Sustainable Fisheries Greenland

Fishery Improvement Project - FIP

- recommendations on the path towards MSC on inshore Greenland halibut

Written by:
Sustainable Fisheries Greenland

Based on FIP working groups with participation from:

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Table of Contents

Key recommendations

- Set a fishery objective, that forms the foundation for the management of the fishery.
- The target must be based on biomass and economy and be built on the annual average length of landed fish.
- The average length of landed Greenland halibut should be stable around 57 cm (approximately 1.7 kg).
- The fishery must be regulated according to the fishery target, but regulations should be gradual.
- The scientific advice should be improved through an age-based approach and should include data collected at landing sites.
- Fishery reference points should be set; for instance, that the fishery closes if the average length in any given year drops below 44 cm.
- Develop a management plan, including a clear "Harvest Control Rule" specific for each management area.
- Remove the "quota-free" areas.
- Remove the minimum legal landing size on inshore Greenland halibut.
- Align the minimum allowed mesh size across inshore gillnet fisheries in West Greenland.
- Gillnets should have a minimum mesh size of 180 mm.
- Gillnets should be allowed for a maximum of 6 months per year in accordance with national legislation, but the timing must be regulated regionally.
- There should be a national strategy including financing for the cleaning of fishing grounds.
- Reporting of bycatch can and should be simplified.
- The actual extent of bycatch should be investigated further.

Introduction

The fishery is the most important industry in Greenland. That applies to the export, the national employment, the economy and people's careers. Northern shrimp and Greenland halibut are particularly crucial, with these two species alone constituting approximately 70% of Greenland export. To ensure that the fishery contributes as much as possible to the national welfare, it must be optimized on several parameters.

Classical optimization of a fishery focuses on the amount of fish. That is the approach in scientific advice, which is often the background for quotas: Which fishing intensity will yield the most kg of fish? It is, however, equally important to optimize the sale of the landed fish: How is the profit from landed fish optimized? In that context environmental certification of Greenland fisheries has become an important aspect. The international markets are increasingly requesting products from sustainable fisheries and globally the most recognized certification label is the Marine Stewardship Council – MSC. In 2013 the northern shrimp fishery was the first Greenland fishery to be certified, with the lumpfish and offshore Greenland halibut fisheries in West Greenland subsequently added. In all cases, Greenland have benefitted economically from the certifications. For that reason, there is both a political and a commercial wish to certify more fisheries.

Based on this, as well as several national initiatives to ensure a sustainable Greenland halibut fishery, the Greenland halibut Fishery Improvement Project – FIP – including the inshore areas Upernavik, Uummannaq and Disko Bay was launched in 2018. The project has the following overall objectives:

- Determine if the Greenland halibut inshore fishery can be MSC-certified in its current state.
- Account for areas that need improvement and complete projects that improve the basis for a successful MSC-certification.
- Formulate concrete recommendations that will result in a successful MSC-certification.
- Draft suggestions for the content of a management plan.

The FIP can be regarded as a concretization and realization of the opinions and intentions laid down in the declaration of intent from Ilulissat in 2017. The declaration was signed by KNAPK, SQAPK, Royal Greenland, Halibut Greenland, APNN, Qaasuitsup Kommunia, GFLK and GN. The overall objective of the declaration was that the fishery in Disko Bay should be responsible and that the dialogue must include all stakeholders. The FIP does exactly that and provides recommendations for concrete initiatives that ensures responsibility, sustainability and profitability.

The basic starting point of the project has been to ensure that all work and recommendations are founded in data and an objective, analytical approach. The debate concerning Greenland halibut is often shaped by assumptions, recollections of past experiences and a lack of knowledge about the special biology concerning Greenland halibut recruitment and growth. The FIP recommendations can, and should be, discussed, but the discussion must be on an informed basis, and the consequences should be made clear.

Photo: Royal Greenland

Marine Stewardship Council

To be MSC-certified a fishery must be evaluated against three overall principles. They generally address 1) The target species 2) The ecosystem (bycatch, benthic habitat etc.) and 3) Management, including the fisheries act. Associated with each principle several sub-principles apply and for each of these, the fishery is evaluated from 0-100. The fishery is certified if the three overall principles on average obtain a minimum score of 80. Each overall principle is divided into sub-principles. If the fishery scores below 60 on any sub-principle it cannot be certified. If the fishery scores below 80 on either overall principle 1, 2 or 3 it cannot be certified, and if any of the sub-principles score between 60 and 80, the certification is conditioned. Within four years sufficient progress must be made, so that the average score increases above 80, or the MSC-certificate is suspended.

Hence, there are clear guidelines to if, and why, a fishery has shortcomings in relation to a possible certification. To determine the state of the inshore fishery for Greenland halibut, the first FIP project was to have a so-called Pre-assessment report made. One or several external experts evaluates the fishery against the MSC-standard, scoring the fishery on all three overall principles. The pre-assessment report on Greenland halibut identified several points that, both alone and in general, made it clear that the fishery in the current state is not eligible for MSC-certification.

Photo: Royal Greenland

Pre-assessment rapporten

The pre-assessment report will not be scrutinized in detail here, but main points will be highlighted. There are three sub-principles where the fishery is expected to score below 60 and therefore not qualify for MSC-certification. In addition, there are eight sub-principles where the fishery most likely will score between 60 and 80 and consequently be subject to conditions if certified.

Score below 60
The sub-principles that achieve a score below 60 are all related to principle 1, the target species:

1. *Reference points:* There are no reference points for the stocks. Hence, there is no measure to evaluate if the stock is healthy or not. The stock size is apparently decreasing and in the absence of reference points this is indicative of a to high fishery pressure.

2. *Strategy:* The stock size is considered as being below the optimal level (overfished), primarily justified by the decreasing average size in all three areas. Additionally, there is no plan for the re-building of the stock to the optimal level.

3. *Strategy:* There is no procedure describing how the level of catch is set in neither Disko Bay, Uummannaq or Upernavik. This should be a key element in a management plan.

Score between 60 and 80
When scoring between 60 and 80 on any single sub-principle, keeping an MSC-certificate requires meeting conditions within a 4-year period. These points pertain to Principle 1 (target species), Principle 2 (the ecosystem) and Principle 3 (management).
Under Principle 1 the points are:

- *Management plan:* There is no management plan for the fishery in Disko Bay, Uummannaq or Upernavik. This applies generally, and at the very least, there needs to be plan for how to exploit the stocks.

- *Scientific advice:* There is scientific advice covering each management area, but it is inadequate as it does not estimate reference points, stock size and fishing mortality. The scientific advice must be re-evaluated and be the foundation of a fishing strategy and an evaluation of the current stock status.

Under Principle 2 the following points have been highlighted:

- *Bycatch:* There are uncertainties regarding composition and level.

    a. It is not possible to evaluate if bycatch data are valid and it is not possible to evaluate if the fishery has negative effects on other species, including particularly sensitive species.

Photo: Royal Greenland

b. The few data on bycatch in addition to the official reporting are from a small study in Disko Bay. There are no similar studies from Upernavik or Uummannaq. Such studies must be conducted to allow for an evaluation of the fishery impact on other species than Greenland halibut.

- *Ecosystem:* It must be documented that the fishery does not have a negative impact on corals or other vulnerable species in the ecosystem. The motivation is not the assumed effect of the fishery, but rather the lack of data.

Under Principle 3 there is only one issue that would possibly score below 60 and therefore by itself be enough to disqualify the fishery from being MSC-certified:

- *Objective:* No objective has been formulated for any of the three management areas and accordingly there is no target for managers to aim at. The lack of a management plan, illustrates that no initiative has been shown to formulate a strategy, aiming at achieving a fishery in accordance with an objective.

Photo: Royal Greenland

Project structure

The project is financed by SFG and supported by the Resources Legacy Fund through the Sustainable Fisheries Fund (SFF) program and runs over a two-year period. A project group with participants from APNN, GFLK, KNAPK, GN and SFG and an associated group of participants from the fishing industry and the coastal fishermen and hunter's association, SQAPK, were established.

The project group set up working groups, that worked with specific issues and with participation from the relevant institutions.

Working groups

The pre-assessment report has formed the basis of the FIP project. The individual projects and working groups have used the areas identified in the pre-assessment report as those that disqualify the fishery from a successful MSC-certification, as a direct starting point. Additionally, the FIP project group visited Ilulissat and Upernavik where local stakeholders provided input to challenging subjects within the Greenland halibut fishery. This has led to work with additional subjects in addition to those identified in the pre-assessment report. These include i.e. minimum legal landing size, simplification of procedures, control, management tools etc. These are all subjects that have large impact on the fishery, the future and sustainability.

The recommendations are based on the results from the following working groups:

Objective and advice:
Setting a fishery objective requires:

- Knowledge regarding the present stock status.
- Estimates of the optimal fish size with regard to growth and economy.
- An improved scientific advice.

Data: GN (growth data for Greenland halibut), industry (data from size sorting at landing sites).

"Quota-free" areas:
What effect has the introduction of "quota-free" areas had on:

- The distribution of the fishery?
- The extent of the fishery in terms of biomass?

Data: GFLK (amount, position), APNN (opening/closing of fishery)

Fishing gear:
What advantages/disadvantages does a longline have compared to a gillnet:

- Efficiency?
- Resources?
- Quality?

If a gillnet is used, what should be considered in relation to:

- Optimal mesh size?
- Fishing period?

Is lost gear a problem in relation to:

- Particular areas?
- Extent?
- Ghost fishing?

Data: GN (previous studies, gillnet selectivity), industry (product quality), fishermen (lost gear, areas, the fishery)

Bycatch:
In order to improve the knowledge on bycatch levels, it must be documented if:

- There is sufficient knowledge?
- What initiatives can ensure the acquisition of new knowledge?

Data: Industry (pilot study from Disko Bay), GFLK (official reporting), GN (survey)

Management plan:
If the fishery is to be MSC-certified it requires concrete changes that must be implemented in the management of the fishery and documented in a management plan approved by the government (Naalakkersuisut). The list of recommendations in this report provides input to such changes.

Each working group has conducted meetings and produced output such as documents, work plans and project applications. The output has subsequently been discussed with the project group and have been implemented in concrete recommendations for the fishery.

Recommendations

All recommendations aim at making the inshore Greenland halibut fishery stable and sustainable in the long term and consequently allow for successful MSC-certification of the fishery in Disko Bay, Uummannaq and Upernavik within a foreseeable future. The recommendations are based on the work with and input from all stakeholders and working groups, consolidated into recommendations formulated by SFG.

In general, the recommendations cannot be evaluated individually. The actions are interconnected and should be viewed as an entity. For instance, the recommended gillnet mesh size directly depends on the objective regarding the target fish size in the catches.

A successful MSC-certification in general requires an official position on:

a) Target (fishing intensity, biomass, size)
b) Scientific advice (quota)
c) Management tools (quota, licenses, fishing period)
d) Fishing gear (gillnet, long line, mesh size, fishing period)
e) Management plan (strategy for the target species, bycatch and habitat, scientific advice, control, public consultation)
f) Documented knowledge about the fishery (biomass of landed Greenland halibut and bycatch, spatial distribution, number of fishermen etc.)

Points a and b are often crucial for the recommendations concerning points c, d and e, while point f is the foundation for an informed discussion about the other issues. In the following, recommendations are grouped according to these overall points.

Photo: Royal Greenland

Target

1) Set a fishery target for Greenland halibut specifically for each subarea. It must be emphasized, that the fishery target does not have to take into consideration local spawning. The inshore Greenland halibut primarily originates from the offshore spawning areas. Hence, the fishery target does not need to consider how large the stock must be in order to reproduce sufficiently, which is the traditional approach behind biologically based reference points.

A fishery target is pivotal. Without it, there is no guide for managers and no benchmark to evaluate management tools against. Hence, in connection with this fishery, setting a fishery target is the most important aspect.

Based on knowledge about Greenland halibut growth, age and financial conditions the fishing pressure that leads to the optimal exploitation can calculated, both from a biomass (tonnage) and economical (kr.) perspective. This is a trade-off between growth and mortality and for Greenland halibut we estimate, that the optimal fishing pressure is approximately at the same level whether focusing on optimizing the biomass of landed fish (fishermen income) or the economic yield from selling processed fish (buyer income). Hence, a fishery target can be set that benefits all parts of the Greenland industry (Fig. 1).

The estimated optimal fishing pressure can be converted to a corresponding average length of the fish in the catches. Length is an easily understandable measurement, good data for evaluation of the current state in all areas is available and it is easy to manage according to fish length.

Therefore, we recommend that the fishery target is formulated as a composition of desired fish lengths in the catches and with a clear target as to the actual observed average length of the catches.

When the Greenland halibut are landed, landing sites sort them according to size and the weight is recorded during data collection. The weight can easily be converted to length for each individual fish by using area-specific conversion factors. Because of area specific conditions in the three management areas the strategy for reaching the target should be area specific.

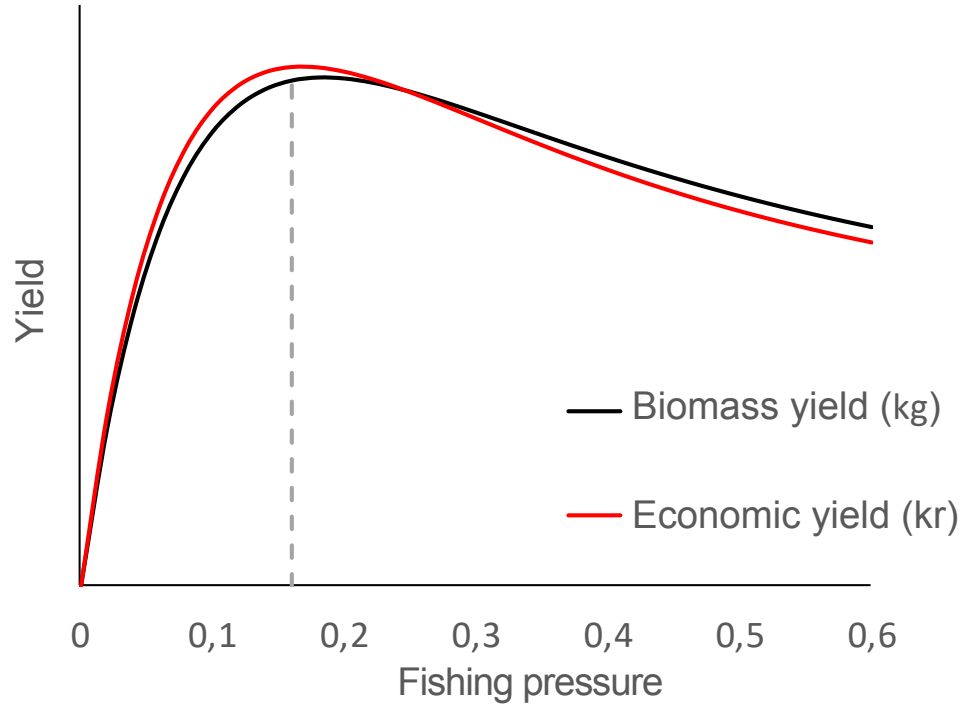

Figure 1: Theoretical evaluation of fishing pressure producing the largest yield in biomass (kg) and profit (kr). The dashed line indicates the average peak at a fishing pressure (F) of 0.16.

2) In the Greenland halibut fishery, the fishery target should be that the size of the landed Greenland halibut is on average stabile around 57 cm in each management area. By doing so, the biomass that can be caught is optimized to the benefit of the fishermen and at the same time, buyers can optimize their profit from the product, with concurrent labor force demands and return to society (Fig. 2). At present, the average size differs substantially between the three management areas: Approx. 52 cm in Disko Bay, approx. 56 cm in Uummannaq and approx. 59 cm in Upernavik. However, in all three areas, the landed Greenland halibut have become gradually smaller over several years (Fig. 3). Because of that, the present state should not be mistaken as an indication of catches that can be maintained at the present level. On the contrary, the fishery must be regulated in order to either increase (Disko Bay), stabilize (Uummannaq) or optimize (Upernavik) the average size of fish landed. Hence, actions must be area-specific.

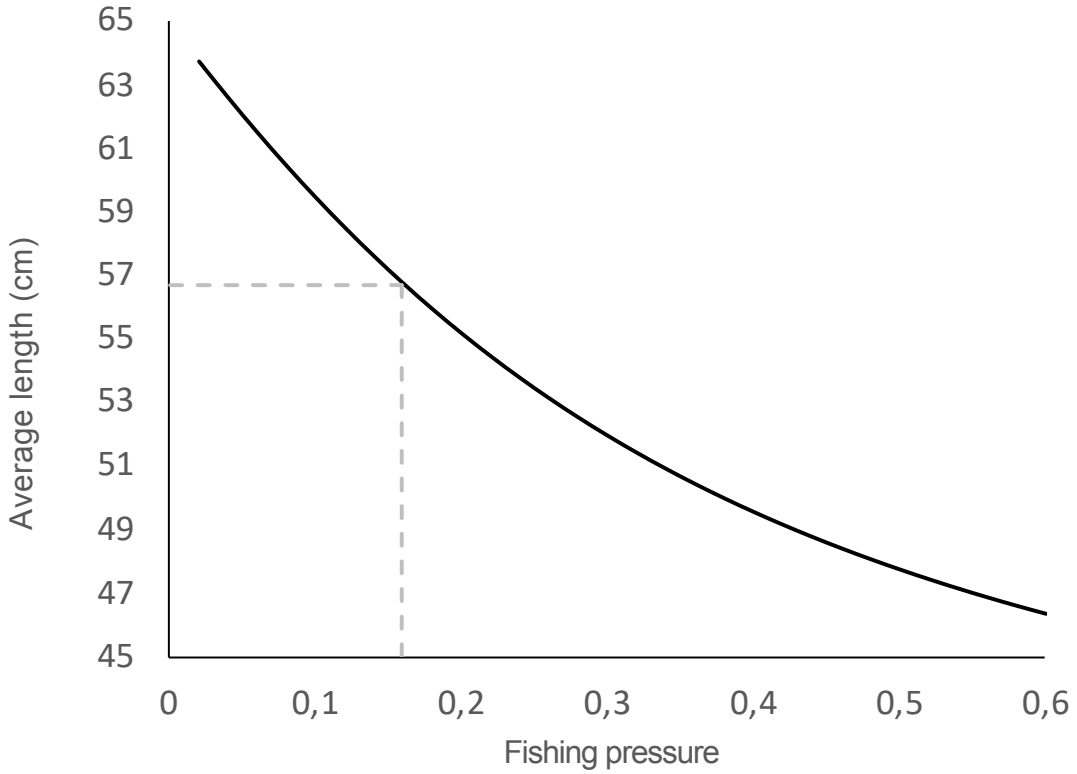

Figure 2: Theoretical estimation of the average length of catches at various fishing pressures. The dotted line indicates the fishing pressure and average length that provides the maximum yield from the fishery.

3) To optimize and balance the fishery, we recommend a gradual regulation. The effect must subsequently be documented using data from the size sorting at the landing sites and the biological surveys. Such an approach has some key advantages as it to a large extent will be the fishermen's own data, knowledge and catch reporting that forms management of the fishery. In 2019 approx. 5 mio Greenland halibut were weighed in the buyers sorting process and that is an excellent starting point for obtaining detailed knowledge about the fishery and its development.

   There is uncertainty about the Greenland halibut stocks response to management initiatives. Therefore, we recommend a gradual change in the catch volume, where the average size is continuously compared to the fishery target. The average size is currently declining in all three management areas, but the starting point differs (Fig. 3).

   We therefore recommend that:

   The catch in Disko Bay is decreased by 15% and maintained at that level for two years. Following this, the size composition of the catch is used to evaluate if the fishery is approaching the target of 57 cm. The fishery is regulated based on this evaluation.

   The catch in Uummannaq is decreased by 5% and maintained at that level for two years. Following this, it is evaluated if the catch composition has stabilized around the target of 57 cm. The fishery is regulated based on this evaluation.

   The catch in Upernavik is maintained at the current level. If the average size in the catch continues to decline and approaches 57 cm, the fishery is reduced by 5% for two years. Following this, the size composition of the catch is used to evaluate if the fishery should be further reduced, maintained at that level or increased.

This process is repeated until the size of the catch is at the targeted level. Subsequently the quotas are regulated according to average fish size. If for instance, there are more large fish in the catch and the average size increases, the quota is increased, and vice versa. The extent of the regulation should be explicitly stated in a management plan.

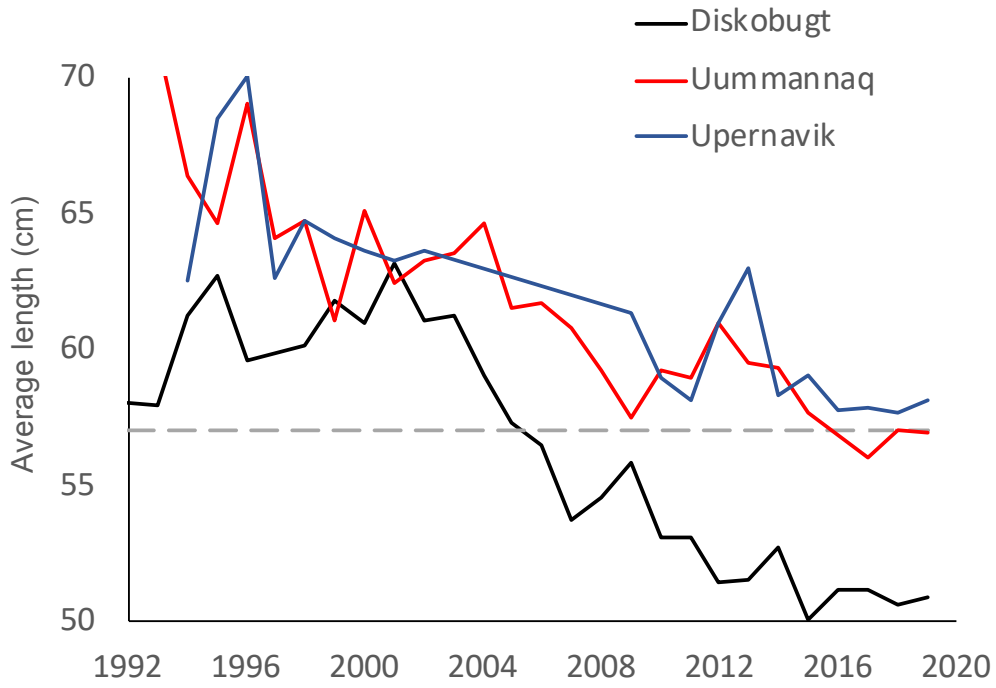

Figure 3: Development in the average size of landed Greenland halibut in Disko Bay, Uummannaq and Upernavik until 2019. The dotted line indicates the recommended stable average size of 57 cm. Data from NAFO SCR Doc. 20/044.

Scientific advice

4) **We recommend that more data are included in the scientific advice and that the advice is improved.** The scientific advice is an important independent source of information on the stock status of Greenland halibut. Biological surveys have been conducted over several years and provide an important historical perspective on stock size development and the average size of the catch. The advice carries great weight when quotas are set and MSC evaluates the fishery in relation to the advice. Therefore, the advice should be based on as many and as accurate data, as possible. In the last few years there has been a positive development in the available data, and this should be reflected in the scientific advice.

   Often, knowledge about the age composition of the catch is key when estimating how large a proportion of the population is caught. For Greenland halibut the correct age determination technique has been debated for several years, but a consensus has now been reached on the most accurate method. This entails that age can be determined from otoliths (Fig. 4) and that knowledge can subsequently be used to infer the age of all Greenland halibut as long as there is information on length or weight.

   When buyers sort the landed Greenland halibut all individual fish are weighed. In addition to providing information about the catch composition, that information can be related to the age determinations and the current estimates of stock size can be improved and made more precise. Hence, it is possible to make an age-based assessment of the stock with appertaining reference points. **Therefore, we recommend that the scientific advice procedure utilizes all available data and present them in international fora where a stock assessment can be subject to an independent review.** This will be a significant step towards fulfilling the MSC criteria for successful certification.

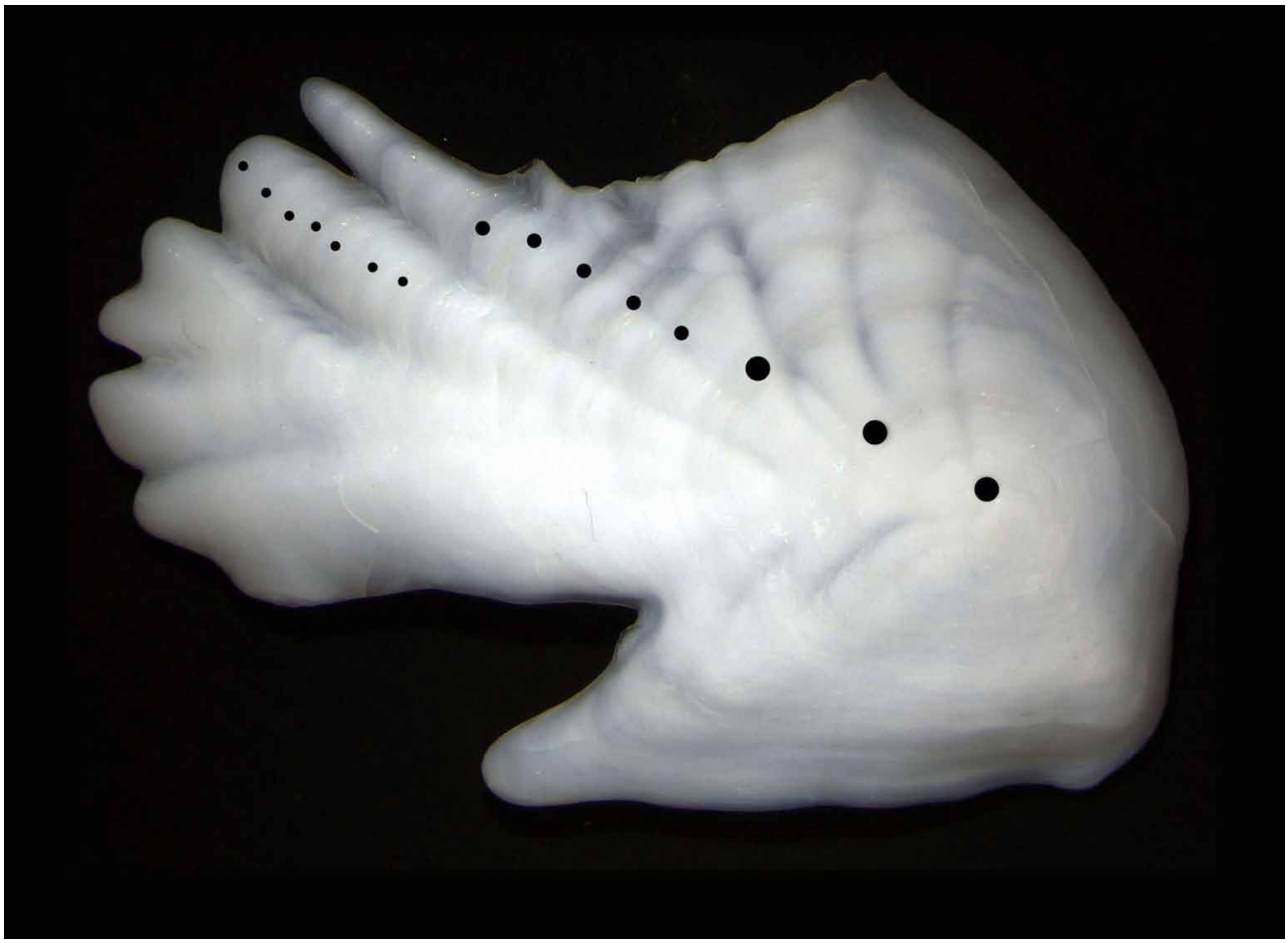

Figure 4: Greenland halibut otolith with indications of annual growth increments. From Dwyer et al. 2016.

5) **Estimate reference points.** Reference points are needed when assessing if a stock is healthy or not. In traditional fishery, advice procedures reference points are related to a stocks ability to reproduce. This consideration is irrelevant in this case as year class strength is determined by the supply of eggs and larvae from the offshore area. Instead, reference points can be estimated from the catch composition:

   We recommend, that if the average fish length in catches drops to 44 cm this should be the lower reference points, below which the fishery is closed until there are indications of stock growth. This can be considered a limit value (Lim).

   We also recommend, that **if the average fish length declines below 50 cm (approx. 1100g), the fishery is reduced by the same ratio as the average length is below this reference point** but calculated in weight. For instance, if the average length is 48 cm (approx. 1000g) the catch is reduced by 1000g/1100g=0.91, hence a reduction of 9% of the set quota. This can be considered a "Trigger" value.

If reference points are not estimated (or constructed) and if they are not implemented in the management and documented in the management plan, the fishery cannot be MSC-certified. An example of a length distribution of the current catches in Disko Bay and the suggested reference points are shown in figure 5.

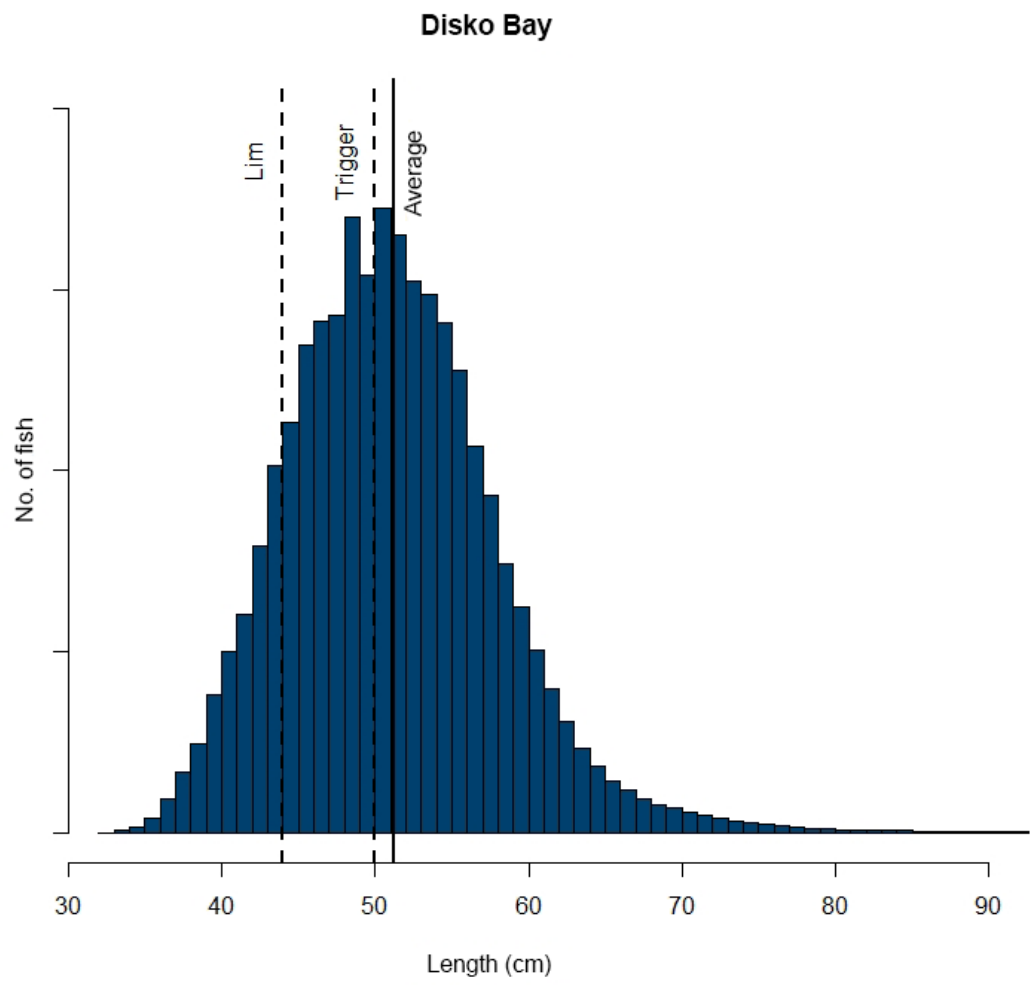

Figure 5: Length distribution of Greenland halibut in Disko Bay in 2019 with indications of the suggested reference points ("Lim" and "Trigger").

Management tools

6) **The management tools should be simplified.** There are rules in place concerning the Greenland halibut fishery, where compliance is difficult to control by authorities. In an MSC-certification process it will have a negative impact if rules are impossible to control and enforce, and a simplification is needed. Simpler rules will be more manageable for the fishermen and GFLK will have improved working conditions with a simpler set of rules to enforce. Concrete initiatives are elaborated under each specific recommendation and include e.g. minimum legal size, mesh size, quota areas, enforcement, TAC setting, bycatch, seafloor cleaning etc.

7) **The "quota-free" zones must be removed.** Generally, it is not appropriate that management units are not equal to the advisory units. For instance, the scientific advice includes the entire Disko Bay region, but the area is managed as if the advice only covers the area with a quota (Fig. 6). That alone is enough to disqualify the fishery from being MSC-certified. When analyzing the distribution of the fishery and the amount caught since introducing the "quota-free" areas in September 2014 it is clear, that it has not had any significant effect. Since the introduction of quota-free zones, the catches are approximately the same and the fishermen utilize basically the same fishing grounds. Changes are to a large extent dictated by where fish can be landed rather than by management (Fig. 6). As the only area, Upernavik, has an increase in the proportion of

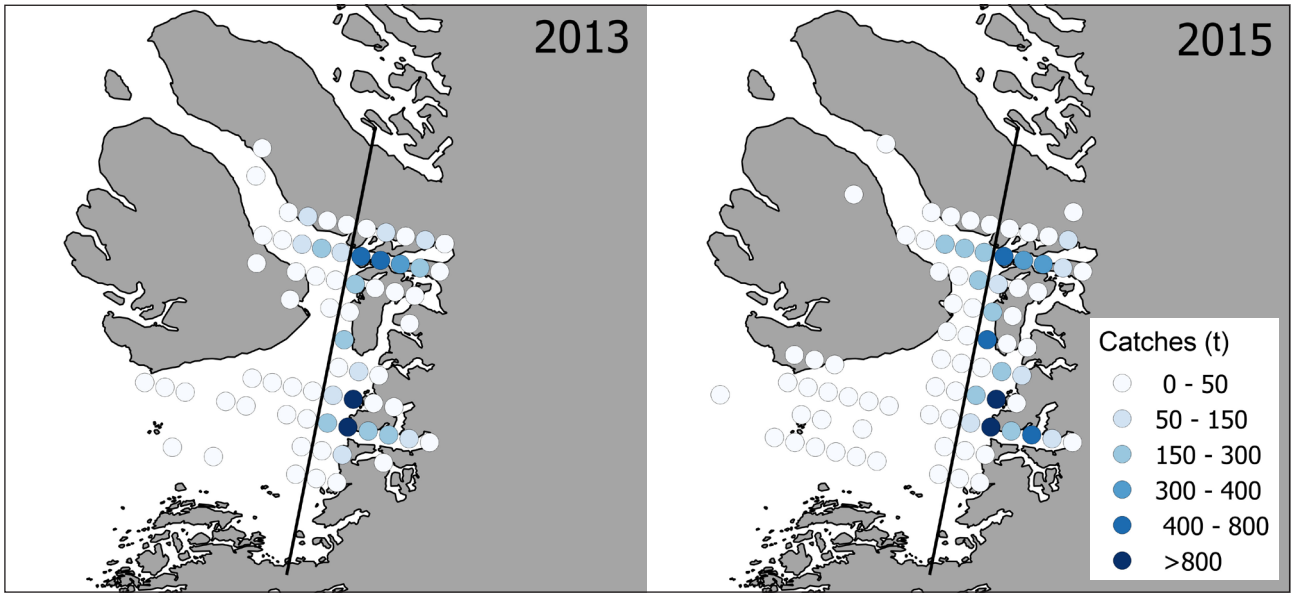

Figure 6: The distribution and intensity of the fishery in Disko Bay in 2013 (before the introduction of "quota-free" areas) and in 2015 (after the introduction of "quota-free" areas). The black line separates the areas with a quota (east of the line) and the "quota-free" areas (west of the line).

the catch taken in "quota-free" areas since 2014. This is, however,due to new opportunities to land fish in the northern and southern part of the management area and the very long coast line (Table 1).

Table 1: Overview of quotas and fishery distribution before and after the introduction of "quota-free" areas in 2014.

	Disko Bay			Uummannaq			Upernavik		
Year	Quota	Catch in whole area (t)	% in "quota-free" areas	Quota	Catch in whole area (t)	% in "quota-free" areas	Quota	Catch in whole area (t)	% in "quota-free" areas
2012	8500	7081	11%	6300	6199	13%	6800	6886	13%
2013	9200	9073	9%	7000	7007	12%	6300	6039	18%
2014	9000	9177	13%	8379	8199	11%	9015	7381	17%
2015	9200	8674	15%	9500	8244	13%	9500	6274	18%
2016	9600	10760	18%	9850	10304	13%	9550	7362	20%
2017	9200	6409	11%	9500	9049	10%	9500	6783	23%
2018	9200	8399	9%	9500	8839	9%	9500	7549	37%

The small dinghies have only been limited in their fishery in quota areas because of an exhausted quota in 4 months (out 156 months). Only on two occasions this has happened besides the month where "quota-free" areas were introduced. Hence, there has been sufficient quota to satisfy fishery without causing a changed fishing pattern.

Additionally, the "quota-free" areas have no biological justification. In each management area the fishery targets the same pool of fish in areas with and without quotas and therefore the clear recommendation from both a management and biological perspective is, that the "quota-free" areas are removed.

Photo: Royal Greenland

8) **Remove the minimum landing size in the inshore fishery.** When assessing the state of a stock and the influence of a fishery it is important to have good data on all fish caught in the fishery. This is also the case for fish below the minimum landing size and it is preferable that these fish are landed, rather than discarded at sea, being wasted or in any other way not appearing in official reports. Today fish below the minimum size of 42 cm are landed, even though it in principle is bycatch (Fig. 7). Minimum size limits are often set to ensure that fish have the opportunity to reproduce at least once before being caught, but this is not relevant in this fishery. With an overall intent of simplifying the procedures in connection with the fishery it is therefore our recommendation that the fishery should operate without a minimum landing size. It is however important to stress, that this can only be done while at the same time setting targets and objectives for the fishery and implementing a strategy to achieve those targets.

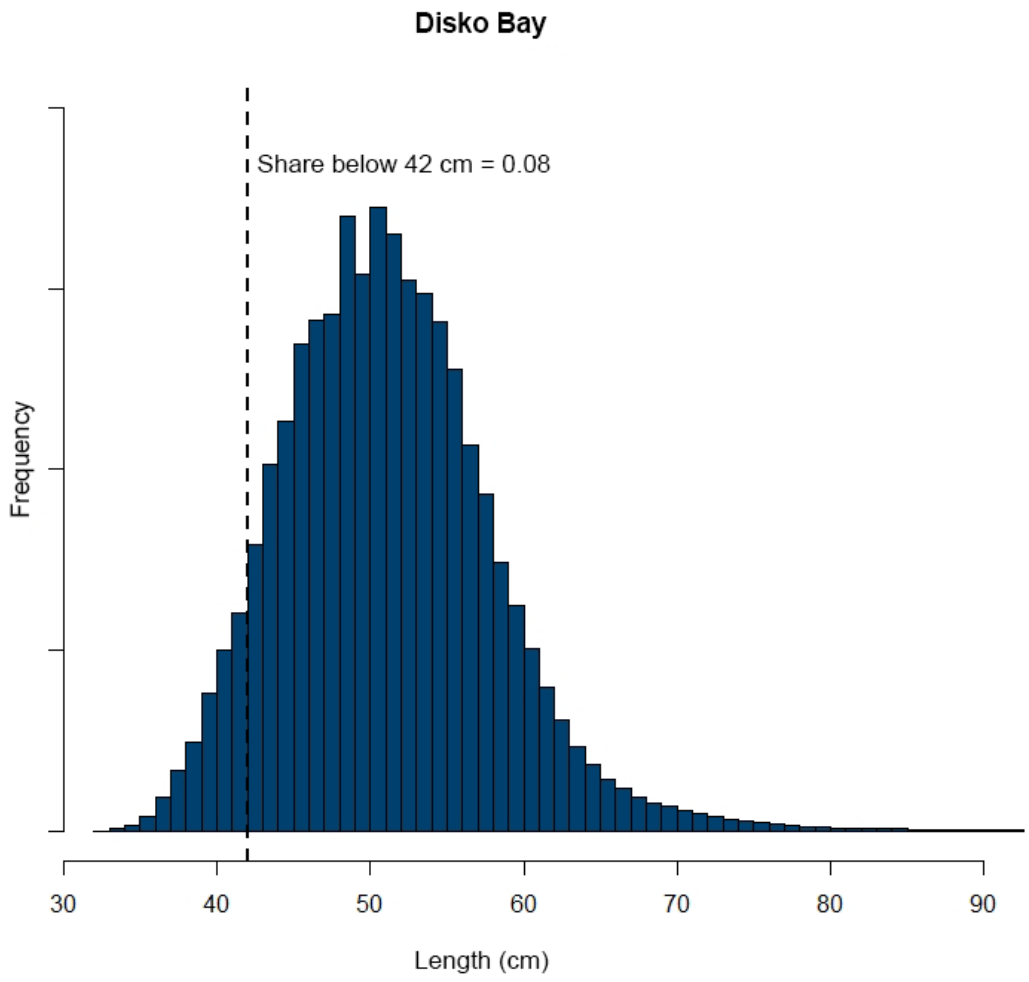

Figure 7: Length distribution from Disko Bay in 2019 with an indication of the proportion of the landed fish that were below the minimum landing size of 42 cm.

Fishing gear

9) **Implement national, harmonized rules, for gill net fishing.** Principle 3 in the MSC-standard addresses the overall management guidelines in relation to a fishery, including laws, executive orders, enforcement, TAC setting, public consultation etc. These rules must be as unambiguous as possible and the procedure of each process must be transparent. In connection with the MSC-standard it is problematic that national law prohibits the use of gill nets targeting Greenland halibut, while at the same time another law allows for regional regulation on the use of gill nets. It is understandable that the use of gill nets is regulated regionally but the government executive order should be phrased, so that guidelines are clear.

We therefore recommend, that there is a national law stating that:

a. **Gill nets are allowed in the inshore fishery.**
b. **The maximum duration of the period each year, where gill nets are allowed.**
c. **The exact period where fishing with gill nets is allowed is a regional matter.**
d. **Which mesh sizes should be used in the gill net fishery.**

There are concrete suggestions to each of these issues in other recommendations. If national law reflects these guidelines it will be possible to control the fishery and ensure that it moves in the direction set out in the objectives. It will also be a more accurate and simpler management procedure. Finally, a regional control over when gill net fishing is allowed will make the fishery adaptable to local ice conditions, which vary between areas and years.

10) **Gill net fishing should be allowed 6 months per year.** If gill nets are used year-round it will be sub-optimal from a sales perspective. If gill nets are used appropriately it should not compromise the quality, but the message from local buyers is, that when they receive poor quality fish, it is most often caught in gill nets. Also, 'long-line fishery' is a positive sales parameter with a cultural significance. We therefore recommend that long lines are allowed all year-round and is not replaced fully by the gill net fishery (Fig. 8). However, gill nets is an efficient fishing gear as it enables the fishermen to be more cost-effective (no baiting) and at the same time it allows for a fishery that to a larger extent than long-lines targets specific fish sizes.

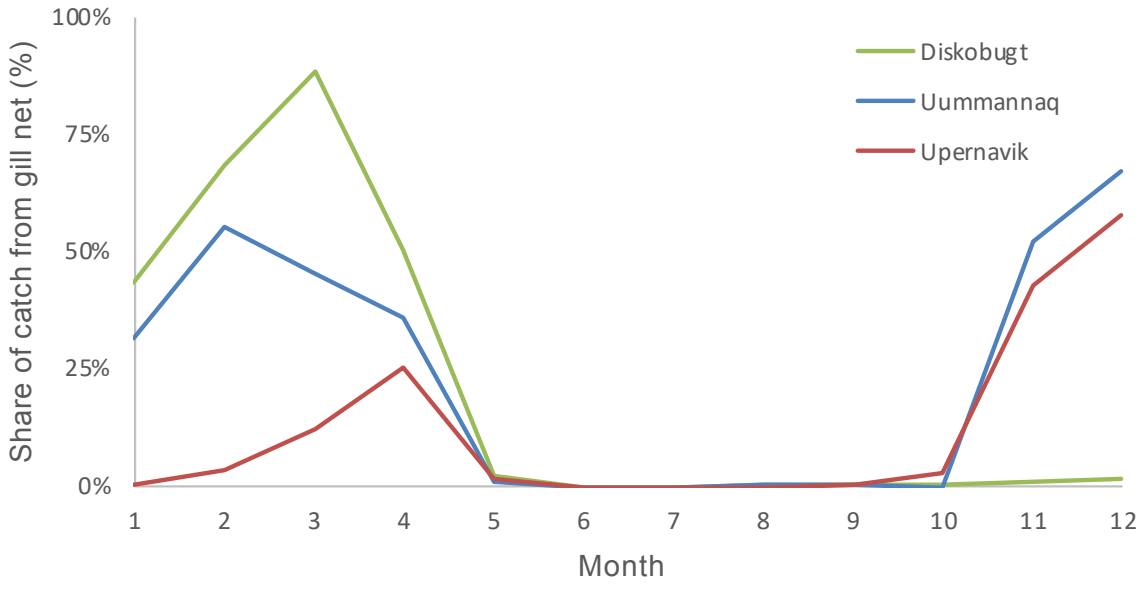

Figure 8: Proportion of landed Greenland halibut that were caught in gill nets in 2019.

11) **Prohibit the use of gill nets with a mesh size smaller than 180 mm in all inshore gill net fisheries targeting Greenland halibut and Atlantic cod.** The mesh size in gill nets to a large extent governs the size of Greenland halibut being caught (Fig. 9). Hence, gill nets are an excellent way of regulating the size composition of the catch. Because we recommend a length-based target for the fishery the use of gill nets with a specific mesh size is the obvious choice as a means to reach this target. Data from the factory sorting process clearly shows an intra-annual variation in the size of the landed fish. The transitions from larger and smaller fish are very clear at the start (November) and end (April) of the periods where gill nets are allowed.

In theory, gill nets with a mesh size of 180 mm captures Greenland halibut that are 62 cm on average. Because there are fewer large fish, the realized average length will be slightly lower, and as long-lines also captures smaller fish the combination of the two gears will be ideal in reaching the overall objective of a 57 cm average. At the same time, the larger fish that are particularly valuable for the industry, are kept in the catches.

Today, there is a tendency that more Greenland halibut are caught in 160 mm gill nets designed for cod. According to current legislation, these gill nets are not allowed in the Greenland halibut fishery, but as the fish have gradually decreased in size, particularly in Disko Bay, it is now common to use these nets in order to maintain the same Greenland halibut catch rates. By disallowing 160 mm gill nets the Greenland halibut fishery is simplified and optimized long term.

In 2019, 4% of the total inshore cod catches in West Greenland were from gill nets (<900 t). In the Upernavik and Uummannaq areas no cod from gill nets where landed, while in Disko Bay 200 t cod were from gill nets out of a total catch of 1316 t cod in that area. The remaining catch was primarily caught with longlines and pound nets. Hence, disallowing 160 mm gill nets would have very limited consequences for the cod fishery.

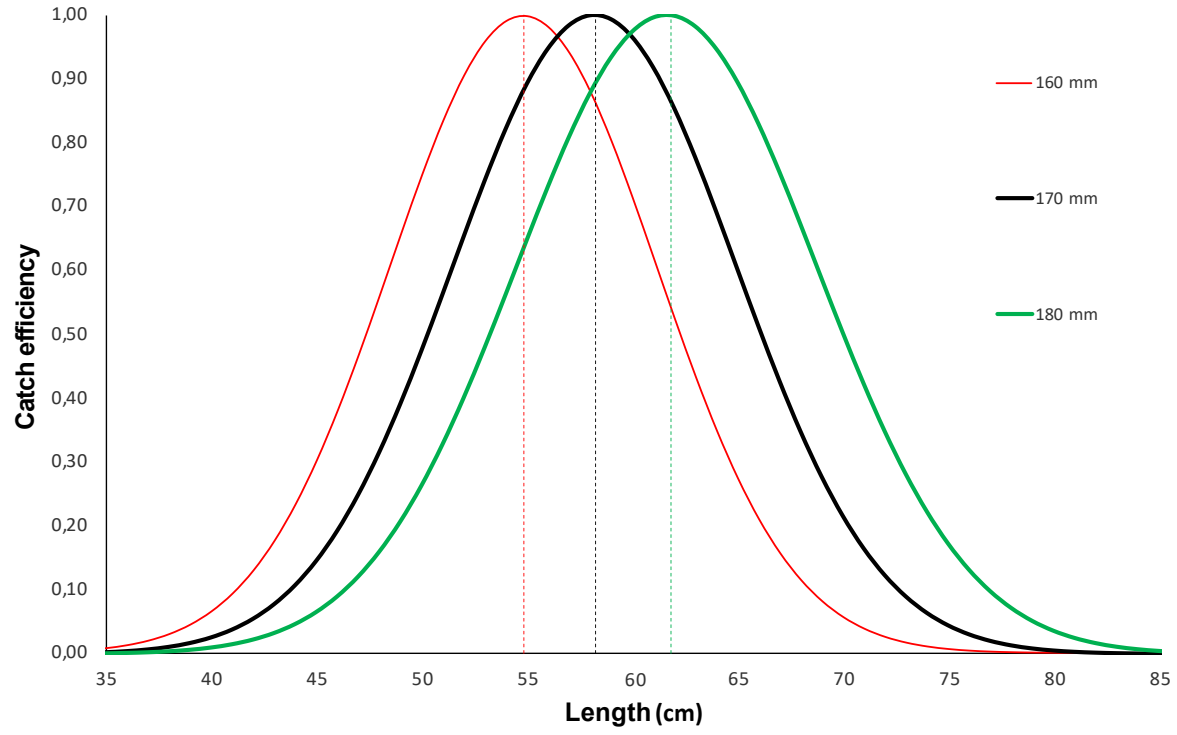

Figure 9: Theoretical catch composition curves using different gill net mesh sizes.

12) **There should be a strategy for the recovery of lost gear.** Across all three management areas, lost fishing gear is considered a challenge. It makes fishing difficult in certain areas, pollutes the marine environment with plastic and lead and the gear continues fishing for long periods after the gear is lost (Ghost fishing, Fig. 10). Ghost fishing in particular has received increased attention from MSC and NGO's. If fishing gear is lost the effect is not limited to the target species through continued "fishing", but also effects other species. Therefore, a strategy must be formulated and concrete actions aiming at minimizing the problem defined. A strategy concerning lost fishing gear should include:

   a. A clear procedure on how to register lost gear under national auspice.
   b. Establish a fund with means allocated specifically for cleaning lost gear off the seafloor.
   c. A model for an annual systematic evaluation of the extent of lost gear and the need for seafloor cleaning.

   The fund should pre-approve potential applicants and have a clear procedure for how to report the results from the cleaning initiatives. By doing so, a high-quality effort is ensured, knowledge is accumulated about the best cleaning procedure and the absence/presence of lost gear and the effect of cleaning is documented. The allocation of funds will benefit from a working group with participation from local associations, but the administrative responsibility should reside with APNN. Finally, the relevant legislation should be modified, so that it to a larger extent reflects the actual conditions and the vessels possibility of retrieving their own lost fishing gear .

Figure 10: Picture from a 2020 cleaning cruise in Disko Bay.

[1] Specifically, the Self Rule executive order nr. 4 of 30. March 2017 and technical conservation measures in the fishery should be changed in §19, section 1 and §20, section 4.

Bycatch

13) **Simplification of the bycatch report procedure.** In connection with a possible MSC-certification it is not necessarily the amount of bycatch that is the issue, but the actual reporting procedure. In Greenland, the challenge is that a vast area must be controlled by relatively few people. There is therefore little or no independent control verifying that official numbers reflect the actual bycatch. Consequently, the validation of official numbers is often based on single projects and biological surveys. Due to these approaches, it seems likely that bycatch is underreported. It is the fishermen's responsibility to report their catch. To increase the likelihood that this is done correctly the procedure must be as flexible and simple as possible. Specifically, we recommend that:

    a. **Bycatch of birds, sharks and mammals should only be reported in number, not weight.**
    b. **It should not be reported what the non-landed bycatch is used for.**
    c. **A user-friendly reporting platform should be developed.**

14) **Initiate bycatch studies.** Good fishery management considers a fishery's cumulative effect on the ecosystem and includes a strategy on how to handle this effect. In order to formulate an objective, set a target and subsequently manage according to it, data are needed. Currently, the data on bycatch in the Greenland halibut fishery – including Greenland shark, skates, rays etc. – are inadequate. Some bycatch studies have been conducted in Disko Bay and they indicate substantial underreporting of bycatch (Fig. 11). In an MSC evaluation process such findings and assumptions are, in lack of better data, transferred to other areas where the results are not necessarily representative. Hence, there is a need to document all available knowledge and acquire additional knowledge. We therefore recommend that the knowledge currently at GN and GFLK is structured and published and that concrete studies of bycatch is conducted in each of the three management areas. The studies do not need to be annual surveys but can be limited to thorough individual studies across areas, seasons and gear.

Figure 11: Picture from a 2016 bycatch study in Disko Bay. Photo: Nikoline Ziemer

Management plan

15) **Make one management plan with subsections for each management area.** The management plan is the pivotal document. It ensures a transparent and documented management strategy and a proper management plan includes all the elements needed to achieve a successful MSC-certification. Additionally, drafting a management plan is an inclusive process, where all stakeholders should be included. By doing so, the probability of broad support increases and that is particularly important in a fishery with numerous people actively involved. In the present situation, where the fishery must be regulated in several areas, including stakeholders is critical for the successful implementation of the management plan.

    The management plan is founded on the same laws and executive orders in each area and has the same overall objective and reference points. There are, however, large regional differences in stock status and fishery patterns between the areas, and consequently, the management plan should be area specific, for instance concerning TAC regulation.

16) **Describe an exploitation strategy – Harvest Control Rule, HCR.** To meet the MSC-standard there must be a clear procedure describing how the quota is set in each management area; e.g. there cannot be increases in the quota or quota transfer during the season, if not described in advance in the management plan HCR. This is also in line with the general recommendation of simplifying the laws governing the fishery.

    Typically, a HCR is based on the scientific advice, and aims at setting a quota very much in line with the scientific advice, including a year-to-year buffer that moderates the annual fluctuations in TAC. In this special fishery, the scientific advice does not have to be the only guideline, as the stock cannot collapse in the classical biological sense (no recruitment), but only be exploited sub-optimally with regards to Greenland halibut growth and profit. The concrete suggestions for HCR elements are specified in the other recommendations.

17) **The management plan must include ecosystem considerations.** In Greenland, management is very often focused solely on the target species. MSC has in recent years increasingly focused on the fact that fisheries can have a large impact on other species, either directly (catch) or indirectly (prey), and on the seafloor. Hence, MSC-certification requires under Principle 2, that management actively considers the fisheries' impact on the entire ecosystem. To underline the importance of Principle 2, it is very often in connection to this principle, that fisheries are challenged on maintaining the MSC-certification.

    The Greenland halibut inshore fishery bycatch biomass will most likely not be a problem in connection with an MSC-certification. The challenge is getting a management plan that explains the strategy concerning the bycatch that is an inevitable part of the fishery. If, for instance, there is a bycatch of Greenland shark or grenadier, the management plan should have a strategy on the implementation of specific actions if the bycatch increases above a certain level. This should be particularly clear for species that can be classified as vulnerable; e.g. the Greenland shark.

    The same rationale applies to the seafloor. The fishery does not constitute a disturbance problem, in particular because the fishery has taken place on the same fishing grounds for years with relatively low-impact gears, but it is a problem if not addressed in a management plan. This could for instance be by making maps of the seafloor and the associated fauna in different locations and comparing theses to the distribution of the fishery. This type of information must be produced by the Greenland Institute of Natural Resources and Greenland's Fisheries License Control Authority and underlines the need to involve all stakeholders in the management plan development process.

Documented knowledge about the fishery

18) **All knowledge about catch, bycatch, lost gear and habitat must be made accessible, applied and improved.** An MSC-certification sets a high standard when evaluating the impact, a fishery has on bycatch and on the habitat. Today, that knowledge is either not accessible (lost gear), defective (bycatch) or inadequately communicated (bycatch, habitat). There needs to be a higher focus on making information available, on applying the information and on specifying the strategy in the management plan. Initially, a working group should be established, focusing on compiling all available data and making concrete suggestions on how a management plan should relate to the different areas. Furthermore, the working group can present a plan, outlining how any knowledge gaps can be filled.

Applications

In some areas, there has been insufficient knowledge to support specific recommendations. In these cases, the working group have made applications to different funds, with the purpose of gathering resources for studies addressing these specific issues. Hence, funds have been requested and granted for the following studies:

- *Extent and effect of lost gear in the Disko Bay*
  GN and SFG were granted funds from "Miljøfonden" [Environmental fund], which is a fund established by Inatsisartut and administrated by the Ministry for Science and Environment. The objective of the study was to investigate the extent of ghost fishing in Disko Bay, clean specific areas and document the extent of the problem. Knowledge about the areas with the greatest challenges is gathered from conversations with local fishermen. The seafloor cleaning is conducted from RV Sanna, which is equipped with video gear used to document retrieval of lost gear during seafloor cleaning and how the lost gear interacts with the seafloor. Once the gear is retrieved the extent of ghost fishing is documented. The study will be carried out in the summer of 2020 and in the first half of 2021.

- *Bycatch in the Greenland halibut fishery*
  SFG and GN have been granted funds to investigate bycatch in the Greenland halibut fishery. The project is not conducted due to a problematic amount of bycatch, but because an impartial study is needed to support the official reporting. The project is be based in the Upernavik district, partly because there already is knowledge available from Disko Bay and partly because Upernavik is the area most eligible for MSC-certification. During the study researchers will accompany the fishermen and when they tend to their nets, all bycatch is registered as well as information about duration, gear, depth, position etc. The project started in 2020 and will be finalized in 2021.

Closing remarks

To ensure that the recommendations receive the needed support from the industry, managers, scientists and the population it is vital, that the recommendations are perceived as reasonable, thought through and realistic from all perspectives. By including many viewpoints in the working groups and by basing our recommendations on a data-based approach we hope this has been achieved. SFG would like to thank all working group participants for their time, discussions and willingness to supply data.

During the autumn of 2020 and forward, SFG will present the recommendations and argue for their inclusion in the approach to the inshore Greenland halibut fishery in Disko Bay, Uummannaq and Upernavik. In this way, the fisheries can remain profitable both in the short and long term and hopefully be MSC-certified within a relatively short period.

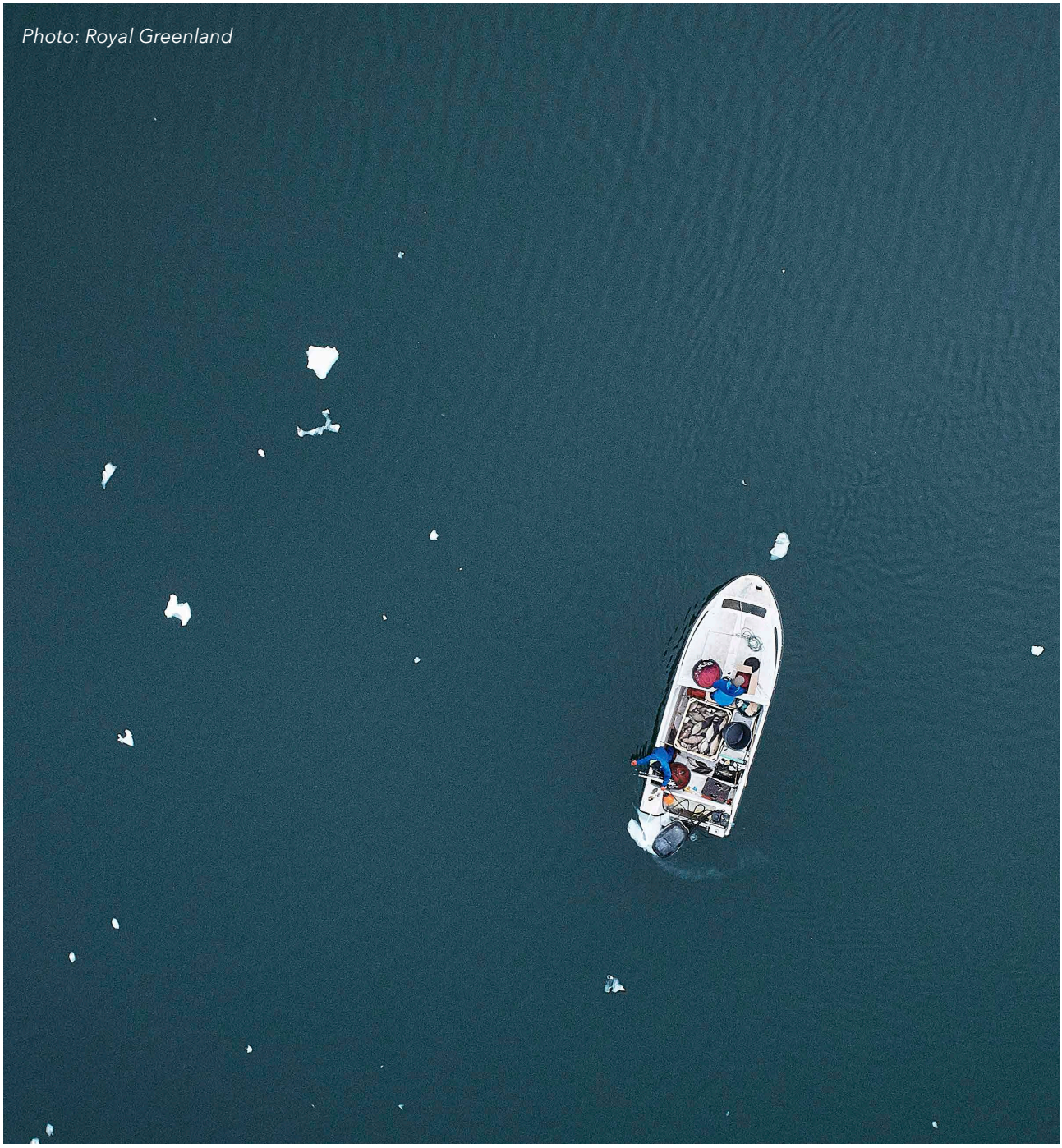

Photo: Royal Greenland