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GEOGRAPHY OF INSHORE FISHING AND SUSTAINABILITY (GIFS)

Report of Activity 2.3 (version 15 August 2014). 'Fishing Activity Past and Present' of the GIFS project

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http://www.gifsproject.eu

The INTERREG 2 Seas project GIFS (Geography of Inshore Fisheries) addresses the challenge of incorporating the socio-economic and cultural importance of inshore fisheries to coastal communities along the English Channel and Southern North Sea more explicitly into fisheries and maritime policy, coastal regeneration strategies and sustainable community development.

Colofon

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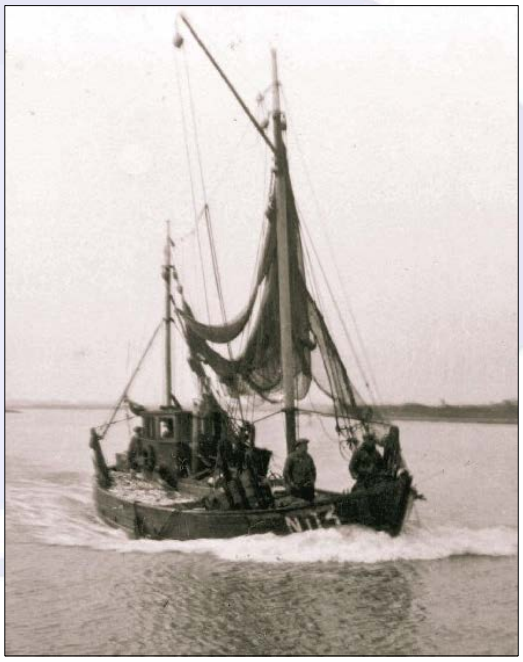
Cover photographs: Fisherman's Dock, Poole harbour, U.K. Photo: © Vince Bevan

Landing of herring in the auction of Nieuwpoort in baskets with the code of the fish buyer; here 'NM'. Fish purchaser from De Panne (third from the right). (1940-1945) Photo: VLIZ

Le Guilvinec, France. Photo: © GIFS Researcher Photography

GEOGRAPHY OF INSHORE FISHERIES AND SUSTAINABILITY – GIFS

FISHING ACTIVITY PAST AND PRESENT: BELGIUM REPORT



Picture: Landing Herring (WWII). Description: Fishing vessel heading towards the Nieuwpoort harbour, completely loaded with herring (1940-1945). Author: Unknown. From reference: Beun, J. et al. (2006). De Nieuwpoortse visserij. VVV Nieuwpoort.
Collection Daniel Moeyaert.

Picture: Cooking brown shrimp on board of the N.106 'De Zeemanshoop'. Author: Provost, Gino Part of dataset: Collection Gino Provost.

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1. SUMMARY

The historical role and importance of inshore waters and Inshore Fisheries in the livelihoods of our coastal communities is undeniable. Today, coastal or inshore waters continue to play a major role for vital processes in the life cycle of fishing resources. At the same time Inshore Fisheries – as a source of income for coastal communities - are subject to major pressures and changes. Until recently in Belgium, there was no quantitative historical assessment of the small-scale fisheries (vessels <12m) within 12 nm or of the fishing activities in the territorial sea or inshore waters of Belgium. The present report aims to improve the understanding of current and historical levels of fishing activity in inshore waters.

In 2010, the Belgian fleet landed a total of 22,000 t. After a maximum of 81,000 t reported landings in 1947, annual landings declined steadily to only 26% of this peak today. Over the last century, 20% of all landed and reported species originated from the coastal shallow waters. The legal framework for commercial Inshore Fisheries activities in Belgium has been defined by different criteria over time. However, since 2006, the legal definition of inshore/coastal fisheries concerns all fishing vessels that have an engine power of 221 kW or less, a tonnage of no more than 70 Gross Tonnage GT, and undertake trips of typically 24 hours with a maximum period of 48 hours. The 'inshore fleet' (based on the definition <70GT) represented approximately 63% of the entire fleet in 1960, decreasing to less than 25% of the entire fleet in recent times. Today, less than 20 vessels remain in this category of vessel type. However, today only 7 vessels are officially registered in the 'coastal fleet segment'. Over the last century, reported landings from the 'inshore' waters amount to 841,700t. The median of annual reported landings was 8,100t with a peak value of 60,500t in 1943 and a minimum of 1900t in recent times (2007). In terms of the species composition of the landings, the trends in Inshore Fisheries are quite similar to that of the overall fleet: a first period (1929-1940) characterized by pelagic and shrimp fisheries, is followed by a peak in landings of pelagic species during and after World War II (1942-1964). Cod is the dominant species in the reported landings from 1965-1987. After the mid 1980s the composition of the reported landings is less dominated by a single species. Herring and sprat (49%), brown shrimp (12%), cod (9%), plaice (6%), whiting (4%) and sole (3%) represent an important proportion over the entire period. Direct employment in commercial Inshore Fisheries has decreased by 94% between 1954 and 2012 (from 680 to 37 Full Time Equivalent, FTE), compared to a decrease of approximately 75% in the total commercial fleet. The economic value of the landings originating from inshore waters, has represented approximately 25% of the overall economic value of the sector (data 1935-2007). Unlike the increase and decline of economically important fishing grounds over the last centuries, the coastal or inshore waters have been a stable source of food for the population and employment and income for the industry.

This present report provides an overview of the results of the GIFS project study on 'Inshore Fisheries past and present', for the particular case of Belgium. The purpose of this research is to provide a longer-term perspective on the importance of Belgian Inshore Fisheries to coastal communities and shed a light on its future potential as a sustainable source of local food, employment and as an economic resource. The work reconstructs time-series on inshore fishing activities (fleet, landings, economic value, employment, unaccounted catches). It contributes to the knowledge of fishing activities in inshore waters, past and present, based on the best available scientific data and information. The time-series and trends demonstrate the historical importance of inshore fiseries, but also underline the challenging social economic and environmental conditions in which the inshore fleet is operating, within the fishing industry. The results help to better inform the public on current and historical levels of fishing activity in inshore waters and suggest its potential role in the future. They can support informed decision making towards more

sustainable fishing in particular for the inshore waters. The report also provides an overview of relevant historical sources that can be of use for similar exercises in other countries.

2. INTRODUCTION

The coastal zones of all fishing nations have played an historical role as a stable and continuous provider of food, resources and employment. As an example, commercial fisheries in the small strip of Belgium's inshore waters have provided more than 20% of all landings over the last century (Lescrauwaet et al. 2010). **The historical role and importance of inshore waters and Inshore Fisheries in the livelihoods of our coastal communities is simply undeniable**.

Today, coastal or inshore waters continue to play a major role for vital processes in the life cycle of fishing resources: hatcheries, nurseries, spawning areas of fish species are mostly located in coastal zones and estuaries (MEA 2005). At the same time Inshore Fisheries – as a source of income for coastal communities - are subject to major pressures and changes. Data on Inshore Fisheries in European waters are not available, but recent studies in the EU (Macfadyen et al. 2011) show that small-scale vessels (under 12m length) constitute more than 70% of the total fleet in most Member States. However, the small-scale fleet represents just 10% of the total GT of the EU fishing fleet and about 35% of its engine power. This small-scale fleet typically operates in the inshore waters within 12 nautical miles (nm) distance from the shoreline. In this regard, the European Commission has repeatedly expressed its concerns for the protection of the Inshore Fisheries within the 12 nm zone, stating that MS should endeavour to give preferential access for small-scale, artisanal or coastal/inshore fishermen.

The concern about the impact of fishing in the coastal zone, and its effects on the livelihoods and subsistence of local people, is not of recent times: in Flanders a prohibition was issued in 1291 to use mesh sizes larger than one silver coin in the coastal waters (Hovart 1985), in 1393 it was prohibited to use trammelnets in beach net setting (Boterberge 2010) and in 1499 the use of certain trawling practices was prohibited in the surf zone and between the underwater sandbanks to protect the breed and recruits (Roberts 2007). This concern was also shared in other neighbouring countries and continued until the EC called for special provisions for inshore fishing to enable this sector to cope with the 'new fishing conditions' (EEC 170/83 review of the CFP). Also in 1986, restrictions were established for the use of beam trawls in the 12 miles zone (EC 55/87).

Inshore/small-scale Fisheries (IF/SFF) and large scale fisheries (LSF) differ in their environmental, social and economic impacts, therefore the Green paper on the reform of the Common Fisheries Policy CFP (22.4.2009 – ***COM(2009) 163***) put forward the idea of **differentiated management**: one management regime for LSF with capacity adjustment and economic efficiency and one **for IF/SSF in coastal communities with a focus on social objectives**. This preferential regime is based on rules restricting access to resources within the 12 nm zones of MS, for LSF. With this in mind, there is a need to document the social-economic and environmental importance of inshore/coastal fisheries in order to be able to define those social objectives. This involves collating data on the characteristics of Inshore Fisheries today in terms of employment, food resource and economic value compared to overall fisheries, but also to assess what their role and importance was in the past in order to determine their potential for the future. Also, the EC has **increasingly recognized the key role that inshore fishermen may play in delivering policy objectives in coastal waters** such as those of the Habitats directive, the Marine Strategy, Marine Spatial Planning, Offshore Energy Infrastructures, Marine Protected Areas.

The Regulation of the new CFP (*(EU) No 1380/2013*) entered into force in December 2013. The new CFP briefly refers to Inshore Fisheries, stating that the Regulation shall **promote coastal fishing activities, taking into account socio-economic aspects. It is aimed to contribute to increased productivity and to a fair standard of living for the**

fisheries sector including SSF and IF. According to the CFP, decisions that affect local communities should be taken as close as possible to these communities. The CFP also explicitly says that recreational fisheries can have a significant impact on fish resources, particularly in coastal waters, where inshore commercial fisheries also operate. It urges MS to ensure that recreational fisheries are conducted in ways that are consistent with the objectives of the CFP. This means according to the principles of the ecosystem approach and including the collection of data needed in support of a robust stock management of resources.

In pursuit of an ecosystem-based approach in the marine environment, it has become increasingly important to document and quantify total removals of fish and fish products. This includes Illegal, Unreported and Unregulated (IUU) catches, such as unreported catches from recreational fishing activities. **Data Collection Regulations in support of the CFP** (EU Council Regulation 1543/2000 and Commission Regulations 1639/2001, 1581/2004 and 199/2008) require European MS to collect data on technical, biological and economic aspects of their national fisheries, and their impact on the marine ecosystem. Regulation 136/2007 requests MS to collect data and report on discards. As a follow-up of this regulation and the outcomes of the revised CFP regarding the so-called 'discard-ban', it is anticipated that from 2015 formal reporting on commercial landings will be extended with commercial discards and removals from non-commercial fishing so as to obtain a more complete view on total removals from the marine ecosystem by fisheries and improve stock assessments. This is of particular importance in coastal zones. Moreover, for the establishment of criteria and definition of good environmental status (GES) for the Marine Strategy Framework Directive MSFD (2008/56/EG), both the current information on total removals and the historical reference conditions are important.

Historical fisheries datasets are of key importance for studies on long-term changes in fisheries activities, fish stocks, and fisher communities. An historical perspective sheds light on fisheries-related **socio-cultural, economical and ecological changes** over time and provides the reference(s) for setting baselines and goals for sustainable management today and in the future. However, the routine data collection requirements related to sea fisheries were until recently limited to landings of the commercial fleet. Discards of the commercial fleet, landings and discards of the recreational fleet, and artisanal and land-based fishing activities are not covered in systematic reporting, and differential reporting particularly for the inshore waters is not available or easily accessible. Studies have demonstrated the scarcity or unavailability of high-resolution historical time-series on fisheries in the public domain and particularly a lack of quantitative data on Inshore Fisheries past and present and (Engelhard 2005, Lescrauwaet et al. 2010).

This report provides an overview of the results of the GIFS project study on 'Inshore Fisheries past and present', for the particular case of Belgium. The purpose of this research is to provide a longer-term perspective on the importance of Belgian Inshore Fisheries to coastal communities and shed a light on its future potential as a sustainable source of local food, employment and as an economic resource.

The current report summarizes the findings of an extensive effort of screening data and information sources, with the objective of identifying, describing and collecting data sources on Inshore Fisheries in Belgium, and reconstructing time-series on different aspects related to inshore fishing activities.

3. OBJECTIVES

The GIFS approach aimed to construct a common view of Inshore Fisheries throughout the project study area (Figure 1), and their relative importance in the sector as a whole (all fishing activities including offshore and large-scale fisheries). By means of an inventory of data sources and subsequent digitization, quality control, standardization and integration of historical data, this approach aimed to answer:

- How did the inshore fleet and its activities change over time?
- How did economic value, volume and composition of landings of Inshore Fisheries change over time?
- How did employment in Inshore Fisheries change over time?
- How do the trends and issues above relate to those in the fisheries sector as a whole?
- What information sources are available to document the historical relevance of Inshore Fisheries in the study area from the parameters described above?

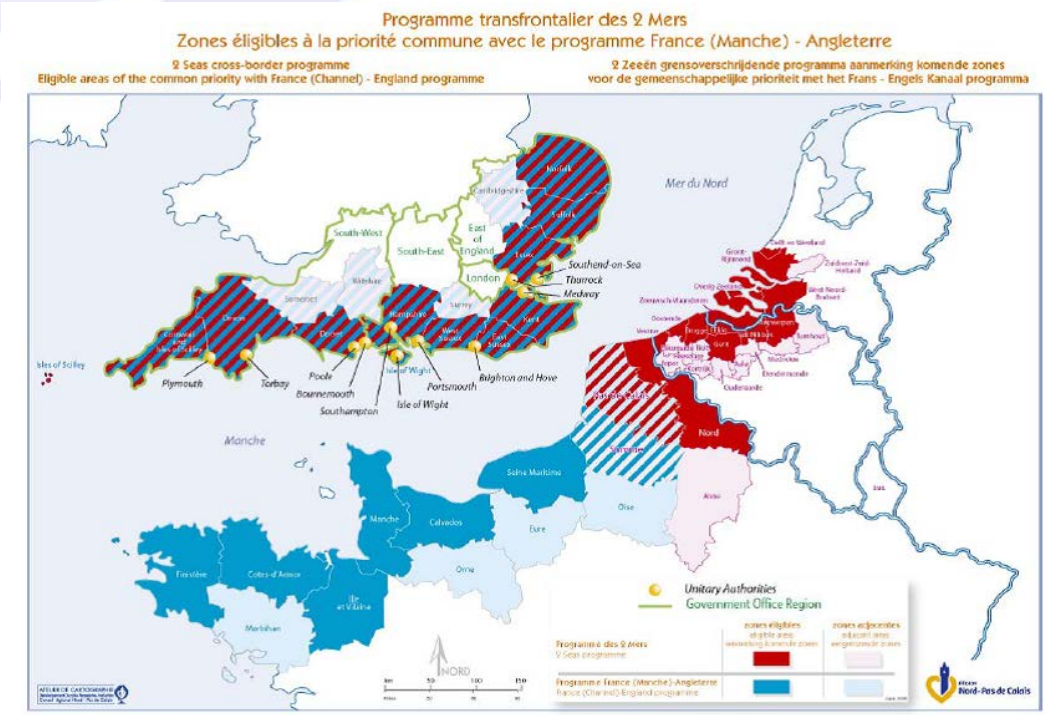

Figure 1: Eligible areas of the INTERREG 2 SEAS cross-border programme

Historical time-series that address the above questions are scarce and data collections date from after the start of intensive exploitation. In Belgium, centralized reporting on landings of sea fisheries at the species level started in 1929 (Lescrauwaet et al. 2010). Besides the gaps in historical information, there is no quantitative assessment of the small-scale fisheries (vessels <12m) within 12 nm or the fishing activities in the territorial sea of Belgium.

4. METHOD & MATERIALS

4.1. STUDY AREA AND SCOPE

4.1.1. FLEET, PORTS AND EMPLOYMENT

The Belgian coast is 67 km long and located in the province of West-Flanders (region of Flanders, Belgium). The Belgian part of the North Sea (Figure 2) is 3,457 km² (0.5% of the North Sea area). Belgium today has four coastal ports (Nieuwpoort, Oostende, Zeebrugge and Blankenberge) and besides the fish auctions located in Oostende, Zeebrugge and Nieuwpoort there are no other or dispersed commercial landing points. Before World War II (WWII, 1939-1945) there were important settlements in Heist and Blankenberge to the east, in the Scheldt estuary, and in De Panne, Adinkerke, Oostduinkerke and Koksijde to the west. Together with the current fishing ports they harboured more than 500 vessels of which approximately 100 had open and half-open decks. Reconstructed time-series on fleet dynamics since 1830 (Lescrauwaet et al. 2013) show a decrease of 85% in the overall fleet size (number of vessels) between 1946 and today, while the fleets' overall engine power has decreased by only 5% in that same period. This 85% decrease in fleet size was compensated by a 10-fold increase in average gross tonnage and a six-fold increase in average kW per vessel.

In 2011, the Belgian commercial sea fishing fleet consisted of 86 ships, with a total engine capacity of 49,135 kW and a tonnage of 15,326 GT (Tessens and Velghe 2012); 43 vessels reported under the Small Fleet Segment (max. 221 kW engine power) of which 2 use passive gear and the others are beam trawlers for shrimp and flatfish. Of the Small Fleet Segment, 21 were inshore vessels that make fishing trips of less than 48 hours within the range of 12 nm. 43 vessels composed the Large Fleet Segment (LSF) with an engine power between 221 kW and a maximum of 1,200 kW. The LSF consisted of 5 vessels using trammel nets, 4 using otter trawl (bordenvisserij) and 34 large beam trawl vessels (≥662 kW). The officially reported Belgian commercial fishing fleet (2012) has no vessels under 10m or above 40m. According to the EU definition (EC Council Regulation Nr 1198/2006), none of the vessels reported in the Belgian commercial fleet can be considered as small-scale fisheries. The Belgian commercial fleet today is highly specialized: more than 68% of the effort (expressed as seadays) and 77% of total landings are achieved by beam trawlers in 2010, focusing primarily on flatfish species such as plaice (*Pleuronectes platessa*) and sole (*Solea solea*).

4.1.2. ORIGIN, VALUE AND COMPOSITION OF LANDINGS

In 2010, the Belgian fleet landed a total of 22,000 t (fresh weight), of which 80% was landed or auctioned in the Belgian ports. After a maximum of 81,000 t reported (fresh weight) landings in 1947, annual landings declined steadily to only 26% of this peak today. Currently, landings are below those achieved in 1929. Considering the period 1929-2010, the most important species in terms of landings were cod (*Gadus morhua*, 17% of all landings), herring (*Clupea harengus*, 16%), plaice (14%), sole, whiting (*Merlangius merlangus*) and rays. In terms of economic value, sole

(31%) and cod (15%) were the most valuable (Lescrauwaet et al. 2010). Close to 73% of all landed species originated from 5 fishing areas: considering the entire period 1929-1999, 20% of all landed species originated from the coastal shallow waters. The North Sea (south) and the Iceland Sea followed closely with 17% and 16% respectively. The eastern and western part of the central North Sea, contributed each with approximately 10% of the total landings. 20% of all landings originated from the central North Sea, if early reports on the spatially aggregated fishing area 'North sea (central)' are included. Today, the main fishing grounds in terms of volume of landings in 2010 were in descending order: North Sea South (IVc), Eastern Channel (VIId), North Sea Central (IVb), Southeast Ireland/Celtic Sea (VIIg) Bristol Channel (VIIf) and Irish Sea (VIIa).

Source: http://www.vliz.be/imis/imis.php?module=ref&refid=210294; http://www.vliz.be/imis/imis.php?module=ref&refid=209014

4.1.3. FISHERIES AND FISHING GEAR

In Belgium the transition from sail to motor engines was near to completion by 1929 and after WWII the commercial fleet consisted mainly of motor engine-powered vessels. The last steamer disappeared in 1964 (Lescrauwaet et al. 2013). As was the case for the steamers, the motor engine-powered vessels used the otter trawl to catch fish. Before 1950, the otter trawl was the main fishing gear, together with drift nets (for pelagic fisheries). After 1960, the otter trawl was mainly used for roundfish (e.g. whiting and cod) fisheries and for shrimp (*Crangon crangon*). The pelagic trawl for herring and sprat was used from 1950 onwards and remained important until 1965 in terms of effort (SD) and landings (Gilis 1962). After 1960, the (re)introduction of the beam trawl (boomkorvisserij) – the most efficient gear for catching targeted flatfish – and the subsequent technological improvements to increase catch efficiency of the beam trawl required an increasing average engine power (Polet et al. 1998). The installment of the beam trawl was subsidized by the Belgian government and supported by royal decree 1/03/1958 (Lescrauwaet et al. 2013). In 1985 otter trawling targeting herring and sprat, shrimp, and other species represented respectively 1%, 11% and 21% of effort in SD while beam trawl targeting sole and plaice represented 62%. Twin trawling ('spanvisserij') for cod explains the remaining 5% effort. With the increasing cost of diesel, recent interest has been given to the otter trawl (10% of SD) compared to the shrimp beam trawl (14% of SD) the flatfish beam trawl (68% of SD) and passive gear (1% of SD) in 2010. Passive forms of fishing that are gaining importance are angling (handlines) for cod and sea bass, trammel- and gillnetting (Tessens and Velghe 2012).

4.1.4. DEFINITION AND RANGE OF INSHORE FISHERIES

LEGAL DEFINITIONS OF INSHORE FISHERIES

The legal framework for commercial Inshore Fisheries activities in Belgium has been defined by different criteria over time.

- **Between 1948 and 1970**, 'Inshore Fisheries' was defined mainly by engine power, including vessels with "engine power less than 80 HP and fishing from the beach up to 15 miles from the coast (vessel type I)" or

"engine power 80 - 120 HP and fishing up to 25 - 30 miles from the coast from Gris-Nez to Hook of Holland (vessel type II)".

- **Between 1971 and 1994**, the criteria for defining Inshore Fisheries changed to 'tonnage' (gross tonnage or GT), to include fisheries with vessels < 35 GT (vessel type I).
- **From 1996 onwards,** coastal fisheries was defined as: 'Fisheries with vessels that have an engine power of 221 kW or less and a tonnage of no more than 70 GT and (fishing) within 25 miles from the Belgian Coast'.

Since 02/02/2006, the legal definition of inshore/coastal fisheries concerns: "All fishing vessels that have an engine power of 221 kW or less, including any additional power, and a tonnage of no more than 70 GT, according to the "Official list of Belgian fishing vessels", as maintained by the Department of Maritime Transport of the Federal Public Service Mobility and Transport, and that undertake trips with a maximum period determined by the Minister (today being 48 hours) with start and end in a Belgian port". Source: http://codexws.vandenbroele.be/Export/1014219.html;http://www.standaard.be/artikel/detail.aspx?artikelid=L03G7F2D. A chronological overview of the definitions applicable to Inshore Fisheries in Belgium, is included in Annex A:.

RANGE OF INSHORE FISHERIES ACTIVITIES

Besides the definitions within the legal framework (see above), inshore fishing activities can also be defined through spatial criteria. This definition should be based on spatial limits that are representative of coastal or inshore waters, or fisheries that typically take place within coastal areas (e.g. brown shrimp fisheries). The spatial boundaries that can be applied for this purpose are:

- the Territorial Sea (up to 12 nm from the shoreline),
- the ICES statistical rectangles, established by the International Council for the Exploration of the Sea ICES.

The statistical rectangles are used for the gridding of fisheries related data to make simplified analysis and visualization. ICES statistical rectangles have been in use since the 1970's, and provide a grid covering the area between 36°N and 85°30'N and 44°W and 68°30'E. The rectangles that overlap with the Belgian part of the North Sea (BNS) are: 31F2, 31F3, and 32F2. One of the 3 relevant reporting rectangles (31F2) has a significant proportion of its area within the BNS, while the 2 other rectangles (31F3, 32F2) are less representative of its area (Figure 2).

Within the GIFS project 'Inshore Fisheries' is broadly defined as fisheries within the territorial waters (< 12 nm). Using this general definition for the eligible area we want to see how specific local/national definitions can fit this general definition best. e.g. "fisheries with vessels under 10 meter", "fisheries within ICES rectangles x, y and z", or others. Given the complexity and diversity in the way fisheries are managed locally, it may very well be that this 'best fit' can be defined ***by exclusion*** i.e. by not taking into account a number of fleet segments which typically - or most of the time - fish outside the 12nm. The best fit can also be defined by target species, i.e. fisheries that focus on species which are characterized by a coastal distribution or typically caught within 12nm. Table 1 and 2 give an overview of the datasources for the historical data in the figures below and provide all definitions of Inshore Fisheries used within these sources.

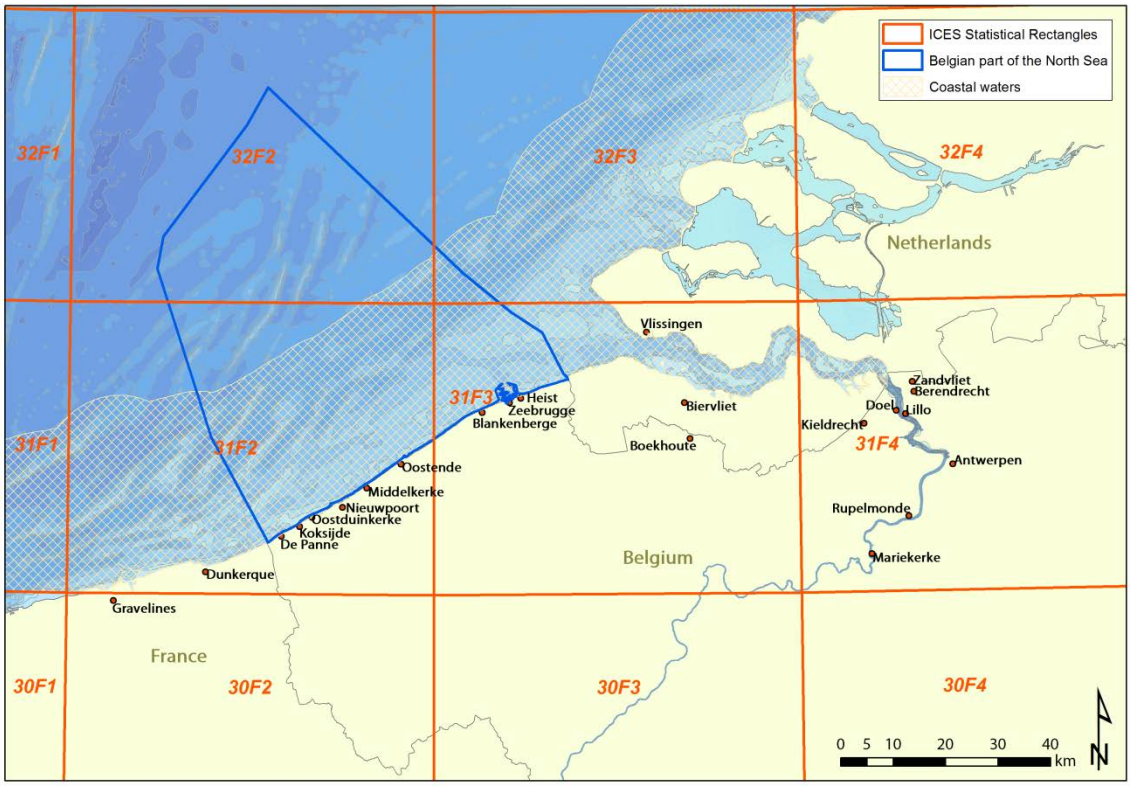

Figure 2: Map of the Belgium coastline and the Belgian part of the North Sea BNS (blue line), demarcation of the fishing area or reporting unit 'Coastal waters' (white shaded area), current and historical fishing ports and overlapping areas with ICES rectangles. ICES rectangle shape file layer created by the Danish Institute for Fisheries Research (DIFRES).

Besides the commercial fishing activities that are registered and subject to reporting, there are fishing activities taking place in inshore waters, with the purpose of provisioning informal sales circuits, for recreational purposes (e.g. handlines) and for subsistence. The latter are not reported and have not been quantified, although preliminary estimates have been published (ILVO 2006, Lescrauwaet et al. 2013) and a systematic monitoring is being established (see below).

4.2. DATA AND INFORMATION SOURCES

4.2.1. ICES FISHSTAT DATABASE

In the absence of standardized definitions of 'coastal' or 'Inshore Fisheries' over time and the lack of (quality) data that provide spatially-explicit information on the inshore waters, it is challenging to reconstruct time-series on Inshore Fisheries for the Belgian sea fisheries. The 'ICES Official Catch Statistics' electronically available from the ICES

data sources webpages, describe reported landings by country, species (or higher taxonomic grouping), ICES reporting area and year. The electronic database is publicly available for redistribution and used as the EU official report on fisheries 'catch' to the Food and Agriculture Organization of the United Nations (FAO). The version 2012 - with updated time-series up to 2010 - is referred to as 'ICES Fishstat'. It contains data at the scale of broad 'Fishing areas' e.g. 'southern North sea (IVc)', however no reference is made to the specific 12 nm limits or any other geographical scale that can serve as a proxy to inshore waters.

ICES data do not contain statistics with spatial reference to the Belgian EEZ or to the BNS. Only from 1996 onwards, data are available for research purposes at a spatial scale that is of relevance to the BNS: at the scale of ICES statistical rectangles. An additional challenge with the data by ICES rectangles is the position of these rectangles by which the data are aggregated (Figure 2). Although one of the 3 relevant reporting rectangles (31F2) has a significant proportion of its area within the BNS, unknown but likely significant landings from the areas of 2 other rectangles (31F3, 32F2) should be taken into account, while part of the landings obtained from 31F2 should be excluded (Figure 2). The HiFiDatabase (4.2.2. below) however contains data reported for the 'coastal waters' from 1929-2010.

4.2.2. HIFIDATABASE: HISTORICAL FISHERIES DATABASE FOR BELGIUM

Based on fragmented and disperse data sources, including previously uncovered original reporting cards, time-series for Belgian sea fisheries were standardized, quality controlled and integrated from 1929 onwards. The detailed procedures for quality control and integration of data are explained below (box 1; Lescrauwaet et al. 2010). The resulting historical fisheries database (HiFiDatabase) contains data by species (41), by port of landing in Belgium (4) and in 'foreign ports,' and by fishing area of origin (31) (Lescrauwaet et al. 2010). Landings in the HiFiDatabase are reported as 'dead weight' and hence were converted to live weight to compare to the (more aggregated) values reported in the ICES Fishstat. The HiFiDatabase contains the highest detailed data in terms of temporal coverage (data from 1929 onwards), temporal scale (monthly values), fish weight classes (e.g., 5 to 7 weight classes for sole) and taxonomic resolution (less species grouping). It contains a reporting unit for the western central North Sea (IVb-1) and the eastern central North Sea (IVb-2), Fladen, and Morray-Firth, and it is the **only source of historical information on fishing activities in the 'coastal waters'**.

Part of the data contained in the HiFiDatabase were identified and selected as best-fit to describe the 'Inshore Fisheries' activities. For the purpose of quality control, the reported landings for the 'coastal waters' in the HiFiDatabase (1929-2010) were compared to the scarce and fragmented historical source documents that were discovered in archives and that report at the level of ICES statistical rectangle: the data for the combined rectangles 31F2 and 31F3 provide a fair match (<10% difference) with the historical time-series for the 'coastal waters'. Considering the spatial scale of the Belgian part of the North Sea (BNS), this time-series is therefore considered to provide an acceptable representation of the commercial fishing activities in the Belgian inshore waters and the BNS. These unique historical data were used to reconstruct time-series on Inshore Fisheries.

4.2.3. OTHER DATA SOURCES

The present effort to describe and quantify Inshore Fisheries past and present in Belgium is taken with a wider perspective and covers economic, social and cultural aspects of the sector. To this purpose, a wide range of documents and sources were screened and searched, including legal sources, economic statistics and publications, social research etc. (see 4.3.).

4.3. METHODOLOGY

Step 1: Compiling an inventory of data sources.

The most effective approach to inventory data sources is to start by looking at well-structured and large databases that allow advanced searching on the basis of specific search terms. These databases can be screened for publications, documents including 'grey' literature (informally published written material -such as reports- that may be difficult to trace because it is not published commercially or is not widely accessible) and data. Search terms may include terms such as 'fisheries', 'landings', 'catches', 'fleet', etc. Where search options allow, wildcards can be used (e.g. 'fish*'). Such databases include:

a) Specialized libraries and databases with digitally accessible collections (on-line index/query possibilities):

- The Food and Agricultural Organization of the United Nations (FAO)
- International Council for the Exploration of the Sea (ICES)
- Fishbase (www.fishbase.org/)
- *Sea Around Us* Project (www.seaaroundus.org/)
- National Institutes of Statistics ADSEI Belgium
- Integrated Marine Information System (IMIS) developed and managed by Flanders Marine Institute VLIZ: http://www.vliz.be/imis/imis.php?module=ref
- Antilope Catalogus: http://anet.ua.ac.be/services.phtml?service=opacantilope

b) Specialized libraries and archives at national level (paper copies):

- Marine institutes and fisheries research organisations: Institute for Agricultural and Sea Fisheries Research (ILVO), Oostende, Belgium
- National sea fisheries services and administrations: Sea Fisheries Service (DVZ), Oostende, Belgium
- State (Brussels and Bruges, Belgium), provincial (West-Flanders, Belgium) and city archives (Nieuwpoort, Oostende, Antwerp, Belgium), the Heritage Library Hendrik Conscience in Antwerp.
- Libraries of fisheries museums, local and national (NAVIGO museum, Koksijde)

c) Catalogues, literature databases and internet 'harvesters':

- JSTOR, Web of Knowledge, Aquatic Sciences and Fisheries Abstracts, Google Scholar, Avano, Antilope and CCB (for completing reference titles).

The method applied for screening and searching depends on the type and nature of the document or the series. As a general approach, the archivist should be contacted previously to assist in the search.

STEP 2: DIGITIZATION PROCESS AND QUALITY CONTROL.

As a general observation, most of the data contained in the sources identified in the previous step will need manual digitalization and transcription to spreadsheets in order to allow for next steps. Integrating data from different sources into one database is a stepwise process, involving basic aspects of data management such as standardization and quality control. Quality control, in all its dimensions, is an essential aspect in the recovery and integration of (historical) data. The different steps involved in controlling the quality of the converting process as well as the data are explained in Box 1.

BOX 1: PREPARING AND QUALITY CONTROL OF DATA

CONVERSION OF SCANNED DATA TABLES (SCANS OF ORIGINAL PAPER COPIES) TO SPREADSHEETS

Where quality of the scans permit, the data from scanned sources can be extracted by means of image/pdf reading software (open source, free of charge) and converted to spreadsheets. The table(s) can then be copied and pasted in spreadsheets. Anomalies (dots, spots, etc. in the printing and/or artifacts due to paper quality, storage and handling of the documents over the years) and misinterpretations of numbers or separators need a first control during the conversion process. The resulting files can be stores as 'original files'.

QUALITY CONTROL OF THE DATA CONTAINED IN THE CREATED SPREADSHEETS

A second quality control focuses on the quality of the data. The annual data tables are generally matrices that list values under specific rows (e.g. species) and columns (e.g. landings by fleet x). Row subtotals should therefore represent a manipulation (sum, average, etc.) of a value in the different column headers or vice versa. Row and column (sub)totals should be calculated independently as a formula in the spreadsheets, and crosschecked with the reported (published)(sub)totals in the original document. Typically, errors occur when numbers were mistakenly copied or calculated in the original source. These errors should be documented and the amended files stored as 'corrected files'.

STANDARDIZATION: TAXONOMY, GEOGRAPHY, UNITS OF MEASUREMENT

One of the main difficulties in integrating and comparing different datasets from various data providers is the standardization of the data. Standardizing is a prerequisite for functional databases. Therefore an analysis must be conducted of the different parameters included in the reported data sources. Single spreadsheets (product from previous steps) should be integrated into one table per feature according to the defined database structure, in order to perform standardization. Standardization should be performed for relevant features or parameters, typically being: (1) taxonomy (species names), (2) geography and spatial units (ports, fishing areas etc.), (3) sampling methodology/fishing gears and (4) reporting units (kW, tonnes etc.). All taxonomic references were obtained from the World Register of Marine Species WoRMS.

GRAPHICAL ANALYSIS

After quality control and standardization, annual tables can be integrated as pivot tables. Pivot tables are dynamic spreadsheet tables that can easily convert data for different visualization and analytical purposes, and allow simple statistical functions. They are a standard function in spreadsheet software (e.g. MS Excel). Pivot tables are therefore based on the joining and integrating of all 'corrected files', after standardization of e.g. species names, ports and fishing grounds etc. (see above). Visual inspection of these graphs allows a second quality control of errors or anomalies in the data. Special attention in the graphical analysis must be given to anomalies or sudden abrupt changes in observed trends. These errors are typically not detected in the first phase of quality control of numerical values, because they are generally not generated by simple calculation or copy errors. A number of problems and errors are evidenced by this visual control, but it can also help as an early-detection of unusual natural or socio-economic phenomena, that require bringing in other (historical, legal, social) expertise and literature study.

STEP 3: RELIABILITY OF RECONSTRUCTED TIME-SERIES. Reliability of fisheries data is a complex issue that starts at the moment the nets are hauled in. For data on catches and landings, for example, it is the combination of the selectivity of fishing gears, management regulations and socio-economic conditions that affect the proportion of

mortality that actually results in 'catch' and the proportion of 'catch' that is effectively reported as 'landings'. The remaining proportion of the 'catch' is then considered either illegal, unreported, unregulated (IUU), or a combination of the previous, and may be either discarded or retained as by-catch. For an overview of terminology and estimates of these factors, see Alverson *et al*. (1994), Gray *et al.* (2004), and Zeller *et al*. (2007). Unreported catches may also include forms of subsistence fisheries, or commercial catches that are not landed at auction points. Illegal unreported catches include those that are landed in ports but are transferred for direct sale and consumption without passing the mandatory reporting procedures at the fish auctions. Similar concepts apply for economic value and employment.

STEP 4: EXPECTED RESULTS. The approach, applied in a methodical, consistent and exhaustive manner, can result in:

- A digitized inventory and annotated bibliography of sources, by which all data and literature sources related to Inshore Fisheries are digitized, linked to context (Inshore Fisheries) and made available in the public domain. In a next step these sources can be queried through an Information System. This may help avoid duplication of time-consuming effort in searching and collecting data and information.

- An integrated database, integrating single spreadsheets corresponding to single reports from sources containing data, that were standardized and quality controlled. This database can be stored in a central location according to professional data management standards and made available for further research purposes.

- An integrated and standardized database that visualizes in a quantitative way the importance of Inshore Fisheries, the historical trends, and their relative importance compared to overall fishing activity.

Reconstructing time series (a sequence of data points, measured at successive points in time spaced at uniform time intervals) on Inshore Fisheries and their value in the present and past gives this sector the much-needed visibility and confirms their important role in coastal communities and ecosystems today.

Applying this method to the case of Belgian inshore sea fisheries, allows assessing the trends in relative importance of Inshore Fisheries over nearly one century (see below). It also allows underlining the relative importance of Belgian Inshore Fisheries compared to fisheries that take place outside of the coastal zone of Belgium. ***Reconstructing time series on Inshore Fisheries and their value in the present and past gives this sector the much-needed visibility and confirms their important role in coastal communities and ecosystems today as well as their potential for tomorrow's vibrant coastal communities.***

5. RESULTS

5.1. METADATA-INVENTORY: RELEVANT DATA SOURCES FOR INSHORE FISHERIES IN BELGIUM

From the inventoried sources, each of the identified data sources (paper format and/or digital for recent years) is described in a detailed overview table with information on available parameters/variables for Inshore Fisheries:

- Landings (tonnes), value of landings (euro), fleet size and vessel characteristics (length category, engine power, others), employment, other.
- units of measurement,
- temporal coverage and resolution,
- spatial coverage and resolution,
- taxonomic and other resolutions,
- physical location of data source
- data policy and users restrictions

The most relevant data sources are listed in Table 1 and 2. The data to reconstruct fishing activities (landings and their economic value, fleet, fishing areas, species) in inshore waters was built on the HiFiDatabase. The data on employment was obtained from different sequential series and databases (Table 2).

Table 1 Overview of data sources for historical data on Inshore Fisheries landings & value of landings and definitions of Inshore Fisheries used within these sources

Region	Period	Identified Data sources	Definitions for Inshore Fisheries used within available data sources
B	1929 - 2007	HiFiDatabase	All fisheries within the spatial reporting unit "Coastal waters"

Table 2 Overview of data sources for historical data on Inshore Fisheries employment and definitions of Inshore Fisheries used within these sources

Region	Period	Identified Data sources	Definitions for Inshore Fisheries used within available data sources
B	1954 – 1970	Series "Jaarverslag over de evolutie van de vissersvloot"	Fisheries with vessel type I (< 80 Horsepower HP) and II (80 – 120 HP)"

B	1971 – 1994	Series "Jaarverslag over de evolutie van de vissersvloot"	Fisheries with vessel type I (< 35 Gross Tonnage GT)
B	1997 – 2012	Database of shipping (part fisheries) from the federal public service mobility and transport	Fisheries with vessels < 221 Kilowatt KW, 70 GT and fishing within area I: within 25 miles from the Belgian Coastline

The complete metadata overview, including the details of the data sources used for the HiFiDatabase, is available in Annex B and Annex C.

5.2. RECONSTRUCTED TIME-SERIES AND RESULTS FOR INSHORE FISHERIES

Fleets

Entire Fleet

The data integration covers the period from 1830 to 2010. In spite of the data gaps (1865-1871 and 1915-1918, see Annex B) the time-series reconstructs the overall trend in total number of fishing vessels. From the beginning of reporting, the total number of vessels increased from 145 in 1832 to 274 in 1864, nearly duplicating in 3 decades (Figure 3). This increase is explained as a direct effect of the system of subsidies (De Zuttere 1909). Oostende remained the most important port throughout this period and the next period of reporting (1892-1911.), as it was more apt to receive larger vessels. The fishing port of Nieuwpoort, the settlements of Heist and Blankenberge to the east, and De Panne/Adinkerke and Oostduinkerke/Koksijde to the west also harboured an important number of vessels. Most of these vessels were inshore vessels that stranded on the beaches to disembark the produce, or used the neighbouring ports of Nieuwpoort, Blankenberge and later Zeebrugge to do so. **De Panne/Adinkerke, Oostduinkerke/Koksijde, Heist and Blankenberge were home to vessels of coastal fisheries and fishing areas at shorter distances**.

A maximum total number of 630 fishing vessels was reported in 1913 (Commissie voor Zeevisscherij 1913), at the outbreak of the First World War (WWI, 1914-1918). At the eve of WWI, the new port infrastructure of Zeebrugge (1907) was harbour to 20 sailing vessels, Oostende to 327 of which 29 steamers, followed by De Panne (87), Heist (67), Blankenberge (67), Nieuwpoort (37) and Oostduinkerke/Koksijde (26). While the fleet size quickly recovered from the destruction suffered during WWI, a revolution took place in fishing power of the fleet as they moved from sail or steam as driving power, to motor engines during the inter-war period (1919-1939). Motors were first installed as

donkeys (to lift the nets) and as auxiliary power (propelling power) on sailing vessels and progressively as central driving power (Commissie voor Zeevisscherij 1912, 1913, 1919-1931). These shifts also required considerable investments and after WWII, fishing moved from a more family-oriented business to shipping companies. Fishing activities became concentrated around only 4 (Oostende, Zeebrugge, Nieuwpoort, Blankenberge) of the previously mentioned ports or fishing communities (Figure 3). The trends for the entire fleet (fleet size, GT, engine power, target species and fishing areas) are described by Lescrauwaet et al. (2010).

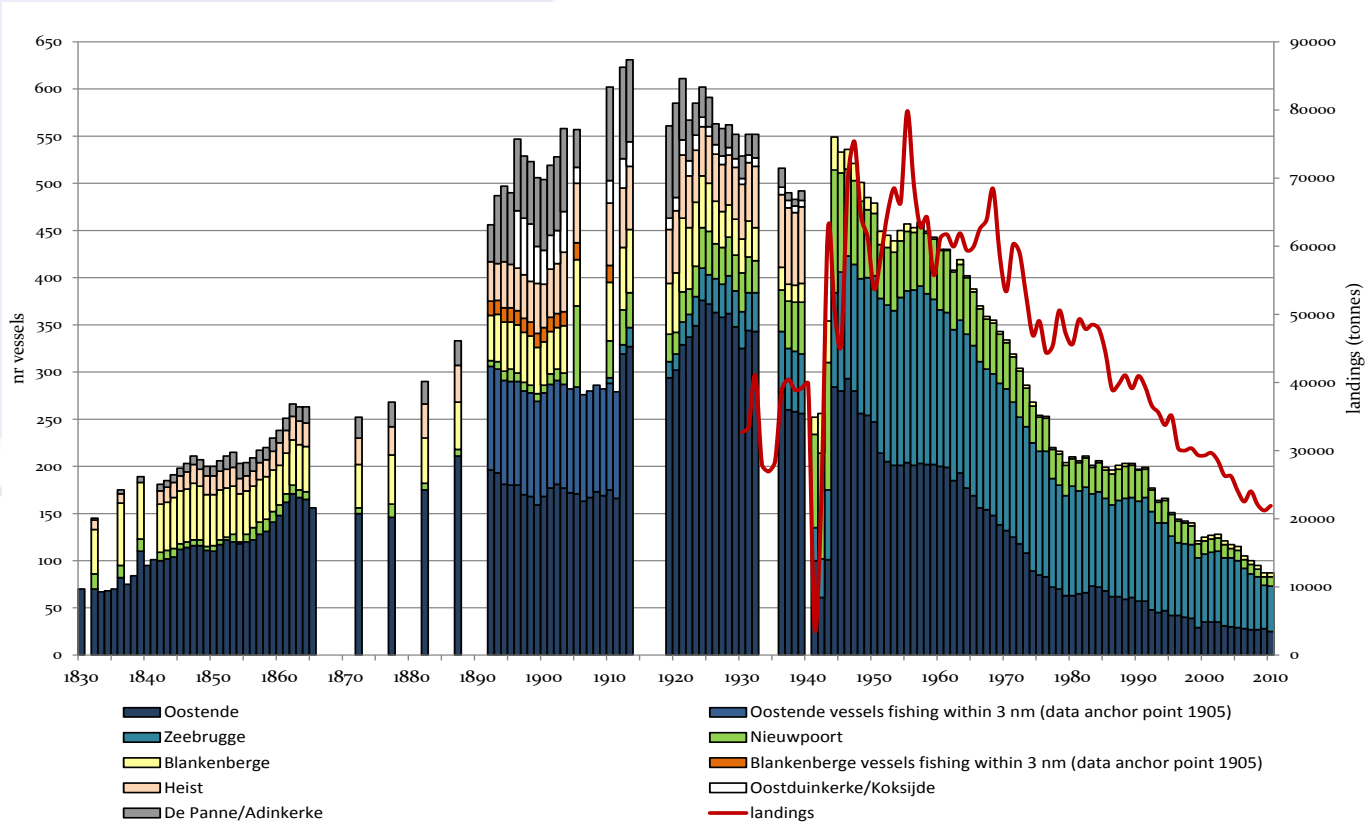

Figure 3: Trend in number of vessels of the Belgian fishing fleet in the period 1830-2010, and the landings of the entire fleet in the period 1929-2010. Source: VLIZ HIFIDatabase, reconstructed from historical sources Annex B

In the 1960s, major structural changes took place in the Belgian sea fisheries fleet. Between 1961 and 1969, governmental subsidies were issued for the renewal of the fleet with bounties for the demolition of older ships and for the purchase of new steel hulled medium-sized motor trawlers (Poppe 1977). In 1959, the paired beam-trawl fishery (‘*bokkenvisserij*’, a ship pulling one beam-trawl on each side of the vessel) was implemented from the port of Zeebrugge: first for the brown shrimp (*Crangon crangon*) fisheries that typically take place in inshore waters, and later also for the sole fisheries. Whereas the port of Oostende had kept its reputation of first fishing port since at least the 18th century (Cloquet 1842, De Zuttere 1909) Zeebrugge definitely took over in 1968 as the most important port in terms of fleet size and in 1985 in terms of landings.

Inshore fleet

Reporting on the fleet that targets species (e.g. brown shrimp, whelk) that are closely related to inshore waters or ecosystems (e.g. depth, sediment) is fragmented and discontinuous. For the 'brown shrimp' fisheries – typically inshore - reported data are too fragmented or incomplete to construct time-series. Shrimp fishing is also a seasonal activity (mainly summer) and shrimp fishers generally shift to target flatfish during other seasons. The best-fit approach to reconstruct long-term time-series for the size of the inshore fleet, is to select the subset of vessels with engine power <221 kW and/or vessels with < 70GT (after 1996) or 35GT (between 1971 and 1994) (Figure 4).

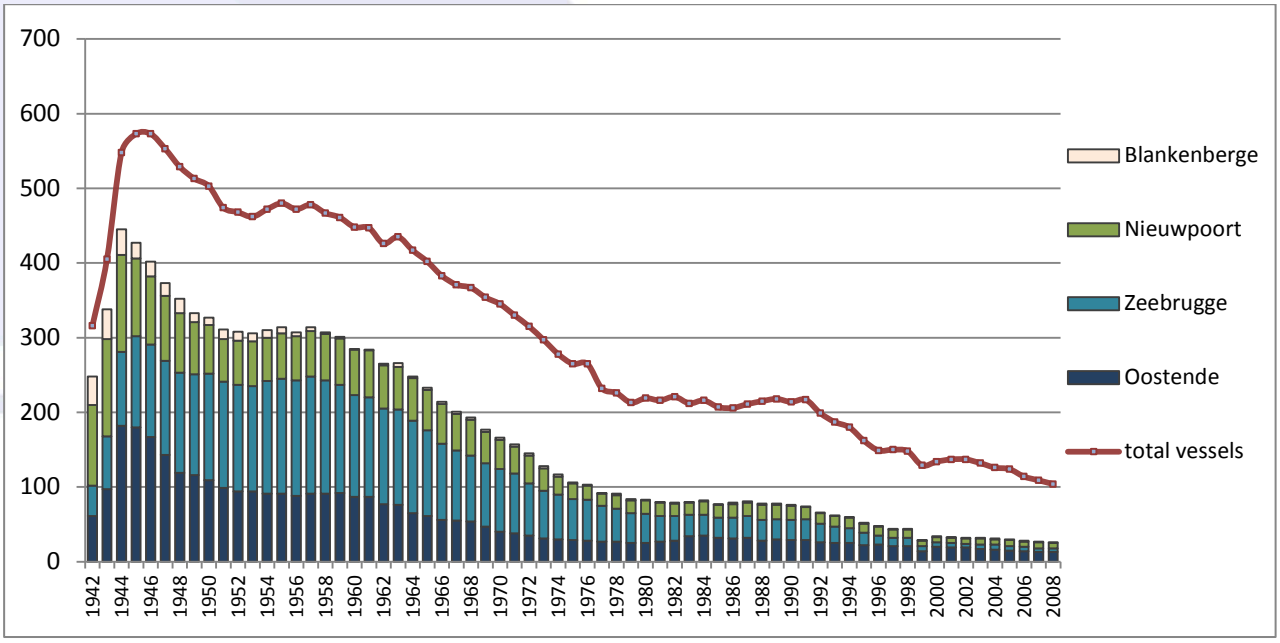

Figure 4: Trend in number of vessels of the Belgian 'inshore fishing fleet' for 1942-2010 (bar columns), based on the criteria of <70GT definition, compared to overall fleet size (red line). Source: VLIZ HIFIDatabase, reconstructed from historical sources see Annex B.

The 'inshore fleet', based on the definition <70GT, represented approximately 63% of the entire fleet in 1960, decreasing to less than 25% of the entire fleet, in recent times. If defined by criteria of engine power, the 'inshore fleet' (<221kW) has fluctuated around 20% of the entire fleet, since the 1990s. Today, less than 20 vessels remain in this category of vessel type, and are mainly registered in the ports of Nieuwpoort and Oostende. However, since the Ministerial Resolution MR of 26/12/2005, these vessels need to actively register to the 'coastal fleet segment' to operate under the legally distinctive framework of 'coastal fisheries', cfr. MR of 26/12/2005, Art. 8 § 4 (see GIFS Governance Report). Today, the vessels in the 'coastal fleet segment' are 7; the N86 RUDY in Nieuwpoort, and the O101 FISTON, the O116 CAROLINE, the O152 ARAN, the O190 RENILDE, the O62 DINI and the O82 NAUTILUS in Oostende (communication 28/02/2014 of the Flanders Fisheries Service). This is a drastic decline compared to 2012, when 20 vessels were registered as part of the 'coastal fleet segment'.

Employment

Little work is conducted on the historical trends in the socio-economic aspects of fisheries and changes in fishing communities. Effects of changing legal frameworks (quota restrictions, effort or fleet restrictions) and technical measures (mesh size, change of gear, etc.) or effects of climate change (e.g. distribution patterns of target species, change in abundance) can have a profound impact on fishing communities, especially where strong traditions persist to use particular vessel type, fishing gear and that target specific - economically interesting – species. One of the effects that is most directly perceived in the community is employment opportunity.

Direct employment in the fishing industry was measured in terms of jobs as members of the vessel crew (Figure 5). Total direct employment decreased from >1800 FTE in 1954, to less than 450 in 2012. This cannot be simply ascribed to the decrease in the number of vessels since, as discussed above, the average tonnage and engine power of vessels increased and vessels became larger, affecting average crew size. A second phenomenon that affected crew size and therefore total employment rates is the increase of automated instruments and technologies. A third aspect that needs to be taken into account is the ageing of fishers: until the early 1980s there was a slow but continuous increase in the proportion of younger age classes (aged <19 years). This 'inflow' of young fishers clearly stops after 1984 – at the same time when the decline in the fishing population takes a halt after steadily decreasing from 1800 to approximately 900 FTE. This younger generation can be traced through the class aged from 19-35 years that continues to increase until 1990 (Figure 5). While in 1988, approximately 70% of the crew was on average aged 35 or younger, today only 40% of the fishers is aged 35 or younger and nearly 10% is older than 55 years.

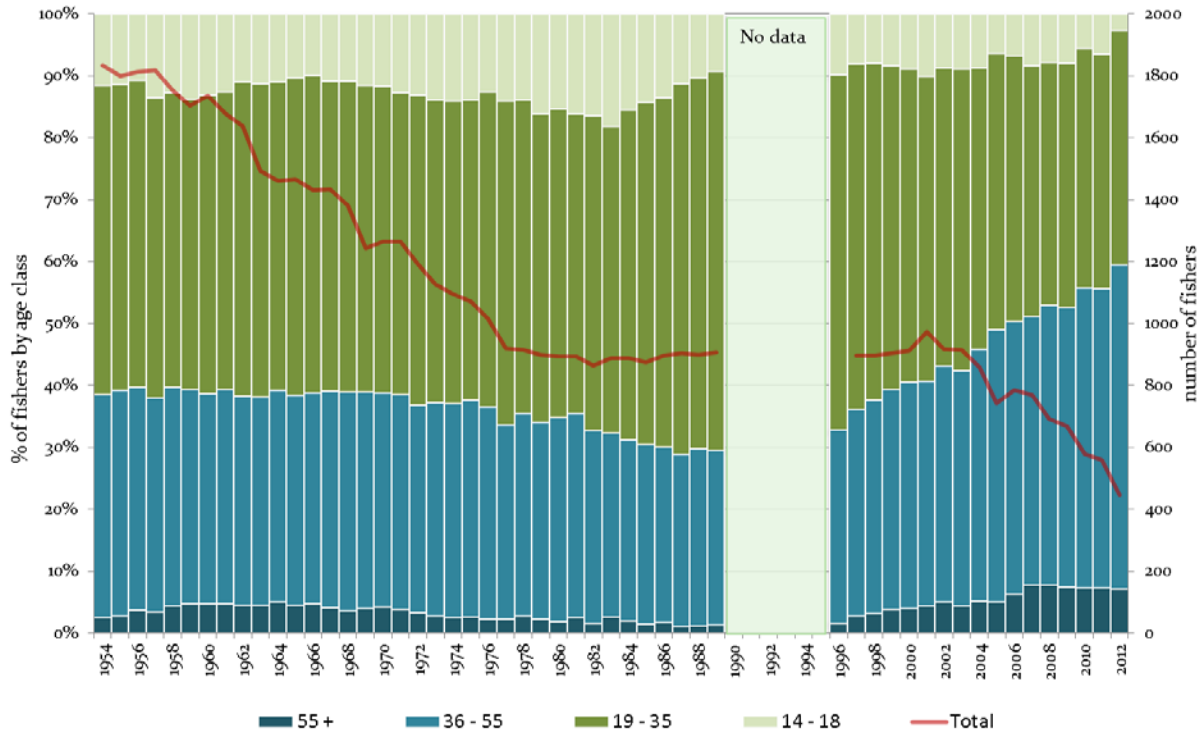

Figure 5: Direct employment in fisheries in Belgium: absolute number of fishers, and proportion by age class, 1954-2012.

Employment in Inshore Fisheries

Direct employment in Inshore Fisheries in Belgium has decreased from approximately 700 FTE in 1954 to less than 40 today (Figure 6). The declining rate was strongest between 1954 and 1971, at the same time as the proportion of inshore fishers aged 35 and younger decreases from approximately 60% to 30%. The – apparent - sudden increase in employment of coastal fisheries in 1971 is largely due to the change in the definition of 'coastal fisheries'. Whereas the 'coastal' or 'inshore fleet' contained the vessel classes I and II (up to 120HP) before 1971, it was modified to contain all vessels smaller than 35GT in 1971 and later expanded to vessels with engine power <221kW and 70GT that conduct fishing trips of 24 hours maximum (recently expanded to 48 hours). After a period of proportional increase of younger fishers between 1975 and 1990, most (+/- 70%) of the inshore fishers are now aged 35-55 or +55% (15%) (Figure 6).

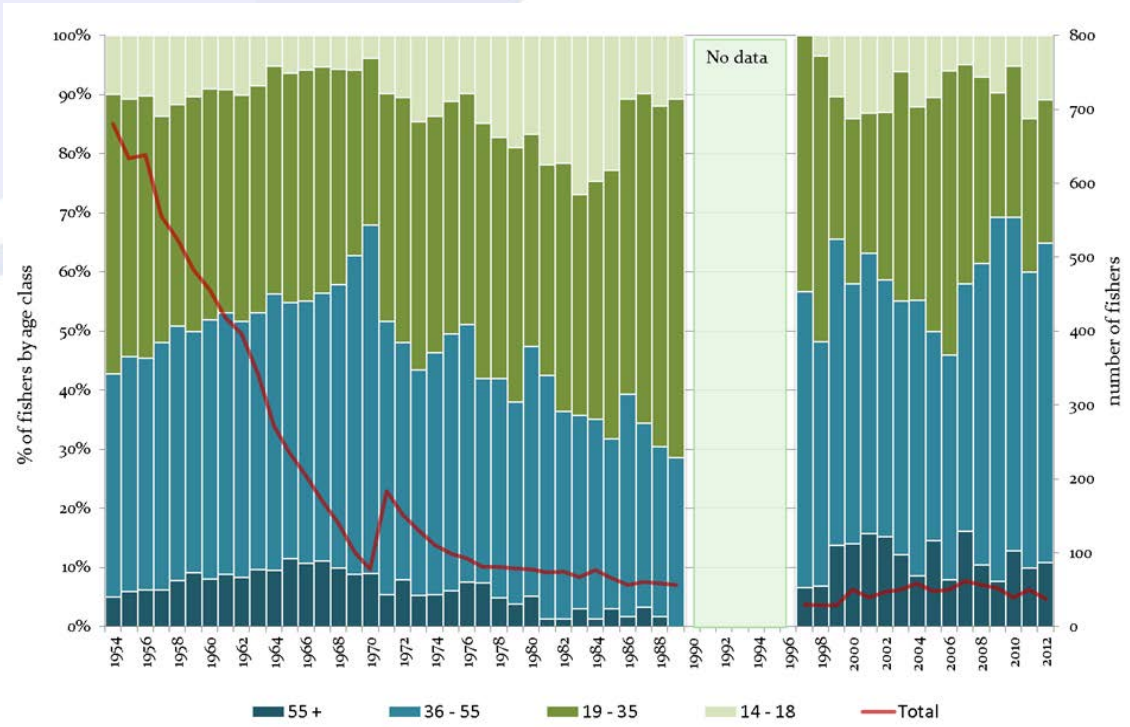

Figure 6: Direct employment in coastal fisheries in Belgium: absolute number of coastal fishers, and proportion by age class, 1954-2012 (note: the abrupt increase in 1971 is due to a change in definition of 'inshore fleet').

The employment rates suggest that direct employment in commercial Inshore Fisheries has decreased by 94% between 1954 and 2012 (from 680 to 37 FTE), compared to a decrease of approximately 75% in the total commercial fleet (Figure 7). This underlines the challenging social economic and environmental conditions in which the inshore fleet is operating, within the fishing industry.

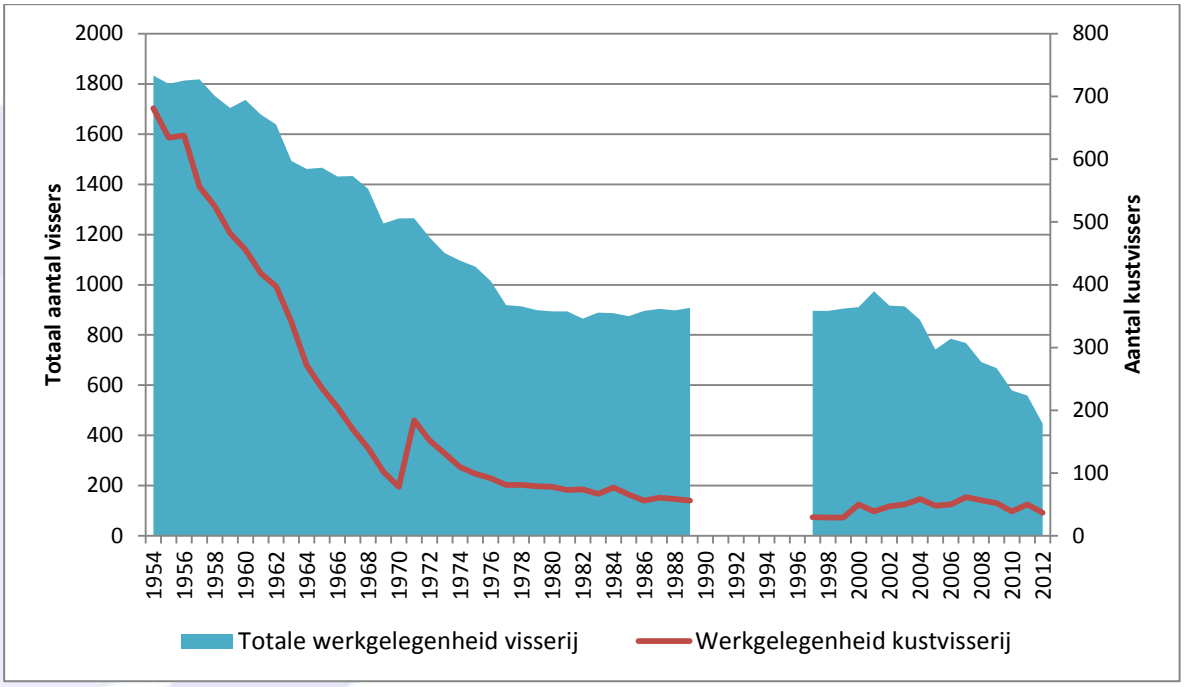

Figure 7: Direct employment (FTE fishers) in the total commercial fleet (blue area, left-hand axis), and in the inshore fleet (red line, right-hand axis) in Belgium, 1954-2012. Source: HiFiData (VLIZ) en database of the Shipping Control Service (Dienst Scheepvaartcontrole) (note: the abrupt increase in 1971 is due to a change in definition of 'inshore fleet').

Landings

Datasets describing the fleet characteristics typically do not report on landings by fleet segment or 'métier' (a combination of vessel type and fishing gear targeting specific fish species). This is partly due to the fact that vessels can switch from one métier to another between fishing seasons. This is particularly true for the inshore fleet that often targets a diverse range of species (from fish to crustaceans to molluscs) as they migrate inshore during the year. As a consequence, landings and value of landings was not commonly reported at national level, by fleet segment or vessel characteristics, or at least not in a sustained and detailed manner. As an exception, the herring and sprat fisheries, the brown shrimp fisheries, roundfish fisheries in Icelandic waters, and demersal (flatfish) fisheries with beam or otter trawlers have been reported as separate categories in the past. These fragmented data were disclosed, archived and described (Lescrauwaet et al. 2010).

For the purpose of analysing trends in volume (tonnes), value (euro) and composition (species) of the landings by the Belgian fleet, the HiFiDatabase was used (VLIZ 2009). One of the time-series of the HiFiDatabase reports on landings by area of origin, including landings from 'coastal waters' (see 'Range of Inshore Fisheries'), and were used to reconstruct time-series on landings by the 'coastal' or 'Inshore Fisheries'. The reported landings from the Inshore waters from 1929-2010 (Figure 8) follow a different pattern as that for the fisheries as a whole, in terms of volume of landings. Reported landings from the 'inshore' waters over the entire period, amount to 841,700t (dead weight). The median of annual reported landings over the entire period is 8,100t with a peak value of 60,500t in 1943 and a minimum of 1900t in 2007 (Figure 8).

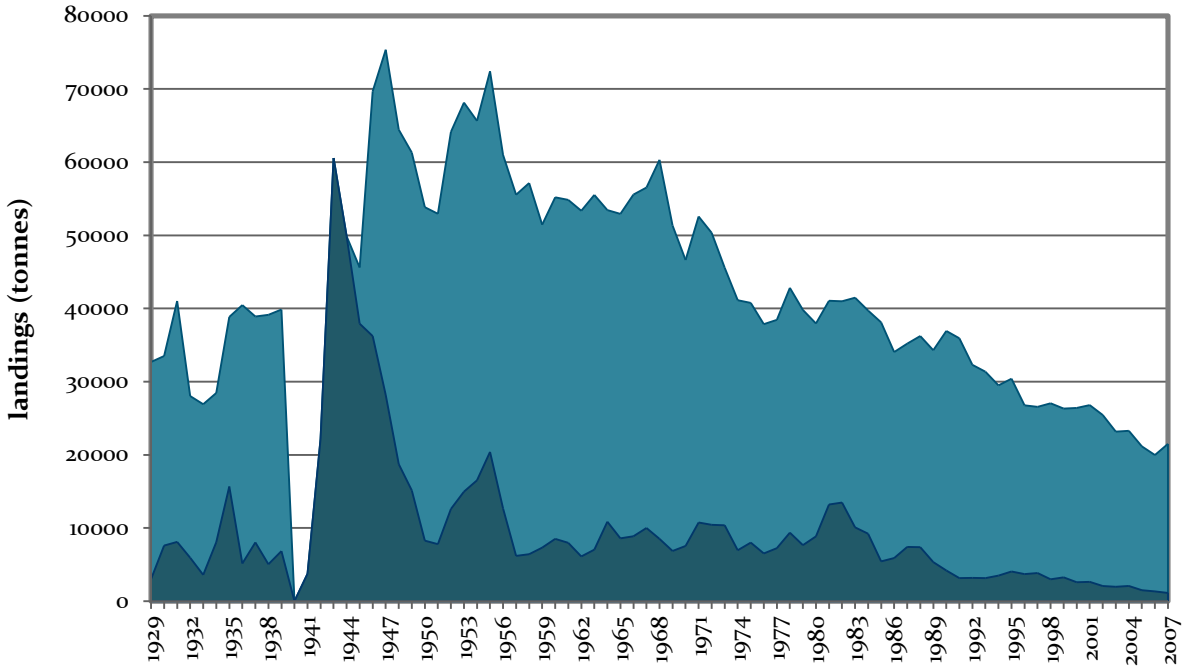

Figure 8: Trend in total volume of landings by Belgian commercial vessels (light blue), and originating from 'inshore waters' (dark blue) in the period 1929-2007. Source: VLIZ HIFIDatabase, reconstructed from historical sources Annex B.

However, in terms of composition of the landings and the key target species, the trends in Inshore Fisheries (Figure 9) are quite similar to that of the overall fleet: a first period (1929-1940) characterized by pelagic and shrimp fisheries, is followed by a peak in landings of pelagic species during and after WWII (1942-1964). Cod is the dominant species in the reported landings from 1965-1987. After the mid 1980s the composition of the reported landings is less dominated by a single species. Herring and sprat (49%), brown shrimp (12%), cod (9%), plaice (6%), whiting (4%) and sole (3%) represent an important proportion over the entire period.

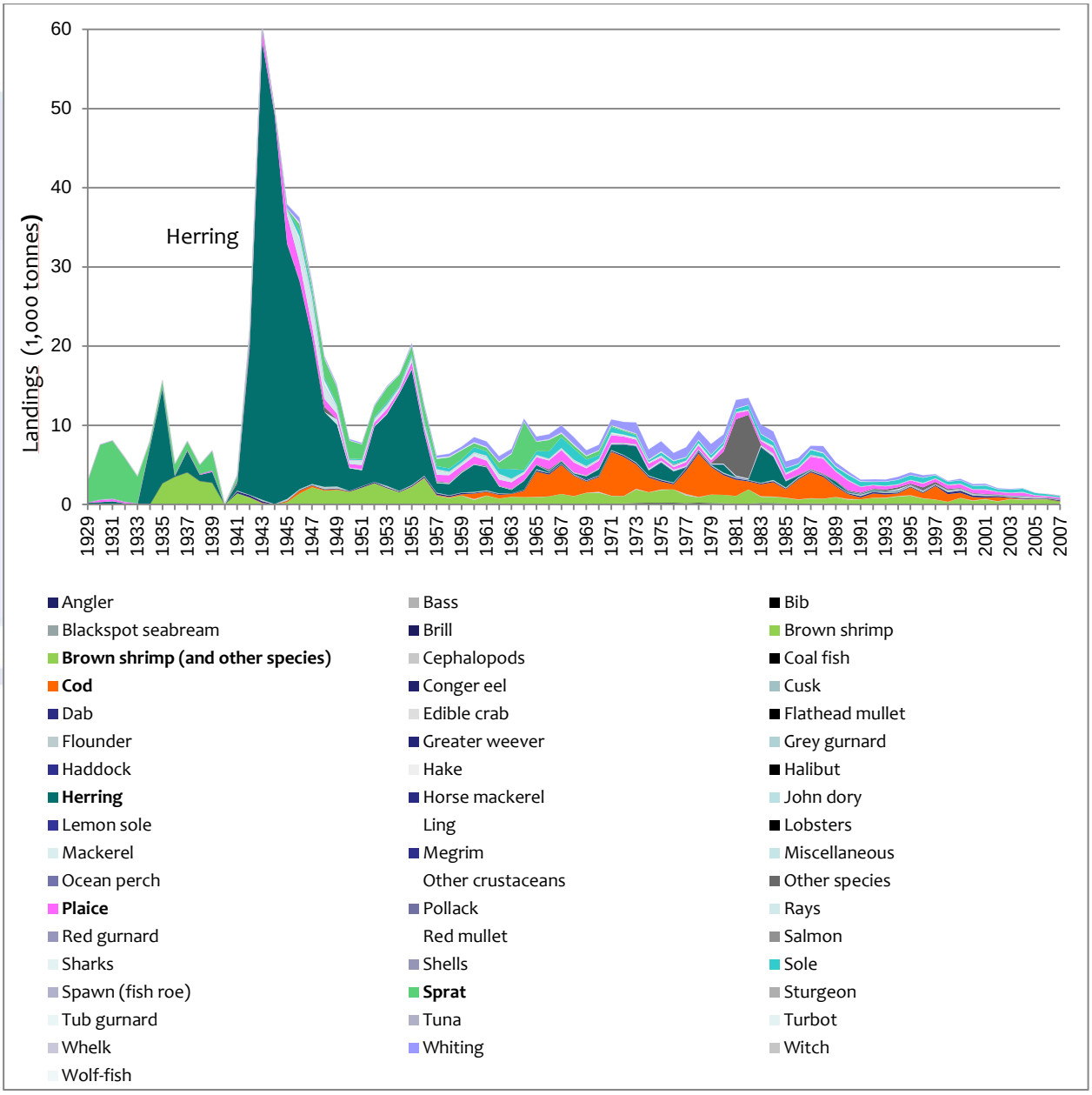

Figure 9: Composition of species in the landings of the Belgian commercial fleet, originating from 'inshore waters' in the period 1929-2007. Source: VLIZ HIFIDatabase, reconstructed from historical sources Annex B.

ECONOMIC VALUE OF LANDINGS FROM INSHORE WATERS

Since the Middle Ages, Flemish fisheries have targeted a variety of fishing grounds, many of which were distant fishing areas. Still, in spite of its limited extension, the Belgian part of the North Sea BNS has been historically the most important fishing area for Belgian fisheries, representing over 20% of the total Belgian landings (see above). The

waters of the BNS are considered as the most important fishing area in terms of source of food for local population, but also as the most stable provider of food. The BNS and in particular the ecosystem of shallow underwater sandbanks is also important as (post)spawning and nursery area (Leloup and Gilis 1961, Gilis 1961, Leloup and Gilis 1965, Rabaut et al. 2007).

The economic value of the landings originating from inshore waters, converted to euro as standard currency (from Belgian Francs) and correcting for inflation (no indexes available during WWII years), has represented approximately 25% of the overall economic value of the sector (data 1935-2007). Some of the species with less commercial value such as sprat, (spent) herring, whelk, were fished in inshore waters, although these species have sustained fishing métiers for many years. Unlike the increase and decline of economically important fishing grounds over the last centuries, the coastal or inshore waters have been a stable source of food for the population and employment and income for the industry. In terms of income, the 'coastal fleet segment' achieves an average gain (net income x 100/turnover) of 1.1% compared to 4.8% for the Eurocutters that also operate in inshore waters. Detailed economic analysis per fleet component is available from the website of the Flanders Sea Fisheries Service (in Dutch only).

A well-known case is the 'spent' North Sea herring fishery which was practiced every winter from November until February-March in the Belgian coastal waters, and the catch was consumed by the coastal and inland population, as fresh, salted and smoked produce. It was practiced for centuries until the stocks of the North Sea herring were harvested below sustainable levels in the North Sea fishing grounds and severe catch restrictions were established in the 1970s. Nowadays this Flemish fishing tradition is lost, and consumers have lost the culinary habits and knowledge of preparing and eating this fish.

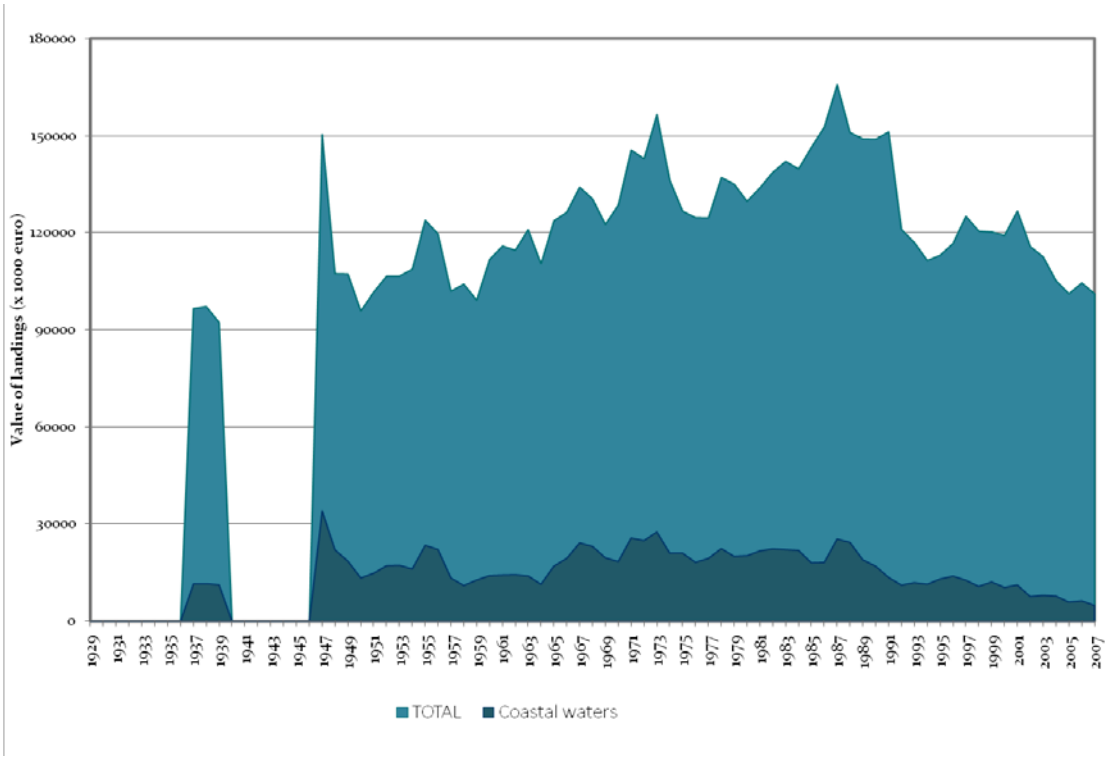

Figure 10: Total value of landings by Belgian commercial vessels (light blue), and originating from 'inshore waters' (dark blue) in the period 1929-2007. Source: VLIZ HIFIDatabase, reconstructed from historical sources Annex B.

Trends in landings per unit of effort in Belgian Inshore waters

Commercial catch per unit of effort (CPUE) - and its variant landings per unit of effort LPUE - is widely used as an index of abundance of fish, although the factors that may potentially bias this index are well documented and the index may be less suitable for pelagic species that display schooling behaviour (Hilborn and Walters 1992). The index needs to be used for analysis of specific métiers and particular fishing areas, in order to be interpreted as a relative index of abundance. An analysis of LPUE was conducted for the demersal fisheries (targeting species that live on or near the sea floor) in the BNS, targeting mainly flatfish. The time-series for LPUE of the demersal (flatfish) fisheries shows a period of higher LPUE just after WWII, with a decrease of 50% in the decade after WWII, suggesting a decrease in biomass of targeted species (Figure 11).

From the beginning of the 1960s until 1967, in the period coinciding with the transition from the otter trawl to the more efficient beam trawl and coinciding with an increase in fishing effort, the LPUE remain around 0.35 kg/HP*Fishing Hour with a slight increase to 0.4 kg/HP*FH in 1967. During the 1970s the fishing effort increases, however the LPUE remains at lower levels (0.15-0.25 kg/HP*FH). As a reference, a similar analysis conducted for the Belgian fisheries in Icelandic waters targeting roundfish (cod, haddock, ling, whiting, etc.) indicated that LPUE values decreased from 0.95 kg/HP*FH in 1946 to 0.24kg/HP*FH in 1983.

Figure 11: Landings per unit of effort (kg/kW*fishing hour), left-hand axis and total fishing effort (kW*fishing hours) by the demersal trawl fisheries on the Belgian part of the North Sea, 1946-1983. Source: HiFiDatabase (VLIZ), analysis Lescrauwaet et al. 2013.

Belgian Inshore waters: brown shrimp fisheries (*Crangon crangon*)

Commercial shrimp fisheries

The Belgian fisheries for brown shrimp are mainly conducted by small (<221 kW) vessels that operate within the Belgian territorial sea and to a lesser extent in northern France and Dutch waters. These are typically Inshore Fisheries. In 1929 approximately 250 vessels participated in the shrimp fisheries, in 1950 these were 187 (otter trawlers, single net) whereas today less than 30 vessels (beam trawler, double beam, 22 mm mesh size) are full-time active in the shrimp fisheries. Part of these 30 vessels operate from foreign (Dutch) ports under Belgian flag since at least 1990 (Churchill 1990, Hoefnagel 1998) and hence report their landings in foreign (Dutch) ports as part of the Belgian statistics. Over the last 50 years, shrimp fisheries represented on average 10% of SD (ship*days) of the total fishing effort of the Belgian fleet (Annual reports 'Landings and value of landings', Flemish government Fisheries Agency). Reported landings of shrimp by the commercial fleet average 1,350 t per year, with a maximum of 4,282 t in 1956. Nearly the same weight (i.e., on average 1,300 t per year) of undersized shrimp is discarded, while on average more than twice the weight of undersized fish is discarded (i.e. plaice, sole, dab, whiting). Overall, for each kg of reported shrimp landed there is at least 3.3 kg of fish and shrimp discarded. This does not take into account the high discards of North Sea crab (*Cancer pagurus*), reported as early as by Leloup and Gilis (1965).

Recreational Crangon landings

In Belgium it is not mandatory for vessels less than 10m length over all (LOA) to report catches. Recreational shrimp fisheries operate in the Belgian coastal waters, from smaller vessels (<8m) using towed gear. Although some of them are known to pursue commercial purposes, they are not part of the official fishing fleet and not included in formal reporting and data collecting systems. There is no limit to the catch of Crangon for the recreational fleet, but the prohibition is on commercializing the catch. The vessels can only operate within the 3nm zone and make use of only one towed net per vessel (max. 3m wide for beam trawl and 4.5m for otter trawl). Regular surveys on ships' safety regulations conducted by government officers and by VLIZ staff (unpublished data, 2012) along the ports and mooring sites in Belgium, suggest that approximately 60 recreational vessels are involved and operate from the 4 ports, particularly the port of Nieuwpoort. A conservative estimate of their catches is based on an effort of 120 SD per vessel and catches of 20kg per fishing trip, although catches of up to 100kg per fishing trip may be achieved (E. Hiele, Shipping Control Service, federal government, pers. comm.). The proportion of the recreational catch versus the commercial catch over the last 5 years was used to back-calculate recreational catches, assumed to exist at least from 1975. This conservative approach indicates that the landings of this component of the recreational fleet amount to at least 8% of that of the commercial fleet (Lescrauwaet et al. 2013).

Other recreational-artisanal shrimp fisheries operate from the beach, on foot and on horseback. Again, there are no data or estimates available for this Inshore Fisheries. However, detailed (and previously uncovered) figures reported during WWII, when these artisanal fisheries were widespread practice for subsistence purposes by coastal residents, suggest that this component of shrimp catches is small to negligible.

The estimation of discards in both the commercial and recreational Crangon fisheries are based on Leloup and Gilis (1965) for the period 1929-1970, and on Polet (2004) for later years. Both report comparable discard rates and fractions of undersize Crangon in commercial landings (respectively 46% and 47%). These levels of discarding are among the highest reported in the world (Kelleher 2005). Efforts are invested to develop fisheries with lower bottom contact (e.g. wing profiles), or with electropulse. The latter however is still in experimental phase (VLIZ 2014).

Belgian Inshore waters: sea angling for cod *(Gadus morhua)*, sea bass *(Dicentrarchus labrax)* and other species

Recreational fisheries include all forms of fishing that do not pursue commercial objectives. Little information exists on recreational fisheries in most North Sea countries (Zeller et al. 2011). In Belgium these include recreational Crangon fishing (above), sea angling, fishing from the coastline (angling from the beach, shrimp fishing on feet or on horseback, and the setting of passive nets along the low watermark). As reported for the Crangon fisheries (above), recreational flatfish fisheries exist in Belgium, which operate from smaller vessels that are not part of the official or commercial fishing fleet.

Except for the use of fixed (passive) nets from the beaches, recreational fisheries are not subject to licensing. Sea anglers are not allowed to fish at night and are allowed a daily maximum of 20kg per angler, of which cod is not allowed to exceed 15kg. The magnitude of recreational angling on the Belgian part of the North Sea (BNS) has only been addressed in a pilot study which estimated recreational angling for cod on the BNS at 100-200t per annum (ILVO-Fisheries 2007). The pilot study was based on the outcomes of angling contests organized by the Associations of Anglers (VVHV), with approximately 2000 members as active sea anglers in 2006. The catch of recreational angling was estimated at a minimum of 50 tonnes per annum was (2000 anglers, 5 days at sea, 5kg catch/day; Lescrauwaet et

al. 2013). Currently, a systematic effort is conducted to monitor installed fishing capacity and estimate fishing effort of recreational angling (LIVIS-EFF Axis4 project) by VLIZ and ILVO, supported by the local FLAG. This study is supported by GIFS and will produce more reliable estimates. The issue of sea angling for sea bass and cod is covering importance in the context of sustainable management of fish stocks. Also from an economical and legal point of view, it is important to balance the interests and challenges of commercial and recreational fisheries, where these target the same species.

Unaccounted and unreported catches in inshore waters

A number of other gears are used in Belgian fisheries in inshore waters, however with much lower intensity and spatial coverage than those presented above. These include seine nets, bottom dredges (1980's), trammel nets and angling and netting from land (jetties, piers). The use of trammel nets in commercial fisheries is rather recent (since 2000). Depestele et al. (2012) studied the impact of trammel nets (multi-layered gillnets) on different components of the marine ecosystem of the BNS (sea birds, benthos, fish stocks, and marine mammals). Haelters and Kerckhof (2005) found that a significant part of the dead strandings of the porpoises on Belgian beaches was caused by drowning in trammel nets, in particular in the first quarter of the year when nets are set for sole and plaice. The coastal municipalities issue licenses for passive beach nets and in 2006 approximately 250 licenses were issued in 4 municipalities (Goffin et al. 2007). Regulations prohibit the use of trammel nets as well as the use of gillnets below low watermark, but they are allowed above the low watermark (on the intertidal): maximum lengths and total number of nets are regulated, and minimum landing sizes of species are enforced (royal decree KB 1989-08-14, KB 2001-12-21 and ministerial decision 2006-12-21).

A recent study suggests that since the 2000s, approximately 50% of all Belgian removals from the BNS are unreported landings and discards (IUU) and total fish discarded by the Belgian fisheries on the BNS may range between 30-40% of all Belgian landings from the BNS (Lescrauwaet et al. 2013). These numbers do not take into account the non-commercial benthic species (e.g. crab, algae) and the catches by the French and Dutch fleets that also have a long-standing tradition of fishing in the BNS (Depestele et al. 2011).

To quantify the non-perceived economic value due to IUU, the total hypothetical value of the unreported and discarded fish and shrimp from the inshore waters was calculated based on HiFiData economic information by species and by year. Expressed as prices 2010 (corrected for inflation) and based on the average price EUR/kg of the commercial landings, the calculations show that the total value of the unreported and discarded weight is approximately 90% of the value of commercial landings considering the entire period 1947-2010. This calculation may represent an overestimation since discards are mostly undersized and therefore of lower commercial value.

It is important to note however that the Dutch and French fleets also obtain substantial amount of landings from the BNS, which currently may exceed 4 times the landings achieved by the Belgian commercial and recreational fisheries covered in the sections above. The estimate of all discarded fish in Belgian inshore waters is in the order of magnitude of reported annual landings by the total Belgian commercial sea fisheries (18,000-22,000t) (Lescrauwaet et al. 2103).

6. DISCUSSION

Historical baselines are extremely valuable as reference conditions for marine ecosystems, to assess their status and set goals for sustainable management. There is now on-going research to reconstruct and study reference conditions or historical baselines that date from before the onset of industrial or large-scale intensive fishing practices (Pauly 1995, Rijnsdorp et al. 1996, Roberts 2007, Pinnegar and Engelhard 2008, Cardinale et al. 2009). Of particular interest are the datasets in which landings are reported in conjunction with fishing effort for particular segments of the fleet, fisheries type, at a high temporal and spatial resolution, as well as socio-economic data.

HISTORICAL TIME-SERIES IN SUPPORT OF POLICIES AND MANAGEMENT OF INSHORE FISHERIES

The reconstructed time-series reported here contribute new and unique knowledge for the inshore waters of Belgium. The historical time-series for the Belgian inshore waters can further contribute to management and policy targets for Inshore Fisheries through:

- Descriptive historical statistics of Inshore Fisheries in Belgian waters and their relative importance in the past
- Analysis of deployed gear, fishing techniques and effort in inshore waters, in the past
- (Re)utilization of 'forgotten' fishing gear and fishing techniques
- Seasonality in historical occurrence, distribution and abundance of target inshore species
- Proportional importance of landings by weight classes and reconstruction of historical weight classes of target species
- Reconstruction of historical LPUE to support recovery or management plans for Inshore Fisheries practiced in the past e.g. the autumn *spent herring* fisheries on the Flemish Banks.
- Literature references and metadata for current fisheries research, e.g. historical references on discard rates for current or future management measures

In spite of the remaining gaps and uncertainties, the current reconstruction provides a first overview of historical trends and current situation of Inshore Fisheries in Belgium, and in particular by the Belgian fleet in inshore waters. As such they can support the wider debate about:

- how to move to more sustainable fisheries,
- what role Inshore Fisheries can play in current and future development of coastal communities,
- how to achieve the agreed policy targets in Belgian marine waters and in particular in the marine areas protected under the EU Habitat and Bird directives,
- how to include Inshore Fisheries in current and future marine spatial plans and planning (e.g. taking into account former fishing grounds of species that are commercially or locally extinct for Inshore Fisheries)

Policy options to support small-scale and Inshore Fisheries include:

- special treatment under the European Maritime and Fisheries Fund EMFF,
- the exemption from particular management requirements and
- safeguards in a context of rights-based management systems with e.g. transferable quota.

From social, economic and cultural considerations, the unreported catches (including discards) represent wasted or lost opportunities for local jobs and security for the formal fishing industry, for secure food, and for leisure and tourism for the wider population. These non-perceived or non-quantified socio-economic benefits and externalized environmental costs need to be taken into account in future strategies and planning for more sustainable fisheries. They must be included in particular to obtain reliable data in compliance of e.g. the GES targets set forward in the MSFD (2008/56/EG), to improve stock assessments and achieving targets of maximum sustainable yield MSY in the CFP, and to achieve favourable conservation status FCS for the species and habitats protected in marine and coastal Natura 2000 sites. While not explicitly mentioned in its final statement, the UN 2002 declaration intended to also cover unregulated and unreported catches by fishing activities (including recreational fisheries) from 2004 onwards. The daily allowable catches in unreported fisheries (such as recreational fishing) must also be connected to EU quota regulations and recovery plans for cod and plaice.

The impact of fisheries on the marine biodiversity and on the marine ecosystem functioning is a key concern in marine conservation strategies, especially in areas where fisheries with traditional high-impact are or have been practiced, e.g. shrimp fisheries. In particular, the time-series provide unique historical reference conditions and a potential baseline for fisheries management in the territorial sea or for the coastal fisheries. The latter is useful in the context of the MSFD and the proposal for Maritime Spatial Planning on the Belgian part of the North Sea.

Particular attention should be drawn to the case of the unreported removals of fish in inshore waters, including discarding. Discarding represents a substantial waste of resources, is unacceptable from a perspective of environmental impact and sustainable management and is to be considered unethical from a societal viewpoint. Furthermore, the impacts of a substantial part of the <10m fleet in Belgium are not taken into account in fisheries or environmental management. Urgently, ways must be explored to include the activities and impacts of the <10m fleet that operates with commercial purposes in current fisheries and environmental management schemes, while looking at specific measures that can stimulate the development of small-scale low-impact fishing activities in inshore waters, that are economically viable for professional fishermen.

However, the results aim beyond informing and supporting fishery and environmental research and policies. It is hoped that they lead to a greater awareness about how Inshore Fisheries have supported jobs and income over the past century. Furthermore, it is hoped that the results help to elucidate the profound changes that have taken place in marine ecosystems, and that they are used in a wider range of educational activities and outreach.

7. SCOPE FOR FUTURE WORK

- The importance of the inshore and the small-scale fleet is a broad policy objective and the social and cultural role of small-scale fisheries including Inshore Fisheries, is explicitly stated in the reformed CFP. The catches and efforts of the <10m fleet and the recreational fleet will also be the subject of systematic surveying in the context of the national data-gathering program for the CFP and the monitoring in compliance of targeted GES. ICES and member countries need to establish regular surveys (every 4–6 years) of total recreational removal, by species, area and gear category.

-The Data Collection Regulations of the Common Fisheries Policy CFP require European MS to collect data on technical, biological and economic aspects of their national fisheries and their impact on the marine ecosystem, as well as to collect data and report on discards. This information must be spatially explicit and will improve stock assessments by including unaccounted removals.

-The 12nm limit that is reserved for coastal fisheries is also extended for another 10 years. It is therefore important to further quantify all fishing activities including recreational and non-commercial fishing activities in inshore waters, and their position and importance in comparison to commercial (coastal) fisheries.

- Although the current report refers to the particular situation of the Belgian fisheries, similar trends may exist in neighbouring countries around the North Sea. Cooperation on these matters is necessary, since vessels operate in neigbouring waters.

- Finally, taking into account total removals is one aspect in moving towards an ecosystem-based approach and planning for future socio-economic viability of fisheries. A more integrated view takes into account aspects of energy and fuel consumption to steam towards distant grounds, employment, food safety and quality. In this respect, the current Belgian fisheries are distibuted in distant areas and based on historical fishing rights that date from times when these energy consumption was of lesser importance. Today, the Fisheries Authority (department of Agriculture and Fisheries, Flemish government) together with the producers' organisation, the Fisheries Research Institute ILVO and an environmental NGO have taken first steps towards a more sustainable future for fisheries through a Strategy for Sustainable Fisheries, which is carried forward by its Task Force.

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Communication 28/02/2014 of the Flanders Fisheries Service

E. Hiele, Shipping Control Service, federal government, (pers. comm.).

10. ANNEXES

ANNEX A: DEFINITIONS OF THE COMMERCIAL INSHORE FISHING FLEET IN BELGIUM

DEFINITIONS 'Inshore Fisheries' "Kustvisserij" - BELGIUM

Concept	*Definition*	*Approach (delimitation on the basis of)*	*Context*	*Entry into force or applicable period*	*Source*	*Remark*
Small-scale coastal fisheries	Fishing carried out by fishing vessels of an overall length of less than 12 metres and not using towed gear	Fleet & fishing gear	EU, legal	From 04/09/2006 onwards	Council Regulation (EC) 1198/2006 of 27 July 2006 on the European Fisheries Fund	In Belgium, no vessel complies with this definition (Marc Welvaert, Sea Fisheries Service, pers. Comm. + Operational Programme 2007 - 2013) NL: http://lv.vlaanderen.be/nlapps/data/docattachments/nop_ned.pdf FR: http://ec.europa.eu/fisheries/cfp/eff/op/list_of_operational_programmes/belgium_fr.pdf Towed gear = gear as listed in Table 3 in Annex I of Commission Regulation (EC) No 26/2004 of 30 December 2003 regarding the fishing vessels register of the Community: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:005:0025:0035:EN:PDF
Inshore/coastal fisheries segment	All fishing vessels that have an engine power of 221 kW or less, including any additional power and a tonnage of no more than 70 GT, according to the "Official list of Belgian fishing vessels", as maintained by the Department of Maritime Transport of the Federal Public Service Mobility and Transport, and that	Fleet, length of trip	Belgium, legal	From 2/02/2006 onwards	Besluit van de Vlaamse Regering van 16/12/2005 tot de instelling van een visvergunning en houdende tijdelijke maatregelen voor de uitvoering van de communautaire regeling inzake de	Important note: Vessel owners must actively register to the 'coastal fleet' segment. Maximum period was 24 hours, but has been raised recently to 48 hours: http://www.standaard.be/artikel/detail.aspx?artikelid=L03G7F2D

	undertake trips with a maximum period determined by the Minister with start and end in a Belgian port				instandhouding en de duurzame exploitatie van de visbestanden	
Inshore/coastal fisheries segment	All fishing vessels that have an engine power of 221 kW or less and usually undertake trips of less than 24 hours at sea	Fleet, length of trip	Belgium, reporting	at least from 1993	Annual report on the outcomes of the Belgian Sea Fisheries, with data on average costs (fuel, fishing gear, …), gross/nett operating results, turnover	
Inshore/coastal fisheries	Fisheries within the "coastal waters"	Spatial	Belgium, reporting	From 1929 onwards	A century of sea fisheries in Belgium : Map of the historical fishing areas	In 1959 the coastal waters were defined as: "an area up to 20 miles from the low-water mark of the east coast of the North Sea, between the line 'Gris Nez-South Foreland' and the parallel of Ijmuiden"
Inshore/coastal fisheries	Fisheries with vesseltype I: engine power less than 80 Hp and fishing from the beach up to 15 miles from the coast or vessel type II: engine power 80 - 120 Hp and fishing up to 25 - 30 miles from the coast from Gris-Nez to Hook of Holland	Fleet & spatial	Belgium, reporting	1948 - 1970	Annual report on the evolution of the Belgian Fishing Fleet, with data on employment	

Inshore/coastal fisheries	Fisheries with vessels < 35 GT (vessel type I)	Fleet	Belgium, reporting	1971 - 1994	Annual report on the evolution of the Belgian Fishing Fleet, with data on employment	
Inshore/coastal fisheries	Fisheries with vessels that have an engine power of 221 kW or less and a tonnage of no more than 70 GT and within 25 miles from the Belgian Coast	Fleet & spatial	Belgium, data gathered within GIFS project	From 1996 onwards	Central shipping database of the Federal Public Service Mobility and Transport	This definition is a pragmatical definition and was selected keeping in mind two criteria 1) Which are the other legal and reporting definitions within Belgium (see above)? 2) What are the possibilities within the database?
Inshore/coastal fisheries	Shrimp fisheries	Resource based, spatial	Belgium, data gathered within GIFS project			This definition is a pragmatical definition and was selected keeping in mind two criteria: 1) Which type of fisheries are typically bound to the coastal zone? 2) What are the possibilities with the restrictions related to the data sources?

ANNEX B: SOURCES OF HISTORICAL TIME-SERIES ON BELGIAN FISHING FLEET

Period	Fleet parameters	Source
1830-1841	Number of ships for the port of Oostende; total tonnage of ships for the port of Oostende	Rapport de la Commission chargée de faire une enquête sur la situation de la pêche maritime en Belgique. Séance du 17 mai 1866. Chambre des Représentants: Bruxelles. XLII, 75 pp
1832,1836, 1839	Number of ships for the ports of Nieuwpoort, Blankenberge, Heist, De Panne/Adinkerke, Koksijde/Oostduinkerke.	Rapport de la Commission 1866 see above
1842-1864	Number of ships by port (Oostende, Nieuwpoort, De Panne/Adinkerke, Koksijde/Oostduinkerke, Blankenberge, Heist); total tonnage of ships by port (all ports)	Rapport de la Commission 1866 see above
1865-1871	No data	No sources
1872, 1877, 1882, 1887, 1892-1903	Number of ships by port, including number of steam trawlers; total tonnage of ships by port; open and half-open vessels for 1892-1911 estimated based on punctual reported numbers for 1892 and 1905	Hoek, P. and Kyle, H. (1905) Appendix J: Statistics of the North Sea fisheries. Part I: The fisheries of the various countries. Belgium *Rapp. et Proc.-Verb. Cons. Int. Explor. Mer 3*: 82-91
1905	Number of ships by port, including number of steam trawlers; Total tonnage of ships by port,	De Zuttere, C. (1909) Enquête sur la pêche maritime en Belgique: introduction, recencement de la pêche maritime.

	including tonnage of steam trawlers	Lebègue & cie: Bruxelles. 634 pp
1910	Number of ships by port, including number of steam trawlers; total tonnage of ships by port, including tonnage of steam trawlers.	Von Schoen, F. (1912) La pêche maritime de la Belgique *Bulletin de la navigation et des pêches maritimes 14*: 185-205
1911-1931	Number of ships by port, including indication of number of steam trawlers; total tonnage of ships by port, including indication of tonnage of steam trawlers.	Provincie West-Vlaanderen. Commissie voor Zeevisscherij Jaarverslag der Commissie voor Zeevisscherij. Druk. Verbeke-Loys: Brugge: 1912, 1913, 1919-1931.
1929-2011	Number of ships by port; tonnage in GRT until 1983, in GRT and GT between 1984 and 1994, in GT from 1994 onwards, HP, kW, total length, total width, ownership and other ship-by-ship information	Officieele lijst der visschersvaartuigen. Ministerie van Landbouw. Dienst voor Zeevisscherij: Oostende (and continued series): 1929-2010
2008-2010	Number of ships by port; total tonnage (GT) of ships by port	Tessens, E. and Velghe, M. (2008) De Belgische zeevisserij: aanvoer en besomming 2008. Vlaamse Overheid. Departement Landbouw en Visserij. Afdeling Landbouw- en Visserijbeleid. Zeevisserij: Brussel. 103 pp Tessens E and Velghe M (2010) De Belgische zeevisserij: aanvoer en besomming 2009. Vlaamse Overheid. Departement Landbouw en Visserij. Afdeling Landbouw- en Visserijbeleid. Zeevisserij: Oostende. 109 pp Anon. (2012). FIVA Activiteitenverslag 2011.

ANNEX C: SOURCES OF HISTORICAL TIME-SERIES ON LANDINGS BY BELGIAN FISHERIES (1700 TO 2012)

Detailed digital sources for annual data on landings and their values were available as from 1998 onwards. This series of annual official reporting was available in paper format since 1973. However, predecessors of this series have been published since the early 20th century (1912). Fragmented parts of these series are kept in paper; in a few disperse province and city archives throughout Flanders. An overview of the situation of sea fisheries in Belgium in 1909-1910 (von Schoen 1912) provided interesting information on the number of vessels and fishermen, their production and fishing areas, ports and auctions, and import and export, at that time. However, it does not refer to or contain data series on landings.

Our literature screening for time-series on landings and the economic value of these landings indicated that structurally embedded reporting in Flanders/Belgium started in 1929 with an acceptable degree of consistency and continuity ever since then, except during the war period (World War II: 1940-1945, and in particular 1941). The reports have been subject to a number of changes (e.g. responsible authority and editor, title and format of the publication). They were either published as an independent report on fisheries, or as insert chapter in agriculture statistics reporting.

Table: Sources containing historical time-series (>5 consecutive years) on landings by Belgian fisheries from 1700 to 2012 with an indication of temporal, taxonomic and spatial resolution.

	Interval	Marking events of for the period	Source	Period	Frequency	Taxonomic resolution	Spatial resolution	Physical location	Digitally available in VLIZ: Data set (D) Full text (F)
1	MODERN TIMES	EU Common Fishery Policy 1972 and 1975: 'Cod Wars' in Iceland waters	Series 'De Belgische zeevisserij. Aanvoer en besomming'. Dienst Zeevisserij.*	1973 - 2012	Annual	By species, subtotals, general total	By port and by fishing area	DVZ	Available in paper format: 1973-1997 D: 1998-2006
2			Series 'De Belgische zeevisserij'. *Landbouwstatistieken*.	1969 – 1999	Annual	By species, subtotals, general	By port and by fishing area	HC-Antwerp	D

			Nationaal Instituut voor de Statistiek.			total			
3			Collection 'Monthly landings'. Archief van dr. Frank Redant, ILVO.	1967 – 1980	Annual	By species, subtotals, general total	By port	ILVO and VLIZ libraries	Available in paper format
4		1958: first 'Cod war', Iceland	Series 'Statistiek van de zeevisserij' *Statistisch tijdschrift*. Nationaal Instituut voor de Statistiek.	1957 – 1968	Annual	By species, subtotals, general total	By port and by fishing area	HC-Antwerp	D
5		World War II (1940-1945)	Series 'Statistiek van de zeevisserij' *Statistisch bulletin*. Nationaal Instituut voor de Statistiek.	1934 – 1956	Annual, no data in 1941, no data by fishing area in WWII	By species, subtotals, general total	By port and by fishing area	Heritage Library Hendrik Conscience Antwerp	D
6			Series 'Bestuurlijk Jaarverslag over de Zeevisscherij'. Bestuur van het Zeewezen.	1934 - 1939	Annual, no publication in 1941	By species, subtotals, general total	By port	VLIZ, DVZ	Available in paper format (1934–1936) F (1937–1939)
7			Officiële lijst der Belgisch vissers-vaartuigen	1929-2012	Annual and semestral	By vessel	By port	VLIZ, Shipping Control offices	paper format (1929–2012) F (1929-2012)

8			Series 'Jaarverslag over de zeevisscherij', Dienst voor Zeevisscherij/ Bestuur van het Zeewezen.	1927 – 1933	Annual	By species (from 1929), subtotals, general total	By port and by fishing area (from 1929)	VLIZ library, library Province West-Flanders,	F (1927–1931) paper format (1932–1933)
9		**1914-1918:** World War I **1914:** natural ice replaced by artificial ice to conserve	Series 'Jaarverslag der commissie voor zeevisscherij', Provincie West-Vlaanderen.	1912 – 1926	Annual; no publication in WWI (1914-1918)	Subtotals, general total	By port	VLIZ library, library Province West-Flanders,	F
10	**BELGIUM** early decades (from 1830)	**1909:** the end of 'salted cod' fisheries in Belgium	De Zuttere (1909). Enquête sur la pêche maritime en Belgique.	1836 - 1907	Annual+ summer/ winter landings for cod	Salted cod, herring and 'fresh caught fish'	By port	Archives and VLIZ library	F
11		**1862**: end of state subsidies in herring fisheries, Belgium **1866**: survey on sea fisheries sector, Belgium	Rapport sur l'état de l'administration dans la Flandre occidentale fait par la Députation permanente au Conseil provincial	1836 - 1869	Annual	Cod, herring and 'fresh caught fish'	By port	State and Provincial archives	D
12		**1884:** arrival of the first steam trawler in Belgium (Oostende)	Memoriael Administratif der Provincie West-Vlaenderen.	1837-1875	Annual (not all volumes contain landing	Cod, herring and 'fresh caught fish'	By port	State archives	D

			Bestuursmemoriaal van de provincie West-Vlaanderen-Section 'Pêche maritime'		statistics)				
13	**UNITED KINGDOM THE NETHERLANDS**	1815-1830	Gazette van Gend	1814-1829	Annual and monthly	Fishing vessel movement and landings Salted cod and herring	Port of Oostende	Library of Ghent University	
14	**French Republic /Empire**	French Republic 1795-1804 And French Empire 1804-1815	Gazette van Gend				Port of Oostende	Library of Ghent University	
15	**'Austrian Netherlands'**	Oostende Compagnie (1723-1731) for stimulating Flemish trade and fisheries	Cloquet (1842). Études sur l'industrie, le commerce, la marine et la pêche nationale	1767-1780, 1783-1789		'Salted cod' and herring		UA Biblio-theek Stads-campus	F
16	**'Spanish Netherlands** (1549-1713)	**Ca. 1475**: start of Flanders *'Doggevaert'* or cod fisheries on the Doggerbank in the North sea **1547**: Flemish fleet consists of 200 vessels	Vlietinck, (1975). Het oude Oostende en zijne driejarige belegering (1601-1604)	1492-1580				VLIZ library	Available in paper format

17	**'Burgundian Netherlands** (1384-1530)	**1396:** Technique for conservation of *herring: 'kaken'* Is applied in Flanders	Degryse & Mus (1966-1967). De laat-middeleeuwse haringvisserij	1398-1427				VLIZ library	Available in paper format