

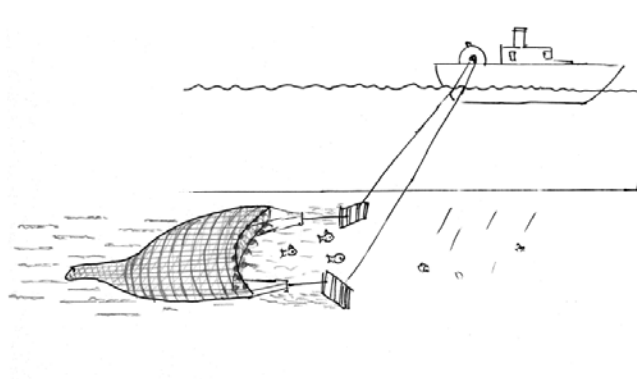
## Exercise I – Material I7

### The environmental impact and sustainability of fishing methods

The Greenland halibut is a deep-sea flat fish living from 500 metres down to 1 kilometre below the surface. It lives on the fishing banks of Greenland as well as along the coastline and in the fjords. Though not entirely certain, halibut is according to marine biologists breeding on the banks.

Being a flat fish, Greenland halibut lives close to the seabed, which defines the fishing techniques used. These are either trawl nets with weights keeping them down to the seabed most often used when fishing in open waters on the banks far from the coast. In the coastal waters and in the deep fjords long lines with hooks attached with bait and to lesser extent drift nets are used.

Due to the government's fishing regulations, big trawlers are not allowed for coastal (inshore) fishing which is defined as 20 sea miles from shore.



The trawl net is kept open by adding two heavy steel otter boards (floaters) that keeps apart the two sides of the trawl net and at the same time helps keeping the net deeper into the ocean. Trawl nets catch everything that goes in to the opening - the fore net - of the trawl net. The only way smaller fish can escape is through the net masks and estimates indicate that 10-20% of these do not survive. A challenge when using trawls is

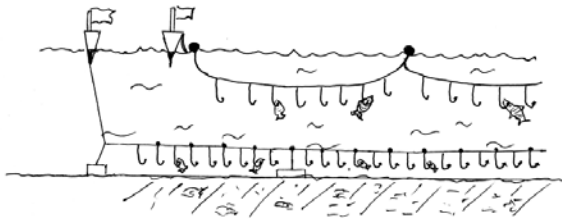
also that fry sticks to the net due the slime that protects their skin. This fry must be cleaned from the net by high pressure flushing.



Trawl nets are drawn by the trawler and need to be kept close to the seabed, which is supported by adding weight to the net. This has destructive impact of the seabed ecology as it destroys vegetation, corals, etc. This implies that trawling is only possible when the seabed is not too uneven and rocky. Heavily fished areas have shown a reduction in bottom

dwellers of up to 70% as a consequence of trawling.

Using long lines does not destroy vegetation on the seabed. However, there appear to be a by catch using long lines that has to be accounted for, though this is less than found in trawls as

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certain species do not swallow the hooks of the long lines. The long line also does less damage to the fish, but more labour goes into this way of fishing including drawing up the long lines, maintaining the long lines, handling of single fish and adding bait to each of the hooks.

General data are not available for fuel consumption, but an estimate is that trawling in total uses 2-3 times the fuel compared to long line fishing.

Fishing methods governance

Two orders from the Ministry of Fishery in Greenland are of special importance for the fishing methods employed. They define requirements for fishing gear and by-catch respectively.

The first order, no. 12 from 2011 states technical protection measures for fishery by defining minimum sizes for net masks in §6 and §7 (§ referring to a paragraph in a law). The mask size is defined as the inner measure of the whole mask (one corner knot to the opposite) and relates to all parts of the trawl net. These measures are as follows: prawns min. 40 mm, polar cod min. 16 mm, Atlantic herring and mackerel 2 min. 32 mm, crab min. 70 mm, blue whiting 260 mm, redfish and lumpfish min. 100 mm, driftnets used for Greenland halibut min. 220 mm and trawl min. 140 mm.

In §9 it is stated that it is allowed to add protection to the downside of the trawl net against seabed rocks as well as to mount a stone basket of the maximum size of 4 square metres to the nets downside as weight to keep the trawl nets down. §10 prohibits fishing with trawl within a 3 sea mile boundary from the coastline, which in the case of halibut is set to be 20 sea mile.

The second order, no. 14 from 2011 states the amount of by-catch allowed by fishing. In §2, by-catch is defined as fish not being part of the licence of the fisher and catch below the defined minimum length from head to tail. This minimum length is e.g. for cod set to be 40 cm, for Greenland halibut 42 cm, for redfish 32 cm and for crab a body shell size of 10 cm. §3 states that the authorities define the maximum amount of by-catch that is acceptable. In general, by catch including too small fish must be weighed, registered and returned to the ocean.

In §6 it is stated that by-catch exceeding 10% in a specific draw, the trawler must relocate to a position that is at least 5 sea mile away from the areas in which the trawler has been fishing the last 60 hours, as this is defined as the maximum by-catch. Alternatively, the trawler can

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install new equipment to their trawl that by technical means will reduce the by-catch. In §10 it is stated that the by-catch on board must in any case not exceed 10% after 10 days.

### Quota and staffing governance

Fishing in Greenland waters within the 200 sea mile territorial line is for halibut regulated by annual quota for the amount in tons of halibut to be caught and for the fishing method to be used. In the coastal areas and fjords only long line and gill net fishing is allowed and only fishing boats not exceeding 7.5 BRT (total registered tons). Generally, the above mentioned regulations of fishing nets and by-catch are mandatory.

In 2014, these regulations set a maximum catch of 26.400 tons in the coastal areas, 15.000 tons off-shore in western Greenland off shore fishing and 6.800 tons in eastern Greenland. Of these off shore quota were 3.900 tons given to Norwegian, Russian and Faeroe Island fishing trawlers and 9.600 to EU fishing trawlers.

In the coastal fishery, all fishermen and boats must be registered in Greenland. The off-shore quota are divided as shown between trawlers with Greenlandic ownership by companies registered and paying taxes in Greenland and those with foreign ownership.

Also the staffing of the fishing trawlers are regulated with a demand for the composition of staffing in three different categories: officers, fishermen on deck and machinists and technicians under deck manning the machinery and production facilities. For officers 60% of the staff shall come from Greenland, while 100% of the fishermen on deck are required to have a Greenlandic background. There are no demands for the composition of the technical staff.

### Actually observed fish sizes and by catch

The catch of Greenland halibut has been investigated in a number of research projects. They seem to support that the size of fish is slightly bigger when using long lines. Research has found that an average of 60 cm size of the Greenland halibut using long lines compared to 50 cm when a trawl is used. This is due to the relative catch and not least the selectivity of methods and that the stock in the coastal waters and fjords seem to comprise of larger halibut.

Precise numbers of the by-catch size are difficult to obtain, but a rough estimate could be that the 10% set as the maximum by regulation also is what mostly is obtained. Though, 15% of by-catch is not uncommon in single draws. The smaller sizes indicate younger halibut in combination with the lower selectivity of the nets when using trawl nets is crucial for sustainability.

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