



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



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

Full evaluation of the project



Colophon

Report on

Electronic monitoring in the Danish Kattegat (3AS) *Nephrops* fishery - Full evaluation of the project

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Original Title

Elektronisk monitorering af jomfruhummerfiskeriet i Kattegat – Samlet evaluering af projektet

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Summary

In connection to the council meeting (agriculture and fisheries) in December of 2019, it was politically decided to introduce electronic monitoring in the majority of Danish fisheries with bottom-trawling gear in the Kattegat. The framework of the project was established in August of 2020 in a “common understanding paper” between the former Minister of Fisheries Mogens Jensen and the Danish Fishermen’s Association PO (DFPO). It was agreed that the project would be implemented in two phases, with the first phase running until 1 October 2021 after which an evaluation will be completed. After the evaluation, it was decided to progress to phase 2 of the project by the Minister of Fisheries Rasmus Prehn. The framework of phase 2 was settled in a 10-point plan (“10-punktsplan”) (see appendix 6). In phase 2 of the project, the electronic monitoring went from a voluntary (12 vessels) to a mandatory project covering all vessels that fishes with bottom-trawling gear and have at least 20 days at-sea in Kattegat. On this basis, the electronic monitoring project is divided into three parts and years: Phase 1 in 2021, the transition between phase 1 and phase 2 in 2022 and phase 2 in 2023.

This report constitutes the evaluation of phase 2 of the electronic monitoring project in Kattegat. The evaluation builds upon the evaluation report for phase 1, where the evaluation concept was discussed within the project’s advisory group. The projects advisory group consisted of DFPO, The Danish society for Nature Conservation, WWF, Greenpeace, OurFish, DTU Aqua, the Ministry of Food agriculture and Fisheries’s Department and the Danish Fisheries Agency. The report is divided into seven sections.

First section describes the background of the project.

Second section analyze electronic monitoring data and review the installation processes, the development in audit time, present a general overview of reviewed material which include distribution of discards and landings for target species, and the extent of non-compliance with the landing obligation during the project period. This section also includes an overview of the Danish Fisheries Agency’s trial fisheries in the Baltic Sea.

Third section present the fishers’ own registration which is compared to the registrations made during audit of electronic monitoring data. The development in BMS (registration of undersized, landing-obligated specimens) before and after installation of electronic monitoring as well as an comparison between BMS-registrations in Kattegat and Skagerrak. The aforementioned analysis shed light upon the development in BMS registrations over time where the subsequent part deals with the spatial aspect as the electronic monitoring system deactivate video recording outside of Kattegat. Finally this section includes an overall comparison of BMS either registered by fishers or estimated based on video audit in Kattegat.

Fourth section is an analysis of observer data from the National Institute of Aquatic Resources (DTU Aqua) in relation to audited video data.

Fifth section describes the cooperation between the Danish Fisheries Agency and vessel owners with vessels subject to mandatory electronic monitoring. The shift from phase 1 (voluntary) to phase 2 (mandatory) is the primary focus in this section of the report. The voluntary trial fisheries in the Baltic Sea are also compared to the phase 2 vessels of the Kattegat project. Furthermore this part includes developments during phase 2 which have been added based on the wishes from fishers, DFPO and the Danish Fisheries Agency.

Sixth section relate to and SDU report regarding the effect on fishers working conditions due to the presence of electronic monitoring.

Seventh section touch upon data security and data ownership.

1.0 Introduction

Electronic monitoring with camera documentation (EM) is utilized and tested in several countries, including Australia, Canada, Chile, the Netherlands, New Zealand, Peru, Sweden, and the United States. Among EU member states and former members, particularly Denmark and Scotland have run long-term and larger-scale projects involving camera documentation. For instance, Denmark's experiments with catch quota management and camera documentation in the North Sea and Skagerrak from 2010 to 2016. Furthermore, electronic monitoring with camera documentation is incorporated into the new EU fisheries control regulation, which specifies that, based on a risk assessment, specific vessels of 18 meters and above will be subject to requirements for having camera monitoring systems on board. The risk criteria (fishing/maritime areas) will be further defined in implementing regulations. Additionally, the European Fisheries Control Agency EFCA has initiated a pilot program where the members commit to equip EM on at least two vessel in the North Western waters, the North Sea and the Baltic Sea.

Following the settling of TACs (Total Allowable Catch) for 2020, it was politically decided that EM and cameras should be implemented in the majority of the Danish trawl-fleet in Kattegat for vessels with 20 or more days at-sea. The poor condition of cod in Kattegat was a significant part of the background for the political decision. The condition had been poor for a number of years but with the REM implementation the underlying cause was the lowest populations size since 1997. The very low cod stock means that cod by-catches are relatively small. This is also reflected in the bycatch recorded in the Kattegat-project. In contrast to the situation for the cod stock, in recent years there has been a large growth in the haddock stock in the North Sea and Skagerrak. The fishermen are also experiencing that part of the growing haddock population is moving into the Kattegat. This is also reflected in the catches of haddock in the Kattegat. Within the camera project, a sharp increase in the catches of haddock has thus been seen, which is clear when looking at the numbers for haddock seen in the Kattegat-project in 2021 compared to 2022 and 2023 respectively (see section 2.4.3 "Development in number and length of focus species in 2021, 2022 and 2023").

This report primarily covers the EM project in the Kattegat. However, some sections there include information and data from the Danish EM trials in the Baltic Sea. Denmark has implemented pilot projects in the Baltic Sea and is in the process of implementing the commitments for the North-Western waters and the North Sea via the Danish pelagic sector's voluntary project with Fully Documented Fisheries. The latter is not included in this report.

This report covers the entire implementation period but will not include several topics from phase 1 which can be found in the evaluation report from phase 1.

2.0 Installation and video audit data

2.1 Installation process

The installation process is described in the first section of the report “Electronic monitoring in the Danish Kattegat (3AS) *Nephrops* fishery).

In addition to the 12 voluntary vessels from phase 1, 61 vessels were subject to mandatory installation of EM equipment including cameras in phase 2. Initially this number were higher, but 29 vessels have been phased out of the project. This decrease since the beginning of the Kattegat-project in 2020 is primarily due to decommission support and changes in fishing patterns. As in phase 1, each fisher chose their own electrician to conduct the installation of the EM system.

Installation process:

- The vessel owner receives a letter of formal notice to comment on the decision and later a decision regarding the requirement for electronic monitoring
- Visit vessel
- Installation offer and draft vessel monitoring plan
- Installation
- Final vessel monitoring plan, loan agreement, and initiation of fishing with electronic monitoring

Step two and four (vessel visit and installation) are the most time consuming of the process. During the vessel visit the Danish Fisheries Agency inspects the vessel with participation from vessel owner and electrician. The exact location of the different components (antenna, BlackBox, cameras and sensors) will be clarified during the vessel visit. A Vessel Monitoring Plan (VMP) will be prepared based on the decisions made during the vessel visit. The installation of the EM system takes 2-3 days and mainly involve the vessel owner and electrician. The Danish Fisheries Agency only partake in the installation online through the Live View function in order to setup software and masking of field of view.

Phase 2 covered a larger number of vessels. The Danish Fisheries Agency divided the installations process into two groups to better facilitate the process. Group one had a deadline for full EM installation on each vessel by the end of 2022. Group two had a deadline for full EM installation on each vessel by the end of June 2023. The main reason for dividing the installation up into two groups were to ensure adequate capacity in terms of electricians to cover the installations as there is a limited number of these and the electricians need to cover other customers as well.

As part of the initiation of the installation process of phase 2, the Danish Fisheries Agency and the Danish Fishermen’s Association Producer Organization (DFPO) made invitations to

vessel owners as well as other interested parties to participate in information meetings. Information meetings were held in Østerby (Læsø), Gilleleje (Northern Zealand), Grenå (Djursland) and Strandby (Northern Jutland). During the information meetings, terms and conditions, installations process as well as daily maintenance and operations were presented and discussed. Any interested parties could ask questions during the meeting to clarify any elements under consideration. Vessel visits often followed the information meetings.

The map below (Fig. 1) show the number of vessels for which the Danish Fisheries Agency have had vessel visits in connection with the installation of electronic monitoring since the end of 2020. The map includes trial fisheries in the Baltic Sea, where three vessels have had electronic monitoring installed, while a fourth vessel already had electronic monitoring as it was part of the Kattegat-project, in addition to participating in a trial fishery in the Baltic Sea. An overview of the number and length of vessels with EM is available in appendix 1.

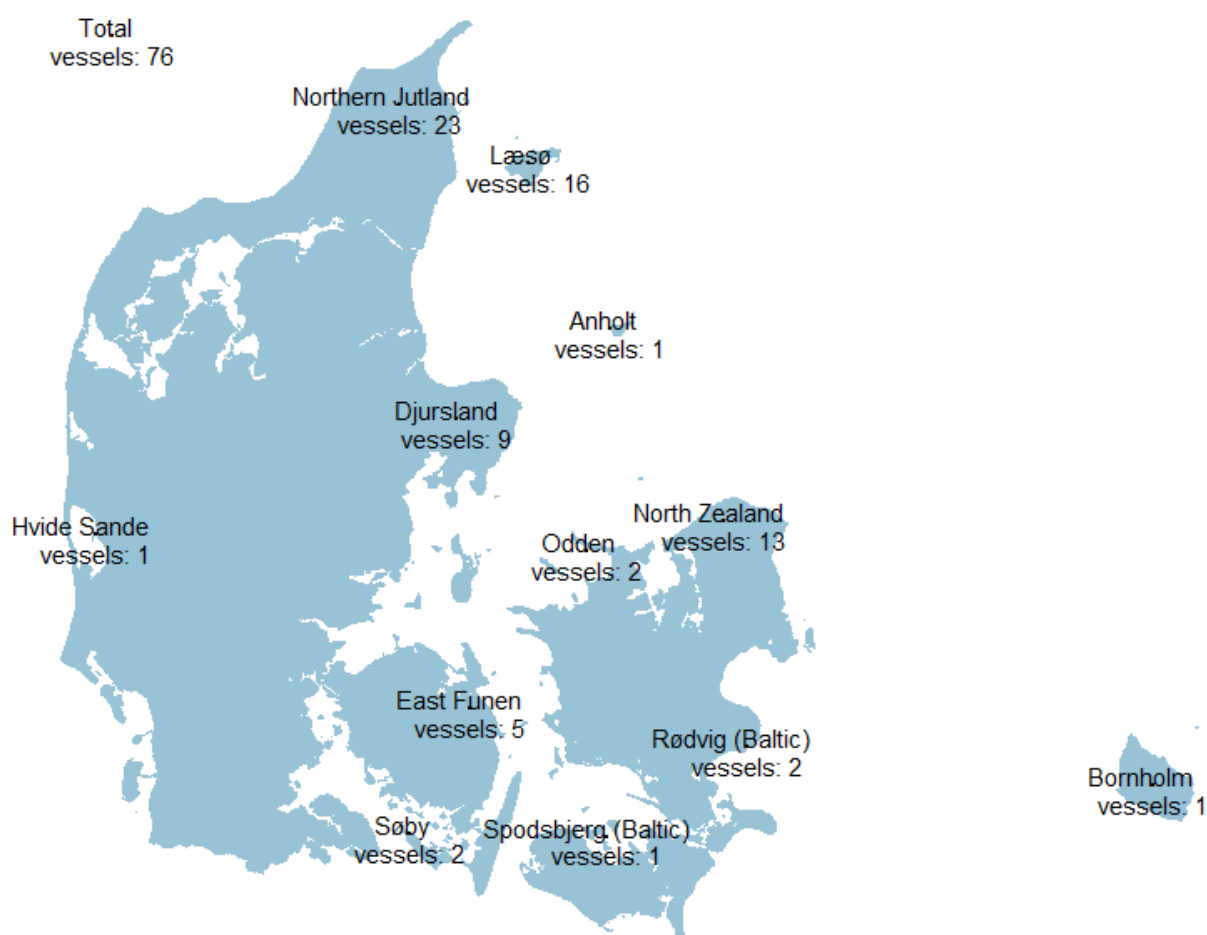


Figure 1. Map of vessels with primary location for electronic monitoring in relation to vessel visits, installation, and maintenance of the electronic monitoring system.

2.2 Review information pr. yr. (Kattegat and trial fisheries)

The table below provides an overview of the Danish Fisheries Agency's registrations (all registrations including all discards and landings).

Table 1. Number of vessels, trips and hauls reviewed pr. yr. in Kattegat.

Year	Reviewed vessels	Reviewed trips	Reviewed hauls	Number of registrations
2021	11	202	378	39,141
2022	18	98	202	49,573
2023	64	102	194	99,225

**One vessel from phase 1 has not conducted fishery in Kattegat post installation*

Table 1 shows that despite a decrease in the number of trawls and fishing trips from 2021 to 2022, there is a consistent increase in registrations, in addition to an increase in the number of vessels. The number of registrations and vessels is higher in August 2023 than in 2021 and 2022, despite the fact that the whole of 2023 is not included in the data volume. The increasing number of registrations, but lower number of observations and fishing trips between 2021 and 2022, is connected to the fact that i) the Danish Fisheries Agency has continually expanded the number of species that are registered during inspections, ii) there has been a significant increase in the number of haddock, iii) relatively speaking, it takes longer to go through a haul, as experience in the work process on board the individual vessel diminish when video auditors have to switch between many different vessels compared to phase 1, where there was a low number of vessels, and iv) in 2022, in parallel with the project in the Kattegat, the Danish Fisheries Agency started trial fisheries, which included camera documentation.

It is also apparent from the table that the Danish Fisheries Agency has not made video audit for all vessels equipped with electronic monitoring in the Kattegat. As the latest date for installation of electronic monitoring was 1 July 2023 for 26 vessels, it was expected that sufficient time would not be available to ensure audit before the evaluation report was due on 1 October 2023. This is the case for nine vessels. The most frequent reason for this is that the vessels have not made fishing operations in Kattegat after installation of electronic monitoring, or that vessels fish in the Kattegat and Skagerrak, but cross into the Skagerrak when the catch processing is done, whereby video recordings stop and audit of the catch is not possible. Video recordings from fishing in the Kattegat have been requested for three vessels, but audit was not possible prior to 21 August 2023. The Danish Fisheries Agency expects to audit these vessels no later than September 2023. One vessel has not accepted video requests from the Danish Fisheries Agency. Based on the "10-punktsplan", the Danish Fisheries Agency must request video recordings in phase 2 of the Kattegat-project.

The following table is an overview of the registration the Danish Fisheries Agency have made during the audit of trial fisheries in the Baltic Sea.

Table 2. Trial fisheries: Number of vessels, trips and hauls reviewed on average pr. yr.

Year	Reviewed vessels	Reviewed trips	Reviewed hauls	Number of registrations
2021	0	0	0	0
2022	2	55	88	747
2023	4	55	93	4.570

The table show an increase in included vessels from 2021 - 2023 and display the reviewed trips and hauls as well as the number of registrations during reviews. An increase in trial fisheries and types of fishery might help explaining this progress.

2.3 Development in review time and number of registrations

Audit time for video recordings has an impact on costs of camera-documented fisheries.

Overall, over the project's period, the audit time has increased due to a continuous increase in species and registrations. For a more detailed overview of this trend, please see Appendix 2.

2.4 Data on catches and discards

In phase 1 the focus was solely on the below mentioned species, which means that information about the species composition of the catches is not representative. One reason for this is that not all of the later recorded species is subject to the landing obligation. Another reason for the lack of registrations in the aforementioned period is the purpose of the phase which was learning and building experience in terms of validations material and data etc., as per the common understanding paper. (Annex 9 in the report “Electronic monitoring in the Danish Kattegat (3AS) *Nephrops* fishery)

Table 3. Focus species in phase 1 and 2.

Focus Species	
Phase 1	Phase 2
Whiting	Whiting
Haddock	Haddock
Hake	Hake
Saithe	Saithe
Cod	Cod
Spurdog	Sole

In the transition from phase 1 to phase 2 in July of 2022 the focus species changed to include sole instead of spurdog. This change happened to target the control on the most important species of fish within the bottom-trawl fisheries. The registration of *Nephrops* was quickly decided not to be an option, as this would increase the audit time tremendously and would not fit the actual purpose of the project, which is the landing obligation.

Cod, haddock, hake, saithe and sole are all subject to the landing obligation and when caught must be taken ashore. Whiting can be discarded since there is a *de minimis* exemption on this species. Discards must be recorded in the logbook. Spurdog was a protected species until 2023 and therefore had to be discarded and recorded in the logbook.

In the following tables, the focus is on catch records in audited material in 2022 and 2023, partly due to the difference between focus species between phase 1 (2021) and phase 2 (partly 2022 and 2023). The evaluation report for phase 1 of the Kattegat-project shows tables and figures for catch records in phase 1.

2.4.1 Compliance with the landing obligation for the focus species

Table 4 below shows the number of hauls where the landing obligation has not been complied with¹. The table shows that almost all vessels violate the landing obligation for haddock (60 out of 63, where haddock is seen) and cod (56 out of 64, where cod is seen), while just over one in four vessels have complied with the landing obligation for sole and hake. Saithe has only been seen for 12 vessels and half of these have complied with the landing obligation for saithe. It should be noted that the Danish Fisheries Agency sends feedback sheets to vessel owners with information on what the Danish Fisheries Agency has observed, including discarding of fish, and that the Danish Fisheries Agency has continuously provided guidance on the landing obligation either directly or after inquiries from vessel owners.

Table 4. Landing obligation (LO) violated on the following hauls for the following species and vessels, 2022 and 2023. Note that the table extends over two years and may therefore have a higher number of vessels and hauls than the table of inspected vessels and hauls per year in the Kattegat. Data until 21 August 2023.

Species	Vessel where seen	Vessels with LO* non-compliance observed	Number of hauls where seen	Hauls with LO* non-compliance observed	Discarded number of fish
Haddock	63	60	294	244	13,618
Sake	59	46	283	135	418
Saithe	12	6	16	6	6

¹ It should be noted that this includes discards of predator-damaged fish that can be legally discarded. The Danish Fisheries Agency has been able to distinguish in EM system for the cause of discards since 4 December 2022. In 2023 (until 21 August 2023), the Danish Fisheries Agency has in total marked three haddock, two cod, one hake and zero saithe as damaged by a predator.

Species	Vessel where seen	Vessels with LO* non-compliance observed	Number of hauls where seen	Hauls with LO* non-compliance observed	Discarded number of fish
Cod	64	56	358	219	1,297
Sole	46	38	255	132	428

*LO = landing obligation

Based on the “10-punktsplan” (appendix 5), the Danish Fisheries Agency has operated with a trivial limit based on a concrete assessment and has had a guiding principal approach to observations of discarding of fish. The Danish Fisheries Agency has nine times made use of the opportunity to obtain an additional 5% of fishing trips based on a risk-based approach. Six of the risk-based additional control audits have been on the basis of large discard amounts of species subject to the landing obligation observed during the 5% random sampling, two risk-based checks have been on the basis of poor video quality and one risk-based check has been on the basis of poor video quality as well as large discard amounts of species subject to the landing obligation observed.

2.4.2 Grouping of vessels in relation to compliance with the landing obligation (haul by haul) based on a ratio between landing and discarding of focus species

Table 5 below shows the grouping of vessels in relation to the ratio between landing and discarding of fish per haul. The table only includes landings and discards of the five focus species subject to the landing obligation.

Table 5. Grouping at 10% interval for the ratio of discards of the focal species cod, hake, haddock, sole and sole. A total of 65² vessels have been checked in 2022 and 2023. Data is up to 21 August 2023.

Discards, interval	Number of vessels	Number of hauls audited	Discards, number	Landings, number	³ Average ratio, discards compared to landings
0-10%	11	49	761	12,623	4.09
10-20%	9	40	1,410	6,744	16.33
20-30%	6	70	1,160	3,145	25.83
30-40%	8	46	1,632	3,060	34.88
40-50%	12	97	4,202	4,976	44.75
50-60%	8	49	3,585	3,069	54.25

² One vessel changes owner, name and port identification number in 2022. The vessel therefore figures twice and thus the total number of vessels comes to 65 for 2022 and 2023.

³ Average ratio, discards compared to landing, is calculated as ('discard number'/'(landed number' + 'discard number'))*100

Discards, interval	Number of vessels	Number of hauls audited	Discards, number	Landings, number	³ Average ratio, discards compared to landings
60-70%	2	3	76	46	64.50
70-80%	3	7	1,431	480	75.67
80-90%	3	22	1,029	182	87.00
>90%	3	11	481	37	97.33

Discard and landing registrations are totaled for the focus species: cod, hake, haddock, sole and sole. It should be noted that this table only contains data from 2022 and 2023, as it was only in August 2021 that the Danish Fisheries Agency began to register both landings and discards of fish. Thus, it would only be possible to have data for a little under half of 2021 and in order to give a more direct relationship between the total audited landings and discards, it has been chosen to only use data from 2022 and 2023 for this table.

Table 5 shows that 11 out of 65 vessels land more than 90% of the fish required to be landed, while 20 out of 65 vessels land more than 80% of the fish required to be landed. There is no trivial limit in the regulations for the landing obligation, and there is no fixed limit for when the discarding of fish occurs as a result of random accidents or deliberate action. The table cannot be used to determine whether it is an accident, ignorance or a deliberate act. The table shows that 45 out of 65 of the vessels have discarded more than 20% of the focus species that must be landed. For 19 vessels, it is more than half of the focus species that must be landed that are thrown out.

2.4.3 Development in number and length of focus species in 2021, 2022 and 2023

The figures below show histograms for catch records in both phase 1 and phase 2. Since sole and spurdog were not focus species in the respective phase 1 and phase 2 and only a very limited amount of saithe has been seen, the inventory is only made for whiting, haddock, hake and cod. Furthermore, it should be noted that landings were first registered from August 2021, which artificially drags the green bar for 2021 in the histogram down. The figures show the number and estimated weight⁴ of discards and landings, respectively. The overall trend is that the majority of catches and discards primarily consist of fish below the minimum size. Overall, more kg are landed than are thrown out of the focus species that must be landed.

⁴ The estimated weight is calculated using the length-weight ratio for each individual fish. Length-weight ratios are based on information from DTU Aqua for each species.

Whiting: Figure 2 shows that the majority of registered whiting are discards. Furthermore, the figure shows that the majority of the whiting seen were below the minimum size for whiting.

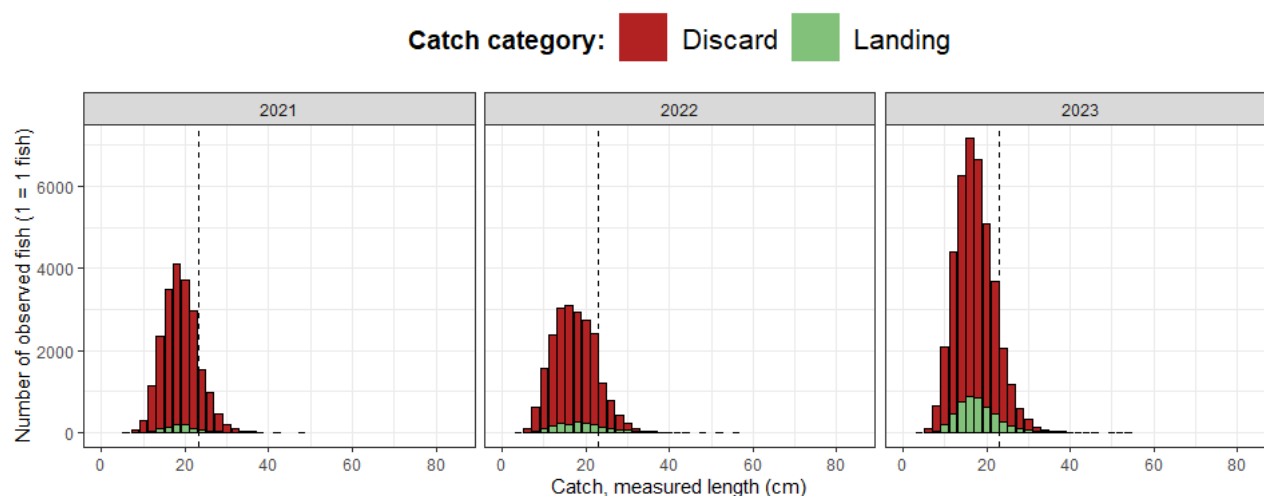


Figure 2. Histogram of observed catch of whiting per year in the Kattegat. X-axis shows the length of the measured catch in cm. Y-axis shows the number of discards and landings for the focus species in question. Dashed vertical lines show the minimum size for whiting. Data is up until 21 August 2023.

Figure 3 shows that the majority of whiting seen, converted to kilograms, are discards.

The trends shown in the figures above are in accordance with current rules for the landing obligation, as there is a de minimis exception from the landing obligation for whiting.

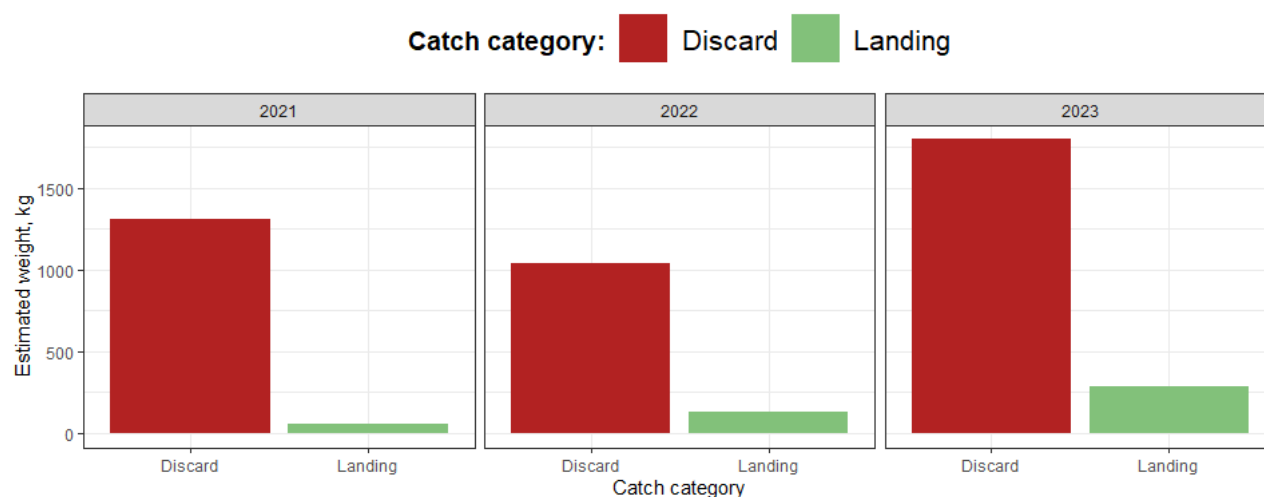


Figure 3. Barchart of whiting catches per year in the Kattegat. X-axis shows whether the catch has been registered as discard or landing during audit. Y-axis shows the estimated weight based on the number and measured length for whiting. Data until 21 August 2023.

Haddock: Figure 4 shows that the majority of haddock seen are landed. Furthermore, the figure shows that the majority of the haddock seen were below the minimum size.

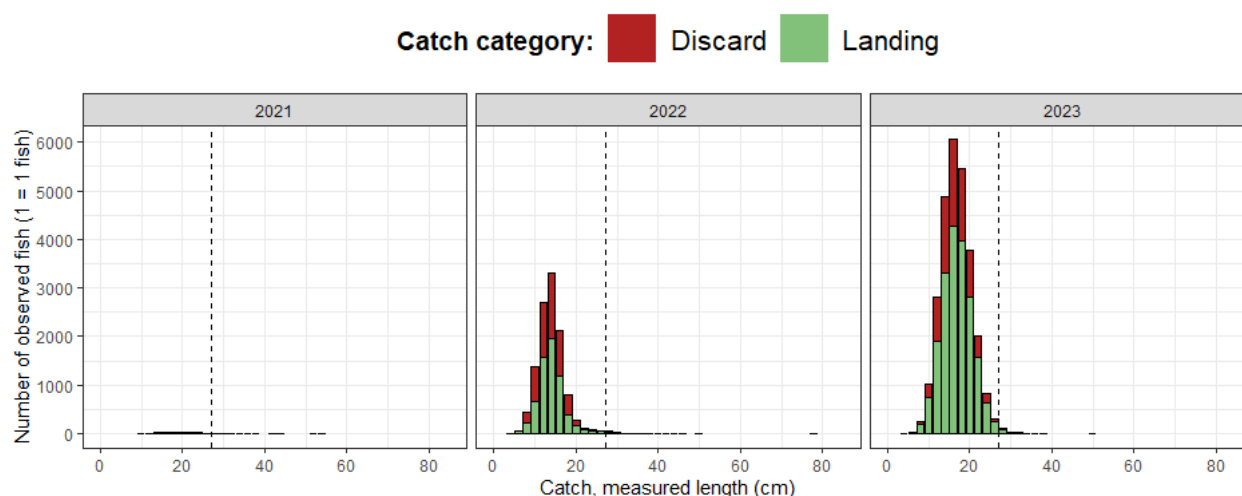


Figure 4. Histogram of observed catches of haddock per year in the Kattegat. X-axis shows the length of the measured catch in cm. Y-axis shows the number of discards and landings for the focus species in question. Dashed vertical lines show the minimum conservation reference size for haddock Data until 21 August 2023.

Figure 5 shows that the majority of haddock seen, converted to kilograms, has been landed. In the autumn of 2022, there was a significant increase in the occurrence of haddock, which is the reason for the large number of registered haddock in 2022 and 2023 compared to 2021. Furthermore, it can be seen that the proportion of landed haddock is higher in 2023 than in 2022.

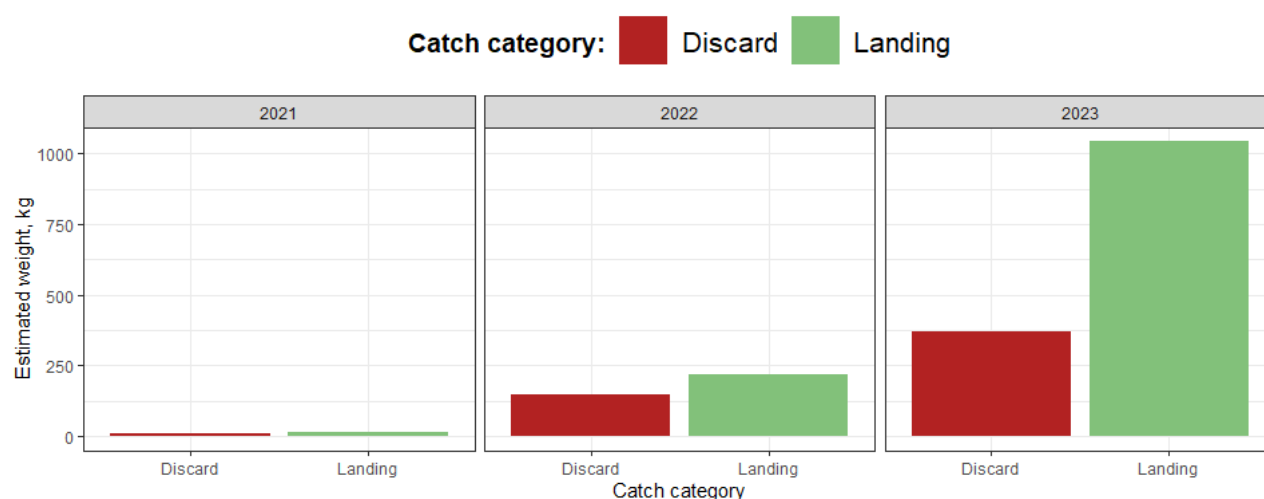


Figure 5. Barchart of haddock catches per year in the Kattegat. X-axis shows whether the catch has been registered as discard or landing during audit. Y-axis shows the estimated weight based on the number and measured length for haddock. Data until 21 August 2023.

Hake: Figure 6 shows that the majority of hake seen are landed. Furthermore, it can be seen that the size of hake varies more compared to whiting and haddock, and that a larger proportion of the seen whiting are above the minimum size than is the case for whiting and haddock (figures 2 and 4).

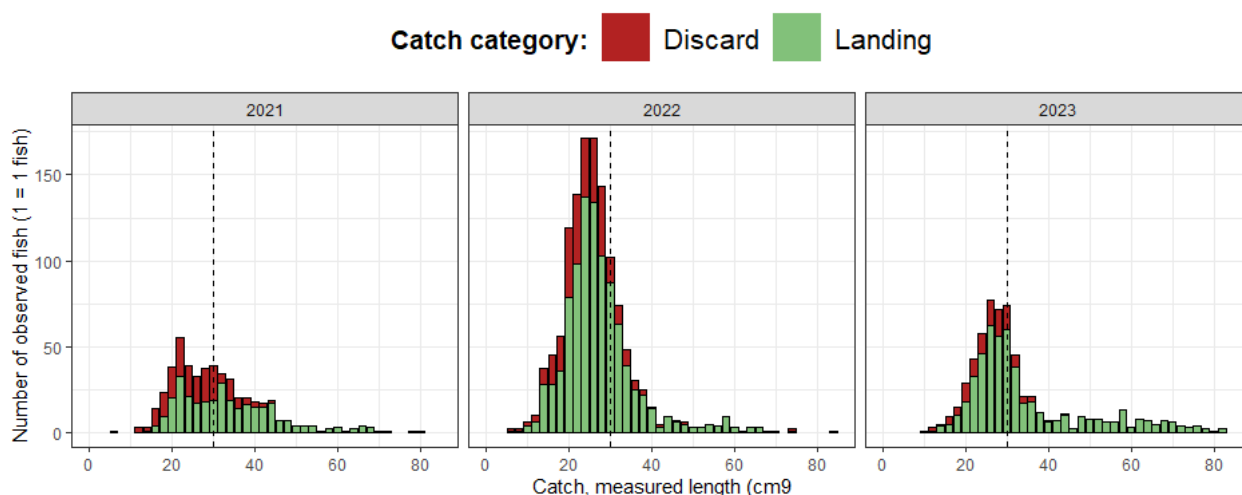


Figure 6. Histogram of observed catches of hake per year in the Kattegat. X-axis shows the length of the measured catch in cm. Y-axis shows the number of discards and landings for the focus species in question. Dashed vertical lines show the minimum conservation reference size for hake. Data until 21 August 2023.

Figure 7 show that the part of hake in estimated kg is landed.

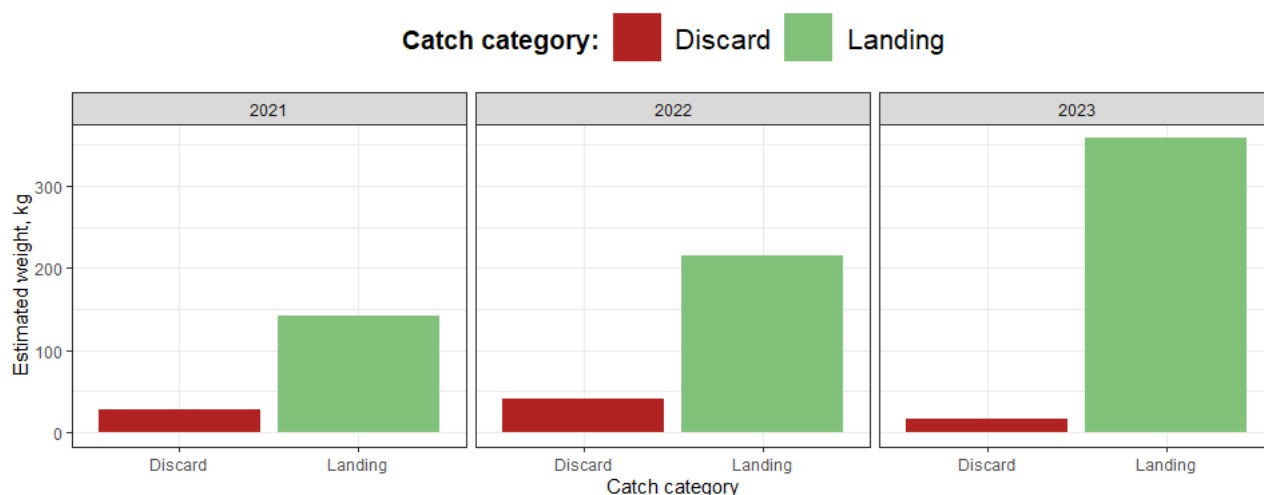


Figure 7. Barchart of hake catches per year in the Kattegat. X-axis shows whether the catch has been registered as discard or landing during audit. Y-axis shows the estimated weight based on the number and measured length for hake Data until 21 August 2023.

Cod: Figure 8 shows that the majority of the cod seen are landed.

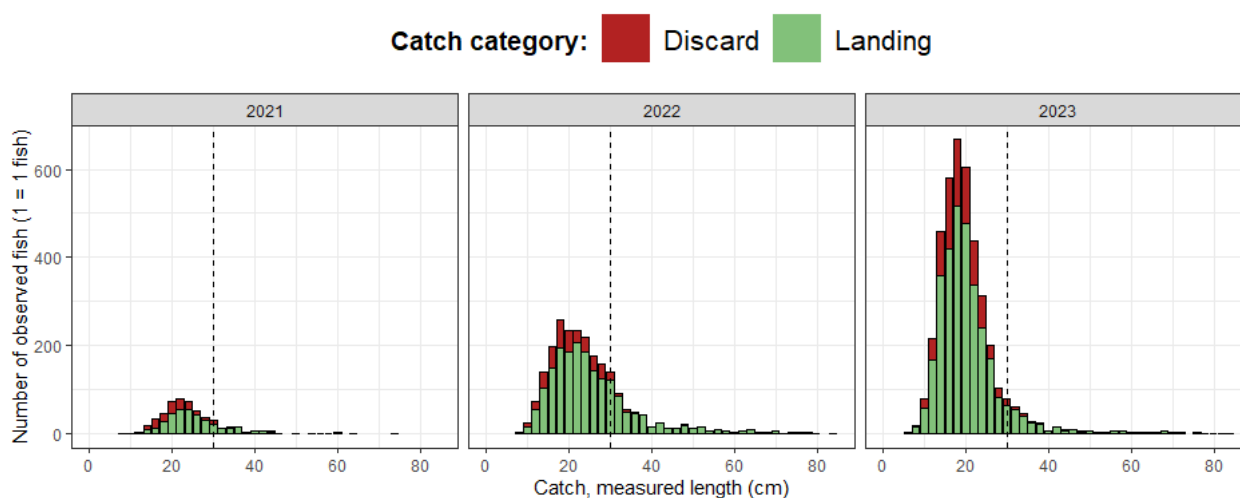


Figure 8. Histogram of observed catches of cod per year in the Kattegat. X-axis shows the length of the measured catch in cm. Y-axis shows the number of discards and landings for the focus species in question. Dashed vertical lines show the minimum conservation reference size for cod. Data until 21 August 2023.

Figure 9 shows that the majority of cod seen, converted to kilograms, is landed. Figure 8 and 9 show a constant increase in the number of registered cod from 2021 to 2023⁵, but a reduction in the number of kilos. This is because a greater proportion of observed cod in 2022 is above the minimum. In other words, there is a greater proportion of larger and thus heavier cod in 2022 than in 2023.

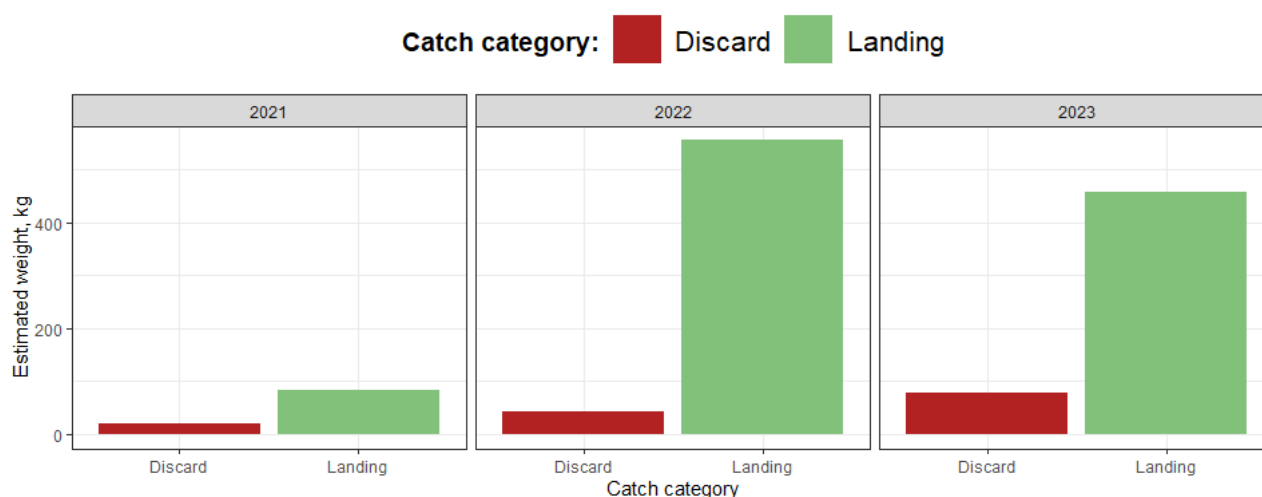


Figure 9. Barchart of cod catches per year in the Kattegat. X-axis shows whether the catch has been registered as discard or landing during audit. Y-axis shows the estimated weight based on the number and measured length for cod. Data until 21 August 2023.

⁵ Date of last data in 2023 is 21 August.

3.0 BMS-registrations

3.1 Development in BMS 2022 and 2023 for vessels in phase 2

Table 6 below show the registrations of BMS-fish of species subject to the landing obligation from the participating vessels eLog-registrations in 2022 and 2023. The registrations are divided into before and after installation of electronic monitoring equipment. Vessels from phase 1 are not included as they have had electronic monitoring systems installed throughout the project period (2021-2023). These vessels are used as control group in the next section.

Table 6. Registration of BMS per species and amount in Kattegat. Before and after camera, total and per trip. The number of trips in Kattegat before camera was 4112 and trips after camera was 2851. Data until 21 August 2023.

Species	Before camera, total (kg)	After camera, total (kg)	Difference, total (kg)	Before camera, per trip (kg)	After camera, per trip (kg)	Difference, per trip (kg)	⁶ Difference in %
Hake	391	5,237	4,846	0.095	1.837	1.742	1,832
Haddock	1,476	65,314	63,838	0.359	22.909	22.550	6,282
Saithe	0	36	36	0.000	0.013	0.013	NA*
Sole	156	338	182	0.038	0.119	0.081	212
Cod	1,960	13,293	11,333	0.477	4.663	4.186	878

**Percent cannot be calculated because one cannot divide with zero.*

For all species, the vessels' BMS registration increases after an EM system with cameras is installed on board. This is particularly the case for hake, haddock and cod, where cod has the lowest increase of the three with an increase of 11,333 kg (878% or approximately 4.7 kg of cod per trip). For comparison, the total Danish landings of cod in the Kattegat were 19 tonnes in 2022 and 21 tonnes in 2023 (as of 17 August 2023).

For hake there is an increase of 5,237 kg (1,832% or approx. 1.7 kg hake per trip), while haddock has an increase of 65,314 kg (6,282% or approx. 22.6 kg hake per trip). It should also be noted that the stock development will play a role, which is clearly seen for haddock, where a significant increase in the occurrence of haddock has been seen from 2022. This is also reflected in figures 4 and 5 in section 2.4.3. The total Danish landings of hake in the Kattegat in 2022 were 16 tonnes and 12 tonnes in 2023 (as of 17 August 2023). The total

⁶ The development in registration of BMS for the 12 vessels from phase 1 is described in the evaluation report for phase 1. Difference in percentage is calculated as "Difference per trip (kg)"/"Before camera, per trip (kg)"*100. Kg per trip is used to correct for a different number of trips for the vessels in the Kattegat before and after the camera. "Before camera" is used in the denominator, as the starting point is that there is no camera system on vessels and a change in registrations must be seen in the context of the new element (camera system on board).

Danish landings of haddock in the Kattegat were 7 tonnes in 2022 and 60 tonnes in 2023 (as of 17 August 2023).

3.2 Development in BMS 2022 and 2023, vessels from phase 1

Table 7 below shows eLog-registration of undersized fish (BMS) in 2022 and 2023 from the 12 vessels that partook in the Kattegat-project from the beginning in phase 1. That is, the 12 vessels that have had an electronic monitoring system since 2021 and thus throughout 2022 and 2023. The vessels can thus function as a control group in relation to vessels that have had electronic monitoring installed during 2022 and 2023. For comparison with the development in the BMS for vessels in phase 2, the cut-off is set for 1 January 2023. All of 2022 is thus an early period for BMS registration and can therefore be compared to "Before camera" for phase 2 vessels, while 2023 can be compared to "After camera". 1 January 2023 has been chosen, as it includes a full year in the early period. It is not possible to create a period of one year on either side of the cut without 2021 being included. Since there is a large increase in the occurrence of haddock in the autumn of 2022, the Danish Fisheries Agency has assessed that it is more correct to include the whole of 2022 in the early period.

Kg per trip is used to correct for different number of trips for the 12 phase 1 vessels in the Kattegat in 2022 compared to 2023.

Table 7. Registration of BMS per species and amount in Kattegat in 2022 and 2023 for vessels which have had electronic monitoring systems installed from phase 1 2021. The number of trips in Kattegat in 2022 and 2023 was respectively 1157 and 651. Data is until the 21 August 2023.

Species	2022, total (Kg)	2023, total (Kg)	Difference, total (kg)	2022, per trip (kg)	2023, per trip (kg)	Difference, per trip (kg)	⁷Difference in %
Hake	1,991	485	-1,506	1.721	0.745	-0.976	-57
Haddock	3,158	11,370	8,212	2.729	17.465	14.736	540
Saithe	3	0	-3	0.003	0.000	-0.003	-100
Sole	113	17	-96	0.098	0.026	-0.072	-73
Cod	3,147	1,969	-1,178	2.720	3.025	0.305	11

For the control group the BMS-registrations of sole, saithe and hake is decreasing. Hake decreases approx. 1 kg pr. Trip (- 57 %). Cod increases approx. 0.3 kg (11%) Haddock has a notable increase of approx. 14.7 kg (540%) BMS-registrations from 2022 to 2023, which support the notable increase in the haddock stock, also seen in the figures 4 and 5 in section 2.4.3.

⁷ Difference in percent is calculated as following: "Difference pr. trip (Kg)"/"2022 , pr. trip (Kg)"*100.

3.3 Comparison of BMS-registrations between Skagerrak and Kattegat

The following table 8 show registrations of landing obligated undersized individuals (BMS) in 2023, depending on whether the vessel conducted fishery in Kattegat (under the petition of electronic monitoring) or in Skagerrak. The electronic monitoring system stop automatically, when the vessel exits Kattegat. All vessels from phase 1 and 2 are included in this table, because an equivalent analysis does not exist for phase 1.

Table 8. Difference in registered BMS per trip (species and amount), Kattegat compared to Skagerrak. Cameras are on in Kattegat but switch off in Skagerrak. The vessels have had 1646 trips in Skagerrak and 3802 trips in Kattegat. Data is until the 21 August 2023.

Species	BMS 3AS, total (kg). Camera on.	BMS 3AN, total (kg). Camera off.	Difference, total (kg)	BMS per trip (kg), 3AS. Camera on.	BMS per trip (kg), 3AN. Camera off.	Difference per trip (kg)	⁸Difference in % (- if more in Skagerrak)
Hake	3,498	397	3,101	0.920	0.241	0.679	281
Haddock	73,019	10,057	62,962	19.205	6.110	13.095	214
Saithe	36	21	15	0.009	0.013	-0.003	-26
Sole	186	0	186	0.049	0.000	0.049	NA*
Cod	13,333	3,743	9,590	3.507	2.274	1.233	54

**Percent cannot be calculated because one cannot divide with zero.*

Table 8 shows larger total amount of BMS-fish in Kattegat compared to Skagerrak, except for saithe.

A direct comparison isolated solely to the presence of EM with cameras between the two areas is not possible, as other factors also affect the BMS registrations. A direct comparison can only be made if the areas have the:

- Same gear requirements
- Same stock assessment
- Same development in the year classes for the stock
- Same fishing season and period
- Same fishing depth

⁸ Difference in %, calculated as (“Difference per trip (Kg)”) / (“BMS per trip (g), 3AN. Camera turned off”) * 100, by default, no camera system is installed on the vessels and a change in registrations should be seen in a context of added elements (camera on in Kattegat).

To illustrate this the landings and TAC in Skagerrak og Kattegat for Skagerrak are shown in appendix 3.

3.4 The BMS register in relation to landing and discarding of species observed during the review of video material

Overall, the video analysis correlates well with the fishermen's self-sampling and catch-registrations based on video audit. See appendix 4 for more a more comprehensive comparison.

4.0 Observer data compared to EM video audit data

Comparison of the results from the Danish Fisheries Agency's Kattegat-project and DTU Aqua's observer program

In general, the pattern of discards in Kattegat is very similar between DTU Aqua's observer program and the Danish Fisheries Agency's Kattegat camera surveys. The analysis is divided into 3 segments, DTU Aqua's observer trips on EM vessels, DTU Aqua's observer trips on vessels without EM and the Danish Fisheries Agency's results of the EM vessels that have been audited. The comparison is made over the three years 2021, 2022 and 2023, when there have been vessels with cameras in the Kattegat. In addition, the calculation is based on an average weight and number per haul for the seven following species whiting, haddock, hake, saithe, cod, spurdog and for the two last year's sole, please see appendix 5, table B5 and figure B5.

As can be seen from table 9, the Danish Fisheries Agency (FST) processes far more hauls than DTU Aqua, which explains why there are far more observations of rarer catch events in FST data. In particular, the number of trips where DTU Aqua have had observers on EM vessels is lower and therefore these results are somewhat more uncertain. This can for instance be seen with spurdog, where DTU Aqua did not observe any discards of these on EM vessels in 2021 and 2022, whereas discards were observed on the FST video audits, as well as on the vessels without EM where DTU Aqua had observers.

However, there is a tendency for the pattern of discards observed by FST audits (FST – with camera) to be more comparable to what DTU Aquas observes on vessels without EM (DTU Aqua – without camera) than it is the case with EM (DTU Aqua – with camera). This may be due to the low number of trips in DTU Aqua's observer program with EM vessels. For cod, however, there is a difference, where more cod is thrown out when DTU Aqua is on board vessels without EM than is registered by FST on vessels with EM. There is, of course, variation between years, and in 2021, on observer trips without EM, an average of seven

discarded cod per haul were recorded and from EM vessels it was less than one cod per haul. In 2022, it was 16 discarded cod per trip on observer trips without EM against an average of less than two cod on EM vessels and in 2023 the numbers were on average 22 discarded cod on observer trips per trip without EM against three on EM vessels. The cod are very small, so when you look at the kilos of cod thrown out per haul, it is between 1-2 kg.

Table 9. Number of covered hauls per year. * The figures for 2023 only cover data up until 30/06/2023.

Year	DTU Aqua – with camera	DTU Aqua - without camera	FST - with camera
2021	9	52	378
2022	10	45	153
2023*	17	11	124

5.0 Development and differences from 2021-2023

5.1 Video quality

When reviewing video material, the quality of the video material is given a grade from 0 to 10, where 0 is completely useless, while 10 is optimal. Table 11 below shows the average rating for sorting cameras, the maximum rating for sorting cameras and the minimum rating for sorting cameras in phase 1 and phase 2 of the Kattegat-project, respectively, as well as for the three Baltic Sea trial fishery projects.

Table 10. Average video quality for sorting cameras, maximum video quality for sorting cameras (average of the highest value for the cameras) and minimum video quality for sorting cameras (average of the lowest value for the cameras) divided by the three project types with camera documentation. Data until 21 August 2023.

Project	Average video quality (sorting area cameras)	Highest video quality (sorting area cameras)	Lowest video quality (sorting area cameras)
Phase 1 (voluntary)	6.9	10	0.5
Phase 2 (mandatory)	6.5	10	0.0
Baltic Sea trials (voluntary)	8.2	9	4.5

Table 10 shows that the average video quality is highest in the Baltic Sea projects. On the other hand, 10 has been given in video quality in both phase 1 and phase 2 of the Kattegat-project. Phase 1 has a higher overall average rating for video quality than phase 2.

5.2 Collaboration

A main difference between phase 1 and phase 2 of the Kattegat-project is that phase 1 was voluntary. To a greater extent in phase 2 than in phase 1, the Danish Fisheries Agency had to deal with certain issues, including issues connected with a lending agreements, responsibility when breakdowns occurred and covering of camera lenses during fishing events in the Kattegat. These issues were not present in phase 1.

Another difference between phase 1 and phase 2 is the implementation of the “10-punksplan”, which was the result of negotiations between DFPO and former Fisheries Minister Rasmus Prehn in connection with the transition from the voluntary phase 1 to the mandatory phase 2. The framework, like the “10-punksplan” has set for the Danish Fisheries Agency, has meant that the Danish Fisheries Agency has widely used the trial fisheries in the Baltic Sea for training new video auditors. The reason for this is primarily the condition in the “10-punksplan” that a maximum of 5% of the fishing trips from a vessel may be sampled. This means that the video material that the Danish Fisheries Agency can collect from vessels in the Kattegat is from different vessels each week. This makes it more difficult for new employees to do audits as, in addition to training in species recognition and the use of software, video auditors must also wrangle with constant changes in location of cameras, vessel layout and workflow on board when doing video audits. The Danish Fisheries Agency has therefore used video material from the trial fisheries for initial training, as the Danish Fisheries Agency can retrieve all video material in the trial fisheries and thus new employees can practice on the same vessel with the same setup until they become familiar with the software and more experienced in species recognition.

Another important element in the “10-punksplan” is that the Danish Fisheries Agency must request video recordings, which has led to the development of a receipt module. There has been a case where requests for video recordings have been repeatedly rejected.

5.3 Guidance

In phase 1 of the Kattegat-project, the Danish Fisheries Agency continuously guided the 12 vessel owners. In addition to this, a feedback sheet was sent once a month or, if no video had been audited in the previous month, a message that nothing had been seen. Alternatively, guidance went through DFPO, if vessel owners did not want direct contact with the Danish Fisheries Agency.

From phase 2, the Danish Fisheries Agency switched to sending a feedback sheet to the vessel owners after audit of the fishing trip (regardless of whether it was based on 5% random sampling or 5% risk-based control). A feedback sheet contains an overview of observed discards of target species subject to the landing obligation, as well as the video quality. The Danish Fisheries Agency, in dialogue with the industry, has continuously updated the content of feedback sheets. Current feedback sheet also includes information on observed landings of landing obligated focus species, as well as eLog and landing declaration data from the audited fishing trip.

The feedback sheets are the Danish Fisheries Agency's guidance to vessel owners. In the message to vessel owners on receipt of the feedback sheet, vessel owners are also invited to get in touch if there are questions or if further guidance is desired. In 2022, the Danish Fisheries Agency had 22 telephone conversations with vessel owners with additional guidance on the landing obligation. In 2023, the Danish Fisheries Agency has so far held 24 telephone conversations for further guidance on the landing obligation.

5.4 System Development / improvement of camera systems

The Danish Fisheries Agency and the system provider, Anchor Lab, as well as fishermen and DFPO have continuously developed the EM systems. The following outlines the various changes in the systems from 2021-2023.

5.5.1 Masking and limiting of video recordings

The purpose of the electronic monitoring in the Kattegat is to document the *Nephrops* fishery, in particular in terms of bycatch of cod and compliance with the landing obligation. It is therefore necessary to film where the catch comes in, where the catch is sorted and where the catch is discarded. The Danish Fisheries Agency puts masking/blocking on the cameras' field of view to limit recording of the fishers as much as possible. However, it cannot be avoided that fishers come within the cameras' field of view, for example if they lean over the sorting area during catch processing. If relevant, and in the case of public access to documents, further blurring is subsequently applied to the videos manually.

In addition, the vessel owner is sent a Vessel Monitoring Plan (VMP), which display areas of the vessel that will be filmed. After completed installation, the VMP is updated with the camera field of view, including masking areas. The vessel owner can at any time contact the Danish Fisheries Agency regarding potential change in the masking, if it turns out that this needs to be adjusted. This information is given to the fisher in connection with vessel visits and when sending the final VMP. Photo examples of masking can be found in the evaluation report for phase 1 of the project (Electronic monitoring in the Danish Kattegat (3AS) *Nephrops* fishery - Evaluation on phase 1 of the project).

The Danish Fisheries Agency has in several cases changed the location of cameras in collaboration with installers and fishers. Changes have been made following a request from a fisher repositioning the camera and the feeling that he was filmed too much with the initial setup. The Danish Fisheries Agency contacted an electrician who, in collaboration with the Danish Fisheries Agency, found a new location that met the fishers wishes.

In 2022, the Danish Fisheries Agency implemented motion detection sensors in the cameras themselves. Based on motion sensor graphs, the Danish Fisheries Agency can request less video from the vessels, as the Danish Fisheries Agency can designate times for sorting during the fishing trip more accurately. This limits the amount of video material that the Danish Fisheries Agency requests and audit. The supplier of the EM systems has further developed firmware to stop and start video recording on board vessels to limit recordings to fishing activity and catch processing. The Danish Fisheries Agency is in the process of testing this setup to further limit video recordings.

5.5.2 Face blurring camera

In January of 2023, the Danish Fishery Agency initiated supplementary work, implementing new camera with face-blur capabilities, using artificial intelligence. The Danish Fishery Agency acquired three camera and found two vessels willing to test then new cameras. Initially challenges regarding lower robustness of the new cameras caused problems. Moreover, the sensitivity of the blurring capabilities of the camera, needs to be constantly adjusted to accurately blur the persons face and hands. If the sensitivity is set too low, the person will not be blurred, and if it is set to high, other objects will be blurred by the artificial intelligence (e.g. fish which needs to be determined by species). To reach the appropriate level requires constant adjustments, namely in a working environment as dynamic and rough as fishing vessels constitute. E.g. constantly changing light conditions, day or night, rain or sun. It has therefore been shown to be exceptionally challenging, and the Danish Fishery Agency has not reached a level of satisfaction on the two vessels yet. The Danish Fishery Agency will in these grounds, suggest further development in testing of the cameras, in cooperation with vessels, ready to reach a higher amount of reviews than the “10-punktsplan” requires.

5.5.3 Receipt module and video request

The “10-punktsplan” between DFPO and former Fisheries Minister Rasmus Prehn states that the Danish Fisheries Agency only retrieves video recordings from the EM vessels' BlackBox hard drives with the fisher's knowledge and consent. Prior to the “10-punktsplan”, the EM system did not have a technical solution that locked access to video recordings for the Danish Fisheries Agency. The supplier of the EM system developed a receipt module in order for the Danish Fisheries Agency only to have the option of retrieving video recordings after the request for the transfer of video material has been accepted and acknowledged on the vessel

in question. This solution was rolled out to all vessels subject to mandatory EM in the Kattegat from week 50, 2022.

5.5.4 Wrongful recording and breakdowns

There have been cases where the EM system recorded in port. In one case, the reason has been that during the installation, by mistake, geofencing had not been put in to control when the EM system should stop recording. This is done based on the GPS position of the vessel. When the vessel owner in question contacted the Danish Fisheries Agency and drew attention to the problem, the supplier was contacted and the system was immediately corrected so that the recordings were stopped. The Danish Fisheries Agency has apologized for the mistake to the fisher.

In addition, there have been cases where a vessel's GPS has broken down during fishing in the Kattegat and recordings therefore continued in port. Similarly, the opposite has happened, where the GPS has broken down while there was no fishing in the Kattegat, and the EM system has therefore not started recording during subsequent fishing in the Kattegat. In both situations, the handling has been the mending of a faulty GPS. In phase 2, the Danish Fisheries Agency has been able to minimize the impact on fishing in the event of breakdowns with the text of the “10-punktsplan” stating that *“Ved tekniske problemer og nedbrud af kameraudstyret kan Fiskeristyrelsen i førstegangstilfælde og ud fra en konkret vurdering tillade, at fiskeriet fortsætter”*. In phase 1, there was not as flexible a framework for handling breakdowns. Due to the more flexible approach to breakdowns, breakdowns of EM systems have not resulted in days in port for vessels.

The supplier of the EM system has, following a request from the Danish Fisheries Agency, expanded the number of ports with geofencing to ensure that the recordings stop when the vessel sails into port. This happened on the basis of a single case where a vessel owner experienced that video recordings continued in a Swedish port, which the Danish Fisheries Agency became aware of following an inquiry from the vessel owner. The Danish Fisheries Agency has also contacted the DFPO to find out if the association know of more Swedish ports than those the Danish Fisheries Agency is aware of, so that, if necessary, geofencing can be implemented for these as well.

5.5.5 Live View/remote access

Live view/remote access to the EM system is used during installation and repair/maintenance. The Danish Fisheries Agency has informed all vessels subject to mandatory EM that situations may occur during the installation process where the Danish Fisheries Agency must access the EM system via Live View. The following scenarios may underlie the need for this central access:

- Setting/adjustment of masking (possibly at the instruction of the fisher)

- Check and/or add-ons for geofencing
- Adjustment of sensors
- Rebooting camera
- Capture of cameras field of view and masking for grid setting (used for length measurement when registering fish) and VMP
- Recording at diagnostic check
- Central registration of any breakdown or failure of the EM system

After the installation, the Danish Fisheries Agency no longer has to access the system centrally without the consent of the fisher. This too was the case in phase 1.

In phase 2, the industry expressed concern that the Danish Fisheries Agency had the technical possibility to access EM systems centrally via Live View without fisher's consent, even though the guidelines for employees were that access to Live View should only take place after consent. On the basis of this concern, the Danish Fisheries Agency asked the supplier to develop a function that put a black masking on the entire image on all cameras when these are not recording during fishing. That is when vessels are in port, or have not yet deployed gear. Should the need for access to a vessel's EM system arise, the Danish Fisheries Agency can only access cameras after entering a personal code that the fisher has. This code unlocks and removes the black masks in Live View. The code can be changed on board by the fisher.

6.0 Work environment on vessels with electronic monitoring

University of Southern Denmark (SDU) published in April 2023 a report titled "Arbejdsmiljøkonsekvenser af elektronisk overvågning af bundtrawlsfiskeriet i Kattegat – danske jomfruhummerfiskere". The report concludes that the electronic monitoring has generally had a negative effect on the fishermen's well-being, where they, among other things, experience more stress.

From the beginning of the Kattegat-project, it has been a clear ambition to ensure the fishers as much anonymity as possible. Therefore, the Danish Fisheries Agency has implemented some solutions that obscure parts of the video recordings - a so-called masking. This is a black "layer" that is placed over the video recordings with the aim of ensuring as much anonymity as possible for the fishers, while at the same time the control purpose can be fulfilled by the Danish Fisheries Agency. It is the opinion of the Danish Fisheries Agency that

large parts of the video recordings cannot be obscured without hampering the Danish Fisheries Agency's ability to carry out the control purpose of the EM systems.

The SDU's report point out that the fishermen are worried about making mistakes - and thus being sanctioned. One point in the "10-åunksplan" concerns precisely this. It has been agreed that, for a time-limited period, the Danish Fisheries Agency as a starting point guides and conducts dialogue with the fishers rather than sanction if violations are observed. However, this only applies if there are no serious or repeated violations. The Danish Fisheries Agency has been able to ascertain that this practice has had a positive effect, with a change in behavior seen with a reduced number of violations.

The dialogue between the authorities and the fishing industry has been constructive, but the fishing industry has stated that the framework for the project needs to be changed. From the authorities' side, however, it has weighed heavily that electronic monitoring is an effective tool for control of illegal discarding of fish. It has also been shown drive a change in behavior with fewer violations of rules.

Concomitantly, the pelagic fleet in Denmark has voluntarily chosen to have electronic monitoring installed on their 11 vessels. The Danish Fisheries Agency is aware that there are differences between the pelagic and the demersal fleet. The bottom trawl fishery for *Nephrops* is characterized by bycatch of both flatfish and roundfish, which is not the case in the pelagic fishery. This may be a factor which influence why the electronic monitoring is viewed differently by the two fishing segments. At the same time, the pelagic project could indicate that electronic monitoring of fishing vessels does not necessarily have a negative impact on the fishermen's work environment, but that the method, time and other circumstances of fishing such as quotas and finances can be decisive factors for how intrusive the electronic monitoring is perceived by the fishers. Electronic monitoring of fishing vessels is also used in several other countries, so it is not a completely unknown method in fisheries control.

The fishers also demand clear lines from the authorities, so that the purpose and guidelines for using the electronic monitoring are clearly described. This could be a communication task for the Danish Fisheries Agency in the dialogue with the fishing industry, which could potentially relieve the fishermen of some of the concerns which, according to SDU's report, have a negative impact on the fishermen's working environment.

7.0 Protection of personal data

The statutory declaration regarding electronic monitoring of certain vessels in Kattegat allow the Danish Fisheries Agency to issue an order that a vessel when fishing in Kattegat must be equipped with a functioning electronic monitoring system with cameras and sensors.

According to the data protection rules, personal data is all information relating to an identified or identifiable natural person. Therefore, large parts of data from vessels with an electronic monitoring system are as a baseline categorized as personal data. When personal data is processed, the data controller must ensure compliance with the data protection rules. It is the vessel owner who is responsible for all data from the electronic monitoring system

During the entire project period, there has been a great focus on ensuring correct processing of personal data. In addition, the focus has been on minimizing the amount of personal data, for instance by using a blur function and masking the people appearing in the video recordings. A working group has also been set up consisting of representatives from the Ministry of Food, Agriculture and Fisheries, the Danish Fisheries Agency and the Danish Fisheries Association PO (DFPO). As part of the work in the working group, a memo has been prepared for the Danish Fisheries Association PO that briefly and generally describes what the GDPR obligations mean for vessel owners who have had an electronic monitoring system installed on their vessel.

The dialogue with DFPO has shown that there have been a number of concerns from the fishermen regarding the processing of data from the vessels with electronic monitoring. It deals with, among other things, the process of insuring data breaches where personal data becomes accessible to unauthorized persons. This has been a major focus point for the Danish Fisheries Agency throughout the project period, and there have been no cases of data breaches.

8.0 Conclusion

This report focuses on electronic monitoring of the *Nephrops* fishery in Kattegat. The Kattegat-project, as well as the Danish Fisheries Agency's trial fisheries, where electronic monitoring is included, have provided independent data (amount, length, number) on the catches, including discards, in the *Nephrops* fishery in Kattegat, and in the Baltic Sea for sandeel, gillnet and fisheries, especially for selected species, including cod.

The main purpose has been to assess electronic monitoring as a control instrument and to document compliance with the landing obligation.

The project shows that electronic monitoring can document catches on fishing vessels and thus functions as an effective control tool for checking the landing obligation. Electronic monitoring has replaced parts of the traditional at-sea control in Kattegat with the introduction of the “10-punktsplan” in 2022. Electronic monitoring provides the opportunity to target the traditional control against other fisheries, where the challenges to a lesser extent include compliance with the landing obligation or closed areas, or towards foreign vessels, as vessels with EM systems on board can be checked for discards and fishing using video recordings.

The results from video audit show that there extensive discarding of mandatory landing obligated species in Kattegat (including cod, haddock and hake) still occur. Species that must be brought ashore. In phase 1 of the project, it was found that the extent of discards is noticeably reduced after vessels have been equipped with EM and have received guidance on the landing obligation (see the evaluation report for phase 1 for details). A corresponding study has not been possible to carry out in phase 2, since the “10-punktsplan” states that the Danish Fisheries Agency takes a maximum of 5% of the fishing trips for sampling and a maximum of a further 5% for risk-based control. This has meant that the Danish Fisheries Agency has not had the opportunity to follow up with review of new fishing trips shortly after guidance. Otherwise, the Danish Fisheries Agency would very likely exceed the permitted audit rate.

For the majority of vessel's it can be said that if one or more of the five focus species (haddock, hake, saithe, cod and sole) have been seen in the catch, then discarding of the species has also been seen, which is non-compliance with the landing obligation. The majority of discards and landings seen on video recordings are below the minimum size. This is consistent throughout the project's period from 2021 to 2023.

Throughout the project, the Danish Fisheries Agency has had a guiding approach, which is also evident from the “10-punktsplan” (see appendix 6). In addition to the guiding principle,

the Danish Fisheries Agency operates with a trifle limit, so that accidents etc. are not sanctioned. For 11 out of 65 vessels, the share of discards compared to landing of the focus species is below 10% for the fishing trips and hauls audited. This in term means that less than 10% of the catch seen by the five focus species is discarded. At the same time, this means that for 54 out of 65 vessels, more than 10% of the catch seen by the five focus species has been discard. A violation of the landing obligation. To date, the Danish Fisheries Agency has not sanctioned with a fine on the basis of the landing obligation. This is due to consideration of the guiding principle, the sanctioning scale generally used for fisheries control in Denmark, as well as the trifle limit according to the “10-punktsplan”. A formal warning has been given to certain vessels. All of these was after transition from phase 1 to phase 2 of the camera project in the Kattegat.

Self-reporting in the electronic logbook (eLog) of undersized fish subject to the landing obligation (BMS) increases after installation of electronic monitoring. This could be seen for several vessels in phase 1 and the trend continues with new vessels in phase 2. Overview in this report of BMS-registration before and after installation of electronic monitoring does not include the 12 vessels that participated in phase 1. Instead, these are used as a control group, since they have had electronic monitoring back from 2021. For hake (4,846 kg, 1,832% or approx. 1.7 kg hake per trip), haddock (65,314 kg, 6,282% or approx. 22.6 kg haddock per trip) and cod (11,333 kg, 878% or approx. 4.2 kg cod per trip) a significant increase in the amount of registered BMS occur after installation of electronic monitoring on vessels in phase 2 during 2022 or 2023.

For the control group's BMS-registration, an increase also occurs for haddock (approx. 14.7 kg haddock per trip or 540%) and cod (approx. 0.3 kg cod per trip or 11%). For hake, there is a decrease (approximately 1.0 kg hake per trip or -57%) in BMS-registrations from 2022 to 2023 for phase 1 vessels, which is the opposite compared to what is seen for phase 2 vessels.

In the report conclusion for phase 1, the Danish Fisheries Agency put forward a number of points that could be optimized in phase 2. This included:

- introduction of a risk-based selection of video recordings for control (implemented in phase 2)
- a *de minimis* threshold for enforcement of violations (implemented in phase 2)
- a smoother installation process (implemented in phase 2)
- more accurate cameras (square lens for instance) on certain vessels (not implemented)

- exemption from part of the traditional controls at-sea for the participating vessels (implemented by the fact that EM vessels are not subject to Last Haul control in Kattegat).

Overall, the experience after three years of camera documented fisheries in Kattegat and the Baltic Sea is that camera documentation is an effective form of control, especially for documenting catches and thus compliance with the landing obligation. The assessment is also that there are no alternative control methods that can effectively control the landing obligation. From the perspective of the authorities, EM with cameras is therefore a very effective control tool.

Electronic monitoring is generally perceived by the industry as a form of control that intervenes unnecessarily in the fishermen's private sphere and gives rise to uncertainty and frustration.

Questions about personal data have also filled a lot during the project period. There have been no data breaches and the Danish Fisheries Agency has focused a lot on ensuring that data is processed correctly and in accordance with the data protection rules. However, there have been concerns from fishermen regarding personal data. A working group on personal data has been set up with the involvement of both authorities and the industry.

It can be seen in a recently published report from SDU that the electronic monitoring has had a negative impact on the fishers' work environment. According to the SDU report, most fishers do not want an electronic monitoring system despite positive incentives. It appears from the report that a larger bycatch quota, freer choice of gear and exemption from reporting obligations are some elements that are perceived positively by the fishers.

During the transition from the voluntary phase 1 to the mandatory phase 2, the Danish Fisheries Agency has experienced that problems arose to a greater extent with lending agreements, responsibility for breakdowns and covering of camera lenses when fishing in Kattegat. In addition, it can be seen that the average video quality has decreased for the vessels included in phase 2. The Fisheries Agency, in collaboration with the industry and the supplier of the EM systems, has developed a receipt module, a black screen in Live View, masking and tested faceblurring cameras. These implementations are made on the basis of the "10-punktsplan" and inquiries/concerns from the industry.

Appendix 1: Overall Vessel information

In total, The Danish Fisheries Agency have implemented electronic monitoring systems on 76 vessels from December 2020 to 2023. The table below show the size-distribution of the participating vessels in the Kattegat-project as well as the voluntary trial fisheries in the Baltic Sea. One vessel sank during the period but remains in the table as it is part of the EM data pool which the report is based on. This is due to the fact that the Danish Fisheries Agency already had reviewed a fishing trip before the vessel sank.

Table B1. Number of participating vessels, smallest, largest and average length.

Project	Number of vessels	Minimum length (m)	Largest length (m)	Average length (m)
Kattegat	73	11.00	23.96	16.05
Baltic Sea	4	14.97	17.37	16.27

**One vessel is subject to the requirement for electronic monitoring in the Kattegat and is simultaneously participating in trial fishing in the Baltic Sea.*

Appendix 2: Development in audit time and registrations

The table below (Fig. B2) displays the development in review time as well as the events impacting the review time from the beginning of the project back in January 2021 up until the 21st August 2023.

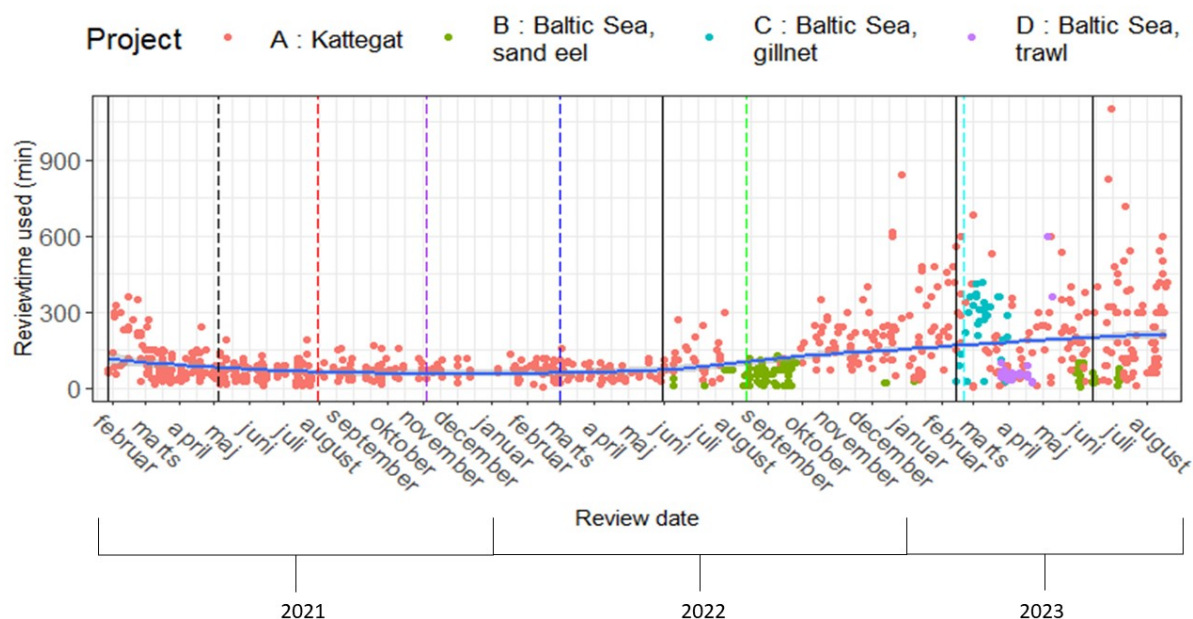


Figure B2. Timeline, development in review time. X-axis display months since first review back in January 2021. Y-axis display the time used in minutes for the review. Each point represents a review of catch handling, where red dots represents reviews for the Kattegat project, green dots are for the project involving sandeel fishing during the closed period in the Baltic Sea, blue dots are for experiments with gillnets during the closed period in the Baltic Sea, and purple dots are for experiments with trawl fishing during the closed period in the Baltic. Blue horizontal line shows the average review time. Vertical indications display events which have had an impact on review time. From the first, until the second solid black vertical line, there were three camera observers. From the second solid black line to the third solid black vertical line, there were four camera observers. From the third solid black line to the fourth solid black vertical line, there were eight camera observers. From the fourth solid black line onwards, there are ten camera observers. The dashed vertical black line indicates the transition to the recording of a total of 14 species. The dashed vertical red line indicates the transition to recording both discards and landings. The dashed vertical purple line indicates the transition to the recording of a total of 21 species. The dashed vertical green line indicates the transition to the recording of a total of 23 species. The dashed vertical yellow line indicates the transition to the recording of a total of 34 species of fish, marine mammals, birds, and shellfish.

Figure B2 shows that the audit time initially decreases, due to increased experience of the video auditors. After this, the audit time is at roughly the same level throughout phase 1, despite an increase in the number of audited species. At the transitioning to phase 2, around July 2022, more video auditors will be employed, who must be trained, thereby increasing the audit time. This is followed by a decline due to the focus on trial fisheries in the Baltic Sea. In the trial fisheries, the catch processing lasted around 20-30 minutes and the audit time is therefore correspondingly shorter than for the catch processing in Kattegat, which frequently takes 1-3 hours. In October-November 2022, audit time increases significantly and finds a new average level of around 200 minutes per audit. In this final period of 2022

and into 2023, more video auditors were hired and more vessels came into the project participate as well as be more trial fisheries, all of which will contribute to increased time spent for audit. However, one important factor that contributes to increased audit time from around October/November 2022 can be seen more clearly in the next figure. The following figure (Fig B3) displays the development in number of registrations within every haul from the beginning of the project back in January 2021 up until the 21th August 2023. The figure also include the various additions (vertical lines) that were made during the project. Registrations cover all annotations made during audit.

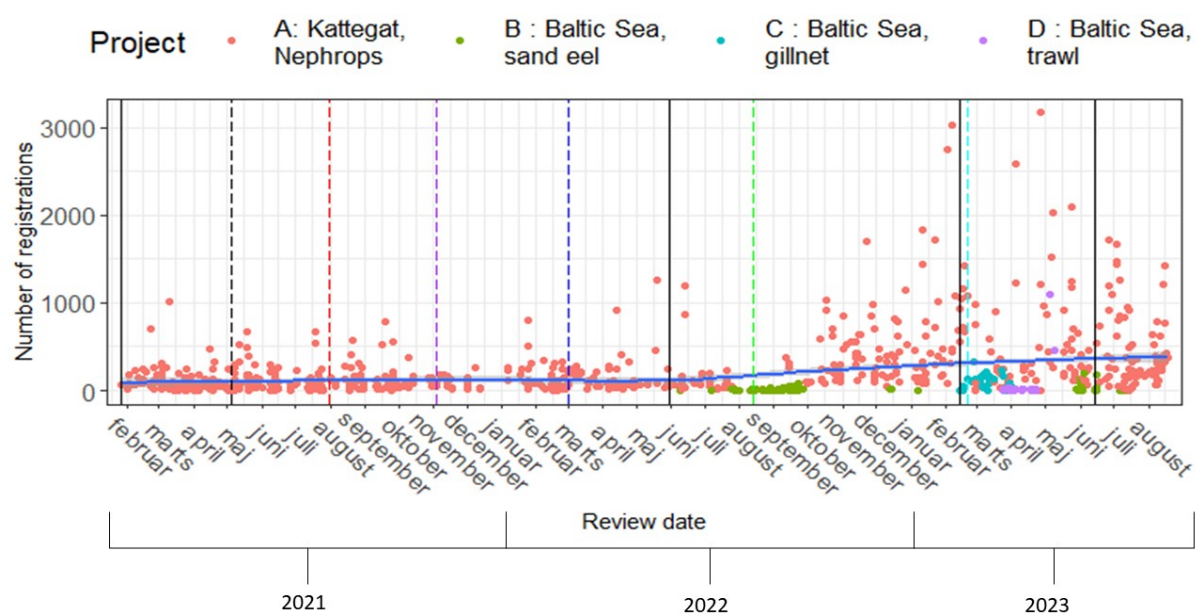


Figure B3. Timeline, development in number of registrations. X-axis display months since first review back in January 2021. Y-axis display the number of registrations within every review. Each point represents a review of catch handling, where red dots represents reviews for the Kattegat project, green dots are for the project involving sandeel fishing during the closed period in the Baltic Sea, blue dots are for experiments with gillnets during the closed period in the Baltic Sea, and purple dots are for experiments with trawl fishing during the closed period in the Baltic. Blue horizontal line shows the average review time. Vertical indications display events which have had an impact on review time. From the first, until the second solid black vertical line, there were three camera observers. From the second solid black line to the third solid black vertical line, there were four camera observers. From the third solid black line to the fourth solid black vertical line, there were eight camera observers. From the fourth solid black line onwards, there are ten camera observers. The dashed vertical black line indicates the transition to the recording of a total of 14 species. The dashed vertical red line indicates the transition to recording both discards and landings. The dashed vertical purple line indicates the transition to the recording of a total of 21 species. The dashed vertical green line indicates the transition to the recording of a total of 23 species. The dashed vertical yellow line indicates the transition to the recording of a total of 34 species of fish, marine mammals, birds, and shellfish.

Figure B3 shows that the number of registrations per haul has remained relatively stable throughout phase 1, despite the addition of several species during the project that must be registered. The number of registrations increases significantly from October-November 2022. The reason is a significant increase in the number of haddock (a species that has been registered throughout the project).

Appendix 3: Landings and TAC in Skagerrak og Kattegat

Table B3 show the Danish landings and TAC for the focus species (cod, haddock, hake and whiting) in 2022 and 2023 (as of 18 August 2023).

Table B3: Landings and TAC 2022-2023 (as of 18 August 2023).

Area	Species	2022		2023 (18/8-2023)	
		Landing, live weight (ton)	TAC	Landing, live weight (ton)	TAC
Kattegat	Cod	19	60	21	60
Skagerrak	Cod	1,484	1,477	1,166	2,440
Kattegat	Haddock	7.0	2,509	60.0	2,682
Skagerrak	Haddock	2,702		1,937	
Kattegat	Hake	16.0	1,857	12.0	2,481
Skagerrak	Hake	920		389	
Kattegat	Whiting	3.0	657	3.0	480
Skagerrak	Whiting	189		162	

Appendix 4: eLog and landing declaration compared to EM data

Figure B4 below shows total registration of focus species in 2021, 2022 and 2023 based on the fishermen's own registrations in eLog and landing declaration, as well as the estimated weight (both discard and landed) based on an audit of video material.

- BMS (undersized fish caught that must be landed)
- DIS (discard)
- DIM (*de minimis*-exempted landing-obligatory species which can be discarded)
- LSC (landing for consumption)

Only fishing trips with video audit are included in the analysis. Sole is not included, as sole is only included in species that are registered as of 5 November 2021, whereby sole cannot be included in the analysis in 2021. It should be noted that the amount of landed weight registered in 2021 seen by video audit likely is underestimated, as it was only from 1 August 2021 that landings were recorded during video audit. Previously, only discards were recorded.



Figure B4. Registration in eLog and landing declaration (BMS, DIS, DIM and LSC) compared to estimated weight of landing and discard of species based on video audit. Data until 21 August 2023.

Figure B4 only shows data from the eLog, landing declarations and video audit data for the fishing trips that have been audited. This means that there may well be catches of, for instance, whiting or saithe on other fishing trips for the vessels. Fishing trips where video material has not been audited. On the fishing trips seen, there are no whiting in the landing declarations, which agrees well with the fact that almost all whiting seen on video material has been registered as discards. Overall, there is a fair agreement between registration in eLog and observations from the EM system converted to an estimated weight, especially considering that eLog is an assessment of weight which can only be written in whole kg, while EM audit data records species and length (with a measurement uncertainty) and then must be converted to an estimated weight using the length-weight ratio for the species. The biggest difference in kg between eLog and video audit data is seen in 2021, where it must be noted that registration of landings were not implemented in the video audit until August 2021.

Appendix 5: Observer data compared to EM video audit data

*Table B5. Overview of the average number of fish and weight observed as discards per haul per year, species and segment. * The figures for 2023 only cover data until 30/06/2023.*

Year	Species	Average per haul	DTU Aqua with camera	DTU Aqua without camera	FST - with camera
2021	Whiting	Number	68.91	101.98	76.65
2021	Whiting	Weight	5.24	8.38	5.05
2022	Whiting	Number	81.94	64.54	90.97
2022	Whiting	Weight	6.69	4.43	4.59
2023*	Whiting	Number	69.22	268.58	167.35
2023*	Whiting	Weight	5.08	18.33	8.49
2021	Haddock	Number	0.11	5.32	1.30
2021	Haddock	Weight	0.01	0.62	0.11
2022	Haddock	Number	0.20	14.64	12.94
2022	Haddock	Weight	0.04	0.55	0.25
2023*	Haddock	Number	0.00	23.60	46.44
2023*	Haddock	Weight	0.00	1.17	2.01
2021	Hake	Number	3.00	4.56	1.28
2021	Hake	Weight	0.40	0.96	0.24
2022	Hake	Number	1.90	2.95	0.99
2022	Hake	Weight	0.30	0.43	0.10
2023*	Hake	Number	0.53	0.18	0.56
2023*	Hake	Weight	0.13	0.04	0.08
2021	Saithe	Number	0.00	0.15	0.03
2021	Saithe	Weight	0.00	0.03	0.00
2022	Saithe	Number	0.10	0.02	0.01
2022	Saithe	Weight	0.01	0.00	0.00
2023*	Saithe	Number	0.00	0.00	0.02
2023*	Saithe	Weight	0.00	0.00	0.00
2021	Spurdog	Number	0.00	0.23	1.11
2021	Spurdog	Weight	0.00	0.69	2.11
2022	Spurdog	Number	0.00	2.60	1.56
2022	Spurdog	Weight	0.00	3.12	1.37
2023*	Spurdog	Number	3.59	0.73	1.83
2023*	Spurdog	Weight	11.76	2.15	1.75
2021	Cod	Number	1.67	7.17	0.85
2021	Cod	Weight	0.20	1.20	0.13
2022	Cod	Number	7.10	16.58	1.69
2022	Cod	Weight	0.75	2.19	0.12
2023*	Cod	Number	0.00	19.98	3.12
2023*	Cod	Weight	0.00	1.52	0.33

Year	Species	Average per haul	DTU Aqua with camera	DTU Aqua without camera	FST - with camera
2022	Sole	Number	0.30	0.96	0.84
2022	Sole	Weight	0.02	0.09	0.08
2023*	Sole	Number	0.12	0.09	0.56
2023*	Sole	Weight	0.01	0.01	0.07

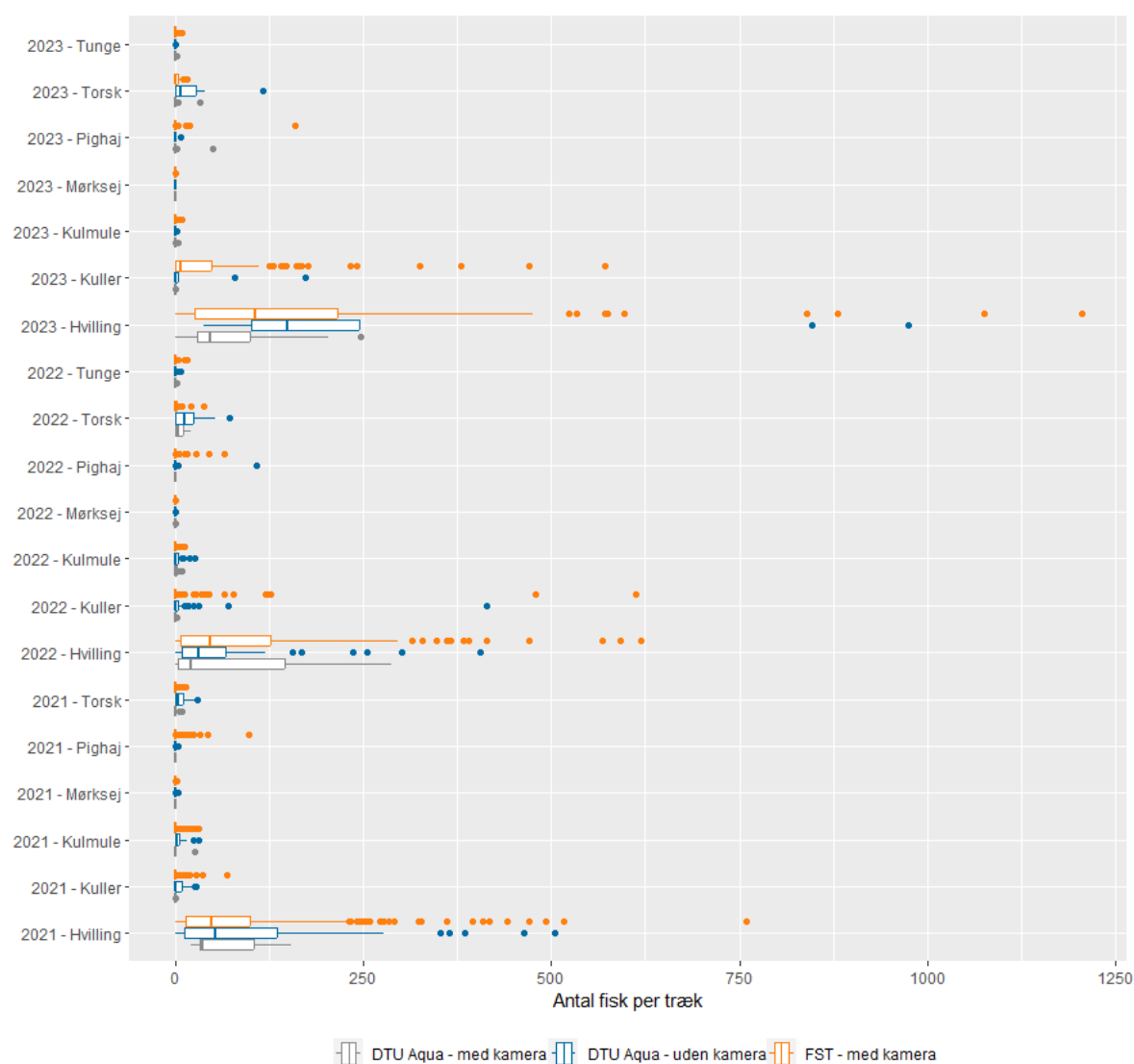


Figure B5. Overview of the variation in the number of fish observed as discards per haul per year, species and segment.

Appendix 6: 10-punktsplan

De 10 ændringer i Elektronisk monitorering af jomfruhummerfiskeriet i Kattegat.

- For at tilvejebringe grundlaget for en risikobaseret udvælgelse af optagelser udtages der tilfældigt 5 pct. af optagelserne for hvert fartøj til kontrol. Derudover bliver der iværksat en risikobaseret udvælgelse af cirka 5 pct. af optagelserne. Fiskere, der overholder reglerne om udsmid, vil derfor opleve et mindre kontroltryk.
- Når Fiskeristyrelsen anmoder om optagelser til gennemsyn vil styrelsen oplyse fiskeren om, hvad begrundelsen for gennemsynet er. Således ved fiskeren altid hvad der er blevet udtaget til kontrol og på hvilket grundlag.
- Fiskeristyrelsen vil frem til juli 2023 fortsætte den nuværende praksis med vejledning som udgangspunkt frem for sanktionering. Gentagne eller grovere overtrædelser på fartøjsniveau kan dog sanktioneres. Ved tekniske problemer og nedbrud af kameraudstyret kan Fiskeristyrelsen i førstegangstilfælde og ud fra en konkret vurdering tillade, at fiskeriet fortsætter.
- Fiskeristyrelsen vil operere med en bagatelgrænse for sanktionering af udsmid konstateret på kameraoptagelserne, så mindre uheld mv. ikke sanktioneres. Det indebærer, at i situationer, hvor et mindre antal fisk ryger over bord ved handlinger, der åbenlyst kan tilskrives uheld eller utilsigtede fejlvurderinger, vil der ikke blive sanktioneret.
- Kamerafartøjerne fritages som udgangspunkt for den tidskrævende last haul kontrol, hvor fiskerens fangst gennemgås og sorteres af fiskerikontrollen.
- Fiskeristyrelsen vil have fokus på at præcisere, hvilke optagelser, der hentes ind til gennemsyn med henblik på at minimere omfanget heraf. I kontrollen indhentes der optagelser fra de seneste fangstrejser i Kattegat.
- Fiskeristyrelsen undersøger muligheden for på sigt at begrænse omfanget af optagelser gennem bevægelsessensorer. Fiskerierhvervet orienteres løbende om fremdriften.
- Der er under fiskeriudviklingsprogrammet samlet for 2022 og 2023 afsat 15 mio. kr. til udvikling af selektive redskaber, der kan understøtte fiskerne i at kunne tilpasse deres fiskeri og fortsat have et bæredygtigt fiskeri trods nedgang i vigtige bestande som torsk. Der arbejdes med igangsættelse af forsøgsprojekter med blandt andet mere frit redskabsvalg, hvor flere af kamerafartøjerne vil have mulighed for at deltage.
- Der arbejdes målrettet på at sikre et mere frit redskabsvalg og andre regellempler til kamerafartøjerne gennem forsøgsprojekter og dialog med EU-Kommissionen og andre medlemsstater. Der arbejdes ligeledes for at fangstdata fra kameraprojektet i Kattegat løbende kan indarbejdes i den biologiske rådgivning.
- Der nedsættes en arbejdsgruppe mellem fiskerierhvervet og myndighederne, der skal bidrage til at understøtte fiskernes opgaver som dataansvarlig og dataejer.

Appendix 7 Vessel Monitoring Plan example

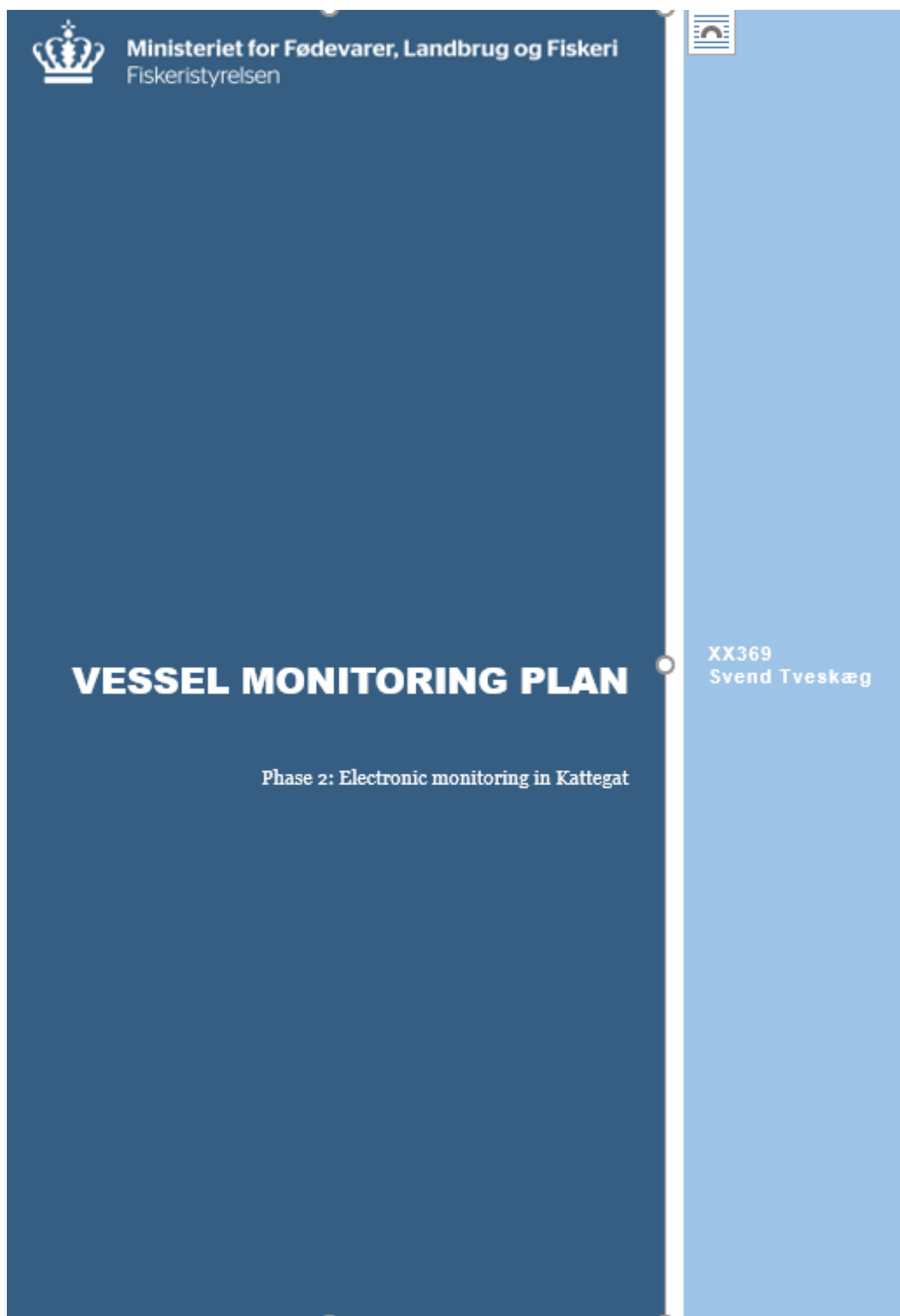


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Vessel Information

Vessel id number:	XX369
Vessel name:	Svend Tveskæg
EU Fleet Register number:	DNK000000001
IRCS:	OVPJ
Home port:	Strandby
Vessel length:	16,99 cm
Vessel type:	Trawler
Main fishery (demersal/pelagic):	Demersal
Gear type(s):	Trawl
Number of crew:	1
Owners name:	Svend Svendsen
Phone:	11223344
E-mail:	Xx369@live.dk
Sim-card number for BlackBox	123456789



Figure 1: XX369, Svend Tveskæg

The electronic monitoring system - setup

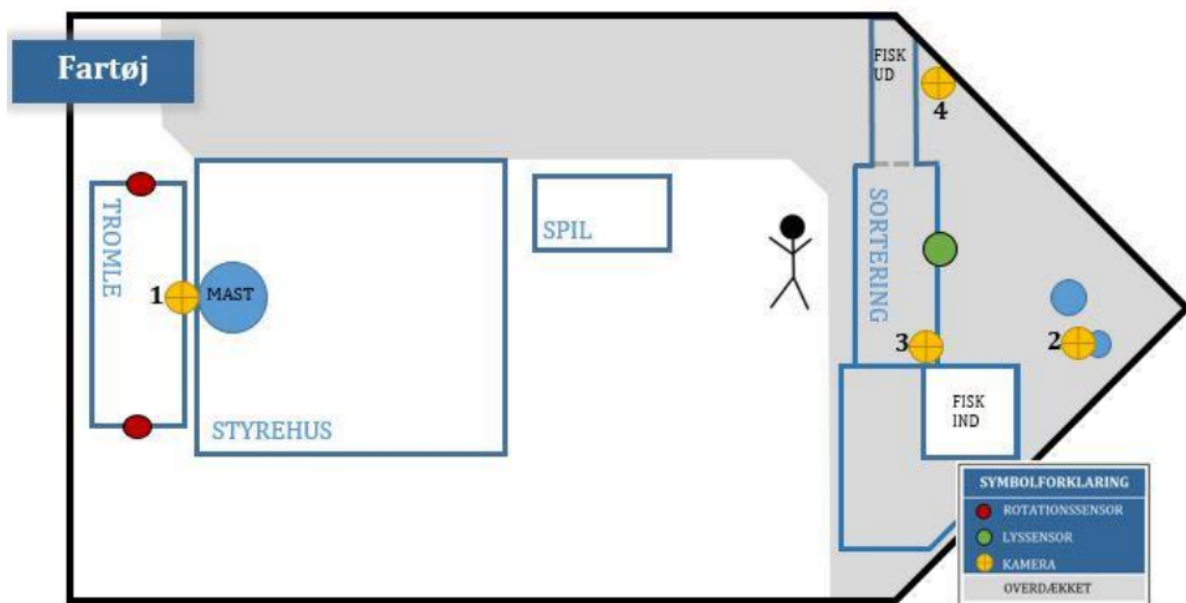


Figure 2: Technical overview of the vessel.

The location of the components

Light sensor: No light sensor used on this vessel.

Rotation sensors: One rotation sensor on the trawl winch. The sensor will register when the winch is active, i.e. when the gear is set and the catching operation begins, and when the gear is hauled and catch is taken on board the vessel. When the sensor is activated for the first time on a fishing trip, the system's cameras will begin recording. Filming will stop when the vessel arrives in port or leaves Kattegat.

Cameras:

1. Trawl camera. Camera 1. This must see if the equipment is outside or inside. The surrounding area around the drum can be unmasked.
2. Capture overview camera. Camera 1. Inside the hopper. This camera must see the area where the catch comes onboard and can be used in case of doubt in species identification.

3. Discard camera. Camera 3 functions as a sorting and discard camera. This camera must see the catch processing, i.e. both landings and discards on the far starboard side of the catch processing area.

4. Discard camera. Camera 4 functions as a sorting and discard camera. This camera must see the catch processing, i.e. both landings and discards furthest to port in the catch processing area.

Camera view



Figure 3: Camera 1 Trawl.



Figure 4: Camera 2 - Capture overview camera.

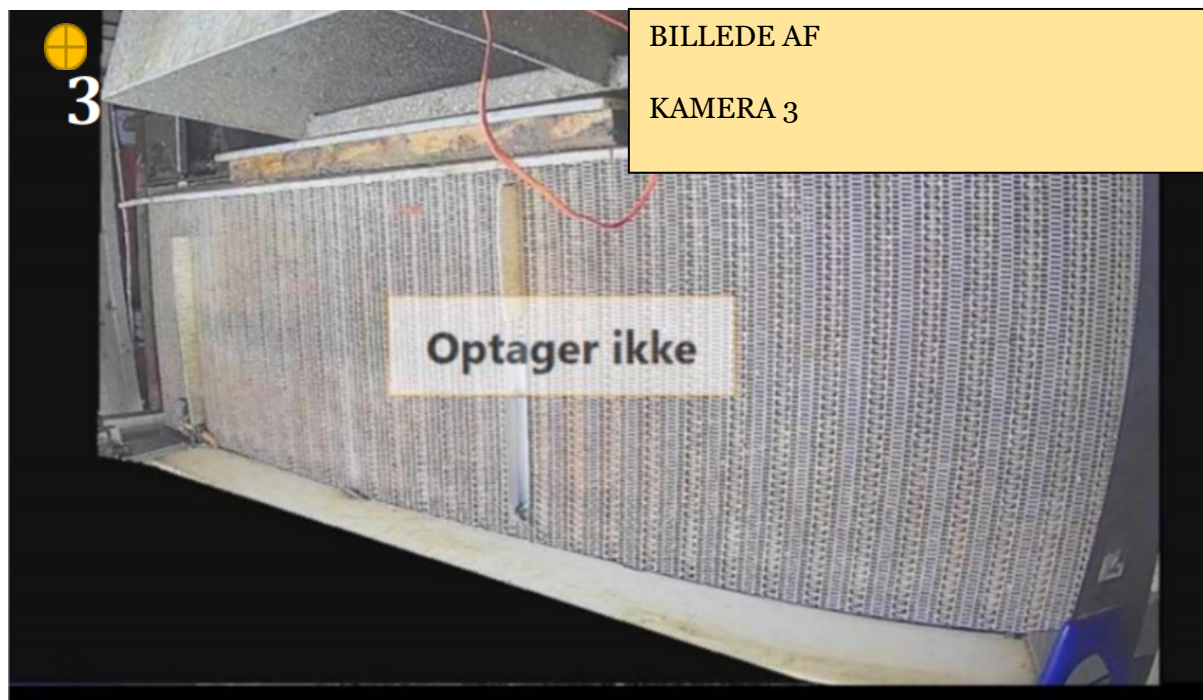


Figure 5: Camera 3 – Discard camera.



Figure 6: Camera 4 – Discard camera

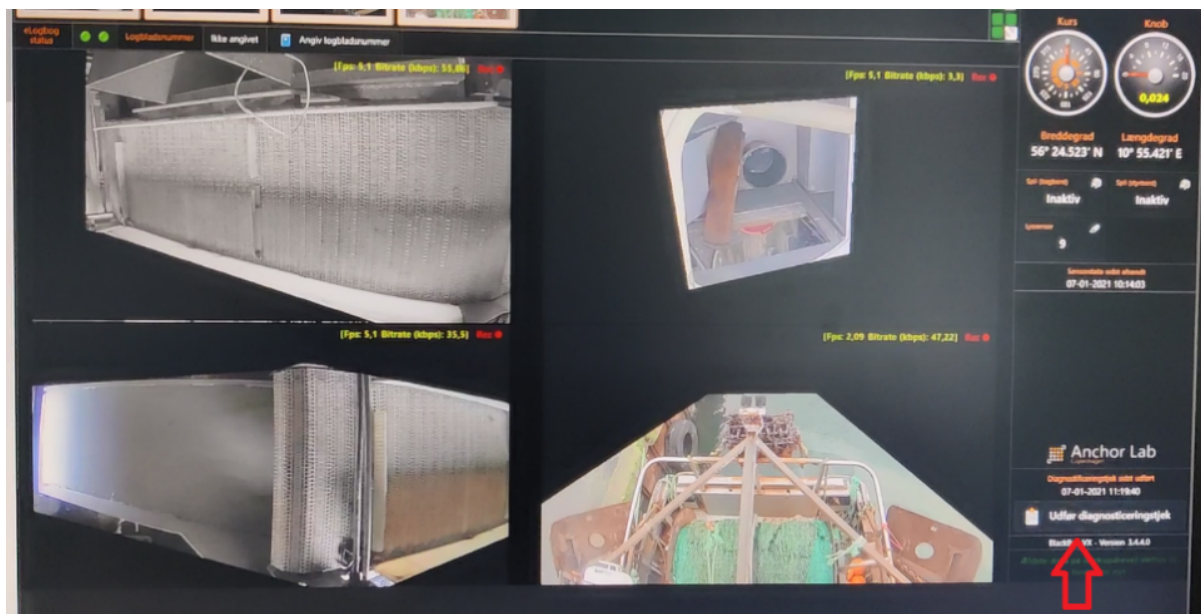
The Black Box system

A functional test of the Black Box VX system is performed before each fishing trip. This is done to ensure that all cameras and sensors are functional. If the function test detects a fault there are instructions for further action in the sub-chapter “System breakdown” (page 15).

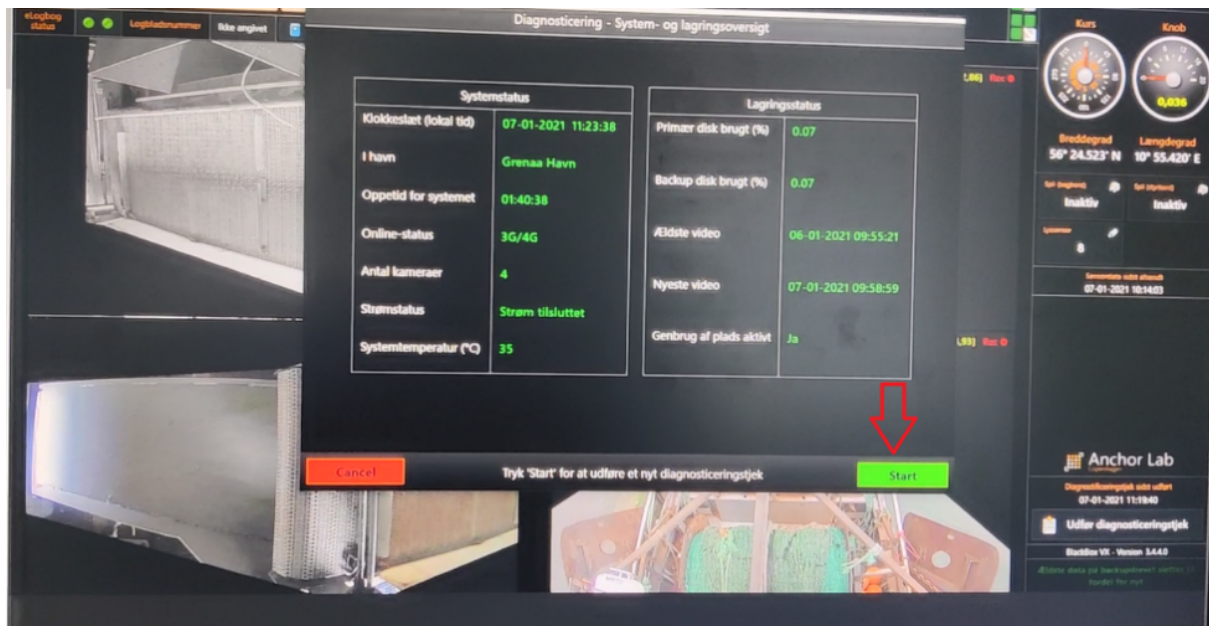
Visual guide for functional testing of the Black Box VX system on board

The function test is carried out on the screen in the wheelhouse.

1: Start



Click on "Perform diagnostic check" in the lower right corner of the screen (marked with )



Pop-up window with diagnostics check "Diagnosticering – System og lagringsoversigt". Press the green "Start" button to initiate the test.

2: Individual check of each camera

Each camera is checked, after which you click on the color icon that best describes the state of the image (red: no image, yellow: dirty/blurred image, green: sharp and clean image).

- If the red icon is selected, this is a system breakdown, and you must check sub-chapter *System breakdown*, for further instructions.

- If the yellow icon is selected, the functional test can be continued, and the camera must then be cleaned before sorting of the catch can be initiated.

- If the green icon is selected, no further action is necessary and the function test can continue.

In the example below, 4 cameras have to be inspected. All images are sharp and clean. The green icon is clicked, and then the "Next" button.

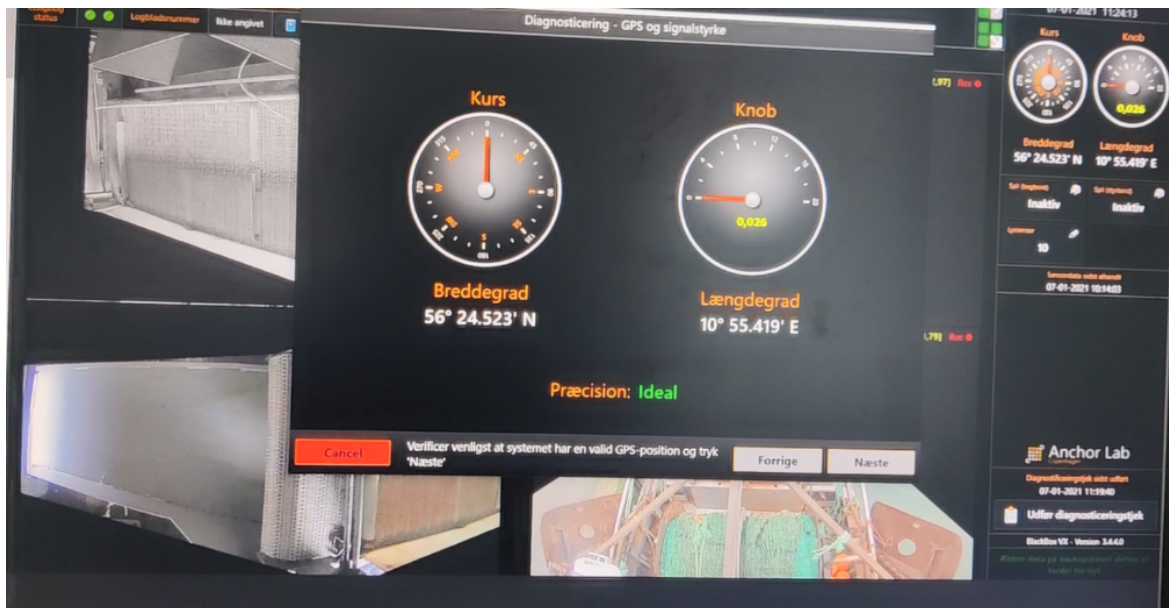


The above mentioned steps are performed for all cameras onboard the fishing vessel.

3: GPS and signal strength

The accuracy/strength of GPS is defined as: **Ideal**, **Excellent**, **Good**, **Moderate**, **Fair**, **Poor** or **Unknown**.

If the precision is green or yellow, the signal strength is accepted. Red is regarded as a system breakdown, and the you must look up the sub-chapter System breakdown for further instructions.



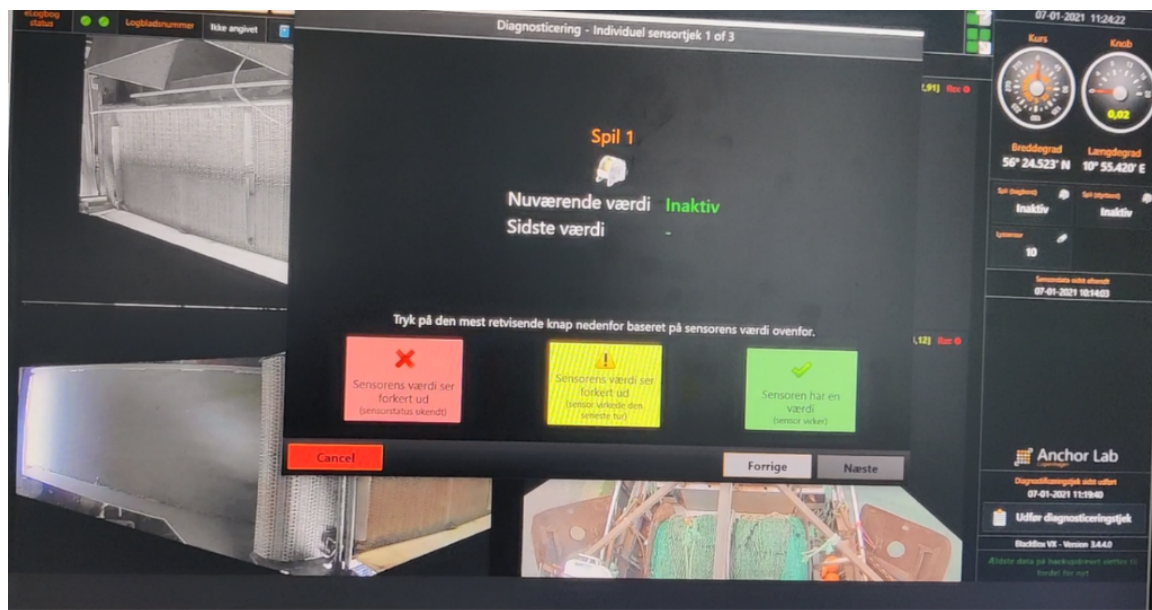
In the example shown above, Precision: **Ideal**. This is good and the "Next" button is pressed.

4: Sensor check

The rotation sensors on the winches are checked first.

Under “Sidste værdi” (latest value), must the date match the date of the previous fishing trip. This shows that the rotation sensors on the winch were functional during the last fishing trip.

Click on the green icon and then on the "Next" button. This step is performed for all winch sensors onboard.

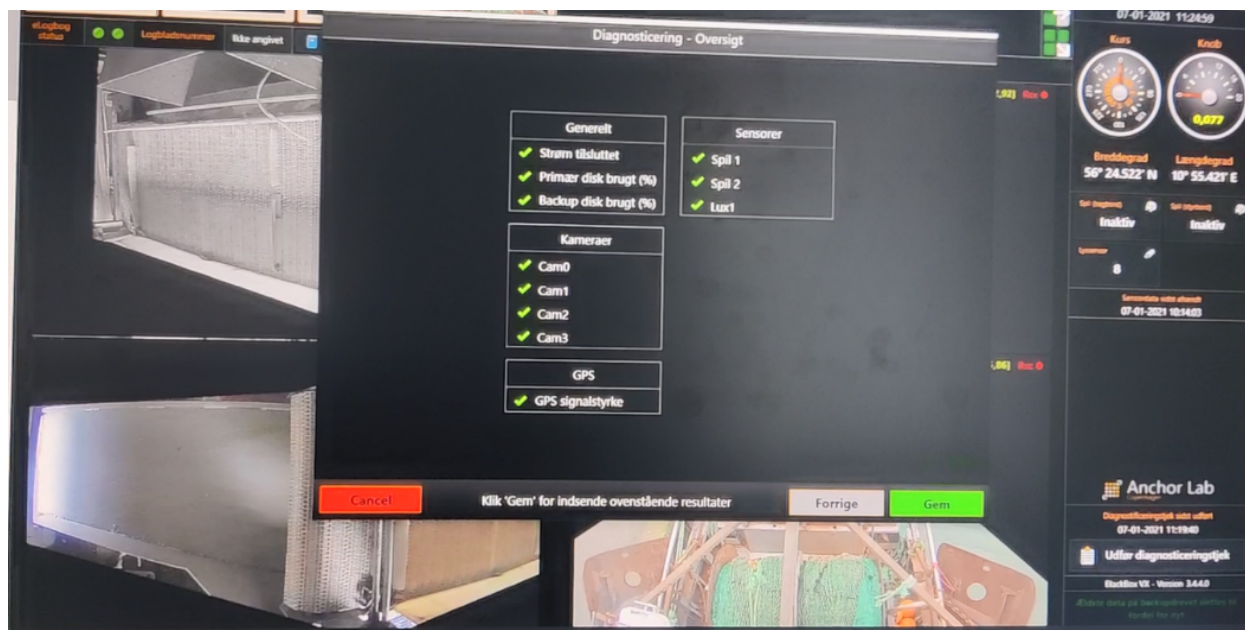


If the present value is green click on the green icon and then on the "Next" button.

5: Summary

The last step is to verify that all systems were functional and green ticks appear next to each component, then click the **green** "Save" button to pressed.

If yellow or red ticks appear, the vessel owner has to consult the section on “system breakdowns on the vessel”. If cameras are marked with a yellow tick, a wipe will most likely be sufficient to solve the problem.



Receipt module

The Danish Fisheries Agency requests transferrer video material for control from the electronic monitoring system. The request will be displayed on the screen of the Black Box VX system, which can be answered direct in the system. The vessel owner/operator subsequently has 3 days after the date of the request, or before the start of the next fishing trip, to respond to the request.

1: 5% sample control

The Danish Fisheries Agency can request to review 5% of the fishing trips in the Kattegat (3AS). When the Danish Fisheries Agency requests video sequences, the following message will appear on the screen onboard the vessel:

This request must be answered within the 3 days or before the next fishing trip begins. **Red** is denying of transferrer of video material from the requested fishing trip, this equates to denial of control. **Green** is accepting of the request and thereby starting transferrer of video from the vessel to the Danish Fisheries Agency server.

1/1

Samtykke til medieoverførsel

Videodataen listet nedenfor er blevet anmodet om at blive overført. Indtast en besked (valgfrit) og giv samtykke eller afslå at mediet må overføres.

Besked fra bestiller

Kære fartøjsejer

Fiskeristyrelsen anmoder om at overføre optagelser fra fangstrejsen med logbogsnummer 0004400000 til 5% stikprøvekontrol.

Kvitter venligst på denne anmodning.

Med venlig hilsen

Efterspurgte medie

Videofil	Start	Stop
Cam0.VX5019.20221113172605207.mp4	13-11-2022 18:26	13-11-2022 19:26
Cam0.VX5019.20221113182605246.mp4	13-11-2022 19:26	13-11-2022 20:26
Cam0.VX5019.20221113202605343.mp4	13-11-2022 21:26	13-11-2022 22:26
Cam0.VX5019.20221113212605345.mp4	13-11-2022 22:26	13-11-2022 23:26

Indtast en valgfri svarmeddelelse til bestilleren her...

☐ Giv automatisk samtykke til fremtidige medianmodninger.

Afslå/Accepter ikke

Giv samtykke

Hvis der trykkes på "Afslå/Accepter ikke" afslås anmodningen. Bemærk venligst, at dette sidestilles med nægtelse af kontrol

Er du sikker på at du ønsker at afslå samtykke til at overføre det anmodede medie?

1113172605207.mp4	13-11-2022 18:26	Ja	Nej
-------------------	------------------	----	-----

Man kan her afgive eventuelle kommentarer til "Afslaa/Accepter ikke" og "Giv samtykke"

☐ Giv automatisk samtykke til fremtidige medianmodninger.

Afslå/Accepter ikke

Giv samtykke

Det er muligt at komme med kommentarer til kvitteringen

2: 5% risk-based control

Based on the Danish Fisheries Agency's risk-based control, the Danish Fisheries Agency can request transfer of additional 5% video material from fishing activities in the Kattegat for review. An example of circumstances that can trigger a risk-based check are violation of the landing obligations or failure to keep cameras clean. When the Danish Fisheries Agency requests these video sequences, the following message will appear on the screen:

This request must be answered within the 3 days or before the next fishing trip begins. **Red** is denying of transfer of video material from the requested fishing trip, this equates to denial of control. **Green** is accepting of the request and thereby starting transfer of video from the vessel to the Danish Fisheries Agency server.

1/1

Samtykke til medieoverførsel

Videodataen listet nedenfor er blevet anmodet om at blive overført. Indtast en besked (valgfrit) og giv samtykke eller afslå at mediet må overføres.

Besked fra bestiller

Kære fartøjsejer

Fiskeristyrelsen anmoder om at overføre optagelser fra fangstrejsen med logbogsnummer 0004400000 til 5% risikobaseret gennemsyn.

Kvitter venligst på denne anmodning.

Efterspurgte medie

Videofil	Start	Stop
Cam0.VX5019.20221210133055602.mp4	10-12-2022 14:30	10-12-2022 15:31

Indtast en valgfri svarmeddelelse til bestilleren her...

☐ Giv automatisk samtykke til fremtidige medieanmodninger.

Afslå/Accepter ikke

Giv samtykke

3: Installation

The system is installed by an electrician chosen by the owner of the vessel. When the installation is complete, The Fisheries Agency order a short video sequences from the

system's hard drive to ensure that the installation is correct and to ensure that the BlackBox VX system works as intended. The short video sequences are used to:

- Adjust masking
- Set up grids
- Ensure that cameras are located at the correct position/angle
- Check motion sensors in the cameras are where they should be
- Secure winch sensors
- General troubleshooting
- Ensure appropriate functionality of the electronic monitoring system

Central live view access to the system is used by the Danish Fisheries Agency and supplier Anchor Lab to:

- Set/adjust unmasking
- Check/add geofencing zones
- Setting of motion sensors
- Taking pictures of camera angles, masking area and grid setting and VMP
- Admission by diagnostic check
- Registration of problems with the entire electronic monitoring system

Central access to the system thru live view and transfer of video sequences is used in connection with installation. In this case, there will be no request or briefing.

The Danish Fisheries Agency strives to shorten this process to the shortest possible time.

When the Danish Fisheries Agency considers installation complete, the vessel owner will be contacted and informed that the system is fully installed and that the receipt module is now activated.

4: After installation

After the electronic monitoring system is considered fully installed, there may be situations where it is necessary for the Danish Fisheries Agency or supplier Anchor Lab to access

central live view access. The Danish Fisheries Agency/Anchor Lab will communicate with the vessel owner if it is necessary with a central live view access.

Central live view access after completed installation can be due to:

- Correction of masking areas
- Release of new software
- Addition of geofencing areas
- Adjustment of sensors
- Restart of system or camera
- Supervision when a system breakdown is reported

Responsibility during fishing

It applies to the master of the vessel to:

1. When fishing in the Kattegat, the electronic monitoring system must be fully functional and in operation at all times. The master of the vessel is responsible for this. In certain circumstances rule no. 7 can apply.

2. The master of the vessel must ensure that the cameras are not covered or otherwise blocked in relation to the guidelines from the Danish Fisheries Agency.

3. The master of the vessel must in connection with fishing in the Kattegat conduct a diagnostic check to ensure that the electronic monitoring system is fully functional and in operation before departure from port.

4. The master of the vessel must ensure that the necessary cleaning of cameras is carried out daily and before hauling in gear and sorting the catch.

5. During fishing in the Kattegat, the Danish Fisheries Agency may, without prior notice, carry out checks on the electronic monitoring system through direct access to still images and real-time camera recordings from the electronic monitoring system, cf. the Fisheries Act § 117, stk. 3, nr. 5.

6. During fishing in the Kattegat, the vessel master is obliged to immediately correct errors that hinder the functioning of the electronic monitoring system. The master of the vessel must report any detected fault without unassay delay to the Danish Fisheries Agency. Fishing must not be carried out until the error has been rectified and reported to the Danish Fisheries Agency. If the vessel monitoring plan lays down detailed guidelines for when fishing must be stopped in the event of an error, these must also be followed, cf. however no. 7.

7. In the case of minor errors in the electronic monitoring system, the Danish Fisheries Agency may allow continued fishing if this is compatible with the control purpose of the electronic monitoring system. The Danish Fisheries Agency can also allow continued fishing when, based on a specific assessment, there is a single breakdown of the electronic monitoring system.

System breakdown

The vessel's electronic monitoring system must be fully functional and in operation at all times when fishing in the Kattegat. Therefore, fishing must not be carried out until the error has been corrected and reported to the Danish Fisheries Agency.

In case of minor errors and based on a specific assessment, fishing can still be permitted, cf. § 4, subsection 7, in executive order no. 925 of 20. June 2022 on electronic monitoring of certain vessels in the Kattegat. These exceptions will be specific to the individual vessel.

System crash onboard fishing vessel Svend Tveskæg

In the event of a fault on the Black Box VX system on the vessel XX369 Svend Tveskæg, the following scenarios apply. System breakdowns can occur when the vessel is in port or during fishing. A distinction is made between these in the following.

The system breakdowns that are marked in **red** in the charts below are critical for the system's functionality and must be immediately reported to FMC.

System error ascertained by diagnostics check before departure from port:		
Component:	Importance:	Action plan:
Camera 4 (Discard-camera port side)	The component is critical to the functionality of the system	- Report immediately to FMC 24-hour duty 72 18 56 09 - Based on a agreement with FMC or FKK (the camera crew), fishing can be continued according to agreement paper (see appendix 5). - The error must be rectified the next time the vessel is in port and before the next fishing trip begins.
Camera 3 (Discard-camera Starbord side)	The component is critical to the functionality of the system	- Report immediately to FMC 24-hour duty 72 18 56 09 - Based on a agreement with FMC or FKK (the camera crew), fishing can be continued according to agreement paper (see appendix 5). - The error must be rectified the next time the vessel is in port and before the next fishing trip begins. -
eLog	This component is <u>not</u> critical to the functionality of the system. The system still fulfills	- Report immediately to FMC 24-hour duty 72 18 56 09 - The case is treated in the same way as vessels without a camera system. - The logbook number for each trip is entered by the master in the field "Enter logbook number" (see appendix 2).

	the control purpose.	
GPS	The component is critical to the functionality of the system	- Report immediately to FMC 24-hour duty 72 18 56 09 - Based on a agreement with FMC or FKK (the camera crew), fishing can be continued according to agreement paper (see appendix 5). - The error must be rectified the next time the vessel is in port and before the next fishing trip begins. -
Winch sensor	The component is critical to the functionality of the system	- Report immediately to FMC 24-hour duty 72 18 56 09 - Based on a agreement with FMC or FKK (the camera crew), fishing can be continued according to agreement paper (see appendix 5). - The error must be rectified the next time the vessel is in port and before the next fishing trip begins. There is a possibility of a temporary solution to the problem. A setting in the system can cause the cameras to record when the vessel moves out of the harbor box. The cameras will record during the entire voyage, and stop when the vessel arrives in port. The error on the winch/rotation sensors must be corrected before the system can be changed back to the original setting. If you want this solution, contact Kristian Plet-Hansen on phone +45 72185681
Camera 2 (Hoppers cverview-camera)	This component is <u>not</u> critical to the functionality of the system. The system still fulfills the control purpose.	- Report immediately to FMC 24-hour duty 72 18 56 09. - The fishing trip can be started if in port - The error must be corrected the next time the vessel is in port and before the next fishing trip begins.

Camera 1 (Trawl camera)	This component is <u>not</u> critical to the functionality of the system. The system still fulfills the control purpose.	- Report immediately to FMC 24-hour duty 72 18 56 09. - The error must be corrected before the next time the vessel is in port and before the next fishing trip begins.
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System error ascertained when the vessel is at sea:

Component:	Importance:	Action plan:
Camera 4 (Discard-camera port side)	The component is critical to the functionality of the system	- Report immediately to FMC 24-hour duty 72 18 56 09 - Based on a agreement with FMC or FKK (the camera crew), fishing can be continued according to agreement paper (see appendix 5). - The error must be rectified the next time the vessel is in port and before the next fishing trip begins.
Camera 3 (Discard-camera Starbord side)	The component is critical to the functionality of the system	- Report immediately to FMC 24-hour duty 72 18 56 09 - Based on a agreement with FMC or FKK (the camera crew), fishing can be continued according to agreement paper (see appendix 5). - The error must be rectified the next time the vessel is in port and before the next fishing trip begins.
eLog	This component is <u>not</u> critical to the functionality of the system. The system still fulfills the control purpose.	- Report immediately to FMC 24-hour duty 72 18 56 09 - The case is treated in the same way as vessels without a camera system. - The logbook number for each trip is entered by the master in the field "Enter logbook number" (see appendix 2).
GPS	The component is critical to the functionality of the system	- Report immediately to FMC 24-hour duty 72 18 56 09 - Based on a agreement with FMC or FKK (the camera crew), fishing can be

		continued according to agreement paper (see appendix 5). - The error must be rectified the next time the vessel is in port and before the next fishing trip begins.
Winch sensor	The component is critical to the functionality of the system	- Report immediately to FMC 24-hour duty 72 18 56 09 - Based on a agreement with FMC or FKK (the camera crew), fishing can be continued according to agreement paper (see appendix 5). - The error must be rectified the next time the vessel is in port and before the next fishing trip begins. There is a possibility of a temporary solution to the problem. A setting in the system can cause the cameras to record when the vessel moves out of the harbor box. The cameras will record during the entire voyage, and stop when the vessel arrives in port. The error on the winch/rotation sensors must be corrected before the system can be changed back to the original setting. The error on the rotation sensors must be corrected before the system can be changed back to the original setting. However, this requires that the vessel is within 3G/4G connection and it may therefore be necessary to sail towards port before this setting can be made.
Camera 2 (Hoppers overview-camera)	This component is <u>not</u> critical to the functionality of the system. The system still fulfills the control purpose.	- Report immediately to FMC 24-hour duty 72 18 56 09. - The fishing trip can be started if in port. The error must be corrected the next time the vessel is in port and before the next fishing trip begins.

Camera 1 (Trawl camera)	This component is <u>not</u> critical to the functionality of the system. The system still fulfills the control purpose.	- Report immediately to FMC 24-hour duty 72 18 56 09. - The error must be corrected the next time the vessel is in port and before the next fishing trip begins.
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Appendix

Appendix 1: Management on landing obligation

Guidelines for the landing obligation can be found on the Danish Fisheries Agency's website	Guidance for the Kattegat can be found on the Danish Fisheries Agency's website
Erhvervsfiskeri > Vejledninger til erhvervsfiskere Link: https://fiskeristyrelsen.dk/erhvervsfiskeri/vejledninger-til-erhvervsfiskere/	Erhvervsfiskeri > Vejledninger til erhvervsfiskere > Landingspligt og discard forbud > ”Vejledning Nordsøen, Skagerrak og Kattegat 2023”: Link: Vejledning til landingsforpligtelsen for demersalt fiskeri i Nordsøen, Skagerrak og Kattegat 2023 (fiskeristyrelsen.dk)

Appendix 2: Logbook number in Black Box VX system

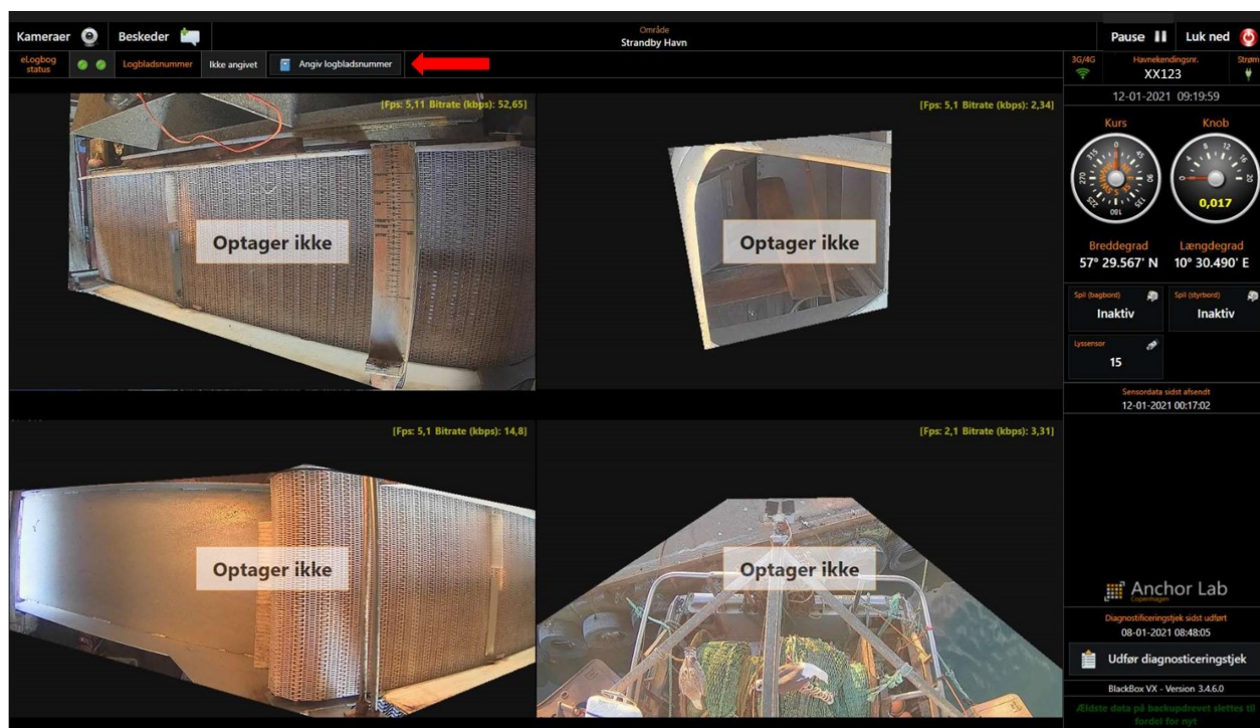


Figure 7: The red arrow shows where the log book number is entered in the BlackBox system.

Appendix 3: Proclamation electronic monitoring of certain vessels in Kattegat

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. 205 af 1. marts 2023:

§ 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-fiskerifartøjer i visse andre farvande med senere ændringer. 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 det pågældende forudgående kalenderår, 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. Antallet af havdage udregnes som antal døgn i et givent kalenderår, hvor et fartøj er til havs i forbindelse med en fangstrejse. Havdage udregnes som antal timer fra afrejse til ankomst divideret med 24, og herefter oprundet til nærmeste antal hele døgn. En kontinuerlig fangstrejseperiode fortsætter så længe der er mindre end 24 timer fra ankomst til næste afsejling. 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, 5. pkt.

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 fartøjsejer omfattet af et påbud i medfør af stk. 1 at give Fiskeristyrelsen adgang til fartøjet på et nærmere angivet tidspunkt med henblik på 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. Fartøjsføreren for fartøjer omfattet af et påbud efter § 2, stk. 1, skal sikre følgende i forbindelse med fiskeri i Kattegat:

- 1) At fartøjets elektroniske monitoreringssystem til enhver tid er fuldt funktionsdygtigt og i drift, jf. dog stk. 2.
- 2) At kameraerne ikke er tildækket eller på anden måde blokeret i forhold til de retningslinjer for placering af kameraerne, som Fiskeristyrelsen anviser.
- 3) At der dagligt og inden afsejling fra havn foretages kontrol af, at det elektroniske monitoreringssystem er fuldt funktionsdygtigt og i drift.
- 4) At der dagligt og inden indhaling af grej og sortering af fangst, samt i øvrigt efter behov, foretages nødvendig rengøring af kameraer.
- 5) Straks at udbedre fejl, der hindrer funktionen af det elektroniske monitoreringssystem. Fartøjsføreren skal indrapportere enhver konstateret fejl uden unødigt ophold 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 i øvrigt følges, jf. dog stk. 2.

Stk. 2. Fiskeristyrelsen kan ved mindre fejl i det elektroniske monitoreringssystem tillade fortsat fiskeri, hvis dette er foreneligt med det elektroniske monitoreringssystems kontrolformål. Fiskeristyrelsen kan desuden tillade fortsat fiskeri, når der ud fra en konkret vurdering er tale om enkeltstående nedbrud af det elektroniske monitoreringssystem.

Stk. 3. Fiskeristyrelsen kan efter forudgående varsel af fartøjsføreren 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.

§ 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, stk. 1, nr. 1-5 og stk. 3, § 5, stk. 2-3 eller
- 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 2023.

Stk. 2. Bekendtgørelse nr. 925 af 20. juni 2022 om elektronisk monitorering af visse fartøjer i Kattegat ophæves.

Ministeriet for Fødevarer, Landbrug og Fiskeri, den 13. juni 2023

Jacob Jensen

Appendix 4: Questions and Answers on electronic monitoring

When are the cameras filming?

The cameras will start filming when fishing starts, i.e. from the rotation sensors detect that the winch is in motion. The recording will stop when the vessel goes into port, i.e. when it moves within the port box.

What happens to the footage from the cameras?

The recordings from the cameras are stored on hard drives on board the vessel.

Based on sensor data, the Danish Fisheries Agency requests video sequences for control based on random samples in order to verify that the landing obligation is being complied with. These video sequences are transferred via the Internet automatically while the vessel is within 2,3 or 4G range.

The Danish Fisheries Agency reviews the video sequences and deletes them within 30 days. If, upon review of the video sequence, it is found illegal actions in contrary to the landing obligation, the video sequence will be saved until a possible case has been settled.

Who can access the recordings and what can they see?

As long as the video footage is on the vessel's hard drive, it is the vessel's personal data and others have no right to the footage.

When video sequences for inspection are in the precession of the Danish Fisheries Agency, they will be subject to right of access to public records and everybody can apply for access to the footage.

If a request is made for access to a video sequence before it is deleted from the Danish Fisheries Agency, the recording will, as a starting point, therefore be handed over. Any video sequences where parts of the crew, due to workflow, have come within an area of the filming, the Danish Fisheries Agency will be applied masking to ensure privacy before the recordings are handed over to those who have applied for access.

What do I do when fishing outside Kattegat?

It is only when fishing in Kattegat that the camera system must record. The camera system must stop recording when the vessel leaves Kattegat, just as the camera system must start recording when the vessel sails into Kattegat again.

The camera system will automatically stop the recordings the moment the system detects that the vessel is leaving Kattegat, just as the system will automatically start the camera recordings when the vessel sails into Kattegat again.

I can't find answers to my questions, what do I do?

The answers can be found in the attached appendix

1. Proclamation on electronic monitoring of certain vessels in the Kattegat
2. Startup guide
3. 10 changes in the monitoring project
4. On the Danish Fisheries Agency's website under the tab Kameraprojekt i Kattegat -> Spørgsmål og svar
(<https://fiskeristyrelsen.dk/erhvervsfiskeri/kameraprojekt-i-kattegat/spoergsmaal-og-svar/>)

If you can't find the answers you can contact:

Kristian Plet-Hansen +45 7218, krscph@fiskeristyrelsen.dk

E-mailadresse: kamerakattegat@fiskeristyrelsen.dk

FMC døgnvagt på [+45 72185609](tel:+4572185609)

Appendix 5: 10 changes to the monitoring project

- To provide the basis for a risk-based selection of video sequence, 5% are randomly selected for each vessel for control. In addition, a risk-based selection of approximately 5% can be initiated. Fishermen who comply with the rules on discards will therefore experience less control pressure.
- When the Danish Fisheries Agency requests video sequence for review, the agency will inform the fisherman of the reason for the review. Thus, the fisherman always knows what video sequence has been sampled for control and on what foundation.
- Until July 2023, the Danish Fisheries Agency will continue the current practice of guidance as a starting point rather than sanctioning. However, repeated or more serious violations at vessel level may be sanctioned. In the event of technical problems and breakdowns of the camera equipment, the Danish Fisheries Agency can, in the first instance and based on a specific assessment, allow fishing to continue.
- The Danish Fisheries Agency will operate with a trivial limit for sanctioning discards detected on the camera footage, so accidents discard is not sanctioned. This means that in situations where a small number of fishes are discarded by actions that can clearly be attributed to accidents or accidental misjudgments, no sanctions will be imposed.
- As a starting point, the camera vessels are excused from the time-consuming last haul control, where the fisherman's catch is reviewed and sorted by the fisheries control.
- The Danish Fisheries Agency will focus on clarifying which recordings are downloaded for review with a view to minimizing the extent of this. During the inspection, recordings are obtained from the most recent fishing trips in the Kattegat.
- The Danish Fisheries Agency is investigating the possibility of limiting the scope of recordings through motion sensors in the long term. The fishing industry is continuously informed about progress.
- A total of DKK 15 million has been allocated under the fisheries development program for 2022 and 2023. DKK for the development of selective gear that can

support the fishermen in being able to adapt their fishing and continue to have a sustainable fishery despite the decline in important stocks such as cod. Work is ongoing to initiate pilot projects with, among other things, a freer choice of gear, in which several of the camera vessels will have the opportunity to participate.

- Targeted efforts are being made to ensure a freer choice of gear and other regulatory moderations for the camera vessels through trial projects and dialogue with the EU Commission and other Member States. Efforts are also being made to ensure that catch data from the camera project in Kattegat can be continuously incorporated into the biological advice.
- A working group is set up between the fishing industry and the authorities, which will contribute to supporting the fishermen's tasks as data controller and data owner.

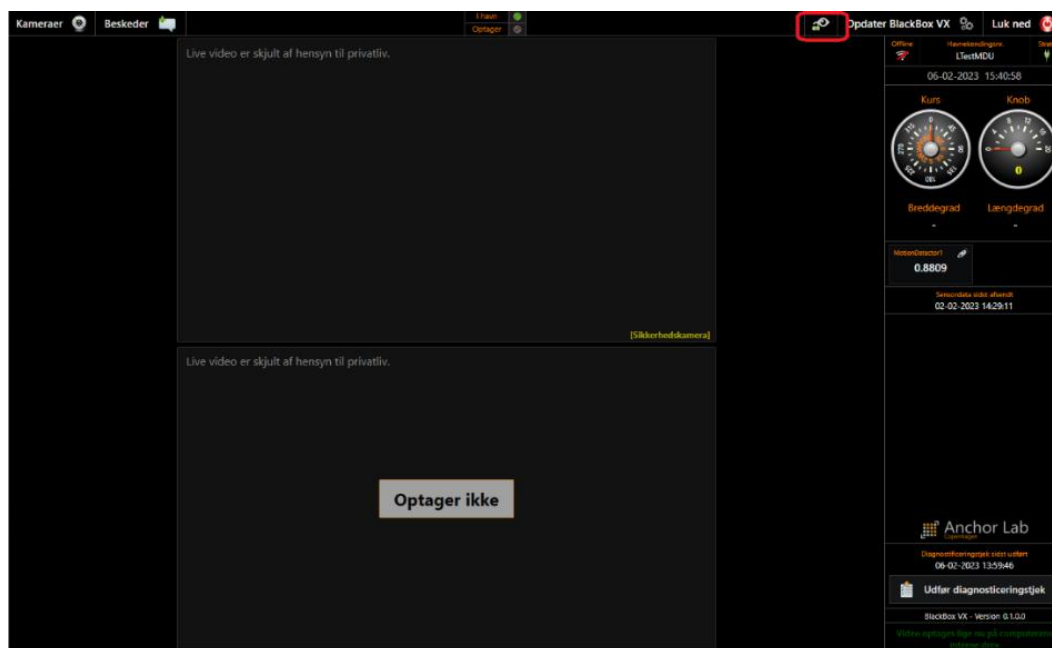
<https://fvm.dk/nyheder/nyhed/nyhed/ti-aendringer-af-monitoreringsprojektet-paa-plads/>

Appendix 6: Display of live video on the screen onboard the fishing vessel

This document describes how to display the video images on the screen when not recording (eg when the vessel is in port or outside Kattegat). In addition, it describes how the password to display the video images on the screen is changed.

1. Display of live video

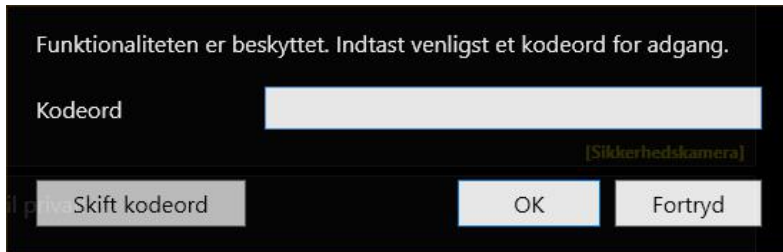
When the video images are hidden, a button in the top right corner of the top menu can be clicked to show them (red square).



When the button is clicked, the live video will be displayed on the screen for 15 minutes, after which they will be hidden again automatically. You can manually hide them before the 15 minutes have passed by clicking the button again.



If a password is established, a login window will appear when clicking the button to display the video images.



If you enter a correct password, the video images will be displayed. You can now turn off the video images on and off without re-entering the password for 30 minutes. After the 30 minutes have passed, the system will automatically log out, so you must enter the password again when you click the button to display the video images.

You can see that the password has been entered by the fact that there is a small "user button" in the top right corner of the menu (the button inside the red square).



If you press the "user button" inside the red square, you log out and you would have to enter a password again when you press the button to display the video images. That way, you can log out before the 30 minutes have passed by clicking on the "user button".

2. change password

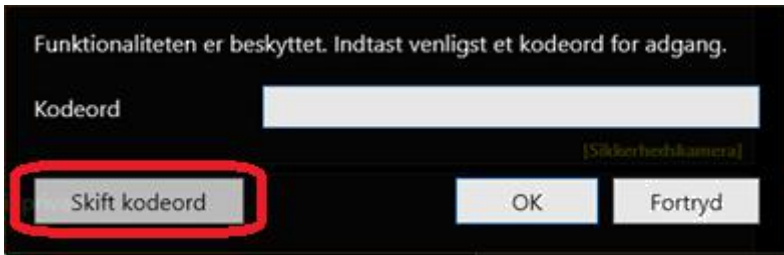
To change the password, you must be logged out. Therefore press the "user button" inside the red square in the image below, if this button is visible. If the button is not visible, this step is ignored.



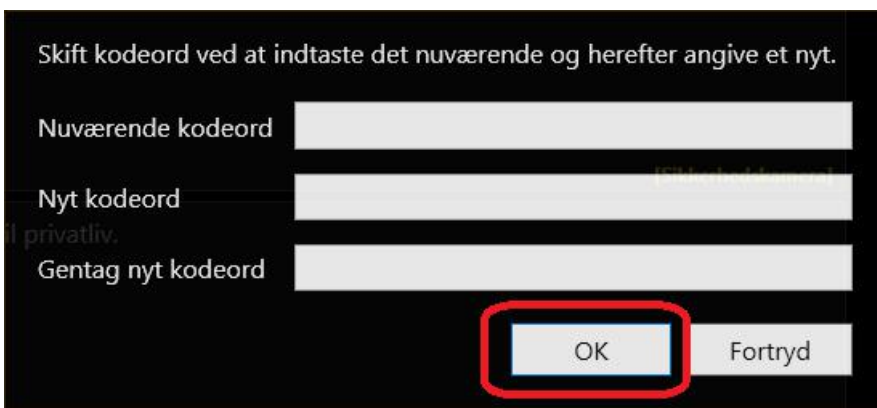
The button is then clicked to display the video images.



This will display the login window where you can enter the current password. Press the "Skift kodeord" button.



Enter the current password and a new one (which is repeated). The password must be at least 4 letters/numbers. When you have entered the new password twice, press OK to save.



You will then be able to display the video images using the new password.