 2012 udgjorde 35.800 EUR. Dette indebærer, at selv de lavest betalte fiskere uden licens tjener mere end gennemsnitslønnen.

Regressionsanalysen af hvorfor fiskerne stopper i fiskeriet viser, at løn er en vigtig variabel til at forklare hvorfor fiskerne stopper i erhvervet. Når lønnen stiger 10%, falder sandsynligheden for at forlade fiskeriet 4,7% i fiskeriet som helhed. For ejere af kystfiskerfartøjer er dette resultat endnu klarere, idet sandsynligheden for at forlade fiskeriet reduceres 19%, når lønnen stiger 10%. Lønnen er således en afgørende faktor

for fiskernes beslutning om at forlade fiskeriet, såvel som lønnen er vigtigere for ejere af kystfiskerfartøjer end for andre fartøjsejere.

## Island

4.848 personer var i 2012 beskæftiget på aktive islandske fiskefartøjer (forstået som fartøjer med mere end 50 havdage). Heraf kan 985 klassificeres som fuldtidsbeskæftigede (inkluderende fiskere der opnår mindst 90% af deres løn er fra et fiskefartøj). 25% af de fuldtidsbeskæftigede fiskere klassificeres som kystfiskere i forståelsen at de arbejder på fartøjer under 15 m længde. Når fuldtidsbeskæftigelse i fiskeriet inkluderer fiskere som tjener mere end 90% af lønnen fra fiskeri, er kun 36 af kystfiskerne fuldtidsbeskæftigede. Anvendes en grænse på 60% er der derimod 551 fuldtidskystfiskere.

Fuldtidsansatte fiskere tjente i gennemsnit 90.300 EUR i 2012 fra fiskeri og erhverv, hvilket er mere end det dobbelte af lønnen i de fleste andre erhverv. Fiskere på fartøjer over 50 m længde, opnåede de højeste lønninger, efterfulgt af fiskere på mellemstore fartøjer. Fuldtidskystfiskere tjente betydeligt mindre, i gennemsnit 47.400 EUR. Fiskere på Vestkysten og i Vest Fjordene opnår betydeligt lavere løn end fiskere i andre dele af landet. Disse regionale forskelle skyldes primært flådesammensætningen, hvor de to lavindkomstregioner har en høj andel kystfartøjer og meget få store/pelagiske fartøjer.

Meget få fiskere opnår alene løn fra fiskeri. I 2012 opnåede en gennemsnitlig fisker 82% af lønnen fra fiskeri, hvor en gennemsnitlig kystfisker opnåede 78%. Det skal bemærkes at 16% af fiskerne var mindre end 50 dage på havet, men at mange af disse deltog i linefiskeri med små fartøjer, som alene er åbent i sommermånederne. Generelt er der ingen sammenhæng mellem gennemsnitsløn og fiskernes alder, dog opnår fiskere under 25 år den laveste løn. Dette skyldes formentlig at denne aldersgruppe primært arbejder i skoleferien.

Fuldtidskystfiskere opnår i gennemsnit 40% lavere løn end fuldtidsfiskere i hele fiskeflåden. Kystfiskeriet er kendetegnet ved at fangsterne er ulige fordelt mellem fartøjerne. Den resterende flåde har gennemgået omfattende optimerings- og rationaliseringsprocesser, hvor kvoterne er koncentreret på få store og veludstyrede fartøjer, mens resten af fartøjerne er taget ud af fiskeriet. Dette indebærer at næsten alle fiskere der arbejder på de større fartøjer opnår høj løn, såvel som fiskere der arbejder på største fartøjer, herunder på pelagiske fartøjer, opnår ekstremt høj løn. På dette grundlag har kystfiskerne en tilskyndelse til at stoppe i kystfiskeriet og overgå til andre erhverv. Endelig er reguleringen med individuelt omsættelige kvoter en væsentlig barriere for mange yngre fiskere, som ønsker at starte egen virksomhed med et lille kystfiskerfartøj, idet det kræver en stor investering i fiskekvoter.

## Sammenligning

Kystfiskeri kan forstås som fiskeri med små fartøjer der fisker tæt på kysten, men der findes ingen internationalt anderkendt forståelse. Nationalt er kystfiskeri derimod defineret af de fartøjer, der indgår i særordninger i lovgivningen. I disse særordninger kan der drives fiskeri på økonomisk favorable betingelser eller der kan opnås beskyttelse mod at bestemte fartøjsgrupper bliver overtaget af større og typisk mere effektive fartøjer. Særordningerne er forskellige fra land til land og ændrer sig over tid. I de nordiske lande anvendes fartøjslængde, redskab, tid for fangstrejser og tæthed til kysten som kriterier for at indgå i særordningerne. Nogle ordninger er obligatoriske, andre frivillige.

I denne rapport er valgt en landespecifik tilgang, hvor kystfiskeri i Island og Danmark omfatter fiskeri med under hhv. 15 og 17 m. I Norge omfatter kystfiskeri fartøjer der fisker demersale arter med passive redskaber, mens kystfiskeri i Sverige omfatter havfiskeri med passive redskaber. Kystfiskeri i Norge og Sverige omfatter således ud over de små fartøjer, som betragtes som kystfiskefartøjer i Danmark og Island, også større fartøjer som anvendere passive redskaber. De fleste fartøjer er dog små.

Norge og Island har de største fiskerisektorer i Norden med hhv. 12.380 og 4.848 personer der opnår løn fra fiskeri. Danmark og Sverige følger efter med 1.687 og 1.525 personer. Det samme mønster ses for kystfiskeri. I Sverige, Norge og Island arbejder 25–34% af fiskerne i kystfiskeret. I Danmark arbejder 62% af fiskerne på fartøjer under 17 m, men en betydeligt mindre andel af de fartøjer de arbejder på indgår i den frivillige kystfiskerordning.

Lønniveauet for fiskere er langt det højeste i Island med 90.300 EUR (fuldtidsfiskere i 2012), efterfulgt af Danmark med 57.600 EUR (fuldtidsfiskere), Norge med 51.500 EUR (alle registrerede fiskere) og Sverige med 26.000 EUR (alle personer med løn fra fiskeri). Det højeste lønniveau er således til stede i de to lande der regulerer fiskeriet med individuelt omsættelige kvoter. For kystfiskeri er mønstret forskelligt. Lønnen er højest i Norge med 61.300 EUR, efterfulgt af Danmark med 49.100 EUR (fuldtidsfiskere), Island med 47.400 EUR (fuldtidsfiskere) og Sverige med 28.100 EUR (alle personer med løn fra fiskeri). Den norske løn omfatter dog kun ejere af fiskerfartøjer, og ikke ansat arbejdskraft, som typisk tjener mindre end ejerne. Endvidere indgår i den norske forståelse af kystfiskeri større fartøjer, hvilket kan føre til en overvurdering af lønniveauet.

Tallene viser at lønnen er højest i Island og laveste i Sverige. Dette resultat skal imidlertid tages med et vist forbehold, idet det er bruttoindkomster der sammenlignes, ikke lønnens købekraft. At lønnen er højest i Island og lavest i Sverige bekræftes dog af den omstændighed, at islandske fiskeres løn næsten er dobbelt så høj som den gennemsnitlige løn i landet, mens svenske fiskers løn er under den gennemsnitlige løn i alle brancher. Lønnen for både danske og norske fiskere er højere end de nationale gennemsnit. For kystfiskere er lønnen også over det nationale gennemsnit i alle landene undtagen Sverige.

Årsagerne til disse mønstre forbliver spekulation, men kan relatere sig til: a) forskelle i indkomstskatter, b) forskelle i fiskebestande og fangstrater med Island og

Norge havende en fordel i forhold til Sverige og Danmark, som fisker på Østersøbestandene, c) forskelle i landenes afhængighed af fiskerisektoren målt som sektorens bidrag til BNP, d) forskelle i fiskeriforvaltning, hvor lande, der bruger individuelt omsættelige kvoter, Island og Danmark, har en fordel, e) forskelle i efterspørgslen efter arbejdskraft efter fiskere, afhængigt af hastigheden af flådeduktioner og f) makroøkonomiske forskelle.

Regressionsanalyserne af hvorfor fiskerne stopper i fiskeriet viser, at løn fra fiskeri er en vigtig faktor for beslutningen om at blive eller forlade sektoren. I Norge og Sverige ses, at sandsynligheden for at forlade fiskeriet falder, når lønnen stiger. I Danmark opnås det modsatte resultat. Dette skyldes dog, at fartøjsejerne løn forøges væsentligt i udgangsåret, idet de modtager væsentlige indtægter ved salg af deres permanente kvoteandele. Resultatet bekræfter at fiskernes løn er afgørende for fiskernes valg af at blive i eller forlade fiskeriet.

Analysen tyder på at fiskere på store fartøjer tjener godt, men at også kystfiskere tjener mere end landsgennemsnittet i Island, Danmark og Norge. I Sverige er lønnen i fiskeriet lavere. Analysen viser endvidere at da lønnen påvirker fiskernes mulighed for at forblive i erhvervet, kan særordninger til kystfiskere virke.

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## EMPLOYMENT AND SALARY OF NORDIC COASTAL FISHERMEN

Fishers are often perceived to be poor, and low income levels are used to justify subsidies and other types of direct and indirect income support to maintain coastal communities. In this study we investigate fishers' income levels in four Nordic countries; Denmark, Iceland, Norway and Sweden for different types of fishers and vessels and in comparison to alternative occupations. The most important result is that fishers in these countries are doing relatively well, and only in Sweden is the fishers' average income level below the average national income. Within the fleets, there are substantial differences. Owners of coastal vessels tend to have the lowest income, and also lower than crews. Owners as well as crews on larger vessels tend to do much better and in the largest fishing nations, Iceland and Norway, very well.

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