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From: Commission Services  
To: Working Party on Internal and External Fisheries Policy  
Subject: Assessment of the ex-post and ex-ante evaluation of the Protocol to the Fisheries Partnership Agreement between the European Union and Greenland  
*- Working document and Final Report*

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Delegations will find attached the Final Report Introduction and parts 1-3 on the abovementioned subject.

This document is circulated in view of the Working Party on 18 July 2014.

**Assessment of the ex-post and ex-ante evaluation of the Protocol to the Fisheries Partnership  
Agreement between the European Union and Greenland  
Final Report Introduction and parts 1-3**

DG MARE 2011/01/Lot 3 – SC13

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## Introduction

In recent years the European Union (EU) has signed a number of Fisheries Partnership Agreements (FPAs<sup>22</sup>) and Protocols with 'third countries'<sup>23</sup>. Most of the FPAs are with southern countries and cover fisheries in tropical waters. There is only one FPA in northern temperate waters with the Government of Denmark and the Home Rule Government of Greenland, hereafter referred to as the EU/Greenland FPA. Other fisheries agreements in northern waters between the EU and Norway, Iceland and the Faeroe Islands focus on the joint management of shared stocks through quota exchanges and are not 'partnership' agreements, as unlike the FPAs they don't provide for financial and technical support. It is the EU/Greenland<sup>24</sup> FPA, and specifically the Protocol to the FPA, that is the focus of this report.

The FPAs have multiple objectives, including supporting responsible fisheries, optimal use of EU fleet capacity, creation of employment and value addition both in the EU and in third countries, provision of product to the EU processing industry and contribution to EU market supplies. They focus on promoting partnership arrangements, which secure access for EU vessels to a range of different species, while providing third countries with financial contributions for access, and support to fisheries sectoral policy.

According to Article 30(4) of the Financial Regulation and Article 18 of its Rules of Application<sup>25</sup>, European Commission Services have to undertake both ex ante and ex post evaluations for all programmes and activities that entail significant spending. The Council of the EU Conclusions on the External Dimension of the Common Fisheries Policy (CFP) adopted on 19 March 2012<sup>26</sup> also request that before a mandate is provided for a new Protocol to be negotiated, where there is already an FPA/Protocol in place an ex post, in addition to an ex ante evaluation be undertaken by the European Commission.

The current Protocol to the EU/Greenland FPA runs from 1 January 2013 to 31 December 2015. This report provides the Council of the EU with the data and technical analyses required to enable it to decide whether or not to provide a mandate to the European Commission to negotiate with the Government of Denmark and the Home Rule Government of Greenland on behalf of the EU for a new Protocol. If a negotiation mandate is provided, negotiations will need to start towards the end of 2014 and be finalised early in 2015, to allow sufficient time for a Council Decision on a new Protocol before the current Protocol expires in December 2015. This timetable means that this evaluation was completed necessarily early into the period of application of the Protocol.

Sections of this report following this introduction:

- present background information on Greenland;
- consider the fisheries governance framework in Greenland;
- review Greenland's fish resources and their status;
- profile the domestic fisheries sector in Greenland;
- document fish trade to/from Greenland;
- provide an ex post evaluation of the current Protocol to the EU/Greenland FPA; and
- provide an ex ante evaluation of a possible future Protocol to the EU/Greenland FPA.

<sup>22</sup> The text of the Basic Regulation for the reformed Common Fisheries Policy refers to Sustainable Fisheries Partnership Agreements (SFPAs). Throughout this report, the term FPA is used in both the past and future sense, as the FPA with Greenland will remain in force rather than revoking and renegotiating it just for the sake of terminology.

<sup>23</sup> EC, 2014a.

<sup>24</sup> Hereafter, when referring to 'Greenland' in the context of the FPA/Protocol or a possible new Protocol, 'Greenland' is taken to read the Government of Denmark and the Government of Greenland.

<sup>25</sup> <http://ec.europa.eu/budget/biblio/documents/regulations/regulationsen.cfm#fmindex> (accessed 23 January 2014).

<sup>26</sup> Council of the European Union (2012) <http://www.consilium.europa.eu/uedocs/cmsdata/docs/pressdata/en/agricult/129052.pdf> (accessed 23 January 2014).



A description of the methodology used to complete this evaluation can be found in Annex D. The methodology demonstrates the extensive consultation which was completed with all relevant stakeholders in Member State administrations and representative industry organisations, as well as in Greenland. A full list of organisations consulted is provided in Annex C.

The principal characteristics of the EU/Greenland FPA and the current Protocol are provided in the table below.

**Table 0:1 principal characteristics of the EU/Greenland FPA and the current Protocol**

<b>Duration of the agreement:</b>	6 years renewable (1 January 2013 – 31 December 2018)	
<b>Duration of the protocol:</b>	3 years (1 January 2013 – 31 December 2015)	
<b>Initialisation of the protocol:</b>	3.2.2012	
<b>Nature of the FPA:</b>	Mixed agreement but allocation of quotas between Member States is submitted to the TAC and quota regulation	
<b>Financial contribution:</b>	EUR 15 104 203 including a financial reserve of EUR 1 500 000 for additional quantities of species as set out in the protocol. EUR 2 743 041 per year for the support and implementation of Greenlandic sectoral fisheries policy	
<b>Species reference prices and authorisation<sup>27</sup> fees</b>	<b>Reference prices EUR/per tonne</b>	<b>Authorisation fees EUR/per tonne</b>
Cod	1 800	90
Redfish (pelagic and demersal)	1 700	53
Greenland halibut	3 500	129
Shrimp – East Greenland waters	2 500	50
Shrimp – West Greenland waters	2 300	80
Atlantic halibut	4 100	217
Capelin	190	5
Snow crab	5 500	120
Grenadier	2 204	n/a
<b>Fishing possibilities as set out in the protocol (tonnes)</b>	<b>Annual possibilities 2013–2015 (adjustable)</b>	
Cod	2 200	
Pelagic redfish	3 000	
Demersal redfish	2 000	
Greenland halibut – West Greenland waters	2 500	
Greenland halibut – East Greenland waters	4 315	
Shrimp – West Greenland waters	3 400	
Shrimp – East Greenland waters	7 500	
Atlantic halibut – West Greenland waters	200	
Atlantic halibut – East Greenland waters	200	
Capelin	60 000	
Snow crab	250	
Grenadier spp. – West Greenland waters	100	
Grenadier spp. – East Greenland waters	100	
<b>Total</b>	<b>85 765</b>	

Source: <http://ec.europa.eu/fisheries/cfp/international/agreements/greenland/indexen.htm> (accessed 23 January 2014)

<sup>27</sup> Throughout this report, fishing licences are referred to as 'authorisations'.

## 1 General background to Greenland

### 1.1 Geography

Greenland is the world's largest island with a surface area of 2.2 million km<sup>2</sup>, making it the 12<sup>th</sup>-largest country in the world. The Exclusive Economic Zone (EEZ) also covers nearly 2.2 million km<sup>2</sup>. While detailed data on the proportion of the EEZ that is fishable when free of ice at different times of the year are not available, due to climate change the fishable area expands as sea ice coverage reduces. However, this increase in accessible fishing areas may be countered to an extent by more adverse weather events associated with climate change, and by the absence of ice which when present serves to break up sea swells, both of which may limit fishing activity. The northernmost point lies just 740 kilometres from the North Pole. From north to south, Greenland extends 2 670 kilometres. Only about 15 % of Greenland's land area is free of ice; the rest is covered by the world's second-largest ice cap. The coastline is approximately 40 000 km long and has countless large and small islands and fjords. It is principally a cliff coast with numerous rocky outcrops, islands, and a network of deep fjords, and the seabed has a complex topography.

Figure 1:1: map of Greenland and its EEZ (with oil & gas licences)



Source: arcticecon.wordpress.com<sup>28</sup>

<sup>28</sup> ArcticEcon, 2011.

**Table 1.1: specific details on Greenland's EEZ**

Indicator	Value
EEZ	2 184 254 km <sup>2</sup>
Shelf area	337 856 km <sup>2</sup>
Inshore fishing area	384 853 km <sup>2</sup>
Coral reefs	0.0 % of world
Sea mounts	0.1 % of world
Primary production	365 mgCm <sup>-2</sup> day <sup>-1</sup>

Source: Sea Around Us<sup>29</sup>. Note: Primary production is the fixation of inorganic carbon by living organisms, leading to the formation of organic compounds

The population of 56 370 (in 2013<sup>30</sup>) has remained relatively constant over the past 20 years and a slight decline is forecast to 2022. The population is currently relatively young (only 7 % above 65 years of age) with a high proportion (65 %) of working age. Residents currently comprise around 85 % Greenlanders (descended from an initial immigration 4 500 years ago) and the remaining 15 % are Danish, but the proportion of foreign citizens has risen (from a very low level) by 83 % in the past five years. Further strong growth in immigrant workers is expected with the emergence of mining and oil operations.

## 1.2 Political situation

A summary of the domestic political situation is presented below, while Greenland's international affairs are addressed in Section 1.4.

In 1979 Denmark granted 'Home Rule' to Greenland, which provided for autonomy over most policy areas, with the exception of foreign policy, defence and a number of other functions, which were performed by Denmark, as the sovereign state. Following a referendum in 2008 a new law on Self-Government took effect on 21 June 2009, furthering devolution of powers to the newly entitled Naalakkersuisit (Government of Greenland). Denmark retains functions related to defence, fishery inspection outside the territorial waters, constitutional affairs, currency and monetary policy.

The current government has a slim majority and is one year into a four-year term, with elections due by March 2017. Fishing is a very important policy area and a key campaigning issue in Greenland. The proposed amendments to the Fisheries Act (in particular the attempts to separate ownership of quota and processing facilities<sup>31</sup>) is cited as the reason that the fisheries minister resigned at the end of 2013, with the new minister delaying adoption of the new act until the proposed amendments are reviewed in more detail.

## 1.3 Development and economic status

The labour force peaked in 2010 at 28 510 and in 2011 was down to 26 791 as the unemployment rate rose from 7.1 % to 9.4 % over the same period. Greenland's inflation rose to 4.3 % in 2012, but dropped back down to around 2 % in 2013, which is more consistent with the levels seen since 2009. The average gross household income was EUR 53 887 in 2011<sup>30</sup>.

<sup>29</sup> Sea Around Us Project, 2014.

<sup>30</sup> Statistics Greenland, 2013.

<sup>31</sup> The intention is to break the monopolies held by the large fishing companies in most towns, which are thought to prevent competitive first-hand sales prices. However, some stakeholders such as KNAPK (The Association of Fishermen and Hunters in Greenland) want revisions to the legislation to enable smaller scale fishing enterprises to be involved in the processing sector.

There are three crucial demographic trends as identified by the Economic Council<sup>32</sup>:

- falling numbers of people of working age;
- stagnating population growth and high net emigration of Greenlanders; and
- population concentration around major towns.

The Government is the largest employer, accounting for 44 % of all jobs. There are four municipalities, with the largest concentration of the population in the South and Western region of Greenland. All transport between settlements is by air or sea, which leads to high transport costs and an inflexible and immobile labour market. The system of production is characterised by significant public intervention, with an underdeveloped private sector and reliance on transfers from Denmark.

In recent years the financial crisis in Europe, Greenland's only main export market, has had a negative impact on demand and prices, although these recovered in 2011. The country relies heavily on the annual block grant provided by Denmark, accounting for an estimated 32 % of GDP. Difficulties facing the country and its businesses include:

- a) high dependency on fisheries;
- b) direct and indirect subsidies to government-owned enterprises;
- c) high wage levels;
- d) an increasingly ageing population expected in the future;
- d) lack of skilled manpower;
- e) emigration of better educated young Greenlanders;
- f) slow private sector development.

Significant opportunities for economic development are emerging, with oil and minerals, transport services (in relation to a potential future opening of the north-west passage to the Pacific), aluminium smelting and energy. The country faces significant challenges in managing environmental and social impacts of potential future economic development.

Gross domestic product (GDP) amounted to EUR 1 848 million in 2012 (current prices), representing a 17 % increase since 2008 despite GDP at fixed prices showing negative annual real growth in 2009 and 2012<sup>33</sup>. Short-term declines in investments in oil exploration and lower shrimp quotas explain the Economic Council's assessment in the autumn of 2012 that growth was negative in 2012, and its forecast of low growth for 2013<sup>34</sup>.

Greenland's GDP per capita was EUR 32 564 in 2012, which was above the European average of EUR 26 220 and above the highest-ranking member states such as Austria, the Netherlands, and Ireland in that year, only being exceeded by Luxembourg<sup>35</sup>. This does not, however, reflect similarly high living standards in Greenland; the cost of living in Greenland is comparatively high due to the fact that nearly all commodities are imported, and much of the GDP per capita is derived from external subsidy support.

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<sup>32</sup> The Economic Council, 2013.

<sup>33</sup> Statistics Greenland, 2014.

<sup>34</sup> Ministry of Finance and Domestic Affairs, 2013.

<sup>35</sup> Central Intelligence Agency, 2013

**Table 1.2: Greenland's development indicators**

Indicator	2006	2007	2008	2009	2010	2011	2012	2013
Real GDP growth, %	5.4	3.4	2.1	- 2.7	4.9	3.2	- 3.3	- 2
Inflation, %	2.8	1.7	9.3	0.6	2.3	2.1	4.3	2.0
Operating and investment (OI) balance (million EUR)	8.7	3.8	- 12.6	- 69.0	27.7	6.6	20.0	0.1
Employment		27 555	28 333	28 478	28 386	28 601		
Of which fishing (%)		5.3	5.3	4.9	4.8	4.3		

Source: Ministry of Finance & Domestic Affairs

As shown in Table 1.3 below, the gross value added (GVA) of fishing in 2012 accounted for around 5 % of Greenland's total GVA. Construction was the largest single sector in GVA terms at 12 % of Greenland's total, followed by public administration (11 %). However, these data probably underestimate the total contribution of the fishing sector, and Greenland's fishing companies have been estimated to contribute 8.7 % of Greenland's GDP. With indirect activity (upstream and downstream businesses) and induced expenditure, fishing accounts for 19.7 % of the Greenland GDP<sup>36</sup>.

<sup>36</sup> Copenhagen Economics, 2013.

**Table 1.3: Greenland's GVA at fixed prices, by sector (million EUR)**

	2008	2009	2010	2011	2012	Change (2008– 2012)	Average annual change (2008– 2012)
Agriculture, hunting	45.0	39.5	37.5	37.1	34.6	- 23 %	- 6 %
<b>Fishing*</b>	77.6	63.9	74.6	70.0	74.5	- 4 %	-3 %
Construction	150.2	161.1	170.7	215.9	172.6	15 %	7 %
Supply of electricity and water	42.5	48.1	49.2	58.3	65.5	54 %	12 %
Extraction of raw materials	9.5	13.4	5.9	23.7	26.1	175 %	64 %
Wholesale trade, except motor vehicles	52.1	60.7	63.1	67.1	60.4	16 %	1 %
Retail and repair, except motor vehicles	53.7	54.0	50.7	54.3	50.5	- 6 %	- 2 %
Hotels and restaurants	24.1	25.2	24.8	23.5	22.6	- 6 %	- 5 %
Shipping	47.4	40.5	45.4	47.6	41.8	- 12 %	8 %**
Air transport	71.2	82.4	86.6	96.2	102.5	44 %	10 %
Post and telecommunications	60.7	67.8	70.6	71.2	74.2	22 %	6 %
Finance and insurance	24.8	23.6	26.1	26.8	25.9	4 %	3 %
Public administration	156.2	151.6	156.9	157.7	168.4	8 %	2 %
<b>Fisheries as % of GVA</b>	<b>5.4</b>	<b>4.4</b>	<b>5.1</b>	<b>4.6</b>	<b>4.9</b>		
<b>Total</b>	<b>1 437</b>	<b>1 434</b>	<b>1 472</b>	<b>1 532</b>	<b>1 507</b>	<b>5 %</b>	<b>1.6 %</b>
Mid-year population estimate	56 462	56 194	56 452	56 615	56 749		
GVA per capita (EUR)	<b>25 444</b>	<b>25 525</b>	<b>26 070</b>	<b>27 053</b>	<b>26 550</b>	<b>4.3 %</b>	<b>1.8 %</b>
<i>Growth in real terms (%)</i>	3.1	- 0.2	2.6	4.1	- 1.6		

Source: Statistics Greenland, 2013. Notes: \*of which GVA for inshore fishing = EUR 34 million (reducing by 16 % since 2008); offshore fishing = EUR 37 million (growing by 8 % since 2008). The relationship between GVA and GDP is: GVA + taxes on products - subsidies on products = GDP

The recent economic climate and limited employment opportunities resulted in the net emigration by Greenlanders from Greenland increasing from 160 people in 2011 to more than 700 in 2012. GDP development in 2013 remained negative, but expectations of positive growth in the coming years are high as: i) fishing is expected to be profitable; ii) four significant infrastructure projects are planned<sup>37</sup>; and iii) three

<sup>37</sup> The infrastructure projects are a prison, a new container terminal in Nuuk harbour, a new parliament building and a 200-home housing development in Nuuk.

mining permits have been granted. Permits include mining for iron ore, rare earth metals and uranium (the latter now being permitted after a parliamentary vote late in 2013).

London Mining's iron-mine project at Isukasia is the furthest advanced and has the potential to become the biggest construction project in Greenland so far, with a capital expenditure of around EUR 1.9 billion. This project could have a major impact on economic activity through the jobs it creates during the construction period (3 300 employees) and the production period (680–810 employees), as well as in the multiplier effects of the project. The iron-mine project is still uncertain and depends on being adequately funded<sup>38</sup>.

The mining permits were granted following impact benefit assessments (IBAs) that determined what conditions should be applied to ensure appropriate benefits to Greenland. Conditions of the permits include the requirement to employ Greenlanders (after a transition period of three years when immigrant workers are permitted while the necessary skills-base is developed in the Greenlandic workforce). This is hoped to compensate for jobs lost in the inshore fishing sector, where consolidation is being encouraged through a scrappage scheme combined with support for diversification into new work areas.

The oil industry is another sector that offers potential for substantial development. The US Geological Survey estimates that the seabed between Greenland and Canada holds a total of 17 billion barrels of oil. The Government's Bureau of Minerals and Petroleum is aiming to develop offshore oil wells<sup>39</sup> and in December 2010 signed seven new licences for exploration and exploitation for gas and oil in Baffin Bay.

Direct or indirect subsidies continue to play a large part in the Greenlandic economy, but attempts are being made to reduce this reliance. At present harbour users, including the state-owned transport company, Royal Arctic Line, pay relatively modest harbour charges to the government for the use of Nuuk harbour. However, harbour dues are to rise in 2014 in order to fund planned expansion of Nuuk harbour with a new container terminal<sup>40</sup>.

Greenland is about to embark on a gradual process of financial reforms to broaden its tax base (changing taxation via a budget-neutral approach to protect low-income families) and diversifying sector revenues. The Ministry of Finance is also introducing a new suite of indicators to monitor the impact of these reforms<sup>41</sup>. With the IBA applied to major development proposals from foreign interests, the government is hopeful that Greenland's workforce can diversify, including a reduced reliance on public sector employment (more than 40 % of the labour force in 2011<sup>42</sup>).

#### 1.4 Geo-political relationships

This section considers broader geo-political matters, not fisheries-specific issues – which are addressed in Section 2.

The general policy for Greenland is to expand and increase exports and trade relations<sup>43</sup>. The Government of Greenland is establishing new representation in the United States and plans the same for Asia (probably in China and South Korea). Following a recent South Korean official visit to Greenland, a business delegation from Greenland travelled to South Korea in 2013, and a number of collaboration options have been launched,

<sup>38</sup> Ministry of Finance and Domestic Affairs, 2013.

<sup>39</sup> *The Economist*, 2010.

<sup>40</sup> Greenland Business Association, 2013.

<sup>41</sup> Based on the EC Sector Indicator Guidance for Programming (EC, 2013a).

<sup>42</sup> Statistics Greenland, 2013.

<sup>43</sup> MoFA, pers. comm., 10 February 2014.

including a business collaboration agreement. The preparation and negotiation of a trade agreement have been initiated.<sup>44</sup>

Greenland also has close ties with its neighbour, Iceland, which has opened a new consulate office in Greenland. Iceland also provides important health services to Greenland. However, the link to Denmark and relations with the EU remain very important for Greenland, with shared values and very similar administrative structures.

#### 1.4.1 Relations with the EU

In 1953 Greenland ceased to be a Danish colony and became an integral part of Denmark. Denmark joined the then European Community in 1973. Home Rule was introduced in Greenland in 1979 and Greenland subsequently seceded from the European Union in 1985. A Fisheries Agreement between Greenland and the EU was established as an integral part of Greenland's negotiations for withdrawal from the Community. The result was that Greenland became associated with the EU as an Overseas Country and Territory (OCT), while the EU's traditional fishing rights were sustained in return for financial compensation.

At the time of secession there was an implicit link between the maintenance of financial assistance to Greenland and the Fisheries Agreement as there was no other instrument through which funds were channelled to Greenland in the years following its withdrawal. However, it should be noted that the Protocol on special arrangements for Greenland annexed to the Lisbon Treaty does not contain provisions on financial assistance.

Until 31 December 2006, all EU financial assistance to Greenland (EUR 42.8 million per year) was channelled through the Fisheries Agreement between the EU and Greenland. However, combining financial compensation for access to fisheries with broader development funding made it difficult to evaluate and distinguish responsibilities and impact. As a result, from 2007 a Fisheries Partnership Agreement with Greenland was established that focused on fisheries only, and a separate financial instrument managed by Directorate-General Development and Cooperation – EuropeAid (DG DEVCO) was established to facilitate Greenland's development.

Greenland's association with the EU is governed by the Overseas Association Decision (OAD), which defines areas of cooperation and lays down the detailed rules and procedures of the association of the OCTs with the EU as defined in Part IV of the TFEU (*inter alia* the existing trade regime between the parties). The previous OAD (2001/822/EC) expired at the end of 2013 and a new Council Decision was adopted on 25 November 2013 (2013/755/EU). The new OAD has no expiry date. It defines the allocations made available for OCTs under the European Development Fund (with Greenland eligible to a Regional Thematic Envelope).

More specifically, a new Council Decision on relations between the EU, Greenland and Denmark (2014/137/EU) was adopted on 14 March 2014 with an expiration date of 31 December 2020. In this document an indicative amount of EUR 217.8 million is set aside for financial cooperation in areas of mutual interest. Furthermore, the document envisages enhanced policy dialogue in areas of mutual interest (e.g. Arctic, environment and natural resources).

Though the EU payments under the FPA and the financial assistance allocated in the context of the Council Decision on relations between the EU, Greenland and Denmark are not linked, there are differing opinions across those consulted within the Government of Greenland on the extent to which they perceive these to be linked. The Ministry of Fisheries, Hunting and Agriculture (MFHA) acknowledges that there is clear separation between the two instruments and its focus is on the FPA, given that the funding allocated in the context of the Council Decision is administered by the relevant ministry in charge of the sector chosen for cooperation<sup>45</sup>. In

<sup>44</sup> Ministry of Finance & Domestic Affairs, 2013.

<sup>45</sup> MFHA, pers. comm., 10 February 2014.



the previous financial period (2006-2013), the sector chosen for financial cooperation in the context of the previous Council Decision (2006/526/EC) was education and hence the Ministry of Education administered the funds disbursed by the EU. The Ministry of Finance and the Ministry of Foreign Affairs, however, note that though the assistance provided by the EU through the Council Decision on relations between the EU, Greenland and Denmark and the FPA are delineated, the funds are still considered as a total package<sup>46</sup>. They suggest that it is easier to accept lower overall returns on the FPA (representing around 2 % of public revenue) when a larger allocation for development assistance is taken into account, along with preferential tariffs and other more strategic benefits provided through the OAD.

Despite the agreement (in the context of the Act on Self Rule of 2009) between Greenland and Denmark to lock the block grant, which in real terms has led to a slight reduction in the block grant from Denmark (as the grant is linked to Danish wage increases and inflation that are less than in Greenland), at EUR 490 million it remains the most significant grant contribution to Greenland's national budget.

#### 1.4.2 Arctic Council

The Arctic Council is described as an inter-governmental discussion forum, but is increasingly viewed as a decision-making body following the ministerial meeting of 2011. It has eight member states, six permanent participants representing the Arctic's indigenous peoples and a growing list of both permanent and *ad hoc* observers. The Arctic Council is currently chaired by Canada (2013–2015) with a Tromsø-based permanent secretariat that was established in 2013.

The Kingdom of Denmark represents Greenland and the Faroe Islands on the Arctic Council, with the Government of Greenland and its Institute of Natural Resources having direct involvement in Expert Working Groups. This arrangement, with indigenous organisations being on the Arctic Council as non-voting permanent participants, has resulted in tension. In 2013 Greenland boycotted the Arctic Council meeting in a bid for more direct involvement. Some resolution to this was negotiated between Greenland and Denmark in August 2013 and Greenland resumed participation in meetings<sup>47</sup>.

There are six Arctic Council working groups that focus on a range of subjects from emergency response to climate change, with Greenland being particularly active in biodiversity areas such as the Conservation of Arctic Flora and Fauna (CAFF), where the Ministry of the Environment and Nature provides the national representative.

In March 2014 the Arctic Economic Council was established to foster sustainable development, including economic growth, environmental protection and social development in the Arctic Region<sup>48</sup>. Each Arctic State and Permanent Participant may, within two months of approval of these recommendations by Senior Arctic Officials, provide the names of up to three representatives to attend the AEC's founding meeting<sup>49</sup>.

The Government of Greenland's Ministry of Foreign Affairs views the Arctic Council as an important evidence base that helps to shape Greenlandic policy, particularly on matters such as climate change where the Climate Change Impact Assessment and Arctic Resilience Reports have made significant contributions<sup>50</sup>.

A 2012 Joint Communication reviewed the EU's contribution to the Arctic since 2008 and sets a path for future engagement with Arctic partners<sup>51</sup>. EU policy on the Arctic recognises the region's growing strategic importance and establishes three high-level objectives, which are consistent with Greenland's policies:

<sup>46</sup> Ministry of Finance, pers. comm., 11 February 2014.

<sup>47</sup> <http://www.nunatsiaqonline.ca/stories/article/65674greenlandcomesbacktothearticcouncil/> (accessed 21 April 2014).

<sup>48</sup> Arctic Council, 2014a.

<sup>49</sup> Arctic Council, 2014b.

<sup>50</sup> Ministry of Foreign Affairs, pers. comm., 10 February 2014.

- protecting and preserving the Arctic in unison with its population;
- promoting the sustainable use of resources;
- international cooperation

The EU aims to achieve these high-level objectives through supporting Arctic research, the sustainable economic development of the Arctic region and close engagement with Arctic stakeholders. Specific policy decisions on commercial whaling and the trade in seal fur<sup>52</sup> have, however, been at odds with Greenland's domestic policies and have had an impact on Greenland's exports in these products. These areas of disagreement may have an influence on bilateral negotiations, including the FPA<sup>53</sup>. The EU's application for an observer in the Arctic was deferred as a result of dissent by Canada, again due to the ban on trade in seal fur<sup>54</sup>.

#### 1.4.3 Maritime borders

Greenland's nearest neighbour to the east is Iceland, with Canada neighbouring to the west. Canada and Greenland signed a Treaty in December 1973 (amended in 1994), which delimits the continental shelf between them in Baffin Bay. It defines a boundary of length about 1 450 nautical miles, but does not distinguish sovereignty of Hans Island (a small, uninhabited barren knoll (1.3 km<sup>2</sup>) located in the centre of Nares Strait). Nor does it address delimitation of the EEZ and the extended continental shelf north of the end point, and these maritime boundary issues remain unresolved. However, this is not reported to create any difficulties or immediate implications for EU shrimp vessels fishing west of Greenland in terms of knowing where they are eligible to fish<sup>55</sup>, as they operate south of this disputed zone.

Currently, no country or group of countries has sovereignty over the North Pole or significant areas of the Arctic Ocean around it. There is no specific treaty regime for the Arctic, but the 1982 United Nations Convention on the Law of the Sea (UNCLOS) is not excluded from application to the Arctic and it may therefore provide a relevant international legal framework for the management of maritime boundary claims. The shrinkage of the polar ice cap may provide access to previously unexploitable fishery and seabed resources and along with the threats posed by climate change there is now a renewed strategic interest in the Arctic region, which is giving rise to new claims regarding maritime boundaries.

UNCLOS provides a potential frame in international law for the settlement of these disputes including delimitation and rules for the use of living and non-living resources, and the protection of the environment. However, the USA is not a party at present since it has not ratified the convention. Its ten-year deadline for submission of claims will not commence until its ratification, and this will potentially delay the submission of claims until after 2019 at the very earliest, but most probably later. Canada had until 2013 to submit claims, and Denmark until 2014. There is a lack of detailed mapping data, since the region is still largely covered with ice and survey work is ongoing.

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<sup>51</sup> JOIN (2012).

<sup>52</sup> Regulation (EC) No 1007/2009.

<sup>53</sup> DG MARE, pers. comm., 21 January 2014.

<sup>54</sup> BBC, 2013.

<sup>55</sup> Ocean prawns, pers. comm., 11 March 2014.

## 2 Fisheries governance in Greenland: institutions, legislation, policy and management framework

### 2.1 Institutional organisations for fisheries sector management

The Ministry of Fisheries, Hunting and Agriculture (MFHA) has overall responsibility for the management of fish resources in Greenland and the administration of required regulations, through the Director General of the Fisheries and Judicial Unit. The MFHA is also responsible for hunting and agriculture, through the Director General of Economics and Human Resources.

The Institute of Natural Resources is responsible for providing the biological basis for fisheries management advice to the MFHA. This includes undertaking fishery-independent surveys to support management advice, coupled with analysis of data collected by scientific observers. Scientists from the Institute participate in scientific working group meetings of the North Atlantic Fisheries Organisation (NAFO) and the International Council for the Exploration of the Sea (ICES).

The Greenland Fishery License Control Authority (GFLK) has a number of key responsibilities, including: control of fishing vessels in Greenlandic territorial waters (i.e. less than 3 nautical miles from the base line); monitoring of Greenlandic vessels operating inside and outside Greenland's EEZ; managing the deployment of Greenland's fisheries observer programme; and, management of authorisation, catch and effort data. GFLK is also responsible for the provision of data to NAFO and the North East Atlantic Fisheries Commission (NEAFC). The Danish Navy Arctic Command is responsible for control activities in Greenland's EEZ, outside of territorial waters.

The Ministry of Environment and Nature also has responsibilities that affect Greenlandic fisheries, most importantly the implementation and management of marine protected areas in Greenland's territorial waters. The Ministry is also responsible for Acts with an environmental focus relating to mineral and petroleum extractive industries.

The Ministry of Finance and Domestic Affairs is responsible for managing the budgets of the institutions above, through the Finance Act. The Finance Act includes specification of annual contributions from the EU's sectoral policy support payments to the accounts of the MFHA, the Institute of Natural Resources and the GFLK. It is interesting to note that the budget of the Institute of Natural Resources is a separate account within the Ministry of Nature and Environment's budget stream.

### 2.2 National fisheries sector legislation, policy, and management

Greenland's baseline data were first designated by Denmark's Royal Ordinance No. 191 of 27 May 1963. Greenland's territorial sea limit was also designated by Royal Ordinance No. 191 of 27 May 1963, at 3 nautical miles from the baseline. Greenland's EEZ was designated through Executive Order No. 629 of 22 December 1976 for southern Greenland<sup>56</sup> and Executive Order No. 176 of 14 May 1980 for northern Greenland<sup>57</sup> at 200 nautical miles from the baseline. Strictly speaking, the Executive Orders designate the fishing zone of Greenland, though the fishing zone is referred to throughout the document as the EEZ.

As discussed in Chapter 1, Greenland and Canada have agreed maritime borders in Baffin Bay, but have not agreed maritime borders to the north in the Lincoln Sea or the sovereignty of Hans Island. It is not clear whether these issues will be resolved during the period of the current Protocol. As already noted, these unresolved maritime boundary issues are unlikely to have any implications regarding the fishing activities of EU fishing vessels in the short term, as the fishing grounds for EU vessels are located further south. However,

<sup>56</sup> South of 75° N on the west coast and south of 67° N on the east coast.

<sup>57</sup> North of 75° N on the west coast and north of 67° N on the east coast.

this could change in the future in the context of climate change, for example if fishing grounds move in response to stock displacement.

The legal framework for the management of Greenland's fisheries resources is provided primarily by Act No. 18 of 31 October 1996 on Fisheries (the 'Fisheries Act'), amended by ten subsequent Acts<sup>58</sup>. The Act is implemented through numerous executive orders, issued in pursuance of the Act, which provide more detailed regulation in specific aspects of fisheries management and for specific fisheries.

The stated aim of the Fisheries Act is to ensure appropriate and biologically sound exploitation of Greenland's fish stocks, with emphasis on: conservation of resources and reproduction; keeping ecosystem impacts of fishing at acceptable levels; matching fishing opportunities with capacity; and, consideration of economic and social considerations related to the fishing industry, processing industry and other related industries. The Fisheries Act covers commercial and non-commercial fishing activities in Greenland's EEZ, Greenlandic commercial fisheries operating outside Greenland's EEZ and landings or transshipments from foreign fishing vessels operating in Greenland's EEZ.

The Fisheries Act also contains the legal basis for the Fisheries Council. The Fisheries Council is composed of fishing industry representatives, with the following having permanent representation: Greenland Employer's Association; the Association of Fishermen and Hunters; the Ministry of Fisheries, Hunting and Agriculture; Greenland Fisheries License Control; Greenland Institute of Natural Resources; the Ministry of Finance; the Ministry of Domestic Affairs, Nature and Environment; the Ministry of Industry and Labour; the Employees Union; the Association of Local Authorities; and the Greenland Employer's Association. The Fisheries Council provides an opportunity for the represented stakeholders to suggest new policy initiatives or revisions to existing legislation. Furthermore, the Fisheries Council has the authority to address specific fisheries-related issues that do not require the presence of government, with the scope of this authority explicitly outlined in the Fisheries Act. The Fisheries Council therefore plays an important role in facilitating interaction between fisheries stakeholders and Greenland, including identification of management priorities. A relevant example is the recent request by the Fisheries Council to set out a Management Plan for the lumpfish roe fishery, to help move towards Marine Stewardship Council certification.

The management of bycatch in Greenland's EEZ is outlined in Executive Order No. 14 of 6 December 2011. The Executive Order includes: minimum size limits for species, below which the individuals are considered to be bycatch; sampling and reporting requirements for bycatches; derogations from the discard ban, e.g. halibut that is caught in non-trawl fisheries; move-on rules; and area closures. The Executive Order also includes provision to grant shrimp trawlers annual derogations from the discard ban, until conditions for acquisition of authorisation for processing fish on shrimp trawlers have been established.

Management plans have been developed for a number of Greenlandic fisheries. These are summarised below.

There is a Greenland cod management plan for the offshore fishery, effective from 2014 to 2016<sup>59</sup>. This replaced the previous management plan, which was effective from 1 January 2012. The revised management plan was developed in 2013, with financial support including sectoral policy support from the Protocol for 2013. A committee for the management of Greenland offshore cod was tasked with proposing the framework for the management plan. The committee was formed of representatives from a variety of stakeholders, including the fishery industry, with three meetings in 2013. The cod management plan for 2014 to 2016 applies to the two offshore components only, i.e. West Greenland and East Greenland. Consequently, it does not include the

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<sup>58</sup> Act No. 12 of 6 November 1997, Act No. 6 of 20 May 1998, Act No. 15 of 12 November 2001, Act No. 5 of 21 May 2002, Act No. 28 of 18 December 2003, Act No. 5 of 12 November 2008, Act No. 17 of 3 December 2009, Act No. 8 of 22 November 2011, Act No. 5 of 4 June 2012 and Act No. 12 of 3 December 2012.

<sup>59</sup> Anon., 2013a.

inshore component and does not apply to the inshore cod fishery. The Management Plan considers the East Greenlandic stock to be part of a shared East Greenland–Icelandic cod stock, which is not inconsistent with the results of recent genetic analysis<sup>60</sup>. The objectives of the management plan are to allow the Greenlandic cod stocks to rebuild, and ultimately maintain fishing mortality at a level to provide maximum sustainable yield. The management plan implements a fixed catch limit of 10 000 tonnes for 2014 to 2016, with a mechanism to adjust the catch limit if surveys indicate that stock abundance has declined by more than 15 %, or increased by more than 30 %. The cod management plan was due to be benchmarked by ICES in February 2014, and collaboration between Greenlandic and Icelandic scientists is expected to commence in 2014 to start movement towards joint management of the shared Eastern Greenlandic–Icelandic stock component. The management plan includes technical conservation measures, including closed areas and restrictions on fishing gears, as well as requirements for data collection, including the training of crew to self-sample for collection of otoliths, maturity and length.

A separate management plan for the West Greenlandic shrimp fishery has been in place since 2010<sup>61</sup>. The management plan is separate to the cod management plan and plans for other species in development. The objectives are to: maintain biomass close to, but above the biomass that can support harvest of the maximum sustainable yield ( $B_{MSY}$ ) in the region of greatest net production and close to a theoretical economic optimum; set short-term limits for total allowable catch (TAC) with the main criterion being the risk of exceeding maximum rate of fishing mortality ( $F_{MSY}$ ), and, restricting inter-annual changes in TAC to 12.5 % (increase or decrease) to ensure social and economic stability in Greenland's fishery sector. The management plan includes technical conservation measures, e.g. the mandatory use of Nordmore sorting grid for vessels over 75 gross registered tonnage (GRT) / 120 gross tonnage (GT).

A lumpfish management plan developed by the Government of Greenland in collaboration with the industry is being implemented for the first time in 2014 for the inshore lumpfish fishery open from March to July, where the roe is harvested to supply a significant export trade. This fishery has now entered MSC assessment process.

For the snow crab fishery, the Greenland Institute of Natural Resources (GINR) has based management advice on the objective of halting the decline in stock biomass. The management is expected to promote the optimal and most sustainable utilisation of the crab resource<sup>62</sup>. Snow crabs are distributed in patches and exploited commercially along the west coast of Greenland and within the fjords primarily from Disko Bay in the north (up to 71° 30' N) to Paamiut in the South (60° 45' N). Quotas are used to manage the fishery and it is assessed when data are available within all the management areas. The crab resource has been managed in the six management areas since 2004: from North to South Upernavik, Uummannaq-Disko Bay, Sisimiut, Maniitsoq-Kangaamiut, Nuuk-Paamiut and Narsaq-Qaqortoq. There are a number of regulations in place to control landings, including the prohibition of landing females and undersized males (< 100 mm carapace length), logbooks for vessels larger than 10 m and a closure of the fishery north of 64° N for the first three months of each year. There is also a regulation that forces the location of the fishing effort to move if soft-shelled crabs exceed 20 % of the catch. However, this is not monitored<sup>62</sup>.

There is a clear distinction between inshore and offshore fishing in the management of Greenland's fisheries. Inshore fisheries are those undertaken by vessels less than 75 GRT/120 GT, operating in Greenland's territorial waters (i.e. less than 3 nautical miles from the baseline). Offshore fisheries are those undertaken by vessels greater than 75 GRT/120 GT operating outside Greenland's territorial waters.

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<sup>60</sup> Therkildsen et al., 2013.

<sup>61</sup> Anon., 2010.

<sup>62</sup> Burmeister, 2012.

Offshore fisheries are regulated through the setting of TACs and individual vessel quotas or individual transferable quotas (ITQs). For inshore fisheries, management varies by fishery. TACs and ITQs apply to the inshore shrimp fishery and the inshore Greenland halibut fishery for vessels greater than 6 m length overall (LOA). TACs also apply to the inshore cod fishery and the inshore Greenland halibut fishery for vessels less than 6 m LOA. The remaining inshore fisheries are not managed with TACs and quotas. Vessels participating in either offshore or inshore fisheries must be licensed. The Fisheries Act specifies that four types of authorisations can be issued, and Executive Order No. 1 of 2 February 2012 specifies which authorisations are required for specific fisheries. These are summarised below:

1. *Fixed-term authorisations with a maximum allowable catch*
  - Used for fisheries managed with TACs and individual vessel quotas, and exploratory fisheries.
  - Applies to offshore fisheries for Atlantic halibut, cod, redfish, capelin and grenadier.
  - Applies to the inshore fishery for scallops.
  - Note – applies to EU fishing vessels taking up fishing opportunities provided through the Protocol, and other foreign fishing vessels taking up fishing opportunities in Greenlandic waters, either through Greenland's bilateral agreements or following transfers of Protocol quota from the EU..
2. *Unlimited-term authorisations with a maximum allowable catch*
  - Used for fisheries managed with TACs and ITQs.
  - Applies to the domestic offshore fisheries for shrimp and Greenland halibut.
  - Applies to the inshore fisheries for shrimp and Greenland halibut for vessels > 6 m LOA.
3. *Fixed-term authorisations without a maximum allowable catch*
  - Used for fisheries with no TACs, olympic fisheries with TACs and other fisheries where quota is shared across all vessels.
  - Also applies to the inshore fisheries for snow crab (TAC).
4. *Unlimited-term authorisations without a maximum allowable catch*
  - Not currently used.

As described above, ITQs are used in the inshore and offshore shrimp fisheries, the inshore Greenland halibut fishery for vessels exceeding 6 m length, and the offshore Greenland halibut fisheries. The Fisheries Act imposes maximum limits for concentration of ITQ ownership. A company or individual can own a maximum of 33.3 % of total quota for the offshore shrimp fishery, a maximum of 15 % for the inshore shrimp fishery and a maximum of 5 % for the inshore Greenland halibut fishery.

It is important to note that the inshore Greenland halibut (for vessels less than 6 m LOA) and cod fisheries are 'olympic fisheries', i.e. fisheries with TACs and a shared quota for all vessels. Since 1 January 2014, a monthly quota system has been implemented in these fisheries, instead of an annual quota as used previously in 2013, in an attempt to prolong the fishing season and provide a more balanced supply of fisheries products to Greenland's fish processing sector. Under the new quota system, the total annual quota is split in to month specific quotas. Due to the widespread importance of the inshore Greenland halibut fishery in social and economic terms, the early exhaustion of initial quota allocations in the fishery has previously resulted in intense pressure on the Government to increase catch limits in season. This has resulted in the catches exceeding the levels advised by the Institute of Natural Resources<sup>63</sup>.

The Fisheries Act also empowers the Government to issue rules on quota flexibility in subordinate legislation, through which companies or quota holders can: transfer unused quota from a given season to the following

<sup>63</sup> MFHA, pers. comm., 12 February 2014.

season; and continue fishing in a given season once their quota has been fully utilised, by borrowing quota from the following season (Fisheries Act, § 21). The Fisheries Act explicitly states that authorisations of non-Greenlandic fishing vessels automatically lapse once the authorised quota has been fully utilised. In this regard, the current Fisheries Act appears to preclude EU fishing vessels from borrowing quotas from the following season. It is worth stressing that the provision for quota flexibility only applies to fisheries with authorisations that specify a maximum allowable catch for the authorisation holder.

To date, the Government has implemented rules for quota flexibility in the Greenland shrimp fishery, through Executive Order No. 1 of 2 February 2012, with the following conditions: shrimp trawlers may transfer quota to the following season, though the transferred quota must be fully utilised by 30 April; and shrimp trawlers that have fully utilised quotas may also continue fishing after 15 November by borrowing quota from the following year. In either case, applications to transfer quota must be submitted to the Ministry of Fisheries, Hunting and Agriculture at least two weeks in advance. There is no specified limit for the amount of quota that can be transferred forwards or backwards, though authorisation holders must state this amount as part of their application to the Ministry of Fisheries, Hunting and Agriculture.

It is relevant to note that the Protocol allows EU vessels to transfer northern prawn authorised quota from one season to the next, so long as the total transferred is less than 5 % of the total original authorisation and utilised by 30 April. As such, the differences in the quota flexibility as applied to EU and Greenlandic fishing vessels are that EU fishing vessels may not borrow authorised quotas in advance, and are limited to transferring a maximum of 5 % of authorisations from one year to the next, whereas Greenlandic vessels may transfer quota forwards and backwards with no explicit limit.

It is also important to note that the agreement on management of Greenland halibut fisheries between Greenland and Iceland (see Section 2.3.5) includes provision for both Greenland and Iceland to: transfer unutilised quota from one year to the next, up to a maximum of 10 % of the total quota allocated to that country, to the following year; and fish an additional 5 % of the total quota allocated to that country, with the total additional catch deducted from that country's quota for the following year. Provision for quota flexibility for East Greenland halibut in Greenland has not yet been implemented in Greenlandic subordinate legislation, though is planned to be in the future<sup>64</sup>.

Revision of the Fisheries Act has been identified as a priority by the Ministry of Fisheries, Hunting and Agriculture. In 2013, a proposed new Fisheries Act was drafted. However a variety of the amendments to the Act were unpopular, most importantly the attempt to separate ownership of ITQs and processing facilities (as mentioned in Section 1.2). The proposed amendments to the Fisheries Act are currently being reviewed. A workshop was held in April, with approximately 170 people in attendance representing a wide range of stakeholders<sup>65</sup>. Discussions included sustainable fisheries management, Marine Stewardship Council certification and efficiency in the domestic Greenland halibut fisheries. Stakeholders drew up suggestions relevant to revision of the Fisheries Act. A working group has been established, including MFHA, Greenland Fishers and Hunters Association (KNAPK) and the Greenland Employers Association, and tasked with reviewing the suggestions from the workshop and working towards a draft of the revised Fisheries Act<sup>65</sup>.

In conclusion, the fisheries management in Greenland is comprehensive, with requirements including the need for fishing vessels to hold authorisations, deployment of scientific observers, etc. The Institute of Natural Resources provides management advice based on a range of fishery-dependent and independent datasets and management plans and ITQ systems have been implemented for some fisheries. The Fisheries Council provides an effective arena to facilitate dialogue and consultations between Greenland's fisheries stakeholders. However, in the inshore fishing sector there are structural issues, particularly for the Greenland

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<sup>64</sup> MFHA, pers. comm., 1 May 2014.

<sup>65</sup> MFHA, pers. comm., 28 April 2014.

halibut fishery, where available fishing opportunities are not sufficient for the level of capacity. This has prevented alignment of catch limits with management advice, which has obvious implications for the long-term sustainability of the fishery.

### 2.3 Management of shared stocks

Greenland has longstanding bilateral fisheries agreements with Norway, Russia and the Faroe Islands, which provide the mutual exchange of fishing opportunities and reciprocal access. Greenland also has a framework fisheries agreement with Iceland. These agreements often include fishing opportunities for shared stocks. A summary of existing agreements is provided below, along with other consultations and developments relevant to shared stocks.

Exchanges of fishing opportunities through fisheries agreements are provided for 2013, to ensure temporal consistency with other sections of the report, e.g. quota utilisation.

#### 2.3.1 Greenland–Iceland–Norway (capelin)

A trilateral agreement on capelin in the Greenland, Iceland and Jan Mayen area has been in place since 1980 between Greenland, Iceland and Norway. A management plan has been in place since 1989, revised most recently in 2003<sup>66</sup>. The allocation key for distributing the capelin TAC is provided in Table 2:1.

The fishery is managed through a two-step management plan, with a TAC set at each stage at a level to ensure that the spawning-stock biomass is at least 400 000 tonnes. The first step includes estimation of the preliminary TAC based on analysis of acoustic survey data by ICES. The survey takes place in the autumn previous to the fishing season for which the TAC is being set, with estimates of abundance for the immature age 1 and age 2 fish. The Protocol (to the EU–Greenland FPA) specifies that Greenland can offer the EU up to 7.7 % of the TAC, considering Greenland's 11 % allocation (see Table 2:1). The second step includes estimation of the final TAC by Iceland based on results of a winter survey – this takes place during the fishing season, by which time the capelin have moved out of Greenlandic waters.

In previous years the late timing of ICES advice for the preliminary TAC relative to the capelin fishing season in Greenland waters has prevented EU fishing vessels from taking up fishing authorisations for the capelin fishery through the EU–Greenland FPA. Consequently, in 2013, after requests to ICES from Greenland, ICES provided advice on the preliminary TAC in February to allow sufficient time for EU fishing vessels to participate in the Greenland capelin fishery<sup>67</sup>. However, despite this earlier provision of scientific advice for the 2013/14 season, EU fishing vessels were still unable to take up fishing opportunities for capelin in Greenlandic waters because the preliminary TAC was set at 0.

Nevertheless, the trilateral agreement specifies that Iceland can establish a TAC unilaterally if no agreement is reached on a TAC, and that Iceland can utilise any unutilised quota from Greenland and Norway. The average catches of Iceland from the 2009/10 to the 2012/13 fishing season were in line with the quota allocations through the trilateral agreement, which suggests that during this period Iceland did not catch unutilised quota from Greenland and Norway (Table 2:1). The agreement also includes provision for compensation in the following year should Greenland and Norway not utilise their quota due to a higher than expected final TAC. Furthermore, if Greenland and Norway make catches in excess of their quota, this is compensated for in the following year. The trilateral agreement also specifies that access to each other's waters should be agreed between the countries. If no such (bilateral) agreement exists, then a total of 35 % of one country's quota can be fished in the other two countries waters.

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<sup>66</sup> ICES, 2013a.

<sup>67</sup> DG MARE, 2013.



Greenland's bilateral agreement with the Faroe Islands also makes provision for Faroese fishing vessels to both buy Greenland's excess capelin quota on a commercial basis and take 50 % of the total Faroese quota of capelin for Icelandic waters in Greenlandic waters, subject to conditions (Section 2.3.4). It should be stressed that the Faroe Islands do not receive quota for capelin through the initial allocation (Table 2:1) and as such are reliant on receiving or buying quota from other parties.

Both purse-seine and pelagic trawlers are allowed to fish for capelin in Greenlandic waters. Pelagic trawls filter large volumes of seawater during normal operation and are thought to retain about 20 % of the capelin passing through the opening of the trawl<sup>68</sup>. The effects of this filtering of the schools through escape mortality are currently unknown but could be considerable as the same schools are often filtered repeatedly. This has led to a ban on pelagic trawls in Icelandic waters where juveniles are generally found, with a limited area where pelagic trawls are allowed to operate along the northeast Icelandic coast. This measure could also be implemented in other areas where juveniles occur, including East Greenland, for the protection of juveniles<sup>69</sup>. There is also a regulation enforced in Icelandic waters using on-board observers that implements an immediate, temporary area closure when a high abundance of juveniles is measured in the catch.

**Table 2:1: allocation key for capelin and the catch by country as percentage of the final TAC (average for 2009/10 to 2012/13 fishing seasons)**

Country	% of TAC	Catch as % of final TAC <sup>a</sup>
Iceland	81	79.2
Greenland	11	10.9
Norway	8	4.6

Source: Allocation key - trilateral agreement between Greenland, Iceland and Norway on the management of capelin in the Greenland, Iceland and Jan Mayen area, 8 July 2003. Catches and final TAC – ICES, 2014c. Notes: Greenland's catch percentage includes catches of EU vessels, taking up fishing opportunities in Greenlandic waters. <sup>a</sup> The Faroes Islands also caught an average of 3.4 % of the final TAC, though the origin of these fishing opportunities is not clear

### 2.3.2 Greenland–Norway fisheries agreement

The fisheries agreement between Greenland and Norway has been in force since 1991. The annually agreed protocol provides the basis of the mutual exchange of fishing opportunities. The protocol for 2013 sets out the exchange of fishing opportunities as outlined in Table 2:2, along with related conditions. Of particular relevance is flexibility provided to Greenland vessels fishing for cod and haddock in the Barents Sea, where quota provided in the context of the Greenland–Russia fisheries agreement may be fished in Norwegian waters if prior authorisation has been given by the Russian authorities. Norwegian vessels are also given the flexibility of fishing pelagic redfish quota provided by the Agreement in NEAFC international waters, if due authorisation has been given by Greenlandic authorities and Norway's NEAFC quota has been used up.

<sup>68</sup> Einarsson et al., 2007.

<sup>69</sup> ICES, 2013a.

**Table 2.2: exchange of fishing opportunities under the Greenland–Norway fisheries agreement (2013)**

Exchange	Species and area	Quota (tonnes)
Greenland vessels fishing in Norwegian waters (north of 62° N)	Cod – Barents Sea <sup>a</sup>	3 500
	Haddock – Barents Sea <sup>a</sup>	1 050
	Saithe – Barents Sea <sup>a</sup>	1 000
	Bycatch – Barents Sea <sup>b</sup>	260
Norwegian vessels fishing in Greenlandic waters	Greenland halibut – West	900
	Greenland halibut – East	275
	Atlantic halibut – East	160
	Pelagic redfish – East	1 800
	Demersal redfish – East	400
	Bycatch – East	150
	Cod – East and West	750

Source: 2013 Protocol for the Greenland–Norway fisheries agreement. Notes: <sup>a</sup> These can also be taken in the Svalbard fishing zone as long as the trilateral capelin agreement is in place. <sup>b</sup> Bycatch must not exceed 12 % by haul, and 7 % at the end of a fishing trip

### 2.3.3 Greenland–Russia fisheries agreement

The fisheries agreement between Greenland and Russia has been in force since 1992. The annually agreed protocol provides the basis of the mutual exchange of fishing opportunities. The protocol for 2013 sets out the exchange of fishing opportunities as outlined in Table 2.3. The protocol notes that Greenland fishing vessels may fish cod and haddock quota provided by the Greenland–Russia Fisheries agreement in Norwegian waters with prior authorisation by the Russian authorities, in accordance with the Greenland–Norway fisheries agreement (also see discussion in Section 2.3.2). Russian vessels may also, through the pelagic redfish fishery flexibility scheme between Greenland and NEAFC waters, fish pelagic redfish quota provided by the Greenland–Russia fisheries agreement in NEAFC international waters, with prior authorisation by Greenlandic authorities. However, it is important to note that, unlike EU and Norwegian fishing vessels, Russian fishing vessels can operate in NEAFC international waters using Greenlandic quota without having exhausted their NEAFC quotas. It is important to note that for 2014, Greenland also accepted 500 tonnes of shrimp quota in the Russian EEZ.

**Table 2.3: exchange of fishing opportunities under the Greenland–Russia fisheries agreement (2013)**

Exchange	Species and area	Quota (tonnes)
Greenland vessels fishing in Russian waters	Cod – Barents Sea	5 900 <sup>a,b</sup>
	Haddock – Barents Sea	530 <sup>a,b</sup>
	Pelagic redfish ( <i>S. mentella</i> ) – east	1 100 <sup>c,d</sup>
Russian vessels fishing in Greenlandic waters	Greenland halibut – east	1 375 <sup>c,d,e</sup>
	Greenland halibut – west (south of 68° N)	1 225 <sup>c,d</sup>
	Greenland halibut – west (north of 68° N)	550 <sup>c,d</sup>

Source: 2013 Protocol for the Greenland-Russia fisheries agreement

Notes: <sup>a</sup> Limit of eight Greenlandic fishing vessels present in the Russian EEZ. <sup>b</sup> Bycatch limit of 10 % per haul for each bycatch species. Bycatch limit of 10 % for all species when landing. A bycatch limit for Greenland halibut applies, with a limit of 12 % per haul and 7 % after termination of fishing and when landing. Bycatch limit of 15 % (by number) of undersized cod, haddock and saithe by haul. <sup>c</sup> Limit of 10 Russian fishing vessels licensed, with a limit of eight Russian fishing vessels present at the same time in the Greenlandic Fishery Zone. <sup>d</sup> Bycatch limit of 10 % demersal fish species. <sup>e</sup> Limit of six Russian vessels fishing for Greenland halibut in East Greenland at any time. Includes 200 tonnes for research fishing.

#### 2.3.4 Greenland–Faroe Islands fisheries agreement

The fisheries agreement between Greenland and the Faroe Islands has been in force since 1997. The annually agreed protocol provides the basis of the mutual exchange of fishing opportunities. The protocol for 2013 sets out the exchange of fishing opportunities as outlined in Table 2.4. It is important to note the clear distinction in the protocol between the exchange of quotas and the exchange of the opportunities to undertake experimental fishing. Specifically, the exchange of experimental fishing opportunities should not create a precedent for future quota exchanges.

In addition to the exchange of fishing opportunities outlined in Table 2.4, the Greenland–Faroe Islands protocol specifies that Greenland fishing vessels may catch up to 2 000 tonnes of Greenland's NEAFC blue whiting quota in Faroese waters. The protocol also states that Faroe Islands fishing vessels may buy Greenland's excess capelin quota on a commercial basis, and catch up to 50 % of the Faroe Island's capelin quota for Icelandic waters in Greenlandic waters. However, when reporting catches, vessels must report whether they were fishing quotas from the EU–Faroe agreement, Icelandic quota or quota purchased on a commercial basis as outlined above.

Finally, the protocol contains a statement that in the event that the NAFO 3M shrimp fishery reopens, Greenland and the Faroe Islands would be willing to resume discussions on mutual use of fishing opportunities. The NAFO 3M shrimp fishery has been closed since 2011<sup>70</sup>.

<sup>70</sup> NAFO & ICES, 2013.

**Table 2.4: exchange of fishing opportunities under the Greenland–Faroe Islands fisheries agreement (2013)**

Exchange	Species and area	Quota (tonnes)
Greenland vessels fishing in Faroese waters	Atlanto Scandian herring	2 050
	Experimental demersal fishery <sup>a</sup>	
Faroese vessels fishing in Greenlandic waters	Experimental Greenland halibut fishery – west <sup>b</sup>	100
	Experimental cod fishery <sup>c</sup>	255 <sup>d</sup>
	Experimental shrimp fishery – east <sup>e</sup>	100

Source: 2013 Protocol for the Greenland–Norway fisheries agreement

Notes: <sup>a</sup> Up to 60 fishing days for one Greenlandic longliner. <sup>b</sup> North of 68° N. <sup>c</sup> A maximum of three trawlers and/or longliners. <sup>d</sup> Bycatch limit of 275 tonnes of Greenland and Atlantic halibut. <sup>e</sup> North of 67° N. Maximum of two trawlers.

### 2.3.5 Joint Icelandic Greenlandic fisheries commission

In 2012 Greenland and Iceland signed an agreement on joint ad hoc management of Greenland halibut fisheries, through the Joint Icelandic Greenlandic fisheries commission<sup>71</sup>. The stated objective of the agreement is to develop a long-term management plan for the Greenland halibut fisheries, including the East Greenland fishery, to conserve the resource and ensure long-term high sustainable yields. The parties agreed to formulate a management plan for the fisheries, effective from 1 January 2015. Previously, quotas were set unilaterally by Greenland and Iceland, resulting in a total TAC in excess of that advised by ICES.

The agreement also specifies interim TAC and allocation keys to apply in 2013 and 2014, in the period before the management plan is finalised (Table 2.5). The parties agreed that the TAC for 2013 should be 26 000 tonnes, with a 15 % reduction in 2014. The agreement sets aside quota for other countries, before allocating the remainder to Greenland (40 %) and Iceland (60 %). The Faroe Islands also targets Greenland halibut from the same stock/management unit, but is not a party to the bilateral agreement between Greenland and Iceland. As such, the agreement does not explicitly allocate quota to the Faroe Islands, though as explained above the agreement does set aside quota to cover the catches of other countries as part of the allocation procedure.

**Table 2.5: Greenland halibut quotas as agreed by Greenland and Iceland (tonnes)**

Country	2013	2014
Greenland	9 800	8 320
Iceland	14 700	12 480
Others	1 500	1 300
<b>Total</b>	<b>26 000</b>	<b>22 100</b>

Source: Anon., 2012

In 2014, Iceland and Greenland also agreed to allow each other mutual access to fishing grounds on Dohrn bank in their respective EEZs<sup>72</sup>. Through the agreement, Icelandic and Greenlandic fishing vessels can catch up to 375 tonnes in the other party's EEZ, with fishing conducted in accordance with that party's regulations on fishing gear and notifications.

<sup>71</sup> Anon., 2012.

<sup>72</sup> Anon., 2014c.

### 2.3.6 Redfish fisheries

Fisheries for demersal and pelagic redfish occur in Greenland waters. The pelagic fisheries target beaked redfish (*Sebastes mentella*) exclusively, whereas the demersal fisheries catch both beaked redfish and golden redfish (*Sebastes marinus*).

Management of these fisheries is discussed below, with separate discussion for the pelagic beaked redfish (*Sebastes mentella*) fishery and the mixed demersal redfish fishery.

#### **Pelagic beaked (*Sebastes mentella*) redfish fishery**

There are thought to be three distinct biological stocks of beaked redfish in the Irminger Sea and adjacent waters. These are: the deep pelagic stock (ICES Divisions V, XII and XIV and NAFO Subareas 1 and 2, > 500 m) in primarily pelagic habitats and including demersal habitats west of the Faroe Islands; the shallow pelagic stock (ICES Divisions V, XII, XIV and NAFO 1–2, < 500 m) which extends to ICES Divisions I and II but primarily covers pelagic habitats and includes demersal habitats east of the Faroe Islands; and the Icelandic slope stock (ICES Division XIV and Subdivision Va) which consists of primarily demersal habitats<sup>73</sup>. Of these, the deep and shallow pelagic stocks are of direct relevance to pelagic redfish fisheries in Greenlandic waters.

Previously, ICES provided advice for beaked redfish in the Irminger Sea and adjacent areas based on two individual management units: one for the demersal fishery on the continental shelves and slopes, and another for the pelagic unit in the Irminger Sea and adjacent waters. Based on the current understanding of stock structure, ICES now provides advice based on three separate management units that are geographical representations of the biological stocks described above. These stocks are partly defined by the depth and the spatial distribution pattern of the fisheries in order to minimise catches of mixed stocks. The three management units are: northeast Irminger Sea (Deep pelagic stock – ICES Subdivision Va, and Divisions XII and XIV); southwest Irminger Sea (Shallow pelagic stock – NAFO Areas 1 and 2 and ICES Subdivision Vb and Divisions XII and XIV); and the Icelandic slope (Demersal stock – ICES Subdivision Va and Division XIV and to the north and east of the proposed northeast Irminger Sea management unit).

Beginning in 2010 the coastal states, together with Norway and the EU, developed interim multiannual conservation and management measures for the deep and shallow pelagic redfish stocks in the Irminger Sea and adjacent waters to apply from 2011–2014<sup>74</sup>. The parties also agreed to establish a long-term management plan for pelagic redfish in this area, including appropriate harvest control rules with the objective of establishing levels of catches and fishing effort that result in the sustainable exploitation of pelagic redfish in this area, including both shallow and deep pelagic stocks.

The measures of the agreement included the setting of TACs, as well as other measures including: a restriction on commencing the fishery before 10 May each year to protect areas of larval extrusion; designation of an authorised area for the deep pelagic fishery, in which no fishing for shallow pelagic redfish should take place; and, a minimum mesh size of less than 100 mm for trawls. The agreement also specified reporting requirements for fishing vessels operating in the fisheries, including daily reporting of catches and compilation of quota and catch data by contracting parties indicating the total quota and the catch already taken from that quota based on these catch reports<sup>74</sup>. However, Russia did not join the measures and did not endorse the share it was allocated. To date Russia continues to set its TAC unilaterally.

<sup>73</sup> ICES, 2013a.

<sup>74</sup> NEAFC, 2011.

For deep pelagic redfish, total TACs were agreed for each of the years of the agreement to implement a phased reduction to a TAC consistent with ICES advice for the fishery, i.e. 38 000 tonnes in 2011, 32 000 tonnes in 2012, 26 000 tonnes in 2013 and 20 000 tonnes in 2014. The agreement included provision for the TACs to be altered based on new scientific advice from ICES. The parties also agreed percentage shares of the TAC for 2011 to 2014, allocated as follows: 28.98 % to Denmark (6.73 % to Faroe Islands and 22.25 % to Greenland), 15.45 % to the EU, 31.02 % to Iceland, 3.85 % to Norway and 20.70 % to the Russian Federation<sup>74</sup>.

For shallow pelagic redfish, the parties agreed that no directed fishery would take place in 2011, with fisheries in 2012 to 2014 dependent on establishment of a recovery plan for the stock and any new scientific advice.

It is important to note that the current interim management measures introduced in 2011 for pelagic redfish in the Irminger Sea and adjacent waters apply to the end of 2014. At the time of writing, it was not clear what revisions might be expected, or the implications this may have on management of the stock.

#### **Demersal redfish (*Sebastes mentella* and *Sebastes marinus*) fishery**

The demersal redfish fishery in Greenland waters has an impact on two stocks: golden redfish (*Sebastes marinus*<sup>75</sup>) in Subareas V, VI, XII and XIV; and the demersal stock of beaked redfish (*Sebastes mentella*) in Division XIVb.

ICES provides separate advice for these two stocks. Historically, ICES has separated Greenlandic catches between the two species using composition of catches. In 2012 and 2013, ICES assumed that 80 % of the catches were beaked redfish and 20 % golden redfish<sup>76</sup>.

Greenland is the only country that targets the demersal beaked redfish stock in Division XIVb. Greenland, Iceland and the Faroe Islands all have fisheries targeting golden redfish in Subareas V, VI, XII and XIV. There are currently no management plans for the stocks concerned, or any formalised agreement between the parties that fish the golden redfish stock, i.e. Greenland, Iceland and the Faroe Islands. Management measures have been introduced in fisheries to protect demersal redfish, specifically the mandatory use of sorting grids in northern prawn fisheries<sup>76</sup>. Currently Greenland sets a mixed TAC for the demersal fishery for both species combined. For the golden redfish fishery, Iceland manages the fishery through a TAC whereas the Faroe Islands manages the fishery through effort limitations.

Iceland, the Faroe Islands and Greenland have proposed a long-term management plan and harvest control rule for golden redfish (*Sebastes marinus*) in Subareas V, VI, XII and XIV, which ICES has reviewed. ICES concluded that the assessment model and available data would allow a full assessment to be performed and maximum sustainable yield (MSY) reference points to be derived and the proposed harvest control rule is thought to be consistent with the ICES MSY approach as well as the ICES precautionary approach. This management plan stated that the aim is to maintain an exploitation rate that is consistent with the precautionary approach and that generates MSY in the long term<sup>77</sup>.

It is important to note that beaked redfish makes up the majority of catches in Greenland's demersal redfish fishery, so it is not clear what impact the long-term management plan for golden redfish would have on Greenland's demersal redfish fishery.

<sup>75</sup> ICES has now renamed the species *Sebastes norvegicus*.

<sup>76</sup> ICES 2013b.

<sup>77</sup> ICES, 2014a.

### 2.3.7 Mackerel

In recent years mackerel has begun to move into Greenlandic waters. Greenland does not participate in coastal state negotiations for mackerel in the northeast Atlantic, but since 2013 attends the negotiations as an observer. Since the start of the experimental mackerel fishery, Greenland has unilaterally set quotas in Greenlandic waters (Table 2:6). The quota and catches of the fishery have increased markedly since 2011. In 2013, one EU fishing vessel participated in the fishery. The majority of catches have been made by vessels chartered by Greenlandic fishing companies.

The EU, Norway, the Faroe Islands and Iceland participate in the coastal state negotiations. In 2014 Greenland and Russia attended as observers. As an observer, Greenland cannot negotiate a share of the overall quota for mackerel as part of a multilateral agreement. However, through setting unilateral quotas, Greenland is affecting the ability of the parties to reach a multilateral agreement. Information available at the time of writing suggests that Greenland's setting of unilateral quotas prevented Iceland from joining the recent trilateral agreement on mackerel share allocations between the EU, Norway and the Faroe Islands<sup>78</sup>.

**Table 2:6: summary of quota and catches (tonnes) in Greenland's experimental mackerel fishery**

Year	Quota	EU	Greenland	Total
2011	8 000.0	0.0	295.8	295.8
2012	11 000.0	0.0	5 219.2	5 219.2
2013	71 400.0	1 366.7	52 796.5	54 163.3
2014	100 000.0			

Source: Data provided by GFLK

### 2.3.8 Greenland's membership in NAFO and NEAFC

The RFMOs relevant to Greenland's fish stocks are NAFO and NEAFC. Greenland is represented in NAFO and NEAFC as part of the 'Denmark on behalf of Faroes and Greenland delegation', and as such participates in meetings of both RFMOs. NAFO and NEAFC provide management advice for a range of fish stocks present in Greenlandic waters, including those corresponding to fishing opportunities through the EU-Greenland FPA (Section 3). Fisheries scientists from Greenland's Institute of Natural Resources attend scientific meetings of both RFMOs, contributing towards management advice (Section 2.1). Furthermore, staff from relevant Greenlandic authorities attend meetings relevant to control measures (Section 6.5).

With respect to NEAFC, Greenland is a Party to the interim conservation and management measures for pelagic redfish fisheries in the Irminger Sea and surrounding areas and is also a party to bilateral or multilateral agreements for a range of stocks (as detailed in Sections 2.3.1 to 2.3.6). However Greenland is not a party to the recent multilateral agreement on mackerel in the North East Atlantic and since 2011 has set unilateral quotas for its experimental mackerel fishery (Section 2.3.7).

With respect to NAFO, Greenland and Canada have agreed TAC shares for the straddling Greenland halibut stock (Section 3.2.8), though no agreement has been reached on the shared northern prawn stock in NAFO Subareas 0 and 1 (Section 3.2.6). In the wider context, since 2003 Greenland has also set autonomous quotas for northern prawn in NAFO Divisions 3LNO<sup>79, 80</sup>.

<sup>78</sup> See <http://www.scottishpelagic.co.uk/newsviews/mackereldispute.htm> (accessed: 14/03/2014).

<sup>79</sup> NAFO & ICES, 2013.

<sup>80</sup> Technically, Denmark sets the autonomous quota on behalf of Greenland.

## 2.4 Foreign vessel catches and numbers

Table 2:7, 2.8, 2.9 and 2.10 summarise catches of non-EU foreign flagged fishing vessels that operated in Greenland's EEZ between 2011 and 2013, i.e. Norwegian, Russian, Icelandic and Faroese fishing vessels, along with the total number of licensed vessels. When looking at the numbers of licensed vessels by country, it is important to note the following: these total numbers of licensed vessels include vessels that did not actively fish; many authorised vessels hold multiple authorisations; and finally, the numbers of licensed vessels are generally far higher for years where capelin can be fished in Greenlandic waters (e.g. licensed Norwegian fishing vessels in 2011).

Table 2:7 provides catches of Norwegian vessels in Greenland's EEZ, without differentiating between quotas received from the EU-Greenland FPA and from direct exchanges between Greenland and Norway. In 2013, the most important species for Norwegian fishing vessels were redfish species, Greenland halibut and cod, with low catches of Atlantic halibut. Catches of these species were reasonably stable from 2011 to 2013, with the exception of catches in the pelagic redfish fishery, which started in 2012. In 2011, Norway also made large catches of capelin, though not in 2012 and 2013 due to the low level of quotas for the stock. The number of licensed Norwegian fishing vessels was significantly higher in 2011 than in 2012 and 2013, due to fishing of capelin in Greenlandic waters.

Table 2:8 provides catches of Russian fishing vessels in Greenland's EEZ. Catches from 2011 to 2013 were stable, and almost exclusively accounted for by redfish and Greenland halibut. From 2011 to 2013 the number of licensed Russian fishing vessels has remained stable, varying between 10 and 14.

Icelandic fishing vessels operating in Greenland's EEZ were targeting capelin between 2011 and 2013 (Table 2:9). Catches of capelin in Greenland's EEZ are highly dependent on the abundance of capelin. Nevertheless, catches were low throughout the period, including in 2011 when capelin abundance was comparatively high. It is clear that licensed Icelandic fishing vessels do not always utilise Greenlandic fishing authorisations. The number of licensed Icelandic vessels has been consistently high in comparison to catches, with 14 vessels licensed in 2013 despite no reported catch.

Table 2:10 provides catches of Faroese fishing vessels in Greenland's EEZ between 2011 and 2013. The most important species were Greenland halibut and cod, with relatively stable catch levels. From 2011 to 2013 the number of licensed Faroese vessels has remained stable, varying between 14 and 18.



**Table 2.7: catches (tonnes) of Norwegian fishing vessels in Greenland's EEZ for quotas received from the EU-Greenland FPA and directly from the Greenland-Norway agreement**

Species	Area	2011	2012	2013
Atlantic cod	ICES XIV & NAFO 1	777.6	754.8	1 237.9
Beaked redfish	ICES XIV & NAFO 1	0.0	2 871.1	2 670.6
Atlantic redfishes	ICES XIV & NAFO 1	507.5	384.6	355.1
Greenland halibut	ICES XIV, V	106.9	850.9	561.1
Greenland halibut	NAFO 1	1 701.6	1 706.0	1 473.3
Northern prawn	ICES XIV, V	37.6	1.8	0.0
Northern prawn	NAFO 1	0.0	0.0	0.0
Atlantic halibut	ICES XIV, V	86.4	83.9	3.9
Atlantic halibut	NAFO 1	0.0	0.4	0.0
Snow crab	NAFO 1	0.0	0.0	0.0
Capelin	ICES XIV, V	56 516.0	0.0	0.0
Others		82.7	160.2	82.1
<b>Total</b>		<b>59 816.3</b>	<b>6 813.8</b>	<b>6 384.0</b>
<b>Vessels</b>		<b>104</b>	<b>43</b>	<b>22</b>

Source: Data provided by GFLK. Note: total catches includes both catches through transferred EU-Greenland FPA fishing opportunities as well as catches through Norway's bilateral agreement with Greenland

**Table 2.8: catches (tonnes) of Russian fishing vessels in Greenland's EEZ**

Species	Area	2011	2012	2013
Atlantic cod	ICES XIV & NAFO 1	0.0	0.0	0.0
Beaked redfish	ICES XIV & NAFO 1	944.3	891.8	1 100.4
Atlantic redfish	ICES XIV & NAFO 1	0.0	0.0	0.0
Greenland halibut	ICES XIV, V	1 091.4	1 163.7	1 372.6
Greenland halibut	NAFO 1	1 755.5	1 777.5	1 834.5
Northern prawn	ICES XIV, V	0.0	0.0	0.0
Northern prawn	NAFO 1	0.0	0.0	0.0
Atlantic halibut	ICES XIV, V	0.0	0.0	0.0
Atlantic halibut	NAFO 1	0.0	0.0	0.0
Snow crab	NAFO 1	0.0	0.0	0.0
Capelin	ICES XIV, V	0.0	0.0	0.0
Others		64.4	34.5	77.2
<b>Total</b>		<b>3 855.5</b>	<b>3 867.5</b>	<b>4 384.7</b>
<b>Vessels</b>		<b>14</b>	<b>13</b>	<b>10</b>

Source: Data provided by GFLK

**Table 2:9: catches of Icelandic fishing vessels in Greenland's EEZ (tonnes)**

Species	Area	2011	2012	2013
Atlantic cod	ICES XIV & NAFO 1	0.0	0.0	0.0
Beaked redfish	ICES XIV & NAFO 1	0.0	0.0	0.0
Atlantic redfish	ICES XIV & NAFO 1	0.0	0.0	0.0
Greenland halibut	ICES XIV, V	0.0	0.0	0.0
Greenland halibut	NAFO 1	0.0	0.0	0.0
Northern prawn	ICES XIV, V	0.0	0.0	0.0
Northern prawn	NAFO 1	0.0	0.0	0.0
Atlantic halibut	ICES XIV, V	0.0	0.0	0.0
Atlantic halibut	NAFO 1	0.0	0.0	0.0
Snow crab	NAFO 1	0.0	0.0	0.0
Capelin	ICES XIV, V	2 005.0	1 100.0	0.0
Others		0.0	0.0	0.0
<b>Total</b>		<b>2 005.0</b>	<b>1 100.0</b>	<b>0.0</b>
<b>Vessels</b>		<b>39</b>	<b>38</b>	<b>14</b>

Source: Data provided by GFLK

**Table 2:10: catches of Faroese fishing vessels in Greenland's EEZ (tonnes)**

Species	Area	2011	2012	2013
Atlantic cod	ICES XIV & NAFO 1	268.9	215.3	254.6
Beaked redfish	ICES XIV & NAFO 1	0.0	0.0	25.5
Atlantic redfish	ICES XIV & NAFO 1	0.0	0.0	0.0
Greenland halibut	ICES XIV, V	89.2	77.0	228.8
Greenland halibut	NAFO 1	102.0	103.3	88.7
Northern prawn	ICES XIV, V	0.0	0.0	0.0
Northern prawn	NAFO 1	0.0	0.0	0.0
Atlantic halibut	ICES XIV, V	1.2	0.8	10.4
Atlantic halibut	NAFO 1	0.0	0.0	0.0
Snow crab	NAFO 1	0.0	0.0	0.0
Capelin	ICES XIV, V	0.0	0.0	0.0
Others		30.3	70.2	16.0
<b>Total</b>		<b>491.6</b>	<b>466.6</b>	<b>623.9</b>
<b>Vessels</b>		<b>18</b>	<b>15</b>	<b>14</b>

Source: Data provided by GFLK

It is important to note that Greenland's fisheries agreements with Norway, Russia and the Faroes (and Iceland for capelin) operate on the basis of a mutual exchange of fishing opportunities between the parties. Therefore, fishing vessels of these countries do not have to pay for fishing authorisations to operate in Greenland's EEZ through these agreements. Furthermore, fishing vessel operators from these countries do not have to pay Greenland to take up fishing authorisations for fishing opportunities originating from the EU–Greenland FPA. This is clearly not the case for fishing authorisations taken up by an EU fishing vessel and could explain the number of authorised but not active vessels. Apart from payments for fishing authorisations, there are only two

other difference in conditions of access between EU and non-EU fishing vessels. With regards to the NEAFC redfish flexibility scheme, Russian fishing vessels may utilise Greenlandic quotas in NEAFC waters irrespective of whether they have exhausted their NEAFC quota, whereas EU fishing vessels must have exhausted their NEAFC quota (Section 2.3.3). Finally, for some of Greenland's bilateral agreements, there are specific limits to the number of foreign fishing vessels that can be licensed to fish in, be present in, and/or be fishing in Greenlandic waters at any time (see footnotes to Table 2:3 and Table 2:4).

## 2.5 Specific national marine protected area measures

Greenland's Ministry of Environment and Nature is responsible for marine protected areas (MPAs) in territorial waters, i.e. up to three nautical miles from the baseline, with Denmark responsible for MPAs in the remaining portion of Greenland's EEZ<sup>81</sup>. Greenland's MPAs are summarised below, based on a recent overview prepared by the Ministry of Environment and Nature<sup>82</sup>.

There are six MPAs in Greenlandic waters with active restrictions in place in the marine zone (Table 2:11). Restrictions in place include restrictions to access, e.g. temporal restrictions to access at Kitsissunnguit, and prohibitions of specific gear types, e.g. the ban of bottom contact gears in the territorial sea of West Greenland between 64° 10' N and 65° 15' N).

There are also 13 bird protection areas in Greenland, which impose temporal restrictions on fishing activities, due to the prohibition of traffic and landing in the bird protection areas and a 500 m buffer between 1 May and 31 August. There are also 12 wetland areas regulated under the framework of the Ramsar Convention, most of which have a marine component.

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<sup>81</sup> Ministry of Nature and Environment, pers. comm., 11 February 2014.

<sup>82</sup> Schiøtz, 2014.

**Table 2:11: marine protected areas in Greenland**

Designation	Name	IUCN Category	Area (km <sup>2</sup> ) <sup>a</sup>
Wilderness area	Melville Bay	Ib	8 008 (5 193)
	Ilulissat Icefjord	Ib	4 024 (329)
National park	North and East Greenland national park	II	972 000 (110 600)
Natural feature	Ivittuut and Kangilinnguit	III	577
Management area	Kitsissunnguit	IV	69
Management area	West Greenland - closed area to bottom trawling and other bottom contact gears	IV	Unknown

Source: World Database on Protected Species<sup>83</sup>. Notes. <sup>a</sup> The provided figures for area are total area protected. Where available, the marine area of protection is provided in parenthesis. Relevant IUCN MPA categories are as follows: Ib wilderness area: protected to preserve natural condition; II national park: managed to protect large-scale ecological processes; III Specific natural feature: protection for a natural feature and associated biodiversity and habitat; IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention

It is important to note that the Ministry of Environment and Nature has coordinated recent efforts to both identify additional coastal areas that might warrant protection, and collate and synthesise relevant information collected through a variety of studies including strategic environmental assessments related to extractive industries. Most importantly, ecologically important marine areas most sensitive to expected increases in marine traffic, taking into account climate change, have been identified using ecological criteria developed by the International Maritime Organisation and principles from a variety of relevant sources, including the Convention of Biological Diversity<sup>84</sup>. Here, marine traffic includes that related to mineral extraction, fishing, tourism and transport.

## 2.6 Monitoring, control and surveillance

The Greenland Fisheries License Control Authority (GFLK) undertakes monitoring, control and surveillance (MCS) of all fisheries in Greenland's EEZ and oversight of Greenlandic vessels operating outside its EEZ. GFLK's budget is under the Ministry of Fisheries, Hunting and Agriculture and for 2014 is set at EUR 4.6 million.

GFLK's inspection approach differs between offshore and inshore fisheries; offshore using sea-based and aerial inspection platforms, while inshore control focuses more on port-based control. Adopting a risk-based approach, greater enforcement effort is focused on the offshore fleet, which accounts for the majority of the catch.

<sup>83</sup> IUCN and UNEP-WCMC, 2014.

<sup>84</sup> Christensen et al., 2012.

Offshore inspection duties are performed by the Royal Danish Navy's Arctic Command (AKO) by agreement with GFLK. Most of the foreign-flagged offshore vessels do not call into port in Greenland and are therefore rarely subject to port inspections. Therefore, compliance is monitored by GFLK via observers on board vessels, vessel monitoring systems (VMS), and data reporting supported by AKO inspections.

GFLK administers the registration and control of Greenlandic and foreign catches and landings, as well as international agreements on control and enforcement. This applies both to bilateral agreements and the work in regional fisheries management organisations (RFMOs), such as NEAFC and NAFO. On a daily basis, data is exchanged with countries that Greenland has fisheries agreements with. GFLK also supplies a number of organisations and institutions with data, such as the Greenland Institute of Natural resources, the central Greenlandic statistical services, the Ministry of Fisheries, Hunting and Agriculture, and the fishing industry.

GFLK employed 55 persons with a staff budget of just over EUR 800 000 in 2013. This included 13 fishery compliance observers in relation to the offshore fisheries, as well as eight wildlife and fisheries compliance officers in the inshore fisheries. As part of the adoption of the FAO Port State Measure Agreement, six Port State Control officers commenced work in the field after completing their training in 2013.

Approximately EUR 1.4 million was spent on offshore fishery control in 2013. The observer coverage in the offshore shrimp fishery only reached 42 % of vessel trips in 2013, which is 8 % less than the planned minimum of 50 %. The drop in observer coverage in 2013 is due to an observer leaving the team and because 13 % of the observer days were focused towards the unforeseen expansion in the experimental fisheries for mackerel on the east coast of Greenland. The observer coverage in these experimental fisheries and related transshipments had a high priority due to the number of vessels participating in the fishery and transshipment operations in connection with the fishery.

A further EUR 350 000 was expended on dockside inspections of the inshore fishery for Greenland halibut, which was the subject of an intensive inspection campaign during the summer peak season resulting in a very high number of dockside inspections as well as inspection at sea. The control units carried out 124 dockside inspections and 225 hygiene controls.

GFLK also participates in international control co-ordination. Throughout 2013 the exchange of catch and quota uptake were undertaken with RFMOs and coastal states in the North Atlantic. Furthermore, 45 Port State Control report operations took place with control authorities in Norway, Faroe Islands, Russia, the EU and Iceland through NEAFC and NAFO. Cooperation with the Canadian authorities was improved in 2013 with joint control exercises and sharing of landing information following the VMS agreement between Greenland and Canada, and the cooperation now includes exchange of landing information from Canadian vessels offloading their catches in Greenland ports. The high level of control and cooperation required of Greenlandic vessels fishing in the Barents Sea Norwegian Zone has helped to improve the control systems throughout Greenland's offshore fleet, resulting in high standards of MCS.

The highly dispersed nature of the many small vessels operating inshore inevitably presents a risk of infringements. There is also expected to be extensive subsistence fishing and bartering, which is unlikely to feature in records. However, the level of landings is comparatively small and overall there are good levels of information gathered from buyers from all scales of the fishery.

GFLK operates an integrated information database that links VMS, hauls, landings declarations and quota holdings to enable risk areas to be flagged. Infringements in the offshore fishery have mainly related to mis-reporting issues. For the inshore fishery, Greenland halibut quotas were found to have been exceeded in 2012, resulting in greater land-based surveillance and the introduction of new port officers in 2013.

There have been further improvements to information and communications technology (ICT) systems used in control and enforcement with a new application to the certification system implemented in the first half of 2013 in order to accommodate a new certificate layout. This was a continuance of the adaption of the electronic certification in accordance with the EU illegal, unreported and unregulated (IUU) regulation. Developments in

2014 will provide an on-line application process for authorisations as well as information on quota uptakes and other information to the fishery sector.

In summary, it can be concluded that Greenland possesses a robust MCS regime, and that current practices and resources ensure that Greenland is generally well placed to effectively control activities within its EEZ, given the limitations of the large area being controlled. Member States fishing in Greenland support this view.<sup>85</sup>

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<sup>85</sup> Ocean Prawns, pers. comm., 11 March 2014 / UK Fisheries Limited, pers. comm., 12 March 2014.

### 3 Greenland's fish resources and their status

#### 3.1 Research mechanisms and organisations

Greenlandic waters are within the convention areas of NAFO and NEAFC. For most species relevant to the FPA/Protocol, the Scientific Council of NAFO and ICES carry out stock assessments and provide management advice. Generally speaking, advice for stocks in West Greenland, i.e. in NAFO 1, is provided by NAFO, whereas advice for stocks in East Greenland, i.e. ICES XIV and V, is provided by ICES. There are some notable exceptions. Advice for northern prawn is provided by a joint NAFO–ICES working group, while for cod and the shallow pelagic redfish stocks that straddle both convention areas the advice is provided by ICES. Furthermore, there are stocks for which scientific advice is provided directly by the Greenlandic Institute of Natural Resources. A summary of stock status is provided below for all stocks relevant to the Protocol, i.e. stocks for which there are indicative fishing opportunities.

Fishing opportunities within the framework of the FPA should be directed at surplus fish resources. It falls outside the remit of this evaluation to explore the surplus of Greenland's fish resources in detail; work that is planned to be undertaken through other studies to be funded by the EU<sup>86</sup>. As such, this section focuses on the status of the relevant fish stocks and comparison of total catches and management advice.

#### 3.2 Status of species

##### 3.2.1 Cod (*Gadus morhua*) in Greenland waters

There are thought to be three separate stocks of cod (*Gadus morhua*) in Greenlandic waters, referred to by their spawning areas: a) offshore West Greenland waters, b) West Greenland fjords, and c) offshore East Greenland waters. The cod stock of relevance to EU fishing opportunities through the FPA is the offshore stock. As such, this section focuses on the offshore cod fishery and relevant stocks, with brief discussion of the inshore cod stock.

##### **Offshore cod fishery (ICES Subdivision XIV and NAFO Area 1)**

The commercial cod fishery in Greenlandic waters started in the 1920s and developed gradually, reaching catch levels in excess of 400 000 tonnes annually in the 1960s. The stock size subsequently declined and the fishery completely collapsed in the early 1990s due to overfishing and unfavourable environmental conditions. Catches have gradually increased since the 2000s with maximum catches in 2008 of approximately 13 000 tonnes. Results from research surveys have indicated that there has been a recent improvement in recruitment. Offshore area closures were implemented between 2008 and 2010 to protect spawning stock aggregations in these areas. The offshore fishery is currently managed with authorisations and a minimum size regulation (40 cm)<sup>87</sup>. ICES has also recommended that measures be implemented in Greenland's redfish fishery to minimise bycatches of cod, recognising that the fishery overlaps with cod spawning aggregations.

A management plan with the objective of rebuilding the stock was implemented in 2011, and has recently been revised (see Section 2.2). The overall strategy for meeting this objective was to follow ICES advice of there being no fishery. However, a small experimental fishery has been allowed under this management plan to collect information on the distribution and composition of the cod stock – the TAC for this fishery was set at 5 000 tonnes in 2011, increased to 5 500 tonnes in 2012, reduced again to 5 000 tonnes in 2013 before subsequently increasing to 10 000 tonnes in 2014<sup>87</sup>.

<sup>86</sup> DG MARE, pers. Comm., 22 January 2014.

<sup>87</sup> ICES, 2013a.

As described in Section 2.2, there are a number of obligations that apply to vessels fishing in the cod fishery. Temporal closures apply during the spawning season, with spatial closures as mentioned above to protect spawning stock aggregations. The management plan requires effort to be distributed in four areas to prevent spatial concentration of effort. Each fishing vessel must also have a trained crew member on board to conduct biological sampling of catches, including sampling for length, sexual maturity and removal of otoliths for age reading. The measures to prevent spatial concentration of effort therefore also ensure that biological sampling is undertaken for catches in each of the four areas.

Results from recent genetic studies have suggested that the stock dynamics are different for cod in East and West Greenland and that the populations may belong to separate spawning units<sup>88</sup>. The studies suggest that the main fishery in West Greenland is based on fish recruited from a West Greenland spawning stock while the East Greenland stock is associated with the offshore spawning population in Iceland. In response to this, work is planned in 2014 to revise the existing management plan to allow separate management of the West and East Greenland populations, as well as analysing what effects the current management plan has had, e.g. the actual effort distribution in the fishery<sup>89</sup>.

There are currently two offshore trawl surveys being carried out and data from these surveys provide the core basis for management advice. One survey targets the main cod grounds off both Southeast and West Greenland and has been carried out since 1982, and therefore includes periods of both high and low cod abundance. The second survey targets shrimp and cod just off West Greenland between 60° and 72° N down to a depth of 500 m<sup>87</sup>.

Since 2005 ICES has consistently recommended each year that no offshore fishery should take place for cod to allow for rebuilding of the spawning stock in Greenland waters (ICES Subarea XIV and NAFO Subarea 1)<sup>90</sup>. In 2013 ICES noted that there were only weak signs of recovery in stock biomass in West Greenland, and that rebuilding of spawning stock biomass would require full protection of the entire West Greenland area along with protection of specific spawning grounds in East Greenland<sup>87</sup>.

Despite ICES advising closure of the offshore Greenlandic cod fishery to allow the stock to recover, Greenland has continued to set a catch limit for the fishery based on Greenland's management plan for the offshore fishery, which was due to be benchmarked by ICES in early 2014 (Section 2.2). Catch limits are in excess of ICES advice, with a 100 % increase in TAC in 2014. Whilst surveys indicate that the stock is no longer in decline and that recruitment has slightly improved allowing increases in stock biomass during the 2000s, it is not clear that the increase in TAC in 2014 is fully justified by the Greenland authorities in scientific terms.

#### **Inshore cod fishery (NAFO Subarea 1)**

As mentioned above, the inshore cod fishery is not directly relevant to EU fishing opportunities through the FPA but is included here for information.

The inshore commercial cod fishery in West Greenland started in the 1920s and developed gradually, reaching catch levels in excess of 30 000 tonnes annually in the 1960s. Catches then declined in the 1970s to 5 000 tonnes but subsequently fluctuated between 5 000 and 35 000 tonnes in the 1980s due to a few strong year classes. The stock size declined, leading to catches below 500 tonnes in the 1990s but catches then gradually increased during the 2000s with a maximum of 13 000 tonnes in 2007 and 2008. This fishery has only required authorisations since 2009 when a TAC of 10 000 tonnes was also introduced for the first time.

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<sup>88</sup> Therkildsen et al, 2013.

<sup>89</sup> Greenlandic Institute of Natural Resources, pers. comm., 1 April 2014.

<sup>90</sup> ICES, 2013b.



The total catch of cod in this fishery was 10 673 tonnes in 2012<sup>90</sup>. Prior to 2009 the only restriction on this fishery was a minimum landing size of 40 cm<sup>87</sup>.

Currently, there is no management plan for the inshore cod fishery in Greenlandic waters. Surveys have suggested that the stock size is increasing and the current fishery does not appear to be impairing recruitment, based on the observed size of recent year classes<sup>90</sup>. Trends from the surveys have been positive: spawning stock biomass (SSB) does not appear to be impaired and catches have been stable at around 10 000 tonnes for the past six years<sup>87</sup>.

Trawling is not allowed in the inshore areas and so inshore cod is primarily targeted by poundnets during the summer months and partly by longliners and gillnets during the winter. Undersized fish caught in poundnets can be released as it is less damaging to the fish than other gear types. Cod is not thought to be caught as bycatch in other fisheries in the fjords<sup>90</sup>.

The biomass of the stock has been estimated to have increased by 202 % between 2006 and 2012. The harvest control rules are expected to stabilise the size of the stock but may not be appropriate if the stock size is low or overfished.

In most years, data from the recruitment gillnet survey is considered a good measure of recruitment (ages 2–3) despite missing some years of data and low levels of coverage in other years. Overall landing statistics are thought to be reliable. However, details including effort and exact location are not available. Sampling of age and length frequency from surveys and the fishery are considered to be sufficient<sup>90</sup>.

### 3.2.2 Pelagic redfish (*Sebastes mentella*) in Greenland waters

Beaked redfish is a slow-growing species with late age at maturity (10–14 years), a long lifespan (> 50 years), and displays schooling behaviour. The species is vulnerable to overexploitation as a result of these characteristics and can therefore only sustain low exploitation rates, which should be taken into consideration in management of the stocks.

As discussed in Section 2.3.6, pelagic fisheries for beaked redfish in Greenlandic waters can cover two stocks: the deep pelagic stock and the shallow pelagic stock. The status of these stocks is discussed separately below.

#### Deep pelagic redfish (ICES Subareas V, XII, XIV and NAFO Subareas 1, 2 > 500 m depth)

The fishery targeting deep pelagic beaked redfish (*Sebastes mentella*) began around 1991–1992 when the commercial fleet targeting the shallow pelagic redfish stock moved into the deeper waters. The main fishing season has occurred from late April to August since 1997 in the northwest fishing area near the Greenland and Icelandic EEZ as well as inside the Greenlandic and Icelandic EEZs. Pelagic trawls are used and vessels operate at depths between 600 and 950 m<sup>91</sup>.

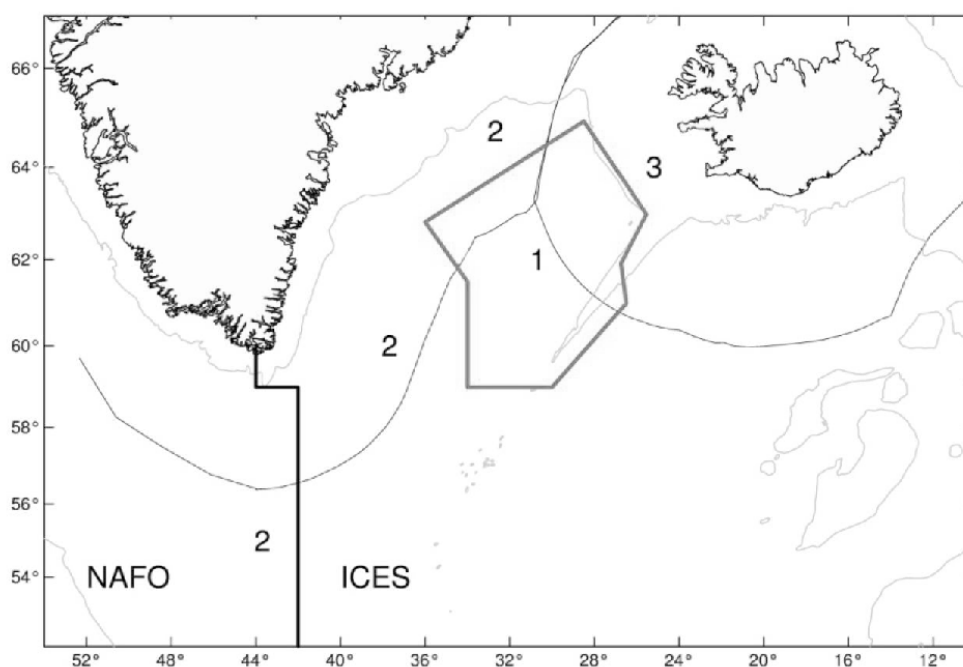
ICES considers that any expansion of the fishery should only be allowed when biological indicators have been identified and a management strategy has been implemented that includes appropriate monitoring requirements<sup>91</sup>.

An analytical assessment has not yet been completed for the stock due to insufficient data from the commercial sector, mainly related to some contracting parties to ICES not reporting depth information for catches, as well as the short time-series of suitable survey data. Improvements to data collection are required, including improved catch and landings data, better survey information and a recruitment index. For these reasons, future TAC levels cannot be determined based on projections and ICES has applied its approach to

<sup>91</sup> ICES, 2013b.

data limited stocks<sup>91</sup>. The redfish deep pelagic stock has been estimated to have decreased by 40 % in the periods 1999– 2003 and 2009–2013.

ICES recommended from 2008 to 2014, on the basis of the precautionary approach, that the maximum annual TAC for the stock should be 20 000 tonnes<sup>91</sup>. As discussed in Section 2.3.6, the NEAFC interim management measures implemented a phased reduction in TAC from 2011 to 2014, with a total TAC of 20 000 tonnes in 2014 as advised by ICES. However, there are fishing nations that did not sign up to the agreement and as such there has not been an overall agreed TAC for the stock. The agreement did attempt to take this into account by allocating approximately 20 % of the TAC to countries that had not signed up. However, autonomous TACs set unilaterally have exceeded this. Total catches in 2011 and 2012 are estimated to have been 18.7 and 2.5 % above the TAC outlined in the agreement<sup>91</sup>. Furthermore, given autonomous quotas set, total catches in 2014 could be almost double the 20 000-tonne TAC outlined in the agreement<sup>92</sup>. It is also important to note that the interim management measures include definition of the deep pelagic management unit (Figure 3.1). Fisheries for deep pelagic redfish must take place within the management unit, whereas fisheries for shallow pelagic fisheries must take place outside the management unit.



**Figure 3.1: map of management unit boundaries for beaked redfish (*Sebastes mentella*) fisheries in the Irminger Sea and adjacent waters. 1 – the deep pelagic management unit; 2 – the shallow pelagic management unit in the Irminger Sea and adjacent waters (including NAFO); 3 – Icelandic slope management unit in the Icelandic EEZ**

Source: ICES, 2013a

<sup>92</sup> ICES, 2014b.

The latest work by ICES has changed the perception of the stock<sup>93</sup>, which appears to be at a historical low. None of the harvest control rules evaluated by ICES were considered to be consistent with the precautionary approach, even those delivering median catches of 7 000 tonnes between now and 2025. It is not currently clear what TAC level ICES will advise for 2015, or whether significant autonomous quotas will continue to be set. However, it is clear that deep pelagic redfish quotas would have to be reduced to a level far below those of recent years in order to ensure that a sustainable fishery for deep pelagic redfish is maintained.

#### **Shallow pelagic redfish (ICES Subareas V, XII, XIV and NAFO Subareas 1, 2 < 500 m depth)**

The fishery targeting shallow pelagic redfish began in 1982 with Russian trawlers, covering wide areas of the Irminger Sea. In the last decade, the main fishing area has been south and southeast of Cape Farewell, Greenland, which is the so-called south-western area. Since 2000, the south-western fishing ground has extended to within the NAFO Convention area<sup>93</sup>.

The relationship between the shallow pelagic stock component with *Sebastes mentella* from the Greenlandic shelf (the demersal stock) remains unclear and therefore ICES considers management should take this into account. Assessments of the stock have been conducted based mainly on surveys to provide survey indices, catches, catch per unit effort (CPUE) and biological data. Previously, commercial CPUE series have been used to determine stock size but as the fishery targets pelagic fish, their aggregating behaviour leads to stable or increasing CPUEs that cannot reliably reflect the status of the stock<sup>93</sup>. Stock estimates can therefore only be provided from the acoustic surveys for redfish, noting that the indices of stock size are approximate due to the varying coverage of the stock distribution. Due to the short length of the data series and the fact that the surveys are only conducted every second year, the quality of the trawl biomass estimate cannot be verified and attempts to measure abundance must be considered with caution<sup>93</sup>.

Nevertheless, acoustic surveys conducted in 2009–2013 indicate that the stock has declined to less than 5 % of the biomass index estimates at the beginning of the survey time-series (early 1990s)<sup>93</sup>. The exploitation rate for this stock is currently unknown and there are no specific management objectives set for this stock.

As with the deep pelagic redfish, improvements to data collection are required, including improved catch and landings data, better survey information and a recruitment index. ICES has had problems with obtaining catch estimates and landings data from some ICES member countries, and particularly with data that is disaggregated by depth. This lack of disaggregated data may have affected the assessments conducted. Due to the lack of a reliable assessment of the stock, fishing possibilities cannot be projected<sup>93</sup>.

On the basis of the precautionary approach, ICES advised that there should be no directed fishery on the shallow pelagic redfish stock (*Sebastes mentella*) in 2013 and 2014, as with the previous three years (2010–2012). ICES also advised that bycatch of this stock in other fisheries should be minimised and a recovery plan should also be developed and implemented<sup>93</sup>. Greenland, as required by the interim management measures for shallow and deep pelagic redfish implemented in 2011 (see Section 2.3.6), has followed this advice. Some fishing nations not part of the interim management measures have continued to set autonomous quotas for the shallow pelagic redfish stock as part of combined quotas for both shallow and deep pelagic stock components<sup>93</sup>.

#### **3.2.3 Demersal redfish (*Sebastes mentella* and *Sebastes marinus*) in Greenland waters**

As discussed in Section 2.3.6, the demersal redfish fishery in Greenland targets two stocks: golden redfish (*Sebastes marinus*) in ICES Subareas V, VI, XII and XIV, a shared stock between Greenland, Iceland and the Faroe Islands; and, the demersal beaked redfish (*S. mentella*) stock in ICES Division XIVb. The majority of

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<sup>93</sup> ICES, 2013b.

catches of redfish are beaked redfish (*S. mentella*) with the remainder golden redfish (*S. marinus*), though the precise catch composition is unknown<sup>94</sup>.

A fishery was started by Greenland to target demersal redfish in 2009. Since then, catches have increased from 100 tonnes to nearly 7 000 tonnes in 2010–2011. Indices of abundance have suggested that the biomass of the stock has been declining since 2003 following a previously stable period. In recent years, the stock biomass is likely to be supported by one or only a few year classes. Historically, factory trawlers operating with bottom trawls were the main operators fishing for demersal redfish on the slopes in Division XIVb, though beaked redfish has also been caught as a valuable bycatch in the fishery for Greenland halibut between 2002 and 2008<sup>95</sup>.

The common nursery ground for most redfish stocks in Subareas XIV and V is East Greenland, which includes both *S. marinus* and *S. mentella* (the demersal and pelagic stocks). Some migration is likely to take place between this stock and the other NW redfish stocks but information remains very limited<sup>95</sup>.

In terms of stock status and management advice, it is most important to consider the status of beaked redfish in Division XIVb, due to its greater contribution to catches in the Greenlandic demersal redfish fishery. ICES has not been able to reliably assess the stock due to the insufficient commercial dataset and the short time-series of suitable survey data. Furthermore, the current research surveys informing stock abundance are not specifically targeting redfish, as the German survey estimates the biomass of cod while the Greenland deep-water survey targets Greenland halibut. It has not been possible for ICES to project fishing possibilities<sup>95</sup>.

In light of the precautionary principle, ICES has advised that the TAC should be set to deliver a maximum catch of 3 500 tonnes of beaked redfish. This compares to the Greenlandic TAC in 2013 that equates to 6 800 tonnes of beaked redfish, assuming that beaked redfish accounts for 80 % of catches from the fishery<sup>95</sup>. Greenland has maintained the same TAC for 2014. The Greenlandic demersal redfish fishery also catches golden redfish from the stock of Subareas V, VI, XII and XIV. It is worth noting that, historically, catches of the golden redfish stock have also exceeded those advised by ICES, though Greenland's contribution to catches is relatively modest<sup>96</sup>. Additionally, there is no formal agreement between the coastal states on the management of the golden redfish stock.

### 3.2.4 Greenland halibut (*Reinhardtius hippoglossoides*) in West Greenland (NAFO Subarea 0 and Divisions 1A (offshore) and 1B-F)

The Greenland halibut stock in West Greenland (offshore component) is part of a common stock distributed in the Davis Strait and southward to NAFO Subarea 3 (off Newfoundland). Catches in this fishery have increased due to an increase in fishing effort in the offshore areas of the fishery from 3 000 tonnes in 1989 to 18 000 tonnes in 1992 and remained at around 10 000 tonnes until 2000. Since 2000, catches increased due to increased effort in Divisions 0A, 0B, 1A and 1CD, reaching 26 900 tonnes in 2010. Catches have remained around the same level in 2011 and 2012<sup>97</sup>. Since 2001, advice has been provided separately for Divisions 0A, 1A and 1B (northern area), and Divisions 0B, and 1C–1F (southern area).

Analytical assessments have not been used as the basis for advice, with recent attempts to carry out an analytical assessment failing due to the short time-series of input data, along with a lack of contrast in input data<sup>97</sup>. As such, NAFO's Scientific Council has provided advice based on fishery-dependent (e.g. standardised

<sup>94</sup> German and Greenlandic surveys, as well as samples from the commercial fishery, are used to estimate the proportion of catches for each species, though the quality of this information is currently unknown.

<sup>95</sup> ICES, 2013b.

<sup>96</sup> ICES, 2013b.

<sup>97</sup> NAFO, 2013.

commercial CPUE indices, length frequency of catches) and fishery-independent (survey biomass indices) data with qualitative statements on risk. In recent years the survey biomass and standardised commercial CPUE indices have shown generally increasing trends, with survey estimates of biomass exceeding the estimated proxy for the precautionary biomass limit reference point ( $B_{lim}$ ). A target reference point ( $B_{msy}$ ) has not yet been estimated for this stock<sup>97</sup>.

The NAFO Scientific Council has recommended that the TAC for Greenland halibut in Divisions 0A, 1A offshore and 1B could be increased from 13 000 tonnes in 2013 to 16 000 tonnes for 2014. This is based on the increasing trends in biomass and CPUE indices along with high CPUE and promising incoming year classes in these Divisions. NAFO recommends that the TAC for Greenland halibut in Divisions 0B and 1C–F should remain unchanged from 2013, i.e. 14 000 tonnes. This is based on the fact that the biomass and CPUE indices have been relatively stable, so there is a low risk to the stock in these Divisions. NAFO also recommended that if indices of stock size were to decline in the short term (3–4 years), the TAC should be reduced<sup>97</sup>.

The total advised TAC in NAFO Subarea 0 and 1 was therefore 30 000 tonnes in 2014 (and 27 000 tonnes in 2013). The total TAC for the fishery has been consistent with this advice, having been set at 27 000 tonnes for 2013 and 30 000 tonnes for 2014.

### 3.2.5 Greenland halibut (*Reinhardtius hippoglossoides*) in East Greenland (Subareas V, VI, XII and XIV)

The Greenland halibut fishery started in 1961 and is mainly fished by factory trawlers operating with a demersal trawl. Catches in the fishery grew gradually from around 30 tonnes in 1961 to 61 156 tonnes in 1989. Catches began to decline after 1990, down to 5 974 tonnes in 2009 before increasing again in the past three years. Most of the fishery is a directed fishery with minor bycatches from other fisheries, such as the demersal redfish fishery in Iceland and Greenland<sup>98</sup>.

The Greenland halibut stock has been below the  $B_{msy}$  reference point since the early 1990s and was estimated to be at 56 % of  $B_{msy}$  in 2012. The stock has been stable and showing a slight increase since 2004 when a record low level of biomass was reported. Landings have been between 20 000 tonnes and 30 000 tonnes for more than a decade. Presently, fishing mortality is estimated to be 1.5 times the target level of fishing mortality ( $F_{msy}$ ).

The location of nursery grounds for this stock are currently unknown, meaning that there is no monitoring of recruits or juveniles. The species is slow growing, appearing in catches at ages 4–6, so recruitment failure will be detected around 5–10 years after it occurs. All management plans should take this into account. The lack of information on recruitment levels also prevents an accurate short-term forecast for the stock<sup>99</sup>.

Greenland halibut in ICES subareas V, VI, XII and XIV are assessed as a single stock unit, although precise stock associations are not known<sup>98</sup>. Data from tagging and genetic studies, as well as the distribution of the fisheries, suggest that Greenland halibut in Subareas XIV and V could belong to the same stock entity and so ICES proposes that a common management approach is advisable<sup>99</sup>.

As described in Section 2.3.5, Greenland and Iceland have agreed joint management measures for the fishery, which applied from 2013. The parties agreed on a TAC of 26 000 tonnes in 2013, with a reduction of 15 % in 2014 (22 100 tonnes). The agreement also states that a management plan will be constructed and applied from the beginning of 2015<sup>100</sup>. In 2013 and 2014 ICES advised that, to reduce fishing mortality to  $F_{msy}$ ,

<sup>98</sup> ICES, 2013a.

<sup>99</sup> ICES, 2013b.

<sup>100</sup> Anon., 2012.

the total catches from the fishery should be reduced to below 20 000 tonnes. Consequently, whilst the TAC is being reduced through the joint agreement, it still exceeds that advised by ICES.

### 3.2.6 Northern prawn (*Pandalus borealis*) in West Greenland (NAFO Subareas 0 and 1)

The northern prawn stock is mainly distributed in NAFO Subarea 1 (within Greenland's EEZ) but a small part of the habitat and the stock is also in Division 0A. The stock is assessed as a single population and the Greenland fisheries exploit the stock in Divisions 1A–1F while the Canadian fleet only fishes in Division 0A<sup>101</sup>. Mortality on shrimp by cod is taken in to account in advice, both in assessing the state of the stock and in exploring risk associated with different catch scenarios.

From 2004–2007 the advised TAC for the entire stock was 130 000 tonnes. This was reduced for 2008–2010 to 110 000 tonnes, increased for 2011 to 120 000 tonnes and then reduced for 2012 to 90 000 tonnes. In 2012 Greenland set a TAC of 101 675 tonnes for Subarea 1, of which 4 000 tonnes was allocated to the EU. The stock was assessed as having further deteriorated in 2012, which led to an advised TAC of 80 000 tonnes for 2013. In this year, Greenland set a TAC of 87 263 tonnes of which 3 400 tonnes was allocated to the EU<sup>101</sup>.

CPUEs have been standardised using models including terms for vessel effect, month, year and statistical area, and the fitted year effects were considered to be a series of annual indices of total stock biomass. Four CPUE series were unified to produce a single series. The estimated CPUE has been variable but moderately high on average from 1976–1987, it then decreased until about 1997, after which it increased significantly to peak in 2008 at more than double its 1997 value. Values for 2009–2013 have been lower<sup>101</sup>.

Surveys have been conducted since 1988 and are used primarily to estimate shrimp stock biomass. The survey index of total biomass remained fairly stable from 1988–1997, after which it increased until 2003. Subsequent values have been lower and generally decreasing. The stock currently comprises a high proportion of females, so fishing risks removing a large amount of the spawning stock biomass and both short-term and medium-term recruitment is expected to be low<sup>101</sup>. This has implications on available fishing opportunities in the short to medium term.

The NAFO Scientific Committee recommended a TAC of no more than 80 000 tonnes in 2013, estimating that a catch of 80 000 tonnes in the medium term (i.e. three years) would give a 34 % probability of exceeding  $Z_{msy}$  (total mortality including fishing mortality and cod predation), a 38 % probability of biomass decreasing below  $B_{msy}$ , and a 3.6 % chance of biomass dropping below  $B_{lim}$ <sup>102</sup>. It is important to note that Canada and Greenland set autonomous quotas, with overall TACs consistently between 20 000 and 30 000 tonnes higher than advised (142 500 tonnes in 2011 with advice of 120 000 tonnes, 118 600 tonnes with advice of 90 000 tonnes in 2012, and 102 767 tonnes with advice of 80 000 tonnes in 2013)<sup>101</sup>. Nevertheless, the stock is estimated to be stable, with median estimates of total mortality and biomass in 2013 below  $Z_{msy}$  and above  $B_{msy}$  respectively. Additionally, the Greenlandic fishery has been certified by the Marine Stewardship Council, indicating that the fishery is managed in a sustainable fashion despite the mismatch between catches and management advice, with a condition that Greenland continues to seek bilateral agreement on the stock with Canada.

### 3.2.7 Northern prawn (*Pandalus borealis*) in East Greenland (ICES Divisions XIVb and Va)

The fishery for northern prawn off East Greenland started in 1978 and until 1993 occurred primarily in the area of Stredband and Dohrn bank as well as on the slopes of Storfjord Deep from approximately 65° N to 68° N and 26° W and 34° W. From 1993, a new fishery started in areas south of 65° N down to Cape Farewell and catches in this area accounted for 50–60 % of the total catch from 1996–2005. In 2006 and 2007 catches in

<sup>101</sup> NAFO and ICES, 2013.

<sup>102</sup> NAFO, 2013.

this southern area decreased to about 25 % of the total catch and then to about 10 % since 2008. Vessels from Greenland, the EU, the Faroe Islands and Norway exploit this fleet in Greenland's EEZ. However, only Icelandic vessels are allowed to fish in the Icelandic EEZ<sup>101</sup>.

From when the fishery began, catches increased rapidly to more than 15 000 tonnes in 1987–1988 but then declined to about 9 000 tonnes in 1992–1993. Catches then increased again to around 11 900 tonnes in 1994 after the extension of the fishery further south. Between 1993 and 2003 catches fluctuated between 11 500 tonnes and 14 000 tonnes. Catches have gradually decreased since 2004 from 10 000 tonnes to 1 235 tonnes in 2011 then 2 109 tonnes in 2012 and 1 702 tonnes in 2013<sup>101</sup>.

Surveys have been conducted in East Greenland to assess the stock status of northern shrimp since 2008. These surveys have led to the estimate that the survey biomass index has been decreasing since 2009 by around 65 %. They have also provided some information about the composition of stock and suggested that the stock is dominated by a large proportion of females and a relatively low number of small males (carapace length less than 20 mm). This apparent scarcity of smaller shrimps in the survey area shows that the total area of distribution of the stock as well as its recruitment patterns are unknown<sup>101</sup>.

The observed CPUE was high from 2000–2008, nearly doubled in 2009 but has since been decreasing and in 2013 was close to the lowest level seen in the time series, despite very low exploitation rates. Currently light fishing occurs in the southern area and the state of the stock in this area is unclear<sup>101</sup>.

The NAFO/ICES *Pandalus* assessment group has consistently advised that TAC for the East Greenland northern prawn fishery should not exceed 12 400 tonnes and this advice has been followed with a TAC of 12 400 tonnes being set from 2007–2013. Total catches have been consistently lower than the set TAC with catches of between 1 200 and 2 200 tonnes from 2011–2013.

### 3.2.8 Atlantic halibut (*Hippoglossus hippoglossus*) in West Greenland (NAFO Subarea 1)

Little information is available on Atlantic halibut (*Hippoglossus hippoglossus*) in Greenland waters. ICES advice has not been given for the stock in this area. In recent years a TAC of 1 000 tonnes has been set by Greenland. Total catches of Atlantic halibut have been low, and in recent years landings have not always occurred in each year. Atlantic halibut are thought to be taken as bycatch in trawl fisheries, however, mitigation measures have been implemented in the shrimp fishery. Longlines must be used to target the species in the west of Greenland.

### 3.2.9 Atlantic halibut (*Hippoglossus hippoglossus*) in East Greenland (ICES Subareas V and XIV)

Similar to the West Greenland stock, little is known about the East Greenland halibut stock. ICES does not provide advice for Atlantic halibut in East Greenland. TAC has been set by Greenland at 2 000 tonnes in recent years though total annual catches have been substantially less than the TAC, at approximately 100 tonnes per year since 2009.

### 3.2.10 Snow crab (*Chionoecetes opilio*) in West Greenland (NAFO Subarea 1)

Snow crab has been exploited in inshore areas off West Greenland since the mid 1990s and offshore since 1999. The biomass of the stock appears to have decreased substantially since 2001 when landings reached a peak of 15 000 tonnes, and CPUE appears to have stabilised at low levels in the majority of areas after decreasing for several years<sup>103</sup>.

As discussed in Section 2.2, recommendations for catch levels are provided at a management level by GINR. The management objective underpinning the catch level recommendations from by GINR is to stop the decline in biomass in the different management areas.

<sup>103</sup> Burmeister, 2012.

EU fishing opportunities for snow crab concern the offshore management areas. GINR recommended that in Disko bay in 2013 and 2014 the offshore catches should not exceed 130 tonnes. GINR recommended that the offshore snow crab fishery in Sisimiut should be closed in 2013 until the stock has fully recovered, with no signs of rebuilding of stock biomass, offshore. In the Nuuk-Paamiut management area, a limit of 1 000 tonnes in the offshore area was recommended. No recommendations were given for the Maniitsoq-Kangaamiut or the Narsaq-Qaqortoq offshore areas due to the lack of survey and fishery data in these management units.

The majority of the recommended offshore catch for 2013 was allocated to the Nuuk-Paamiut management area, where the commercial CPUE has been reasonably stable in recent years if not slightly increasing. There has not been a survey in this area since 2006, so there is a lack of fishery-independent data for the management unit. In other areas, e.g. the offshore Sisimiut area, the stock does not appear to be recovering from recent low levels despite low quotas and other management interventions.

### 3.2.11 Capelin (*Mallotus villosus*) in East Greenland (ICES Subareas V and IV and Division IIa)

The fishery targeting capelin (*Mallotus villosus*) in the Iceland–East Greenland area has been in operation since the mid-1960s and TACs have been set for this stock since 1980 in accordance with a 400 000 tonne SSB escapement strategy management plan. Greenland, Iceland and Norway divide the TAC between the parties involved in the fishery as part of the tripartite capelin agreement (Section 2.3.1). This plan involves two steps. First, a preliminary TAC is set by ICES. This preliminary TAC is used to set the TAC for the capelin fishery in Greenlandic waters. Later in the year, the final TAC is set by Iceland based on its survey. As such, whilst the TAC effective in the Greenlandic fishery is based directly on ICES advice, the total TAC for the fishery as a whole is set by Iceland. The management plan has not been evaluated by ICES regarding its compliance with the precautionary approach<sup>104</sup>.

Capelin is a short-lived species that dies after spawning (age 3–4). As the SSB is comprised of only one or two age groups, the stock is highly dependent on recruitment and exhibits high natural variability in stock abundance. The distribution of the stock is fairly well known. Adult capelin is mostly found north of Iceland before the spawning migration starts and juveniles are found on the Icelandic continental shelf<sup>104</sup>.

As described above, ICES provides advice for the preliminary TAC, but not the final TAC. Consequently, it is not appropriate to compare ICES advice with the final TAC set for the fishery. Nevertheless, ICES advised that no fishery should take place in the 2010/11 season until survey estimates prove SSB exceeds the 400 000-tonnes threshold, with the same advice provided for the 2012/13. This is equivalent to advice for a preliminary TAC of 0 tonnes, with the final TAC dependent on the results of Iceland's survey. For the 2011/12 season ICES advised a catch limit of 366 000 tonnes, based on a precautionary adjustment of the harvest control rule for the fishery. The TACs set for the Greenlandic capelin fishery are in line with those advised by ICES. Given the high natural variability of the capelin stock, it is difficult to assess the status of the stock. However, the stock is considered to be stable<sup>104</sup>.

### 3.2.12 Mackerel (*Scomber scombrus*) in Greenland waters

Discussion of mackerel is included because of the recent development of the experimental mackerel fishery in Greenlandic waters. Catches of mackerel (*Scomber scombrus*) were recorded in Greenland waters for the first time in 2011. 296 tonnes were initially caught in 2011, then there was an increase to 5 219 tonnes in 2012 and then 54 163 tonnes in 2013. This new fishery is thought to be the result of a westward expansion in the summer distribution of adult mackerel, which have started to reach southeast Greenland waters. It is currently unknown whether this expansion of mackerel distribution is likely to be permanent or cyclical<sup>105</sup>. It is important to note that Greenland has been setting TACs unilaterally for the experimental fishery (see Section 2.3.7).

<sup>104</sup> ICES, 2013b.

<sup>105</sup> ICES, 2013c.



In 2008, ICES put in place a management plan for mackerel in the Northeast Atlantic, used to determine management advice for the stock. In 2013, ICES investigated the effect of uncertainty in the catch and concluded that the catches of the stock had been previously underestimated and so the previous stock assessment method and management plan were not appropriate for providing catch advice for the stock. The results of a triennial egg survey conducted in 2013, along with estimates of mortality based on catch have given strong indications of an increase in stock size. As such it was concluded that the current levels of catches do not pose a threat to the stock<sup>106</sup>. Therefore, in 2013 advice for mackerel in the Northeast Atlantic was provided by ICES on the basis of the past three years' landings. This was seen as an interim measure though, with recommendations that advice should be updated in 2014 to include more stock size information in an appropriate assessment model. ICES advised that total catches for the entire stock should not exceed 889 886 tonnes in 2014.

From 2009 to 2013 there was no internationally agreed TAC due to failures to reach agreement in coastal state negotiations. Catches of mackerel in the Northeast Atlantic were consistently higher than the TAC advised by ICES during this time.

In 2014 the EU, Faroe Islands and Norway reached agreement on quota shares for the fishery<sup>106</sup>. Iceland was the only coastal state not to join the agreement, and therefore will continue to set quotas unilaterally. It is highly likely that catches in 2014 will continue to exceed the advice, given that there is no internationally agreed TAC for 2014.

### 3.2.13 Grenadiers

Catch data provided by GFLK indicates that 95 % of grenadier bycatch in all offshore fisheries in Greenlandic waters between 2011 and 2013 was accounted for by roundnose grenadier (*Coryphaenoides rupestris*). As such, discussion of grenadier stock status focuses on roundnose grenadier. It is important to note that the EU fishing opportunities for grenadiers are limited to bycatches only.

#### **Roundnose grenadier (*Coryphaenoides rupestris*) in West Greenland (NAFO Subareas 0 and 1)**

There have been no fisheries targeting roundnose grenadier (*Coryphaenoides rupestris*) in West Greenland since 1978 but the species has since been caught as bycatch, primarily in the Greenland halibut fishery. The biomass of roundnose grenadier has increased gradually since 2010 but was still at a very low level in 2012 and is mostly composed of small fish<sup>107</sup>. The next full assessment of this stock will be conducted by NAFO in 2014. NAFO have advised that there should be no directed fishery for roundnose grenadier from the stock, with catches restricted to bycatches from other fisheries. As such, bycatches of roundnose grenadier by EU fishing vessels are in line with advice for the stock.

#### **Roundnose grenadier (*Coryphaenoides rupestris*) in East Greenland (ICES Subareas I, II, IV, VII, IX, Division XIVa and Subdivisions Va2 and XIVb2)**

In East Greenland, grenadiers are assessed by ICES as part of a wider stock that is distributed across a number of ICES subareas and subdivisions (Subareas I, II, IV, VIII, and IX, Division XIVa, and Subdivisions Va2 and XIVb2). Roundnose grenadier are only taken as bycatch in these areas, i.e. there is no directed fishery, and catches have declined to very low levels in recent years. There are currently no known specific management objectives for this stock, and based on ICES' approach for data-limited stocks it is recommended that catches of the species should not exceed 120 tonnes across these subareas until there is evidence that

<sup>106</sup> Anon., 2014a.

<sup>107</sup> NAFO, 2013.

the stock is at sustainable levels. This is a data-limited stock and improvement of the advice for the stock will require regular data collection by observers on board commercial vessels that catch the species as bycatch<sup>108</sup>.

### 3.2.14 Summary

The sustainability of fisheries targeting stocks of relevance to the Protocol varies. Details are provided in Table 3:1, and summarised below.

The West Greenland halibut fishery is sustainable. TACs for the East Greenland fishery are currently above those advised by ICES, though management measures are in place to reduce the TAC in line with advice. Consequently, whilst overfishing is likely to occur in 2014, the sustainability of the stock is improving. There is some risk of overfishing in the West northern prawn fishery with TACs exceeding advice, though the stock status for 2012 indicates the fishery is being sustainably exploited and the fishery is MSC certified. The East northern prawn fishery is sustainable. The capelin fishery is thought to be stable. The snow crab fishery is being managed to stop the decline in the stock.

The sustainability of the Atlantic halibut fisheries is not known, noting that reported catches of the species have been low or non-existent in recent years.

TACs for deep pelagic redfish are now in line with precautionary advice. However, recent evaluations performed by ICES suggests that the stock has declined to a historic low.

TACs for the demersal redfish fishery are higher than precautionary advice, though stock status is not known. It is important to note that in 2013 the quota for EU fishing vessels accounted for less than 25 % of Greenland's total TAC.

TACs for the offshore cod fishery are higher than advised, suggesting that the exploitation rates are not precautionary. However, it should be noted that the agreed quota for the EU remained constant between 2012 and 2014 despite the large increase in Greenland's total quota in 2014.

Three key fisheries are thought to be sustainable, stable, or precautionary advice is followed (West Greenland halibut, east northern prawn and capelin) and five key fisheries are either thought to be unsustainable, at risk of overfishing, or precautionary advice is not followed (cod, East Greenland halibut, west northern prawn, demersal redfish and pelagic redfish). However, for these five fisheries, the EU quotas established under the agreement are either a very small fraction of the overall quota (e.g. West northern prawn, pelagic redfish), additional measures are taken (e.g. cod) or a stepwise decrease of the quota has been taken recently (East Greenland halibut). The sustainability of the two Atlantic halibut fisheries is unknown and the snow crab fishery is managed based on advice from the Greenlandic Institute of Natural Resources. Finally, the Northeast Atlantic mackerel fishery is thought to be sustainable in the short term.

As for bycatch species, precautionary advice for roundnose grenadier in West Greenland has been followed. Greenland's quota for roundnose grenadier in East Greenland does not appear to be consistent with ICES advice, in that the quota for bycatch is higher than the recommended level.

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<sup>108</sup> ICES, 2012. ICES Advice, Book 9.

**Table 3-1: species-specific tables summarising i) advice (for the stock), ii) TACs set (total TAC with Greenlandic TAC separately where appropriate), iii) total catches in Greenlandic waters, iv) indicative quota levels as specified in the Protocol, v) EU quotas as agreed by the Joint Committee, vi) catches by EU fishing vessels, and vii) the catches by EU fishing vessels as a percentage of the total TAC, for 2012 to 2014**

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Cod	NAFO 1, ICES XIV	Advice	0	0	0	Severely depleted. Current catch levels may prevent stock recovery.	Greenland stock. TAC set by Greenlandic authorities. ICES provides management advice. No analytical assessment, advice based on survey data, catches, CPUE and biological data.
		Greenland TAC	5 500	5 000	10 000		
		Total catch in Greenlandic waters	5 288	5 455	n/a		
		Indicative quota	3 500	2 200	2 200		
		Agreed quota	2 000	2 200	2 200		
		EU catch	2 040	1 676	n/a		
		EU catch (%)	37.1	33.5	n/a		

Source: TAC advice: ICES, 2013b. Total catches and FPA quotas: data provided by DG-MARE. Greenland TAC: Data provided by GFLK

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Deep pelagic redfish ( <i>Sebastes mentella</i> )	ICES V, XII, XIV, NAFO 1, 2	Advice	20 000	20 000	20 000	Unknown. Recent estimates suggest stock at historic low.	Shared stock. Multilateral agreement on management sets TACs for parties in line with advice (including Greenland). However not all fishing nations are part of the agreement and total TAC (including autonomous quotas) has exceeded advice. No analytical assessment, advice based on survey data, catches, CPUE and biological data. Long-term management plan to be developed. Improvements to data collection are required.
		Total TAC <sup>a</sup>	32 000	26 000	20 000		
		Greenland TAC	7 120	5 785	4 450		
		Total catch in Greenlandic waters	4 523	5 913	n/a		
		Indicative quota	8 000 <sup>b</sup>	3 000	3 000		
		Agreed quota	5 999 <sup>b</sup>	3 000	3 000		
		EU catch	2 596	2 177	n/a		
EU catch (%)	8.1	8.4	n/a				

Source: TAC advice: ICES, 2013b. Total catches and FPA quotas: Data provided by DG-MARE. Greenland TAC: Data provided by GFLK. <sup>a</sup> This does not include autonomous quotas set unilaterally outside of the agreed Interim Management Measures. <sup>b</sup> Includes fishing opportunities associated for the demersal redfish stock component (1 800 tonnes in 2012)

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Demersal redfish	ICES XIVb (S. <i>mentella</i> ), ICES V, VI, XII and XIV (S. <i>marinus</i> )	Advice	1 000	3 500	3 500	S. <i>mentella</i> – unknown, but precautionary advice not adopted. S. <i>marinus</i> – stock at full reproductive capacity,	Covers two stocks: demersal S. <i>mentella</i> in Division XIVb (Greenlandic stock); and S. <i>marinus</i> in Subareas V, VI, XII and XIV (shared stock with Iceland and Faroes, with no formal agreement between coastal states). TACs for both stocks exceed advice. Advice provided by ICES. No analytical assessment for S. <i>mentella</i> stock, advice based on survey data, catches, CPUE and biological data. Advice for S. <i>marinus</i> stock based on analytical assessment (indicative of trends only). Mixed fishery of S. <i>mentella</i> and S. <i>marinus</i> , dominated by the former. Lack of species-specific information.
		TAC (Greenland)	8 500	8 500	8 500		
		Total catch in Greenlandic waters	8 167	8 178	n/a		
		Indicative quota	n/a	2 000	2 000		
		Agreed quota	n/a	2 000	2 000		
		EU catch	n/a	1 957	n/a		
EU catch (%)	n/a	23.0	n/a				

Source: TAC advice: ICES, 2013b. Total catches and FPA quotas: Data provided by DG-MARE. Greenland TAC: Data provided by GFLK.

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Greenland halibut	NAFO 0, 1	Advice	27 000	27 000	30 000	Stock is stable, with biomass greater than the proxy for B <sub>lim</sub>	Shared stock between Greenland and Canada. Bilateral agreement between coastal states. Advice provided by NAFO. No analytical assessment, advice based on survey data, catches, CPUE and biological data. Adopted TACs are consistent with the scientific advice.
		Total TAC	27 000	27 000	27 000		
		TAC (Greenland)	13 500	13 500	13 500		
		Total catch in Greenlandic waters	13 516	13 570	n/a		
		Indicative quota	2 500	2 500	2 500		
		Agreed quota	2 650	2 650	2 650		
		EU catch	1 784	2 034	n/a		
EU catch (%)	6.6	7.5	n/a				

Source: TAC advice: NAFO, 2013. Total catches and FPA quotas: Data provided by DG-MARE. Greenland TAC: Data provided by GFLK.

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Greenland halibut	ICES V, VI, XII, XIV	Advice	0	20 000	20 000	Overfishing currently taking place, with biomass above possible $B_{trigger}$ levels.	Shared stock between Iceland, Greenland and the Faeroes. In 2014 TACs set through bilateral Iceland–Greenland agreement. Advice provided by ICES. Advice based on analytical assessment.
		TAC	26 000	26 000	22 100		
		GRL TAC	13 000	9 800	8 320		
		Total catch in Greenlandic waters	12 488	9 063	n/a		
		Indicative quota	7 500	4 315	4 315		
		Agreed quota	6 320	4 465	4 465		
		EU catch	5 400	3 799	n/a		
		EU catch (%)	20.8	14.6	n/a		

Source: TAC advice: ICES, 2013b. Total catches and FPA quotas: Data provided by DG-MARE. Greenland TAC. Data provided by GFLK

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Northern prawn	NAFO 0, 1	Advice	90 000	80 000	80 000	Biomass greater than $B_{msy}$ and total mortality less than $Z_{msy}$ .	Shared stock between GRL and Canada. No agreement on allocation of TAC. Advice provided by joint ICES-NAFO working group. Advice based on analytical assessment. Greenlandic authorities have set TACs consistently higher than scientific advice.
		TAC	118 596	102 767	n/a <sup>a</sup>		
		GRL TAC	101 675	87 263	82 807		
		Total catch in Greenlandic waters	110 443	91 248	n/a		
		Indicative quota	4 000	3 400	3 400		
		Agreed quota	4 000	3 400	3 400		
		EU catch	3 717	4 175	n/a		
		EU catch (%)	3.1	4.1	n/a		

Source: TAC advice: NAFO & ICES, 2013. Total catches and FPA quotas: Data provided by DG-MARE. <sup>a</sup> Canadian TAC unavailable

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Northern prawn	ICES XIV	Advice	12 400	12 400	n/a	Sustainable	Shared stock between GRL and Iceland, though Iceland has not exploited the stocks since 2006. Advice provided by joint ICES–NAFO working group. No analytical assessment, advice based on survey data, catches, CPUE and biological data. Advice has consistently been followed.
		Greenland TAC	12 400	12 400	n/a		
		Total catch in Greenlandic waters	2 176	1 716	n/a		
		Indicative quota	7 000	7 500	7 500		
		Agreed quota	8 000	7 500	6 500		
		EU catch	1 405	1 504	n/a		
		EU catch (%)	11.3	12.1	n/a		

Source: TAC advice: NAFO & ICES, 2013. Total catches and FPA quotas: Data provided by DG-MARE

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Atlantic halibut	NAFO 0, 1	Advice	n/a	n/a	n/a	Not known	Stock structure not known. TACs set by Greenland based on advice from Institute of Natural Resources. No analytical assessment. Direct fishery allowed with longline only in Greenland.
		Greenland TAC	1 000	1 000	1 000		
		Total catch in Greenlandic waters	0.405	0	n/a		
		Indicative quota	200	200	200		
		Agreed quota	200	200	200		
		EU catch	0	0	n/a		
		EU catch (%)	0	0	n/a		

Source: Total catches: Data provided by DG-MARE. Total catches and FPA quotas: Data provided by DG-MARE

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Atlantic halibut	ICES XIV	Advice	n/a	n/a	n/a	Not known	Stock structure not known. TACs set by Greenland based on advice from Institute of Natural Resources. No analytical assessment. No stock assessment and no advice available.
		Greenland TAC	2 000	2 000	2 000		
		Total catch in Greenlandic waters	99	8	n/a		
		Indicative quota	1 200	200	200		
		Agreed quota	1 200	200	200		
		EU catch	0	0	n/a		
		EU catch (%)	0	0	n/a		

Source: Total catches: Data provided by DG-MARE. FPA quotas: Data provided by DG-MARE

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Snow crab	NAFO 0, 1	Advice <sup>a</sup>	1 930	1 330	n/a	Unknown. Appears stable in some areas, though no signs of stock recovery in others.	Greenland stock. TAC set by Greenlandic Authorities. Advice provided by GINR. No analytical assessment, advice based on survey data, catches, CPUE and biological data.
		Greenland TAC <sup>a</sup>	n/a	n/a	n/a		
		Total catch in Greenlandic waters	n/a	n/a	n/a		
		Indicative quota	500	250	250		
		Agreed quota	500	250	200		
		EU catch	0	0	n/a		
		EU catch (%)	0	0	n/a		

Source: TAC advice: Burmeister, 2012. FPA quotas: Data provided by DG-MARE. Notes: <sup>a</sup> Offshore components only

Species	Stock area	TAC & catch	2011/12	2012/13	2013/14	Stock status	Comment
Capelin	ICES V, XIV, IIa	Advice	732 000 <sup>a</sup>	300 000 <sup>a</sup>	0 <sup>a</sup>	Unknown, appears stable and near average.	Shared stock between Iceland, Greenland and Norway. Management plan in place, with advice from ICES used to set EU fishing opportunities in Greenlandic waters. No analytical assessment, advice based on projections from survey data.
		Total TAC	732 000 <sup>a</sup>	300 000 <sup>a</sup>	160 000		
		Greenland TAC	80 520 <sup>a</sup>	33 000 <sup>a</sup>	17 600 <sup>b</sup>		
		Total catch in Greenlandic waters	75 251	1 100	0		
		Indicative quota	55 000	60 000	60 000		
		Agreed quota	56 364	5 775	0		
		EU catch	11 324	0	n/a		
EU catch (%)	1.5	0	n/a				

Source: TAC advice: ICES, 2013b. FPA quotas: Data provided by DG-MARE. Total catches: Data provided by DG-MARE. Notes: <sup>a</sup> Based on preliminary TAC. <sup>b</sup> Based on final TAC

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Mackerel	Northeast Atlantic	Advice	586 000 - 639 000	497 000 - 542 000	889 886	Current exploitation for the stock appears sustainable in short term	Shared stock. Parties at coastal state negotiations are Iceland, the Faroe Islands, the EU and Norway. In 2014, multilateral agreement reached by coastal states with the exception of Iceland. Greenland and Iceland setting TACs unilaterally. ICES provides management advice. No analytical assessment used in 2013, advice based on landings data.
		Total TAC	927 000	906 000	1 089 097		
		Greenland TAC	11 000	71 400	100 000		
		Total catch in Greenlandic waters	5 219	52 797	n/a		
		Indicative quota	n/a	n/a	n/a		
		Agreed quota	n/a	n/a	n/a		
		EU catch	0	1 366	n/a		
EU catch (%)	0	0.15	n/a				

Source: TAC advice, TAC and total catches: ICES, 2013c



Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Roundnose grenadier	NAFO 0, 1	Advice	n/a	n/a	n/a	Stock biomass is at low levels. NAFO recommends that there should be no directed fishery	Shared stock. TAC (for bycatch) set by Greenland. Advice provided by NAFO. Advice based on survey biomass indices landings.
		Greenland TAC	1 000	1 000	1 000		
		Total catch in Greenlandic waters <sup>a</sup>	95	151	n/a		
		Indicative quota	n/a	100	100		
		Agreed quota	n/a	200	100		
		EU catch <sup>a</sup>	50	49	n/a		
EU catch <sup>a</sup> (%)	5.0	4.9	n/a				

Source: TAC advice: NAFO 2013, Total catches and FPA quotas: Data provided by DG-MARE. Greenland TAC: Data provided by GFLK. Notes: <sup>a</sup> Total catch in both East and West Greenland

Species	Stock area	TAC & catch	2012	2013	2014	Stock status	Comment
Roundnose grenadier	ICES I, II, IV, Va2, VIII, IX, XIVa and XIVb2	Advice	n/a	120	120	Unknown	Shared stock. TAC (for bycatch) set by Greenland. Advice provided by ICES. Advice based on trends in landings.
		Greenland TAC	1 000	1 000	1 000		
		Total catch in Greenlandic waters <sup>a</sup>	95	151	n/a		
		Indicative quota	n/a	100	100		
		Agreed quota	n/a	200	100		
		EU catch <sup>a</sup>	50	49	n/a		
EU catch <sup>a</sup> (%)	5.0	4.9	n/a				

Source: TAC advice: ICES, 2012, Total catches and FPA quotas: Data provided by DG-MARE. Greenland TAC: Data provided by GFLK. Notes: <sup>a</sup> Total catch in both East and West Greenland

### 3.3 Ecosystems

#### 3.3.1 Bycatch/discards

Executive Order No 14 of 6 December 2011 outlines the management of bycatches and discards in Greenlandic waters. Bycatches are defined in the Executive Order as catches of species not covered by the fishing license of the vessel, or individuals that do not meet minimum size requirements for commercial fish species. A maximum bycatch rate limit of 10 % by weight by haul applies to all fishing vessels, except for northern prawn trawlers for which the limit is 5 %, and poundnet and pot fisheries. If this rate is exceeded, the vessel must move fishing grounds at least 5 nautical miles from the logged start and end positions, unless a minimum of 60 hours has passed. Additionally, fishing vessels with and without permits for onboard processing shall not have total bycatches exceeding 10 % by weight of the total catch after ten and four 24 hour-periods respectively.

Discarding is prohibited for all catches, with the following exemptions. Exemptions are given to allow the release of bycatches, where release mortality rates are thought to be low. In these instances the bycatches should be released alive, as far as is possible<sup>109</sup>. These are as follows

- Halibut caught as bycatch by gears other than trawls.
- Male crabs below the minimum landing size, and all female crabs, apart from those infected with bitter crab disease
- Bycatch of undersized fish from pound net fisheries.

An exemption is also granted for catches damaged in the course of processing, which can be discarded as 'unmarketable discards'. Unmarketable discards must be recorded in logbooks. Finally, derogations to the ban on discards are also granted to northern prawn trawlers on an annual basis. This derogation can be applied until the trawlers are permitted to process finfish in the same processing factory as prawns, currently prohibited by Danish hygiene regulations<sup>109</sup>. This derogation therefore maintains a level playing field for all trawlers, whether bound by Danish regulations or not.

It is interesting to note that the wording of the Protocol is not entirely consistent with the Executive Order. Article 1 para. 6 states that it is prohibited in the Greenlandic EEZ to discard catches of fish stocks managed through catch or effort limits. It is not clear whether this statement has any legal power, though it is worth noting that this statement contradicts the first part of the paragraph, i.e. that EU fishing vessels should abide by the applicable bycatch rules in Greenlandic waters. The wording is in fact more restrictive than the Greenlandic legislation, as EU northern prawn trawlers do receive a derogation to the discard ban and unmarketable discards are permitted, and less restrictive than the Greenlandic legislation, as the discard ban in fact applies to all species (with some exemptions). Consultations with northern prawn vessel operators suggests that Danish northern prawn trawlers discard as per the derogation, whilst Estonian northern prawn trawlers do not discard as per the Protocol, with both Danish and Estonian vessels operating within the requirements of Greenlandic legislation.

Regardless, discarding is prohibited for all vessels operating within Greenland's EEZ (with the exemptions and derogations outlined above) and the impact of bycatch is considered to be generally low in both offshore and inshore fisheries. A 2011 assessment of the domestic offshore shrimp fisheries showed that bycatch impact on commercial fish, e.g. Atlantic cod and redfish, is insignificant and that bycatch of all commercial species is not expected to hinder rebuilding of depleted populations<sup>110</sup>.

<sup>109</sup> MFHA, pers. comm., 7 May 2014.

<sup>110</sup> ICES, 2009.

Various methodologies and technologies are used in offshore and inshore fisheries to minimise bycatch amounts, including mandatory fish-excluding devices, mandatory sorting grids and a quota allocation system for bycatch caught by foreign fishing vessels, including the EU<sup>111</sup>. In addition, the Ministry of Fisheries, Hunting and Agriculture has additional powers in place to protect specific areas, including the authorisation to close fishing grounds where major bycatches have been reported (Section 2.2).

Observer coverage is high in offshore fisheries, with offshore shrimp fisheries covered by an observer rate of > 40 % of the time for offshore trips < 10 % of coastal trips, therefore confidence in bycatch and discard estimates is normally high, particularly when associated with offshore fisheries<sup>111</sup>. In addition, bycatch estimates of captains (logbooks) and observers are generally considered consistent with each other<sup>111</sup>.

That said, there are some bycatch species that have been identified as requiring a degree of additional information (in relation to composition and abundance of bycatch), including redfish *spp.* and Atlantic cod, in order to better understand fishing impact<sup>111</sup>. In addition, there has been some concern over bycatch reporting by both Greenlandic and international fleets due to a lack of species-specific detail, which has in turn prevented a detailed understanding of the impact of some fisheries<sup>112</sup>. For example in 2011, there was suggestion that the recording of bycatch was viewed as a subsidiary activity in the inshore shrimp trawl fisheries off West Greenland with little instruction on sampling method or control. It was suggested that this may have led to errors and inconsistencies, particularly in terms of defining different classes of bycatch. In addition, bycatch was not weighed and values were often subject to a subjective visual estimate<sup>112</sup>.

#### ***In-shore fisheries (Greenlandic fisheries)***

Bycatch composition and abundance is reportedly subject to uncertainty for some of Greenland's inshore fleets, including snow crab (*Chionoecetes opilio*) fisheries<sup>112</sup>.

Greenland's inshore shrimp fisheries, distributed along most of the West Greenlandic coast, regularly catch juvenile redfish, cod and Greenland halibut as bycatch species. Changes in reporting of bycatch have also shown that these fisheries are having an impact on additional non-commercial species including other *Pandalus spp.* Bycatch in the West Greenland shrimp fishery from 1977 to 1984 was logged almost entirely as 'commercial' species, i.e. Atlantic cod, Greenland halibut and redfishes, with redfish dominant. However, in 1984 reporting of unspecified and non-commercial species became commonplace and subsequently, the total bycatch consisting of aforementioned commercial species dropped dramatically from 100 % in 1982–1984 to only 70 % in 1985–1986<sup>112</sup>.

Further declines in the proportional representation of commercial species between 1984 and 2010 occurred, declining to only 10 % on average in recent years, partially attributed to the introduction of mandatory sorting grids to these fisheries in 2000, with dispensations for smaller vessels due to safety concerns<sup>115</sup>. Conversely, bycatch of non-commercial fishes and unspecified species has risen so that the total bycatch remains overall at similar abundance rates. Bycatch of the shrimp *Pandalus montagui* has only been logged in recent years (since 2000). However, it now appears to be a frequent bycatch for the shallow-water shrimp trawlers, with recorded quantities fluctuating greatly between about 0.1 % and 1 % of the total catch of northern prawn. It is thought that the fluctuations in reporting are due to inconsistencies with reporting and weighing of bycatch<sup>113</sup>.

Long-line fishing in northern inshore areas targeting Greenland halibut induces bycatch, including redfish, Greenland shark, roughhead grenadier and cod and targeted cod fisheries (June–July peak effort). In shallow waters, using pound and gill-nets induces bycatches of mainly Greenland cod (*Gadus ogac*) and wolf-fish<sup>112</sup>.

<sup>111</sup> Lassen et al., 2011.

<sup>112</sup> Kingsley, 2011a.

<sup>113</sup> Kingsley, 2011b.

Other fisheries within these areas include scallop fisheries conducted with dredges at the West coast from 64-72° N, which are known to have bottom impacts. However, bycatch within this fishery is considered insignificant<sup>112</sup>.

Little or no information is available concerning bycatch in Greenland's salmon fisheries (West Greenland) which are nearshore surface gill-net fisheries. These types of fisheries are often connected to problematic bycatch of elasmobranchs, marine mammals, seabirds, water birds, sharks and unmarketable sizes of finfish<sup>114</sup>. However, available data suggests that historical problems related to bird bycatch within these fisheries has reduced due to a reduction in fishing effort, as discussed further in Section 3.3.3.

#### **Offshore & experimental fisheries**

Currently, important developments are being made in Greenland in relation to bycatch, including the collection of additional scientific data due to the acknowledgement of uncertainties over bycatch levels and species composition that are thought to exist in inshore and offshore fisheries currently<sup>115</sup>. This includes a project that is currently under way between GINR and the Ministry of Fisheries, Hunting and Agriculture to improve biological recording (notably bycatches) through the observer programme<sup>115</sup>.

**Table 3.2: total reported bycatch (tonnes) by species and country for offshore and experimental fisheries in Greenlandic waters (2013)**

Species code	Species	EU	Greenland	Norway	Russia	Total
MZZ	Marine fishes nei	94.6	50.4	0.0	0.0	145.0
RNG	Roundnose grenadier	49.2	29.3	9.6	39.4	127.5
COD	Atlantic cod	25.0	60.5	21.3	0.0	106.8
CAT	Wolf-fishes nei	8.4	5.4	2.7	28.3	44.8
AES	Aesop shrimp	40.0	0.0	0.0	0.0	40.0
RED	Atlantic redfishes nei	5.1	27.8	0.0	0.0	32.9
Others		36.2	33.6	48.5	9.4	127.7
<b>Total</b>		<b>258.5</b>	<b>206.9</b>	<b>82.1</b>	<b>77.2</b>	<b>624.7</b>

Source: Data provided by GFLK

As shown in Table 3.2, bycatch information for Greenland is often reported by Greenlandic and EU vessels under marine fishes, rather than for a specific species or species group. The species category 'Marine fishes nei' contributed the greatest proportion of bycatch for EU vessels. In contrast, Russian vessels reported roundnose grenadier as the predominant bycatch species whilst for Norwegian vessels the predominant bycatch species was cod and tusk. These differences likely reflect the different fisheries and areas of operation for the different fleets.

Bycatch from offshore commercial deep-sea fisheries for Greenland halibut off West Greenland (Greenlandic trawlers) is known to induce bycatch of nine deep-sea species including blue hake (*Antimora rostrata*), roundnose grenadier (*Coryphaenoides rupestris*), spiny eel (*Notacanthus chemnitzii*), roughhead grenadier

<sup>114</sup> Gilman et al., 2012.

<sup>115</sup> Lassen et al., 2011.

(*Macrourus berglax*) and spinytail skate (*Bathyraja spinicauda*)<sup>116</sup>. The importance of understanding the impact of deep-sea fisheries on species is increasingly recognised, particularly because of the long life cycles and low fecundity of some deep-sea species. However, no significant correlation was noted between abundance and fishing effort within these fisheries, although a reduction in mean weight was significantly correlated with fishing effort over a 24-year period<sup>116</sup>.

### **Shrimp fisheries**

Offshore shrimp fisheries have contrasting management in relation to bycatch as processing of finfish is prohibited on the same production deck as shrimps due to foodstuff authority regulations. Therefore, shrimp trawlers are currently permitted to discard bycatch<sup>117</sup> (Section 2.2). However, discarding of other shrimp spp. was prohibited at the beginning of 2011<sup>117</sup>.

The management plan for Greenland's western northern prawn fishery was introduced and adopted by the Greenland Parliament in July 2010<sup>115</sup> and the rules concerning bycatch include:

- Bycatch of commercial species shall be reported and deducted from the vessel's quota or from the national quota if no vessel-quota has been established;
- If bycatches exceed 10 % of the total catch, the fishery must not resume within a distance of 5 nm from the position of the haul where maximum was exceeded; and
- The mandatory use of sorting grids. (Which is said to have resulted in a low level of bycatch within the fisheries.)

It has been suggested that reported bycatches for both inshore and offshore vessels targeting northern prawn off West Greenland are subject to uncertainty<sup>118</sup>. For example, some vessels will record *Pandakus* species as a holistic group, rather than separate the species e.g. northern prawn (*P. borealis*) and Aesop shrimp (*P. montagui*), which complicates the interpretation of the bycatch rates of species such as Aesop shrimp.

Experimental fisheries for mackerel in East Greenland waters have caught bycatch of tuna, a species previously not observed in Greenland waters, which may have potential implications for continued exploitation management<sup>117</sup>.

### **3.3.2 Endangered, threatened and protected species**

Currently, Greenland does not have any legislation pertaining directly to endangered, threatened or protected species (ETP), and there are directed fisheries by Greenlanders for both whales and seals. The whale fishery targets the relatively abundant population of minke whales, however all large whales, except the West Greenland population of minke whales, and several small whales found in West Greenland are currently CITES-listed species<sup>117</sup>. Species including the narwhal (*Monodon monoeros*) and the North Atlantic right whale (*Balaena glacialis*) are listed as endangered by the IUCN red list<sup>119</sup>.

Observations of interactions between fisheries and ETP species are reported as minimal within Greenland's offshore and inshore fisheries<sup>130</sup>. For example, there are thought to be no interactions between the West Greenland northern prawn fishery and ETP species<sup>120</sup>. There is reportedly, however, a potential for Greenland

<sup>116</sup> Jørgensen et al., 2014.

<sup>117</sup> Lassen et al., 2011.

<sup>118</sup> Kingsley, 2011a.

<sup>119</sup> IUCN, 2013.

<sup>120</sup> Lassen et al., 2011.

halibut and shrimp trawl fisheries to have an adverse impact on the Greenland shark (*Somniosus microcephalus*) due to the low fecundity and long life history of these species<sup>121</sup>.

### 3.3.3 Seabirds

Greenland represents an important habitat area for cliff-nesting seabirds including auk species, and historically Greenland fisheries have been associated with high bycatch mortality due to large commercial gillnet fisheries, in particular those for salmon and lumpsucker<sup>122</sup>. Reductions in Greenlandic populations of both auk species and thick-billed guillemots have been partially blamed on these gill-net fisheries<sup>123</sup>. Data suggests that bycatch is predominantly limited to southwest Greenland and that present-day problems are mainly focused on common eiders (*Somateria mollissima*), and to a lesser extent king eiders (*Somateria spectabilis*)<sup>124</sup>.

In 1972, the take of thick-billed murre (*Uria lomvia*) in salmon gillnets offshore of West Greenland was estimated to be 500 000<sup>122</sup>, this estimate was fine-tuned to 200 000 in 1984<sup>125</sup>. However, declines in salmon fisheries, which have been restricted to Greenlandic fishermen only, have reportedly induced a dramatic decline in mortality rates<sup>126</sup> and between 1976–1980 the estimated mortality reduced by 80–90 %<sup>127</sup>.

In 2002 mandatory reporting of bird bycatch data was introduced for Greenland, and annual hunting statistics show that bycatch of eiders is dominant and was reported in large numbers, along with other birds including common guillemots, common loons and black-legged kittiwake that were reported in lower numbers<sup>126</sup>.

In the recent years there has been an increasing exploitation rate for lumpfish (*Cyclopterus lumpus*) through the lumpfish roe fishery. The fishing season is short, with the majority of the catch being caught in May–June. Lumpfish is caught along most of the west coast and is caught using gill nets and in some areas there is a substantial bycatch of birds, especially common eiders (*Somateria mollissima*)<sup>118</sup>. In 2000–2001 it was estimated, using numbers of harvested and bycaught individuals sold, that 2 024 eiders (predominantly common eiders) were killed annually in the Nuuk area alone<sup>118</sup>; the Maniitsoq area was also identified as an area at risk of high bycatch<sup>124</sup>. Following the introduction of mandatory reporting in 2002, data showed that in 2003–2008, 3 260 eiders were killed annually on average in Greenlandic fisheries, predominantly originating from the lumpsucker fisheries. However, other estimates are somewhat higher, in the region of 6 000 to 20 000 eiders killed every year<sup>124</sup>.

It has been suggested that the accuracy of bycatch data reporting for seabirds is constrained by misreporting of hunted birds as bycatch<sup>124</sup> and that additional data is required for seabird bycatch, including the exact locations of bycatch and the circumstances, prior to management suggestions being made.

### 3.3.4 Habitats

The effect that the multinational offshore and national inshore fisheries bottom-trawling for shrimps have on hard corals and sponges has become a clear concern in recent years and the sustainability of bottom-trawl fisheries has been questioned as a result of this, with mitigation measures included in the Greenland management plan for the shrimp fisheries<sup>128</sup>. Quantifying or analysing the effects of fisheries on bottom

<sup>121</sup> IUCN, 2013.

<sup>122</sup> Tull and Germain, 1972.

<sup>123</sup> Evans and Waterstone, 1978.

<sup>124</sup> Merkel, 2011.

<sup>125</sup> Piatt & Reddin, 1984.

<sup>126</sup> Żydels et al., 2013.

<sup>127</sup> Manville, 2005.

<sup>128</sup> Kingsley, 2011.

sediments or communities is constrained due to a paucity of available information about bottom characteristics and benthic ecosystems for Greenland<sup>130</sup>. Particular areas already identified as vulnerable to exploitation within Greenland's waters include cold-water coral communities<sup>129</sup> and other hard-bottom habitats, these areas are particularly vulnerable to trawl gear, which can affect bottom habitats and reduce species diversity.

Regulations now in force in Greenland to protect these habitats include the use of rolling rockhopper ground gear, and toggle chains of 72 mm or longer to keep trawl netting off the bottom<sup>130</sup>. Area closures are also applicable for areas that have been identified as having particularly high concentrations of sponge and coral beds, this includes an area of 650 square nautical miles<sup>130</sup>. In addition, vessels are now required to report live coral catches of > 60 kg and live sponge catches of > 800 kg to the Licensing Authority and vessels are required to move if bycatch exceeds these amounts (a minimum of 2 nautical miles away)<sup>130</sup>.

In addition, the authorities have powers to close any additional areas which are considered 'vulnerable marine areas', and the 'new fishing areas' in West Greenland that lie North of 74° N have special regulations in force to protect vulnerable habitats there<sup>130</sup>.

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<sup>129</sup> Edinger et al., 2007.

<sup>130</sup> Arboe and Kingsley, 2013.