Ministry of Food, Agriculture
and Fisheries of Denmark
Danish Fisheries Agency

Electronic monitoring in the Danish Kattegat (3AS) *Nephrops* fishery

Evaluation on phase 1 of the project

Colophon

Report on

Electronic monitoring in the Danish Kattegat (3AS) *Nephrops* fishery - Evaluation on phase 1 of the project

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Original Title

Elektronisk monitorering af jomfruhummerfiskeriet i Kattegat - Evaluering af projektets fase 1

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Summary

In connection to the council meeting (agriculture and fisheries) in December 2019, it was politically decided to introduce electronic monitoring in the majority of Danish fisheries with towed gear in the Kattegat[1]. The framework of the project was established in August 2020 in a Common Understanding paper between the former Minister of Fisheries Mogens Jensen and the Danish Fishermen's Association (DFPO). It was agreed that the project would be implemented in two phases, with the first phase running until 1 October 2021, and that phase 1 should undergo an evaluation process.

This report present the evaluation of phase 1. The evaluation is based on an evaluation concept, which has been discussed in the observer committee of the project. The observer committee includes DFPO, the Danish Society for Nature Conservation, WWF, Greenpeace, OurFish, DTU Aqua, the Ministry of Food, Agriculture and Fisheries and the Danish Fisheries Agency. The report is divided into five parts.

Part one describes the framework and set-up for the monitoring project, including the organization, method and regulations. The evaluation is based on data from the Danish Fisheries Agency, contributions from the National Institute of Aquatic Resources (DTU Aqua), and responses from a questionnaire survey sent to the 12 vessels that have participated in phase 1 of the project. The regulation consists of Executive Order no. 984 of 25 June 2020. This allows the Danish Fisheries Agency to designate vessels, which are to install electronic monitoring with camera documentation provided they have had an average of more than 20 days at sea in the Kattegat during a reference period. It also specify the conditions for the participating vessels, including the requirement that the equipment must always be functioning during fishing trips in the Kattegat. In addition, the general EU regulation (the Common Fisheries Policy and associated implementing rules) lay out the specific conditions for how the landing obligation is to be implemented, including which species are exempted as a result of e.g. a *de minimis* exemption (e.g. whiting). In addition, the first part describes the installation process, which took longer than expected. By mid-April 2021, all 12 vessels were equipped with electronic monitoring systems. The delay was due to i.a. COVID-19 restrictions, and that instalment took longer than anticipated. Finally, the electronic monitoring system is described. The sensors installed on the vessel detect when the gear is set, after which the cameras begin to record. Recordings are stored in the blackbox (computer) on the vessel, from which the Danish Fisheries Agency can request video sequences for audit.

Part two describes the specific framework of the project, which covers the species cod, haddock, hake, saithe, whiting, and spurdog and presents an overview of the spatial distribution of cod discards. In addition, the amount of discards observed during audit for the selected species during the project period is presented. Data show that discarding of species subject to the landing obligation happen. For cod, haddock and hake the discard ratio at the beginning of the project period is 6 %, 7 % and 27 % respectively, but this decreases significantly to 2 %, 1 % and 3 % respectively, after a period where the vessel owners and skippers have received guidance on the landing obligation by the Danish Fisheries Agency. This is a clear indication that guidance have had a clear, positive effect on the amount of discards. Comparison of the observed discards of cod for

[1] **Statement on a project on fully documented fisheries in the Kattegat (Denmark)**: The project will cover the majority of the Danish fisheries with bottom trawls in the Kattegat.

vessels with electronic monitorering to the estimations made by DTU Aqua for the total Danish fishery in the Kattegat in the previous year (2020), a considerable lower amount of discards is observed on the vessels with electronic monitorering. Based on their scientific observer programme, DTU Aqua estimate a discard ratio of approx. 65% in 2020 for cod in the Kattegat. It should be noted that the total cod catches in the Kattegat has been very low in the last couple of years because the cod stock is in a poor state. In absolute terms, discards are low (less than 0.1 tons per species) excluding whiting, for which discarding is allowed, and spurdog, for which discarding is mandatory because it is a protected species. For the species cod, haddock, hake, saithe and whiting, data show that the majority of discarded fish are below the minimum conservation reference size.

Part Three concern electronic monitoring as a control tool. In phase 1 of the project, 10 % of all fishing activities made by each of the 12 vessels were selected for control by video auditors in order to ensure sufficient representation. It has been an essential part of the project to ensure the anonymity of the participating fishers. To do so, masking has been added to the video recordings. A mask is a black area within the field of view of the cameras that thereby is hidden, for example areas where the faces of fishers otherwise would be recorded. In general, camera documentation ensures a high-level of documentation of the catch process, including whether discarding occur, as video quality is generally high and possible sources of error (including missed discards, incorrect species identification or incorrect length determination) have been minimized as much as possible. Therefore, there is a basis for video recordings to be used as documentation for sanctioning of non-compliance with the landing obligation in the future — possibly supplemented by data on the recordings of undersized fish in the logbook. The third part also present considerations regarding a possible *de minimis* limit and the possibilities of easing parts of the current control elements through the introduction of electronic monitoring.

Part Four describes how the electronic monitoring system has functioned during the project period, and how errors and malfunctions have been handled. Overall, the malfunctions that have occurred, have not significantly impeded the fishing activities — and errors have typically been remedied swiftly enough for the vessel concerned to have lost no more than one fishing day. Nothing suggest that the electronic monitoring system itself has been difficult to operate for the participating vessels, and only two vessels have asked for more information in the feedback reports provided by the Danish Fisheries Agency. On the other hand, a new eLog system, which turned out to be flawed, has definitely been a nuissance to some of the vessels, and has possibly had an impact on the quality of data, although there is no specific indications that this has limited the fishing opportunites of the vessels. In general, the Danish Fisheries Agency's IT system has operated satisfactorily, and the time spent on video audits has decreased during the project period.

Part Five describes in detail how "face masking" works and summarizes the fishermen's experience of the project in terms of impact on the working environment. This is based on the replies submitted to a questionnaire survey made by the Danish Fisheries Agency. Several of the participating vessels state that the project has had a negative impact on their working environment by creating a sense of being under suspicion and a general uncertainty. Three participants state that the project has had an impact their recruitment and retention of crew. However, there is no indication that the project — beyond the installation period itself — has led to a significant loss of fishing days. Only one participant responds that the project has given rise to a change in the catch sorting process. Based on an analysis by DTU Aqua, it is not possible to conclude whether the 12 vessels differ from the general Danish *Nephrops* fleet in the Kattegat. DTU Aqua state that

electronic monitoring can improve the quality of data used for mapping of the impact of fishing compared to the current data sources (logbook and VMS).

The conclusion of the evaluation state a number of recommendations for phase 2 of the project (Annex 10). DFPO do not agree with all recommendations. Annex 10 shows what DFPO agree on.

1.0 Introduction

Electronic monitoring with camera documentation is used or tested in a number of countries around the world, including Australia, Canada, Chile, New Zealand, Peru and the United States[2]. In the EU, Denmark and Scotland in particular have had large scale projects with a long duration concerning electronic monitoring with camera documentation, such as the Danish trials on catch quota management and camera documentation in the North Sea and Skagerrak from 2010-2016[3].

In connection with the setting of the quotas for 2020, it was politically decided that electronic monitoring with camera documentation should be introduced in the majority of the Danish fisheries with towed gear in the Kattegat[4]. The reasoning being, among others, that the cod stock in the Kattegat is in a very poor state, which has been the case for a number of years.

It follows from Denmark's statement at the Council meeting that the project will be implemented in several stages until 2022. In August 2019, the former Minister of Fisheries Mogens Jensen and the Danish Fishermen's Association (DFPO) agreed on a Common Understanding (Annex 9) in which the detailed framework for the project is stated. It was decided that phase 1 of the project were to cover 10-15 vessels and that:

'The lessons learnt shall be continuously evaluated by the observer committee throughout 2021 and an overall evaluation shall be made as of 1 October 2021'.

The main purpose of using electronic monitoring with camera documentation in the *Nephrops* fishery in the Kattegat has been to demonstrate compliance with the landing obligation and to assess electronic monitoring as a control tool.

This report presents the evaluation of phase 1 of the project. Phase 1 involved 12 voluntary vessels, which DFPO found among its members. These 12 vessels have been able to fish while following previously applicable technical rules[5], while other vessels in the Kattegat fishing with towed gear are required to use specific selective gears. The evaluation does not include an assessment of the status of the cod stock in the Kattegat.

1.1 Method

The evaluation has been written based on the evaluation concept of 5 July 2021 (Annex 1), which has been discussed in the project's observer committee, steering committee and with DFPO (where the 12 vessels involved in phase 1 of the project are organized). The evaluation is based on data from the Danish Fisheries Agency (BlackBox Analyser data, video recordings, eLog data), contributions from DTU Aqua, and replies from a questionnaire survey sent to the participating vessels (Annex 5).

[2] Catalyzing the Growth of Electronic Monitoring in Fisheries, Progress Update August 2020
[3] Final Report on Development and usage of REM systems along with electronic data transfer as a measure to monitor compliance with the Landing Obligation – 2016. DOI: 10.13140/RG.2.2.23628.00645
[4] From a statement made by Denmark at the council meeting 16- 17 december 2019
[5] Among others Seltra panel with a mesh size of 270 mm.

1.2 Regulation

Executive Order No 984 of 25 June 2020 constitutes the legal basis for the project (see Annex 2 sub-Annex 3). The Executive Order allows the Danish Fisheries Agency to inspect and install an electronic monitoring system on vessels that have had an average of 20 or more days at sea per year in the Kattegat since 2017. The Executive Order cover fishing activities in the Kattegat and specifies, that it is the responsibility of the vessel owners to ensure that the electronic monitoring system is operational at all times when fishing in the Kattegat. Furthermore, the Executive Order states that the vessel owner is responsible for the data, that the Danish Fisheries Agency has access to the data from the vessel, and that the Danish Fisheries Agency may use data for statistical and control purposes, as well as hand over data for research purposes.
The control purpose of electronic monitoring is primarily to ensure compliance with the landing obligation. Twenty species are subject to the landing obligation in the Kattegat in 2021, which mean that they must always be taken ashore and registered. The landing obligation is part of the Common Fisheries Policy of the EU and is enshrined in the Common Fisheries Policy (Regulation (EU) No 1380/2013 of the European Parliament and of the Council) and is implemented through a number of delegated acts. Fish above the minimum conservation reference size (MCRS) must be registered as landings, while fish below the MCRS must be registered as Below Minimum Size (BMS). However, a number of species are subject to derogations, whereby they can be discarded but discards must be registered in the electronic logbook (eLog). This is the case for example for rays, which can be discarded on the basis of high survival, and whiting that can be discarded due to a de minimis rule. In addition, protected species must be registered and discarded.

1.3 Organization of the project

As part of the start up the project, an organization of the project was established within the Fisheries Agency with a steering committee, a project group and an observer committee (Fig. 1). The steering committee is chaired by the Director of the Danish Fisheries Agency and makes decisions concerning the design, finances, implementation and ongoing progress of the project. The project group has been responsible for preparing presentations for the steering committee, preparation of the tender, IT systems, etc. and was, as of November 2020, extended with a camera team responsible for the day-to-day operation of the project. During this process, the project group also set up temporary working groups on, for example IT-related issues. The observer committee consists of a number of stakeholder organizations, who follow the project, and are consulted on important decisions regarding the progress of the project. The day-to-day operation of the project is run by the Danish Fisheries Agency's camera team.

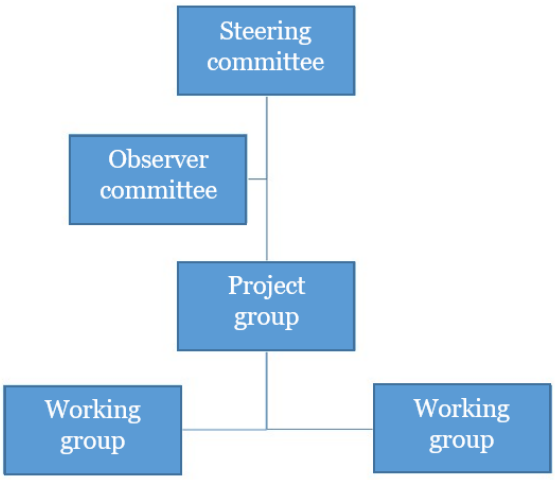


Figure 1. Project organization for the project on electronic monitoring of Nephrops fisheries in the Kattegat.

1.4 Installation process

The installation process in phase 1 began with the first contact to some of the vessel owners on 6 November 2020. In respect with the voluntary participation in the project, the 12 vessel owners were allowed to decide, which installer they wanted to make the installation of the electronic monitoring system, and the Danish Fisheries Agency made inspections in the ports on the dates and times the vessel owners had expressed were favorable to them. Present during the inspection was the camera team, vessel owner and at times the crew, an installer (ship electrician), the regional control and a representative from DFPO. Together with the vessel owner and installer, the placement of the components of the electronic monitoring system was determined.

All participating vessels have individual designs, and it can be challenging to find the right setup for the electronic monitoring system. The cameras must be able to record the catch processing areas, while not obstructing or being obstructed by the on-board working process. In addition, the cameras must be mounted safely and in a way where the occurrences of dirt and water droplets are minimized (as the cameras are rounded, an inevitable water droplet will be right in front of the lens, if the camera is not installed with at an angle). During the inspections, a plan was prepared for the installation of each vessel. An example of this is presented in Fig. 2. This plan is part of the individual vessel monitoring plan, which also hold a picture from each camera (after masking), a description of the individual components and their functions, a start-up guide, the vessel owners responsibility during fishing, an action plan for each component in the event of a breakdown in port or during a fishing trip, a guide to fishing outside the Kattegat, guidance for further information on the landing obligation, the Executive Order on the project and the Common Understanding paper (see Annex 2).

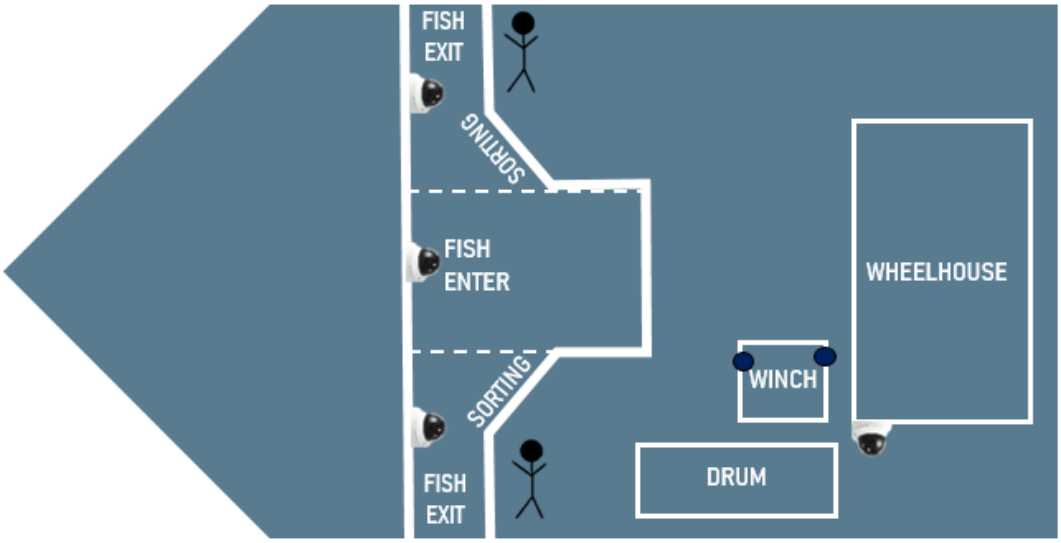


Figure 2. An example of a plan for the placement of the different components of the electronic monitoring system (rotation sensors (blue dots) and cameras).

The map below (Fig. 3) shows the month of installation for vessels participating in the project. Each vessel is represented by a dot in the port where the installation was done. The color of the dot shows in which month the installation was finished on the vessel.

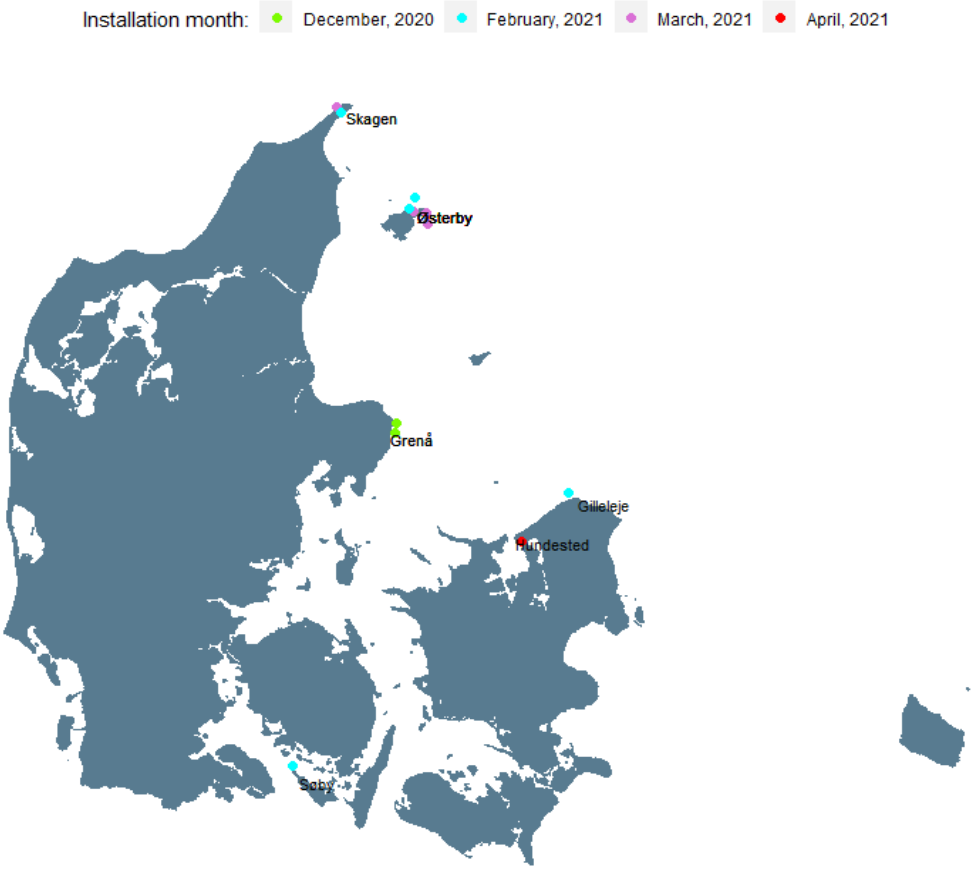


Figure 3. Overview map of ports where installation took place with coloration at each port based on which month the installation was finished.

Despite of COVID-19, all 12 participating vessels were inspected for the placement of the electronic monitoring system components by the end of 2020. However, it was only possible to complete the installation of the electronic monitoring system on two vessels before the end of 2020.

By mid-April 2021, all 12 vessels had an electronic monitoring system installed. This was later than expected and can be attributed to several circumstances, including Covid-19, and that not all of the selected installers had sufficient time/capacity to install the electronic monitoring system satisfactorily.

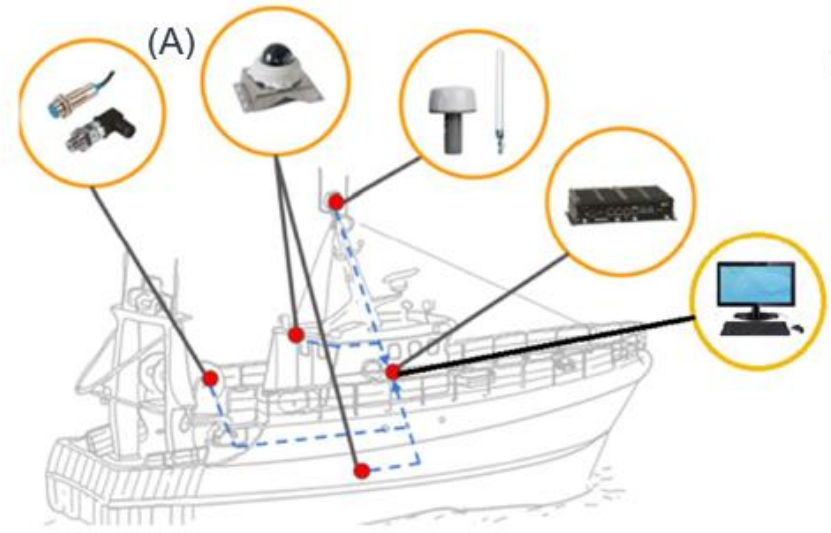
Based on the experience from the installation process in phase 1, it takes three working days to set up an electronic monitoring system system on a vessel.

1.5 How does the electronic monitoring system systems work?

The Black Box VX system installed on the selected vessels consists of a control box, sensors, GPS and GSM antenna, UPS and cameras (Fig. 4A). The control box is a computer that connects and stores input from the various sensors and cameras. The software of the system is designed to handle and control sensors and cameras, store sensor data and video material, present the information on a screen in the wheelhouse and transmit data online, including video data. The components of the electronic monitoring system are shown in Figure 4B.

The rotation sensors are located at the vessel's winch or drum. They record when the winch is active, i.e. when the gear is set and the fishing operation begin, and when the gear is hauled and catch is taken on board the vessel. At first activitation of the sensors on the winch on a trip, the cameras will start to record.

A GPS logs the vessel's position every 10 seconds throughout the fishing trip. On a screen in the wheelhouse the vessel owner can see everything the cameras record. The recordings will stop when the vessel arrives in port or leaves the Kattegat. All information is stored on the vessel and can subsequently be retrieved for processing by the Fisheries Control Office.



(B)

Components	Amount
Rotation sensor	2
Camera	4-7
GPS Antenna	1
GSM Antenna	1
UPS	1
Control box	1
Light sensor	0-1

Figure 4. Black Box VX components and their placement on board a vessel.

Based on sensor data, the Danish Fisheries Agency request video sequences for control. This is done to verify compliance with the landing obligation. Using the GSM antenna, these video sequences are automatically transmitted via the internet after request from the Danish Fisheries Agency when the vessel is within 2, 3 or 4G range.

The Danish Fisheries Agency retrieves and audit the video sequences using Anchor Lab's software, Black Box Analyzer. The video sequence is deleted immediately after audit, provided that no infringements with the landing obligation are observed. If an audit of a video sequence reveals non-compliancw with the landing obligation, the video sequence can be stored until a possible process following the infringement has been completed. After this, the video sequence is deleted.

As long as the video sequences are only on the vessel's hard drive, it is the vessel's personal data and others do not have rights to access the recordings. Once video sequences have been transmitted for audit to the Danish Fisheries Agency, they will be covered by public access and therefore everyone can apply for access to the recordings.

If access to a video sequence is requested before it is deleted by the Danish Fisheries Agency, the recording will in principle be released. Any video sequences where, due to workflow, parts of the crew have come within a non-masked area of the filming, will be blurred using a video editing program before the recordings are handed over to those who have applied for access to the video.

2.0 Catch and discard data

2.1 Framework

From the beginning of the project, it was decided that the focus would be on six species in phase 1. Thus information would not be systematically collected on all species included in the catches for each vessel. The reasoning being that not all species subject to the landing obligation, and according to the Common Understanding phase 1 of the project was aimed at building up experience and competence in relation to validation of material, etc. In phase 1, the focus has therefore been on the following species:

- Cod (*Gadus morhua*)
- haddock (*Melanogrammus aeglefinus*)
- whiting (*Merlangius merlangus*)
- hake (*Merluccius merluccius*)
- saithe (*Pollachius virens*)
- spurdog (*Squalus acanthias*)

Cod, haddock, hake and saithe are all subject to the landing obligation meaning that all catches must be taken ashore no discarding is allowed for these species. Whiting can be discarded because of a *de minimis* exemption while spurdog is a protected species and therefore must be released back to the sea. All discards of whiting and spurdog must be registered. Spurdog was included in the project by request from DFPO, because the electronic monitoring project was seen as an opportunity to aquire data and thereby document the stock and create a basis for conducting a pilot for spurdog in the same way as the current possibilities allowed through the TAC and quota regulation for certain waters but not currently the North Sea, the Skagerrak and the Kattegat. As the project has primarily aimed to investigate the applicability of electronic monitoring with camera documentation in relation to compliance with the landing obligation, only discards have been registered consistently. A major reason for this is that at the start of the project it was uncertain how much time would be needed per video audit of each catch handling. The needed time would be longer if the audits of video sequences were to cover the entire catch, since this would mean that species identification and length measurements would have to be done for both discards and landing. The evaluation thus focuses only on the discards of the above-mentioned focus species. The Danish Fisheries Agency is currently looking into the possibility of expanding the number of registered species, as well as species identification and length measurements of landings of certain other species. Since this has not been done from the beginning of phase 1 of the project, this work is not included in this evaluation.

2.2 Spatial distribution of fishery and bycatch of cod

Fig. 5 below show the spatial distribution of discards of cod in the Kattegat (ICES squares) from 1 January to 18 August 2021 based on audited video sequences.

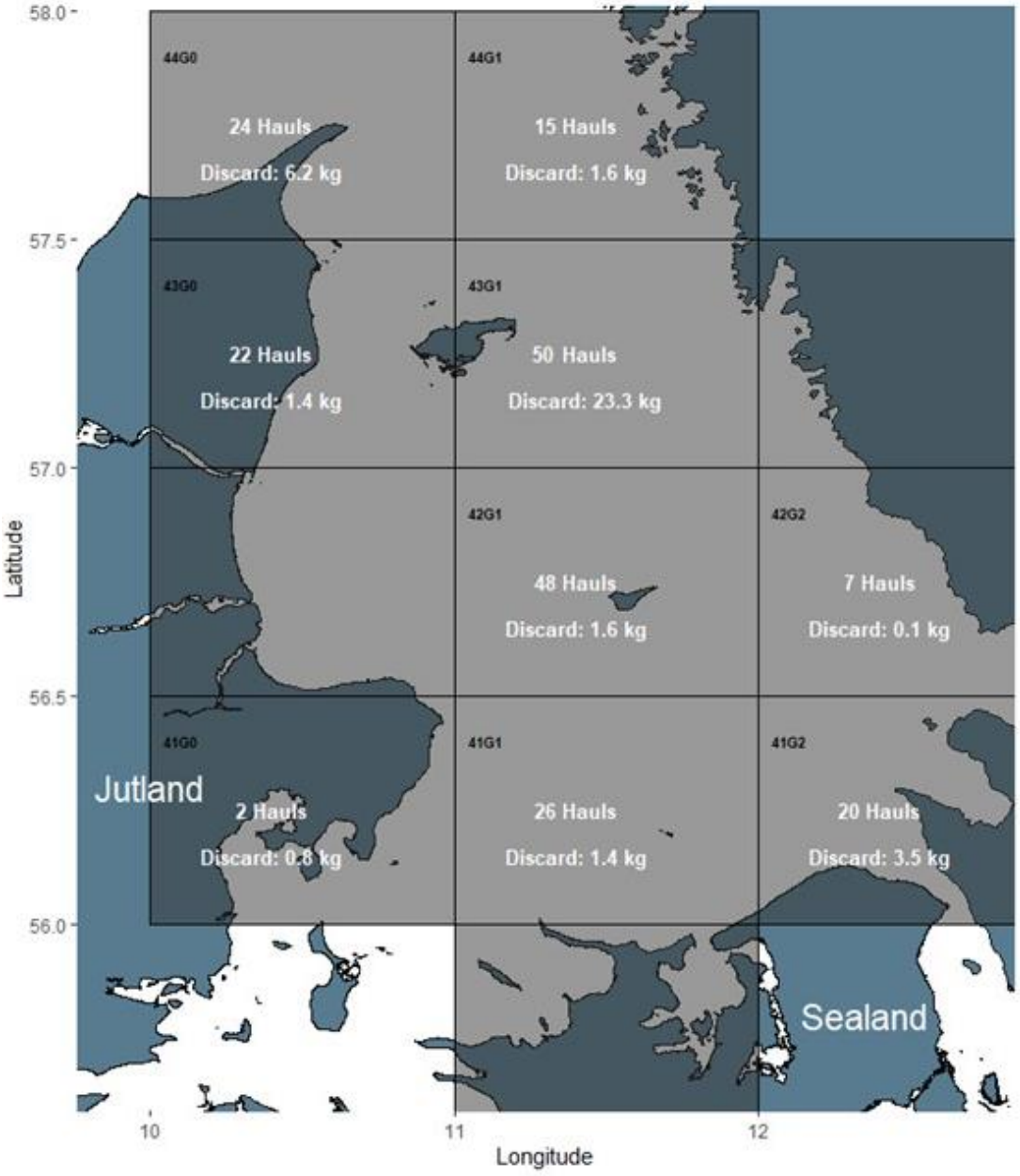


Figure 5. Discards of cod (estimated weight in kg based on the length measurements from video audits). Number of hauls are the total number of hauls carried out in the ICES square by vessels partaking in the project where it has been possible to link records of ICES square for the haul in the eLog with EM data.

A total of 214 hauls are discplayed. The majority of these are distributed in ICES square 43G1 og 42G1, with 50 hauls and 48 hauls respectively. The majority of discards of cod are registered in ICES square 43G1, where 23.3 kg cod has been seen discarded during video audits. This is more than in all other ICES squares in the map taken together. The map consist of discard data based on the electronic monitoring attibuted to the ICES square in which the hauls was done based on eLog registries. For 61 hauls it has not been possible to link data from eLog to data from the electronic monitoring. A total of 275 hauls have been selected for control and audited in the period. Corresponding maps for haddock, hake, whiting and spurdog can be found in Appendix 6. It has not been possible to make a similar map for saithe. This is assumed to be due to the fact that hauls

where saithe have been seen discarded during video audits are among the 61 hauls where it has not been possible to link eLog and electronic monitoring data.

2.3 Extent of cod bycatches in the Nephrops fishery (eLog), including total catches of Nephrops and cod.

The landing obligation for cod in the Kattegat was introduced by the Common Fisheries Policy of the EU. As part of the scientific work in different fisheries in the Danish waters, DTU Aqua monitor a number of fishing trips with onboard observers.

For 2019 and 2020 were the landing obligation had been introduced, DTU Aqua estimated that the total discard of cod in the Danish fishery in the Kattegat was 33 and 44 tonnes, respectively. In the table below the estimated discard and landings of cod in 2019 and 2020 are presented.

Table 1: Estimated discard of cod in the Kattegat in 2019 and 2020 based on the observer program run by DTU Aqua and registered landings (Danish fishery).

Year	Catch (tonnes)	Landings (tonnes)	Discard (tonnes)	Discard ratio (%)
2020	68	24	44	65
2019	97	64	33	34

Source: Observerdata from DTU Aqua and the webpage of the Danish Fishery Agency

Informations from DTU Aqua's observerprogramme is not available for 2021 yet and it is therefore not possible to compare data from the project with electronic monitoring with observer trips in 2021. Additionally, vessels not taking part in the projet with electronic monitoring are now obliged to use mere selective trawl gear than what was possible to use in 2019 and parts of 2020.

Information of the total fishery in the current period can thus only be estimated based on the fishers' own registrations in eLog, sales slips and declarations of landings.

The table below shows the total catch calculated per 16 August 2021 for all vessels with bottom trawls fishing in the Kattegat where the catch value of *Nephrops* exceeds 50% of the total catch value on the fishing trip.

Tabel 2a: Catch for human consumption, fishers' own BMS registrations, value of catches of the species and percentage of value of the species for all vessels with bottom trawls, where the catch value of Nephrops exceeds 50% of the total catch value on the fishing trip in the Kattegat (105 vessels in total).

Species	Catch for human consumption	BMS	Value according to sales slips	Percentage of the total value
Nephrops	1,040,729 kg	819 kg	58,466,888 DKK	90.5 %
Cod	8,122 kg	2,726 kg	161,584 DKK	0.3 %

The table below shows the same as table above but solely for the 12 vessels fitted with electronic monitoring with camera documentation. The table only covers the period in which the vessels had had an electronic monitoring system installed.

Tabel 2b: Catch for human consumption, BMS records, value of catch of the species and percentage of value of the species for vessels with camera documentation in the Kattegat (12 vessels in total).

Species	Catch for human consumption	BMS	Value according to sales slips	Percentage of the total value
Nephrops	156,272 kg	209 kg	8,420,187 DKK	88.6 %
Cod	1,807 kg	1,245 kg	34,280 DKK	0.4 %

The 12 vessels with EM are included in the 105 vessels covered in table 2a. By comparing the landings and registrations for the two segments in the evaluation period (with and without camera documentation) it can be seen that vessels with camera documentation account for approx. 15% of the total landings of *Nephrops* in the Kattegat during the period, approx. 22% of the total landings of cod and approx. 46% of the total registrations of BMS cod.

2.4 Discarding of cod and focus species based on video audit

Table 3 below show the proportion of discards observed during video audit compared to the total catch registrations in the logbook (BMS, landings, discards, and *de minimis*)[6]. The column with percentage indicates how large a share the observed discards from video audits comprise of compared to the total catch registered. It is not possible to enter deliminated numbers in the eLog. The estimated weight based on length measurements of discards seen on video recordings is therefore rounded to the nearest kg. As an example: 44 kg of cod discards are estimated by video audit which account for 5.15% of the 810 kg of cod registered in the logbook (both BMS and landings for human consumption).

Numbers in the table are for all vessels, fishing trips and hauls where video audit have been done. The total catch in eLog is thus not the total catch for all 12 vessels in the entire period, but the total catch for all fishing trips where video audits have been done.

Tabel 3: Discards compared to total catches (BMS, discards, landings) in the logbook for fishing activities audited for control of focus species in phase 1 until 18 August 2021.

Species	Total discard, video audit, kg	Total catch registered in eLog, kg	Discard video audit compated to catch in logbook (%)
Whiting	1,507	1,874	80.42
Hake	70	347	16.79

[6] Discarding of whiting is allowed as *de minimis* which mean registrations in the eLog cover both discard and landings. For cod, hake, haddock and saithe the estimated amount from video audit should have been 0 kg.

Species	Total discard, video audit, kg	Total catch registered in eLog, kg	Discard video audit compated to catch in logbook (%)
Haddock	43	710	5.71
Saithe	1	1	50.00
Spurdog	355	246	144.31
Cod	44	810	5.15

Due to the difference between whether a species must landed (cod, haddock, hake and saithe), or whether it can / must be discarded (whiting and spurdog), the percentage is calculated with or without the discard observed during video audit. Furthermore, the total discard seen during video audit is rounded to the nearest full kg. Therefore, the percentage for saithe ends up at 50.00%. There are differences between table 1, 2 and table 3 in terms of quantities and percentages. This is because tables 1 and 2 are based on logbook records, but for all fishing trips in the Kattegat (for 105 vessels and for the 12 vessels with EM, respectively). Table 3 is based on both camera data and logbooks registries, but solely for fishing trips where video sequences from the fishing activities have been audited.

Table 3 shows that discards as a percentage of total catch per species is higher for whiting (80.42 percent) than for all other species except spurdog. This is not surprising, as discardring is allowed for whiting in the Kattegat for the participating vessels. Discard ratios are lowest for haddock and cod (below 6 percent), while the discard ratio for hake is 16.79 percent. For saithe, the discard ratio is 50.00 percent, but for saithe it has to be taken into account that the total amount of discards are lower than 1.5 kg. In absolute amount, less than 0.1 tonnes are discarded for each of the species cod, haddock, saithe and hake.

Cod, hake, haddock and saithe must be taken ashore as BMS. The table below shows the estimated weight of discards for these four species in relation to the recorded amount of BMS.

Tabel 4: Discards of cod, haddock, hake and saithe compared to BMS in logbook for fishing activities audited.

Species	Discards video audit, kg	BMS eLog, kg	Discards video audit compared to BMS in logbook (%)
Hake	70	133	52.63
Haddock	43	164	26.22
Saithe	1	0	Inf
Cod	44	316	13.92

The proportion of the estimated weight of discards seen during video audit in relation to the registered weight of BMS is highest for hake (52.63%), followed by haddock (26.22%) and then cod (13.92%). For saithe, no BMS has been registered. The share is calculated as discards seen during audit divided by BMS registration, which means that if no illegal discard had been seen, the share would have been 0%.

Whiting can be discarded as de minimis, while spurdog must be discarded as it is a protected species. Discards must be registered in the eLog on a haul-by-haul basis for discard of whiting or spurdog. Table 5 below shows the estimated weight of discards for these two species compared to the registered amount of discards in eLog.

Table 5: Discard seen during audit of hauls compared to registered discard in logbooks for those hauls (de minimis for whiting, discard for spurdog).

Species	Discards video audit, kg	Total catch eLog, kg	Discards video audit compared to catch in logbook (difference in kg)
Whiting	1,507	1,602	95
Spurdog	355	246	-109

The difference between estimated weight for discarded whiting seen during audit compared to registration in the eLog amount to 95 kg which correspond to approximately 6% difference depending on whether the eLog register or the audited amount is used as the denominator when calculating the percentage. For whiting there is a higher amount registered in the eLog than what has been seen during audit of video sequences. This is a good indication of the fact that a certain uncertainty in weight exist when converting numbers and lengths of discards to an estimated weight in kg. Additionally, weight estimates onboard the vessel add to this uncertainty, e.g. because it is not possible to register decimalnumbers in eLog and the estmation made by the fishers.
The difference between estimated weight for discarded spurdog seen during audit compared to registration in the eLog amount to 109 kg which correspond to approximately 30.7% difference if the estimated amount from video audit is used as the denominator, while it amounts to approximately 44.3% if the registered amount in the eLog is used the denominator. A higher amount of spurdog is registered during video audit than what has been registered in the eLog[7].

Further assessment of the extend of discards can be achieved by comparing the registered discards with the total catch of the vessels.

Table below (table 6) show the extend of discards seen during audit compared to the total catch registered in the logbook of all catches.

Tabel 6: Discard seen during audit compared to the registered amount of total catches (all species) in the eLog.

Species	Discards, video audit, kg	Total catch in eLog, kg	Discards from audit compared to catch in logbooks (%)
Whiting	1,507	55,536	2.71
Hake	70	55,536	0.13

[7] It should be noted that the fishers are required to release of spurdog as quickly as possible in order to increase the likelihood of survival for the shark.

Species	Discards, video audit, kg	Total catch in eLog, kg	Discards from audit compared to catch in logbooks (%)
Haddock	43	55,536	0.08
Saithe	1	55,536	>0.00
Spurdog	355	55,536	0.64
Cod	44	55,536	0.08

Compared to the total catch of the vessels, the share of discards amount to less than 0.15% for all species that must be landed. The amount of discards is therefore relatively small compared to the total catch for all species. It should be noted that discarding of hake, haddock, saithe and cod is non-compliance with the landing obligation as all catches of these four species must be landed.

Video sequences have been audited as vessels were fitted with an electronic monitoring system. Guidance to the vessel owners and crew has been a key element when discarding of species subject to the landing obligation was observerved during video audit. When assessing the extend of discardring it is important to take into consideration that the installment of the electronic monitoring systems have been done successively during phase 1 and that a certain "lag-time" typically exist where vessel crew and owners become familiar with the systems.

Tables below (table 7 and table 8) provide an indication of this "lag-time". The two tables show the number and estimated amount of discards seen during video audit as well as the discard ratio this amount to when compared the video audits to the registered amounts in the logbooks ((BMS, discard and/or landings). Table 7 show from 15 February to til 2 May 2021 (11 weeks) and thereby cover an early stage of phase 1, where the presence of the electronic monitoring systems was new to vessel crew and vessel owners. Table 8 show from 3 May to 18 July 2021 (11 weeks) and thereby cover a later stage of phase 1, where all vessel owners had received guidance on how to comply with the landing obligation.

Table 7: Discard information, early stage of phase 1 (15 February - 2 May 2021). Total number of fish of each species seen discarded during video audit, the average length of these in cm, the estimated total weight of these discards, the number of vessels and hauls from which the

discarding has been seen and the discard ratio for each species calculated in the same manner as in table 3.

Species	Total discards, numbers	Average length (cm)	Total discard, kg	Number of vessels	Number of hauls	Discard video audit compared to catch of the species in logbook (%)
Whiting	8,399	19.23	587.68	11	128	49.64
Hake	288	28.73	52.33	11	128	26.65
Haddock	393	19.14	34.58	11	128	7.23
Saithe	3	28.55	0.67	11	128	100.00
Spurdog	4	74.44	8.22	11	128	Inf.[8]
Cod	128	24.90	25.04	11	128	6.29

[8] No spurdog has been registered in the logbook in the early stage of phase 1. Calculation of a discard ration therefore lead to division by zero, which is not possible and return Inf.

Table 8: Discard information, later stage of phase 1 (3 May - 18 July 2021). Total number of fish of each species seen discarded during video audit, the average length of these in cm, the estimated total weight of these discards, the number of vessels and hauls from which the discarding has been seen and the discard ratio for each species calculated in the same manner as in table 3

Species	Total discards, numbers	Average length (cm)	Total discard, kg	Number of vessels	Number of hauls	Discard video audit compared to catch of the species in logbook (%)
Whiting	10,008	19.57	733.05	10	115	116.12
Hake	35	27.98	6.37	10	115	3.07
Haddock	34	21.56	4.00	10	115	1.49
Saithe	7	21.08	0.61	10	115	37.89
Spurdog	139	73.31	310.77	10	115	135.91
Cod	55	20.50	5.98	10	115	2.28

Table 7 (early stage of phase 1) cover 128 hauls carried out by 11 vessels, while table 8 (late stageof phase 1) cover 115 hauls and 10 vessels. Although more hauls have been carried out in the early stage of phase 1, less whiting have been discarded (8,399) in the early stage than in the later stage (10,008) and the discard ratio is higher for whiting in the later stage than in the early stage. For hake, haddock and cod the trend is the opposite where fewer fish are discarded in the later stage (35 discards of hake in later stage compared to 288 discards of hake in early stage , 34 discards of haddock in later stage compared to 393 discard of haddock in early stage and 55 discards of cod in later stage compared to 128 discards in early stage). At the same time the discard ratio is decreasing for these three species from 6.29% to 2.28% for cod, 7.23% to 1.49% for haddock and 26.65% to 3.07% for hake. This is an indication that dialog and guidance has induced an increased awareness on what is not allowed to be discarded but has to be taken ashore and deducted from the quota[9], although discarding is still observed albeit at a lower level. This is even more clear when looking at the individual vessels. In Fig. 7 (page 21) the discard profile for a vessel is shown. Discards decrease dramatically after a couple of calls from the Danish Fisheries Agency where guidance on the landing obligation is done. Appendix 3 show discard profiles for alle participating vessels and the overall trend is that the extend of discards of species subject to the landing obligation decrease over time.

A decrease is not seen for saithe and spurdog. Three saithe has been discarded in the early stage of phase 1 while seven has been seend in the later stage. Because of the low numbers it is not possible

[9] It is beyond the scope of the project to document the quota deduction for BMS fish seen as not being discarded during video audit. A transition to registration of landings will enable such documenation if phase 2 of the project is adopted.

to conclude anything for saithe. Spurdog has a significant increase with four discards observed in the early stage compared to 139 in the later stage of phase 1. Seasonal variation is a possible explanation for this.

In the survey among participating vessels owners, a question realtes to whether a change in the way their fishing activities are carried out has happened after the installment of the electronic monitoring system. Only one confirm a change which is stated as a change in the way the catch sorting is done (six vessel owners state ”no” to the question). DTU Aqua has made an analysis of the fishing activities for the 12 fartøjers (section 5.6). Based on this analysis it cannot be concluded whether a change in the fishing pattern has happened due to the presence of cameras onboard.

Fig. 6 below show all discards of the six focus species registered in phase 1 of theproject. The dashed line show the minimum conservation reference size (MCRS) for the species. Since one vessel hasn't fished in the Kattegat yet, the discards are from 11 vessels.

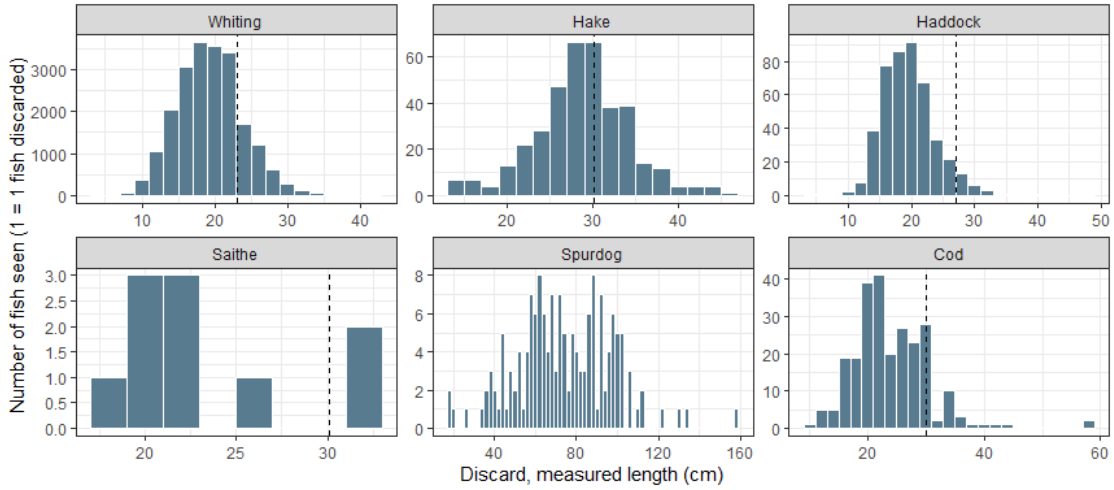


Figure 6. Histogram of registered discards. X-axis show the length of the observed discard in cm. Y-axis show the number of discarded fish (note that the y-axis has a large variation in the extend between species. For whiting the y-axis extend beyond 3000, but only 3 for saithe). Black dashed vertical lines show the minimum conservation reference size (MCRS) for the species in the Kattegat. Note that for hake, haddock, saithe and cod the histogram should be empty since discarding is a violation of the landing obligation for these species.

Table below show the share of discard measured to be below or above the MCRS for cod, haddock, hake, saithe and whiting. This is based on the length measurement made duringvideo audit by video auditors.

Table 9: Share of discards above or below MCRS. No discarding is allowed for cod, haddock, hake and saithe. The share is based on the length measurements made during video audit and an uncertainty in the length measure exist.

Species	Above MCRS	Under MCRS	Above MCRS (%)	Under MCRS (%)
Whiting	4,009	17,153	18.94	81.06
Hake	145	231	38.56	61.44
Haddock	25	427	5.53	94.47

Species	Above MCRS	Under MCRS	Above MCRS (%)	Under MCRS (%)
Saithe	2	8	20.00	80.00
Cod	29	219	11.69	88.31

The majority of discards are below the MCRS for all five species, which is legal discarding for whiting but not for cod, hake, haddock or saithe.
Discarding fish above MCRS is not allowed for species with a quota which mean that discards of whiting above the MCRS are illegal discard. It should be noted that a certain uncertainty exist in the length measurements. This is further highligted in section 3.3 but in general the uncertainty is small. If comparing with Fig. 6 it can be seen that for whiting, hake and cod several discards have a length measurement considerably above the MCRS. Overall it can be said that the majority of discards are below the MCRS.

2.5 Size composition of discarded cod

Table 10 below show the total number of discards, the average measured length in cm and standard deviation around the average, the total estimated discard in kg, the number of vessels and hauls for each species covered by video audit. Table 10 resemble table 7 and table 8 but with the difference that table 10 cover all audited hauls in phase 1 as of 18 August 2021. 32 hauls are therefore included in table 10 which are not covered by table 7 or table 8.

The average length of discarded cod was 23.89 cm with a variation of ±6.52 cm. The MCRS for cod in the Kattegat is 30 cm. Compared with the previous table 9 it can be seen that the majority of cod discards (88%) are below the MCRS.

Table 10: Discard information, numboer of discards, average length and standard deviation in cm, estimated weight and the number of vessels and hauls from which the discard numbers have been drawn.

Species	Total discard, numbers	Average length in cm and SD	Total discard, kg	Number of vessels	Number of hauls
Whiting	21,162	19.38 (4.52)	1,507	11	275
Hake	376	28.74 (5.62)	70	11	275
Haddock	452	19.64 (4.43)	43	11	275
Saithe	10	23.32 (4.73)	1	11	275
Spurdog	157	73.70 (23.06)	355	11	275
Cod	248	23.89 (6.52)	44	11	275

Table 11 below show the same amount of discards as shown in table 10 but with a division on whether the individual fish has been measured as being below or above the MCRS during audit.

Table 11: Discard number, length of discarded fish and estimated weight of discards grouped by whether discard was above or below MCRS of the focus species[10].

Species	Total number of above MCRS discards	Average length of above MCRS discards and SD	Total weight of below MCRS discards, kg	Total number of below MCRS discards	Average length of below MCRS discards and SD	Total weight of below MCRS discards, kg
Whiting	4,009	26.06 (2.58)	604	17,153	17.81 (3.28)	903
Hake	145	34.02 (3.48)	41	231	25.42 (3.90)	29
Haddock	25	30.30 (4.40)	8	427	19.02 (3.56)	35
Saithe	2	31.38 (0.03)	1	8	21.31 (2.36)	1
Cod	29	35.60 (7.04)	16	219	22.34 (4.59)	29

The table above show, as table 9, that the majority of discards are below the MCRS. The share of fish above the MCRS depend on whether this is presented based on number of fish or amount in kg. This is due to the fact that more fish below the MCRS are need to make up 1 kg than the number of fish above the MCRS. Registations in logbooks and landing declarations as well as Last Haul control only register the amount of fish by weight (kg). Both number, length and amount of fish are input for stock assessment. Electronic monitoring with camera documentation thereby allow for better data for stock assessment than the current data from logbooks and Last Haul, which only register in kg.

2.6 Summary

Data from electronic monitoring with camera documentation show that discarding of species subject to the landing obligation occur. For cod and haddock the share of discards is relatively small (around 5%) while it is higher for hake (roughly 15%). Compared to the total catch of all species the amount of discards of focus species small. Yet the discards should have been landed and deducted from the quota accordring to regulations. Discards decrease significantly after vessels have had the electronic monitoring systems installed for a while and recieved guidance on the landing obligation from the Danish Fisheries Agency. Data show that the majority of doscards are below the MCRS. It should be noted that increased registrations of BMS fish and data on the numbers and lengths of illegal discards are data which cannot be found elsewhere except for observer data. Roughly 250 observer trips are made per year in Denmark, covering alle fisheries and areas. The observer coverage is therefore markedly below the 10% of trips, which as a minimum have been audited in phase 1 of the electronic monitoring project in the Kattegat. Electronic monitorring thereby allow for a larger pool of valid data regarding the extend of discards

[10] Division is baed on length measurements during video audit and a certain uncertainty to this exist.

in the *Nephrops* fishery in the Kattegat. These data can be used for better assessment of the fishing mortality of the stocks and thereby create a better basis for stock assessment and quota settings.

3.0 Setup for control and camera documentation as a control tool

In phase 1 of the project the benchmark for audit was set at a minimum of 10% of all fishing activites. The video sequences were randomly selected for audit except for the first available video sequences from installment of a electronic monitoring system which where always audited in order to allow for small adjustments in camera placement and masking if necessary. In cases where such adjustments were necessary, video sequences from the next fishing trip were selected for audit as well in order to ensure that the adjustments had lead to the wanted improvements

In order to ensure the best possible basis for comparison with the eLog, it was decided early in the project to audit all fishing activities (hauls) from each fishing trip, if the fishing activities took place in the Kattegat. This allow for a more robust comparison between camera observations and recordings in eLog because comparison between the two systems can be done at a trip level.

During the full span of phase 1 of the project it has not been a problem to achieve a minimum of 10% audit of all video sequences with fishing activities despite the time necessary for audit has been longer in this project than in the previous North Sea trial run by the Danish Fisheries Agency. At certain times less than 10% of fishing activites have been audited for some vessels (if solely looking at the share audited for 1 week or 1 month) but overall for the whole period, the 10% audit ratio has been obtained later or been offset by an earlier audit ratio of more than 10% for the vessel in question. A 10% audit ratio has been used, as this, based on a large number of other projects, has been assessed to be an appropriate coverage ratio to ensure a representative control. Thus, a 10% audit ratio has been used in previous projects in Europe, for example in Scotland and Denmark. Also, a audite ratio of 10% is used elsewhere in the world, for example in Canada and Chile.

When examining the different vessels in the project for the development in occurance of discards, different patterns are seen over time following guidance from the Danish Fisheries Agency which has been done throughout phase 1. Examples of this follow in Fig. 7 and Fig. 8.

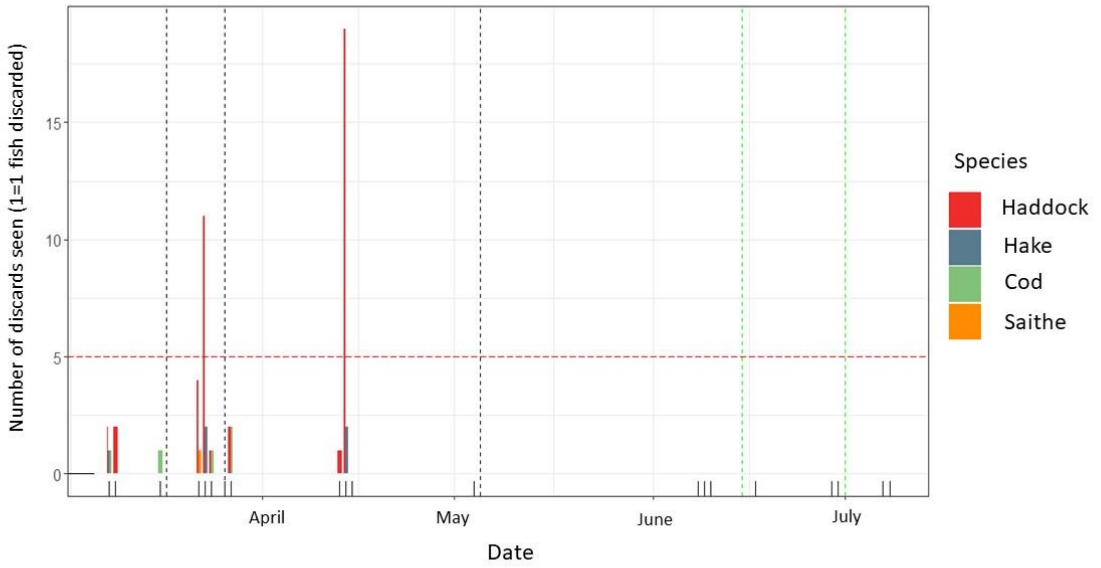
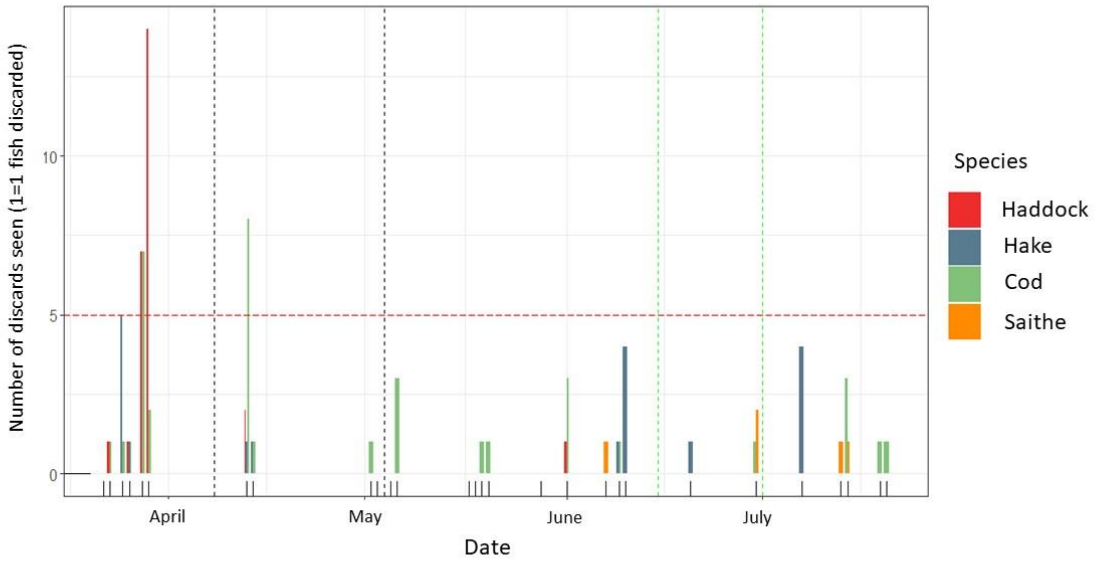


Figure 7. Discaring and guidance in the landing obligation over time for a vessel. X-axis: Date of fishing activity. Y-axis: Number of observed discards of hake, saithe, haddock and cod. Black dashed lines: Phone call or message via the BlackBox system that illegal discards have been seen during audit. Green dashed lines: Feedback report sent from the Danish Fisheries Agency to the vessel owner. Black lines on the x-axis show where the vessel has had fishing activities, which has been taken out for control and audited by the Danish Fisheries Agency. The red dotted horizontal line mark where 5 is on the y-axis. This is to make it easier to relate the examples, as there is a rather large difference between some vessels in the number of fish discarded per fishing activity. The video quality for cameras where discarding occur is 8 (± 1.96) and 7 (± 2.00), respectively, where 1 is for a video quality so low that the video is useless, while 10 is the grade for a perfect video quality.

The example above shows how the vessel initially has non-compliance with the landing obligation for haddock, hake and cod. After initial contact from the Danish Fisheries Agency with guidance in the landing obligation, this does not change (black dotted line on the far left of the figure). Likewise, there is still illegal discarding of haddock and hake after another contact from the Danish Fisheries Agency, but from May 2021, no more discards of haddock, hake, saithe or cod are seen during audit. Thus, by August 2021, the vessel has complied with the landing obligation for the focus species for nine fishing trips selected for control in a row. This indicates that the vessel has adapted its practices to comply with the landing obligation and, based on a risk-based approach, control could be targeted at other vessels.

The opposite is the case for the vessel in the example in the figure below.



Figur 8. Discaring and guidance in the landing obligation over time for a vessel. X-axis: Date of fishing activity. Y-axis: Number of observed discards of hake, saithe, haddock and cod. Black dashed lines: Phone call or message via the BlackBox system that illegal discards have been seen during audit. Green dashed lines: Feedback report sent from the Danish Fisheries Agency to the vessel owner. Black lines on the x-axis show where the vessel has had fishing activities, which has been taken out for control and audited by the Danish Fisheries Agency. The red dotted horizontal line mark where 5 is on the y-axis. This is to make it easier to relate the examples, as there is a rather large difference between some vessels in the number of fish discarded per fishing activity. The video quality for cameras where discarding occur is 9 (± 0.71) and 9 (± 0.52), respectively, where 1 is for a video quality so low that the video is useless, while 10 is the grade for a perfect video quality.

The example above show how the vessel initially has roughly the same starting point as the example before (Fig. 7). While the number of illegal discards decreases, fishing activities audited for control throughout the period from April to July have one to four fish of the species haddock, hake, cod and/or saithe discarded (non-compliance with the landing obligation).

Timelines with discards over time for all 11 vessels with fishing activites in the Kattegat can be found in appendix 3.

It has been necessary to mask of much larger areas for the field of view for cameras than in previous projects, as much greater emphasis on ensuring the anonymity of fishermen has been placed in the this projects. Examples of this masking can be seen in section 4.
However, it is not possible to fully avoid filming the fishers if the sorting process of the catches is to be audited, and discarded species identified and length measured. Full anonymity cannot be guaranteed, as persons with knowledge of vessels must be assumed to be able to recognize the individual vessel based on the layout of the vessel that is visible within non-masked areas and thus recognize persons on board. In case of access to documents, the Danish Fisheries Agency can add further blur to video recordings.

3.1 Experience with documentation of catches in relation to sanctions in phase 2 of the project.

From the Common Understanding it can be seen that:

"*As this is a new control measure where it is necessary to build up experience and compentence in relation to validation of material, etc.m data from the project will as a principle not form the basis for enforcement on phase 1 of the project. All vessels will still be subject to the current control practices*".

Based on this, the approach in phase 1 has been for the camera coordinator or project employee to follow up on observed discards that are non-compliance with the landing obligation, by making a phone call to the vessel owner or master and guide in rules of the landing obligation. If subsequent follow-up and re-guidance in the landing obligation has been necessary, this has at times been done by sending a message through the electronic monitoring system. Such messages appears on the screen in the wheelhouse of the vessel and blocks most of the screen. It is therefore not possible to perform a diagnostic check until the message marked as read.

At times a certain lagtime occur between illegal discards and contact to the vessel owner has happened. This is due to the fact that several weeks may have passed since the fishing trip took place and to the video viewers' audited the fishing activity, for example due to prioritization of other vessels. In addition to the two example figures in section 3, timelines with discards over time for all 11 vessels with fishing activites in the Kattegat can be found in appendix 3. The lagtime does not change the fact that video recordings will show whether the landing obligation has been complied with or not.

In addition to the discard observed by video auditors, BMS registrations can be used as a basis for comparison, because species subject to the landing obligation must be landed and registered in the landing declarations. However, phase 1 of the project has revealed that landing declarations have been filled in inadequately for several of the vessels. On closer inspection, it appears that the reason for this is that the vessels have registered BMS catches in the eLog, rather than in the landing declaration. Therefore, BMS registrations from the eLog has been used in the following figures.

The two figures below show examples of registrations of BMS catches in the eLog from January 2021 and onwards. Appendix 4 lists all timeline figures for BMS registrations for participating vessels.

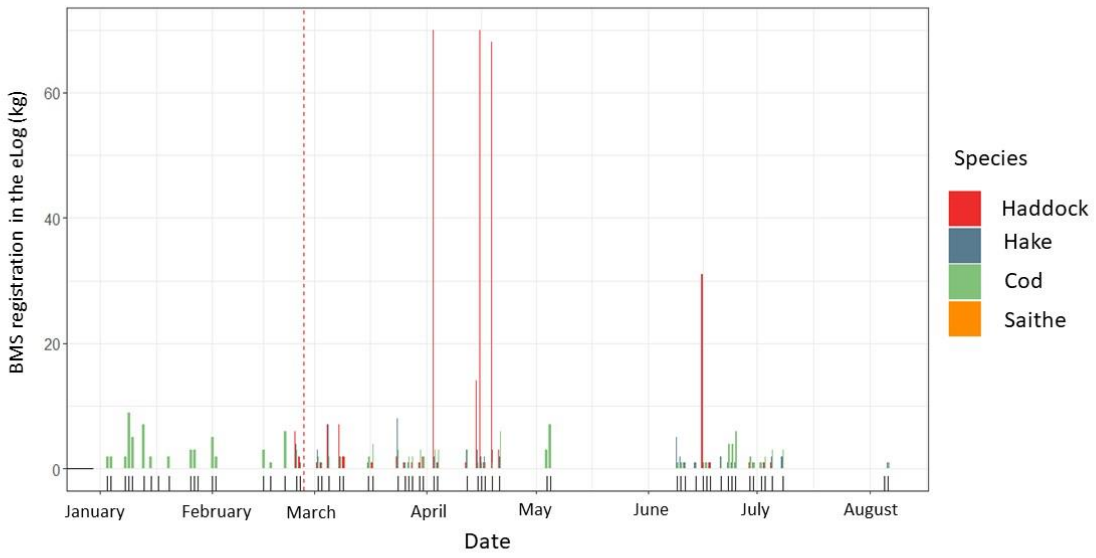


Figure 9. Example of BMS registrations in the eLog of cod, haddock, hake and saithe from January 2021 for one vessel. Black lines on the x-axis show where the vessel has reported a fishing activity in the Kattegat in the eLog. Red vertical dashed line show when the electronic monitoring system was installaed on the vessel.

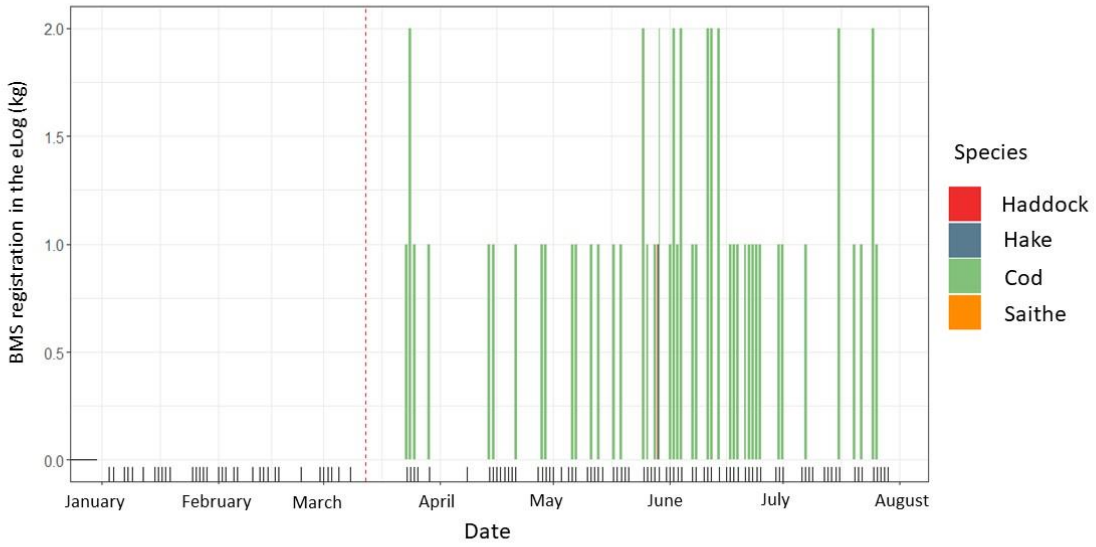


Figure 10. Example of BMS registrations in the eLog of cod, haddock, hake and saithe from January 2021 for one vessel. Black lines on the x-axis show where the vessel has reported a fishing activity in the Kattegat in the eLog. Red vertical dashed line show when the electronic monitoring system was installaed on the vessel.

For one vessel, BMS landings, mainly of cod, are registered in the eLog, before the electronic monitoring system is installed (red vertical dashed line in figures). Although an increase in BMS

registration in the eLog occurs after installment of the electronic monitoring system, this is primarily the case for four fishing trips, where large amounts of haddock have been registered as BMS in the eLog.

For the second vessel, no BMS of either haddock, hake, cod or saithe had been registered in the eLog before the electronic monitoring system was installed. This is in contrast to the fishing trips after installment of the electronic monitoring system, where 1-2 kg BMS cod are registered in the eLog for most fishing trips. In other words, a change from ongoing observations of discards to no discards being seen during audit can be explained by a change in fishing behavior whereby avoidance of undersized fish has been increased, or that undersized fish previously discarded (to a certain extent) are retained on board and registered in the logbook.

It should be noted that the y-axis in the two figures is very different, as the first figure has a y-axis extending to 60 kg, due to large registrations of haddock in April/May.

Table 12 below shows for each vessel the video quality of the two cameras focused and assessing discards. The video quality is assessed on a scale from 1-10, where 10 is best and 1 is poorest. If a video is rated at 7 or higher, video auditors are not required to write a comment about the video quality because the video quality is considered to be satisfactory.

Table 12: Video quality in audited hauls. Average (and standard deviation) of quality rated from 1-10.

Vessel	Audited hauls	Video quality cam1	Video quality cam2
1	19	7.00 (1.68)	8.00 (1.77)
2	29	8.00 (1.48)	7.00 (1.34)
3	31	9.00 (0.71)	9.00 (0.52)
4	32	8.00 (1.96)	7.00 (2.00)
5	19	7.00 (2.27)	2.00 (1.76)
6	25	8.00 (2.03)	8.00 (0.78)
7	25	8.00 (1.51)	8.00 (2.77)
8	9	8.00 (0.28)	8.00 (0.28)
9	20	6.00 (2.00)	5.00 (1.69)
10	18	9.00 (1.00)	8.00 (1.43)
11	48	8.00 (1.41)	7.00 (1.68)

In general, the video quality is acceptable for participating vessels, and for some vessels, low video qualities is mainly a result of challenges with getting camera placed in an optimal area for good field of view, rather than, for example, smudge on camera lenses. However - which was also the case in the North Sea project – it is necessary with a continuous assessment and reminders to vessel owners on the importance of keeping camera lenses clean.

There is no doubt that the EM system provides video sequences with a quality that can document non-compliance with the landing obligation, and include length measurements with a relatively small margin of uncertainty, which can be used as a basis for possible sanctioning.

It has been observed in phase 1 of the project that accidental discarding has occurred, for example, a cod managing to wringgle its way out through the discard chute, which it would be reasonable not to sanction. An instruction for enforcement with a *de minimis* limit would address some of the concerns raised in several responses to the questionnaire survey, in which fishers express frustration over the possibility of making an accidental discard and what this may cause in terms of possible sanctions.

3.2 Compliance with guidelines in the vessel monitoring plan

In general, masters have complied with guidelines in the vessel monitoring plan. Certain details, in particular performing diagnostic checks, have required some habituation. The experience from phase 1 indicates that frequent dialogue, as well as the use of feedback reports, where for example it is clarified whether diagnostic checks are performed sufficiently, provides a basis for a development and habituation to the use of EM with cameras among vessel owners.

In phase 1 of the project, there have been a number of cases where the vessel monitoring plans have not been fully complied with. Through quick contact and dialogue, this has generally turned out to be caused by misunderstandings, and it has been possible to solve the challenges. However, there have been two minor cases. In one case, a master of a vessel with a electronic monitoring system that had broken down completely sailed for approx. 1 week. The master of the vessel had not (as is stated as the guideline in the vessel monitoring plan) contacted the Danish Fisheries Agency in order to inform on the problem, which meant that it was the Danish Fisheries Agency that discovered the error. This episode is the most serious breakdown that has happened on an electronic monitoring system in phase 1 of the project.

Another vessel had a breakdown on one of the discard cameras during a fishing trip (trip 1). The vessel owner contacted and informed the Danish Fisheries Agency and completed his fishing trip, which was fully in accordance with the vessel monitoring plan. However, the vessel made a new fishing trip (trip 2) without repairing the malfunctioning discard camera, which the vessel owner had been made aware of by the Danish Fisheries Agency during a phonecall. Next, the vessel owner made another fishing trip (trip 3), despite phonecalls, a message in the electronic monitoring system, text messages and email to the person informing that the vessel was not allowed to make a new fishing trip until the malfunctioning camera was repaired. This was clearly in violation with the vessel monitoring plan, since guidelines in the vessel monitoring plan makes it clear that the vessel was not allowed to make voyage 2 or voyage 3. After voyage 3, the camera was repaired.

3.3 Sources of error when auditing and handling video recordings

Previous reports and projects regarding EM as a control tool mention a number of factors that can complicate the audit process of video sequences. Thus, the following factors are mentioned as the primary challenges[11]:

1) Lights turned off
2) Water droplets on camera lenses
3) Field of view of camera being blocked and
4) Dirty camera lenses

The electronic monitoring system used, BlackBox VX, operates with cameras that can record video in infrared, where problem number 1 is eliminated.

Problem number 2 is sought to be resolved by tilting cameras. This does not prevent the formation of water droplets, but reduces the extent of droplet formation in the center of the camera lens. Thus, the water droplet will only be seen in part of the field of view and will therefore not block the view at the center to the same degree. This can be a challenge to achieve at times because of the specific placement of the camera on certain vessels, but as a whole this approach has been possible on vessels in the project, and the problems with water droplets on the camera lenses has been a minor issue.

Problem number 3 has been sought to be avoided by involving the fishers at the inspection, where the placement of cameras was drafted. By getting on overview of the workflow and having installers involved in the preparation of a sketch of the placement of the cameras, compromises have been found between work procedures, ship layout and view to the sorting areas. However, a large difference in the possible places where cameras could be fitted on the 12 participating vessels exist. Some vessels have had a layout that made it easy and obvious where cameras should be placed without interfering with the workflow and with a good view over the sorting and discarding areas. On other vessels, it has been a challenge to find places where cameras would not interfere with the fishing gear, would not get blocked during the work process and at the same time could film the sorting and discard areas. On one vessel, it was even necessary to place a camera below the bulwark to film a discard area.

Problem number 4 has been sought to be reduced through close dialogue with vessels, including feedback reports, where the video quality of seen fishing activities is highlighted.

Overall, errors when auditing video sequences can be the result of three errors:

1) Unobserved discards
2) Incorrect species identification
3) Incorrect length measurement

It has not been possible to complete an in-depth analysis of type-1 and type-2 errors during phase 1 of the project. The Danish Fisheries Agency is currently in contact with DTU Aqua in order to coordinate a project where analysis of catch handling on one or more vessels can be made with EM and observers. To minimize the risk of incorrect species identification the camera coordinator and project officer audited samples of audits made by video auditors from January to March 2021. Additionally, ongoing meetings with video auditors with the aim of highligting what characteristics

[11] Final Report on Development and usage of Electronic Monitoring Systems as a measure to monitor compliance with the Landing Obligation – 2015. DOI: 10.13140/RG.2.2.13561.67683.

the species have and which species might be confused with another. Fig. 11 show examples of images of the six focus species.

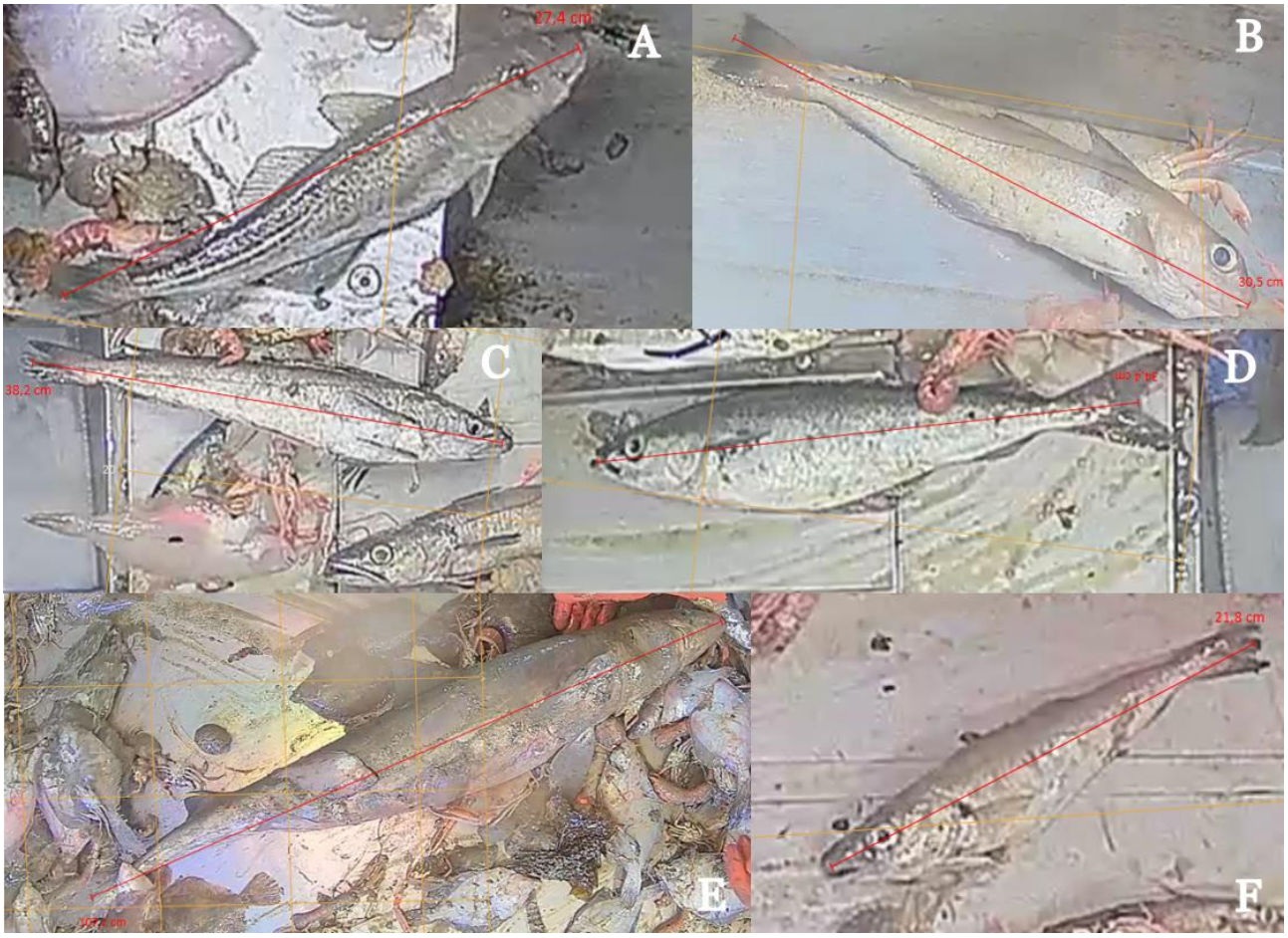


Figure 11. Examples of discard images from phase 1 with length measurement. A: Cod, B: Haddock, C: Hake, D: Saithe, E: Spurdog, F: Whiting.

In addition, video auditors have been urged to register cases where they are in doubt with a note on what they believe the species is. Doubtful registrations can thus be looked at again with the camera coordinator or the project employee. Video auditors are instructed to only register a fish as belonging to a specific species if they are certain that the fish seen is actually such a species. Finally, a minimum of 10% of audited videos are double checked, meaning that another video auditor go re-audit an already audited video without knowing the registrations made by the first video auditor.

For type-3 errors, length measurements have been made on board the individual vessels to get the length, width and height of the vessel's structures (sorting surface, conveyor belt, etc.) that are visible withinin the cameras' field of view. This is used to set the length and width of a grid overlay which in the BlackBox Analyzer software is added to the video sequence in order to make length measurements. Finally, a number of objects have been measured when the Danish Fisheries Agency's camera team was on board the vessels. These objects (knives, measurement boards, etc.) are sometimes visible within the area of grid overlay in the video sequences. The correct length measurements of the objects are known, and video auditors have been instructed to make measurements of the lengths of these objects. Since the video auditors do not know the correct length, this allows to assess the quality of length measurements.

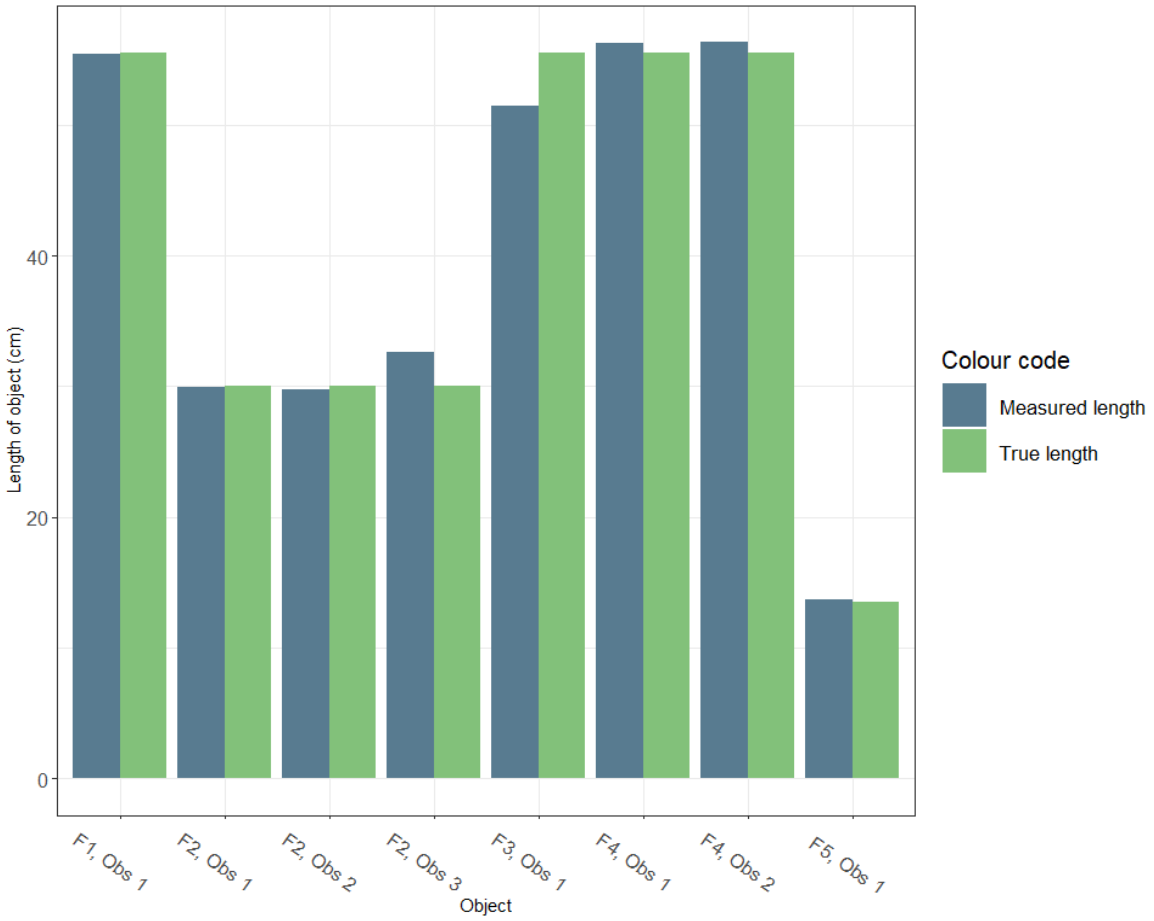


Figure 12. Length measured using grid overlay on video recordings compared to the actual/true length of the object measured physically. F corresponds to vessel, while Obs corresponds to observation. The eight objects in the figure are thus seen on four different vessels.

From the figure above it can be seen that vessel 1, vessel 2, vessel 4 and vessel 5 all show good agreement between the assessed length and the actual length of the object. For one camera on vessel 2 and for vessel 3, there is a difference of approx. 4 cm below and approx. 2.5 cm above the correct length respectively. Fore these, an adjustment of the grid overlay should be made to give a more accurate length measurement.

3.4 Electronic monitoring with camera documentation as a control tool

Presence at sea at the time of catch sorting is necessary to ensure compliance with the landing obligation, because illegal discaring is difficult to document in any other way. At-sea control and aerial surveillance can to some extent ensure this, but their presence is easy for vessels to detect and these control measures do not allow for full coverage, which mean it cannot be ruled out that illegal discarding may occur when the at-sea control or aerial surveillance is not present. In addition to electronic monitoring, onboard observers allow for full coverage and compliance with the landing obligation. In some parts of the world, such as the United States, vessels in certain fisheries are obliged to carry observers on each fishing trip and each haul is checked by the observer. Electronic monitoring does not allow for the same level of data quality as observers, as it is more difficult to identify species, take length measurements and not possible to determine age or sex by use of video sequences which physical presence on the vessel allow for. On the other hand, electronic monitoring has lower operating costs than observers. This is not least because it is not necessary to audit all video recordings, as recordings are randomly taken for control and it is

therefore not possible to know during catch handling onboard whether the sorting process will be taken for control later (which is possible to know with observers). Electronic monitoring therefore allow for 100% coverage of fishing activity, eventhough the audit ratio of fishing activities is at 10%. This reduces the relative costs of control compared to the coverage level, also in relation to, for example at-sea control. In addition, the use of electronic monitoring has the potential for further developments, such as in the long term a more automated registration of fishing activities and catches. Electronic monitoring with camera documentation can replace part of the current control at sea, such as the Last Haul control, which is time-consuming for both vessels and fishery inspectors. In addition, electronic monitoring could replace the VMS system, since the electronic monitoring system's GPS also is independent of the vessel's own GPS and record positions of the vessel at a much more frequent than the VMS system.

There is no doubt that electronic monitoring is effective as a measure to control whether the landing obligation is complied with. It is important to keep in mind that electronic monitoring cannot be used as the sole control measure, at least not in its current form. Other control tools are more suitable for a number of points for control (for example, at-sea control is suitable for control of the gear which is not the case for electronic monitoring). Another important factor is that while at-sea control, control of landings aerial surveillance can be targetted at random vessels, electronic monitoring can only be used to control the vessels where the system is installed. This mean the, for example foreign vessels cannot be controlled with electronic monitoring, which as an example at-sea control allow for. However, current control measures can, based on a risk-based approach, be eased or redirected by allowing vessels with electronic monitoring to be inspected much less, because electronic monitoring with camera documentation can be used for control of compliance with regulations on discards and closed areas.

3.5 Summary

The benchmark of a 10% audit of the fishing activities as a minimum has been fulfilled through phase 1 of the project. The introduction of a more risk-based approach, where vessels demonstrating a high level of compliance are controlled at a lower rate, and vessels with a low level of compliance are controlled more frequently could be considered. In general, the electronic monitoring with camera documentation allow for documentation of the fishing activities, including discard occurrence, as the video quality in general is good and possible sources of error have been minimized as much as possible. There is a basis for the usage of video sequences to be used as documentation for sanctioning non-compliance with the landing obligation in the future - possibly supplemented with data on registration of undersized fish in the logbook. This in turn also mean that electronic monitoring can be used to ease some of the current control measures, including Last Haul control and control of closed areas, as well as potentially the VMS. The latter is currently not compatible with current EU regulations. The approach for masking used in phase 1 mean that it cannot be completely ruled out that discards occur which are not registered during audit of video sequences - if this uncertainty is to be minimized the approach for masking must be revised. In order to take into account the uncertainty in species determination and the like, as well as to ensure that discards of a few fish during the catch handling are not considered as violation, a *de minimis* limit should be introduced before sanctioning of non-compliance with the landing obligation are made based on video audit.

4.0 Ease of system use for participating vessels and the Danish Fisheries Agency

4.1 Errors and malfunctions, and the extent of obstacles for the fishery

The Danish Fisheries Agency records every error and malfunction that have occurred during the project. In addition, in the questionnaire survey sent by the Danish Fisheries Agency to participating vessels there are questions aimed at identifying the first-hand experiences with malfunctions (see Annex 5 for replies to the questionnaire survey). A total of seven out of 12 vessel owners replied in full or in part to the questionnaire survey.

For most vessels, the errors and malfunctions that have occurred, have not been prevented the vessel from fishing. Thus, the installation of the electronic monitoring system itself has been the main aspect of the project that has lead to a potential loss of fishing days. The installation has taken three days for all vessels, except one where installation was done in two days. On some vessels, the installation has taken place while other repairs were being made, thus making the installation process appear as longer than three days. However, this was due to the fact, that there was no need to prioritize the installation of the electronic monitoring system, as the vessel would need to stay in port anyway.

A number of minor errors and malfunctions has occured throughout phase 1. One vessel had problems with the GPS antenna. It is unclear whether this was due to the quality of the first installation. The breakdown of the antenna has not caused additional time in port for the vessel.

Four vessels have had problems with malfunctions on rotation sensors. This is due to difficulty in placing the rotation sensors on the winches used on the some of the vessels engaged in the *Nephrops* fishery in the Kattegat. The Danish Fisheries Agency is in continous dialogue with Anchor Lab inorder to find alternative sensors to record fishing activities (e.g. on/off swithces or motiondetection sensors). Malfunctions on rotation sensors have not led to additional time in port, as the electronic monitoring system will begin to record video if a restart on board is made and the system can also be set to automatically start video recording one the vessel is out of port based on a geofencing bounding box (port box).

Four vessels have experienced malfunctions on one of the cameras. For one vessel, the camera 'pink' video recordings shortly after installation, and the camera was replaced shortly after. Similarly, a camera on another vessel also began to have 'pink' video recordrings about three and a half months after the installation. In both scenarios video sequences were still useable, although the footage was of a lower quality. Replacement of the cameras did not result in extra time in port for the vessels. On a third vessel an error on a camera caused it to shut down fully. In this case, replacement could take place immediately after the fishing trip had been completed, in accodiance with the vessel monitoring plan, and without additional time in port needed, as the vessel was in port anyway. The fourth vessel was previously mentioned in section 3.2. From the time the malfunction was reported to the Danish Fisheries Agency, until a new camera arrived in the port where the vessel stayed, a day had passed. However, the vessel could not get its installer to come such a short notice and therefore it took longer before the vessel had the malfunctioning camera replaced with the new. It should be noted that vessel owners are free to choose any installer themselves and that the vessel owner was free to find another installer to replace the malfunctioning camera. As the vessel (in non-compliance with the vessel monitoring plan) went to sea anyway, it resulted in one day of additional time in port for the vessel before the malfunctioning camera was replaced.

In the case outlined above, better availability of an installer could have prevented additional port time. As the vessels themselves choose their installer, the Danish Fisheries Agency cannot intervene directly in such cases, but since the Agency is in contact with several installers, the Danish Fisheries Agency may propose alternative installers for vessel owners, if a similar situation should arise. A list of installers is kept at the Agency and is extended on an ongoing basis.

One vessel has experienced a malfunction that was serious. In this case the control box itself broke down, which meant that the electronic monitoring system did not function at all. The incident is described in section 3.2 as well. The vessel owner did not report the malfunction to the Danish Fisheries Agency (which is a non-compliance with the vessel monitoring plan). From the time when the Danish Fisheries Agency's was made aware of the issue, until a new control box had arrived in the relevant port and the installer could replace the malfunctioning control box, one day had passed. It was necessary for the vessel to stay one additional day in port due to the malfunction.

Several vessel owners state that there have been problems with the eLog system. This meant that it has been necessary for some of the vessels to use a paper logbook for a while. This was caused by a new eLog system which turned out to be flawed, and this has caused an inconvenience to some of the participating vessels. However, there is no indication that vessel owners have found the electronic monitoring system itself difficult to use. At the beginning of the project, some vessel owners or skippers were not aware that a diagnostic check was required before leaving port and that the camera lenses had to be cleaned before the beginning a fishing trip. However, this quickly became a routine for all the participating vessels, although continuous follow-up with regard to the cleaning of camera lenses has been necessary for some vessels.

4.2 Feedback report

A question in the questionnaire sent to the participating vessel owners was:

"*Do you read the feedback reports?*"

Here, two out of the seven vessel owners who replied to the questionnaire stated no, four stated yes and one did not answer the question. The next question concerning the feedback reports was:

"*Is the level of information adequate in the feedback reports?*"

Two answered yes, two answered no, and eight have not answered the question.

The two who replied 'no' would like for a text summing up whether the vessel doing complying well or not to be in the report, in addition to the specific numbers from the vessel's eLog and the observed discards. In addition, one vessel owner would like the feedback reports to indicate what the value of the discarded cod is compared to the total value of the fishing trip, as well as more text on the uncertainty of length measurements and species identification than what the feedback reports already have.

It seems beyond the scope of the project for feedback reports to contain information on the value of discarded catches, as, among other things, a valuation would be subject to considerable uncertainty. However, the Danish Fisheries Agency may consider whether the reports in the future may contain additional text on the uncertainty associated with length measurement and species identification than what is at present shown in the current feedback report in Section 2 of the feedback reports.

Annex 8 provides an example of a feedback report.

4.3 The requirements to the Danish Fisheries Agency, including IT and data infrastructure due to the project

Four desktop computers were aquired to the project to ensure high quality of video views during audit. Three video auditers are responsible for auditing all video material selected for control (see Annex 7 for an overview of the costs of the project). The figure below shows the development of the time used for video audit through phase 1 for all vessels.

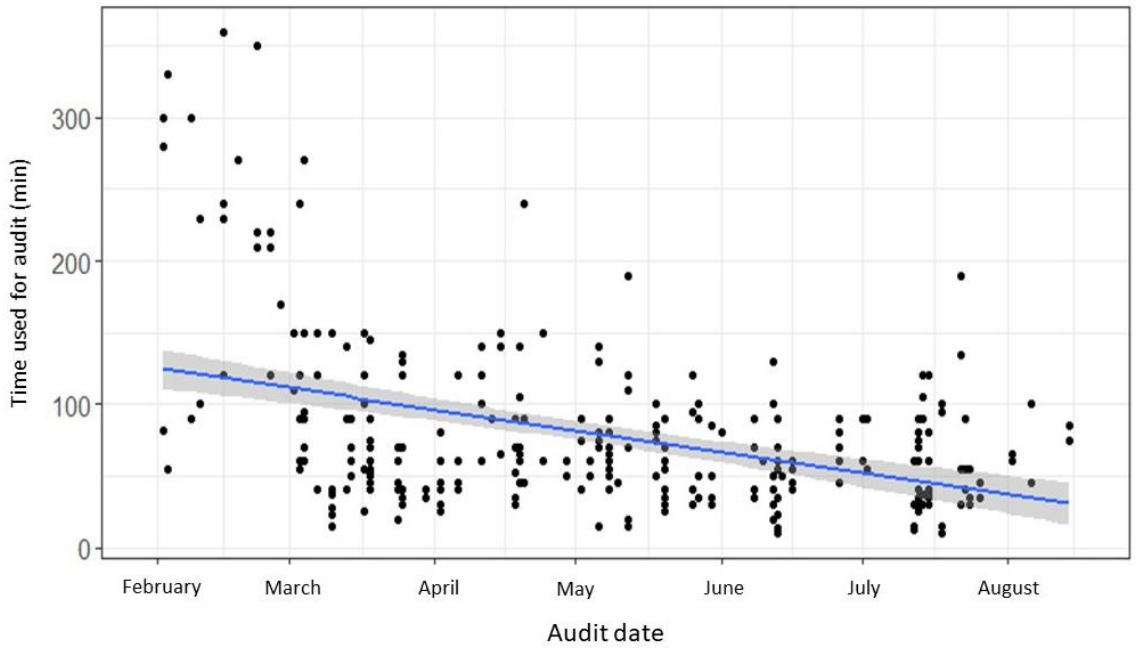


Figure 13. Timeline, development in time used for audit. X-axis: Audit date of fishing activity audited. Y-axis: Time in minutes spent by video auditor per fishery activity viewed.

Overall, audit times has decreased as video auditors have become more experienced. A number of video sequences have an audit time roughly at the same level as was the case in the previous North Sea and Skagerrak project, where the audit time on average was 21 minutes per fishing activity. In the current project, the average audit time of several vessels in July is still around 100 minutes per fishing activity.

A major difference between the 12 vessels in the project for electronic monitoring in the *Nephrops* fisheries in the Kattegat and the former electronic monitoring project run by the Danish Fisheries Agency in the North Sea and the Skagerrak is, that all vessels in the Kattegat - except one - do not have a conveyor belt and use have than one area designated to discarding. This makes it more difficult to audit videos, as discards are visible at a shorter time. This makes it necessary for video auditors to go back and re-view parts of the videos more often to ensure correct species identification and take length measurements than if discards were visible for longer. Also, as discards take place in more than one area it has for some fishing activities been necessary for video auditors having to go through the same catch sorting twice, first focusing on one discard camera, then again focusing on another discard camera. The use of slides or the actual floor of the vessel as part of the sorting and discarding area is more comparable to the vessels in the former North Sea

and Skagerrak project, with no conveyor belt. For these vessels, the audit time was around 40 minutes per catch sorting in 2016.

Overall, it should be expected that the audit time per catch sorting, will continue to be higher for the Kattegat project than what was the case for the trawlers participating in the former North Sea and Skagerrak project in Denmark. It should therefore be expected that it will be necessary to employe more video auditers if more vessels are to be part of the electronic monitoring project. Additionally, more than four computers will be needed. An extension of the project to cover more vessels will accordingly require extra resources for personnel and IT equipment.
Another difference between the former project in the North Sea and Skagerrak and the project in the Kattegat is that video sequences are requested and subsequently transferred to the Danish Fisheries Agency, whereas video transfer took place automatically for all video sequences when the vessels were within 3/4G coverage in the former North Sea project. The advantage of requesting video sequences is that only the video sequences need for audit are transferred whereby the Danish Fisheries Agency does not have large amounts of video files stored. When video sequences have been audited, they are deleted but since the video files are stored onboard the individual BlackBox system for each vessel, the Danish Fisheries Agency can retrieve video sequences again if necessary. However, there is one major drawback to this setup: the videos must be requested manually, and it can take some time from the request for a video sequence is made until the video file is fully transmitted and can be viewed by video auditors. The figure below shows an overview of requested video sequences compared to the time before full transmission had been completed.

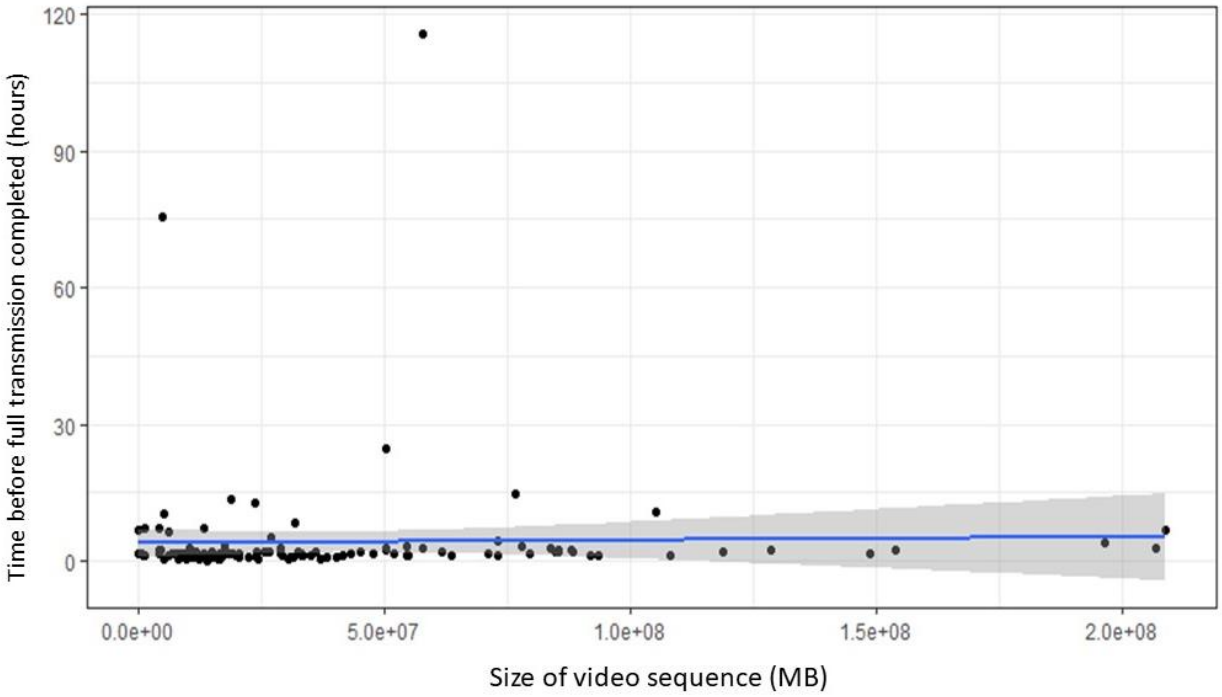


Figure 14. Transfer times for requested video sequences. X-axis show the size of the requested video file in MB. Y-axis show time until transfer had been completed in hours. Every black dot is a requested video file. Blue trend line show the average increase in time per transfer compared to the size of the video file.

The figure above shows that even relatively small video files can take a long time to transfer (more than 30 hours), while relatively large video files can be transferred in 1-2 hours. This is because time from request to full transfer is far more dependent on whether a vessel is within 3/4G coverage, or whether a vessel has turned off its electronic monitoring system in port (whereby the

transfer cannot take place) than on the size of the video files. In practice, the camera coordinator and project manager request video sequences 48 hours before video auditors are expected audit a video.

The table below shows the total number of hauls, fishing trips and registrations of objects (including registration to which are marked as uncertain, double checks and objects used test of the length measurement) that have been made in phase 1, as well as the time used for audit in total in hours. This is for each vessel (note 11 vessels, as one vessel has not yet fished in the Kattegat in 2021) and in total for all vessels.

Table 13: Number of hauls and trips, total registrations made as well as the total time used for audit of video sequences covering these hauls, trips and registrations per vessel and in total.

Vessel	Audited hauls	Audited trips	Registrations	Audit time (hours)
1	19	11	1,608	39.1
2	29	21	2,313	32.5
3	31	20	4,116	30.4
4	32	12	1,676	37.0
5	19	13	365	9.2
6	25	14	3,003	22.1
7	25	17	4,229	31.2
8	9	6	946	18.9
9	20	15	2,265	56.3
10	18	6	1,760	29.6
11	48	18	1,085	57.5
Total	275	153	23,366	363.8

The above table covers the period January to August 2021 for 11 vessels. It can be anticipated that the amount of data will increase rapidly. This in turn mean that a streamlined data management is necessary.

In phase 1, the data management has taken place through a fixed transfer of logbooks and data for the participating vessels in an exchange of data from the Danish Fishery Agency's IT and Data section to the project managers (camera coordinator and project officer). Data is pulled from several sources, including the eLog on the vessels, BTAST and Anchor Lab's Analyzer database.

A series of reports on the Danish Fishery Agency's internal portal provides an overview of e.g. logbooks, top 50 vessels targetting *Nephrops*, as well as a 10% random sample list that helps assess which fishing trips to audit.

An Excel sheet is used to provide an overview and present overall result of video audits. Assessment of which fishing trips are to be double-checked takes place in a very basic way by selecting every tenth fishing trip audited for double check.

This current work process of entering data in an Excel sheet is not suitable if the project is to cover more than approx. 25 vessels in total.

To ensure a sufficient data flow in the future, a new system is under development and testing. Video audits and their results must be entered in this system in the future, where critical key fields are filled directly from automatic data exchange, and there is a validation of the entered information to ensure data quality. Data from approved audits are to be transferred to the IT and Data section. In the same system, auditors can also select the fishing trips to be audited so that the whole work process from start to finish follows a step-by-step process.

The aim is for this system to be developed and make it capable of handling far more than 25 vessels and to be capable of being used regardless of fishing area.

4.4 Summary

Overall, the malfunctions occurring during the project have been of such a character that they have not significantly impeded the fishing opportunities - and the serious malfunctions have been remedied so that the vessels in question have only lost one potential day of fishing. There is no specific indication that the electronic monitoring system itself has been difficult to use for the participating vessels, and only two vessels are requesting more information in the feedback reports provided. On the other hand, a new eLog system, which turned out to be faulty, has certainly been a nuisance to some of the vessels, although there is no evidence that it has meant fewer days at-sea. In general, the Danish Fisheries Agency's IT system has functioned satisfactorily, and the time per audi has decreased during the period. However, there will be a need for an upgrade of the system, employment of more video auditors and acquisition of more IT equipment if the project is to continue with more vessels.

5.0 Effect on fishers' working conditions

5.1 Masking and blurring

It was a clear ambition from the beginning that the fishers should be ensured as much anonymity as possible ("*it is the fish - not the fishermen that are to be monitored*"). In the tender, emphasis was placed on solutions that could ensure such anonymity. A masking of the field of view within the video recordings is added to the camereas to ensure this. A mask is a black "layer" that is laid over areas of the field of view at the recording. Masking is setup by the Danish AgriFish Agency in collaboration with the electronic monitoring system provider, Anchor Lab. The cameras will only record in the part of the field of view that is not masked. Masks cannot subsequently be removed from an already recorded video. The use of masks also saves space on the hard disk, as masking reduces the size of the video files.

An example of a field of view of a electronic monitoring system is shown in Fig. 15. Four cameras are mounted on this vessel. Camera 1A is the trawl camera. It is only used to see if the gear is onboard or out, and the masking can therefore be placed very close to the drum. In this example, the master has chosen not to mask off as much as is possible. Camera 2A record where the catch comes onboard. It can be placed above deck in for instance on a mast, as shown in the example, or it can be placed inside the box where the catch enter. Camera 3A record the sorting of the catch. Camera 4A is the discard camera and record the part of the catch that is discarded. All the areas where handling of fish should not take place are masked off (black areas) inorder to avoid record the the crew when they work at the sorting areas.

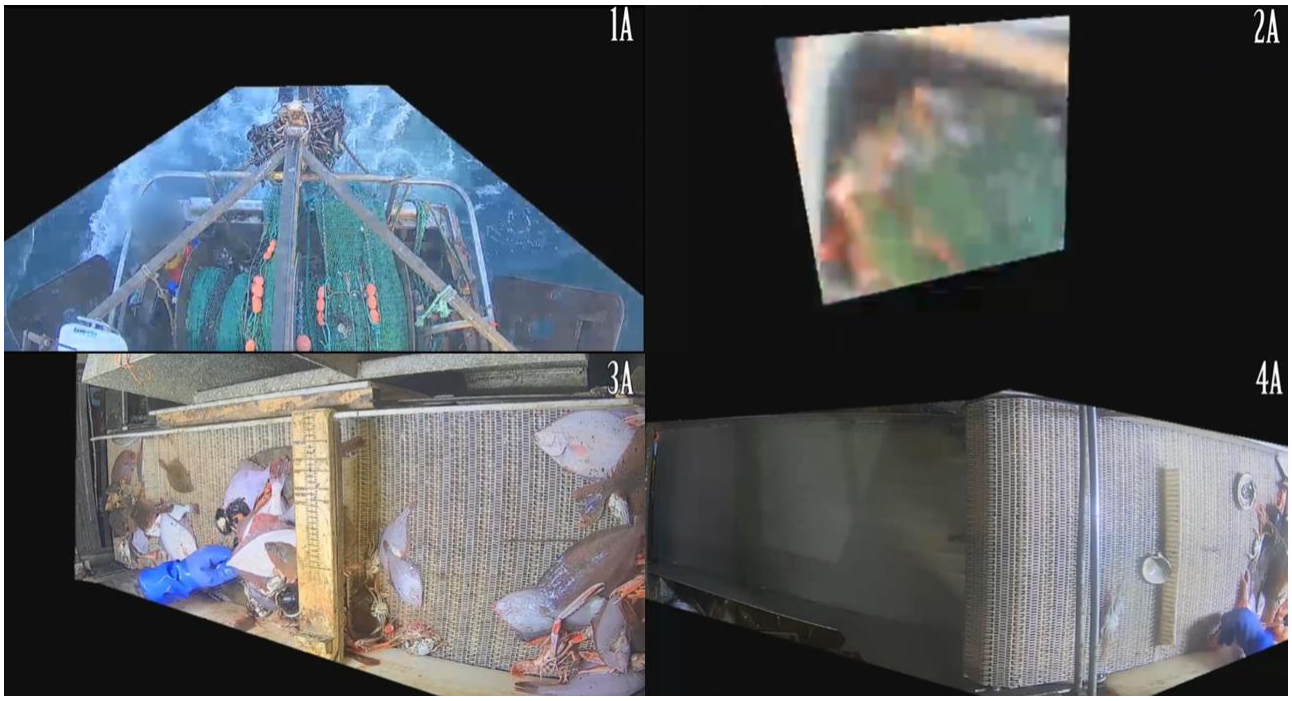
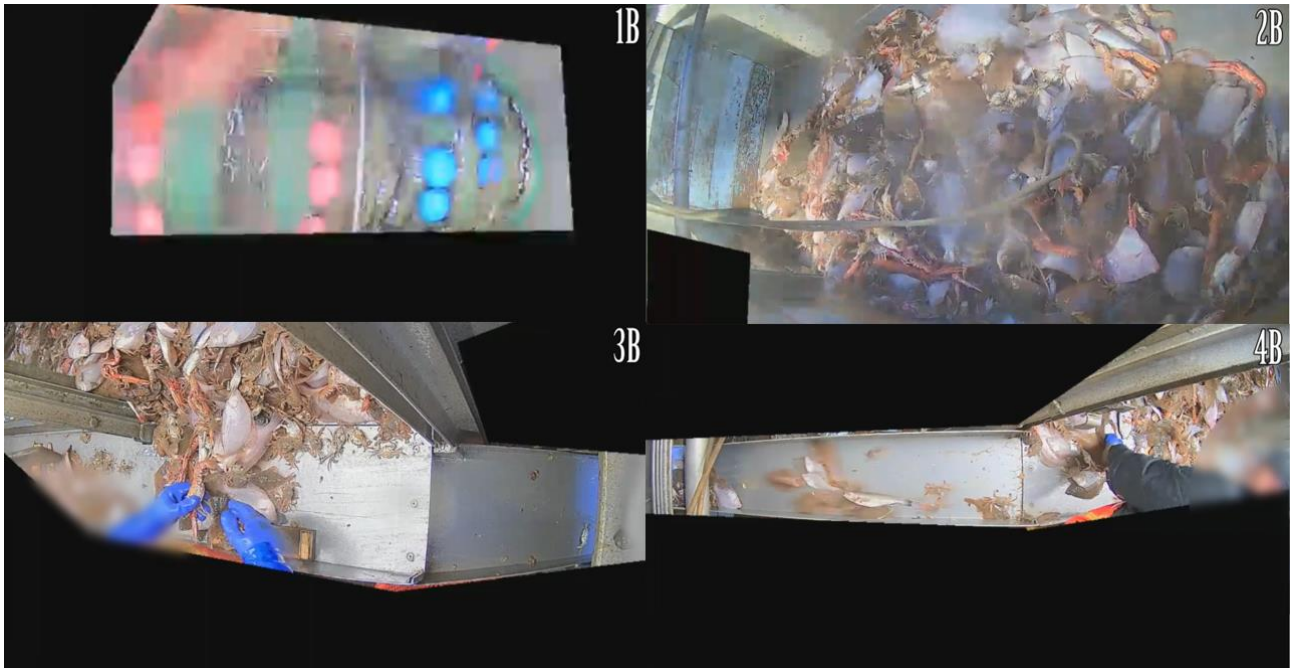


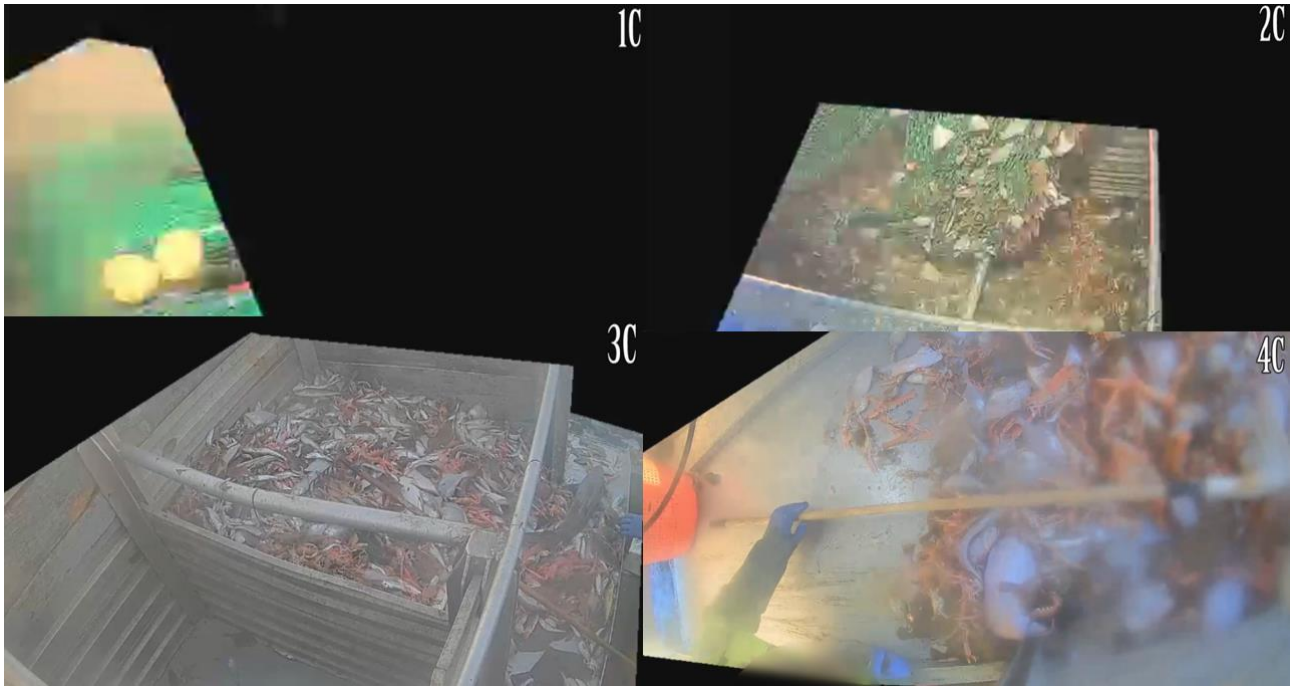
Figure 15. Example 1.

Another example of the different field of views of a electronic monitoring system is shown in Fig. 16. Four cameras are mounted on this vessels. Camera 1B is the trawl camera. Camera 2B record where the catch is taken onboard. Cameras 3B and 4B record the catch sorting area and discard area on both sides of the vessel which mean to cameras function as discard cameras.



Figur 16. Example 2.

A third example of the field of views of a electronic monitoring system is shown in Fig. 17. Four cameras are mounted on this vessel. Camera 1C is the trawl camera. Camera 2C record where the catch is taken onboard. Camera 3C record the catch sorting area and discard area on the starboard side and at the same time also record when the catch is taken onboard from another angle than camera 2C. Due to the layout of the ship, it is necessary to place the discard camera far from the actual sorting and discarding area, as the camera otherwise would be struck by the gear when the catch is taken onboard. Camera 4C record the sorting and discard area on the port side. Camera 3C and 4C are therefore both discard cameras. Unlike camera 3C, camera 4C only needs to record the sorting and discarding, and it has been possible to place it closer to the sorting area.



Figur 17. Example 3.

In the questionnaire survey, participating fishers were asked to assess from 1-5 whether:

"The possibility to mask and blur ensure a sufficient anonymity for the fisher."

1 was to be stated if one strongly disagreed and 5 was to be stated if one strongly agreed. The fishers stated the following: One stated 5, two stated 3 and two stated 1. The other seven fishers did not answer.

Among the fishers who responded to the questionnaire survey, there seems to different opinions as to whether the masking ensures a sufficient level of anonymity. As mentioned in section 3.0, the current level of masking lead to a challenge in terms of whether illegal discards can occur without sufficient documentation. An increased level of masking is therefore not considered to compatible with the control purpose. Subsequent blurring to ensure the fishers' anonymity can be added to video recordings these need to be handed over the other due to access to documents. An example of blurring is shown in Fig. 17.

5.2 The electronic monitoring systems effect of the work environment

In the questionnaire survey, the participating vessels were asked:

" Has the camera system affected your work environment?"

Of the 12 participants, seven answered the question. Of these seven, six answered yes.

Several elaborated on the answer, and it is clear that it is the opinion among particpants that the camera system has had a negative effect on the work environment. A feeling of being suspected of

malpractice and uncertainty of what mistakes during catch sorting as well as the risk of malfunction of the electronic monitoring system induce stress. A vessel owner states:

" *... However, the most significant mental impact is that we are actually in a situation where the legal position is unknown. Catch sorting cannot be done without making some incorrect estimates. But what is the consequence? - or rather: When do we commit something that illegal? We simply do not know the terms of the camera surveillance we are subject to.*"

Furthermore, it was asked in the survey:

" Has there been an effect in relation to recruitment and retention of crew that there has been camera surveillance on the vessel?"

Of the seven answers to the survey in general, three answered yes and four answered no to this question.

One respondent elaborated that people do not want to join as crew when there is surveillance on the vessels.

The installment of the electronic monitoring system has not in itself meant that the fishers has not been able to conduct their normal routines during catch sorting, etc. In addition, no fines have been issued during phase 1 of the project for non-compliance with the landing obligation based on video audit, as emphasis has been placed on guidance and dialogue with the vessels. As mentioned in section 3, setting a *de minimis* limit for discards may alleviate some of the uncertainty and concerns expressed by fishers.

5.3 Transmission of data to external parties (access to document, etc.)

No requests for access to documents have been received during phase 1 of the project and no data has been handed over to external parties.

5.4 Effect on fishing activites due to installation/other conditions

To the question: "*Have these issues with the camera system obstructed the fishing opportunity*?" six vessel owners have answered no, while one has not answered the question. All seven who responded to the questionnaire survey responded that it has not been necessary for the vessel to stay longer in port due to issues with the electronic monitoring system. No vessel owners have answerered how many fishing days they have lost due to participation in the project, and also no one has answered whether it has necessary for their vessel to stay in port for example due to installation or maintenance of the electronic monitoring system or the eLog.

As previously mentioned, it has been necessary to set aside three days for the installation of the electronic monitoring system. Furthermore, all vessel owners had to set aside 2-5 hours during the day where inspection was made by the Danish Fisheries Agency in order to draft the vessel monitoring plan and make a plan for the placement of components of the electronic monitoring system. Because no one has answered whether they have lost fishing days or had to stay in port due to the electronic monitoring system or the eLog, it can not be determined whether the fishing activities have been affected by installation of the system or other conditions of the project. Answers to the survey suggest that this not been the case, at least not to a significant degree

5.5 The process of drafting the vessel monitoring plan and planning of the installation

Initially it was the plan that all 12 vessels would have the electronic monitoring system installed by the end of 2020. This was not achieved, as the system was not installed on all vessels until mid-April 2021, due to a number of reasons described in section 1.3. The installation process can be divided into a number of steps:

1) First contact with vessel owner in order to specify which installer is to be used for installation and to find a time and place for the inspection of the vessel.
2) Date for inspection (to draft a vessel monitoring plan and make a sketch of the placement of eletronic monitoring system components).
3) Approval of the installation offer and agreement of an installation contract.
4) Installation.

On average, it took 16 days during phase 1 of the project to go from bullet point 1 (first contact) to bullet point 2 (inspection). Next, it took on average 63 days from bullet point 2 (inspection) to bullet point 3 (installation agreement) and 78 days from bullet point 2 (inspection) to bullet point 4 (installation completed). Thus, the installation phases with obtaining tenders for installation among installers, as well as determining the installation agreement and setting a date for installation have taken longer than what was expected for phase 1. There is a need to re-evaluate the process for installation, if it is decided to go ahead with phase 2.

5.6 Adaptation in the fishing activies

Participating fishers was asked in the questionnaire survey:

" Have you made changes to the way you conduct you fishing activities since the installment of the camera system?"

To this, one of the seven fishers who responded to the questionnaire survey answer that he has made changes in the way the fishing activities are conducted. Elaborating this it is stated that a different catch sorting process is the change.

The remaining six fishers state that they have not made any changes.

The Danish AgriFish Agency has asked the National Institute of Aquatic Resources (DTU Aqua) to make an analysis of the spatial distribution of fishing activites for participating vessels before and after installation of the electronic monitoring system[12].

To investigate whether a difference in the vessel segments' traditional fishing pattern exist, only the fishing patterns of the vessels with electronic monitoring in the period January - July 2020 are compared to the same period in 2021. However, it should be noted that the vessels where the electronic monitoring system was installed in 2021 only are included as vessels with electronic monitoring beginning from date where the electronic monitoring system was used. The difference in the spatial distribution of the electronic monitoring vessels' fishing areas in January - July 2020 and 2021, respectively, is shown in Fig. 18.

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[12] In order to analyze the spatial distribution of the *Nephrops* fishery in the Kattegat for vessels with and without electronic monitoring, as well as an analysis of whether the vessels that have had electronic monitoring installed, have changed their fishing pattern before and after installation of cameras, the following assumptions has been made:
1. Fishery for *Nephrops* is defined as trips with bottom trawling gear where *Nephrops* constitute the main share of the catch value and where the mesh seize is greater than 90 mm.
2. The VMS analysis is show VMS points where the vessel speed is registered to be between 2-4 knots.
3. Only fishery for *Nephrops* in the Kattegat is part of the analysis.

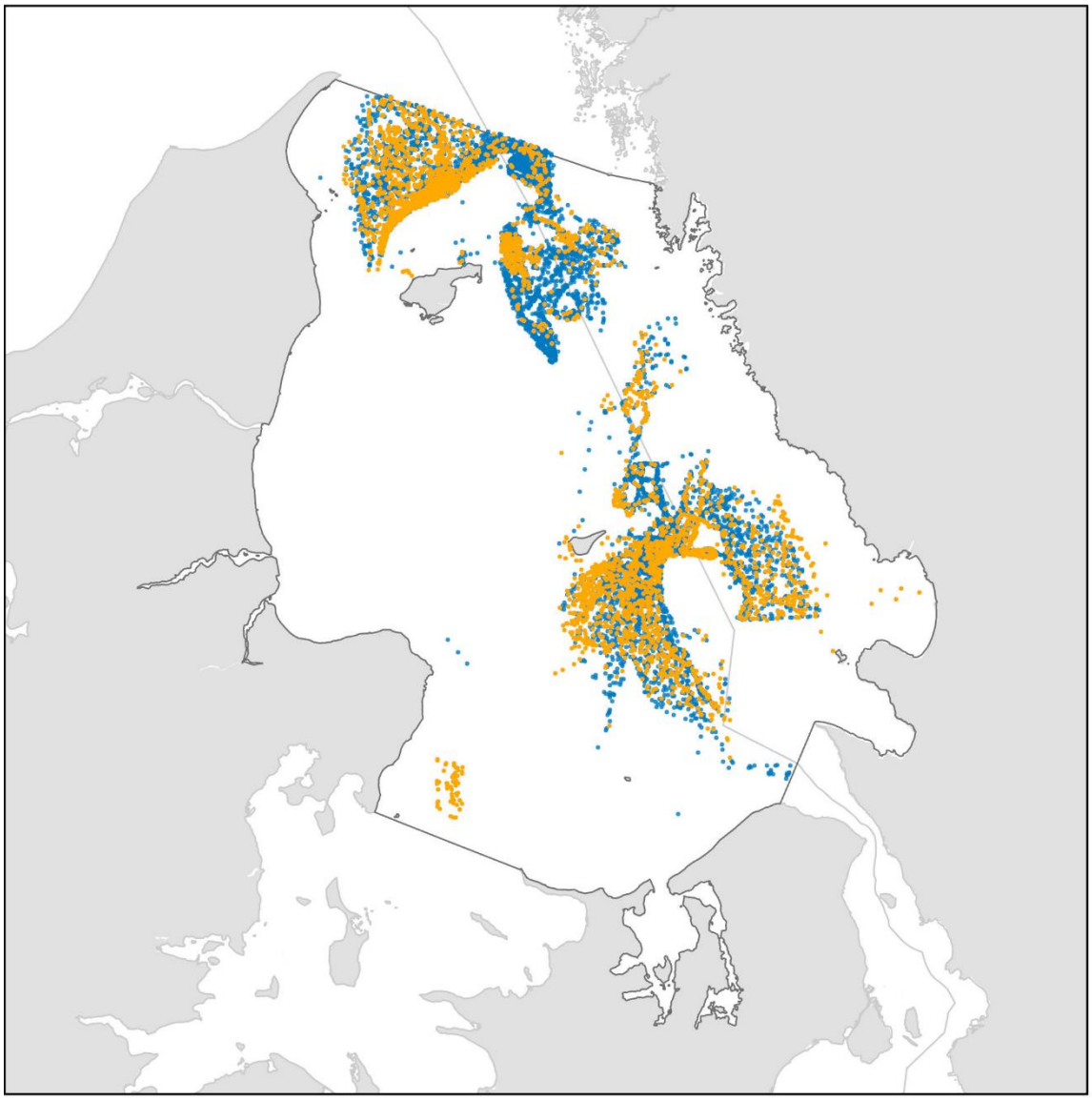


Figure 18. VMS points for vessels with electronic monitoring, January - July 2020 (blue points) and January - July 2021 (yellow points).

From Fig. 18 it follows that the area east of the island of Læsø, according to VMS, has less fishing activity than in the previous year where the electronic monitoring system has not been installed.

The same analysis as shown in Fig. 18 has run using logbook registrations. The fishers are required to register the start and stop position for each haul in the logbook. Fig. 19 show "tow lines" (line drawn from start to stop position for each haul) for vessels for the period January – July in the year before and after electronic monitoring was installed, respectively. It should be noted that the vessels where the electronic monitoring system was installed in 2021 only are included as vessels with electronic monitoring beginning from date where the electronic monitoring system was used. The difference in the spatial distribution of the fishing patterns for vessels with electronic monitoring in January - July 2020 and 2021, respectively, is shown in Fig. 19.

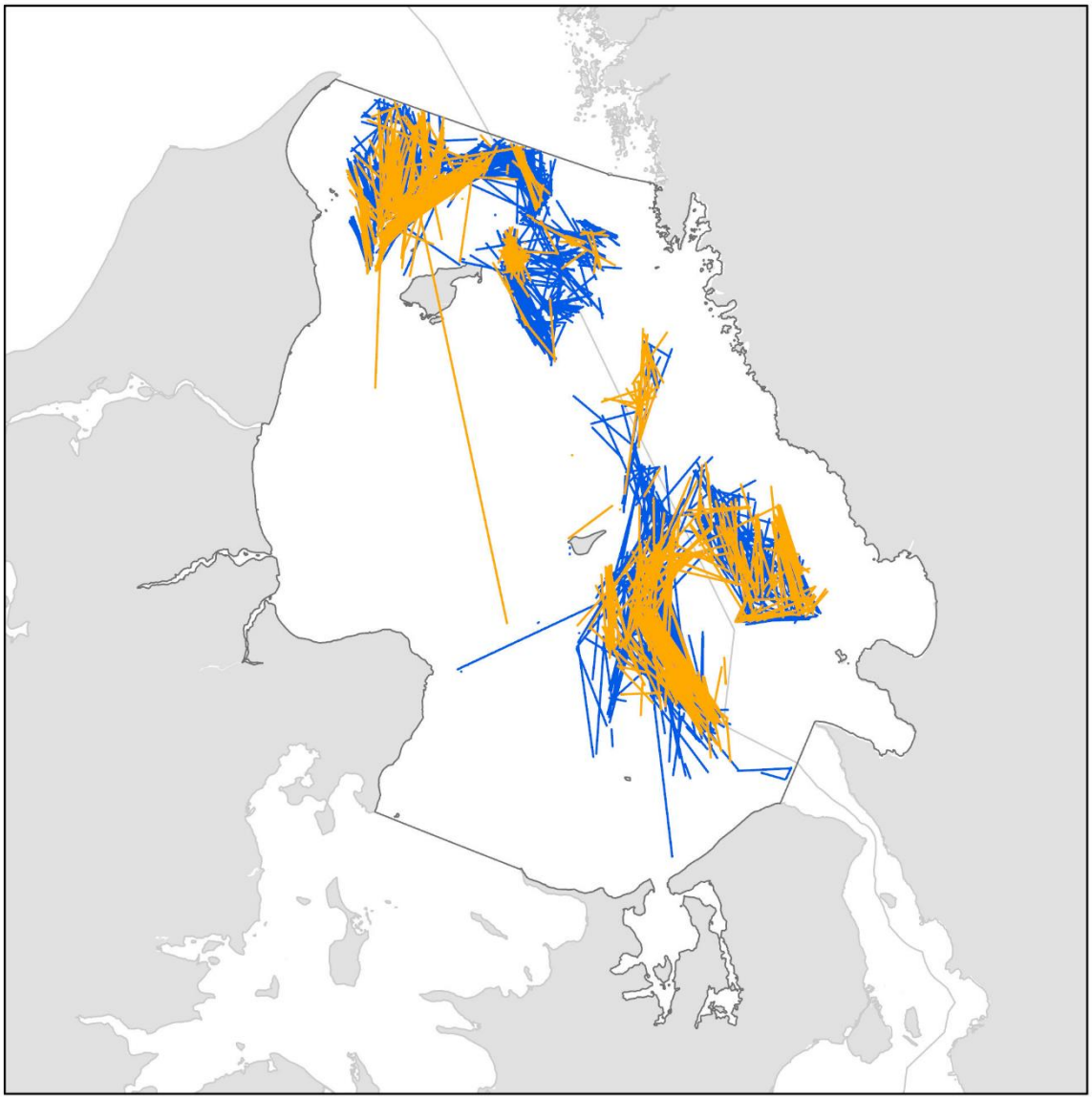


Figure 19. "Tow lines" for vessel with electronic monitoring January - July 2020 (blue lines) and January - July 2021 (yellow lines).

When comparing with Fig. 18 it can be seen that there are cases where no positional data has been registered in the logbooks for the vessels with electronic monitoring. Therefore it is not possible to see any fishing activity in an area southeast of Djursland. It can also noted in Fig. 19 the vessels with electronic monitoring have had limited fishing activites – according to their eLog data - in the area east of the island of Læsø after the electronic monitoring system has been installed. This may be an indication of a change in the fishing patterns after installation of the electronic monitoring system. However, other factors may be the cause of such changes, eg the special circumstances in 2020 due to the Covid-19 pandemic, it is not possible to make a definite conclusion as to whether a change in the fishing patterns has occurred.

Vessels with electronic monitoring are exempted from regulations regarding the mandatory use of certain selective gears. The rest of the *Nephrops* fleet in the Kattegat are required to follow this regulation. The vessels with electronic monitoring can therefore not be assumed to representative for remaining *Nephrops* fishery in the Kattegat. Based on the maps tt cannot be determined whether vessels with electronic monitoring have changed their fishing patterns. This too is the case

for the twelfth participating vessel, which the Danish Fisheries Agency as of 23 September 2021 still has not audited video sequences from, because the vessel has not yet conducted fishing activites in the Kattegat in 2021. Furthermore, DFPO has provided maps based on AIS data from where a change in fishing patterns cannot be seen in the area east of Læsø.

The analysis from DTU Aqua show that the current data from the fisheries have errors, for example due to human misentries in this eLog. The BlackBox system allows for the recording of more accurate data on where and when fishing activities take place.

5.7 Summary

Despite of the masking capabilities, some of the participating fishers perceive the presence of camera surveillance as a nuisance. The response to the questionnaire survey shows that camera surveillance can make the participating fishers feel as if they are under suscpicion and that they experience uncertainty and stress. Part of this concern may be mitigated by the introduction of a *de minimis* limit before discards lead to santions. It can not be determined whether there have been a changes in the fishing patterns after installation of the electronic monitoring. One fisher indicate that he has changed the way he operate, but this is specified to be a change in the catch sorting. The 12 participating vessels are not representative for general *Nephrops* fleet in the Kattegat. Whether the presence of cameras play into this, or whether other factors are the cause, cannot be determined on the basis of the analysis of the spatial distribution made by DTU Aqua. The analysis shows that electronic monitoring can improve the data basis for the mapping of the spatial distribution of fishing activities compared to the currently existing data.

6.0 Conclusion

The main purpose of using electronic monitoring with camera documentation in the *Nephrops* in the Kattegat has been to document compliance with the landing obligation and assess electronic monitoring as a control measure. The conclusions made in this report are based on the 12 participating vessels and cannot be directly extrapolated to the general *Nephrops* fleet.

Phase 1 of the project has provided independent data (amount, length, number) concerning the extent of discards in the *Nephrops* fishery in the Kattegat for selected species, including cod. The results show that species (including cod, haddock and hake), which should be landed, are still being discarded in the Kattegat. The amount of discards are significantly reduced after the vessels have had electronic monitorering fitted for a while and have received guidance in the regulations of the landing obligation. Whether this can be attributed to a general change in fishing behaviour is difficult to assess based on the current data basis. The majority of fish discarded are below the minimum conservation reference size. In absolute numbers, the amount of discards are limited. The amount of BMS is 1,245 kg compared to a catch for human consumption of 1,807 kg for cod, while the BMS for *Nephrops* is 209 kg in compared a catch for human consumption of 156,272 kg for *Nephrops*. *Nephrops* constitute 88.6% of the value of catches for the participating vessels, while cod constitute 0.4%.

The project also shows that electronic monitoring allow for good quality video sequences that can be used as documentation for enforcement and control of compliance with the landing obligation. Electronic monitoring can thus be used as an effective control measure in this respect and is assessed to be able to replace or ease parts of the current control at-sea, including the Last Haul control.

There is a potential for further developments of the usage of electronic monitoring, including in the long term a more automated registration of fishing activities and catches. However, electronic monitoring cannot stand alone in its current form, as other control measures are needed for control purposes like control of gear, and because electronic monitoring only allow for control of the vessels where the system is installed. Electronic monitoring makes it possible to redirect currently used control meaures at other fisheries, where the challenges are expected to be less with respect with compliance with the landing obligation or adherence to closed areas, or towards foreign vessels, because vessels with electronic monitoring can be controlled for discard occurence and fishing activities using video footage.

Most participating fishers perceive electronic monitoring as a control measure that unnecessarily interferes with the private sphere of fishers and gives rise to uncertainty and frustration despite the masking capability used. However, there is no indication that the electronic monitoring system itself has been difficult to use, or that errors and malfunctions to a notable degree have lead to a loss of fishing opportunities. The questionnaire survey was sent to and answered by the participating fishers in July 2021, which means that 11 out of the 12 vessel owners or masters had experience with operating within the framework of the electronic monitoring project. There is no indication that the fishers' perception of electronic monitoring with camera documentation becomes more positive after participating in the project for a period of 4-6 months.

In phase 2 of the project, optimization through a a risk-based selection of video sequences for control, a *de minimis* limit for enforcement of non-compliance, a smoother installation process, and more accurate cameras on certain vessels would be worth pursuing. In addition, the possibility to ease some of the current control measures at-sea for the participating vessels should be explored.

Appendix 1: Evalueringskoncept – projekt om elektronisk monitorering i Kattegat

Ministeriet for Fødevarer, Landbrug og Fiskeri
Fiskeristyrelsen

Dato:	15. juli 2021
Sagsnr.:	21-163216-000027
Ref.:	uffsve/krschp
Enhed:	FKK

Evalueringskoncept – projekt om elektronisk monitorering i Kattegat

Indledning og baggrund

I januar 2020 blev der iværksat et projekt med henblik på at indføre elektronisk monitorering af hovedparten af fiskeriet med bundslæbende redskaber i Kattegat. Overordnet har projektet til formål at sikre uafhængig dokumentation af jomfruhummerfiskeriet i Kattegat, herunder omfanget af bifangsten af torsk. Desuden har projektet til formål at sikre en effektiv kontrol af dette fiskeri og en høj regelefterlevelse, herunder ift. landingsforpligtelsen.

Det fremgår af det fælles forståelsespapir, der blev indgået i 2020 mellem den daværende minister og DFPO, at projektet efter 1. januar 2021 løbende evalueres, og at der pr. 1. oktober 2021 foretages en opsamlende evaluering, herunder af hvordan kameramonitorering fungerer som kontrolinstrument i praksis.

Fiskeristyrelsen har tidligere gennemført forsøg med kameramonitorering på udvalgte fartøjer, hvor det efterfølgende er konkluderet, at kameramonitorering er i stand til præcist at dokumentere udøvelsen af fiskeriet, herunder om der foretages udsmid samt at længdebestemme de fangede fisk inden for en mindre fejlmargen. Evalueringen i 2021 bør derfor fokuseres på de kontrolmæssige aspekter, herunder anvendelse af de indkomne data i styrelsens kontrol med landingsforpligtelsen, og om anvendelse af kameramonitorering på sigt kan afløse dele af den traditionelle kontrol. I det omfang det er muligt, bør anvendelsen af data ift. forskning og bestandsvurdering også berøres, idet dette aspekt dog også vil være genstand for evaluering i slutningen af projektets fase 2.

Set-up og evalueringsparametre

Evalueringen vil blive gennemført af Fiskeristyrelsen med relevante bidrag fra eksterne parter, herunder DTU Aqua samt de deltagende fartøjer. Evalueringen i perioden indtil den 1. oktober 2021 vil i sagens natur bære præg af, at ordningen alene har været gennemført i lidt over et halvt år, men kan give nogle foreløbige resultater, som kan blive båret med videre i det videre projektforløb. Der vil ske afrapportering til projektets styre- og følgegruppe.

2. *Data om fangster*

2.1 Hvad er omfanget af bifangster af torsk i jomfruhummerfiskeriet (e-log), herunder samlet tal for fangster af jomfruhummer og torsk ?

2.2 I hvilke geografiske områder fiskes og registreres bifangster af torsk ?

2.3 I hvilket omfang sker der genudsætning af torsk eller andre arter ?

2.4 Hvordan er størrelsessammensætningen af genudsatte bifangster af torsk ?

⟹ Hvad betyder kameramonitoreringen for datakvalitet og viden om genudsætning af bifangst?

3. *Kontrol set-up og kameraovervågning som kontrolværktøj*

3.1 Er der behov for justeringer i det anvendte kontrol set-up (f.eks. andel af videooptagelser til gennemsyn) ift. en effektiv udførelse af kontrollen af fartøjsgruppen ?

3.2 Hvordan kan de opnåede erfaringer med dokumentation af fangster i projektets fase 1 anvendes som grundlag for sanktioner af overtrædelser i projektets fase 2?

3.3 Er fartøjsmonieringsplanens retningslinjer blevet efterlevet af fartøjsførerne?

3.4 Hvilke fejlkilder er der ved gennemsyn af videooptagelser, herunder artsbestemmelse, længdemål og vægt, og hvordan håndteres disse?

⟹ Hvad kan foreløbigt konkluderes om kameramonitorering som et generelt kontrolværktøj?

Vil der på sigt kunne ske afløftning af dele af den traditionelle kontrol for fartøjer med kamera ombord – og er der andre dele af kontrollen, hvor kameraovervågning ikke er et velegnet alternativ ?

4. *Systemets brugervenlighed for deltagende fartøjer og Fiskeristyrelsen*

4.1 Har der været problemer med test/udfald af systemet, der har lagt hindringer i vejen for udøvelsen af fiskeriet, herunder eksempler på defekt udstyr?

4.2 Er informationsniveauet tilstrækkeligt i de gennemsynsrapporter, som fiskeren får efter gennemgang af videomateriale ?

4.3 Krav til Fiskeristyrelsens IT- og datainfrakstruktur for en hensigtsmæssig drift

⟶ Hvad kan foreløbigt konkluderes om brugervenligheden af systemet for de deltagende fartøjer/Fiskeristyrelsen ?

5. *Påvirkning af fiskerens arbejdsforhold*

5.1 Hvordan fungerer muligheden for maskering af ansigter og beskyttelse af fiskernes privatliv ?

5.2 Hvordan har kamerasystemet påvirket fiskernes arbejdsmiljø og praktiske hverdag ?

5.3 Hvor meget data er blevet udleveret til eksterne parter (aktindsigt m.v.) ?

5.4 Hvor meget er fartøjernes fiskeriaktivitet blevet påvirket af installation/andre forhold i relation til projektet?

5.5 Hvordan har processen med udarbejdelse af fartøjsmoniteringsplan og planlægning af installation forløbet ift. de deltagende fartøjer og Fiskeristyrelsens overordnede styring af projektet ?

5.6 Har det haft betydning i forhold til rekruttering og fastholdelse af besætning, at der har været kameraovervågning på fartøjerne?

6. Har de deltagende fartøjer foretaget ændringer i måden hvorpå der fiskes og sorteres, herunder træklængde, antal fangstrejser, områder og tidspunker ?

Evalueringen kan endvidere bilægges en oversigt over projektets etablerings- og driftsudgifter i fase 1.

Kilder og metode til besvarelse af spørgsmål:

Black box analyzer data - videooptagelser
E-log data for fangster
Afregningsdata
Input fra deltagende fartøjer/DFPO
Input fra FVM/Fiskeristyrelsen/DTU Aqua

Særligt punkt 4 vil primært være baseret på input fra de deltagende fartøjer. Dette kan ske mundtligt på møder og/eller skriftligt, f.eks. ved besvarelse af spørgsmål. Vægtningen heraf kan justeres efter drøftelse med DFPO.

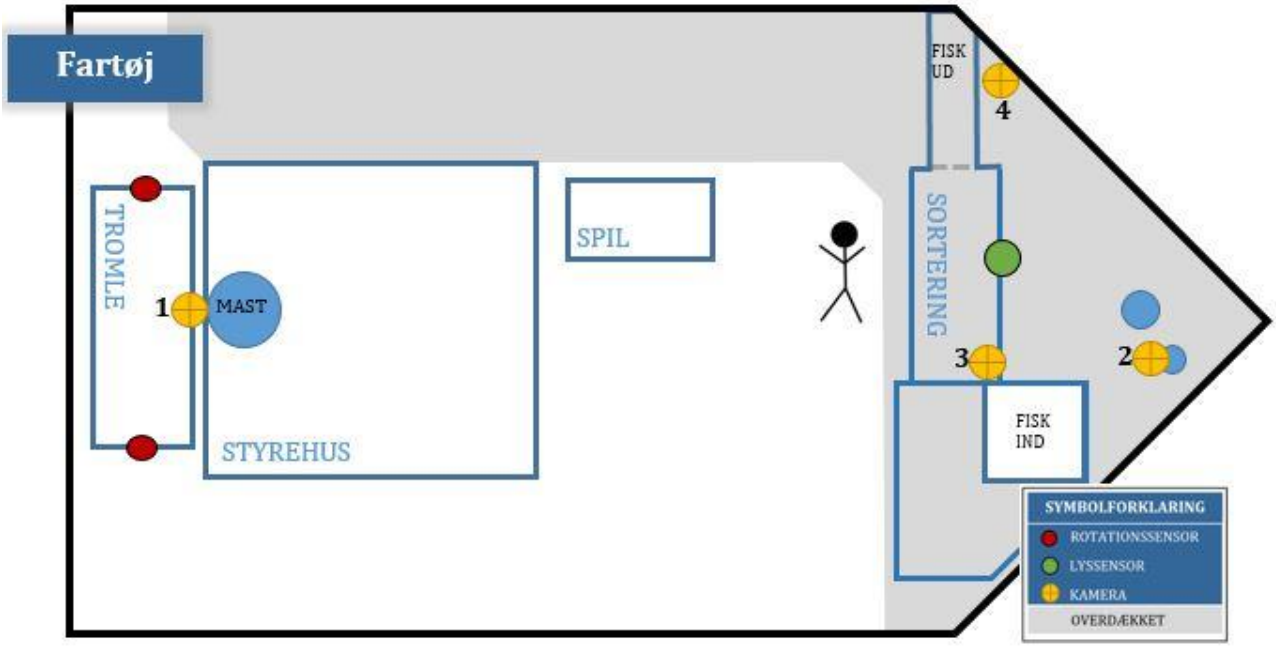
Appendix 2: Eksempel på fartøjsmoniteringsplan

Information fra fartøjsfører

Havnekendingsnr:	XX369
Fartøjsnavn:	Svend Tveskæg
EU Fleet Register number:	
IRCS:	
Basishavn:	
Fartøjslængde:	
Fartøjstype:	
Hovedfiskeri (demersal/pelagisk):	
Geartype(s):	
Besætningsantal:	
Ejers navn eller ejers repræsentant:	
Telefonnr:	
E-mail:	
Sim-kort	

Figur 1 XX369 SVEND TVESKÆG

Opsætning af det elektroniske monitoreringssystem



Figur 2 Grafisk beskrivelse af besætningens håndtering af fangst & andre væsentlige detaljer

Komponenternes placering

Lyssensor

- *1 lyssensor ved sorteringsbordet. Lyssensoren vil registrere når der er tændt lys på dækket.*

Rotationssensorer

- *2 sensorer på fartøjets tromle. Sensorerne vil registrere når tromlen er aktiv, altså når redskabet sættes og fangstoperationen påbegyndes, og når redskabet hales og fangst tages ombord på fartøjet. Når sensorerne på tromlen aktiveres første gang på en fangstrejse, vil systemet kameraer påbegynde optagelserne. Optagelserne vil stoppe når fartøjet ankommer til havn.*

Kameraer

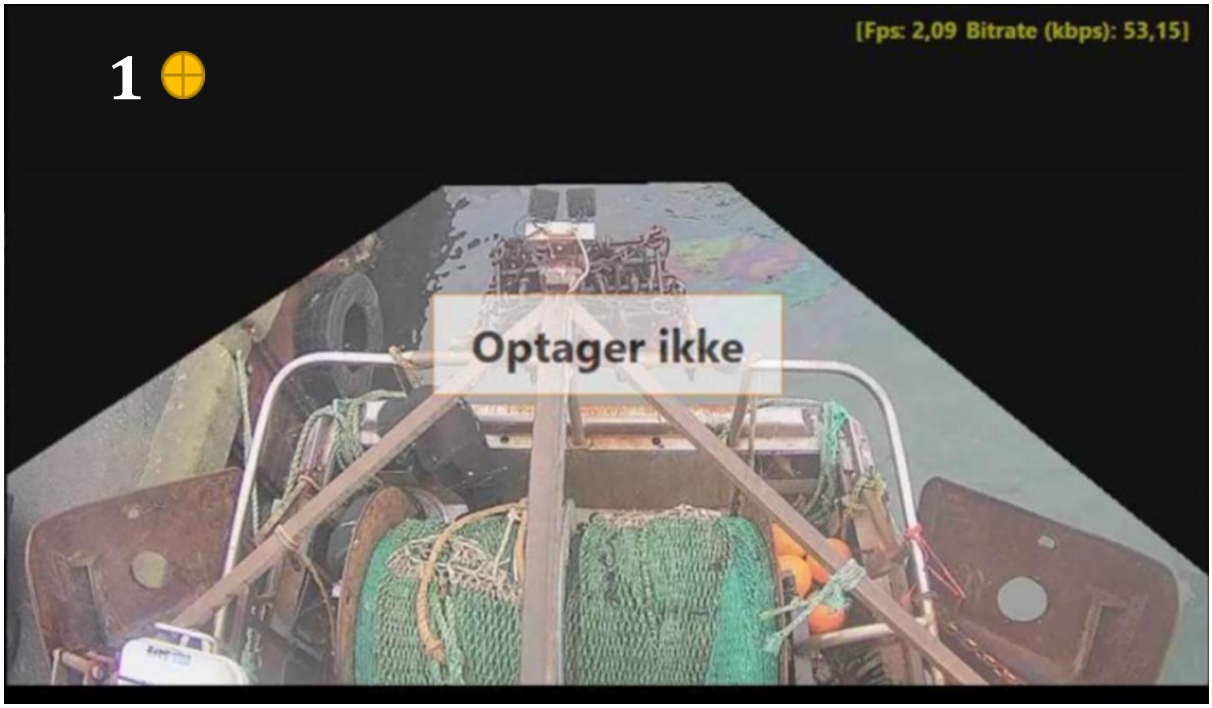
1. *<u>Trawlkamera.</u>*
   Agter på masten pegende mod fartøjets trawl. Det skal udelukkende se om udstyret er ude eller inde. Det omkringliggende areal rundt om tromlen kan afmaskeres.

2. *<u>Fangstoverview-kamera.</u>*
   På tværstang pegende mod lugen (Fisk-ind-markeringen). Dette kamera skal se hvor fangsten kommer ind.

3. *<u>Fangstbehandlings-kamera.</u>*
   Midtskibs på skottet pegende mod sorteringsfladen. Dette kamera skal se sorteringen af fangsten.

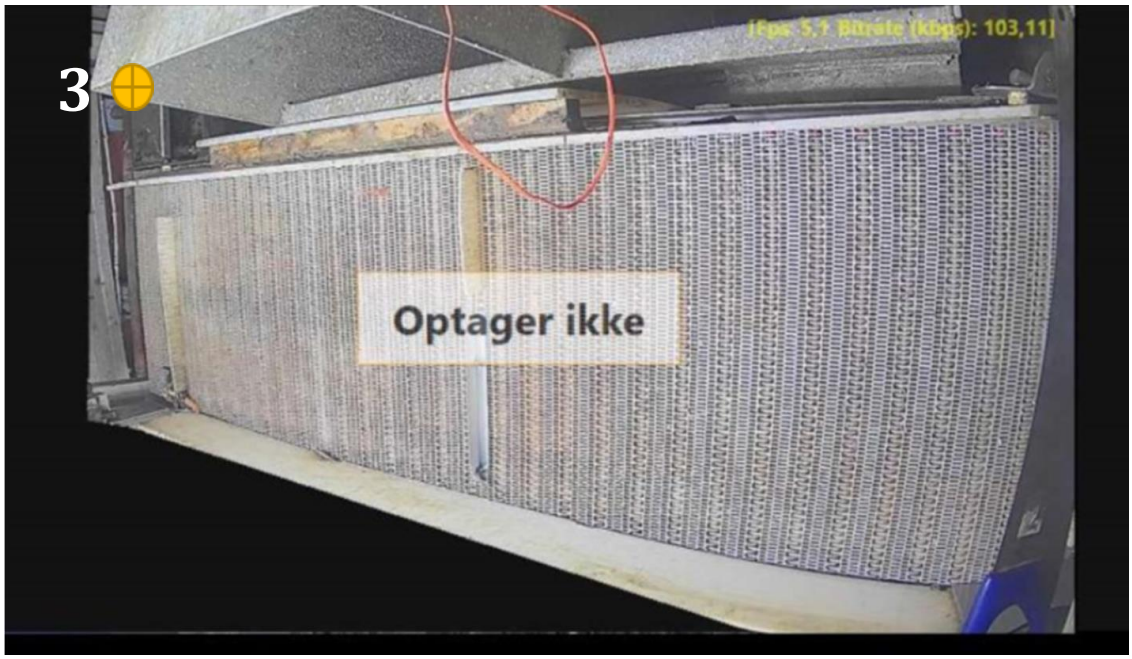
4. *<u>Discard-kamera.</u>*
   På dæk (overdækningen) ved bagbord sluse (Fisk-ud-placeringen). Dette kamera skal se den del af fangsten der genudsættes.

Kameraernes synsfelt

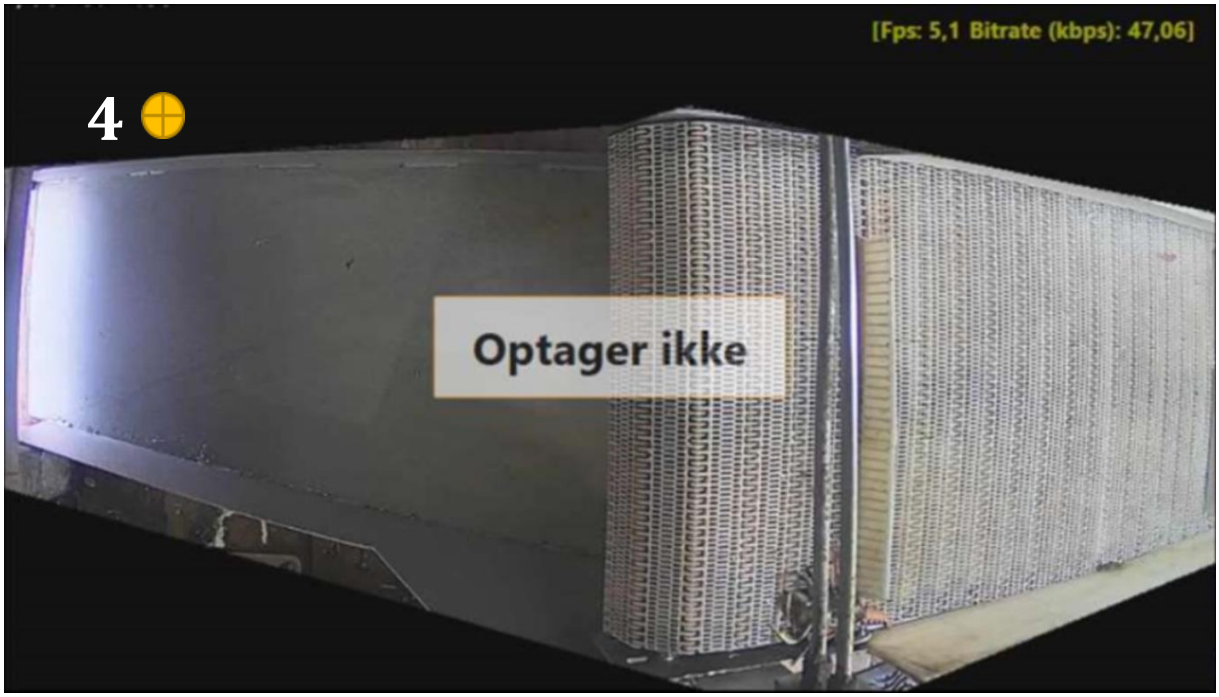


Figur 3 Kamera 1. Trawlkamera

Figur 4 Kamera 2. Fangstoverview-kamera.



Figur 5 Kamera 3. Fangstbehandlingskamera.



Figur 6 Kamera 4. Discard-kamera.

Opstart

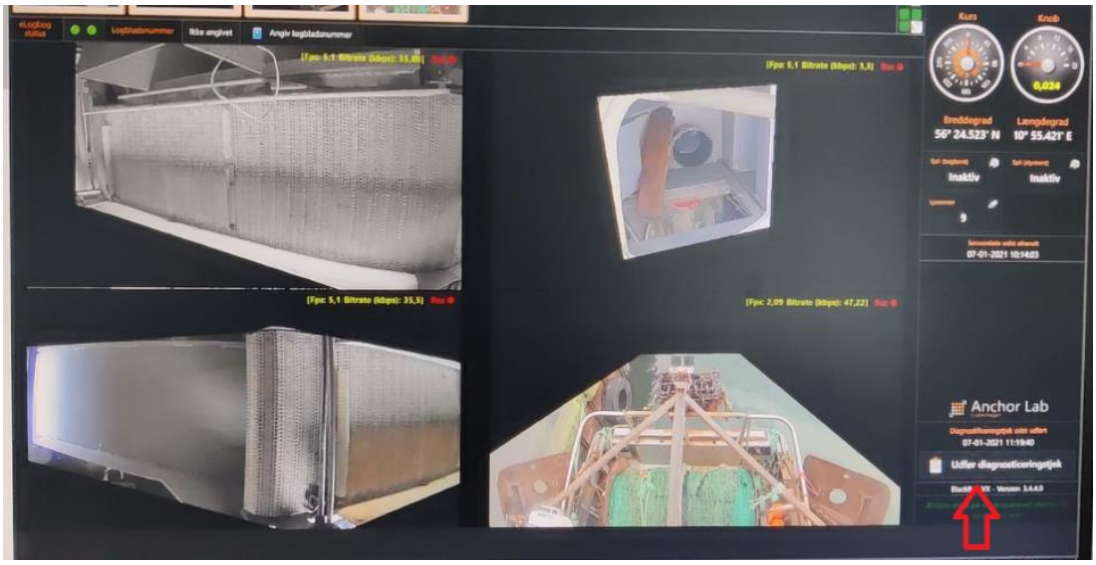
En funktionstest af Black Box VX-systemet udføres inden fiskeaktivitet påbegyndes. Dette gøres for at sikre at alle kameraer og sensorer i systemet er funktionsdygtige. Hvis det i løbet af funktionstesten viser sig, at der forefindes et nedbrud i systemet, ligger der, i underkapitlet Systemnedbrud (side 11) en vejledning for videre handling.

Visuel guide til funktionstest af Black Box VX-system ombord

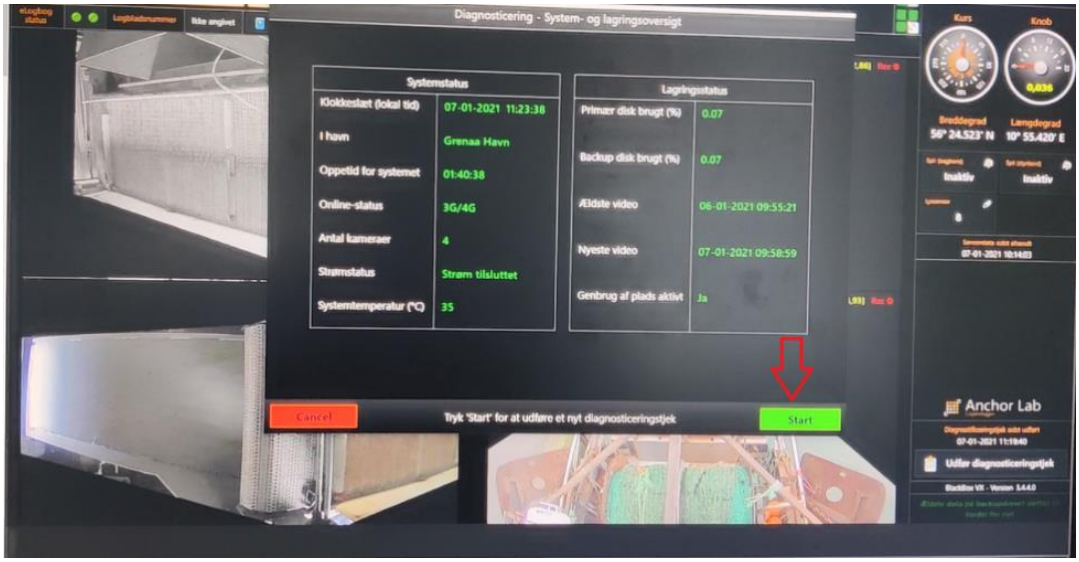
Funktionstesten udføres på skærmen i styrehuset. Testen vil altid kunne udføres.

1: Start

Klik på ”Udfør diagnosticeringstjek” i nederste højre hjørne af skærmen (markeret med ⇧)



Pop-up med ”Diagnosticering – System og lagringsoversigt”. Tryk på den grønne ”Start”-knap

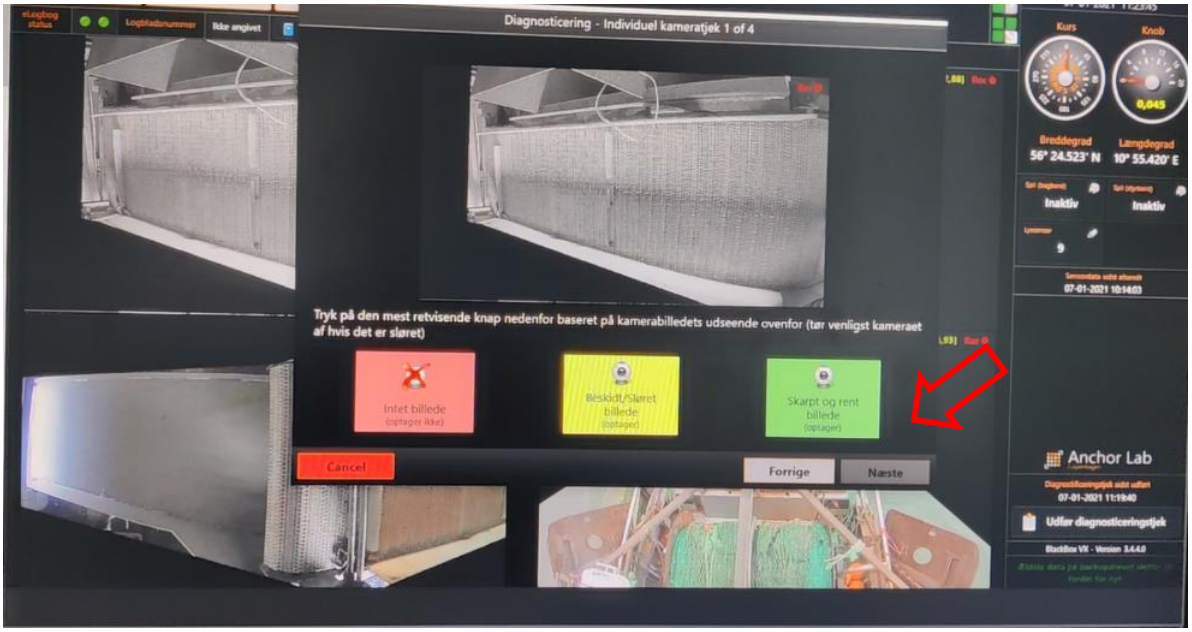


2: Individuelt tjek af hvert kamera

Hvert kamera tjekkes, hvorefter man klikker på det farveikon, der bedst beskriver billedets tilstand (rød: intet billede, gul: beskidt/sløret billede, grøn: skarpt og rent billede).

- Hvis det røde ikon vælges, er der tale om et systemnedbrud, og man skal slå op i underkapitlet *Systemnedbrud,* hvor der findes en vejledning for videre handling.
- Hvis det gule ikon vælges kan funktionstesten fortsættes, og kameraet skal efterfølgende tørres af inden fangstsortering.
- Hvis det grønne ikon vælges, er ingen yderligere handling nødvendig, og funktionstesten fortsættes.

På det viste eksempel er 4 kameraer opsat. Alle billeder er skarpe og rene. Der klikkes på det grønne ikon, og derefter på ”Næste”-knappen.

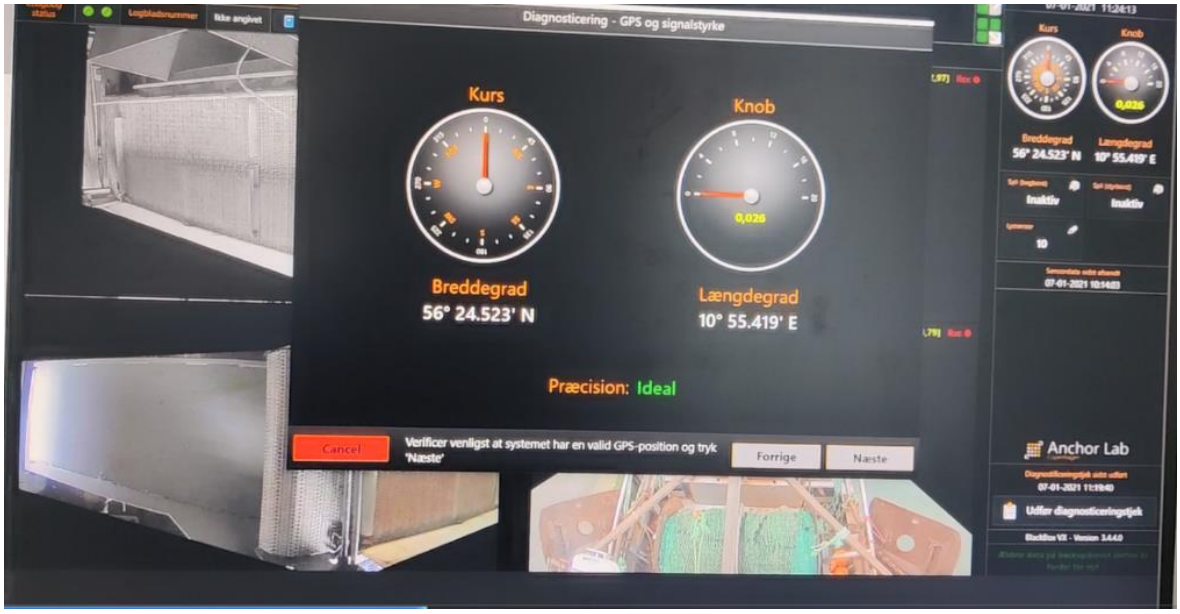


Dette udføres ved alle 4 kameraer

3: Tjek af GPS og signalstyrke

GPS'ens præcision bliver i systemet beskrevet som: Ideal, Excellent, Good, Moderate, Fair, Poor eller Unknown.

Er præcisionen angivet med grøn eller gul tekst, godtages signalstyrken. Er den rød, er der tale om et systemnedbrud, og man skal slå op i underkapitlet *Systemnedbrud,* hvor der findes en vejledning for videre handling. I viste eksempel ses Præcision: Ideal. Dette er godt og der trykkes på "Næste"-knappen.

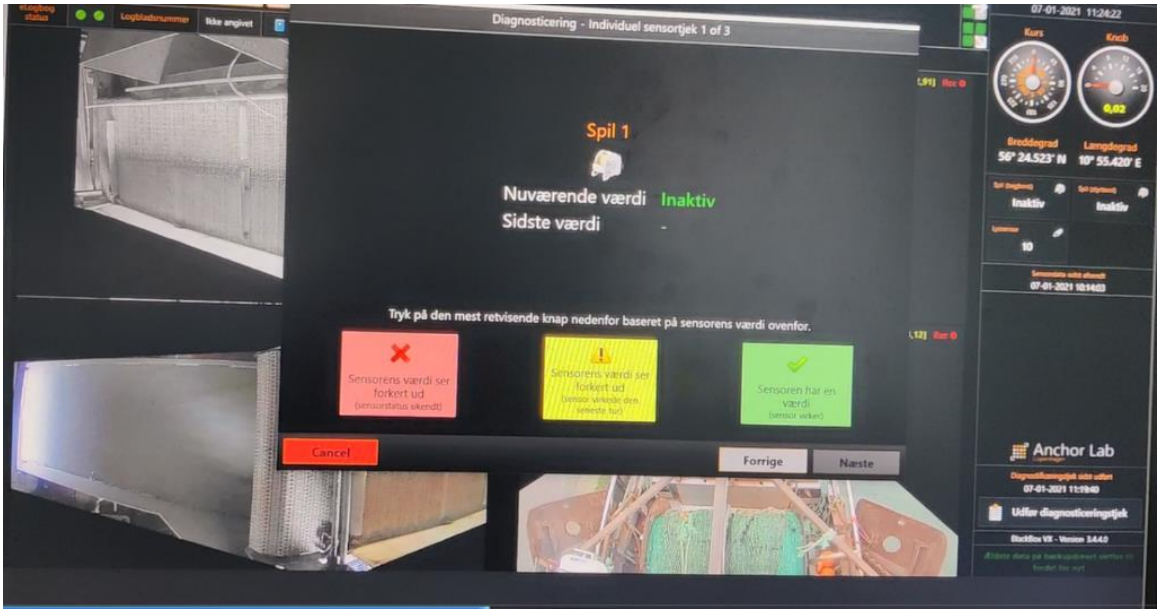


4: Tjek af sensorer

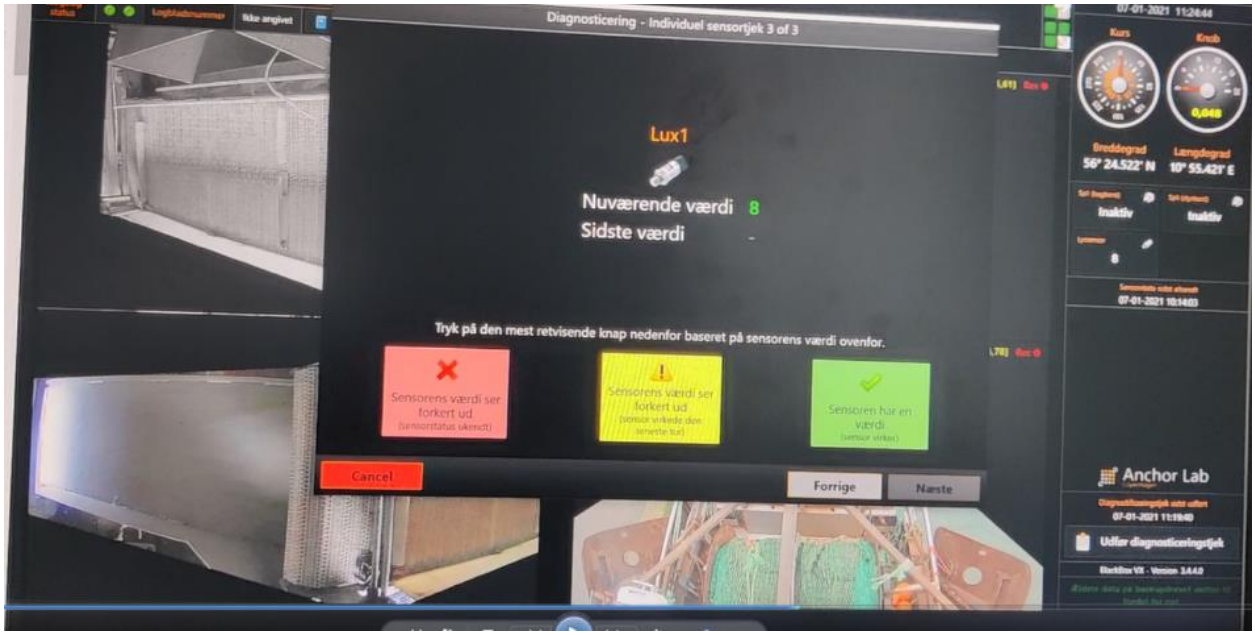
Rotationssensorerne på spillene tjekkes først.

Under *Sidste værdi* skal datoen for seneste sensordata matche datoen for forrige fangstrejse. Derved ses at rotationssensorerne var funktionsdygtige ved seneste fangstrejse.

Der klikkes på det grønne ikon og efterfølgende på ”Næste”-knappen. Dette gøres for begge rotationssensorer.



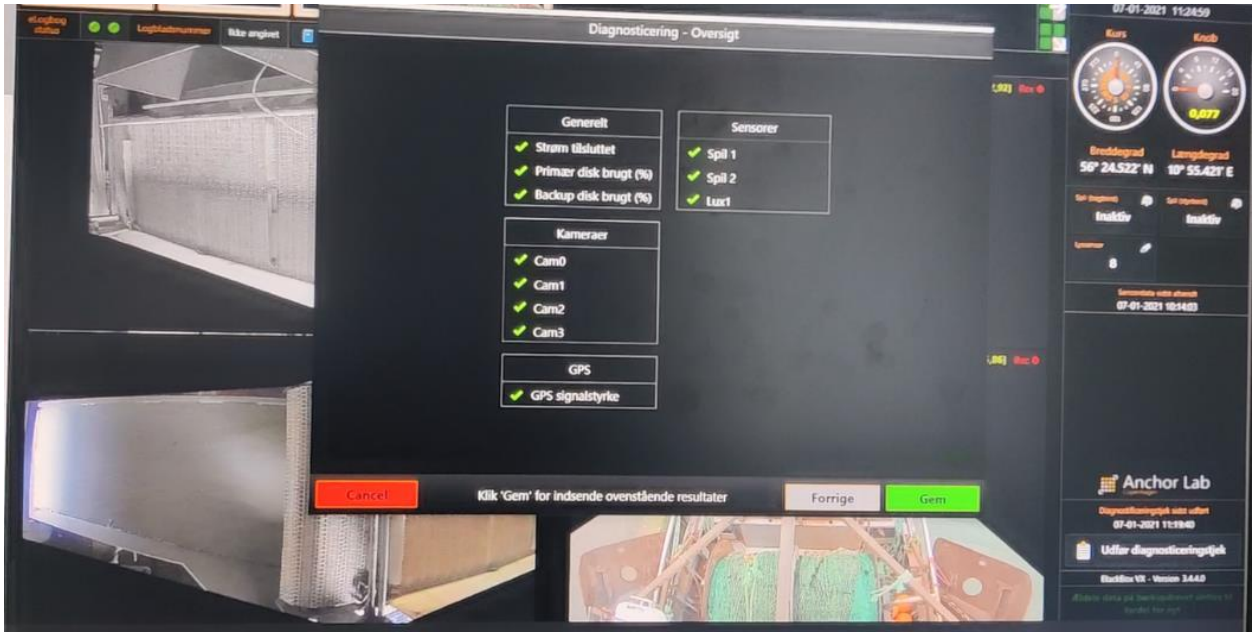
Er der installeret lyssensor på fartøjet, vil denne også komme op til tjek som vist herunder. Viser den nuværende værdi grønne tal, virker lyssensoren. Der klikkes på det grønne ikon og efterfølgende på ”Næste”-knappen.



5: Oversigt over funktionstesten

I eksemplet var alle systemdele funktionsdygtige og der vises grønne flueben ved hver komponent. Der trykkes på den grønne ”Gem”-knap.

Såfremt systemdele har gule eller røde flueben henvises til sektionen om systemnedbrud på fartøjet. Er kameraer markeret med gult flueben vil en aftørring med stor sandsynlighed være tilstrækkelig.



Ansvar under fiskeri

- Det gælder for fartøjsføreren at:

  (uddrag fra Bek. 984 §4):

  1. Ved fiskeri i Kattegat skal fartøjets elektroniske monitoreringssystem til enhver tid være fuldt funktionsdygtigt og i drift. Fartøjsføreren er ansvarlig for dette.

  2. Fartøjsføreren skal sikre, at kameraerne ikke er tildækket eller på anden måde blokeret i forhold til de retningslinjer for placering af kameraerne, som anvises af Fiskeristyrelsen.

  3. Fartøjsføreren skal dagligt og inden afsejling fra havn foretage kontrol af, at det elektroniske monitoreringssystem er fuldt funktionsdygtigt og i drift (Se Visuel guide til funktionstest af Black Box VX-system ombord side 6).

  4. Fartøjsføreren skal sikre, at der dagligt og inden indhaling af grej og sortering af fangst, samt i øvrigt efter behov, foretages nødvendig rengøring af kameraer.

  5. Under fiskeri i Kattegat er fartøjsføreren forpligtet til øjeblikkeligt at udbedre fejl, der hindrer funktionen af det elektroniske monitoreringssystem. Enhver konstateret fejl skal uden unødigt ophold indrapporteres til Fiskeristyrelsen. Der må ikke udøves fiskeri, før fejlen er udbedret og indrapporteret til Fiskeristyrelsen (se afsnittet om systemnedbrud side 11).

Systemnedbrud

Som udgangspunkt skal fartøjets elektroniske monitoreringssystem til enhver tid være fuldt funktionsdygtigt og i drift ved fiskeri i Kattegat. Der må altså ikke udøves fiskeri, før fejlen er udbedret og indrapporteret til Fiskeristyrelsen.

Ved mindre fejl i det elektroniske monitoreringssystem, kan fiskeri fortsat tillades. Disse undtagelser vil være specifikke for det enkelte fartøj.

Systemnedbrud på Svend Tveskæg

Ved fejl på Black Box VX-systemet på fartøjet XX369 Svend Tveskæg er nedstående scenarier gældende. Systemnedbrud kan forekomme når fartøjet er i havn eller under fiskeri. Der distingveres mellem disse i det følgende.

For fejl der konstateres ved funktionstest inden afsejling fra havn gælder følgende:		
Defekt komponent:	**Vigtighed:**	**Handleplan:**
Lyssensor	Komponenten er *ikke* kritisk for systemets funktionsdygtighed, der stadig lever op til kontrolformålet.	- meldes straks til FMC døgnvagt 72 18 56 09. - en fangstrejse kan påbegyndes - fejlen skal udbedres næste gang fartøjet er i havn, og inden næste fangstrejse.
Kamera 1 (Trawlkamera) (figur 3)	Komponenten er *ikke* kritisk for systemets funktionsdygtighed, der stadig lever op til kontrolformålet.	- meldes straks til FMC døgnvagt 72 18 56 09. - en fangstrejse kan påbegyndes - fejlen skal udbedres næste gang fartøjet er i havn, og inden næste fangstrejse.
eLog	Komponenten er *ikke* kritisk for systemets funktionsdygtighed, der stadig lever op til kontrolformålet.	- meldes straks til FMC døgnvagt 72 18 56 09 - tilfældet behandles på samme vis som fartøjer uden kamerasystem. - Logbladsnummer for hver tur indtastes af fartøjsfører i feltet "Angiv logbladsnummer" (se figur 7 i bilag 2)
Kamera 2 (fangstoverview-kamera) (figur 4)	Komponenten er *ikke* kritisk for systemets funktionsdygtighed, der stadig lever op til kontrolformålet.	- meldes straks til FMC døgnvagt 72 18 56 09. - en fangstrejse kan påbegyndes - fejlen skal udbedres næste gang fartøjet er i havn, og inden næste fangstrejse.
Kamera 3 (Fangstbehandlingskamera)	Komponenten er kritisk for	- meldes straks til FMC døgnvagt 72 18 56 09

For fejl der konstateres ved funktionstest inden afsejling fra havn gælder følgende:		
(figur 5)	systemets funktionsdygtighed.	- en fangstrejse kan ikke påbegyndes før fejlen er blevet udbedret.
Kamera 4 (Discard-kamera) (figur 6)	Komponenten er kritisk for systemets funktionsdygtighed.	- meldes straks til FMC døgnvagt 72 18 56 09 - en fangstrejse kan ikke påbegyndes før fejlen er blevet udbedret.
GPS	Komponenten er kritisk for systemets funktionsdygtighed.	- meldes straks til FMC døgnvagt 72 18 56 09 - en fangstrejse kan ikke påbegyndes før fejlen er blevet udbedret.
Rotationssensor	Komponenten er kritisk for systemets funktionsdygtighed.	- meldes straks til FMC døgnvagt 72 18 56 09 - en fangstrejse kan ikke påbegyndes før fejlen er blevet udbedret. Der er mulighed for en midlertidig løsning på problemet. En indstilling i systemet kan få kameraerne til at optage, når fartøjet bevæger sig ud fra havneboksen. Kameraerne vil optage under hele sejladsen, og stoppe når fartøjet ankommer til havn. Fejlen på rotationssensorerne skal udbedres før systemet kan ændres tilbage til original-indstillingen. - Ønskes denne løsning kontaktes Kristian Plet-Hansen på +45 72185681 eller Ditte Maja Noach på +45 72185698. - Fiskeriet kan først fortsættes når ændringen er blevet fortaget.

Når fartøjet er under fiskeri gælder følgende:		
Defekt komponent:	Vigtighed:	Handleplan:

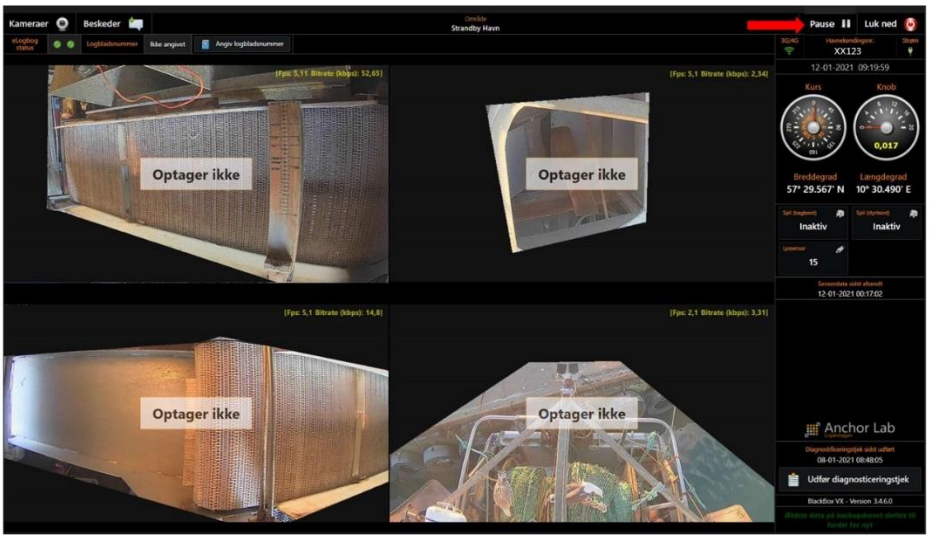
Når fartøjet er under fiskeri gælder følgende:		
Lyssensor	Komponenten er *ikke* kritisk for systemets funktionsdygtighed, der stadig lever op til kontrolformålet.	- meldes straks til FMC døgnvagt 72 18 56 09. - fangstrejsen kan fortsætte. - fejlen skal udbedres næste gang fartøjet er i havn og inden næste fangstrejse.
Kamera 1 (Trawlkamera) (figur 3)	Komponenten er *ikke* kritisk for systemets funktionsdygtighed, der stadig lever op til kontrolformålet.	- meldes straks til FMC døgnvagt 72 18 56 09. - fangstrejsen kan fortsætte. - fejlen skal udbedres næste gang fartøjet er i havn og inden næste fangstrejse.
eLog	Komponenten er *ikke* kritisk for systemets funktionsdygtighed, der stadig lever op til kontrolformålet.	- meldes straks til FMC døgnvagt 72 18 56 09 - tilfældet behandles på samme vis som fartøjer uden kamerasystem. - Logbladsnummer for hver tur indtastes af fartøjsfører i feltet "Angiv logbladsnummer" (se figur 7 i bilag 2)
Kamera 2 (fangstoverview-kamera) (figur 4)	Komponenten er *ikke* kritisk for systemets funktionsdygtighed, der stadig lever op til kontrolformålet.	- meldes straks til FMC døgnvagt 72 18 56 09. - fangstrejsen kan fortsætte. - fejlen skal udbedres næste gang fartøjet er i havn og inden næste fangstrejse.
Kamera 3 (Fangstbehandlingskamera) (figur 5)	Komponenten er kritisk for systemets funktionsdygtighed.	- meldes straks til FMC døgnvagt 72 18 56 09 - fangstrejsen må afbrydes. En igangværende fangstoperation kan afsluttes, hvorefter fartøjet må sejle mod havn. - Fiskeriet kan ikke fortsætte før fejlen er blevet udbedret.
Kamera 4 (Discard-kamera) (figur 6)	Komponenten er kritisk for systemets funktionsdygtighed.	- meldes straks til FMC døgnvagt 72 18 56 09 - fangstrejsen må afbrydes. En igangværende fangstoperation kan afsluttes, hvorefter fartøjet må sejle mod havn. - Fiskeriet kan ikke fortsætte før fejlen er blevet udbedret.
GPS	Komponenten er kritisk for systemets funktionsdygtighed.	- meldes straks til FMC døgnvagt 72 18 56 09 - fangstrejsen må afbrydes. En igangværende fangstoperation kan

Når fartøjet er under fiskeri gælder følgende:		
		afsluttes, hvorefter fartøjet må sejle mod havn. - Fiskeriet kan ikke fortsætte før fejlen er blevet udbedret.
Rotationssensor	Komponenten er kritisk for systemets funktionsdygtighed.	- meldes straks til FMC døgnvagt 72 18 56 09 - Såfremt første træk er begyndt og video optager kan fangstrejsen fortsættes. - **Hvis der ikke har været kørt med spil og der derfor endnu ikke optages video må fangstrejsen må afbrydes. I så fald kan fiskeriet i udgangspunkt ikke fortsætte før fejlen er blevet udbedret.** Der er mulighed for en midlertidig løsning på problemet. En indstilling i systemet kan få kameraerne til at optage, når fartøjet bevæger sig ud fra havneboksen. Kameraerne vil optage under hele sejladsen, og stoppe når fartøjet ankommer til havn. Fejlen på rotationssensorerne skal udbedres før systemet kan ændres tilbage til original-indstillingen. **Dette kræver dog at fartøjet er indenfor 3G/4G-forbindelse og det kan derfor være nødvendigt at sejle mod havn før denne indstilling kan laves**. - Ønskes denne løsning kontaktes Kristian Plet-Hansen på +45 72185681 eller Ditte Maja Noach på +45 72185698. - Fiskeriet kan først fortsættes når ændringen er blevet fortaget.

Fiskeri uden for Kattegat

Det er kun ved fiskeri i Kattegat, at kamerasystemet skal optage. Kamerasystemet skal stoppe optagelserne, når fartøjet forlader Kattegat, ligesom kamerasystemet skal starte optagelser, når fartøjet igen sejler ind i Kattegat.

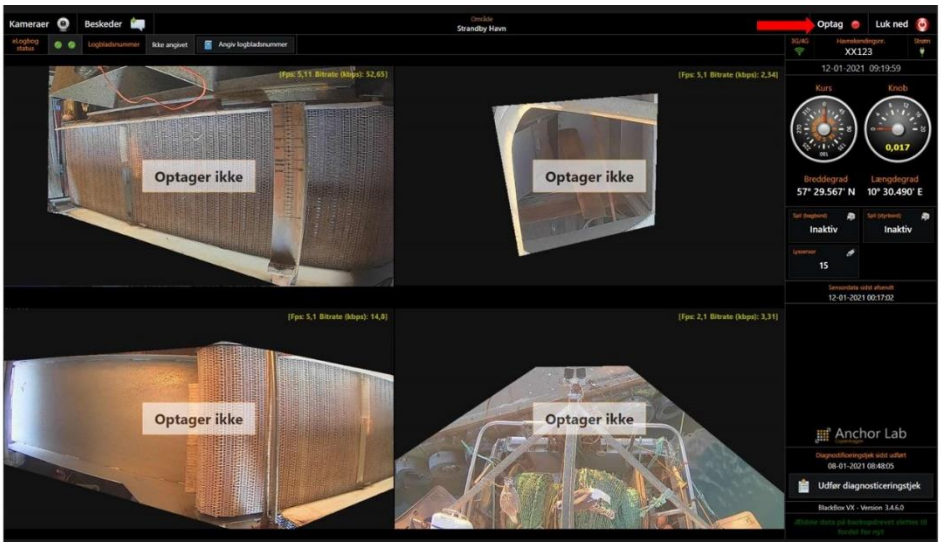
På nuværende tidspunkt kan fartøjsføreren ved hjælp af mus og skærm sætte optagelserne på standby i det øjeblik fartøjet sejler ud af Kattegat. Pt. vil systemet sætte videooptagelserne på pause, mens systemet vil forsætte med at logge sensordata (kurs, fart, position samt data fra rotationssensorer) hvert 10. sekund.



Stop

Fartøjsføreren skal manuelt ved udsejling fra Kattegat sætte kameraoptagelserne på pause.

Dette gøres ved at klikke på ”Pause”-knappen i skærmens øvre højre hjørne.



Start

Fartøjsføreren skal manuelt inden indsejling i Kattegat sætte kameraoptagelserne i gang igen.

Dette gøres ved at klikke på ”Optag”-knappen i skærmens øvre højre hjørne.

I første kvartal 2021 vil der komme endnu en softwareopdatering til kamerasystemet, der bevirker, at kamerasystemet automatisk vil stoppe kameraoptagelser og logning af sensordata i det øjeblik systemet registrerer, at fartøjet sejler ud af Kattegat, ligesom systemet automatisk vil starte kameraoptagelserne og logning af sensordata når fartøjet igen sejler ind i Kattegat.

Det skal bemærkes til ovenstående tekst, at den automatiske softwareopdatering er implementeret. Da dette er sket efter fartøjsmoniteringsplanerne for fase 1 er teksten medtaget her.

Bilag (til fartøjsmoniteringsplanen)

Underbilag 1: Vejledning til landingsforpligtigelse

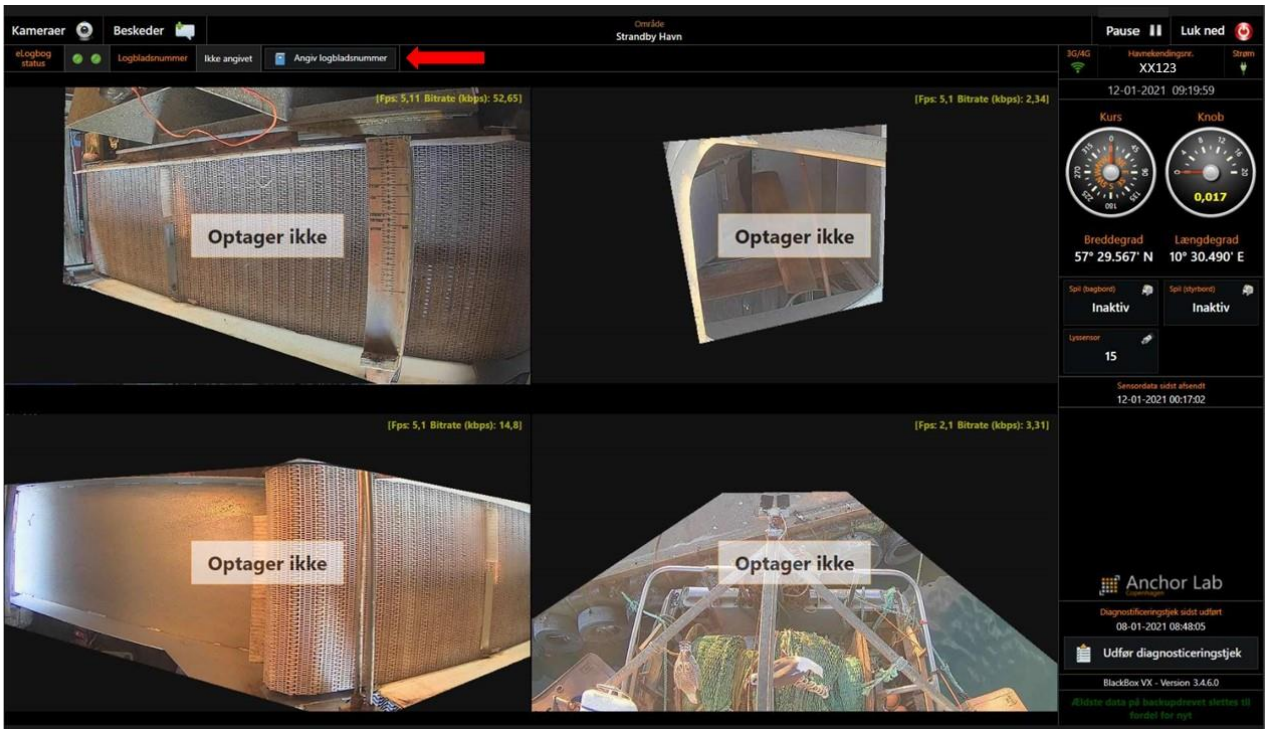
Vejledninger til landingsforpligtigelsen findes på Fiskeristyrelsens hjemmeside under fanen:

Erhvervsfiskeri > Fiskerireformen > Discardforbud:

https://fiskeristyrelsen.dk/erhvervsfiskeri/fiskerireformen/discardforbud/

Vejledning for Kattegat findes under drop-down menu "Vejledninger" ->
Vejledning til landingspligt for demersalt fiskeri i Nordsøen og ICES 3a (incl. Skagerrak og Kattegat)

Underbilag 2: Logbladsnummer i Black Box VX system



Figur 7 Den røde pil viser hvor logbladsnummeret skrives ind på skærmen i styrehuset

Bekendtgørelse om elektronisk monitorering af visse fartøjer i Kattegat

I medfør af § 117, stk. 2, og § 130, stk. 2, i lov om fiskeri og fiskeopdræt (fiskeriloven), jf. lovbekendtgørelse nr. 261 af 21. marts 2019, som ændret ved lov nr. 559 af 7. maj 2019, fastsættes:

§ 1. Denne bekendtgørelse fastsætter krav om elektronisk monitorering af visse fartøjer i Kattegat ved erhvervsmæssigt fiskeri med henblik på at gennemføre et nationalt projekt vedrørende fuldt dokumenteret fiskeri gennem elektronisk monitorering af visse fartøjer i Kattegat, jf. artikel 15, stk. 2, i Rådets forordning (EU) 2020/123 af 27. januar 2020 om fastsættelse for 2020 af fiskerimuligheder for visse fiskebestande og grupper af fiskebestande gældende for EU-farvande og for EU-fiskerfartøjer i visse andre farvande. Den elektroniske monitorering skal sikre data til brug for kontrol og forskning.

§ 2. Fiskeristyrelsen kan meddele påbud om, at et fartøj, der har været 20 havdage eller flere i Kattegat i gennemsnit pr. år i perioden fra og med 1. januar 2017 til og med 31. december 2019, eller som har været 20 havdage eller flere i Kattegat i det pågældende indeværende kalenderår, skal anvende et af Fiskeristyrelsen udvalgt elektronisk monitoreringssystem med kameraer og sensorer. Påbuddet fastsættes til at gælde fra en nærmere angiven dato.

Stk. 2. Fiskeristyrelsen kan pålægge fartøjsejeren at lade det elektroniske monitoreringssystem montere inden for en tidsfrist forud for datoen fastsat i medfør af stk. 1.
Stk. 3. Et påbud i medfør af stk. 1 kan kun opfyldes med et elektronisk monitoreringssystem, der er udvalgt og godkendt af Fiskeristyrelsen.

Stk. 4. Fiskeristyrelsen kan pålægge en ejer af et fartøj omfattet af et påbud i medfør af stk. 1 at give Fiskeristyrelsen eller en af Fiskeristyrelsen udpeget montør eller dennes ansatte adgang til fartøjet på et nærmere angivet tidspunkt med henblik på montering af det elektroniske monitoreringssystem. Dette omfatter også adgang i forbindelse med udarbejdelse af en fartøjsmonitoreringsplan, jf. § 3.

Stk. 5. Fiskeristyrelsen kan i forbindelse med adgang til fartøjet i medfør af stk. 4 med to ugers varsel pålægge et fartøj omfattet af stk. 1 at ligge i havn på en fastsat dato i en nærmere angivet havn.

§ 3. Forud for montering af et elektronisk monitoreringssystem udarbejder Fiskeristyrelsen en fartøjsmonitoreringsplan for det pågældende fartøj. Fartøjsføreren og fartøjsejeren skal bidrage i nødvendigt omfang i forhold til fremvisning af fartøjet og med beskrivelser af tekniske forhold og indretning af fartøjet.

Stk. 2. På baggrund af det konkrete fartøjs indretning og tekniske forhold fastsætter Fiskeristyrelsen i fartøjsmonitoreringsplanen krav til den nærmere opsætning af det elektroniske monitoreringssystem, herunder vedrørende placering og antal af kameraer og placering af sensorer.

§ 4. For fartøjer omfattet af et påbud efter § 2, stk. 1, gælder følgende:

1) Ved fiskeri i Kattegat skal fartøjets elektroniske monitoreringssystem til enhver tid være fuldt funktionsdygtigt og i drift. Fartøjsføreren er ansvarlig for dette.

2) Fartøjsføreren skal sikre, at kameraerne ikke er tildækket eller på anden måde blokeret i forhold til de retningslinjer for placering af kameraerne, som anvises af Fiskeristyrelsen.

3) Fartøjsføreren skal dagligt og inden afsejling fra havn foretage kontrol af, at det elektroniske monitoreringssystem er fuldt funktionsdygtigt og i drift.

4) Fartøjsføreren skal sikre, at der dagligt og inden indhaling af grej og sortering af fangst, samt i øvrigt efter behov, foretages nødvendig rengøring af kameraer.

5) Fiskeristyrelsen kan uden forudgående varsel foretage kontrol af det elektroniske monitoreringssystem gennem direkte adgang til stillbilleder og kameraoptagelser i realtid fra det elektroniske monitoreringssystem, jf. fiskerilovens § 117, stk. 3, nr. 5.

6) Under fiskeri i Kattegat er fartøjsføreren forpligtet til øjeblikkeligt at udbedre fejl, der hindrer funktionen af det elektroniske monitoreringssystem. Enhver konstateret fejl skal uden unødigt ophold indrapporteres til Fiskeristyrelsen. Der må ikke udøves fiskeri, før fejlen er udbedret og indrapporteret til Fiskeristyrelsen. Hvis fartøjsmonitoreringsplanen fastsætter nærmere retningslinjer for, hvornår fiskeri skal indstilles ved fejl, skal disse desuden følges.

7) Uanset nr. 1 og 6 kan Fiskeristyrelsen ved mindre fejl i det elektroniske monitoreringssystem tillade fortsat fiskeri, hvis dette er foreneligt med det elektroniske monitoreringssystems kontrolformål.

§ 5. Al data fra det elektroniske monitoreringssystem er ejet af fartøjsejeren, der er dataansvarlig.

Stk. 2. Fartøjsejeren er forpligtet til at opbevare al data fra det elektroniske monitoreringssystem i ét år, hvorefter data skal slettes.

Stk. 3. Fiskeristyrelsen har adgang til data, herunder kamera-optagelser, med henblik på efterfølgende gennemsyn i det omfang det er nødvendigt i forhold til opfyldelsen af de formål, som er angivet i stk. 4. Fartøjsejeren og fartøjsføreren er forpligtet til at sikre, at Fiskeristyrelsen har adgang til data fra den elektroniske monitorering. Fiskeristyrelsen trækker nødvendig data direkte fra det elektroniske monitoreringssystem eller ved kopiering fra det elektroniske monitoreringssystems harddisk. Sensordata kan automatisk overføres løbende til Fiskeristyrelsen.

Stk. 4. Fiskeristyrelsen kan anvende data trukket fra det elektroniske monitoreringssystem til statistik og kontrol- og håndhævelsesformål. Fiskeristyrelsen kan desuden videregive udleveret data til forskningsmæssige formål og trække data med henblik på videregivelse til forskningsmæssige formål.

§ 6. Med bøde straffes den, der:

1) Overtræder eller forsøger at overtræde § 4, nr. 1-6 eller § 5, stk. 2 og3.
2) Undlader at efterkomme et påbud udstedt i medfør af § 2, stk. 1-5.
Stk. 2. Der kan pålægges selskaber m.v. (juridiske personer) strafansvar efter reglerne i straffelovens 5. kapitel.

§ 7. Bekendtgørelsen træder i kraft den 1. juli 2020.

Underbilag 4: Spørgsmål og svar om projektet og udstyret

Hvad er meningen med kameraprojektet?

Projektet skal medvirke til at belyse, hvordan kameramonitorering fungerer som kontrolinstrument i praksis og hvilke dele af den normale kontrol, de deltagende fartøjer på sigt vil kunne undtages for.

For uddybning se bilag 2 "Et bæredygtigt fiskeri i Kattegat".

Hvornår filmer kameraerne?

Kameraerne vil starte med at filme når fiskeriet igangsættes, dvs. fra rotationssensorerne registrerer at spillene er i bevægelse. Optagelsen vil ophører når fartøjet går i havn, altså når det bevæger sin inden for havneboksen.

Hvad sker der med optagelserne fra kameraerne?

Optagelserne fra kameraerne lagres på harddisk ombord på dit fartøj.

Ud fra sensordata trækker Fiskeristyrelsen videosekvenser til kontrol baseret på stikprøver med henblik på verificering af at landingsforpligtigelsen bliver overhold. Disse videosekvenser overføres via internettet automatisk mens fartøjet er inden for 2,3 eller 4G rækkevidde.

Fiskeristyrelsen ser videosekvenserne igennem og sletter umiddelbart efter videosekvensen, såfremt der ikke konstateres uoverensstemmelser med landingspligten. Hvis der ved gennemsyn af videosekvens konstateres ulovlig genudsætning i modstrid med landingsforpligtigelsen vil videosekvensen blive gemt indtil en eventuel sag er afgjort.

Hvem kan få adgang til optagelserne, og hvad kan de se?

Så længe videooptagelserne kun ligger på fartøjets harddisk er det fartøjets personlige data og andre har ikke ret til optagelserne.

Når videosekvenser til kontrol er hos Fiskeristyrelsen vil de være omfattet af aktindsigt og alle har derfor som udgangspunkt ret til at søge om adgang til optagelserne.

Såfremt der søges om aktindsigt i en videosekvens inden den bliver slettet fra Fiskeristyrelsen vil optagelsen som udgangspunkt derfor blive udleveret. Eventuelle videosekvenser hvor dele af mandskabet grundet arbejdsgang er kommet inden for et ikke afmaskeret område af filmningen vil kunne få lagt yderligere afmaskering på ved hjælp af et filmediteringsprogram inden optagelserne udleveres til dem der har søgt om aktindsigt.

Jeg kan ikke finde svar på mine spørgsmål, hvad gør jeg?

Svarene vil evt. kunne findes i vedlagte bilag

1. Bekendtgørelse om elektronisk monitorering af visse fartøjer i Kattegat
2. opstartsguide
3. Et bæredygtigt fiskeri i Kattegat

Hvis ikke, er du velkommen til at kontakte os, enten

Kristian Plet-Hansen på +45 72185681, krscph@fiskeristyrelsen.dk eller

Ditte Maja Noach på +45 72185698, dimano@fiskeristyrelsen.dk

Eller skrive til projektets e-mailadresse: kamerakattegat@fiskeristyrelsen.dk

Eller FMC døgnvagt på +45 72185609

Underbilag 5: Et bæredygtigt fiskeri i Kattegat

Et bæredygtigt fiskeri i Kattegat

Selvom Danmark er et lille land, er vi alligevel en af Europas største fiskerinationer. Det kan vi med god grund være stolte af. For fiskeriet sætter et klart aftryk på Danmark og bidrager i dag med en væsentlig eksportindtægt. Samtidig bidrager fiskerierhvervet til et Danmark i bedre balance gennem de mange arbejdspladser fiskeriet og dets følgeerhverv skaber uden for storbyerne. Derfor er det afgørende, at dansk fiskeri fortsat udvikles, og at regulering og kontrol understøtter dette.

Selvom dansk fiskeri allerede i dag er kendetegnet ved høj grad af bæredygtighed, hvor op imod 80 % af alle landinger er bæredygtighedscertificerede med MSC-mærket, er det fortsat vigtigt, at fiskerierhvervet bliver endnu grønnere og endnu mere bæredygtigt. Danmark skal gå forrest med de nyeste og mest bæredygtige løsninger. Det gælder også i forhold til den måde fiskerikontrollen indrettes på.

Det er afgørende, at fiskerikontrollen indrettes så der hele tiden er en klar sammenhæng mellem kontrolformålet og de byrder, som fiskerikontrollen påfører den enkelte fisker. Det skal med andre ord sikres, at fiskerikontrollen understøtter et endnu grønnere fiskeri med respekt for den enkelte fiskers ret til at drive sin virksomhed og beskytte sit privatliv. For det er den enkelte fisker, der skal leve med kontrollen i sin hverdag, og det er derfor vigtigt, at fiskeren sikres et sundt, værdigt og sikkert arbejdsmiljø.

På den baggrund er Danmarks Fiskeriforening PO og Fødevareministeren nået til enighed om en model for projektet om kameramonitorering af fiskeriet i Kattegat, der skal sikre, at Danmark bliver et foregangsland inden for moderne grøn fiskerikontrol. Principperne i modellen er som følger:

Frivilligt forsøg med kameramonitorering.
Der monteres i 2020 kameramonitoreringsudstyr på 10-15 fartøjer, som ønsker at deltage i projektet. Danmarks Fiskeriforening sikrer den frivillige deltagelse per 1. oktober 2020. Det er et krav for deltagende fartøjer, at de har et væsentligt fiskeri med bundslæbende redskaber efter jomfruhummer i Kattegat. Projektet skal medvirke til at belyse, hvordan kameramonitorering fungerer som kontrolinstrument i praksis og hvilke dele af den normale kontrol, de deltagende fartøjer på sigt vil kunne undtages for. Projektet følger i øvrigt reglerne i forordningen om fiskerimuligheder og redskabsreglerne i reguleringsbekendtgørelsen.

For at gøre det mere attraktivt at deltage i forsøget udarbejder Fødevareministeriet en model, der tilbyder de deltagende fartøjer ekstra årsmængder, primært torsk og tunge. Miljø- og Fødevareministeriet vil fremadrettet – i dialog med fiskerierhvervet – overveje hvordan det kan gøres yderligere attraktivt at deltage i projektet.

Da der er tale om et nyt kontroltiltag, hvor det er nødvendigt at opbygge erfaring og kompetence i forhold til validering af materiale mv., vil data fra projektet som udgangspunkt ikke danne grundlag for håndhævelse i projektets første fase. Alle fartøjer vil fortsat være underlagt den hidtil gældende kontrolpraksis.

Projektets anden fase
Fremdriften i projektet følger Danmarks erklæring på rådsmødet i december 2019 og hovedparten af det danske trawlfiskeri i Kattegat skal således gradvist have monteret kamera senest ved udgangen af 2021. Indhentede erfaringer evalueres løbende i følgegruppen igennem 2021 og der foretages en opsamlende evaluering per 1. oktober 2021. Miljø- og Fødevareministeriet initierer derefter projektets anden fase, hvor hovedparten af det danske trawlfiskeri i Kattegat gradvist omfattes.

Selve monteringen af kameraudstyret sker efter dialog med de fiskere, der deltager i projektet og DFPO indgår i følgegruppen til projektet.

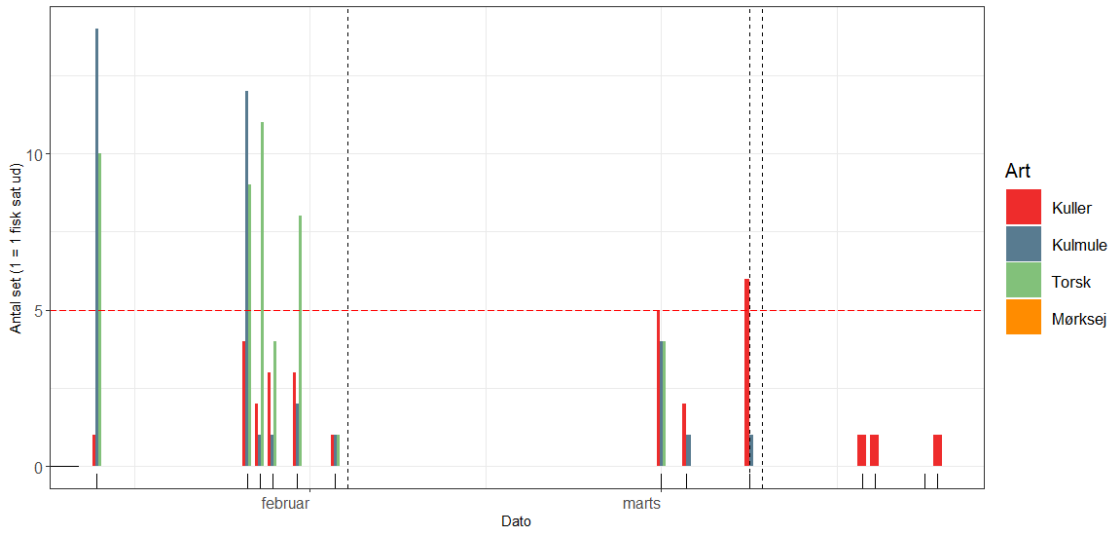
Fremtidens sikre og selektive fiskeriredskaber.
Der etableres et forsøgsfiskeri med henblik på at udvikle nye redskaber, der forbedrer selektiviteten, så der opnås en selektivitet på niveau med den selektivitet, der opnås ved fiskeri med "svensk rist", uden at jomfruhummerfangsten forringes. Det er væsentligt, at de nye redskaber er sikre/forsvarlige for fiskeren at anvende og ikke påvirker arbejdsmiljøet negativt. Udviklingen af fremtidens sikre og selektive fiskeriredskaber skal ske i samarbejde med DTU Aqua.

Øget videndeling gennem ny teknologi.
Der skal udvikles en applikation (app), der kan hjælpe fiskerne med at dele information i realtid. Derved vil fiskerne kunne advare hinanden om i hvilke områder, der eksempelvis fanges torsk, så de øvrige fiskere kan undgå området i samme tidsrum og derved mindske uønskede fangster. Finansiering hertil tilvejebringes af Fiskeafgiftsfonden og projektet drives af Danmarks Fiskeriforening.

Arbejdsgruppe om fremtidens bæredygtige fiskeri i Kattegat.
Som supplement til følgegruppen om kameraprojektet nedsættes en arbejdsgruppe med repræsentanter fra fiskerierhvervet, DTU Aqua, relevante grønne organisationer samt Miljø- og Fødevareministeriet og Fiskeristyrelsen til at følge og evaluere ovennævnte initiativer og supplerende komme med anbefalinger til, hvordan der kan sikres en bæredygtig fiskeriforvaltning, der er tilpasset en dynamisk natur i Kattegat.

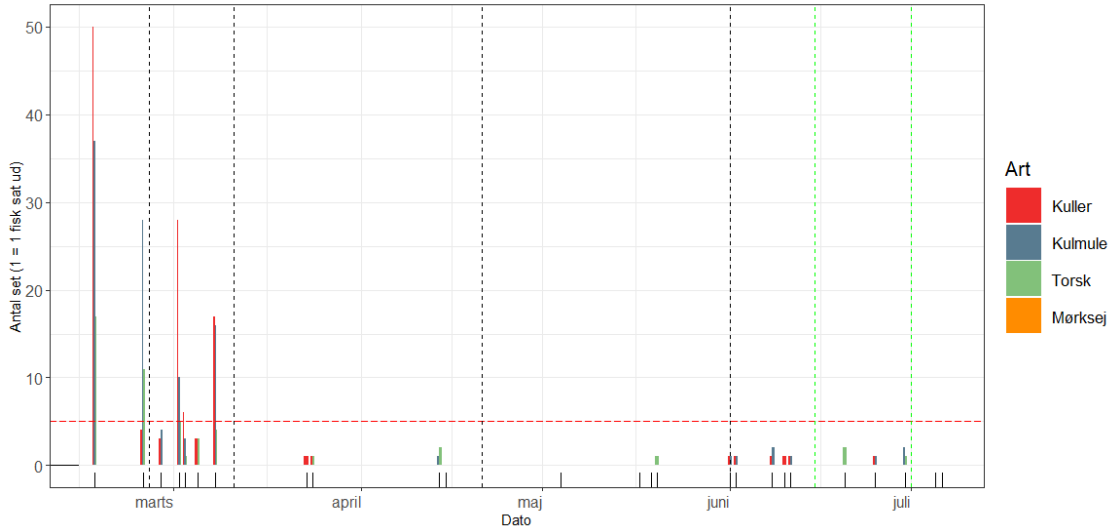
Appendix 3: Genudsætninger over tid

Ud fra den genudsætning/discard, der observeres ved kameraovervågning, kan antallet af genudsætninger over tid plottes på et søjlediagram for hvert fartøj. Nedenstående figurer viser genudsætninger over tid for hvert fartøj deltagende i kameraprojektet i Kattegat. På x-aksen vises dato, hvor en sort streg på selve x-aksen viser, hvornår det pågældende fartøj har haft en fiskeriaktivitet i Kattegat, som Fiskeristyrelsen har udtaget til kontrol. Y-aksen viser antallet af sete fisk genudsat af arterne kuller, kulmule, torsk og mørksej. Farven på søjlediagrammet angiver arten. Sorte stiplede linjer viser, hvor Fiskeristyrelsen har været i kontakt med fartøjet og vejledt i landingsforpligtigelsen, grønne stiplede linjer viser hvornår en tilbagemeldingsrapport er sendt til fartøjet og den røde vandrette stiplede linje angiver fem på y-aksen. Dette er indsat, da der er stor forskel mellem de enkelte fartøjer i mængden af antal fisk ulovligt genudsat. Således har ét fartøj 77 kuller ulovligt genudsat på en fiskeriaktivitet, mens der på et andet fartøj aldrig er set mere end én ulovlig genudsætning per art per fiskeriaktivitet.

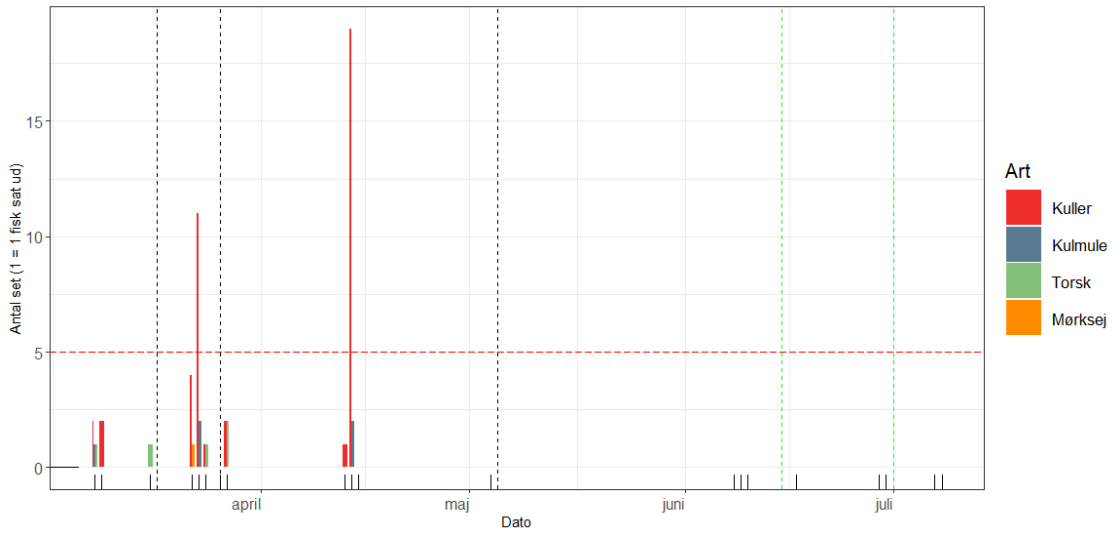


Fartøj 1. Genudsætning ift. vejledning i landingspligten. X-akse: Dato for start af fiskeriaktivitet. Y-akse: Antal genudsætninger af kulmule, mørksej, kuller og torsk set på kamera. Sorte stiplede linjer: Opringning eller besked på skærmen i styrehuset med vejledning i landingspligten, herunder at torsk, kuller, kulmule og mørksej ikke må genudsættes. Grønne stiplede linjer: Tilbagemeldingsrapport afsendt fra FST til fartøjsejer. Sorte streger ved x-aksen viser, hvor der har været fiskeriaktivitet, som er blevet gennemset. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 7 (±1,68) og 8 (±1,77), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.

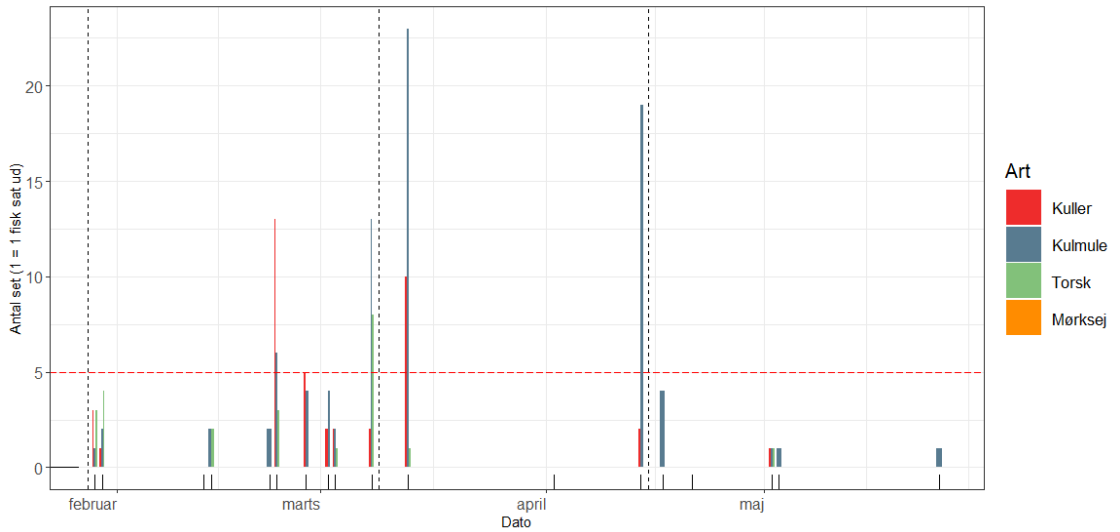
Fartøj 2. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 8 (±1,51) og 8 (±2,77), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.



Fartøj 3. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 8 (±1,48) og 7 (±1,34), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.

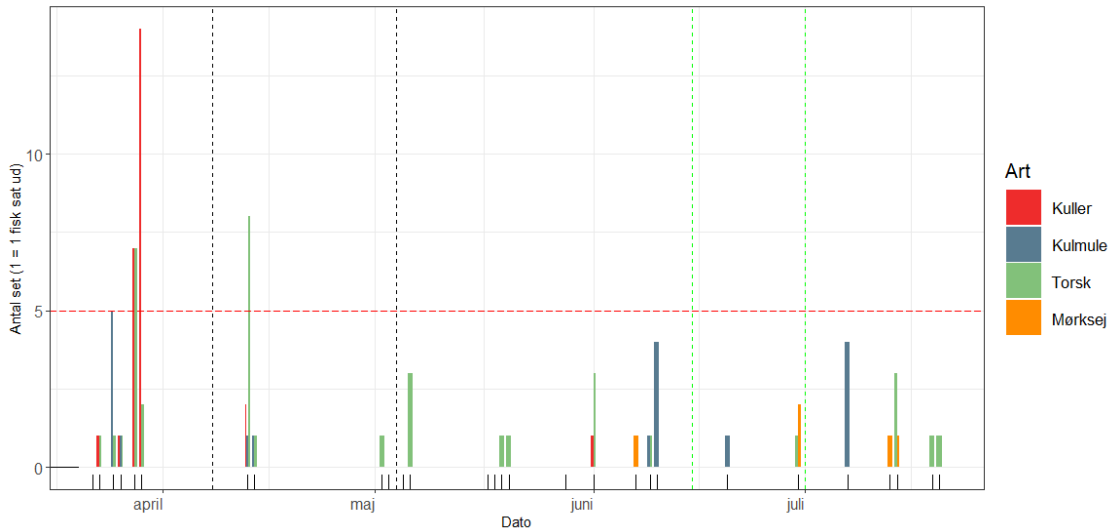


Fartøj 4. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 8 (±1,96) og 7 (±2,00), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.

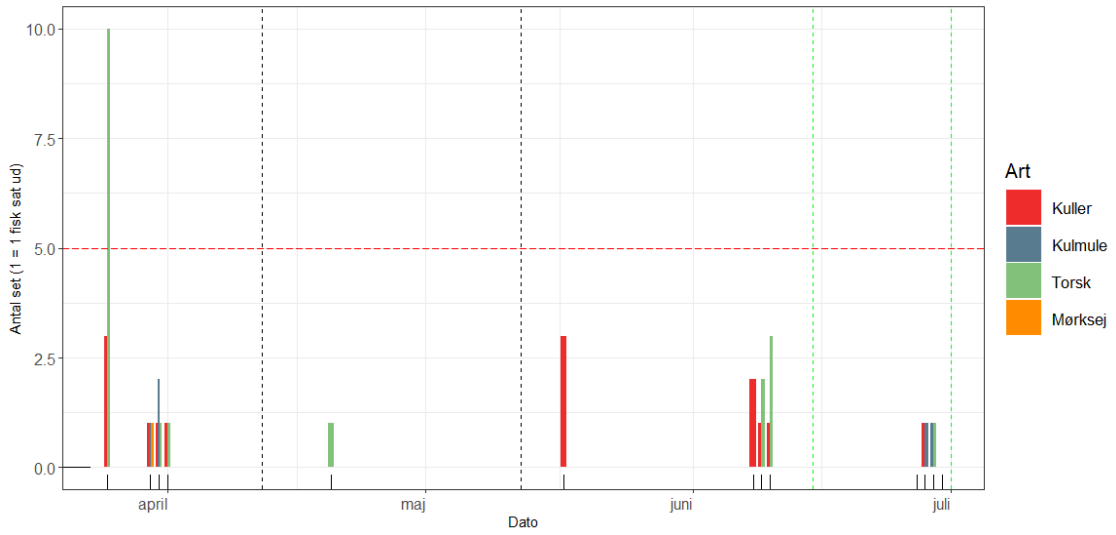


Fartøj 5. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 6 (±2,00) og 5 (±1,69), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.

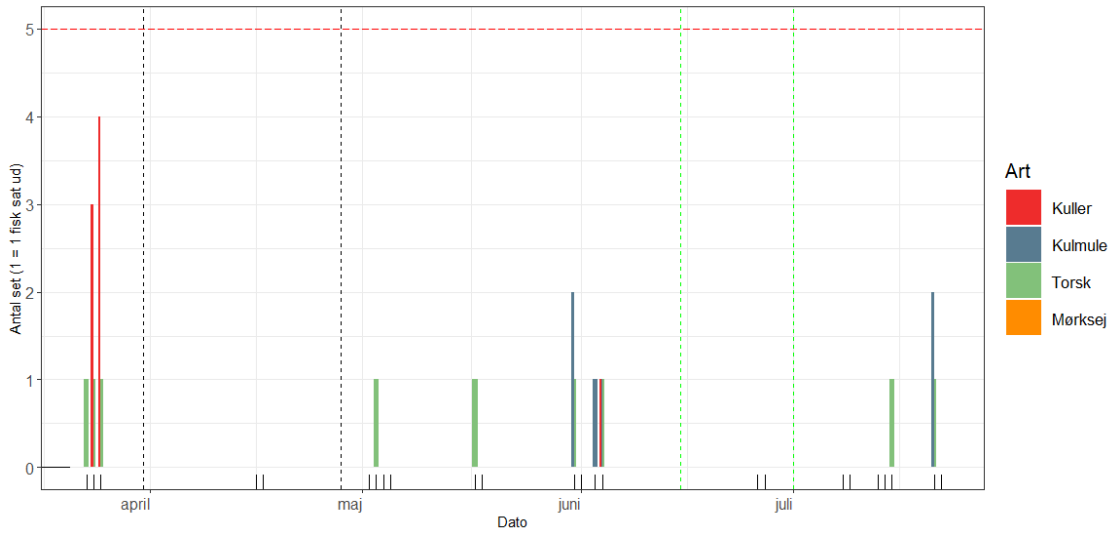
Fartøj 6. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 8 (±1,41) og 7 (±1,68), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.



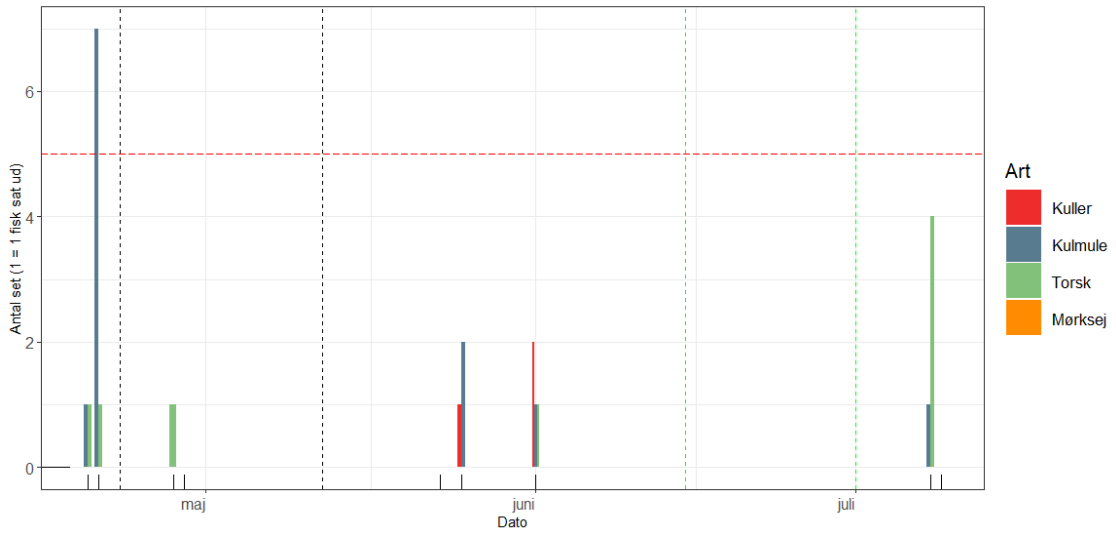
Fartøj 7. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 9 (±0,71) og 9 (±0,52), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.



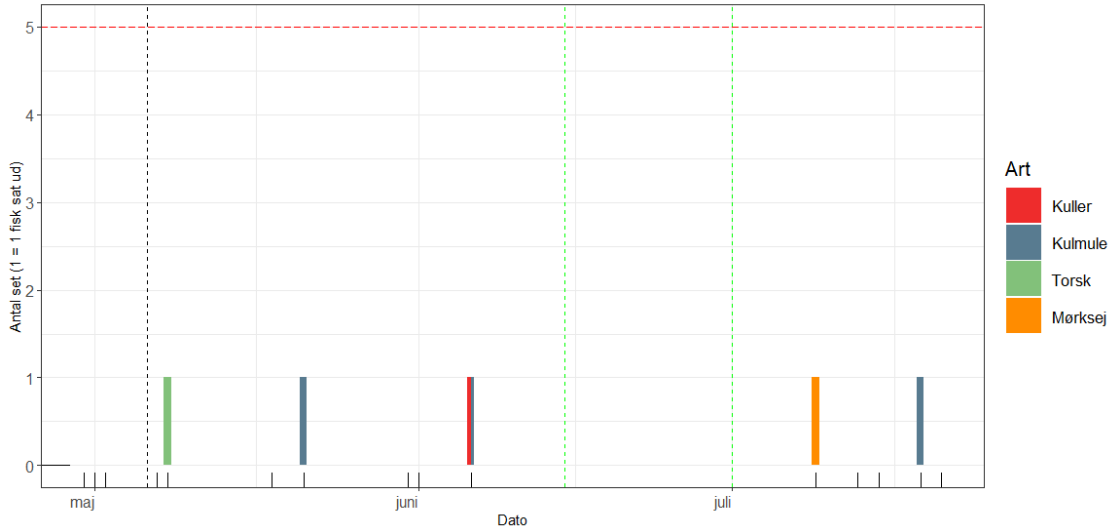
Fartøj 8. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 9 (±1,00) og 8 (±1,43), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.



Fartøj 9. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 8 (±2,03) og 8 (±0,78), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.



Fartøj 10. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 8 (±0,28) og 8 (±0,28), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.

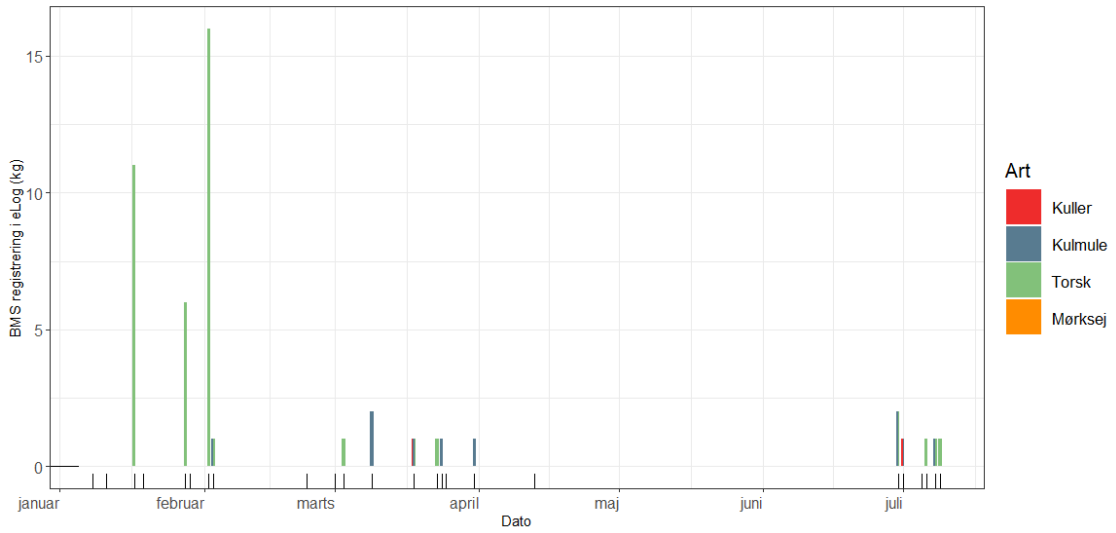


Fartøj 11. Genudsætning ift. vejledning i landingspligten. Videokvaliteten for kameraer med genudsætning ligger på henholdsvis 7 (±2,44) og 2 (±1,63), hvor 1 er helt ubrugelig video, mens 10 er helt perfekt video.

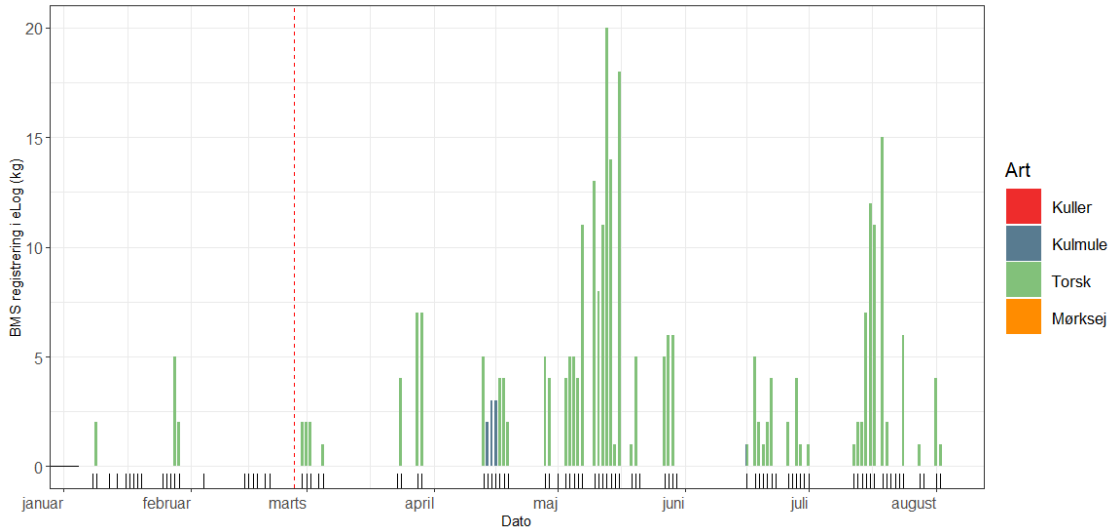
Appendix 4. Tidslinjer, BMS-registrering i eLog før og efter opsætning af kamerasystem

Ud over den discard videokiggere observerer, kan BMS-registreringer inddrages til sammenligningsgrundlag, eftersom arter omfattet af landingsforpligtigelsen skal ilandbringes og registreres.

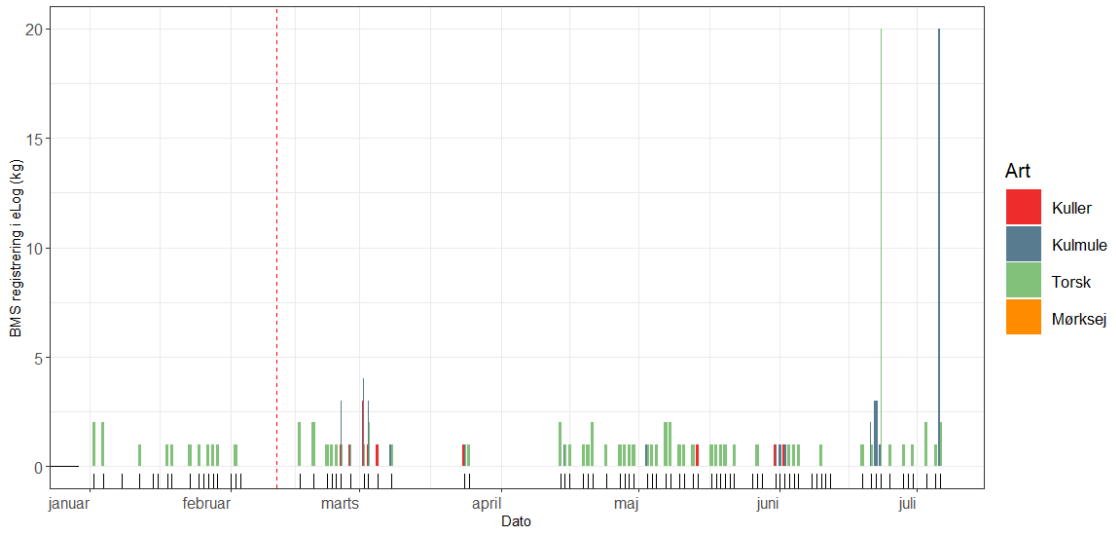
Nedenstående figurer viser registrering af BMS i eLog fra januar 2021 til august 2021 for hvert fartøj deltagende i kameraprojektet i Kattegat, der har haft fiskeri i Kattegat i denne periode (11 i alt). Visse fartøjer, eksempelvis fartøj 11, har ikke foretaget fiskeri i Kattegat i 2021 før kamerasystemet var installeret og derfor kan søjlediagrammerne kun vise BMS registrering efter installation af kamerasystem.



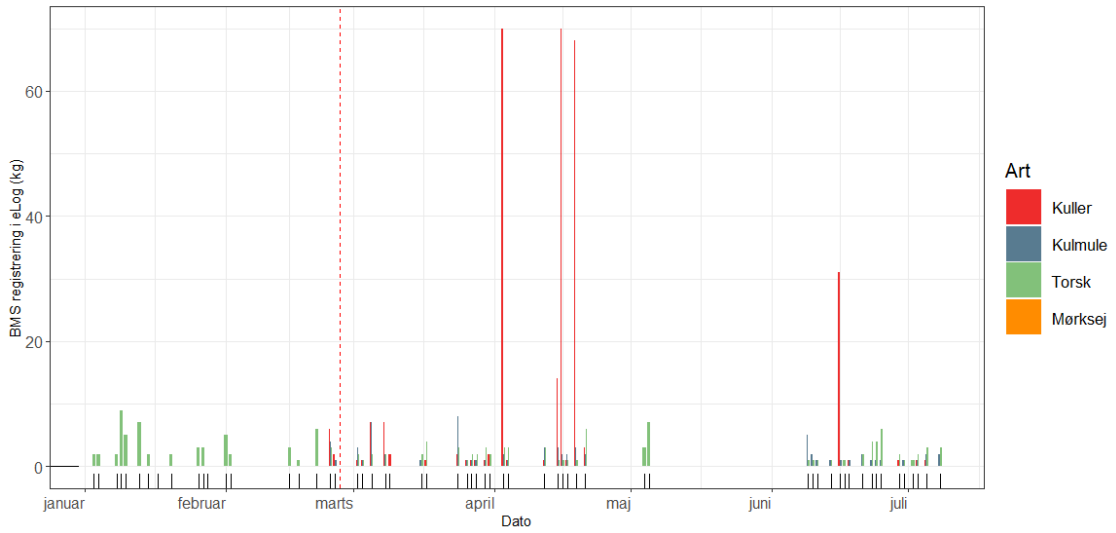
Fartøj 1. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021. Sorte streger ved x-aksen viser, hvor fartøjet i eLog har rapporteret fiskeriaktivitet i Kattegat. Røde lodrette stiplede linje viser installationsdatoen af kamerasystemet for fartøjet.



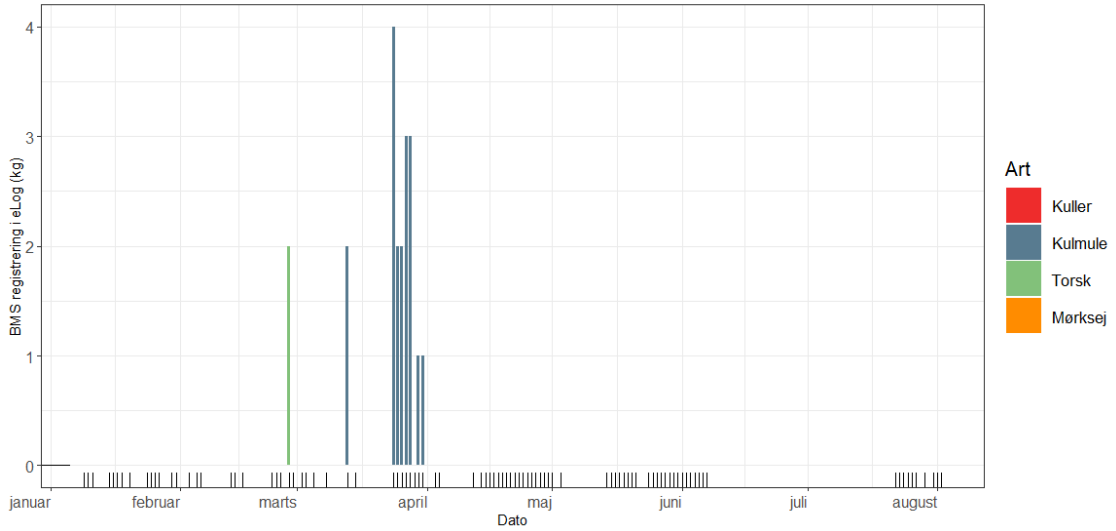
Fartøj 2. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



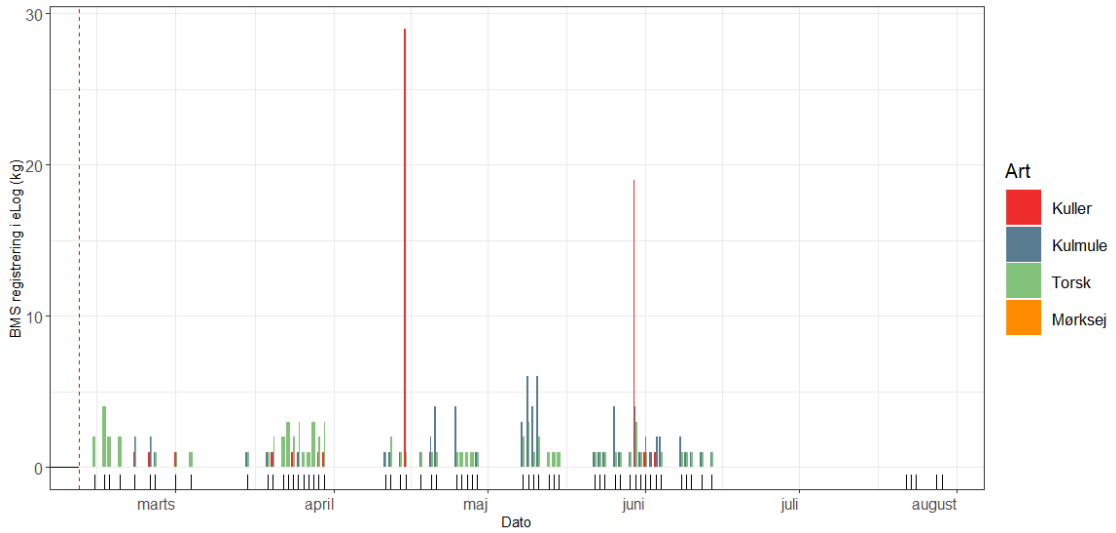
Fartøj 3. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



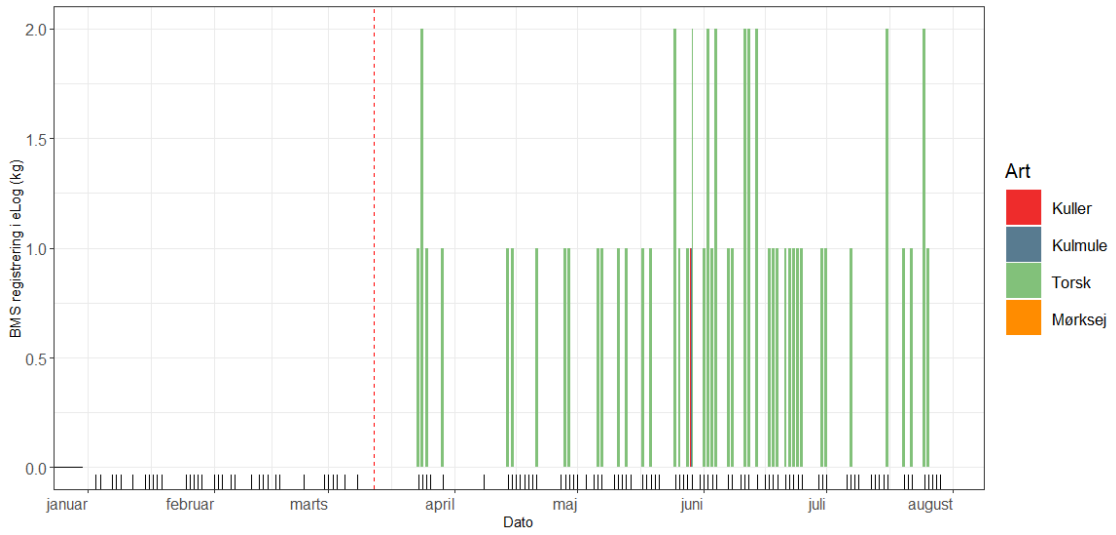
Fartøj 4. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



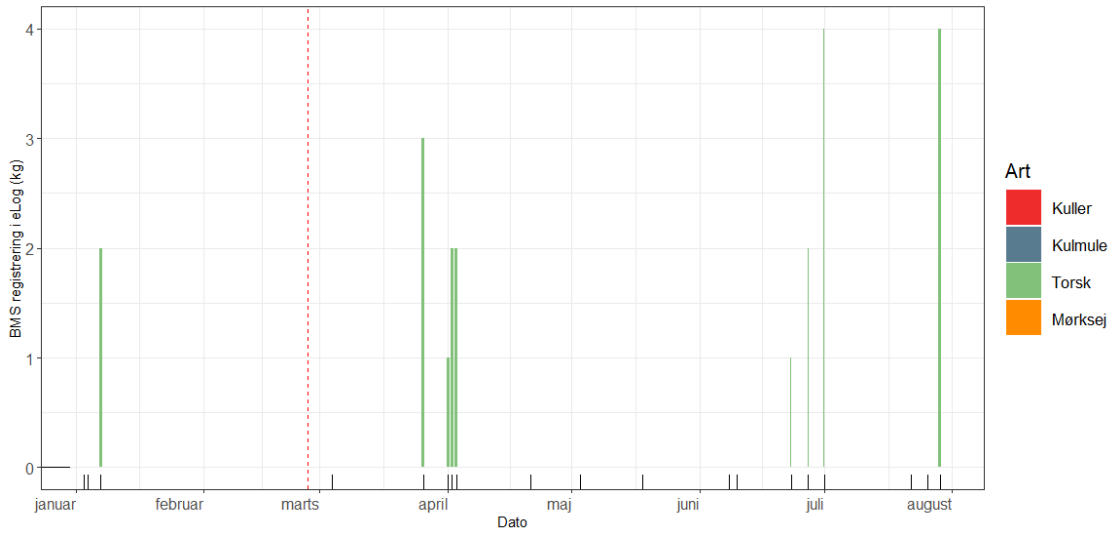
Fartøj 5. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



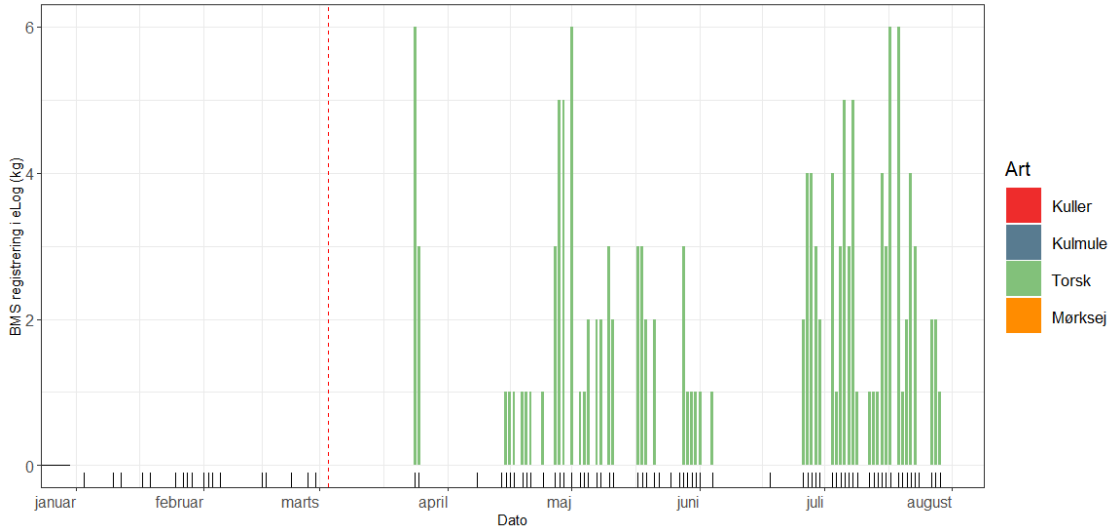
Fartøj 6. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



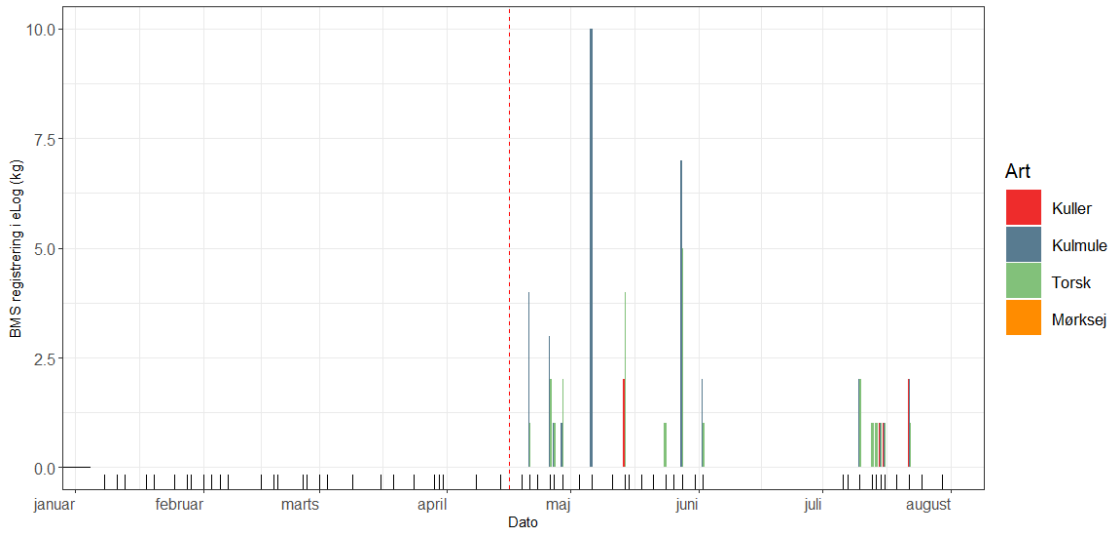
Fartøj 7. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



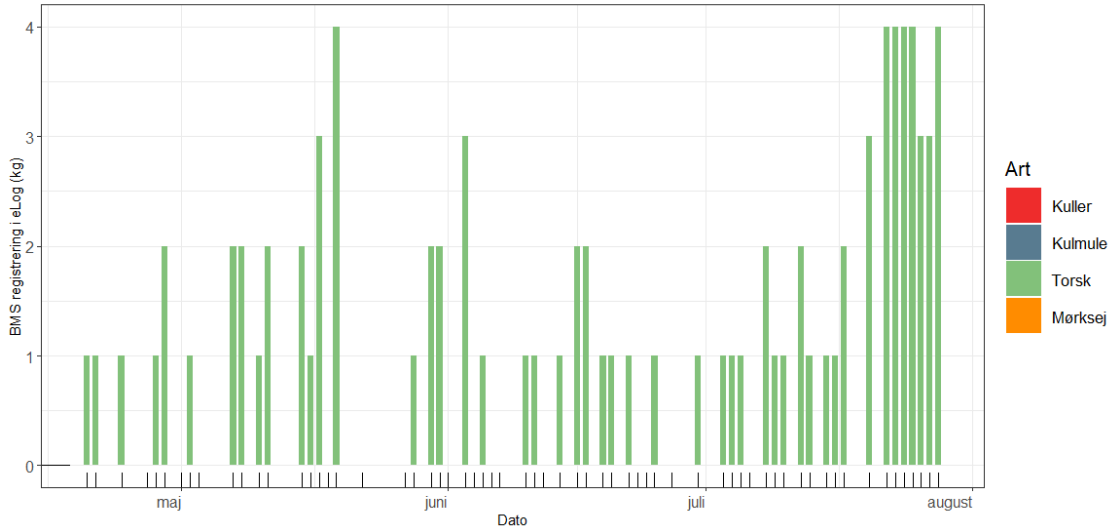
Fartøj 8. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



Fartøj 9. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



Fartøj 10. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.



Fartøj 11. Fartøjets BMS-registreringer i eLog af torsk, kuller, kulmule og mørksej fra januar 2021.

Appendix 5: Besvarelser af spørgeskemaundersøgelse for deltagende fartøjer

		Deltagere (n=12)	
Spørgsmål	Svar	N	%
1.1 Har du benyttet dig af din fartøjsmoniteringsplan?	Ja	5	41,7
	Nej	2	16,7
	Ikke besvaret	5	41,7

1.2 Hvis ikke, hvorfor?

Svar 1: *Føler ikke vi har fået de betingelser vi blev lovet fra en start.*

1.3 Er fartøjsmoniteringsplanen forståelig?	Ja	6	50,0
	Nej	0	0,0
	Ikke besvaret	6	50,0

1.4 Hvis ikke, hvilke elementer fungerer ikke?

Svar 1: *Ja den er forståelig, ingen tvivl vi bliver pisset på fra øverste instans. Ditte og Christian har jeg et utrolig godt samarbejde med og forstår os, men føler dem længere op ikke forstår det er et frivillig forsøg vi gik med til.*

1.5 Orienterer du dig i tilbagemeldingsrapporterne?	Ja	4	33,3
	Nej	2	16,7
	Ikke besvaret	6	50,0

1.6 Hvis ikke, hvorfor?

Svar 1: *Ja, men syntes det er indviklet.*

Svar 2: *Jeg har læst min tilbagemeldingsrapport. Den er meget bygget op på tal og procenter. Har noteret mig at kamera-tallene skal ses som et overslag – altså et skøn.*
Kan ud fra tallene konstatere, at der bestemt ikke er et entydigt mønster når kamera-tal sammenlignes med de mængder vi vurderer/når frem til og indberetter i Elog. Vi har således i mindst halvdelen af de træk der er medtaget i rapporten indberettet mere end konstateret via kameraoptagelserne.
Konklusionen herpå kan ikke være entydig, men må baseres på to forklaringer: Dels er det praktisk umuligt at gennemføre en sortering af fangsten uden at der begås fejl, og dels kan den korrekte mængde (vægt) ikke kan bestemmes ud fra kamera. Der vil være tale om et overslag eller skøn.

1.7 Er informationsniveauet tilstrækkeligt i tilbagemeldingsrapporterne?	Ja	2	16,7
	Nej	2	16,7
	Ikke besvaret	8	66,7

1.8 Hvis ikke, hvilke informationer ønskes tilføjet til tilbagemeldingsrapporterne?

Svar 1: *Meget stor forskel på de tal vi har registret og de tal der er i rapporten. På hver art burde der også være en tekst, sammen med procenter, om man gør det godt eller skidt, lige som kamera tjek ved afsejling. Eksempelvis: Super godt, kræver forbedringer eller meget dårligt.*

Svar 2: *Nej. Mener der bør være supplerende bemærkninger og konklusioner, så rapporten ikke alene indeholder tal og procenter. Eksempelvis savner jeg bemærkninger om de udfordringer, der ind imellem må være ved at vurdere såvel art som mængde.*
Vi har i perioden haft adskillige træk med meget tang, og/eller sand, hvor vi selv har meget vanskeligt ved at artsbestemme. Hvordan er effekten heraf for dem der gennemser kamera-optagelserne. Der må være en betydelig usikkerhedsfaktor. Her mangler jeg en vurdering af en helt indlysende problematik. Samtidig må det ofte været meget vanskeligt at artsbestemme (se forskel) mht. kuller, hvilling, kulmule og torsk, når der er tale om meget små individer. En problematik rapporten ikke omhandler.
Mener det er fint at kameratallene i rapporten sammenholdes med vores indberetninger via Elog, men proportionerne er også interessante. Hvad er andelen af torsk eksempelvis i forhold til den samlede værdi af fangstrejsen.

Spørgsmål	Svar	N	%
2.1 Er der opstået problemer med eLog version 11.1.2?	Ja	4	33,3
	Nej	2	16,7
	Ikke besvaret	6	50,0
2.2 Hvis ja, hvilke?	Begrænset antal linjer i landingserklæring	3	25,0
	Problemer med at afslutte og afsende logbog	1	8,3
	LSC og BMS fangstlinjer lægges sammen	1	8,3
	Andet	0	0
	Ikke besvaret	9	75,0

Spørgsmål	Svar	N	%
2.3 Er der opstået problemer med kamerasystemet?	Ja	3	25,0
	Nej	3	25,0
	Ikke besvaret	6	50,0
2.4 Hvis ja, hvilke?	Fejl på rotationssensor	2	16,7
	Fejl på kamera	2	16,7
	Fejl på computer	0	0,0
	Antenneproblemer	1	8,3
	Andet	1	8,3
	Ikke besvaret	9	75,0
2.5 Har disse problemer med kamerasystemet lagt hindringer i vejen for udøvelsen af fiskeriet?	Ja	0	0,0
	Nej	6	50,0
	Ikke besvaret	6	50,0

2.6 Hvis ja, uddyb gerne situationen

Svar 1: *Nej – Vi har fortsat fiskeriet de gange der har været problemer. Den ene gang fordi vi først konstaterede det ved hjemkomst. Mener heller ikke det på nogen måde kan være rimeligt, at fiskeriet skal stoppes hvis der opstår fejl på kameraer..*

2.7 Har fartøjet været nødsaget til at blive i havn på grund af problemer med kamerasystemet?	Ja	0	40,0
	Nej	7	58,3
	Ikke besvaret	5	41,7

2.8 Hvis ja, hvor mange fiskedage er gået tabt?

Ingen svar

2.9 Hvilke datoer er der tale om?

Ingen svar

2.10 Hvor mange dage har fartøjet i alt været nødsaget til at være i havn (pga. installation og evt. reparation af kamerasystem eller eLog?

Ingen svar

Spørgsmål	Svar	N	%
3.1 Har du foretaget ændringer i måden hvorpå du fisker siden opsætningen af kamerasystemet?	Ja	1	8,3
	Nej	6	50,0
	Ikke besvaret	5	41,7
3.2 Hvis ja, hvilke?	Flere fangstrejser	0	0,0
	Færre fangstrejser	0	0,0
	Ændring i træklængde	0	0,0
	Tidspunkt for fiskeaktivitet	0	0,0
	Andre fiskepladser	0	0,0
	Anderledes fangstsortering	1	8,3
	Andet	0	0,0
	Ikke besvaret	11	91.7
3.3 Har kamerasystemet påvirket dit arbejdsmiljø?	Ja	6	50,0
	Nej	1	8,3
	Ikke besvaret	5	41,7

3.4 Hvis ja, hvordan?

Svar 1: *Ja det giver noget mere stres !!!!!*

Svar 2: *Føler mig mistænkelig gjort, at vi ikke kan få lov til at fiske på samme betingelser som ikke kamera fartøjer ved evt nedbrud af systemet. Usikkerheden ved fejl på sorterings arbejde og evt nedbrud på systemet stresser helt vildt, samt hvad der sker ved opfiskning af torske kvoten.*

Svar 3: *Hvis man kommer i tanke om, at man måske er kommet til at smide en forkert fisk ud, eller har tabt en fisk, er det hårdt at gå og tænke over om de opdager det, og hvad konsekvensen evt. er.*

Svar 4: *Det er ikke godt at blive overvåget.*

Svar 5: *Det er stresser og giver sygist problemer, og påvirker familien, overvejer og opgive og fiske og forsøge og finde noget i land.*

Svar 6: *Det har som forventet ikke været muligt at placere kameraerne uden at vi med mellemrum filmes, og det gælder i begge sider ved begge discard-kameraer. Det er absolut en udfordring. Imidlertid er den væsentligste mentale påvirkning, at vi reelt befinder os i en*

situation med en helt ukendt retsstilling. Sortering af fangsten kan ikke gennemføres uden at der begås en række fejlskøn. Men hvad er konsekvensen? – eller rettere: Hvornår begår vi noget ulovligt? Vi kender simpelthen ikke præmisserne for den kameraovervågning vi er underlagt. Til gengæld har vi nu dokumenteret hvor små mængder torsk det drejer sig om, og at der bør være tillid til de indberetninger, der er foretaget mht. bifangst af torsk.
Oplevelsen af et kontroltiltag helt ude af proportion med problemstillingen, og en opfattelse af at de økonomiske proportioner er uden betydning, er faktisk ganske ubehageligt og stærkt belastende for ens arbejdsmiljø. Jeg fornemmer desværre, at alle fiskere i disse år oplever mere og mere kontrol, ind imellem helt ned i detaljer der ganske enkelt ikke kan forklares, og en oplevelse af en udpræget mistillid fra myndigheder generelt. I den forbindelse er kameraovervågning bestemt ikke noget der trækker i den rigtige retning mht. arbejdsmiljø, og der er helt konkrete eksempler på fiskere forhyret på et forsøgsfartøj, der har forladt erhvervet pga. kameraovervågningen.

3.5 Har det haft betydning i forhold til rekruttering og fastholdelse af besætning, at der har været kameraovervågning på fartøjet?	Ja	3	25,0
	Nej	4	33,3
	Ikke besvaret	5	41,7

3.6 Hvis ja, på hvilken måde?

Svar 1: *Folk vil ikke med nå der er overvågning på båden.*

3.7 Er du enig i følgende udsagn? *"Maskering og slørringsfunktion sikre tilstrækkelig anonymitet for fiskeren."* Sæt kryds, hvor 1 betyder Meget uenig og 5 betyder meget enig	1	2	16,7
	2	0	0,0
	3	2	16,7
	4	0	0
	5	1	8,3
	Ikke besvaret	7	58,3

3.8 Andre kommentarer til projektets fase 1?

Svar 1: *Når torsk og tunger bliver filmet, hvorfor så ikke genudsætte dem, som vi gør med de små rødspætter?*
Jeg mener, at overvågningen er helt ude af proportioner. Der fanges ganske få torsk i fiskeriet, og deres værdi er nul kroner. Sammenlignet med værdien af vores jomfruhummer, er det en urimelig økonomisk konsekvens at kræve, at et fartøj bliver i havn ved fejl på systemet.

Svar 2: *Skibet er solgt pr. 1/8 2021.*

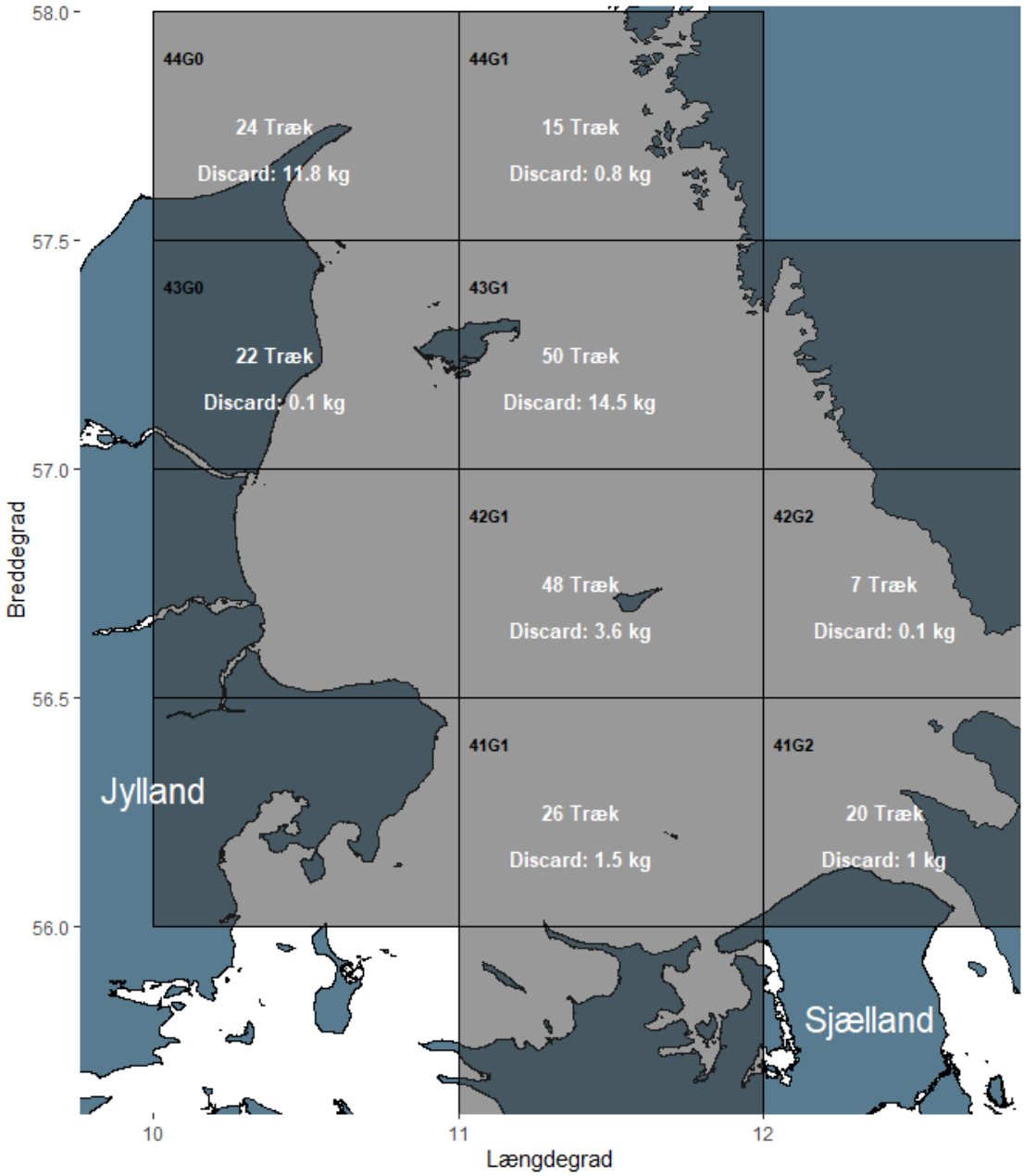
Svar 3: *Vi har generelt oplevet et godt samspil med Fiskeristyrelsens folk – altså Ditte og Kristian. De er til at få kontakt med, og jeg føler der er en fornuftig og god dialog. Vi har selv forsøgt at medvirke positivt, men det hænger helt sammen med, at status for os trods alt må betegnes som frivillig deltagelse. – vi har selv meldt os.*

Desværre må jeg konstatere at projektets fase 1 kun har bekræftet min helt store bekymring ved kameraovervågning, idet det i praksis vil/kan betyde, at jeg risikerer at overtræde loven hver eneste gang vi tager på havet. Derfor er jeg meget utryg ved hvordan praksis med kameraovervågning vil blive. Sagt med andre ord: Hvad er præmisserne for hvornår vores adfærd er lovlig eller ulovlig?
Det er en kendsgerning, at hver gang vi sorterer vil der være en række fejlskøn, også selv om vi gør alt hvad vi kan for at undgå det. Bag håndteringen af hver enkelt fisk der nu filmes, ligger der en menneskelig handling udført af fiskeren. For hver eneste fisk eller skaldyr skal der foretages et valg - eller et skøn.
- er den egnet til konsum, er vi 1 mm over mindstemålet eller er vi 1 mm under mindstemålet
- skal fisken genudsættes og indføres i logbogen eller kan den landes til konsum
- kan jeg lade fisken gå ud over siden uden konsekvenser, eller skal den tages med i land til destruktion alene af kontrolmæssige hensyn.
Det er den arbejdsproces alle fiskere hver dag gennemfører på havet i et blandet fiskeri, og ind imellem under ganske vanskelige vejrforhold, og på mindre åbne både. Men for hver eneste lille fisk skal der via kamera ske en 100 % monitering eller overvågning, hvilket reelt er det samme som 100 % kontrol. Og som nævnt - hvad er præmisserne for hvornår jeg er ulovlig og skal straffes. Vil der være en tolerancegrænse på 10 %, 5 eller nul, og kan grænserne ændres efter behov.
Indførelse af kameraovervågning med tvang vil derfor medføre en fremtid, hvor vi fiskere ikke kun kan dømmes på egne fejlskøn, men også efter myndighedernes skøn (eller fejlskøn). Det er ikke en retstilstand for fiskeriet der er en retsstat værdigt.
Endelig må det nævnes, at min bekymring desværre ikke er blevet mindre i takt med den markante opstramning Fiskeristyrelsen tilsyneladende er i gang med, via en nidkær praksis med forfølgelse af selv meget minimale forseelser eller forglemmelser. Mange fiskere har desværre i dag en opfattelse af, at de nærmest er i "krig" med deres eget land. Det kan vi simpelthen ikke være bekendt.

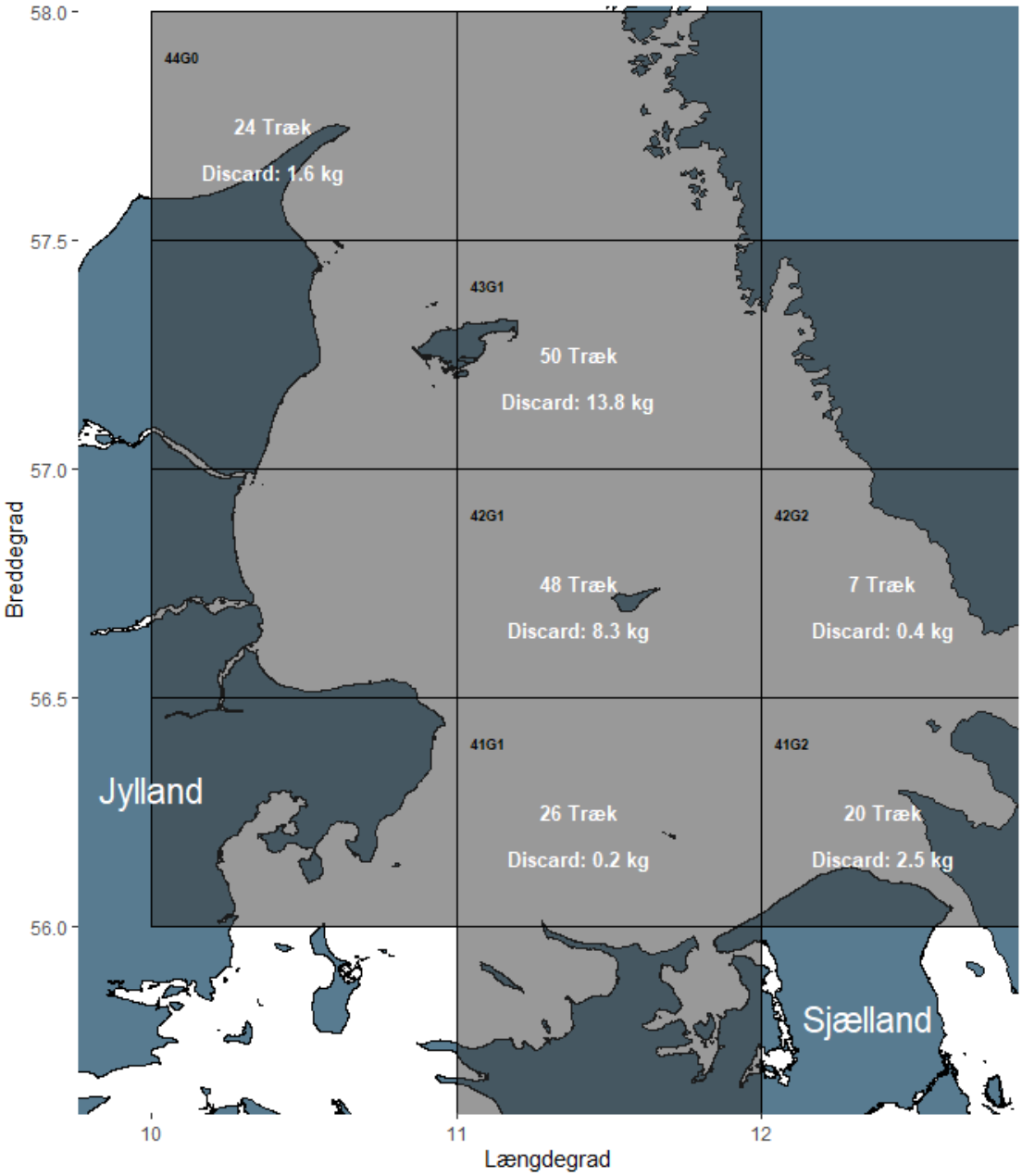
Svar 4: *Skibet har fisket i Skagerrak i hele perioden. Kameraet har ikke været tændt.*

Appendix 6: Kort over forekomst af discard og fangst af kuller, kulmule, hvilling og pighaj

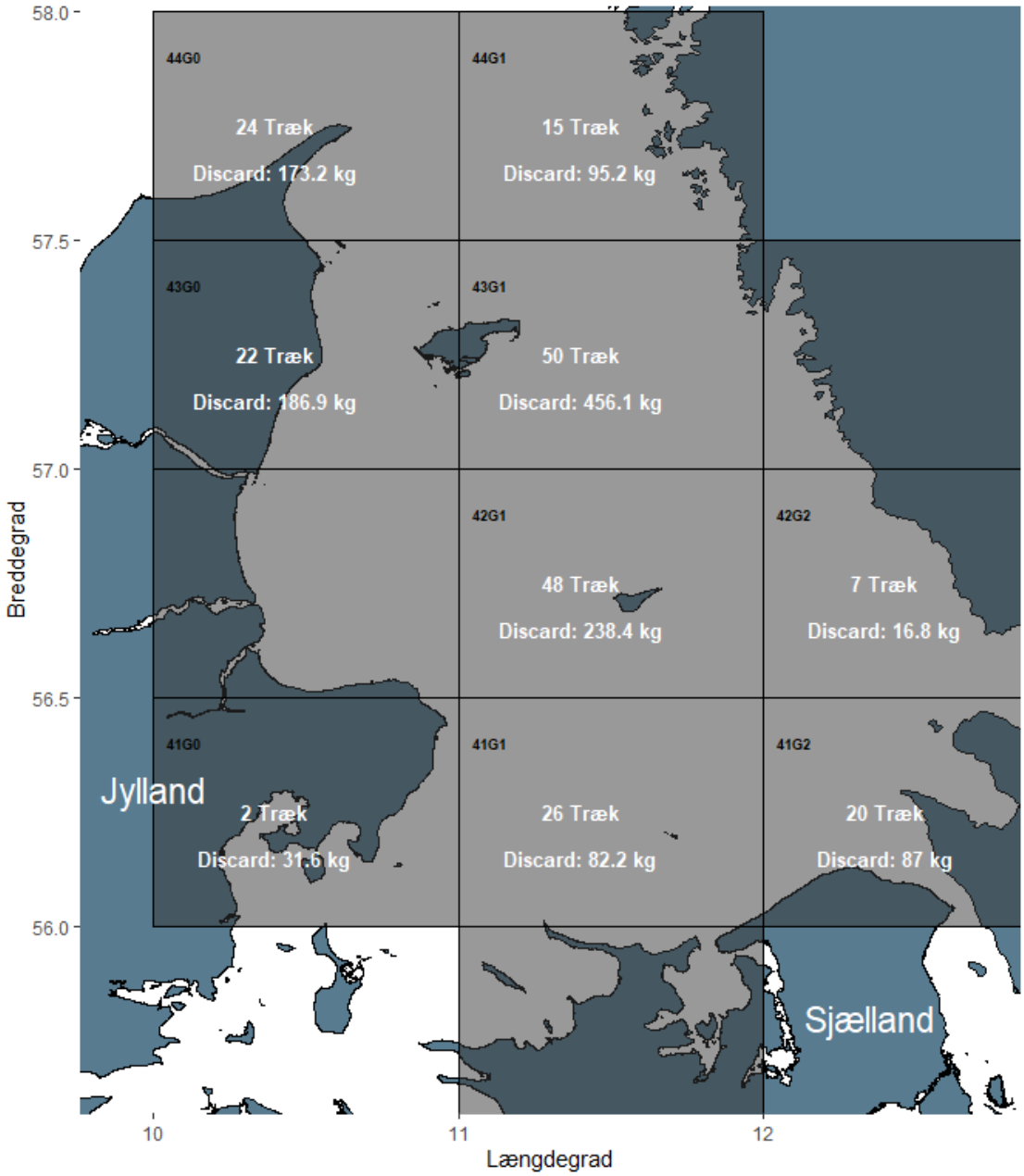
Det har ikke været muligt at lave kort over forekomst af discard for mørksej, da ingen indtastning i eLog matcher med videodata for denne art. Dette skyldes datamangler, der gør at det ikke altid er muligt at koble eLog og kameradata for hver fiskeriaktivitet. Således har det ikke været muligt at koble 61 af de 275 fiskeriaktiviteter fra kameradata med eLog.



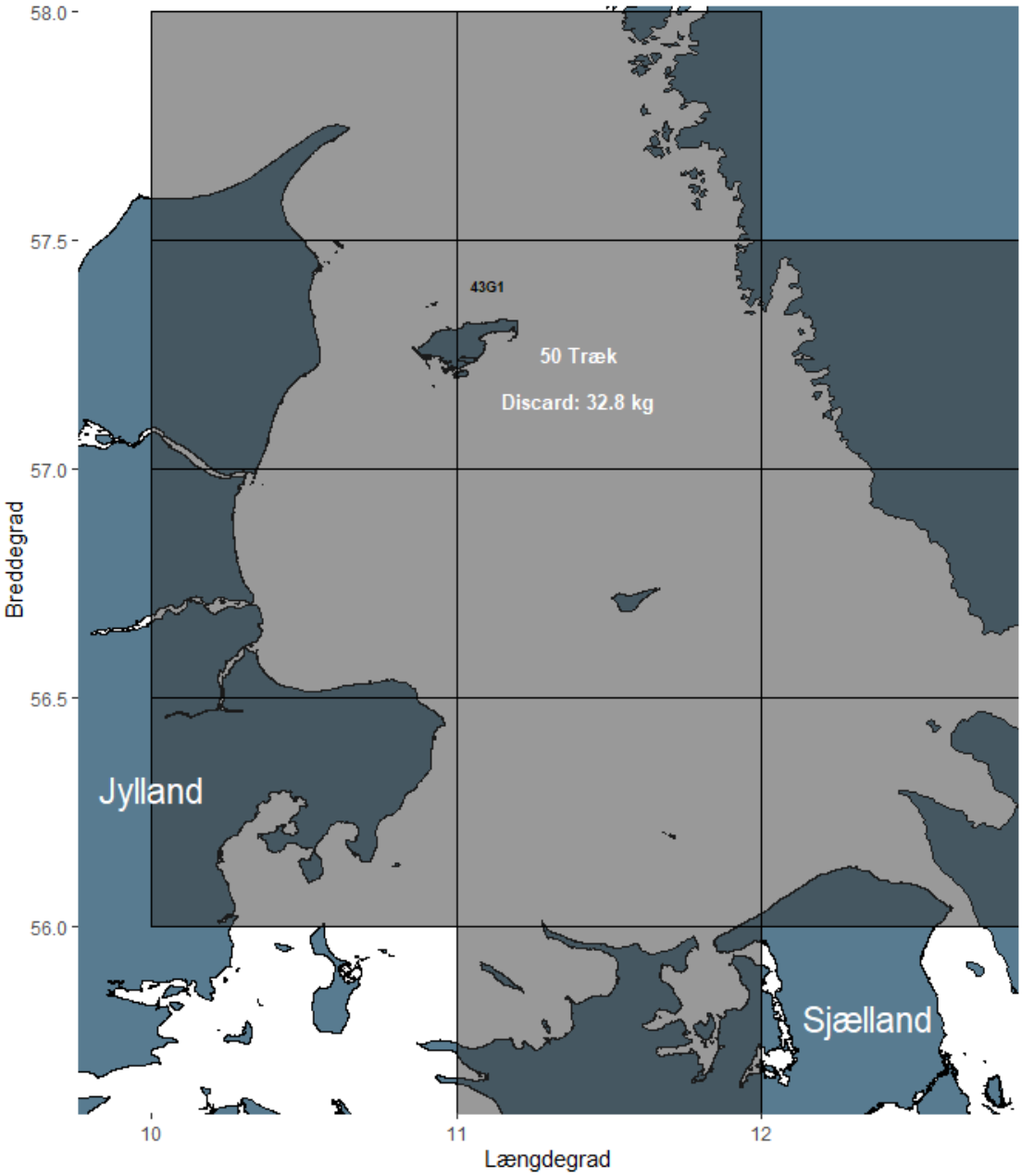
ICES kort. Discard af kuller (estimeret vægt i kg ud fra længdemål vurderet på videooptagelser). Antal træk er samtlige træk foretaget i ICES rektangel af fartøjer i projektet, hvor kobling med eLog har været mulig for trækket.



ICES kort. Discard af kulmule (estimeret vægt i kg ud fra længdemål vurderet på videooptagelser). Antal træk er samtlige træk foretaget i ICES rektangel af fartøjer i projektet, hvor kobling med eLog har været mulig for trækket.



ICES kort. Discard af hvilling (estimeret vægt i kg ud fra længdemål vurderet på videooptagelser). Antal træk er samtlige træk foretaget i ICES rektangel af fartøjer i projektet, hvor kobling med eLog har været mulig for trækket.



ICES kort. Discard af pighaj (estimeret vægt i kg ud fra længdemål vurderet på videooptagelser). Antal træk er samtlige træk foretaget i ICES rektangel af fartøjer i projektet, hvor kobling med eLog har været mulig for trækket.

Appendix 7: Oversigt over afholdte udgifter

Nedenfor fremgår af tabel 1 en oversigt over de afholdte udgifter i fase 1 fordelt på hovedudgiftskategorier.

Tabel 1. Afholdte udgifter i fase 1 (Januar 2020 - juli 2021) – Tkr.

Udgiftstype	Forbrug
Løn	2.259.688
Rejser, seminarer, rådgivning m.v.	206.526
Kamerasystemer inkl. licenser til AnchorLab	853.600
Installation af kameraudstyr	556.948
IT-relaterede udgifter	568.886
I alt	4.445.648

Den overvejende del af udgifterne, herunder løn, indkøb af kameraudstyr og installation finansieres af tilskudsmidler fra Den Europæiske Hav- og Fiskeriudviklingsfond.

Appendix 8: Tilbagemeldingsrapport, eksempel

Ministeriet for Fødevarer, Landbrug og Fiskeri
Fiskeristyrelsen

Projekt om elektronisk monitorering i Kattegat

Følgende rapport er baseret på indtastninger i e-Loggen, samt observationer fra Black Box VX kamerasystem. Rapporten indeholder informationer om kameraernes videokvalitet, sete genudsætninger og overholdelse af landingsforpligtelsen.

Fartøj:

X381

Tilbagemeldingsrapportens startdato:

2021-05-01

Tilbagemeldingsrapportens første træk:

2021-05-10 20:20:00

Tilbagemeldingsrapportens sidste træk:

2021-06-20 03:21:00

Seneste diagnosticeringstjek i rapportens data:

2021-07-21

Status på at udføre diagnosticeringstjek inden sejlads

Det er godt :)

1. Videokvalitet

Når en fangstrejse gennemses er der flere faktorer der har indflydelse på om der er tilstrækkeligt udsyn til genudsætningen. Det kan være selve opsætningen på fartøjet, arbejdsprocessen, dråber eller snavs på linsen, billedets opløsning, m.fl. Når et træk er set til ende vil en videokigger bedømme videokvaliteten for det gældende træk. Der fokuseres her på de kameraer, der i fartøjsmoniteringsplanen kaldes for discard-kamera, altså dem der anvendes til artsgenkendelse og identifikation af genudsætninger. Videokvaliteten bliver vurderet på en skala fra 1-10, hvor 1 er ringest, mens 10 er bedst.

Tabel 1 viser hvor god videokvaliteten har været på fartøjet for de træk, der er blevet gennemset inden for den pågældende periode. Tallet i parentes angiver standarddeviationen omkring gennemsnittet. En høj standarddeviation betyder at videokvaliteten svinger meget, mens et lavt tal betyder at gennemsnittet er retvisende for videokvaliteten generelt.

Tabel 1. Videokvalitet i sete træk. Gennemsnit (og standarddeviation) for kvalitet vurderet fra 1-10.

Fartøj	Sete træk	Videokvalitet kam1	Videokvalitet kam2
X381	XX	8 (0.92)	8 (1.64)

Figuren herunder er en graf for videokvaliteten på fartøjet for de træk, der er blevet gennemset inden for den pågældende periode. Videokvalitet rangeres fra 1-10, hvor 10. Kun kameraer med genudsætning er vurderet.

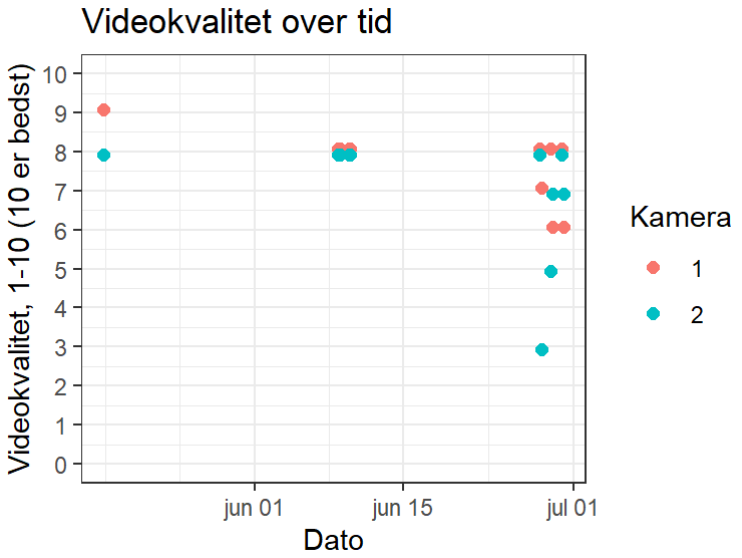


Fig. 1. Videokvaliteten på fartøjet for de træk, der er blevet gennemset inden for den pågældende periode.

2. Genudsætninger

Når et træk gennemses registreres genudsætningen ved at tage et mål af hver enkelt genudsat og artbestemt fisk.

Tabel 2 viser mængden af genudsætninger for de gennemsete træk i den pågældende periode.

Af tabellen skal forstås:

Træk: start-tid for det pågældende træk (dansk tid).

ART: fokusarterne: hvilling (HVL), kuller (KUL), kulmule (KLM), mørksej (MSJ), torsk (TOR) og pighaj (PHJ).

Længde, gennemsnit (SD): gennemsnitslængden i cm af genudsætningerne for arten, samt standarddeviation omkring gennemsnittet. En høj standarddeviation betyder at den målte længde af sete genudsætninger af arten svinger meget.

Samlet discard, kg: den samlede estimerede vægt i kg af sete genudsætninger for arten. Her bemærkes det at denne vægt ikke er vejet, men er beregnet ud fra den pågældende arts formel for forholdet mellem længde og vægt. Dette er baseret på den målte længde af hver set genudsætning og skal derfor betragtes som et overslag.

Samlet discard, stk.: det samlede antal genudsætninger set for den pågældende art i løbet af fangstbehandlingen af trækket.

Tabel 2. Information om genudsætninger, længde i cm, samlet vægt og antal af discard per træk.

Logbld_Nr	Træk	Art	Længde, gennemsnit (SD)	Samlet discard, kg	Samlet discard, stk.
000XXXXXX	2021-XX-XX XX:XX:XX	HVL	17.68 (3.88)	9	171
000XXXXXX	2021-XX-XX XX:XX:XX	HVL	19.69 (3.31)	2	34

Tabel 2. Information om genudsætninger, længde i cm, samlet vægt og antal af discard per træk.

000XXXXXX	2021-XX-XX XX:XX:XX	KLM	23.49 (NA)	0	1
000XXXXXX	2021-XX-XX XX:XX:XX	KUL	21.50 (3.88)	0	3
000XXXXXX	2021-XX-XX XX:XX:XX	PHJ	95.85 (NA)	4	1
000XXXXXX	2021-XX-XX XX:XX:XX	TOR	31.34 (3.12)	1	2

3. Andel over mindstemål

Tabel 3 viser andelen af sete genudsætninger over og under mindstemålet (MCRS).

Af tabellen skal forstås:

Fartøj: fartøjs ID.

Træk: start-tid for det pågældende træk (dansk tid).

Art: fokusarterne: hvilling (HVL), kuller (KUL), kulmule (KLM), mørksej (MSJ), torsk (TOR) og pighaj (PHJ).

Over MCRS: antallet af sete genudsætninger, der er længdemålt til over mindstemålet.

Under MCRS: antallet af sete genudsætninger, der er længdemålt til under mindstemålet.

Under MCRS [%]: procentdelen af samlede sete genudsætninger, der var under mindstemålet.

Tabel 3. Andel over og under mindstemål set sat ud

Fartøj	Logbld_Nr	Træk	Art	Over MCRS	Under MCRS	Under MCRS [%]
X381	000XXXXXX	2021-XX-XX XX:XX:XX	HVL	13	158	92
X381	000XXXXXX	2021-XX-XX XX:XX:XX	KUL	0	3	100
X381	000XXXXXX	2021-XX-XX XX:XX:XX	HVL	6	28	82
X381	000XXXXXX	2021-XX-XX XX:XX:XX	TOR	1	1	50
X381	000XXXXXX	2021-XX-XX XX:XX:XX	KLM	0	1	100

4. Sammenligning af kamera og eLog

Tabel 4 sammenstiller observationer fra videooptagelser med indtastninger i eLog for de gennemsete fangstrejser. Tabellen viser andelen af genudsætninger set på kamera ift. den samlede fangstregistrering af den pågældende art i logbogen.

Af tabellen skal forstås:

Art: fokusarterne: hvilling (HVL), kuller (KUL), kulmule (KLM), mørksej (MSJ), torsk (TOR) og pighaj (PHJ).

Logbog: logbogsnummeret for turen.

Samlet discard kamera, kg: den estimerede samlede genudsætning set på kamera.

Samlet fangst eLog, kg: den indtastede mængde samlet set i eLog

Forskel i kg (- hvis mest på kamera): Forskel mellem indtastning i eLog ift. set genudsat på kamera, baseret på estimeret vægt fra kamera. Hvis der er tastet mere i eLog bliver tallet positivt, mens tallet bliver negativt, hvis der er set mere på kamera end tastet i eLog for turen. Mindre forskelle er helt forudsigeligt, dels pga. vægten er estimeret ud fra længde ved kamera, dels fordi eLog ikke tillader indtastning af komma-tal.

Tabel 4. Genudsætning set ift. samlet fangst i logbog af fokus arter

Art	Logbog	Samlet discard kamera, kg	Samlet fangst eLog, kg	Forskel i kg (- hvis mest på kamera)
HVL	000XXXXXX	9.16	91	82
HVL	000XXXXXX	16.71	9	-8
KLM	000XXXXXX	0.47	0	0
KUL	000XXXXXX	0.49	1	1
PHJ	000XXXXXX	3.87	4	0
TOR	000XXXXXX	0.86	4	3

Tabel 5.1. Discard set på kamera ift. indtastning af arten i eLog.

Logbld_Nr	Art	Discard_kamera	eLog_for_arten	Procent
000XXXXXX	HVL	9.16	91	10.1
000XXXXXX	PHJ	3.87	4	96.8
000XXXXXX	HVL	16.71	9	185.7
000XXXXXX	KUL	0.49	1	49.0
000XXXXXX	TOR	0.86	4	21.5
000XXXXXX	KLM	0.47	0	Inf

Tabel 5.2. Discard set på kamera ift. indtastning af jomfruhummer, torsk, hvilling, kuller, kulmule og mørksej samlet i eLog.

Logbld_Nr	Art	Discard_kamera	eLog_samlet	Procent
000XXXXXX	HVL	9.16	1975	0.5
000XXXXXX	PHJ	3.87	1975	0.2
000XXXXXX	HVL	16.71	845	2.0
000XXXXXX	KUL	0.49	845	0.1

Tabel 5.2. Discard set på kamera ift. indtastning af jomfruhummer, torsk, hvilling, kuller, kulmule og mørksej samlet i eLog.

000XXXXXX	TOR	0.86	845	0.1
000XXXXXX	KLM	0.47	2519	0.0

6. Sammenligning af kamera og eLog fordelt på kategori

Tabel 6 dækker over de samme informationer som tabel 4; andelen af genudsætninger set på kamera ift. den samlede fangstregistrering af den pågældende art i logbogen. Forskellen er at tabel 5 yderligere er inddelt efter den indtastede kategori i logbogen.

Disse kategorier dækker over “de minimis” (indtastet som DIM i logbogen), genudsætning (indtastet som DIS i logbogen), landet konsum (indtastet som LSC i logbogen) og BMS, hvor arter, der ikke er undtaget fra landingspligten enten skal landes som konsum (over mindstemål) eller som BMS (under mindstemål). Torsk, kulmule, kuller og mørksej er ikke omfattet af undtagelse fra landingspligten og skal derfor enten tages i land som BMS eller tages i land til konsum. Hvilling må genudsættes som de minimis, hvilket vil sige at genudsætning skal være indført som DIM.

Af tabellen skal forstås:

Art: fokusarterne: hvilling (HVL), kuller (KUL), kulmule (KLM), mørksej (MSJ), torsk (TOR) og pighaj (PHJ).

Logbog: logbogsnummeret for turen.

Kategori: indtastede fangstkategorier

I logbøger for kategori, kg: den indtastede mængde indtastet for kategorien i eLog

Samlet discard kamera, kg: den estimerede samlede genudsætning set på kamera.

Forskel i kg (- hvis mest på kamera): Forskel mellem indtastning i eLog ift. set genudsat på kamera, baseret på estimeret vægt fra kamera. Hvis der er tastet mere i eLog bliver tallet positivt, mens tallet bliver negativt, hvis der er set mere på kamera end tastet i eLog for turen. Mindre forskelle er helt forudsigeligt, dels pga. vægten er estimeret ud fra længde ved kamera, dels fordi eLog ikke tillader indtastning af komma-tal.

Genudsætning set ift. samlet fangst i logbog af fokus arter

Art	Logbog	Kategori	I logbøger for kategori, kg	Samlet discard kamera, kg	Forskel i kg (- hvis mest på kamera)
HVL	000XXXXXX	de minimis	27	9.16	18
HVL	000XXXXXX	Landet konsum	64	9.16	55
HVL	000XXXXXX	de minimis	4	16.71	-13
HVL	000XXXXXX	Genudsætning (DIS)	2	16.71	-15
HVL	000XXXXXX	Landet konsum	3	16.71	-14
KUL	000XXXXXX	Landet konsum	1	0.49	1
PHJ	000XXXXXX	Genudsætning (DIS)	4	3.87	0
TOR	000XXXXXX	Landet konsum	4	0.86	3

7. Genudsætninger over tid

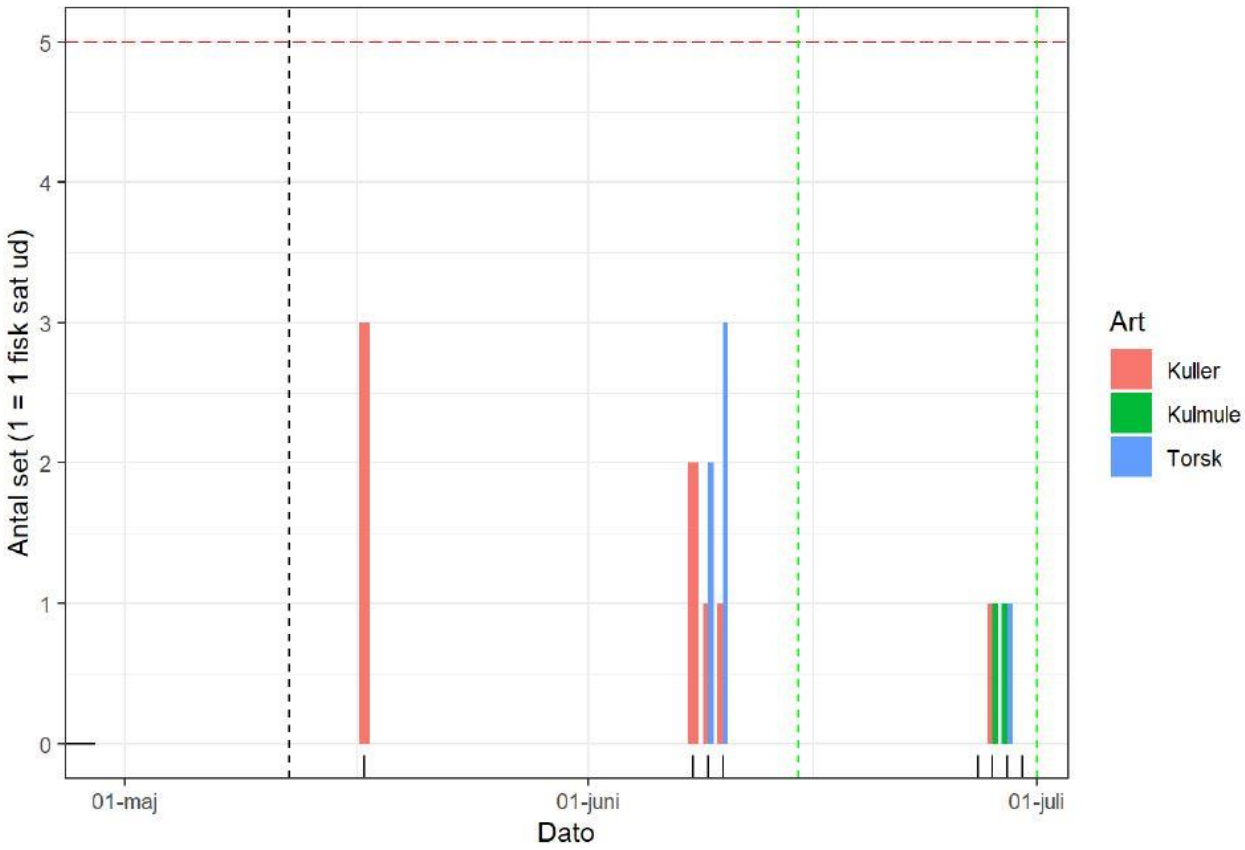


Fig. 2. Genudsætning ift. vejledning i landingspligten. X-akse: Dato for start af fiskeriaktivitet. Y-akse: Antal genudsætninger af kulmule, mørksej, kuller og torsk set på kamera. Sorte stiplede linjer: Opringning eller besked på skærmen i styrehuset med vejledning i landingspligten, herunder at torsk, kuller, kulmule og mørksej ikke må genudsættes. Grønne stiplede linjer: Tilbagemeldingsrapport afsendt fra FST til fartøjsejer. Sorte streger ved x-aksen viser, hvor der har været fiskeriaktivitet, som er blevet gennemset.

Figur 2 viser genudsætningen for fartøjet over tid.

Af grafen skal forstås:

X-aksen er en tidslinje, der viser dato for start af fiskeriaktiviteter.

Y-aksen viser antallet af genudsætninger for kulmule, mørksej, kuller og torsk set på kamera.

De sorte stiplede linjer er en opringning eller en besked på skærmen i styrehuset, der indeholder vejledning i landingspligten, herunder at torsk, kuller, kulmule og mørksej ikke må genudsættes.

Grønne stiplede linjer er dato for tilbagemeldingsrapport afsendt fra Fiskeristyrelsen

De korte sorte streger ved x-aksen viser, hvor der har været fiskeriaktivitet, som er blevet gennemset.

Appendix 9: Fælles forståelse mellem Danmarks Fiskeriforening og Ministeren for fødevarer, fiskeri og ligestilling

Selvom Danmark er et lille land, er vi alligevel en af Europas største fiskerinationer. Det kan vi med god grund være stolte af. For fiskeriet sætter et klart aftryk på Danmark og bidrager i dag med en væsentlig eksportindtægt. Samtidig bidrager fiskerierhvervet til et Danmark i bedre balance gennem de mange arbejdspladser fiskeriet og dets følgeerhverv skaber uden for storbyerne. Derfor er det afgørende, at dansk fiskeri fortsat udvikles, og at regulering og kontrol understøtter dette.

Selvom dansk fiskeri allerede i dag er kendetegnet ved høj grad af bæredygtighed, hvor op imod 80 % af alle landinger er bæredygtighedscertificerede med MSC-mærket, er det fortsat vigtigt, at fiskerierhvervet bliver endnu grønnere og endnu mere bæredygtigt. Danmark skal gå forrest med de nyeste og mest bæredygtige løsninger. Det gælder også i forhold til den måde fiskerikontrollen indrettes på.

Det er afgørende, at fiskerikontrollen indrettes så der hele tiden er en klar sammenhæng mellem kontrolformålet og de byrder, som fiskerikontrollen påfører den enkelte fisker. Det skal med andre ord sikres, at fiskerikontrollen understøtter et endnu grønnere fiskeri med respekt for den enkelte fiskers ret til at drive sin virksomhed og beskytte sit privatliv. For det er den enkelte fisker, der skal leve med kontrollen i sin hverdag, og det er derfor vigtigt, at fiskeren sikres et sundt, værdigt og sikkert arbejdsmiljø.

På den baggrund er Danmarks Fiskeriforening PO og Fødevareministeren nået til enighed om en model for projektet om kameramonitorering af fiskeriet i Kattegat, der skal sikre, at Danmark bliver et foregangsland inden for moderne grøn fiskerikontrol. Principperne i modellen er som følger:

Frivilligt forsøg med kameramonitorering.
Der monteres i 2020 kameramonitoreringsudstyr på 10-15 fartøjer, som ønsker at deltage i projektet. Danmarks Fiskeriforening sikrer den frivillige deltagelse per 1. oktober 2020. Det er et krav for deltagende fartøjer, at de har et væsentligt fiskeri med bundslæbende redskaber efter jomfruhummer i Kattegat. Projektet skal medvirke til at belyse, hvordan kameramonitorering fungerer som kontrolinstrument i praksis og hvilke dele af den normale kontrol, de deltagende fartøjer på sigt vil kunne undtages for. Projektet følger i øvrigt reglerne i forordningen om fiskerimuligheder og redskabsreglerne i reguleringsbekendtgørelsen.

For at gøre det mere attraktivt at deltage i forsøget udarbejder Fødevareministeriet en model, der tilbyder de deltagende fartøjer ekstra årsmængder, primært torsk og tunge. Miljø- og Fødevareministeriet vil fremadrettet – i dialog med fiskerierhvervet – overveje hvordan det kan gøres yderligere attraktivt at deltage i projektet.

Da der er tale om et nyt kontroltiltag, hvor det er nødvendigt at opbygge erfaring og kompetence i forhold til validering af materiale mv., vil data fra projektet som udgangspunkt ikke danne grundlag for håndhævelse i projektets første fase. Alle fartøjer vil fortsat være underlagt den hidtil gældende kontrolpraksis.

Projektets anden fase
Fremdriften i projektet følger Danmarks erklæring på rådsmødet i december 2019 og hovedparten af det danske trawlfiskeri i Kattegat skal således gradvist have monteret kamera senest ved udgangen af 2021. Indhentede erfaringer evalueres løbende i følgegruppen igennem 2021 og der foretages en opsamlende evaluering per 1. oktober 2021. Miljø- og Fødevareministeriet initierer

derefter projektets anden fase, hvor hovedparten af det danske trawlfiskeri i Kattegat gradvist omfattes.

Selve monteringen af kameraudstyret sker efter dialog med de fiskere, der deltager i projektet og DFPO indgår i følgegruppen til projektet.

Fremtidens sikre og selektive fiskeriredskaber.
Der etableres et forsøgsfiskeri med henblik på at udvikle nye redskaber, der forbedrer selektiviteten, så der opnås en selektivitet på niveau med den selektivitet, der opnås ved fiskeri med "svensk rist", uden at jomfruhummerfangsten forringes. Det er væsentligt, at de nye redskaber er sikre/forsvarlige for fiskeren at anvende og ikke påvirker arbejdsmiljøet negativt. Udviklingen af fremtidens sikre og selektive fiskeriredskaber skal ske i samarbejde med DTU Aqua.

Øget videndeling gennem ny teknologi.
Der skal udvikles en applikation (app), der kan hjælpe fiskerne med at dele information i realtid. Derved vil fiskerne kunne advare hinanden om i hvilke områder, der eksempelvis fanges torsk, så de øvrige fiskere kan undgå området i samme tidsrum og derved mindske uønskede fangster. Finansiering hertil tilvejebringes af Fiskeafgiftsfonden og projektet drives af Danmarks Fiskeriforening.

Arbejdsgruppe om fremtidens bæredygtige fiskeri i Kattegat.
Som supplement til følgegruppen om kameraprojektet nedsættes en arbejdsgruppe med repræsentanter fra fiskerierhvervet, DTU Aqua, relevante grønne organisationer samt Miljø- og Fødevareministeriet og Fiskeristyrelsen til at følge og evaluere ovennævnte initiativer og supplerende komme med anbefalinger til, hvordan der kan sikres en bæredygtig fiskeriforvaltning, der er tilpasset en dynamisk natur i Kattegat.

Appendix 10 Overvejelser og anbefalinger ift. projektets fase 2

Gennem fase 1 af projektet om elektronisk monitorering af jomfruhummerfiskeriet i Kattegat er der opbygget viden og indhentet en lang række erfaringer om bl.a. indsamling og behandling af kameradata, karakteren og omfang af genudsætninger fra de deltagende fartøjer, interaktionen med fartøjerne, installationsprocessen og elektronisk monitorerings anvendelighed som kontrolredskab. Som nævnt ovenfor er det den generelle vurdering, at elektronisk monitorering er velegnet som kontrolinstrument ift. landingsforpligtigelsen. Imidlertid peger erfaringerne fra fase 1 også på en række elementer, som med fordel kunne ændres med henblik på en hensigtsmæssig gennemførelse af fase 2, hvor antallet af fartøjer vil blive forøget væsentligt. Disse følger nedenfor i form af konkrete anbefalinger. Tabellen indeholder endvidere DFPOs betragtninger ift. den konkrete anbefaling.

Anbefaling fra Fiskeristyrelsen	Betragtning fra DFPO til anbefaling
Risikobaseret tilgang Fase 1 viser, at der er forskel på, i hvor stor udstrækning de enkelte fartøjer overholder landingsforpligtelsen, efter at kameraudstyret har været monteret i en periode. Det anbefales derfor, at der i fase 2 indføres en risikobaseret tilgang fsa. kontrolfrekvensen, således at fartøjer med en høj regelefterlevelse igennem 3 måneder kontrolleres mindre end 10 %, og fartøjer med lav regelefterlevelsen kontrolleres mere end 10 %	Ingen anmærkninger fra DFPO
Afløftning af den traditionelle kontrol Fase 1 viser, at elektronisk monitorering er et effektivt redskab fsa. kontrol af landingsforpligtigelsen. Det anbefales derfor, at mulighederne afsøges for at afløfte dele af den traditionelle kontrol til søs, herunder Last Haul kontrol, for fartøjer med kameraudstyr monteret.	Ingen anmærkninger fra DFPO
Installationsforløb Fase 1 viser, at processen med installation af kameraudstyr har taget længere tid end og med fordel kan strømlines, såfremt antallet af deltagende fartøjer forøges. Det anbefales derfor, at der aftales en fast deadline for installation allerede ved inspektion på fartøjet med tilstrækkeligt langt varsel (2-3 måneder) mhp. at minimere risikoen for udskiftning af installatører undervejs.	DFPO mener dette er overflødigt
Bagatelgrænse Fase 1 viser, at der er en mindre usikkerhed forbundet med artsgenkendelsen ifm. gennemsyn af de videooptagelser, der udtages til kontrol, om end disse søges minimeret mest muligt. Desuden viser fase 1, at en del af de deltagende fartøjer oplever det som meget uklart, i hvilken udstrækning fejl ved sorteringen eller lign. fører til sanktion. Det anbefales derfor, at der indføres en bagatelgrænse for discard i en instruks for håndhævelse.	DFPO tilslutter sig at der skal være en bagatalgrænse for mængden af discard førend sanktionering sker.

Anbefaling fra Fiskeristyrelsen	Betragtning fra DFPO til anbefaling
Opgradering, kameraer Fase 1 viser god overensstemmelse på længdemålinger, men et potentiale foreligger for at optimere dette. Det anbefales derfor, at der fremover anvendes square-lens kameraer i de områder, hvor det vurderes hensigtsmæssigt.	Ingen anmærkninger fra DFPO
Opgradering, rammer Fase 1 har vist, at Fiskeristyrelsens nuværende rammer har været tilstrækkelige til at gennemføre projektet. Ved udvidelse af projektet til flere fartøjer må det forventes, at der vil være behov for opgradering. Det anbefales derfor, at mulighederne for udvidelse af IT infrastruktur og antal videokiggere afsøges.	Ingen anmærkninger fra DFPO
Opgradering, sensorer Fase 1 har vist, at de anvendte sensorer til registrering af start og stop af fiskeriaktiviteter for visse fartøjer er udfordret af indretningen på fartøjerne. Det anbefales derfor, at mulighederne for anvendelse af andre sensorer eller alternativ placering af sensorer afsøges.	*DFPO påpeger, at der er bekymring for om de sensorer, der anvendes på trawl spil er egnet til formålet og tilslutter sig anbefaling.*
Videreudvikling, digitalisering Fase 1 har vist et digitalt udviklingspotentiale i fiskerikontrollen. Det anbefales, at mulighederne afsøges for en yderligere digitalisering og automatisering af fiskerikontrollen understøttet af elektronisk monitorering.	DFPO tilslutter sig anbefaling og ser gerne at udviklingen kan gå til en automatisk føring af logbog.
Videreudvikling, automatisering Fase 1 har oparbejdet en robust datapulje for de omfattede fartøjer og arter. Det anbefales, at indsamlet data fra projektet anvendes til at understøtte udvikling af software til automatisk artsgenkendelse og længdemåling, da dette vil lette gennemsynsprocessen.	Ingen anmærkning fra DFPO.

Anbefaling fra Fiskeristyrelsen	Betragtning fra DFPO til anbefaling
Overordnet Projektet om elektronisk monitorering af jomfruhummerfiskeriet i Kattegat skal gå videre til fase 2.	DFPO kommer med tekst.