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INFORMATION

From: To:	General Secretariat of the Council Delegations
Subject:	EU- Norway consultations: Working Group Report on technical measures in Skagerrak

Delegations will find attached an information from the European Commission services on the Report of the Working Group on technical measures in Skagerrak (see doc. ST 11135/18)

EU-NORWAY WORKING GROUP

REPORT ON

TECHNICAL MEASURES IN SKAGERRAK

Gothenburg, July 2018

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1. Introduction

During the Fisheries Consultations between Norway and the EU for 2018 it was decided to establish a Working Group with the aim to:

(1) Develop and prepare a system for the introduction of a comprehensive and harmonised Real Time Closure (RTC) as a tool to enhance the exploitation pattern in the Pandalus fishery in the Skagerrak.

(2) Review the gear selectivity characteristics of Danish anchor seines, species selective grids in pelagic trawl and size selective grids in the Pandalus fishery.

(3) Compare EU and Norwegian technical regulations in the Skagerrak for all fisheries

According to its Terms of Reference, the Working Group shall submit its recommendations by 1 July 2018 in good time before the yearly consultations in autumn 2018.

2. Mandate of the Working Group

The Delegations agreed on the following Terms of Reference for the Working Group:

"1. The Working Group shall develop and prepare a system for the introduction of a comprehensive and harmonised Real Time Closure (RTC) as a tool to enhance exploitation pattern in the Pandalus fishery in the Skagerrak.

The Working Group shall make recommendations, inter alia, for:

Biological and technical parameters

- The minimal set of data needed to close an area (size, and number of samples);
- Identify the length that could be used to trigger the RTC;
- The percentage of Pandalus below trigger length (in number and/or weight) that will lead to closure of an area, and explore mechanisms for equivalence between weight and number;
- Guidelines for delimiting the geographical boundaries of a closed area;

- Guidelines for which gear may be used inside a closed area;
- The period for which the area should be closed;

Procedural issues

- Procedures for notifying relevant parties of a closure;
- The mechanism by which a closure would be initiated and lifted;

Control issues

- The monitoring of closed areas;
- The exchange of information between control bodies;
- Requirements for monitoring;

2. The Working Group shall review the selectivity characteristics of the following gears:

- Danish anchor seines, in particular consider whether the cod-end selectivity across a range of species for Danish seines is different to that of otter trawls and Scottish seines (fly shooting). The Working Group should also present data on the species composition, including seasonal and temporal trends for both Danish seines and otter trawlers operating in similar fisheries in the Skagerrak.
- Analyze and evaluate the efficacy of species selective grids in pelagic trawl, considering the technical design features and level of use in the fishery.
- Analyze and evaluate the efficacy of size selective grids in the Pandalus fishery, considering the technical design features and level of use in the fishery.

3. The Working Group will undertake a comparison between EU and Norwegian technical regulations for all fisheries, identify specific elements where there are differences and propose possible approaches to harmonization where relevant, also including joint RTC in other fisheries than Pandalus.

"

3. Meetings

The Working Group met in Gothenburg, Sweden, 6th and 7th of February; in Skagen, Denmark the 26th of April and in Gothenburg again the 23-25th of May 2018. A wide-ranging discussion took place on the possible measures that could

be envisaged within the framework of the Terms of Reference. Consultations with the industry were held on the 25th of April and the 24th of May. Comments on the report are invited from the industry and will be added as annexes to the final version before the meeting in September.

4. Summary of the outcome of discussions

4.1. Real Time Closures in the Pandalus fishery

The Working Group recalled the discussions regarding an RTC system protecting juvenile specimen of cod, haddock, saithe and whiting in Skagerrak and the North Sea as finalized in Edinburgh in May 2009. Drawing from this experience, they composed a table with potential building blocks for an RTC system specific for pandalus and in line with the ToR (Annex I).

The initial scoping discussions on the 6th and 7th of February in Gothenburg were guided by this table and resulted in the conclusion that control and procedural parameters could largely be adopted from the existing RTC system for cod, haddock, saithe and whiting. Further discussions within the Working Group and with the industry then focussed mainly on biological and technical parameters of the RTC system.

The Working Group also underlined that the scope of their recommendations is limited to the pandalus trawl fishery in Skagerrak and does not affect fishing activities targeting other species. They further suggest RTC closures should affect pandalus fishery with the traditional species selective Nordmøre sorting grids but allow access to pandalus trawls using a size selective grid according to specifications laid out by the Working Group below in section 5.1.7. Upon request from the industry, minimum requirements for this size selective grid were defined as to allow for flexibility while the fishery further adopts this gear to their respective fleet.

The Working Group further considered that inclusion of other gear exemptions within RTC closed areas should be made possible upon review of scientific evidence of their equivalence in size selectivity.

Section 5 outlines the recommendations of the Working Group under each point of the ToR. Annex II and its appendices i, ii and iii line out provisions of an RTC system for pandalus aligned with these recommendations.

4.2. *Gear selectivity*

The Working Group reviewed available scientific evidence for selection characteristics for the Danish anchor seine, pelagic grid and size-selective grid in the pandalus fishery.

The Danish delegation explained that the **Danish anchored seine** is presently a small-scale fishery with approximately 20 vessels targeting demersal fish for consumption, including plaice, witch flounder and haddock in the Skagerrak on a seasonal basis and the increase in minimum mesh size to 120mm has had disproportional effects on the catch in the fishery and its viability. The Working Group should therefore review a mesh size reduction in this gear. The Swedish and Norwegian delegation explained they have no Danish anchored seine fishery in Skagerrak in their respective fleets. The Norwegian delegation further reviewed data on Danish fishing vessels fishing with Danish anchored seine and concluded that the fishery is limited to the EU zone. Consequently, they viewed changes in the mesh size in this fishery as an internal affair for EU. However, Norway did not object to a reduction of mesh size for this fishery in the EU waters of Skagerrak.

The Working Group acknowledged that bycatches of saithe in the herring fishery in Skagerrak have previously been problematic because of the lack of demersal quotas in the pelagic fleet and in some cases limited handling possibilities for saithe catches in herring landing harbours. The Norwegian delegation informed that a **sorting grid** with a maximum bar distance of 55 mm was made mandatory for Norwegian vessels fishing for herring with pelagic trawl in the Skagerrak, from the 1st of January 2018 to reduce problems with saithe bycatches. Swedish University of Agricultural Sciences (SLU) presented their results of scientific gear trials in collaboration with the industry with a pelagic grid with 50 mm bar distance on a vessel within the Swedish pelagic fleet (Annex III). In these trials, unwanted saithe bycatches were on average reduced with 98% by grid use with only a minor loss of the target catch of herring (5-10%). The Swedish Pelagic Federation (SPF) informed the Swedish delegation that their fleet uses the grid on a voluntary basis during part of the 3rd quarter of the year when they experience most problems with saithe bycatches. The Working Group reviewed logbook data for seasonal trends in fleet activity and noted that information on bycatches in the herring fishery in the Skagerrak is sparse.

The Working Group reviewed results from scientific trials with the **size-selective pandalus grid** within the Swedish, Norwegian and Danish fleets. English summaries of these gear trial results can be found in Annex [IV] for Sweden, [V] for Denmark and [VI] for Norway. Swedish and Norwegian trials indicated significant reductions in the catches of smaller prawn with only limited reductions of the targeted large prawn. The first trials by the Danish fleet indicated no

significant selection of the grid and issues with blockage of the grid early on in the tow. The Working Group would like to encourage the industry and gear producers to cooperate and exchange information about successful rigging of this new gear in order to avoid blockage during hauls. Discussions in the Working Group suggest grid efficiency can be improved by modifications that enhance the water flow over the grid: e.g. adequate mesh sizes before and after the grid, floating devices and towing speed. It was also emphasised that correct installation of the grid systems in the trawl is essential for it function. In particular the grid angle is of importance for the selection properties. Of importance is also how the fishing is conducted, where speed when trawling is crucial.

The size selective pandalus grid currently lacks a separate gear code and as a result no information is available about the use of the gear from neither EU nor Norwegian logbook data. According to the Swedish fishery producer organisation (SFPO) approximately 50 % of their members have purchased the grid. Considerable number of vessels in the Norwegian fleet have purchased a grid. However for the time being there is no exact information available on the actual number of trips where the grid is used.

4.3. *EU and Norwegian technical regulations*

The Working Group is compiling and comparing EU and Norwegian technical regulations in a table according to the format in Annex VII. The Working Group aims to finalise the table ahead of the consultations in September.

5. Real Time Closures in the Pandalus fishery

The main purpose of the joint Real Time Closure (RTC) system is to protect large concentrations of small Pandalus from being caught. Thus the Pandalus is given time to grow and contribute to a larger biomass and strengthening the stock. RTC system might also initiate wider use of selective gears in this fishery.

5.1. Biological and technical parameters

5.1.1. Equivalence of size measures

Carapace length is the most common measure for measuring northern prawn at a scientific level. The Norwegian delegation noted that Norwegian managers as well as the Norwegian Coast Guard prefer to use total length, measured as the distance from the front of the eye to the back of the tail. The Danish and Swedish delegations noted that they use carapace length as a size measure. The Working Group agreed on a size conversion tool for conversion of size metrics for individual pandalus between carapax length, Norwegian total length and weight, allowing the same size thresholds to define small pandalus despite different size metrics used by different parties [annex VIII].

5.1.2. Trigger length

The Working Group reviewed data on size distributions of pandalus in catches from scientific observer programs. This data allows for projections of the proportion of hauls with excess small pandalus using different trigger length and proportion threshold scenarios. Norway, Sweden and Denmark compiled tables with data from 2015-2017 showing proportions per quarter as well as per year [annexes IX; X and XI]. They acknowledged these proportions do not represent the expected likelihood of *closures* since this requires factoring in information about the likelihood of any haul to be controlled and on the number of hauls needed to initiate a closure. With this information, the Working Group suggests an RTC trigger length of [Norway and Sweden: 6,5 cm Norwegian total length - 14,8 mm carapace length; Denmark: 6,0 cm Norwegian total length - 13,6 mm carapace length].

5.1.3. Threshold for area closure

The Working Group gave a preference to define samples containing pandalus below trigger length in number of individuals (% pandalus below length limit in number). This position will not prejudice the EU position on proportions in weight for the RTC system for whitefish. The Working Group noted the

Danish industry preferred weight proportions instead of number proportions. As for trigger criteria, suitable threshold options were scoped with the help of annexes IX; X and XI, keeping in mind the likelihood for any haul to be controlled and number of controls to initiate a closure. With this information the working group suggests and RTC threshold for area closure of [Norway and Sweden: 15%; Denmark: 20%] to define samples with excess prawn under the trigger length.

5.1.4. Minimal set of data for area closure

It was agreed upon that a sample of 2 litre or 1 kg, representative for the entire Pandalus catch, should be taken before any on-board catch sorting. The Working Group agreed that a closure should be initiated by [Sweden: at least one haul with excess pandalus below the trigger size. If 2 such hauls would be made necessary we prefer these to be within a time span of 96 hrs / Norway: either 1 such haul in a specific situation or 2 such hauls in 96 hrs; Denmark: a minimum of two such hauls within a time span of 48, prepared to consider 2 hauls in a longer period f.ex 72 hours] contained within an area corresponding with the geographical boundaries below.

5.1.5. Geographical boundaries of the area

The geographical boundaries of a closed area should be defined by an area taking into account the haul trajectories that led to the decision for closure. In addition, it was felt that the boundaries for the area could take into account depth curves and other relevant information. Haul trajectories could be at the boundary of a closed area, without the need to include a buffer zone. The Working Group suggests an upper area limit of 50 sq nmiles for any RTC.

5.1.6. Period of closure

Closed areas would be closed for 14 days.

5.1.7. Allowed gear use within a closed area

RTC closed areas would be closed for all access by conventional shrimp trawls (with conventional grids of 19 mm bar spacing), but allow access to fisheries not targeting pandalus. Pandalus trawls fitted with a further developed size selective grid to sort out smaller pandalus would also be allowed access to closed areas. Discussions in the Working Group are ongoing to define minimum requirements of further developed size selective pandalus grids. [Annex II, appendix iii].

The Working Group also advises that further gear exemptions with equivalent selectivity should be made possible upon review of scientific evidence of their size selectivity.

5.2. Procedural issues

5.2.1. Procedures of notification

The Working Group suggest that established methods for notification of area closures for cod, haddock, saithe and whiting could be adopted also for pandalus RTC closures. This included decisions about control locations on a risk based manner and 24h service by respective FMCs (Fisheries Monitoring Center).

5.2.2. Mechanisms to initiate or lift a closure

The Working Group suggests closures would start at midnight after the decision to close and reopen automatically upon expiry (after 14 days).

5.3. Control issues

5.3.1. Monitoring

The Working Group discussed the practical issues regarding monitoring, control and enforcement and concluded that this is the responsibility of each Coastal State. However, for monitoring, established control issues could be adapted from the RTC systems for whitefish. The control authorities were deemed the responsible entity to carry out controls, and the Working Group advises against the use of scientific observers in control activities as this was deemed to interfere with their role as independent observers. The Working Group adapted annex 1 from EU regulation No 724/2010 for whitefish to an RTC control sampling protocol suitable for pandalus [Annex II, appendix i]

The master is always responsible to use the size selective gear as such that it leads to the correct catch composition within an RTC area. If a control of a vessel with an exempted gear within an RTC area still shows excess pandalus below the trigger size in the catch this vessel is obliged to move out of the RTC area for the remainder of the closure period.

The Working Group discussed the option that vessels with a further developed size selective pandalus grid that enter a closed area could only be allowed to have the further developed size selective grid aboard, allowing for landing controls and VMS AIS to guide controls of gear use in closed

areas. The Swedish and Norwegian industry expressed their concern that this would interfere with their ability to change gear to the traditional Pandalus grid as they move through different fishing grounds. The Danish industry informed they do not expect to fish in RTC areas.

In addition, vessels should register use of the size selective pandalus grid with the correct gear code in their logbook (national gear codes for size selective pandalus grids). The Working Group suggests that it would be an advantage to have clear reporting/gear code for the further developed grid in the EU logbook and NO logbook, visible to the respective control authorities. Vessels wishing to fish in a closed area are to notice their intention and gear use to the respective coastal state FMC before entry in a closed area.

5.3.2. Exchange of control information

The Working Group modified version of annex 2 in EU regulation No 724/2010 for RTCs for whitefish to match one species (pandalus) as a reporting format for closures and the underlying control results between coastal states [Annex II, appendix ii].

It was not deemed necessary to report RTC control results that did not lead to closures between coastal states. However, the Working Group discussed the possibility to allow for RTC sample results on both sides of the border to be used to initiate a closure. Therefore the Working Group suggests that sample results from single controls with excess pandalus below the trigger size close to the border would be reported to the neighbouring control authorities/FMC.

5.3.3. Monitoring requirements

The Working Group agreed it would be useful to have a minimum size of the catch that initiates a control to avoid controls on unrepresentative catches. Upon analysis of catch statistics, the Working Group gave preference to 100kg as a minimum catch size for an RTC control. No limitations to the time length of the haul were deemed necessary.

On the basis of the above, the Working Group suggests provisions of the RTC system for pandalus as outlined in Annex II and its appendices i, ii and iii.

6. Gear selectivity

6.1. Danish anchor seines

6.1.1. Gear description

Danish anchor seine is a fishing method which involves the use of an anchor where the fishing vessel is stationary whilst hauling the gear.

Gear description from Noack et al., 2017 (see Annex XII for full reference):

> *"Although the netting materials and codend constructions used in Danish seines, Scottish seines, and bottom trawls are similar, the gears have pronounced differences in construction and in the way they are operated. Bottom trawls use trawl doors to spread the net, and the towing speed is relatively constant throughout the fishing process. Seiners do not use any doors or other spreading devices, and the speed at which the net is dragged is slower than that in trawling, but it continuously increases during the fishing process. Scottish seiners move forward during the retrieval process, whereas Danish seiners do not as they are anchored."*

Further information describing the historic and socio-economic background for the Danish request to change the minimum mesh size for Danish Anchor seine from 120 mm to 105 mm in Skagerrak is provided in Annex XII.

6.1.2. Comparison of cod-end selectivity with similar fisheries

Scientists of the Danish national institute of aquatic resources (DTU Aqua) presented their studies of the difference in the selection process between the Danish anchor seine and otter trawl (Annex XIII).

Selectivity studies in annex XIII systematically indicate that Danish Anchor seine is a more size-selective fishing gear than an otter trawl.

6.1.3 Species composition

Plaice is the most important species in both weight and value for Danish Anchor seine fishery in Skagerrak, but cod, haddock and witch flounder are also important.

Information on species composition, including seasonal and temporal trends for both Danish seines and otter trawlers operating in similar fisheries in the Skagerrak for 2017 are included in annex XIV.

6.2. Species selective grids in pelagic trawls

6.2.1. Gear description

Grid with positive attack angle and exit in the bottom of the trawl.

6.2.2. Effects on catch composition

Swedish University of Agricultural Sciences (SLU) presented their results of scientific gear trials in collaboration with the industry with a pelagic grid with 50 mm bar distance on a vessel within the Swedish pelagic fleet (Annex III). In these trials, unwanted saithe bycatches were on average reduced with 98% by grid use with only a minor loss of the target catch of herring (5-10%).

6.2.3. Level of use in the fishery

Swedish pelagic trawl fisheries in Skagerrak

Approximately 60% of the Swedish fishery for herring with pelagic trawls in the Skagerrak takes place in the 3rd quarter of the year. The industry has been closely involved in scientific trials evaluating the pelagic grid The Swedish Pelagic Federation (SPF) informed the Swedish delegation that their fleet uses the grid on a voluntary basis during part of the 3rd quarter of the year when they experience most problems with saithe bycatches.

Average landings of herring by pelagic trawls in the Skagerrak by Sweden 2013-2017:

Average herring landings in the Skagerrak 2013-2017

Month	Jan	Feb	Mar	Apr	Maj	Jun	Jul	Aug	Sep	Okt	Nov	Dec
Herring landed (ton)	814	527	711	509	0	0	311	4907	1199	431	769	332
% of yearly landings	8%	5%	7%	5%	0%	0%	3%	47%	11%	4%	7%	3%

Norwegian pelagic trawl fisheries in Skagerrak

From 2008, the Norwegian fleet has not been permitted to fish herring with pelagic trawl. The reason was the risk of intermixture of herring below minimum catch size and by-catch of other species, in particular saithe, when fishing herring with pelagic trawl. Normally the vessels fishing herring in the Skagerrak do not have a quota for saithe.

According to the fleet, pelagic trawl is the best gear to catch herring in Skagerrak. The Institute for Marine Research was also positive to open for such fishery in order to get more information on the catch composition. From 2012, the Directorate of Fisheries therefore could give vessels dispensation to use pelagic trawl, in the area, and from 2016, such dispensation could be given on the condition that an observer was on board the vessel.

The trial fishing in 2016 and 2017 show a variation in the by-catches. Over the years, relatively big quantities of large saithe, were registered in several hauls. In the trials, sorting grids with bar distance of mainly 55 mm was used, but also 40 mm was used by one vessel. The results show considerably lower quantities of saithe in the catch when using a sorting grid. With sorting grid the by-catch of saithe is 0.4 %, but 5 % when a grid was not installed.

On this basis, the Directorate recommended that use of grid with maximum 55 mm bar distance in the herring fishery in Skagerrak should be mandatory for the Norwegian fleet. As most vessels used 55 mm, the basis for recommending lower bar distance was not sufficient.

According to the regulation for herring fishing for 2018, it is permitted to fish herring with pelagic trawl is allowed, if a sorting grid, with maximum bar distance of 55 mm, is used. Vessels intending to fish herring with pelagic trawl in Skagerrak, shall inform the Sea-going services of the Directorate of Fisheries at least 48 hours before starting the trip.

Danish pelagic trawl fisheries for herring in Skagerrak
Denmark noted that only a small part of the total Danish herring fishery with pelagic trawls takes place in Skagerrak. The yearly landings of herring with pelagic trawls in Skagerrak varies from 669 tons to 3.914 tons in the period from 2013-2017. Approximately 67 % of this fishery takes place during the 3rd quarter and the rest in the 4th quarter.

6.3. Size selective grids in the Pandalus fishery

6.3.1. Gear description
See annex II-iii.

6.3.2. Effects on catch composition
The Working Group reviewed results from scientific trials with the size-selective pandalus grid within the Swedish, Norwegian and Danish fleets. English summaries of these gear trial results can be found in Annex [IV] for Sweden, [V] for Denmark and [VI] for Norway.

6.3.3. Level of use in the fishery
The size selective pandalus grid currently lacks a separate gear code and as a result no information is available about the use of the gear from EU logbook data. According to the Swedish fishery producer organisation (SFPO) approximately 50 % of their members have purchased the grid.

Considerable number of vessels in the Norwegian fleet have purchased a grid. However, for the time being there is no exact information on the actual number of trips where the grid is used

7. EU and Norwegian technical regulations

7.1. Comparison technical regulations in EU and Norway

Parties to complete annex VII by September.

7.2. Recommendations for harmonization

The Danish and Swedish parties noted they would like to review gear exemptions within the RTC system in the fishery for cod, haddock, saithe and whiting. Due to the selectivity of these gears, the Working Group proposes that fishery with pandalus trawls equipped with a Nordmøre grid without a collecting bag and fishery with Nephrops trawls equipped with a species-selective grid could continue within RTC closed areas for whitefish.

Annex I - Potential building blocks for an RTC system specific for pandalus

The Working Groups overview of possible elements in a comprehensive and harmonised Real Time Closure (RTC) for the Pandalus fishery in the Skagerrak	
Biological and technical parameters	
• Equivalence of size measures	
	Different size measures (carapax length, from front edge of the eye to the rear edge of the tail, total length, weight)
	Size conversion tool
• Trigger length	
	What are undersized/young prawns? [<6,5cm length from front edge of the eye to the rear edge of the tail – 15mm carapax length (current NO minimum catching size) / second sorting (lus) / marketable size: > 250 specimen/kilo (current EU marketing standard)]
	Agreed reference size for the RTC system
• Threshold for area closure	
	Percentage in numbers/weight.
	Conversion tool numbers/weight.
	% in number [current NO regulation: 15% in number]
	% in weight [current EU regulation for cod, haddock saithe and whiting: 10% in weight]
• Minimal set of data for area closure	
	The source of information (coast guard, inspections at sea, scientific observers, research vessels, VMS, logbook, landing information/inspections, masters)
	Close after one (1) haul with too many undersized/young prawns?
	Time length of the haul/area covered by the haul
	Minimum size of the haul?
	Minimum quantity available to samples should be?
	Size of the sample to trigger closure
	Sampling according to agreed methodology. Sampling method to be outlined in annex (~ annex 1 in 724/2010)
	Agreed sampling report to be filled by coast guard. Sampling report form as annex?
	Different number of samples according to the trigger level
• Geographical boundaries of the area	
	Connection between number of hauls and size of the area to be closed?
	Connection between number of hauls and shape of the area to be closed?
	Fixed grid/area?
	Dynamic area - at least 4 joining points, no more than 6 joining points [current EU regulation for cod, haddock saithe and whiting; art 7, 724/2010]

	Depth?
	Minimum fixed size
	Minimum width
	What the maximum fixed size should be [250 nmil^2 (current NO regulation); 50nmil^2 if area outside baseline, Current EU regulation for cod, haddock saithe and whiting; art7 724/2010]
	What the maximum number of areas closed in a zone should be [commercial impact zone or other defined areas] at the same time?
	What the maximum area closed in a zone should be [commercial impact zone or other defined areas] at the same time?
	Mid point of fishing operation or operations above the agreed trigger level equals mid point of the closed area [current EU regulation for cod, haddock saithe and whiting; art 7.2, 724/2010]
	Buffer zone; defined area around the closed areas
• Period of closure	
	Cover day and night (24 hours)
	Closed for a period between minimum [14] days and maximum [21] days?
	Closed for a fixed period and automatically opened after XX days.[14 days in current NO regulation for prawn; midnight on the 21th day in current EU regulation for cod, haddock saithe and whiting; art7.3, 724/2010]
	Closed for a fixed period and automatically opened after? [21 days?]
	The closure comes into effect at midnight UTC on the day of decision [~sufficient time between the decision and the closure to allow for vessels to be informed]
	The closure comes into effect 12h after the coastal state's decision [~sufficient time between the decision and the closure to allow for vessels to be informed] [current EU regulation for cod, haddock saithe and whiting; art 7.3a, 724/2010]
• Allowed gear use within a closed area	
	Closed areas open for vessels using selective devices in gears avoiding capture of undersized/young prawn?
Procedural issues	
• Procedures of notification	
	Communicate in an agreed format to member states and third countries
	Coastal state to post decisions on its website in an agreed format
	Joint website? / Hyperlinks to other countries RTC websites?
	Coastal state to inform vessels in the area to the extent possible [current EU regulation for cod, haddock saithe and whiting; art 8.1a, 724/2010]
	Coastal state to inform commission [current EU regulation for cod, haddock saithe and whiting; art 8.1b, 724/2010]
	Coastal state to inform the different fishery monitoring centres (FMC's) by e-mail about decision [current EU regulation for cod, haddock saithe and whiting; art 8.1c, 724/2010]
	Coastal state to inform other member states and third countries allowed to fish in the concerning area [current EU regulation for cod, haddock saithe and whiting; art 8.1d, 724/2010]
	Relevant FMC's should inform vessels affected by the closure [current EU regulation for cod, haddock saithe and whiting; art 8.2, 724/2010]

• Mechanisms to initiate a closure	
	The process to initiate a closure should be triggered by a report received from the inspector or observer.
	Report in an agreed format to the Coastal state. Including time, details of sample, location of haul(s), depth.
	Decision by the Coastal state on the basis of the report, including delimitation of the area.
	Where areas straddle jurisdictions the instigating country shall inform the neighbouring country/ies of the findings and the decision to close. [current EU regulation for cod, haddock saithe and whiting; art 7.4, 724/2010] The neighbouring country/ies shall close their part of the area without delay.
	Samples to be published without identifying the vessel
	Enable voluntary reporting/initiation by fishery?
Control issues	
• Monitoring	
	Targeted inspection and monitoring activities including through joint deployment plans
	Deployment plan: Coastal states to map where and when proportions of undersized/young prawns potentially reach above the threshold for area closure and coastal guard to focus inspections to these areas. [~ RF 724/2010 art 6.1&2]
	The Coastal state could invite other countries to carry out sampling on their behalf in order to make effective use of resources
	Monitoring should be carried out by using surveillance tools (VMS, AIS, air surveillance, fishery patrol vessels)
• Exchange of control information	
	Exchange of contact points; FMC's
	Prior consultations should be envisaged in case of closures of areas that straddle jurisdictions [current EU regulation for cod, haddock saithe and whiting; art 7.4, 724/2010]
	Exchange of VMS data for areas in the vicinity of boarders between jurisdictions
	The Coastal state could invite other countries to provide information for monitoring purposes
• Monitoring requirements	
	Working group to evaluate the implementation of the RTC scheme
	Information that may be useful for the evaluation by ICES

ANNEX II

JOINT REAL TIME CLOSURE SYSTEM FOR PANDALUS IN THE SKAGERRAK

1. Source of information

The basic source of information shall be inspections at sea on commercial fishing vessels conducted by control authorities.

2. Targeted inspection resources

A risk-based strategy should be applied to identify areas where there is a risk of catching numbers of pandalus below trigger length which exceed the trigger levels. Inspections shall be carried out in particular in these areas to measure whether the percentage of small pandalus exceeds the trigger level, including through Joint Deployment Plans.

3. Inspection, reporting and publication

3.1 Control authorities will inspect pandalus trawl catches using the sample procedure outlined in Appendix i.

3.2 Inspection details and the number of prawn in the sample under the trigger level shall be recorded in the report set out in Appendix ii.

3.3 If the results from [Sweden: at least one haul with excess pandalus below the trigger size. If 2 such hauls would be made necessary we prefer these to be within a time span of 96 hrs / Norway: either 1 such haul in a specific situation or 2 such hauls in 96 hrs; Denmark: a minimum of two such hauls within a time span of 48, prepared to consider 2 hauls in a longer period f.ex 72 hours] show that Pandalus under the trigger level is more than [Sweden and Norway: 15 %; Denmark: 20%] of the total number of pandalus, the body responsible for the sampling shall consider whether a RTC should be recommended. This includes taking into account physical factors, *inter alia* depth contours, temperature, and other factors such as catch composition, fishing activity etc.

3.4 If the Inspection body decides to recommend a closure, a report shall be completed immediately and sent to the contact point in the Coastal State.

3.5 If the Coastal State decides to implement a closure based on a recommendation from the Inspection body, it shall immediately publish results from control samples in which the percentage of pandalus below trigger length exceeds the trigger level on its website the position in which the fishing operation took place and the time it was conducted.

3.6 The Coastal States could invite other countries to carry out samples on their behalf.

4. Trigger length

The trigger length shall be [Norway and Sweden: 6,5 cm Norwegian total length - 14,8 mm carapace length; Denmark: 6,0 cm Norwegian total length - 13,6 mm carapace length].

5. Threshold level

The threshold to define samples with excess prawn under the trigger length shall be [Sweden and Norway: 15%; Denmark: 20%].

6. Decision to close

6.1 Without delay, the Coastal State shall close an area if the results from [one/two] samples show a proportion of pandalus under the RTC trigger size exceeding the threshold level. Samples should be taken within [48/72/96 hrs] and contained within an area corresponding with the geographical boundaries below. The body responsible for the sampling shall consider whether a RTC should be recommended. This includes taking account physical factors, *inter alia* depth contours, temperature, and other factors such as catch composition, fishing activity etc.

6.2 Neighbouring Coastal States may seek cooperation to initiate an RTC closure using sample results on both sides of the border.

6.3 If the area to be closed straddles jurisdictions the Coastal State shall without delay inform the neighbouring Coastal State of the findings and the decision to close. The neighbouring Coastal State shall then consider a closure in its EEZ.

7. Size and shape of the area

7.1 The geographical boundaries of a closed area shall be based on the following criteria:

a) The area definition should take into account the haul trajectories that led to the decision for closure, depth curves and other relevant information.

b) Shall have an upper area limit of 50 sq nmiles.

8. Notification of entry into force of the closure

8.1 The Coastal State shall without delay:

a) Post a notification of the closure on its website including a map, coordinates and the underlying sampling reports, and

b) Inform vessels in the vicinity of the area to the extent possible, and

c) Inform the Directorate of Fisheries or European Commission (DG-Mare) and FMCs in relevant countries by email. The Notification shall contain information on the date and time when the closure is in force, the coordinates delimiting the closures and web address to find more information.

8.2 The relevant FMCs shall inform vessels that are affected by the closure to the extent possible.

9. Entry into force

The closure shall enter info force at midnight UTC on the day of decision. There should be sufficient time between the decision and the entry into force for vessels to be informed.

10. Duration and scope

10.1 The area shall be closed for 14 days and automatically reopened.

10.2 The area closure is limited to the pandalus trawl fishery and does not affect fishing activities targeting other species.

10.3 Area to be closed to pandalus trawl vessels flying any flag.

10.4 Vessels using a size selective grid according to the specifications outlined in Appendix iii are to be allowed in the RTC closed area. Vessels wishing to use this exemption are to notice their intention and gear use to the respective coastal state FMC before entry in a closed area. In addition, such vessels are allowed only one pandalus grid on board.

10.5 If a control of a vessel with an exempted gear according art 10.4 within an RTC area still shows a catch with excess pandalus below the trigger size this vessel is obliged to move out of the RTC area for the remainder of the closure period.

11. Exchange of information and monitoring of closed areas

11.1 For the purpose of exchanging information about closures the Coastal States shall exchange information about their contact points, FMCs.

11.2 The Coastal States monitoring activities should targeted and be carried out by using surveillance tools such as VMS, air surveillance and fishery patrol vessels including through Joint Deployment Plans.

11.3 The Coastal State could invite other countries to provide information for monitoring purposes.

11.4 Sample results from single controls with excess pandalus below the trigger size close to the border should be reported to the neighbouring control authorities/FMC.

ANNEX II – appendix i

Sampling Methodology

Samples shall be taken and measured in accordance with following provisions.

1. Whenever possible, samples shall be taken and measured in close cooperation with the master of fishing vessel and his crew. The master of fishing vessel and his crew shall be encouraged to participate in the process. They shall also be encouraged to share any information that could be relevant with respect to the delimitation of a closed area.

2. The total catch in the haul shall be estimated.

3. A sample shall be taken in accordance with following procedure:

   a) The sample must be taken in such a way that it reflects the catch composition of Pandalus in the haul. To achieve that, the skipper, or a person he designates, shall assist when sample is taken.

   b) The minimum size of the sample shall be 2 kg or 1 litre of Pandalus.

4. The quantity of Pandalus under trigger size shall be calculated as a percentage of the total number of pandalus.

5. The sampling report form, presented in Annex II-ii shall be duly completed immediately after the sample has been measured.

Annex II - appendix ii

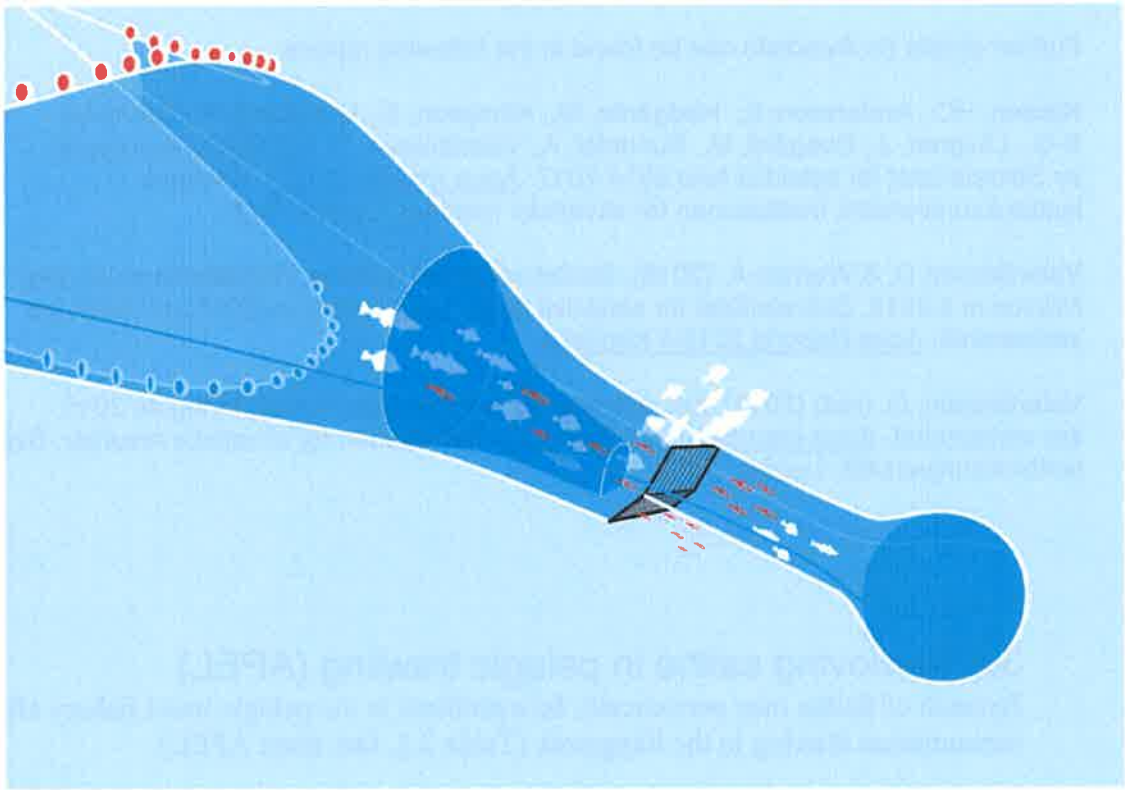
REAL-TIME CLOSURES - SAMPLING REPORT TO THE COASTAL STATE PANDALUS in relation to Minimum reference size.						
Inspection/ observation details	Inspection platform	Inspector/observer name	Inspector/observer name	Date and time (1) of inspection/ observation	Position (2) of inspection/observation	
Fishing vessel details	Name	Call sign	Registration number	Flag state	Type of gear Single/Double	Mesh size mm
Selection measures	Grid (for sorting out Pandalus)	Grid, mm	Other		Collection bag	Mesh size in collection bag
Fishing operation details	Start	Date and time (1)	Position (2)			
	Stop	Date and time (1)	Position (2)	Duration of fishing operation (3)		
Catch details	Estimated total catch in the haul (kg)					
	Estimated Pandalus catch in the haul (kg)					
	Size of Pandalus sample (kg/litre)					
	Total number of Pandalus in sample					
	Number of Pandalus below trigger size in sample					
	% of undersized Pandalus (number below the trigger size/total number)					
Observations and additional information	Additional information from other sources, e.g. received from master.					
Inspector Signature	Not required if completed electronically and transmitted to coastal state by e-mail					

(1) dd/mm/yy hh mm (local time 24 hours).
(2) e.g. 56°24' N 01° 30' E.
(3) hh mm.

Annex II - appendix iii

Selective grid in the fishery for Northern prawn to be allowed in the RTC

Bottom trawl with a mesh size in the extension piece and cod end of at least 35 mm, equipped with a sorting grid with a maximum bar spacing of 19 mm in the upper part of the grid and a minimum bar spacing of 9,5 mm in the lower part of the grid. Behind the lower part of the grid is an unblocked outlet to the seafloor. Mesh size of at least 35 mm applies posterior to the sorting grid.



The following are sections of SLUaqua's synthesis report on the gear trials with the selective grid in the pelagic fishery.

Nilsson, HC., Andersson, E., Hedgärde, M., Königson, S., Ljungberg, P., Lunneryd, S-G., Lövgren, J., Ovegård, M., Sundelöf, A, Valentinsson, D. (2018) Projects accomplished by the Selective Fisheries Secretariat 2014-2017: a synthesis report, Aqua reports 2018:13, Swedish University of Agricultural Sciences, Department of Aquatic Resources, Lysekil, 26 s.

Further details (in Swedish) can be found in the following reports:

Nilsson, HC., Andersson, E., Hedgärde, M., Königson, S., Ljungberg, P., Lunneryd, S-G., Lövgren, J., Ovegård, M., Sundelöf, A, Valentinsson, D. (2018) Syntesrapport av Sekretariatet för selektivt fske 2014-2017. Aqua reports 2018:9. Sveriges lantbruksuniversitet, Institutionen för akvatiska resurser, Lysekil, 24 s

Valentinsson D. & Wernbo A. (2018). Storleksselektivt räkfiske: Kombinationsrist räka. I Nilsson m fl 2018. Sekretariatet för selektivit fiske- rapportering av 2016 och 2017 års verksamhet. Aqua Reports 2018:4 Kapitel 9

Valentinsson, D. (red) (2016). Sekretariatet för selektiv fiske-Rapportering av 2015 års verksamhet. Aqua reports 2016:8 Kapitel 7. Institutionen för akvatiska resurser, Sveriges lantbruksuniversitet, Lysekil. 126 s.

3.5 Removing saithe in pelagic trawling (APEL)

Bycatch of Saithe may periodically be a problem in the pelagic trawl fishery after consumption Herring in the Skagerrak (Table 2.1, fact sheet APEL).

- Reduced by-catch of saithe in herring trawls by a flexible grid (APEL-1)
  - Aim: reducing bycatch of Saithe in Herring trawls.
  - Semi-pelagic trawl with grid (3x3.6 m large with 50 mm bar spacing) with positive attack angle.
  - Scientific evaluation was done by a video analysis.
  - The grid removed 98% of the bycatch of Saithe and 5 to 10% of the target species (Herring).
  - The flexible material in the grid prevented specimens above 53 cm to enter the codend, and was flexible enough to handle on the net drum.
  - The gear is used by some vessels, but is not the standard gear in the fishery.

Grid for eliminating saith from a semi-pelagic trawl

APEL-1

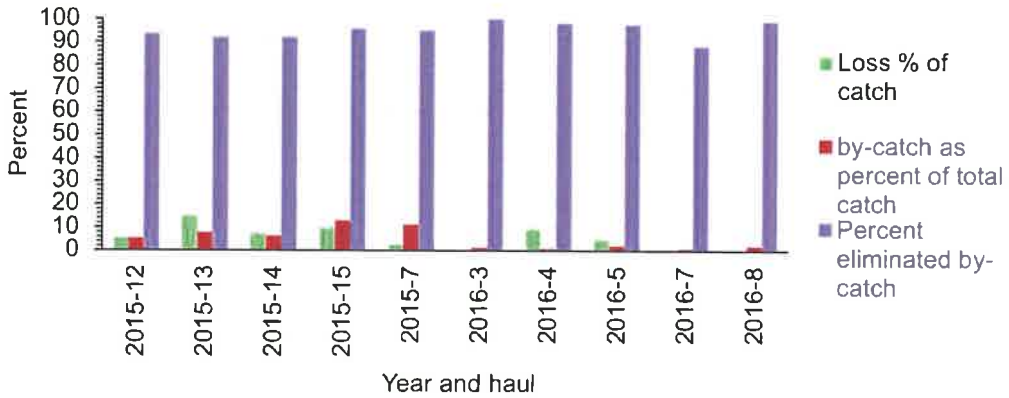
- facilitating escapement of large saith in a herring fishery

Fishery / target species: Herring for consumer market
Area: Skagerrak
Vessel: GG-330 Carmona, LOA 50 m / 2000 kW
Gear: Gloria 1032, semi pelagic trawl
Modification: Grid with exit in the bottom of the trawl

Gear design

Gear parameter	Grid
Width	3m
Height	3.6m
Material	Polyuretan
Slot posts	12mm
Slot width	50mm
Slot height	200mm

Results (Sorting efficiency and loss of catch)



Slutsats

- 98% elimination of unwanted by-catch, 5-10% loss of catch
- New stiffer material rejected fish > 53 cm to go through the grid
- Optimal size of exit. Increased size of exit facilitated the release of saith without affecting catch efficiency.

The Swedish Secretariat for Selective Fishing
Department of Aquatic Resources (SLU Aqua)

Contact: andreas.sundelof@slu.se
www.slu.se/selective-fishing

An image showing the assembly of the large grid into the nettings of a pelagic trawl.

Annex IV – Swedish research with the size-selective pandalus grid

The following are sections of SLUaqua's synthesis report on the gear trials with the size-selective pandalus grid in the Swedish pandalus fishery.

Nilsson, HC., Andersson, E., Hedgärde, M., Königson, S., Ljungberg, P., Lunneryd, S-G., Lövgren, J., Ovegård, M., Sundelöf, A, Valentinsson, D. (2018) Projects accomplished by the Selective Fisheries Secretariat 2014-2017: a synthesis report, Aqua reports 2018:13, Swedish University of Agricultural Sciences, Department of Aquatic Resources, Lysekil, 26 s.

Further details (in Swedish) can be found in the following reports:

Nilsson, HC., Andersson, E., Hedgärde, M., Königson, S., Ljungberg, P., Lunneryd, S-G., Lövgren, J., Ovegård, M., Sundelöf, A, Valentinsson, D. (2018) Syntesrapport av Sekretariatet för selektivt fske 2014-2017. Aqua reports 2018:9. Sveriges lantbruksuniversitet, Institutionen för akvatiska resurser, Lysekil, 24 s

Valentinsson D. & Wernbo A. (2018). Storleksselektivt räkfiske: Kombinationsrist räka. I Nilsson m fl 2018. Sekretariatet för selektivit fiske- rapportering av 2016 och 2017 års verksamhet. Aqua Reports 2018:4 Kapitel 6.

Nilsson, H. (red) (2018). Sekretariatet för selektiv fiske-Rapportering av 2014 års verksamhet. Aqua reports 2018:2 Kapitel 3. Sveriges lantbruksuniversitet, Institutionen för akvatiska resurser, Lysekil, 63 s.

Valentinsson, D. (red) (2016). Sekretariatet för selektiv fiske-Rapportering av 2015 års verksamhet. Aqua reports 2016:8 Kapitel 1. Institutionen för akvatiska resurser, Sveriges lantbruksuniversitet, Lysekil. 126 s.

■ Combination grid for *Pandalus* trawls (APRA-1)

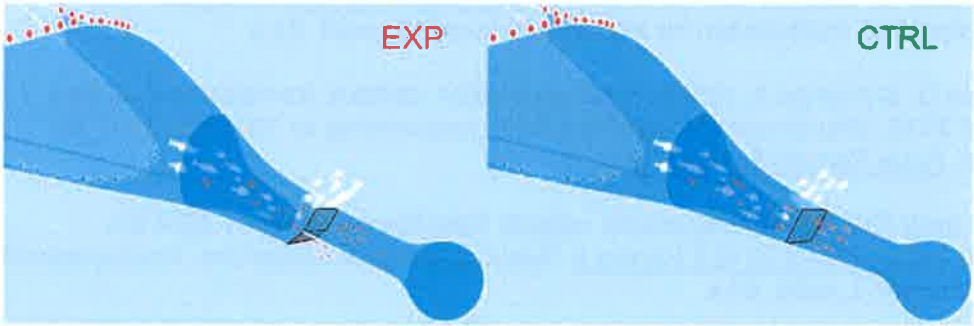
- Aim: improved size selectivity for *Pandalus*.
- A two-section Nordmøre grid that combines species- and size selectivity in *Pandalus* trawls. The lower grid section has narrow (9-10 mm) bar spacing to sort out small shrimp and the upper grid section has standard 19 mm bar spacing to sort out fish.
- The combination grid sorted out unwanted sizes of *Pandalus* effectively. At least 60 % of the smallest shrimp fraction was sorted out, but also catches of medium sized (industrial) shrimp was reduced significantly.
- Loss of the largest (fresh consumption) shrimps was around 5 % but is affected by the choice of lower grid bar spacing
- The combination grid is legal to use but additional incentives are probably needed due to marginal industry up-take.

A combination grid for Northern prawn trawls

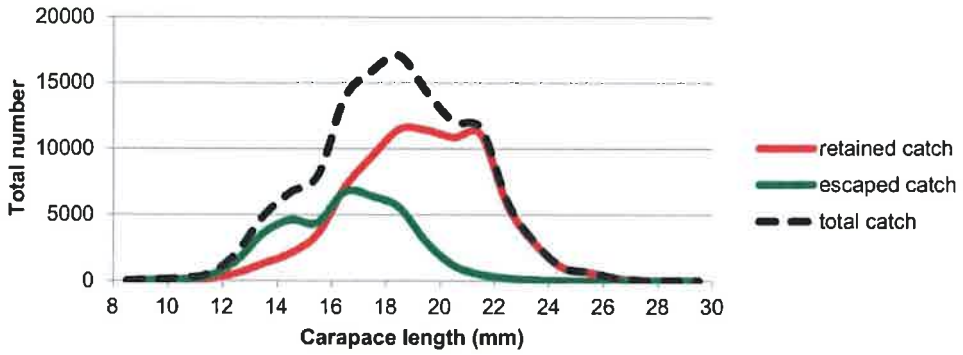
- to reduce catches of small Pandalus

Fishery / target species: Bottom trawling for Northern prawn (*Pandalus borealis*)
Area: Skagerrak, Kattegatt and eastern North Sea (ICES divisions 3.a and 4.a East)
Vessels: SD 511 Eros III, LOA 15,3 m / 245 kW och GG 707 Arkö, LOA 26,1m/736 kW
Gear: Northern prawn trawl with Nordmøre grid
Gear modification: A two-section Nordmøre grid that combines species- and size selectivity in *Pandalus* trawls. The lower grid section has narrow (9-10 mm) bar spacing to sort out small shrimp and the upper grid section has standard 19 mm bar spacing to sort out fish by-catches

Experimental design (**EXP**=experimental trawl, **CTRL**= standard trawl)



Results (retained and escaped *Pandalus* by size)



Conclusions

- The combination grid sorted out unwanted sizes of *Pandalus* effectively. At least 60 % of the smallest shrimp fraction was sorted out, but also catches of medium sized (industrial) shrimp was reduced significantly.
- Loss of the largest (fresh consumption) shrimps was around 5 % but was affected by the choice of lower grid bar spacing
- The combination grid is legal to use but additional incentives are probably needed due to limited up-take in the fishery

The Swedish Secretariat for Selective Fishing
Department of Aquatic Resources (SLU Aqua)
contact: daniel.valentinsson@slu.se
www.slu.se/selektivtfiske

Cruise report
S 486 Sajoni

Test of sorting grids in the shrimp fishery in Skagerrak

DTU Aqua: Jordan P. Feekings, Rikke P. Frandsen, Tiago Veiga Malta and Flemming Thaarup

SLU: Baldvin Thorvaldsson

March 2018

Summary

In the beginning of March 2018, DTU Aqua tested the Swedish shrimp grid against a standard shrimp grid. Both grids have a bar spacing of 19 mm, while the Swedish grid also has an escape grid with 10 mm bar spacing mounted in the bottom of the grid. The escape grid is designed to let out the smallest size fraction of shrimps. A technician from SLU (Swedish University of Agricultural Sciences) who has experience in fishing with this sort of grids, was present throughout the trial.

The trial was planned for a season with large amounts of small shrimps in the catches. This was to ensure that there would be sufficient data in the length classes where an effect could be expected. The two grids were fished in parallel in a twin rig system and the catches were processed in accordance with best scientific practice for this experimental setup. The fishery followed commercial practice with regards to choice of fishing grounds, tow speed and tow duration, and total catches per trawl ranged from 150-900 kg.

No significant effect of the extra grid section was found for any fraction or size group of *Pandalus.*

When comparing landed weights of cooked shrimps and raw shrimps (which on this vessel includes the very smallest shrimps) the result is the same; no significant difference between the two gears.

The Swedish grid section was constructed, and the grid mounted, by a Swedish net maker who produces these grids. According to our Swedish colleague, the Swedish grid was mounted correctly. Underwater footage showed that the extra section of the Swedish grid was being blocked by shrimps early in the tow. This is the most likely explanation for the lack of effect.

Trials were conducted on board the modern shrimping vessel S486 Sajoni. The crew is used to handle a grid but found the Swedish grid difficult because it is longer than the standard grid.

Resumé

I begyndelsen af marts 2018 gennemførte DTU Aqua et forsøgsfiskeri for at sammenligne fangsterne I en svensk rejerist og en standard rist. Begge riste har en tremmeafstand på 19 mm. I forlængelse af denne rist, har den svenske rist en sektion med 10 mm tremmeafstand. Denne sektion er placeret under den anden og dens formål er at lade de mindste rejer slippe ud. En tekniker fra SLU (Swedish University of Agricultural Sciences) der har stor erfaring med at fiske med denne slags rist, deltog i hele forsøget.

Forsøget blev gennemført i en periode hvor der er store forekomster af små rejer. Dette skulle sikre at en effekt af den ekstra rist-sektion ville fremgå af forsøget. De to riste blev fisket parallelt på hver sin tvillingetrawl og fangsterne blev oparbejdet efter den bedste videnskabelige foreskrifter. Fiskeriet fulgte kommerciel praksis med hensyn til valg af fiskegrund, slæbehastighed, slæbelængde og fangsterne per trawl lå mellem 150 og 900 kg.

Der var ingen signifikant effekt af at tilføje den ekstra rist sektion på nogle af de målte størrelsesgrupper af *Pandalus*.

Ligeledes var der ingen signifikant forskel mellem de to riste på den landede vægt af hhv kogte og rå rejer (på dette fartøj indeholder fraktionen af rå rejer også de allermindste rejer).

Den svenske rist var produceret og monteret i Sverige af en vodbinder der er specialiseret i dette. Ifølge vores svenske kollega var risten monteret korrekt. Undervandsoptagelser viser at den nederste sektion af risten blev blokeret af rejer tidligt i slæbet. Dette kan forklare fraværet af en effekt.

Forsøgene blev gennemført på den moderne rejetrawler S486 Sajoni. Mandskabet er vant til at håndtere riste men havde svært ved at få den svenske rist om bord og på tromlen. Dette skyldes at den er længere end standard risten.

Introduction

In Skagerrak, Swedish, Norwegian, and Danish fishermen share the quota for deep water shrimp (*Pandalus borealis*). Meshes in the codends are small, and to avoid high discards of fish, a 19 mm grid is mandatory. Due to national differences in quotas, Danish, Norwegian, and Swedish fishermen aim for different catch compositions. As a result, Norway and Sweden wish to minimize catches of small shrimps while this fraction of the catch composes an important part of the revenue for the Danish fishermen.

To reduce catches of small shrimp, Norway and Sweden have developed similar versions of the same grid. In these grids, the lower part has a bar distance of app. 10 mm and allows shrimp below this size to escape. Initial trials have indicated that the use of this kind of grid may also increase catches of the large "Cooked" fraction which potentially compensates for the loss of small shrimps.

To investigate the applicability of this sort of grid in the Danish fishery, it was decided to test a Swedish model of the two-section grid against the standard one-section grid on board a Danish vessel. Trials were conducted in early spring where catches of small shrimps are known to be high.

The objectives of the trial were to:

1. Compare size distribution in catches of *Pandalus* between the two grid systems
2. Evaluate handling of the two-section grid
3. Evaluate the applicability of the two-section grid in a Danish fishery

Materials and methods

The trial was conducted from the 8th to the 15th of March 2018. We fished on known fishing grounds in Skagerrak on board the Danish shrimp trawler S486 Sajoni. The two grids were fished in parallel in a twin rig system and the catches were processed in accordance with best scientific practice for this experimental setup. The fishery followed commercial practice with regards to choice of fishing grounds, tow speed and tow duration.

Sajoni is a 28 m long twin trawler equipped to process shrimp and with capacity and quota for fish by-catch as well. Besides the skipper, the vessel has two crew members. Throughout the trial, a technician from SLU (Swedish University of Agricultural Sciences) with experience in fishing with this sort of grid, participated.

We used the vessel's own two trawls which are identical and only a few months old (Appendix 1). The two-section grid was mounted by a Swedish netmaker to ensure that it followed the Swedish standards. In the following, this grid is referred to as the "Swedish grid". The one-section grid was mounted by the vessels own netmaker in Denmark. This grid is referred to as the "Standard grid". The two grids were fished simultaneously in the twin trawl setup. Midway through the cruise, codends were shifted between the two trawls.

To monitor the performance of the grids we used underwater cameras (GoPro Hero 4 in an aluminum housing (depth 300 m)) with light (INON LF-3100EW) and tilt sensors (StarOddi).

The Swedish grid

The grid was made of plastic and molded in one piece (Appendix 2, Fig. 1C). The bar distance in the upper section was 19 mm and 10 mm in the lower section. There was an escape hole in the top of the grid to guide catch that was unable to pass between the bars into a 170 mm fish codend, where the first 3 meters was made of square meshes. The grid was mounted in a net section with 36 mm netting and had a guiding panel in front of it. According to our Swedish colleagues, the upper and lower sections of the grid are mounted at approximate angles of 50 and 26 degrees respectively.

Fig 1. The standard grid being mounted by a Danish netmaker (A), The Swedish (port side) and Standard (starboard side) grid at the end of a haul (B), and the Swedish grid mounted in the grid section and ready to be installed in the trawl.

The Standard grid

The standard grid was made of plastic (Appendix 3, Fig1A). As for the Swedish grid, there was a guiding panel in front of the grid and the codend had an escape hole in top of the grid and a fish codend to retain large fish by-catch. The standard grid is to be mounted at an angle of approximately 55 degrees.

The shrimp codends

Both shrimp codends were made of dyed nylon netting. They were made for the trial by the Danish net maker and had a nominal mesh size of 38 mm. The codends were measured with an Omega Gauge before and after the trials. Mean mesh size of the Standard and the Swedish codends were 35.9 mm (95% confidence range: 35.8 – 36.1 mm) and 37.2 mm (95 % confidence range: 37.1-37.4 mm) respectively. Though ordered to be identical there is a small but significant ($p<0.01$) difference in mesh size between the two codends.

The catch

The catch was processed separately for the two gears. Sorting and processing of the shrimps is fully automatic; fish, soft shelled *Pandalus*, and some specimens of other species of shrimps () are discarded while the remaining catch passes two graters with 10.5 mm bar spacing. All shrimps smaller than this are landed raw while the remaining catch is cooked, cooled, and landed as cooked shrimps. Subsamples of the different fractions of the catch were taken while the catch was being processed. 2 kg of the cooked shrimps were sampled from cargo, 1.5 kg raw shrimps were sampled underneath the grater and a sample of 2 kg of the discard shrimp was taken after a subsample of the discard had been sorted into the shrimp and fish fractions. As described above, the discard is composed of small individuals of fish, other species of shrimps and soft shelled *Pandalus*. By weight, the discard was dominated by Norway pout (12 - 49%) and other shrimp species than *Pandalus* (20 - 61%).

All specimens of cod, witch and pollock retained in the fish codend were measured and the result was used as an indicator of equal fishing effort of the two trawls.

Data analysis

Catch at length of *Pandalus* was analysed in a catch comparison setup using the SELNET software as described by Wienbeck et al. (2014). Catch weight of different species and fractions were compared in paired t-tests and plotted with 95% confidence limits.

Results

10 valid (and 2 invalid) hauls were sampled at depth ranging from 210 meters to 392 meters (table 1). Shrimps ranged in carapace length from 9 to 39 mm. From each fraction of the shrimp catch, 60 to 575 (average 280) specimens were measured, resulting in a total of 20 144 individuals (Fig. 2). Total catches per trawl ranged from 150-900 kg (Table 2).
Temperature at the surface was just below zero and on the bottom it was around 7°C.

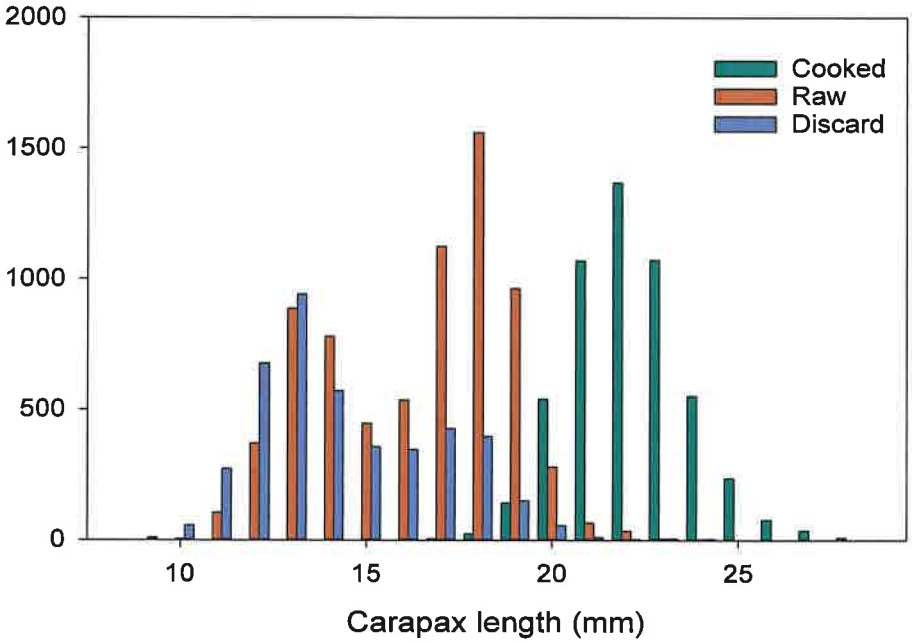


Figure 2. Length distribution of measured *Pandalus* in the different fractions of the catch.

Mean angle of the Swedish grid was measured to be 50.3 (95% confidence range 49.5 - 51.0 degrees) and 24.0 degrees (95% confidence range 22.5 – 25.5 degrees) respectively in the upper and lower sections. This is similar to the angles with which it is mounted. The standard grid was measured to have a mean angle of 36.9 (95% confidence range 35.7 - 38.0 degrees) which was somewhat lower than the intended 55 degrees.

Table 1. Haul information. N.A. means "no available information".

Haul	Depth (m)	Tow duration (h)	Tilt: Swedish 19/10	Tilt: Standard 19
1	INVALID			
2	241.5	10	N.A.	N.A.
3	234.8	8	N.A.	N.A.
4	210.4	9	52 ° / N.A.	39 °
5	230.9	6	51 ° / N.A.	37 °
6	279.0	9	51 ° / N.A.	40 °
7	370.8	10.5	N.A. /27 °	36 °
8	INVALID			
9	376.2	7	50 ° / 22°	35 °
10	392.4	5	49 ° / 24 °	35 °
11	288.0	6	49 ° / 23 °	37 °
12	242.1	5.5	50 ° / 24 °	36 °
Mean	286.6	7.6	50.3 ° / 24.0 °	36.9 °
95 % confidence	40.16	1.15	0.76 ° / 1.47 °	1.17 °

Catches

There was no significant difference between catch weights of large fish in the fish codends ($p > 0.05$) indicating that fishing effort of the two codends was similar (Fig. 3).

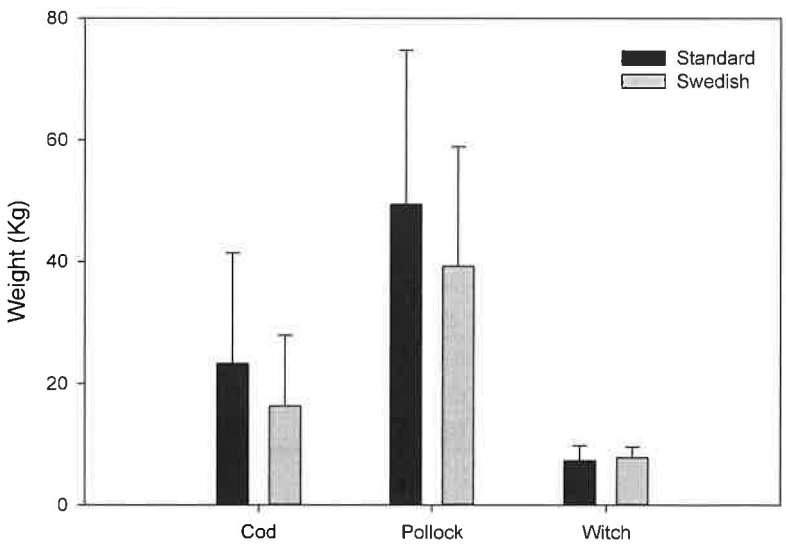


Fig. 3. Weights of cod, pollock and witch in the fish codends of the two gears.

Total catches in the shrimp codend ranged from 151 kg to 898 kg (Table 2). The proportions of raw and cooked varied greatly among areas and depths but there was no significant differences in either fraction between the two gears (p>0.1). The amount of *Pandalus* in the discard also varied between hauls but with no significant effect between the gears (p>0.1).

On average 12 % of the "raw" fraction consisted of other shrimp species than *Pandalus* – mainly *Pasiphaea tarda*. In Denmark, these shrimps are landed together with the raw *Pandalus*.

Table 2. Total weights (kg) of catches of *Pandalus*, Norway Pout, other species of shrimp (shrimp sp.) and other species of fish (fish sp.). Standard deviation (st.dev.) and the 95% confidence limits are given. Haul 1 and 8 were invalid. In haul 1 the standard grid was mounted incorrectly and in haul 8, the Swedish grid had twisted

	Cooked	Raw		Discard				Total
	Pandalus	Pandalus	Shrimp sp.	Pandalus	Shrimp sp.	Norway pout	Fish sp.	
Standard								
2	70	533	107	28	65	52	38	893
3	70	325	35	39	121	119	103	811
4	90	187	73	4	68	43	20	486
5	45	98	12	19	252	91	35	552
6	17	261	39	24	45	44	12	442
7	12	500	20	25	41	34	10	642
9	8	265	15	12	18	35	7	360
10	5	145	15	7	28	16	8	224
11	8	167	13	13	18	20	11	250
12	10	74,2	5,8	20	25	7	8	150
Mean	33,5	255,5	33,5	19,0	68,1	46,1	25,2	480,9
st.dev.	30,6	149,7	30,8	9,9	68,1	32,8	28,1	235,5
95% confidence	19,0	92,8	19,1	6,1	42,2	20,3	17,4	146,0
Swedish								
2	55	421	99	30	58	65	51	780
3	70	283	87	37	205	65	152	899
4	75	202	78	9	83	24	32	503
5	40	86	14	8	197	79	39	463
6	14	164	26	9	45	14	15	287
7	15	519	41	56	71	115	25	842
9	8	307	13	36	48	75	22	509
10	3	178	22	9	39	32	11	294
11	10	242	18	31	31	69	19	420
12	10	93	7	20	25	43	14	212
Mean	30,0	249,5	40,5	24,7	80,2	58,1	38,0	521,0
st.dev.	26,2	131,3	32,6	15,3	62,7	28,6	39,8	229,9
95% confidence	16,2	81,4	20,2	9,5	38,8	17,7	24,7	142,5

Effect of the grid

Figure 4 shows the relative shrimp catches in the two grids. At a "Catch comparison" value of 0.5, catches in the Swedish grid are similar to those of the standard grid. If the Swedish grid works as it is designed to, the smaller length groups will have values below 0.5. However, 0.5 is within the 95% confidence limits (dotted line) for all length classes which means that there is no significant difference in catches of any size fraction of *Pandalus* in the two grids.

When comparing landed weights of cooked shrimps and raw shrimps (which on this vessel includes the very smallest shrimps) the result is the same; no significant difference between the two gears (p>0.1) (Table 2).

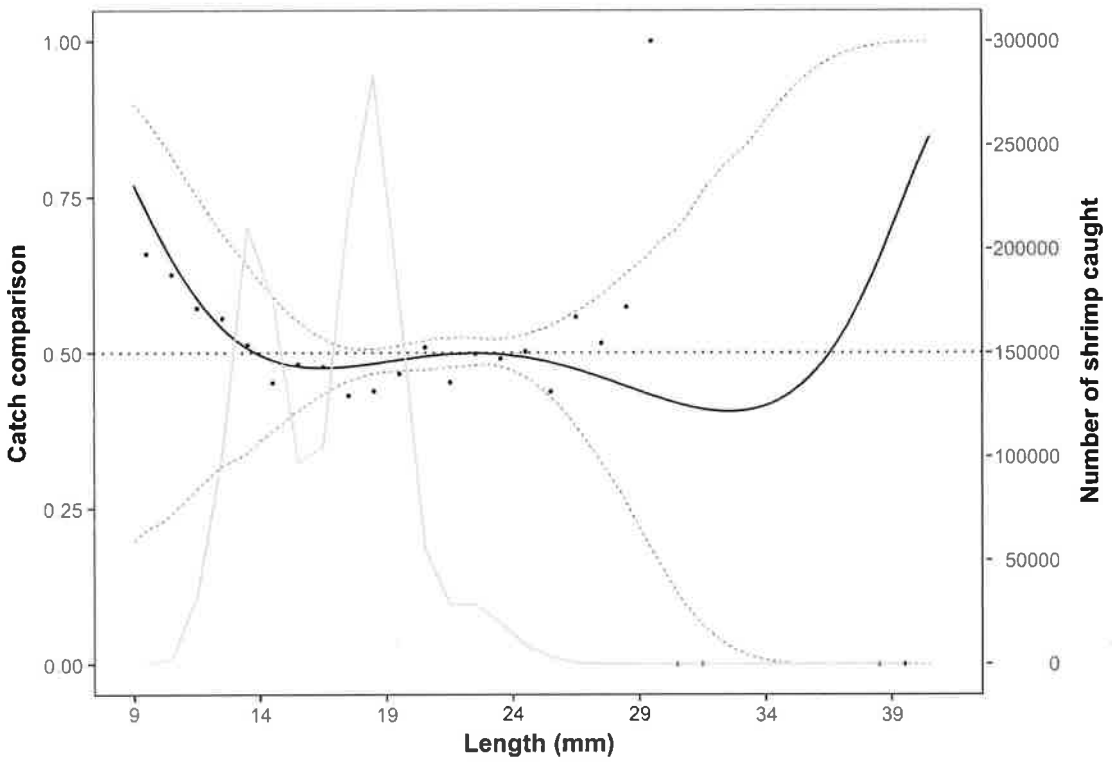


Figure 4. Catch comparison analysis of the length distributions of *Pandalus* in the two gears.

The Swedish grid section was constructed, and the grid mounted in the grid section, by a Swedish net maker who produces these grids. According to our Swedish colleague who joined the cruise, the Swedish grid was mounted correctly and it appeared clean when it came on deck. However, underwater footage showed that the 10 mm section of the Swedish grid became blocked by shrimps early in the tow (Figure 5). This is the most likely explanation for the lack of effect. Blocking of the lower grid section has also been observed in similar grid systems tested in Swedish and Norwegian waters (Daniel Valentinsson and Robert Misund pers.com.).

The small difference in mesh sizes of the two shrimp codends may have obscured an effect of the Swedish grid. However, the difference in mesh size (1.3 mm corresponding to 3.6%) is expected to be too small to result in a size selective effect of the magnitude that was expected from the addition of the extra section of the grid.

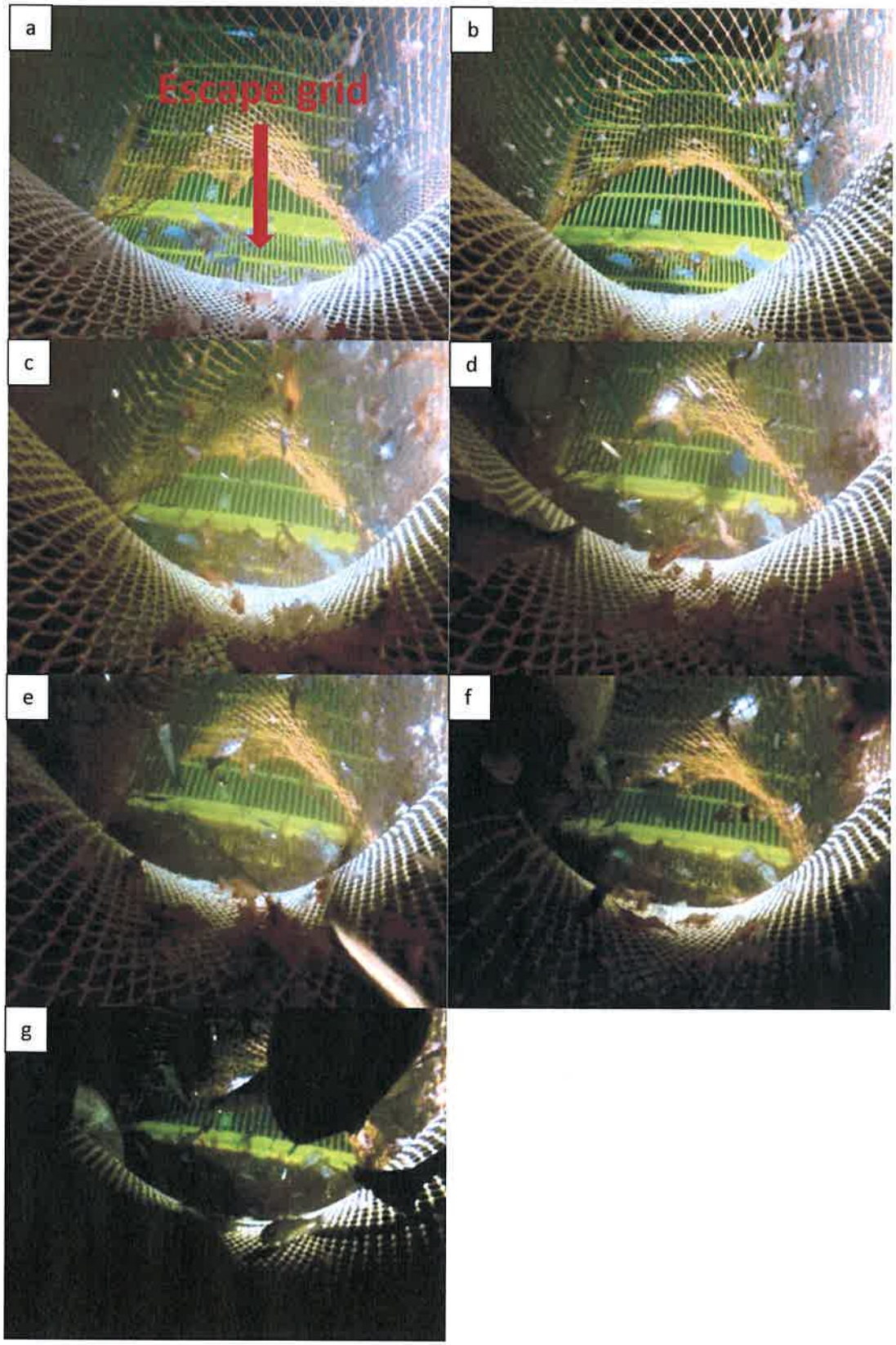


Figure 5. Screen dumps from video recordings of the Swedish grid during the first hour of fishing. a) start of the haul, b) 10 min into haul, c) 20 min into haul, d) 30 min into haul, e) 40 min into haul, f) 50 min into haul, g) 60 min into haul.

Handling of the grids

Trials were conducted on board the modern shrimping vessel S486 Sajoni. The crew is used to handle a grid but found the Swedish grid difficult because it is longer than the standard grid. The grid is therefore difficult to get on deck and fit on the drum.

The fishermen also noticed that the "Standard" grid was better at returning to its original shape after having been bent on the drum.

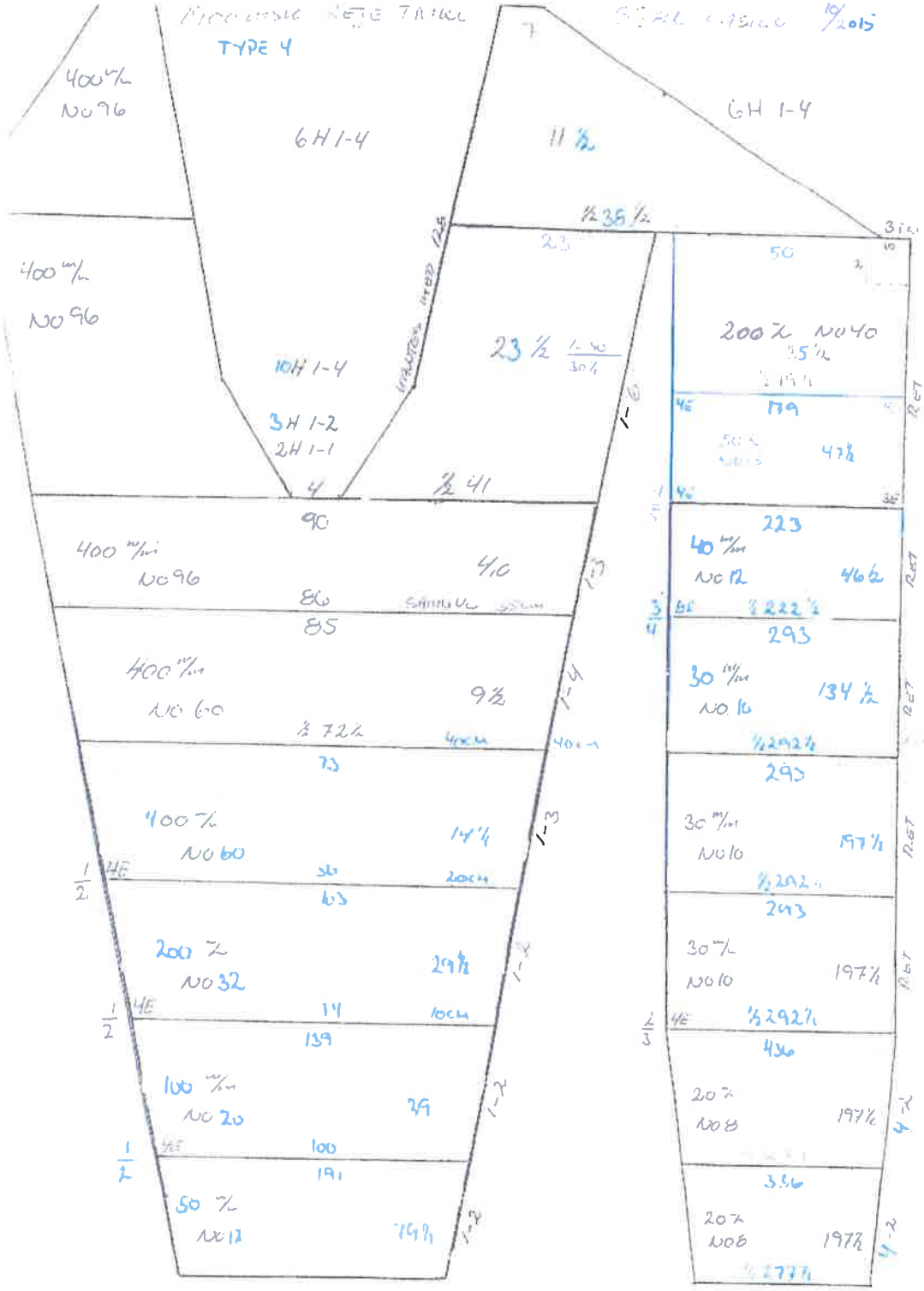
Applicability of the "Swedish grid" in the Danish fishery.

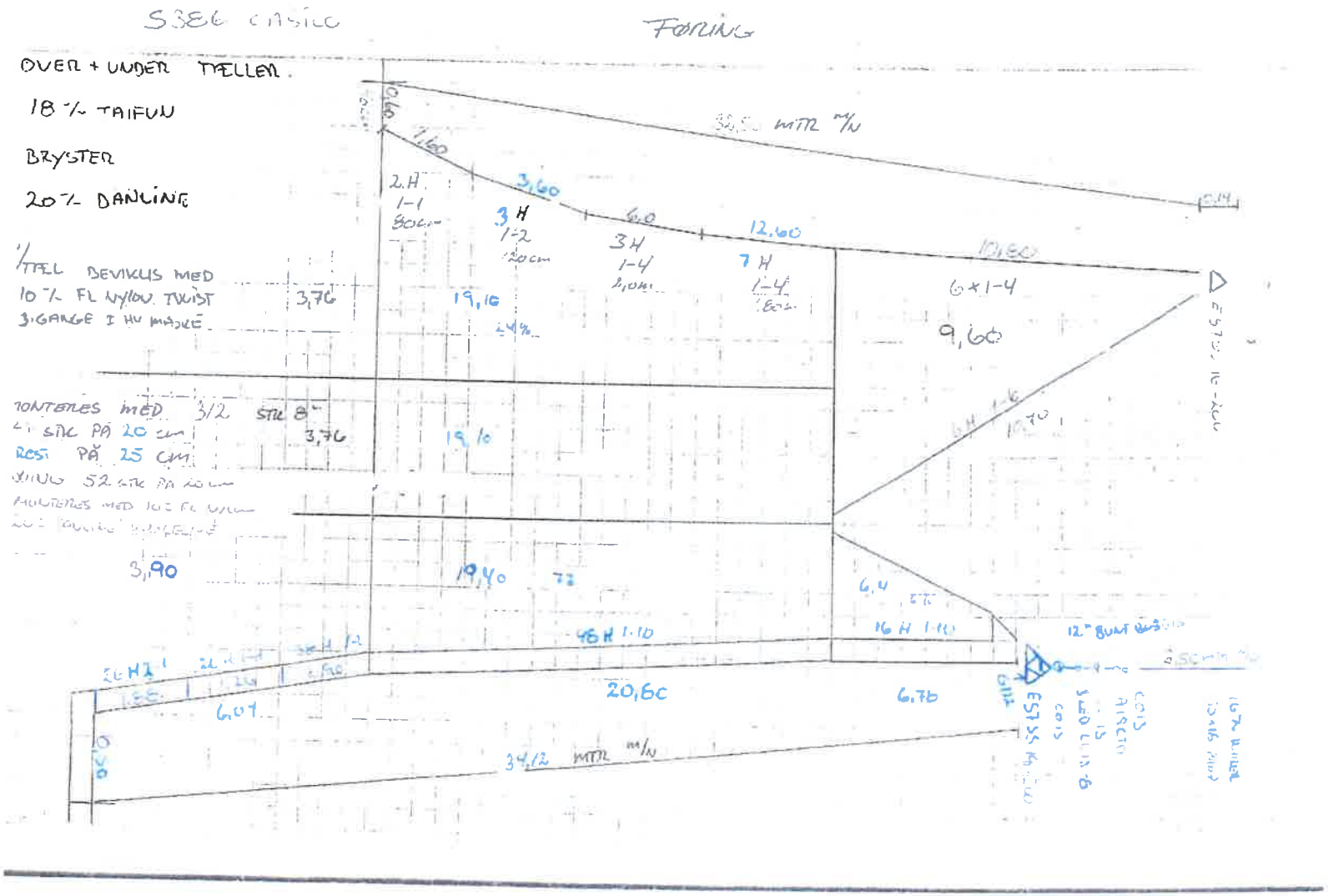
Without any documented effect of the extra grid section on the catch of small shrimp, there is no justification for introducing a new gear which is more difficult to handle and will represent an extra cost to the vessel.

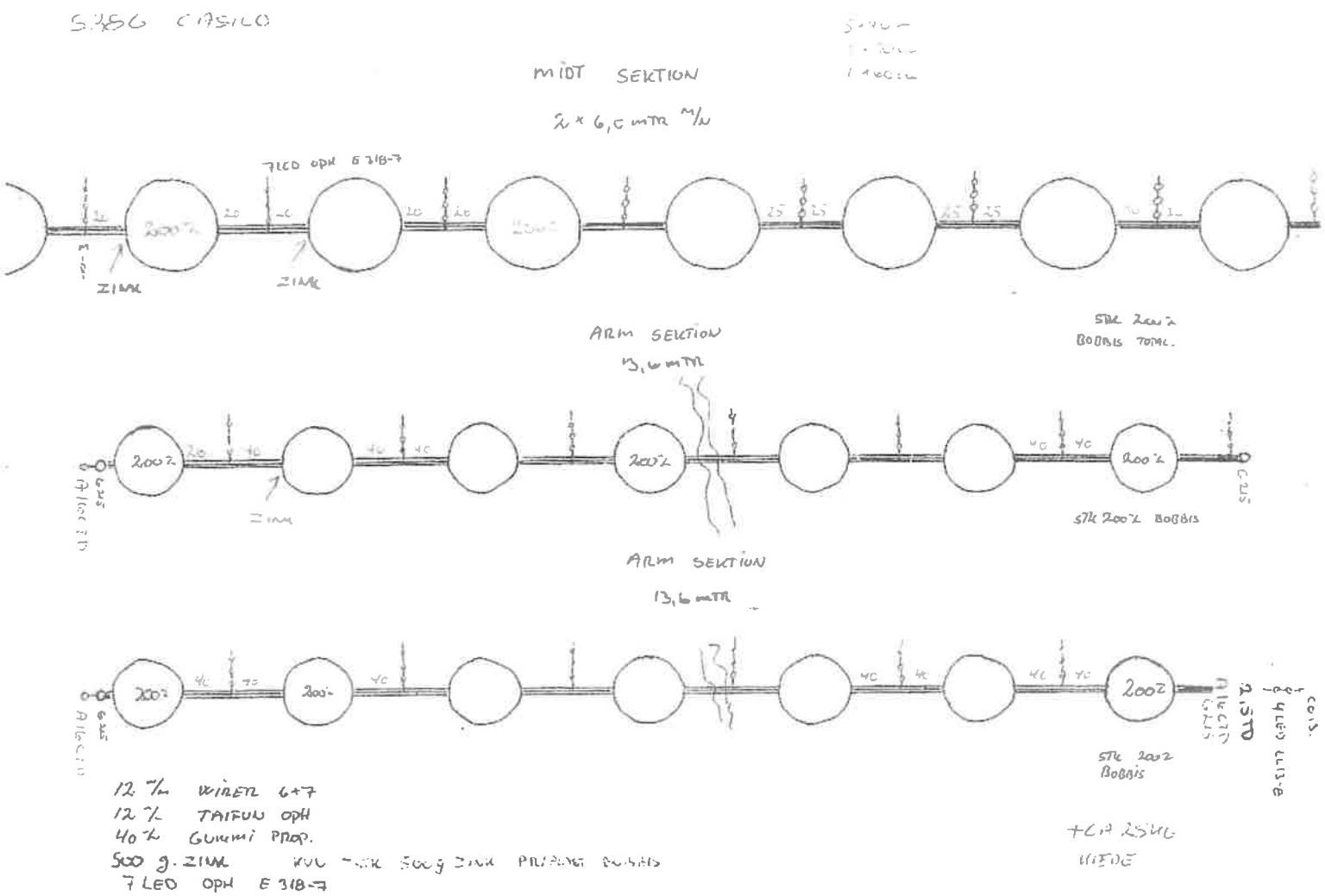
References

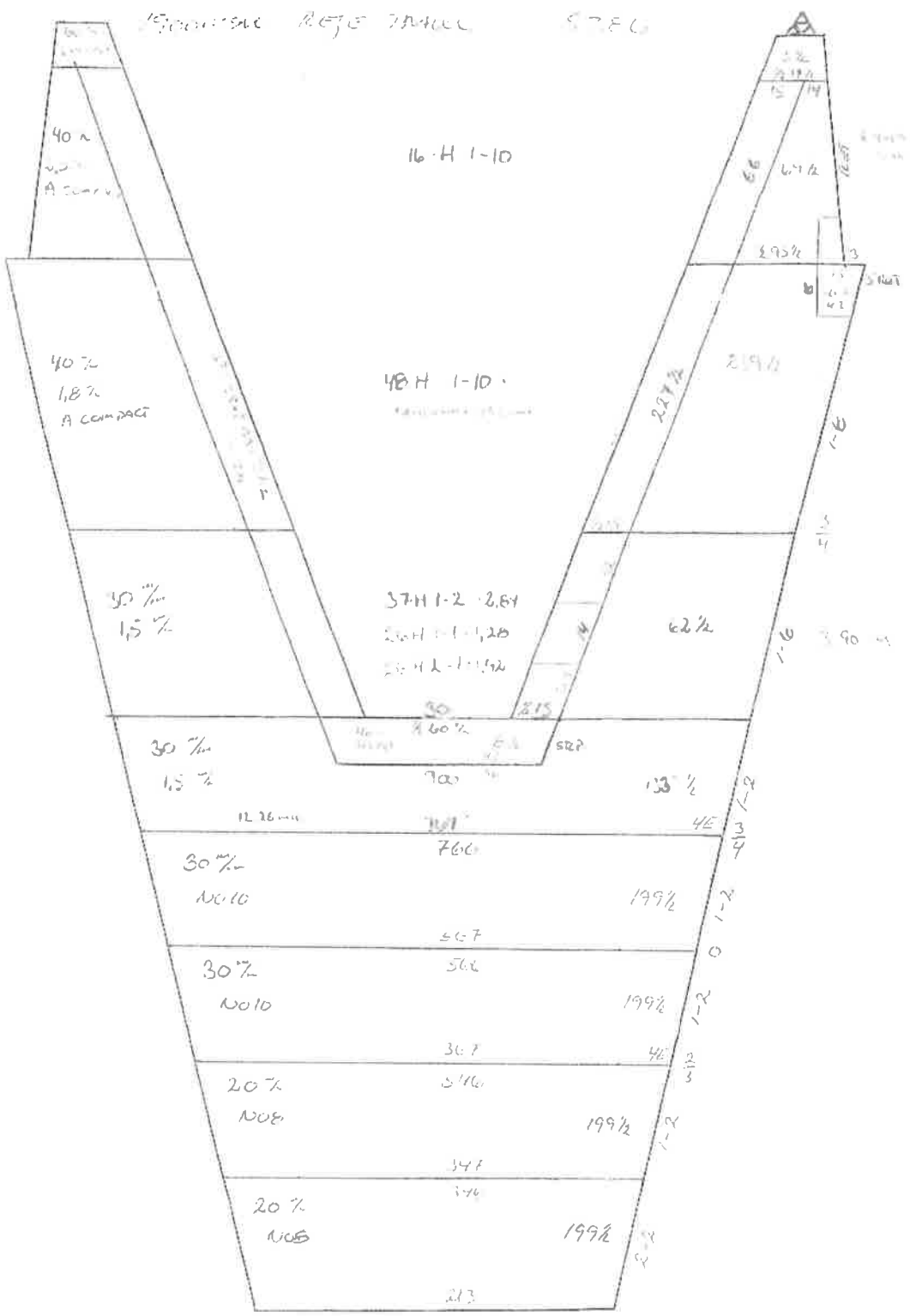
Wienbeck, H, Herrmann, B., Feekings, J.P., Stepputtis, D., Moderhak, W. 2014. A comparative analysis of legislated and modified Baltic Sea trawl codends for simultaneously improving the size selection of cod (*Gadus morhua*) and plaice (*Pleuronectes platessa*). Fisheries Research 150 (28-37).

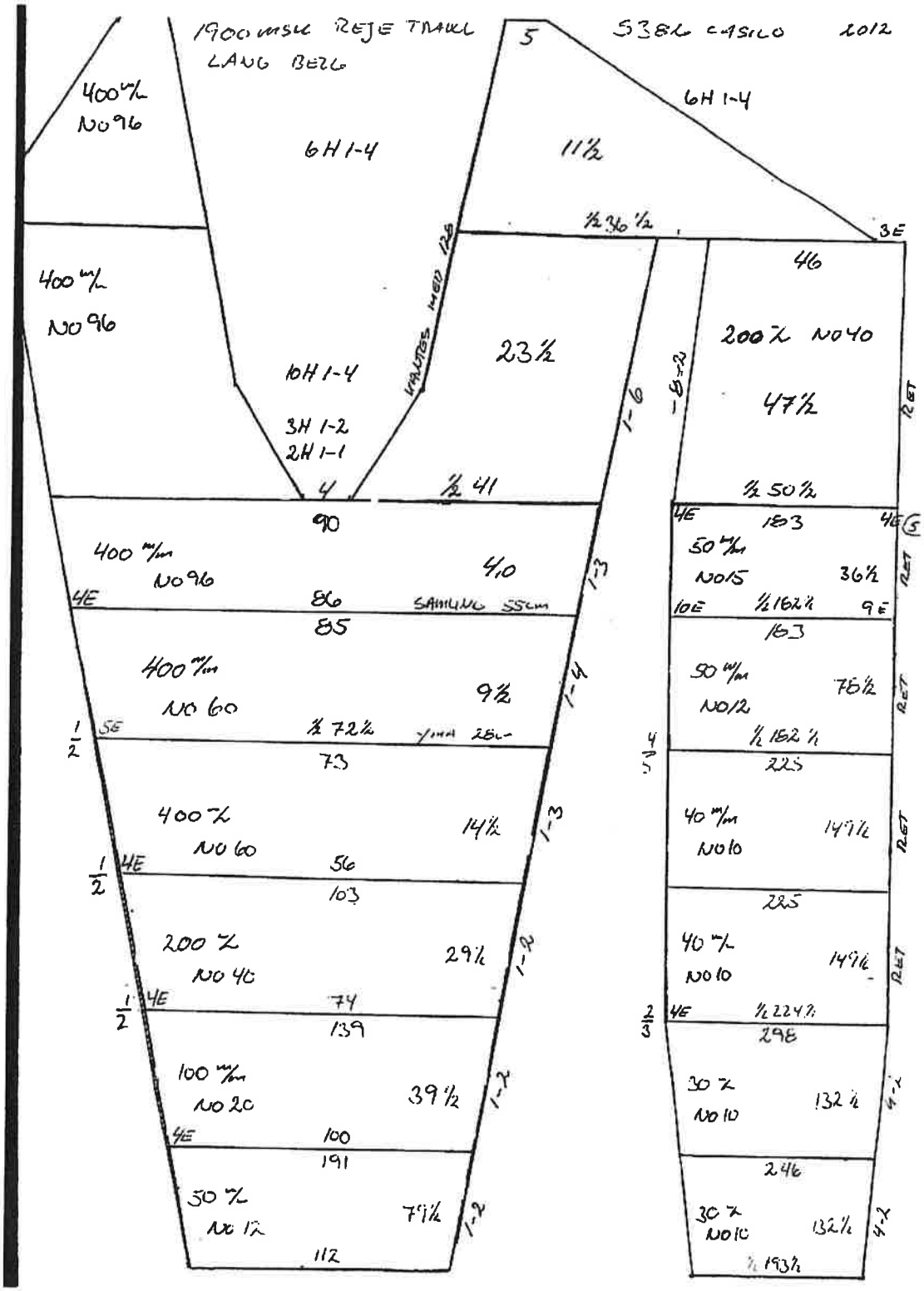
Appendix 1 – The trawls

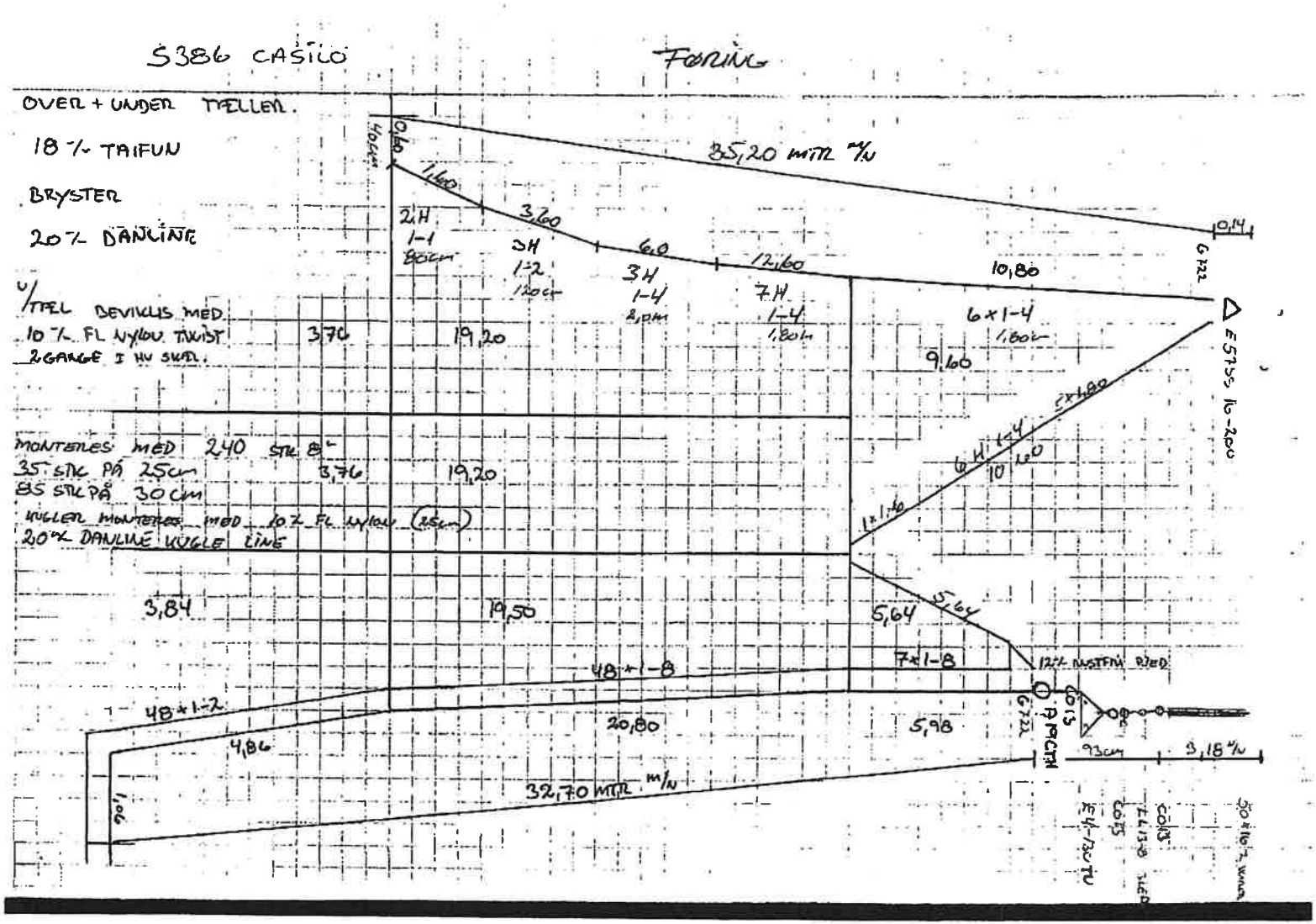



FØRING
OVER + UNDER TELLER.
18 % TAIFUN
BRYSTER
20 % DANLINE
1/TEL DEVIKLIS MED
10 % FL NYLON TWIST
3-GANGE I HV MASKE
MONTERES MED 3/2 STK 8"
3,76
19,10
3,90
19,40
20,60
6,07
6,76
9,60
34,12 MTR M/N
3,60
12,60
10,60
6×1-4
7 H
1-4
3 H
1-4
3 H
1-2
2 H
1-1
16 H 1-10
12" BUNT

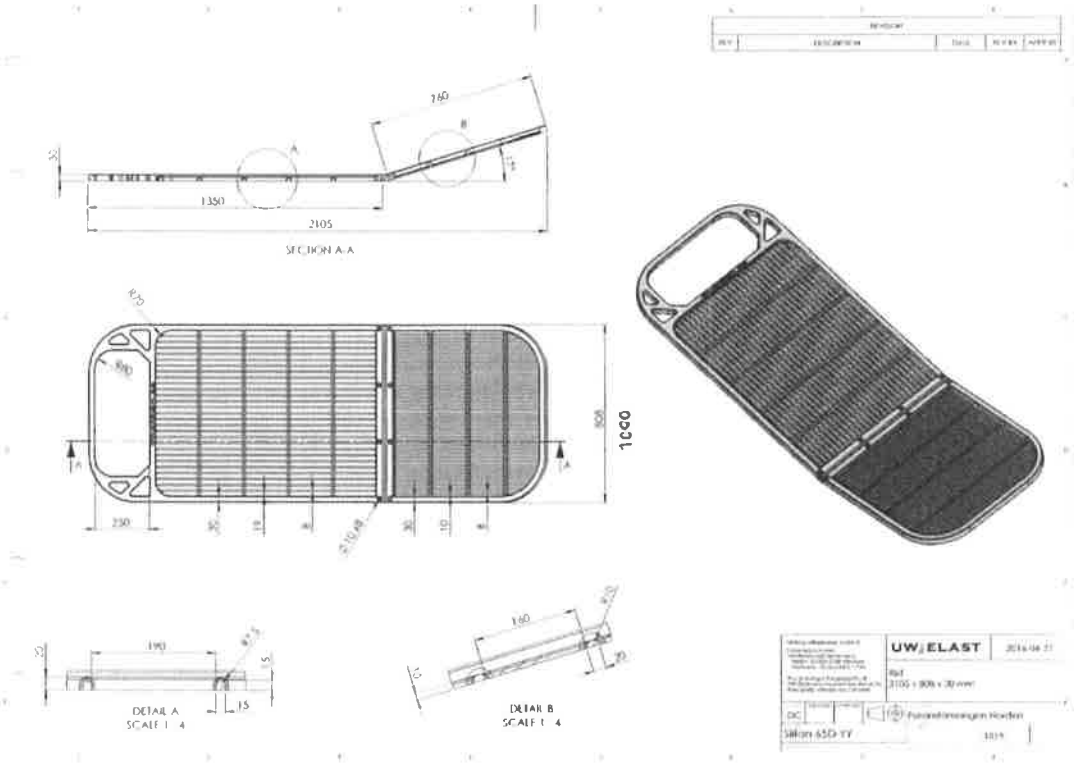

MIDT SEKTION
2 x 6,0 mtr M/N
7LED OPH E 318-7
ZINK
ZINK
STK 200 L
BOBBIS TOTAL.
ARM SEKTION
13,6 mtr
200 L
ZINK
STK 200 L BOBBIS
ARM SEKTION
13,6 mtr
200 L
STK 200 L
BOBBIS
12 % WIRER 6+7
12 % TAIFUN OPH
40 % GUMMI PROP.
500 g. ZINK
7 LED OPH E 318-7
+CA 25 KG
WIDE


16 H 1-10
40 %
1,8 %
A COMPACT
30 %
1,5 %
30 %
1,5 %
30 %
NO 10
30 %
NO 10
20 %
NO 8
20 %
NO 8
199 %
199 %
199 %
199 %
62 %


1900 MSL REJE TRAIL
LANG BELG
5
SSEL CASILO 2012
400 m/h
NO 96
6H 1-4
6H 1-4
11½
½ 36 ½
3E
400 m/h
NO 96
10H 1-4
3H 1-2
2H 1-1
4
VALITES MED 12B
23½
1-6
1-3
1-4
1-3
1-2
1-2
1-2
½ 41
90
400 m/m
NO 96
4,0
4E
86
SAMLING 55cm
85
400 m/m
NO 60
9½
1/2
5E
½ 72½
73
400 m
NO 60
14½
1/2
4E
56
103
200 m
NO 40
29½
1/2
4E
74
139
100 m/m
NO 20
39½
4E
100
191
50 m
NO 12
79½
112
46
200 m NO 40
47½
RET
½ 50½
4E
153
4E
5
50 m/m
NO 15
36½
RET
10E
½ 162½
9E
153
50 m/m
NO 12
75½
RET
4/5
½ 162½
225
40 m/m
NO 10
149½
RET
225
40 m
NO 10
149½
RET
2/3
4E
½ 224½
298
30 m
NO 10
132½
246
30 m
NO 10
132½
½ 193½


S386 CASILO
FØRING
OVER + UNDER TRELLER.
18 % TAIFUN
BRYSTER
20 % DANLINE
U/TREL DEVIKLIS MED
10 % FL NYLON TVINST
2 GANGE I HV SKEL.
MONTERES MED 240 STK 8"
35 STK PÅ 25cm
85 STK PÅ 30 cm
KULLER MONTERES MED 10 % FL NYLON (25cm)
20 % DANLINE KULLE LINE
35,20 MTR M/N
32,70 MTR M/N
3,18 M/N
12% MASTFIN RØD
48×1-8
48×1-2
7×1-8
6×1-4
E5755 10-200

Appendix 2 – The Swdish grid



Appendix 3 – The Standard grid

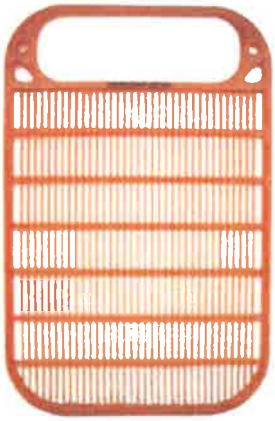
OMF A/S OCEAN MARINE & FISHING GEAR A/S

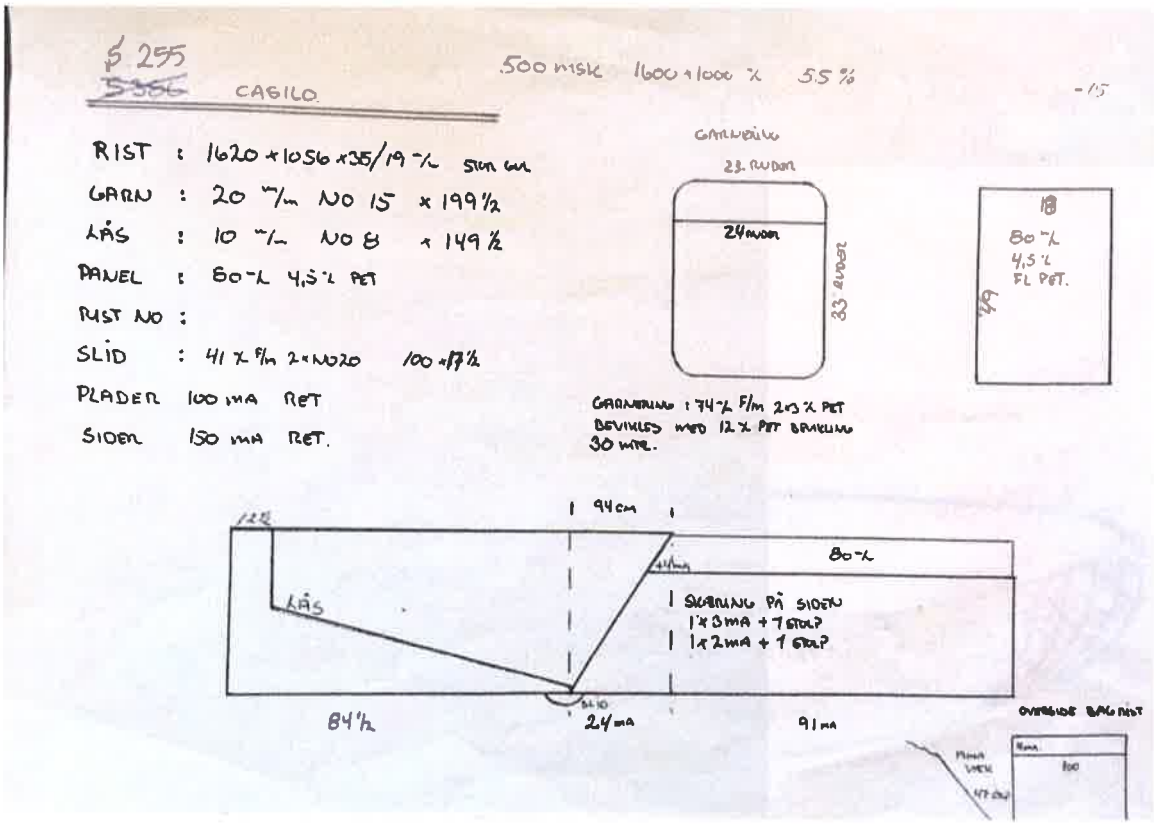
Reje-rist / Shrimp-grid, DG0050:

Ribafstand / Rib-distance: 19 mm

Dim : 1600 x 1000 x 25 mm

Vægt / Weight: 12 kg





FISKERIDIREKTORATET

Forsøk med sollerist av plast

Forsøk med sollerist av plast montert i seksjon av diamantmasker om bord i «Eli R» i juli 2017

Livet i havet – vårt felles ansvar

Rapport fra Fiskeridirektoratet

Tittel (norsk/engelsk): Forsøk med sollerist av plast montert i seksjon av diamantmasker om bord i «Eli R» i juli 2017		År (nr): 2017	Arkivsaksnummer:
Saksansvarlig:	Ansvarlig avdeling:	Dato utgitt:	ISSN/ISSB:
Emneord: sollerist, reke, forsøk, redskap			Totalt antall sider: 24

Sammendrag:

Bruk av dette ristkonseptet er et godt verktøy med tanke på utsortering av småreker med dertil reduksjon av utkast av reker under minstemål. Selv om datagrunnlaget er noe begrenset kan en også gå ut i fra at et eventuelt tap av kokereker er svært begrenset ved bruk av dette ristkonseptet.

Håndteringsmessig anses dette ristkonseptet som uproblematisk selv ved bruk av netttrommel.

Summary:

Forsøk med sollerist av plast montert i seksjon av diamantmasker om bord i «Eli R» i juli 2017.

av

John Willy Valdemarsen, Robert Misund og Dagfinn Lilleng

Innledning

I arbeidet med å utvikle funksjonelle sorteringsristsystemer for utsortering av småreke i kombinasjon med rist for utsortering av fisk, «Nordmørsrist», har et dansk firma, Ocean Marine and Fishing Gear AS laget en standardrist av helstøpt plast med 80 cm bredde og lengde. Spilene er montert i vifteform der spileavstanden er 9,5 mm i den ene enden og 10,5 mm i den andre. Hensikten med denne konstruksjonen er at reker som treffer ristflaten i mindre grad skal kile seg fast mellom spilene og dermed bli liggende på risten og hindre passasje av små reke som skal utsorteres. Denne smårekeristen har samme bredde som 19

mm ristene av plast som i dag er den vanligste risttypen i rekefiskeriene i Nordsjøen og Skagerrak, 80 cm.

Ristløsninger for utsortering av småreker tilpasset de minste reketrålerne har blitt videreutviklet fra den opprinnelige Trygg-risten av Egersund Trål avd. Hvaler. Konstruksjonen har hatt ulike utforminger inkludert rister laget i aluminium, inkl. spiler montert i vifteform. Disse ristene har hittil vært montert i en seksjon av kvadratmasker. Åkrehamn Trålbøteri har i tillegg utviklet et ristkonsept basert på plastmateriale montert i en seksjon av vanlige diamantmasker (Valdemarsen og Misund 2016).

Egersund Trål, Hvaler konstruerte en tilsvarende ristløsning der de nye plastristene ble benyttet og montert i en seksjon av diamantmasker med 40 mm maskevidde. Denne ble tatt i bruk av reketråleren «Eli R», som var godt fornøyd med dette ristkonseptet og erfarte at mye av uønskede småreker forsvant når denne risten ble benyttet.

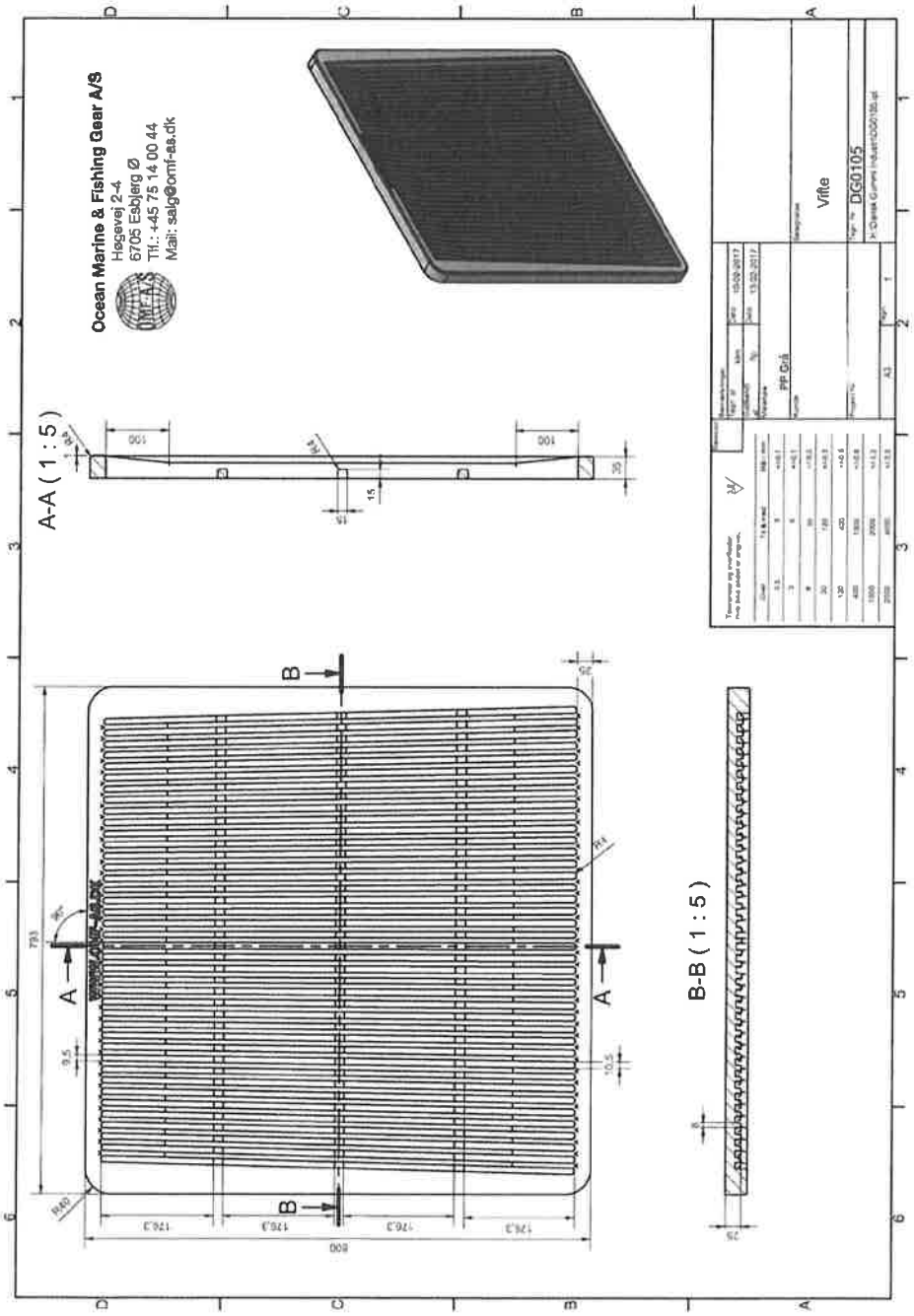
Denne rapporten omhandler forsøk utført om bord i «Eli R» i juli 2017 der formålet var å dokumentere håndtering, operative egenskaper under fiske samt seleksjonsegenskapene til det nye plastrist konseptet.

Ristkonstruksjoner og montering

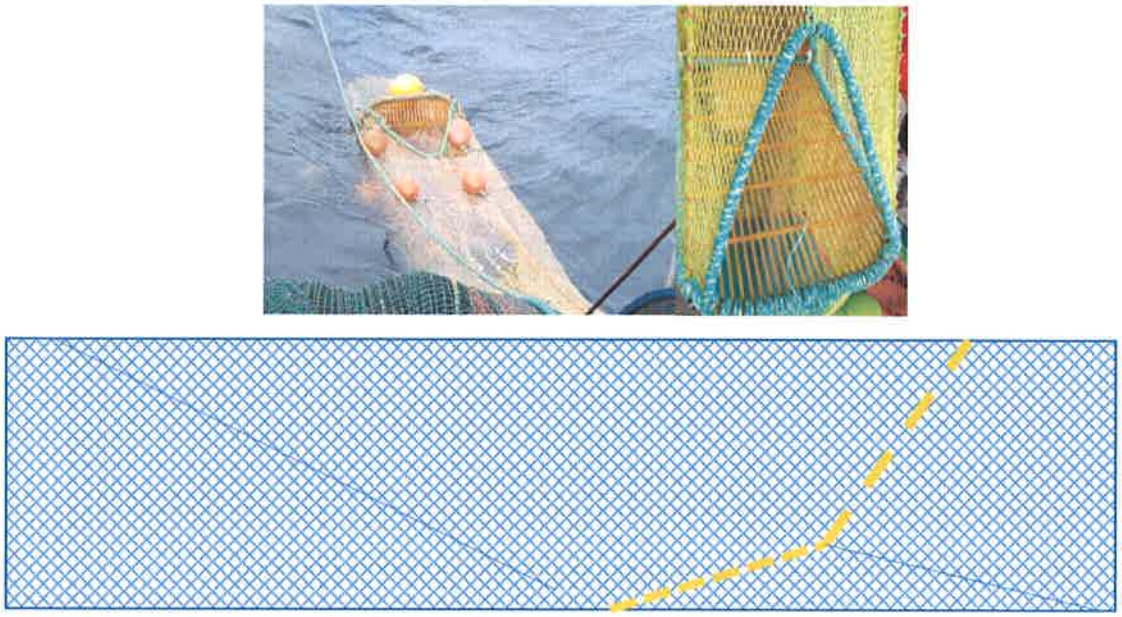
Ristkonstruksjonen som ble testet i dette forsøket er vist i figur 1. Seksjon med småkerist ble innmontert i styrbord trål i dobbeltrålrigging illustrert på figur 2. I babord trål var det innmontert ett standard oppsett med bruk av en ordinær 19 mm rist. Begge ristseksjonene var laget av diamantmasker. Ledenettet foran ristene var laget av 40 mm diamantmasker. Det var montert en gummistrikk gjennom tverrmaskene bakerst på ledenettet. Ristarrangementet var påmontert fløyt med ca 10 kg oppdrift. Fiskeutslippet (bøylen på 19 mm risten) var fjernet og de to ristene var hengslet sammen som vist på bildet i figur 3. Utslippsåpningen for fisk oppe foran 19 mm risten var trekantformet, som for ordinær Nordmørsrist. Det ble ikke brukt oppsamlingspose for fisk over utslippsåpningen. Posen bak ristene hadde 45 mm maskevidde.

I de fire første halene i andre forsøksperiode var styrbord trål utstyrt med et lignende ristkonsept, men der plastristene var montert i en kvadratmaskeseksjon og der fiskeutslippet (bøyle i selve risten) på 19 mm risten var beholdt. Skisse av dette ristoppsettet er illustrert på figur 4.

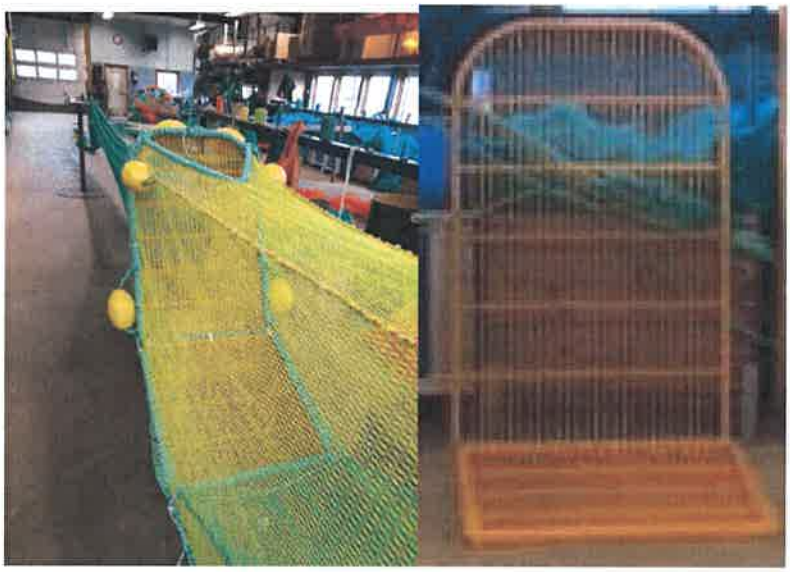
I hvert av de fire halene i første forsøksperiode og de tre siste i andre periode var styrbord trål utstyrt med 19 mm plastrist montert i en kvadratmaskeseksjon som illustrert på figur 5. Det ble ikke benyttet kuleoppdrift på dette ristoppsettet. Posen hadde 45 mm maskevidde.



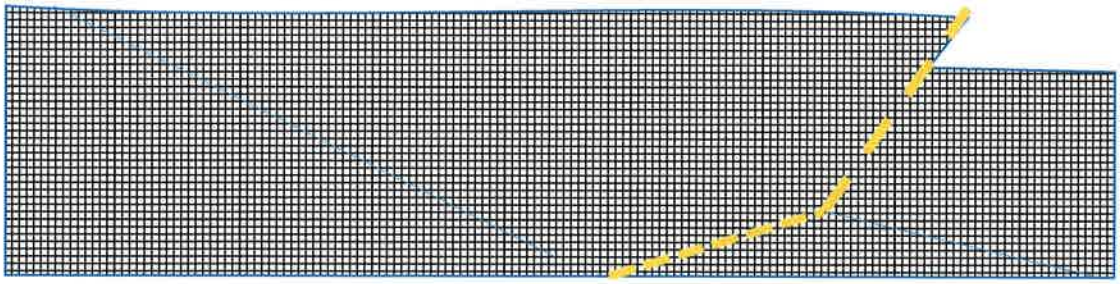
Figur 1. Konstruksjon av 9,5-10,5 mm sollerist bruk under forsøkene.



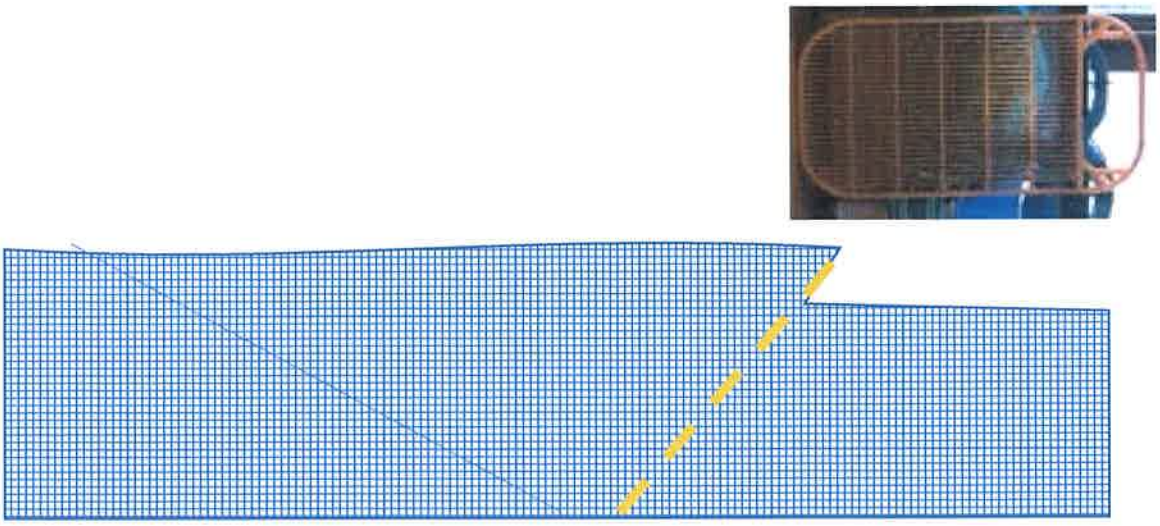
Figur 2. Illustrasjon av monteringen av 10 og 19 mm rister i en seksjon av diamantmasker som benyttet i forsøkene om bord i «Eli R».



Figur 3. 10 og 19 mm rister hengslet sammen som brukt under forsøkene montert i seksjonen av diamantmasker.



Figur 4. Illustrasjon av monteringen av 10 og 19 mm rister i en seksjon av kvadratmasker



Figur 5. Illustrasjon av standard 19 mm rist montert i en kvadratmaskeseksjon.

Forsøksgjennomføring

Analysen baseres på forsøk utført i 4 tråltrekk den 12. og 13 juli, og 7 tråltrekk dagene 24-27. juli. Alle forsøkene ble utført i Hvalerdypet og langs kanten av dette.

I den første forsøksperioden var det nye plastristkonseptet med 10 og 19 mm spileavstand montert i babord trål mens styrbord trål var utstyrt med 19 mm rist for utsortering av fisk. Det var montert StarOddi tiltsensorer på 10 og 19 mm ristene for å dokumentere ristvikler i løpet av trålhalene. Det ble også gjort forsøk på å observere ristene med Go Pro kamera i noen av forsøkene. Fangsten i hver trål ble adskilt og opparbeidet hver for seg i grupperinger for kokereke, råreke og «subb» som var en blanding av hvitreke og noe reke mindre enn 7 cm øye-hale lengde. Prøver fra hver trål ble målt for å dokumentere fordeling av reke under gjeldene minstemål på 6,5 cm øye-hale lengde.

I den andre forsøksperioden ble det samme ristkonseptet rigget i babord trål. Styrbord trål var i de 4 første trålhalene utstyrt med den samme type plastrister montert i en seksjon av kvadratmasker hvor 19 mm risten hadde et fiskeutslipp på 20 cm (utslippsbøyle). I de siste 3 trålhalene ble det montert 19 mm rist som også benyttet i det første forsøket.

Vinkler til de ulike ristene ble målt i enkelte trålhal. GoPro kamera ble brukt til å observere 10 mm risten i to trålhal. I et trålhal observerte kamera ledenettet.

I de 4 første trålhalen i andre periode ble reke produsert samfengt for begge trålene. Varmt vær gjorde det vanskelig å produsere fangsten fra hver trål for seg. Totalfangsten ble veid i henholdsvis kategoriene kokereke, råreke og «subb». Det ble tatt prøver på ca 1 liter fra hver fangst som ble lengdemålt i cm-grupper. I et trålhal ble reke som satt fast i 10 mm risten lengdemålt. Fangst i hver trål ble anslått med «skipperskjønn».

I de tre siste trålhalene ble fangstene i hver trål opparbeidet hver for seg, først styrbord trål og deretter babord trål som dermed var i sjøen ca 30 min, mens første fangsten ble opparbeidet. Prøver fra hver trål ble lengdemålt i disse trålhalene.

RESULTATER

Fangstsammensetning og virkning på seleksjon av rekestørrelse

Fangstresultater for 11 trålhal i de to forsøksperiodene er gjengitt henholdsvis i tabellene 1 og 2 under. I første periode ble det trålt tilsammen 13 timer og 10 minutter med en total rekefangst på 1475 kg som tilsvarer en fangstrate på 112 kg/time. I andre forsøksperiode ble det i 7 hal tauet 35 timer og 35 minutter med en total rekefangst på 2967 kg som tilsvarer en fangstrate på 83,5 kg/time.

I halene der fangstene med og uten sollerist ble produsert hver for seg slik at fangst av henholdsvis kokereke, råreke og «subb» eller «utkast» ble dokumentert utgjorde kokereke i første perioden 41,7 % av levert fangst fanget i trål med sollerist, mens andelen kokereke uten sollerist var 34,6 %. I andre perioden var disse forholdene henholdsvis 56,1 % og 32,4 %.

Et annet resultat var at trålen med sollerist resulterte i ca 20 % merfangst av kokereke i løpet av forsøkene.

Virkning av 10 mm sollerist på «subb» var at dette utgjorde 16% av totalfangsten med sollerist og 25% uten sollerist i de 4 halene i første forsøksperiode, mens innslaget av subb var ca 22% i begge trålene i de tre trålhalen der fangstsammensetningen ble dokumentert i den andre forsøksperioden. «Subb» besto mest av til dels stor hvitreke. Dette bekreftes av målingene som ble gjort av antall reker over og under minstemålet på 6,5 cm øye-hale lengde som gjengitt i tabellene 1 og 2. Disse målingen viste klart at innslaget av undermåls reke nesten ble halvert når det ble brukt sollerist, og at innslag av undermåls reke var mindre i andre forsøksperiode enn i første.

Tabell 1. Fangstdata fra 4 trålhal 12. og 13. juli der størrelsessammensetningen av reke i trål med og uten 10 mm sollerist av plast ble sammenlignet om bord i dobbeltråleren M/S «Eli R».

					FANGST (Reke i kg)									
Hal nr	Dato	Tid	Dyp (m)	Retning	BB trål (med 10 mm sollerist)					BB trål (uten 10 mm sollerist)				
					Kokt	Rå	Utkast	<6,5 cm	Totalt levert	Kokt	Rå	Utkast	<6,5 cm	Totalt levert
1	12.jul	6:50-10:30	175-320	S	103	122	39	11,50 %	225	83	127	54	20,50 %	210
2	12.jul	12:30-16:20	175-320	N	133	169	45	12,85 %	302	90	163	55	23,50 %	253
3	13.jul	5:50-9:00	175-320	S	58	102	31	13,94 %	160	58	134	59	19,20 %	192
4	13.jul	11:00-13:30	140-220	N	18	42	30	14,37 %	60	21	52	80	16,77 %	73
Totalt					312	435	145		747	252	476	248		728

Tabell 2. Fangstdata fra 7 trålhal i perioden 24. 27. juli der størrelsessammensetningen av reke i trål med og uten 10 mm sollerist av plast ble sammenlignet om bord i dobbeltråleren

M/S «Eli R» i 3 trålhal (5-7) og der begge trålene var utstyrt med sollerist i 4 trålhal (1-4). I de 4 første trålhalene i hver trål anslått mens fangstfordelingen ble veid i de 3 siste trålhalene.

					FANGST (reke i kg)									
Hal nr	Dato	Tid	Dyp (m)	Retning	BB trål (med 10 mm sollerist)					BB trål (hal 1-4 med 10 mm sollerist, 5-7 uten 10 mm sollerist)				
					Kokt	Rå	Utkast		Totalt levert	Kokt	Rå	Utkast		Totalt levert
1	24.jul	05:30-12:10		S	?	?	ikke registrert		300	?	?	ikke registrert		100
2	24.jul	13:30-19:45			60	34	ikke registrert		94	60	34	ikke registrert		94
3	24.jul	21:30-7:00			120	187	ikke registrert		307	120	187	ikke registrert		307
4	25.jul	08:30-12:00		N	*150*	*150*	ikke registrert		300	*150*	*150*	ikke registrert		300
5	26.jul	05:05-9:00		S	120	145	79	3,31	265	100	201	73	6,76	301
6	26.jul	11:55-15:50		N	75	102	51	7,85	177	65	164	58	13,72	229
7	27.jul	06:25-10:15	180-370	N	65	57	40	1,16	122	30	41	43	3,38	71
					590	675	170		1565	525	777	174		1402

Ristvinkler

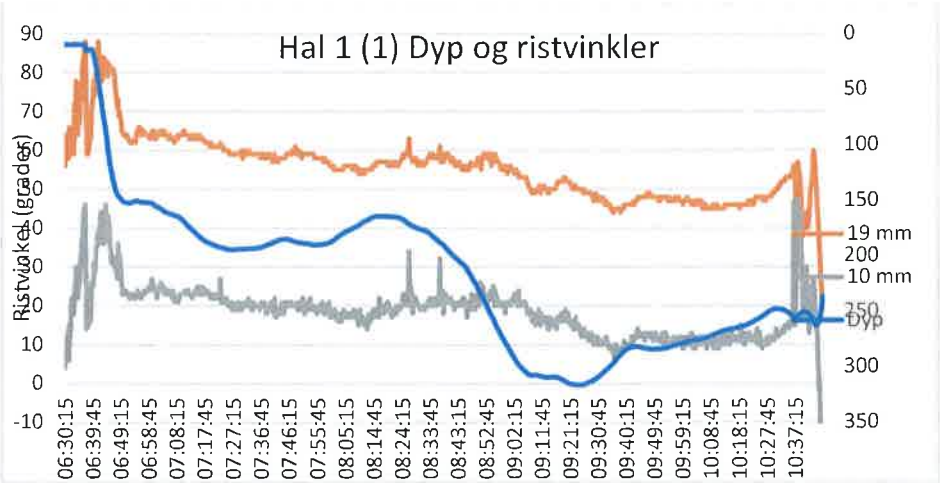
Målinger av vinkler til 10 og 19 mm ristene i de 4 trålhalene i den første forsøksperioden er vist på figurene 6-9. På figurene er også gjengitt fiskedyp i løpet av trålhalene.

Figurene viser at 19 mm risten i starten av trålhalet har en vinkel på ca 60 grader. Normalt reduseres denne vinkelen med ca 10 grader i løpet av et trålhal på ca 4 timer og med trålfangster på ca 400 kg. Tilsvarende starter 10 mm risten med ca 20 graders vinkel som reduseres med ca 15 grader i løpet av trålhalet. Vinkelforskjellen mellom de to ristene var ca 40 grader i hele trålhalet.

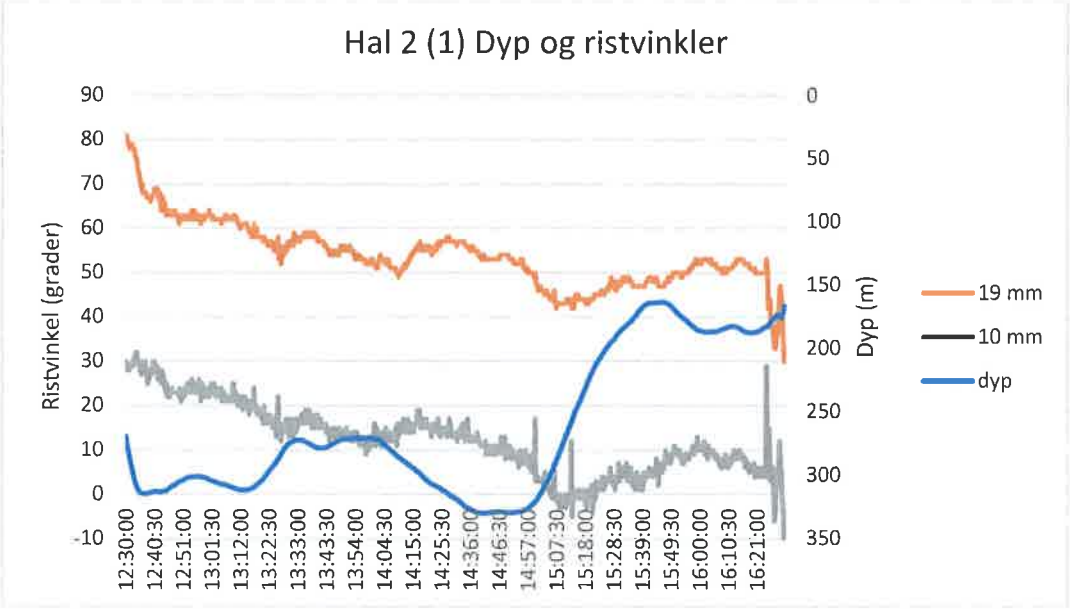
Tilsvarende vinkelmålinger for ristene i det samme plastristkonseptet for to trålhal (nr 5 og 6) i den andre forsøksperioden er vist på figurene 10 og 11. I figur 12 er vist vinkelen til 10 mm risten i hal nr 1 i denne andre forsøksperioden.

I trålhalene 5 og 6 var ristvinklene tilsvarende som målt i den første forsøksperioden. I det første trålhalet (nr 1) ble vinkelen til smårekeristen redusert til 0 og delvis til negativ vinkel. I dette trålhalet var det spesielt mye maneter i trålen samt ganske mye små kråkeboller.

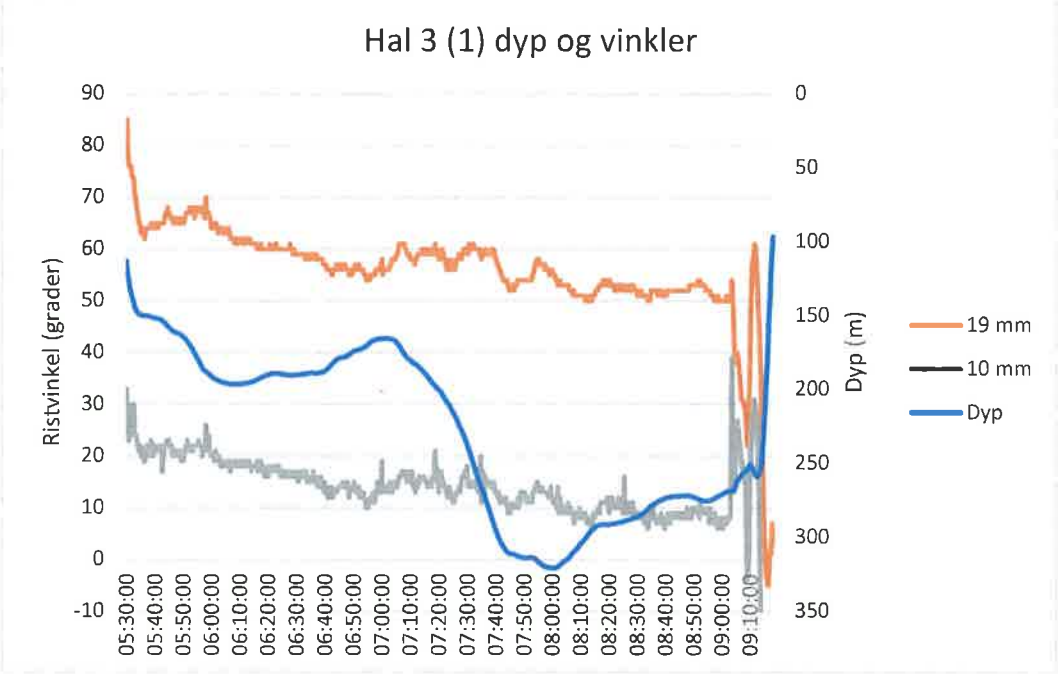
Vinkel til 19 mm standard risten i styrbord trål i hal 6 er vist på figur 13. Vinkelen til denne risten var ca 10 grader lavere (startet på ca 50 grader som ble redusert til ca 40 grader) enn 19 mm risten i babord trål utstyrt med sollerist (sammenlign med figur 11).



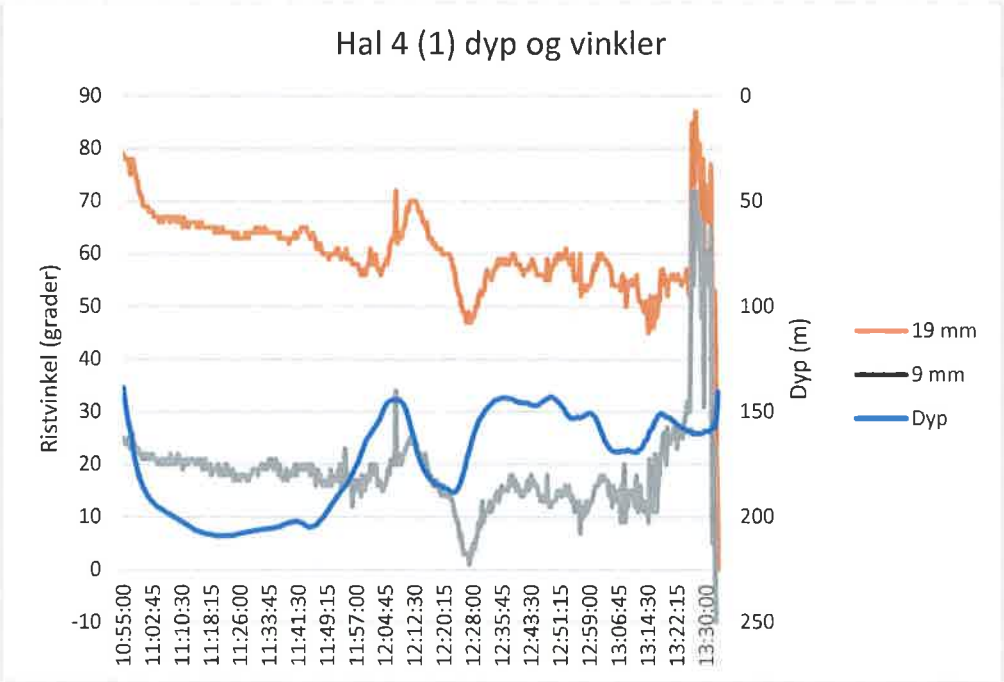
Figur 6. Ristvinkler og fiskedyp i hal nr 1 i første forsøksperiode.



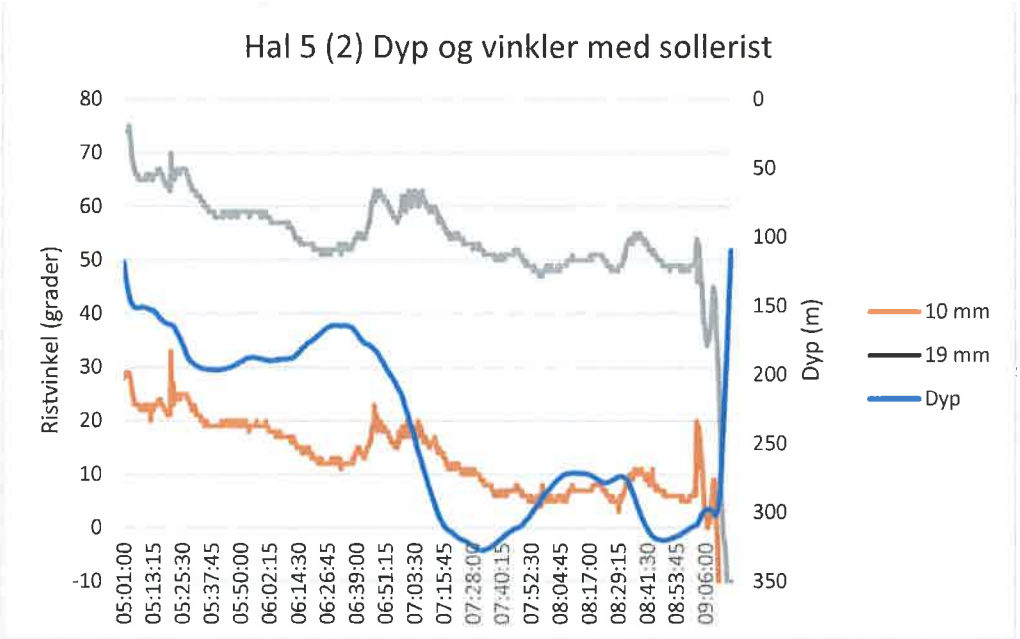
Figur 7. Ristvinkler og dyp i hal 2 i første forsøksperiode.



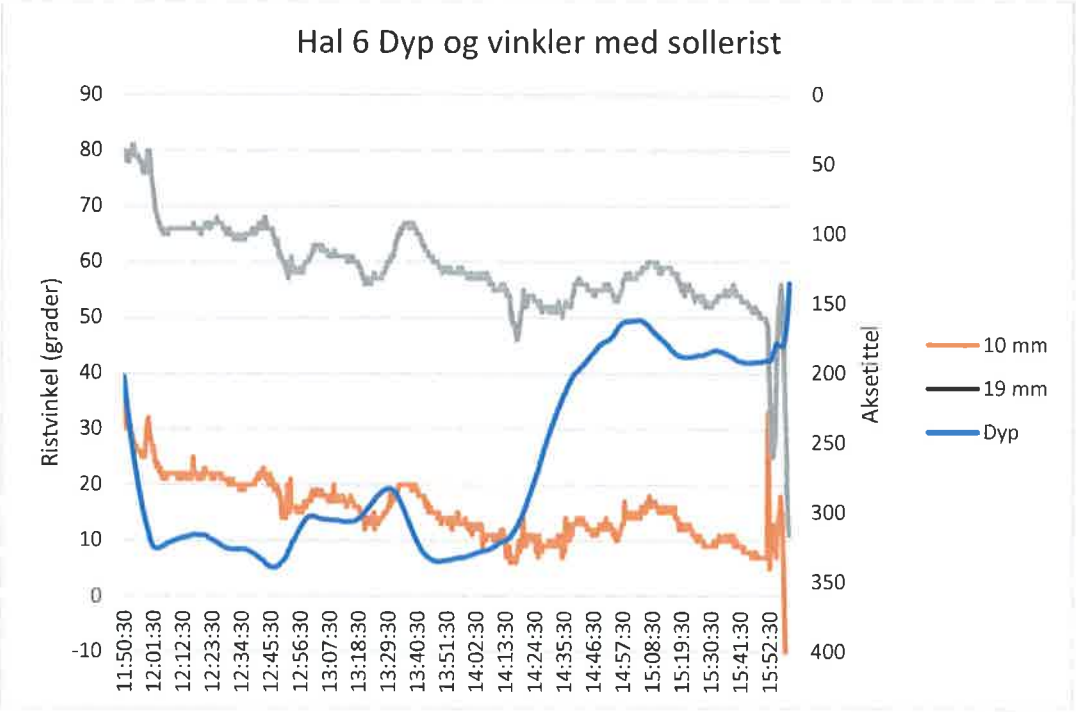
Figur 8, Ristvinkler og dyp i hal 3 i første forsøksperiode.



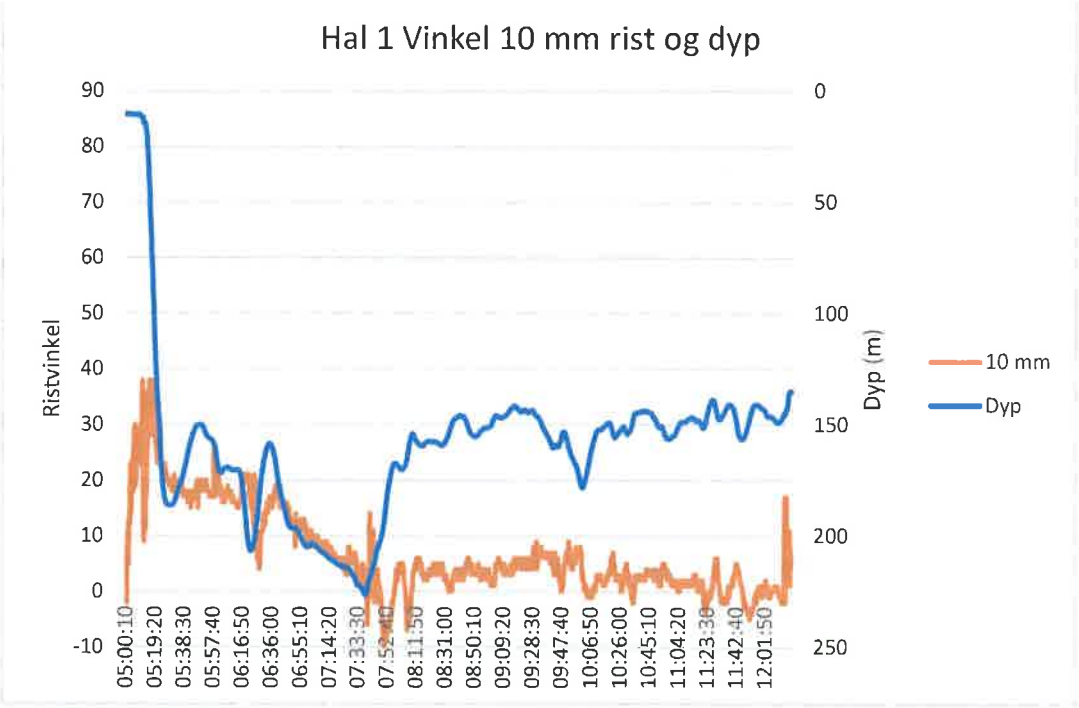
Figur 9. Ristvinkler og dyp i hal 4 i første forsøksperiode.



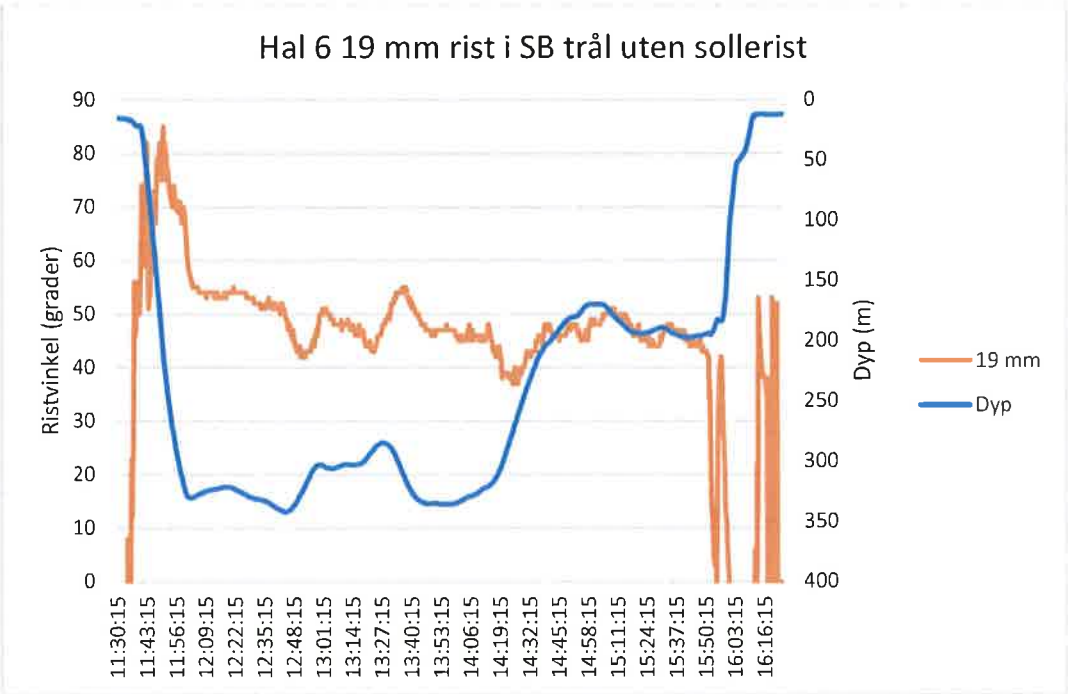
Figur 10. Ristvinkler og dyp i hal 5 i andre forsøksperiode



Figur 11. Ristvinkler og dyp i hal 6 i andre forsøksperiode.



Figur 12. Ristvinkel til 10 mm rist (solleristen) i hal 1 i andre forsøksperiode.



Figur 13. Vinkel til 19 mm rist i styrbord trål i hal 6 i andre forsøksperiode. Risten var montert i kvadratmaskeseksjon og var ikke utstyrt med kuler til oppdrift.

Kameraobservasjoner

Kameraobservasjonene i deler av hal 2 i andre forsøksperiode viste ca 70 % av 10 mm risten og ca 50 % av 19 mm risten. På figurene 14-18 er ristflaten vist med stillbilder med ca 20 minutters sekvenser. Rekefangsten i dette halet var beskjeden (ca 100 kg på ca 6 timer tauetid), som nok er en viktig årsak til at det er relativt lite reke på ristflaten når denne ble kameraobservert.

Tilsvarende viser bildeseriene på figurene 19- 30 ristflatene med ca 20 minutters intervaller i hal 7. I dette halet ble nesten hele smårekeristen observert samt bakre del av ledenettet. Det ble gjort opptak i ca 3 ½ time, og trålen ble lettet fra bunn midt i halet pga en fastkjøring.

Kameraobservasjonene i det 7. tråltrekket viste at ristflaten ble fylt opp med reke etter 5-10 minutters tauing. En del reke forsvant etter hvert, delvis fordi aktiv fisk berørte risten og fikk da ristet løs reker som lå på risten. Når trålen ble lettet fra bunn forsvant også noe reke fra ristflaten. En del reke ble presset mot nettet i forkant av ristene. En annen observasjon var at organismer, spesielt maneter ble fanget opp av ledenettet og ble liggende mot dette. Dette skyldes strikken som var montert på tvers i endemaskene på ledenettet. Det var tydelig at dette resulterte i turbulens bakenfor og dermed foran og over ristflaten.

Observasjonene av ledenettet lengre framme som vist på figur 31 viste imidlertid ingen tegn til opphoping av organismer i dette partiet av ledenettet.

Et sammendrag av kameraobservasjonene er at sammenføyningen av de to ristene var god. Reke som kom mot ristenheten traff vanligvis smårekeristen først og ble enten ledet videre mot 19 mm risten, la seg på ristflaten eller passerte mellom spilene i solleristen.

Mesteparten av rekene som ble ledet mot 19 mm risten passerte denne i den delen nederst (ca 50 %) som ble observert. Med relativt gode fangstrater av reke ble mye av solleristen tildekket av reke relativt raskt, da ristvinklen va mellom 20 og 25 grader. I løpet av trålhalet forsvant noen av rekene som lå mot ristflaten. Dette kan skylde at ristvinkelen ble redusert i løpet av halet, at større fisk rengjorde risten for reke samt at ristvinklen varierte når det ble gitt ut eller tatt inn trålwire ved endring av fiskedyp.

Som i tidligere forsøk ble reke liggende mot nettet på sidene av ristene. Dette antyder at ristene bremser vannstrømmen og delvis leder denne til sidene mot nettet.

Opphopning av passive organismer, som blant annet maneter mot bakre del av ledenettet resulterte i «bakevje» bak dette som igjen resulterte i redusert vannstrøm mot ristflatene. Observasjon av relativt lite reke i opphopningen mot ledenettet antyder at mesteparten av reke kom bakover langs bunnpanelet. Denne observasjonen kan være grunnlag for å vurdere om ledenettet har tilsiktet funksjon som er å lede reke mot nedre og fremre del av risten. Kanskje er den negative effekten ved redusert vannstrøm gjennom ristene på tap av kommersiell rekestørrelse enn en liten gevinst ved å lede reke ned med et lite funksjonelt ledenett.

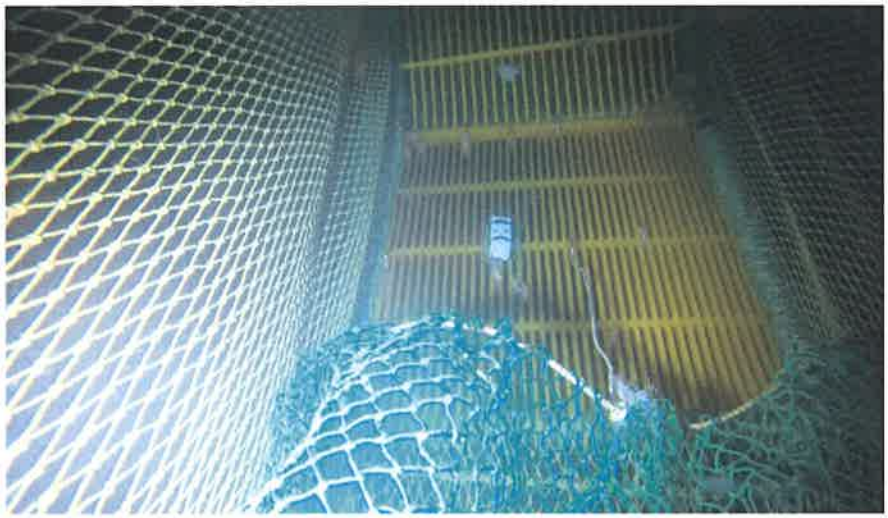
Figur 14. Ristflatene etter ca 1 minutt tauing i hal 2 i andre forsøksperiode (Hvit enhet festet på 10 mm risten er Star Oddi tiltsensor)

Figur 15. Ristene etter ca 20 minutter tauing i hal 2.

Figur 16. Ristene etter ca 40 min tauing i hal 2

Figur 17. Ristene etter 1 times tauing i hal 2.

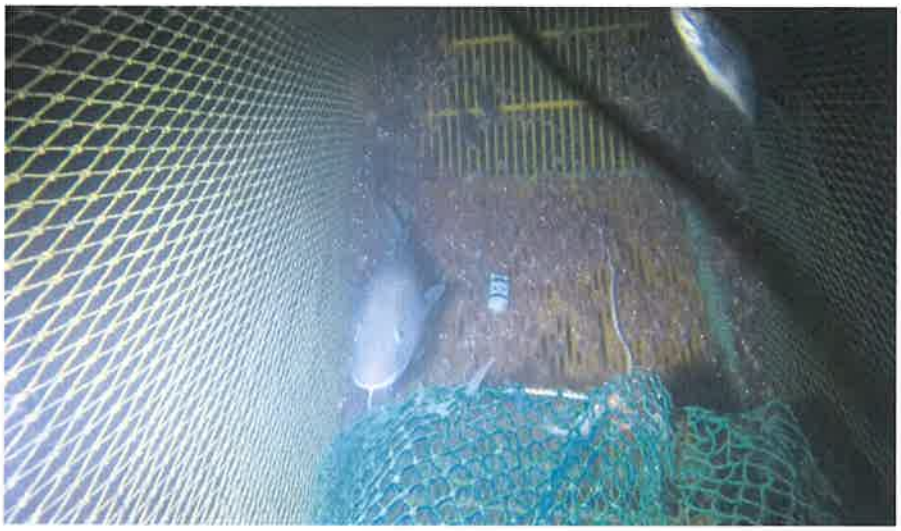
Figur 18. Ristene etter 1 time og 20 minutter tauing i hal 2.



Figur 19. Hal 7, start tauing

Figur 20. Hal 7, etter 5 min tauing

Figur 21. Hal 7, etter 10 min tauing



Figur 22. Hal 7, etter 15 min tauing

Figur 23 Hal 7, etter 35 min tauing

Figur 24. Hal 7, etter 55 min tauing

Figur 25. Hal 7, etter 1 tog 15 min

Figur 26. Hal 7, etter 1 t og 35 min

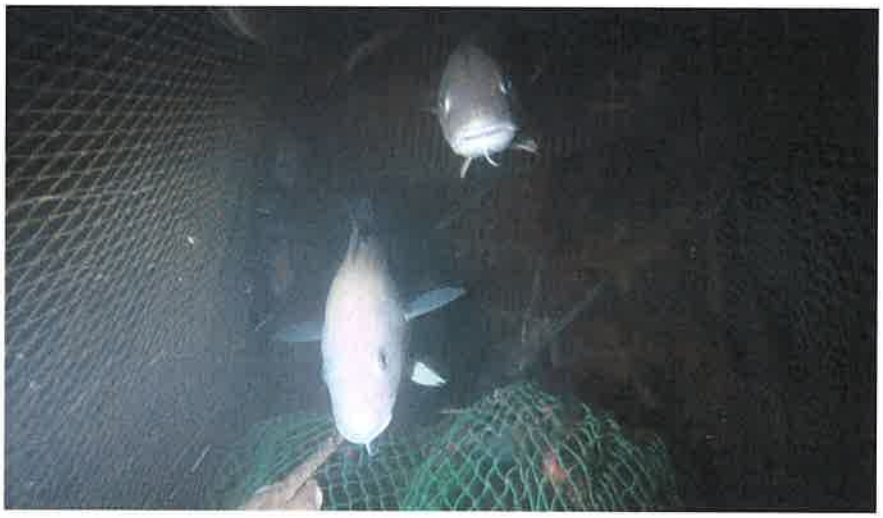


Fig 27. Hal 7, etter 1t og 55 min

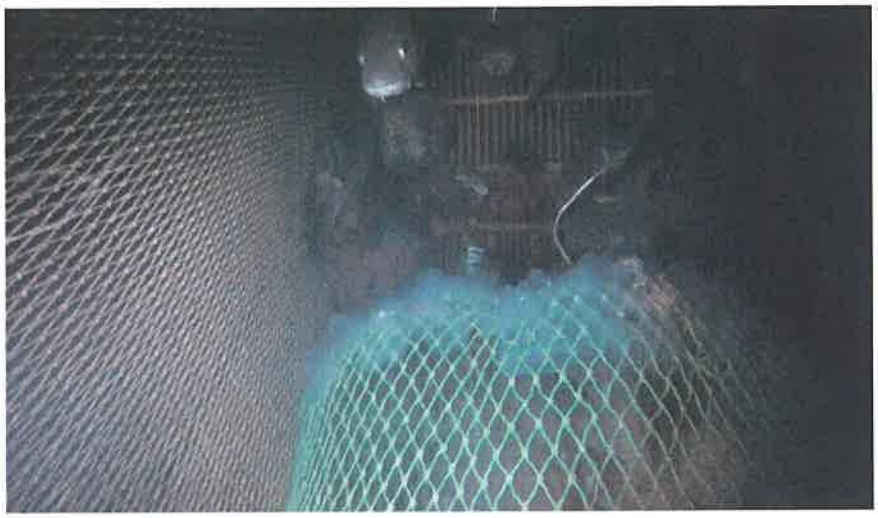
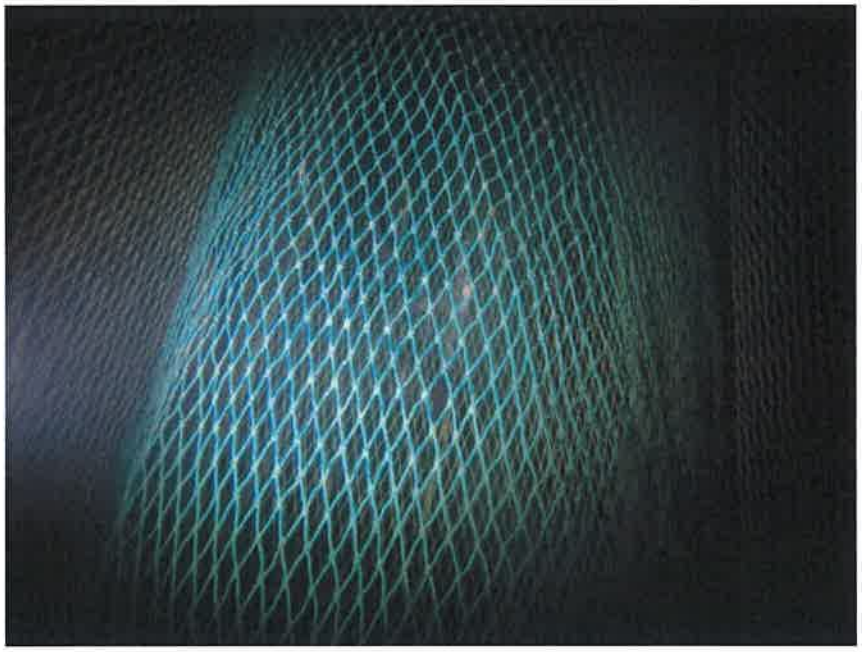


Fig 28. Hal 7, etter 2t og 15 min

Fig 29. hal 7, etter 2t og 35 min

Fig 30. Hal 7, etter 2t og 55 min



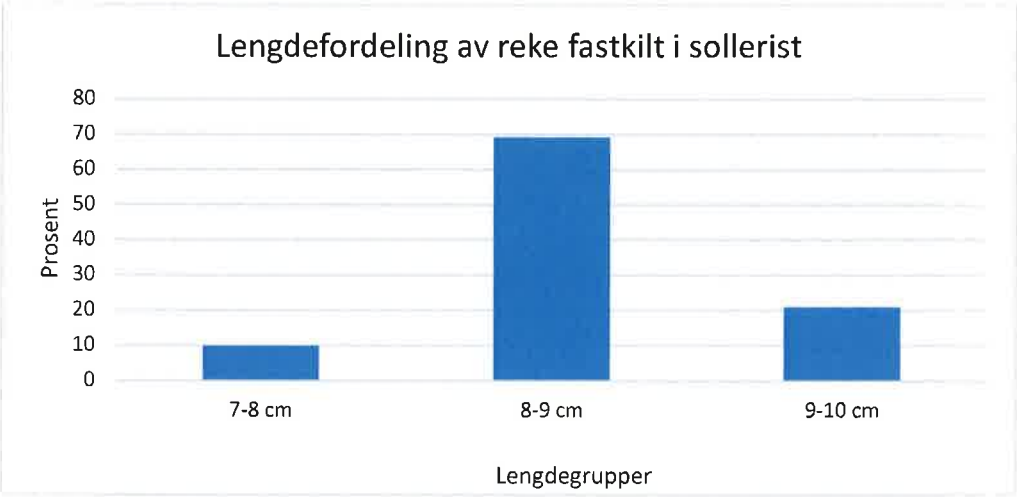
Figur 31. Bilde av ledenettet med kamera plassert over dette og observerer ned og framover (framme er øverst i bildet)

Andre observasjoner

Håndteringen av de nye plastristene montert i en nettseksjon av diamantmasker var uproblematisk på trålrull både ved utsetting og innhiving.

Relativt mye reke var kilt fast mellom spilene på solleristen, som vist på bildet i figur 32. Lengdefordelingen av disse rekene er gjengitt på figur 33. Dette viser at all reke under 7 cm slipper gjennom risten og at lite reke over 8-8-5 cm s(kokereke) slipper gjennom.

Figur 32. Sollerist etter tauing med reke fastkilt mellom spilene (ca 100 reke)



Figur 33. Lengdefordeling av reke som var kilt fast i sollerist ved avsluttet trålhal (nr 3).

Oppsummering av forsøkserfaringene.

Teknisk sett fungerte det nye plastristkonseptet der begge ristene var montert i en seksjon av diamantmasker tilfredsstillende. Vinkelen til både 10 mm sollerist og 19 mm rist ble redusert med 10-15 grader når det kommer fangst bak i posen, noe som også er erfart med andre monteringsoppsett av «Trygg-rist» konsepter. Diamantmaskenett i ristseksjonen er sterkere og dermed mindre utsatt for nettskader enn seksjoner laget av kvadratmasker.

Plastristene som er lettere i vekt enn metallrister, og faktisk nesten nøytrale i sjø, krever mindre kuleoppdrift enn rister laget helt eller delvis av metall. Håndtertering på nett-trommel var uproblematisk. Spilene i plastristene er fleksible og ble ikke varig deformert ved ytre fysiske påvirkninger. Dette betyr at spileavstandene er jevnere og konstante under lengre tids bruk.

Seleksjonsvirkningen på rekestørrelse av den nye solleristen så ut til å være tilfredsstillende, men datagrunnlaget fra de 7 trålhalene der denne effekten ble undersøkt under dette forsøket er for lite til å kvantifisere seleksjonseffekten godt nok.

Et litt uventet resultat var at babord trål utstyrt med det nye solleristkonseptet nesten alltid fanget ca 20 % mer kokereke enn styrbord trål når denne var utstyrt med en vanlig 19 mm seleksjonsrist. Dette var for øvrig de samme erfaringene skipper hadde gjort seg med bruk av dette ristkonseptet før vi kom om bord. De 4 første trålhalene i den andre forsøksperioden ble gjennomført med de samme trålene men med 10 mm sollerist av plast i begge trålene. Selv om fangstene i disse trålhalene ikke ble opparbeidet hver for seg, tydet ikke den visuelle vurderingen av de to trålfangsten at disse var tydelig forskjellige. En sannsynlig konklusjon av disse resultatene er derfor at 10 mm sollerist ikke resulterer i tap av kokereke. Virkningen på utsortering av undermåls reke og hvitreke er imidlertid litt usikker basert på resultatene som ble oppnådd. Mesteparten av «subben» som ble fanget besto imidlertid av stor hvitreke, såkalte «amerikanere». Lengdemålingen som ble foretatt for å påvise innslag av undermåls reke på 6,5 cm viste imidlertid at innslaget av undermåls reke ble tilnærmet halvert når det ble brukt sollerist på 10 mm.

Observasjonene med kamera viste at solleristen ble blokkert relativt raskt under et av trålhalene. En blokkert rist betyr at sollevirkningen blir betydelig redusert etter som rekefangsten øker. Den største utfordringen for å forbedre solleristkonseptet er derfor å utvikle mekanismer som kan rengjøre ristflaten under tauing.

Konklusjon er imidlertid at bruk av dette ristkonseptet er et godt verktøy med tanke på utsortering av småreker med dertil reduksjon av utkast av reker under minstemål. Selv om datagrunnlaget er noe begrenset kan en også gå ut i fra at et eventuelt tap av kokereker er svært begrenset ved bruk av dette ristkonseptet.

Håndteringsmessig anses dette ristkonseptet som uproblematisk selv ved bruk av nett-trommel.

Referanser

Valdemarsen, J. W. og Misund , R. 2016. Funksjonstester av tre ulike Trygg-rist varianter om bord i M/S ¨Tempo¨ i tidsrommet 5.- 15. juni 2016.

Annex VI

FISKERIDIREKTORATET

Telefon: 03495
Faks: 55 23 80 90
Adresse: Postboks 185 Sentrum, 5804 Bergen
Besøksadresse: Strandgaten 229, Bergen
E-post: postmottak@fiskeridir.no

www.fiskeridir.no

Livet i havet – vårt felles ansvar

Annex VI

Annex VII - DRAFT summary technical measures in the Skagerrak – Content to be completed by the WG.

	Subject	**Current EU-rules**	**Possible revised EU-technical rules, according to Council general approach (doc 8151/17)**	**Current Norwegian rules**	**Norwegian rules (according to current hearing)**	**Differences Comments on need for/scope for harmonization**
Mesh size rules: Trawls, Danish seine						
Mesh size rules: Gillnets						
By-catch rules						
Minimum size rule						
Other rules						
Prohibited species/periods						
Species under landing obligation						

Annex VIII - Size conversion Pandalus shrimp

Proposed size conversion tool, including a measure of the number of (equally sized) prawn needed to reach a kilo.

Carapace length (mm)	Norwegian Total length (mm)	Weight (g)	Number/kilo assuming all prawn are of = length
8	38,2	0,3	2896
10	46,1	0,7	1489
12	54,1	1,2	864
14	62,0	1,8	546
16	69,9	2,7	367
18	77,9	3,9	258
20	85,8	5,3	188
22	93,8	7,1	142
24	101,7	9,1	109
26	109,7	11,6	86
28	117,6	14,5	69
30	125,6	17,8	56
32	133,5	21,6	46

- W=0.0007* Carapace length ^2.9821 (ICES, NIPAG)
- Norwegian TL = 3,9746 x Carapace length + 6,3557.
  TL and CL expressed in mm (pers.com. Søvik 2017)

The relationship between TL and CL (both given in mm) is as follow (based on length measurements on 162 shrimp in January 2017):
CL = 0,2465 x TL – 1,2045
TL = 3,9746 x CL + 6,3557

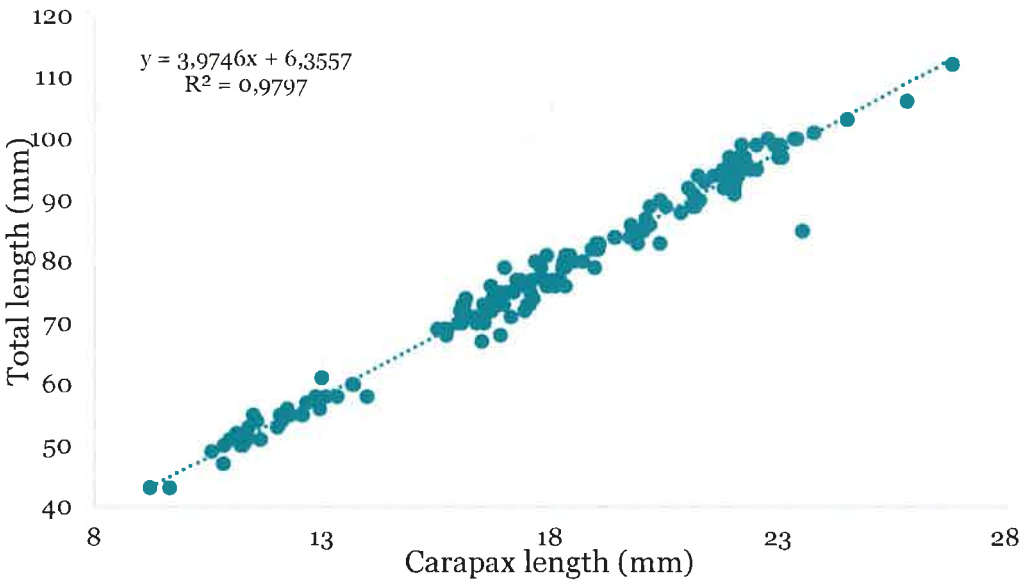


Figure 1. Norwegian total length (mm) (from the front of the eye to the back of the tale) given as function of carapax length (mm).

The size of a Northern prawn shall be measured as shown in Figure 1:

(a) Carapax length: the length of the carapace, parallel to the midline, from the back of either eye socket to the distal edge of the carapace. (conform EU reg 850/98, annex XIII, for Norway lobster)
(b) Norwegian total length: Measured from the front edge of the eye to the rear edge of the tail.(Forskrift om utøvelse av fisket i sjøen J-187-2017, Kapittel IX, § 44)

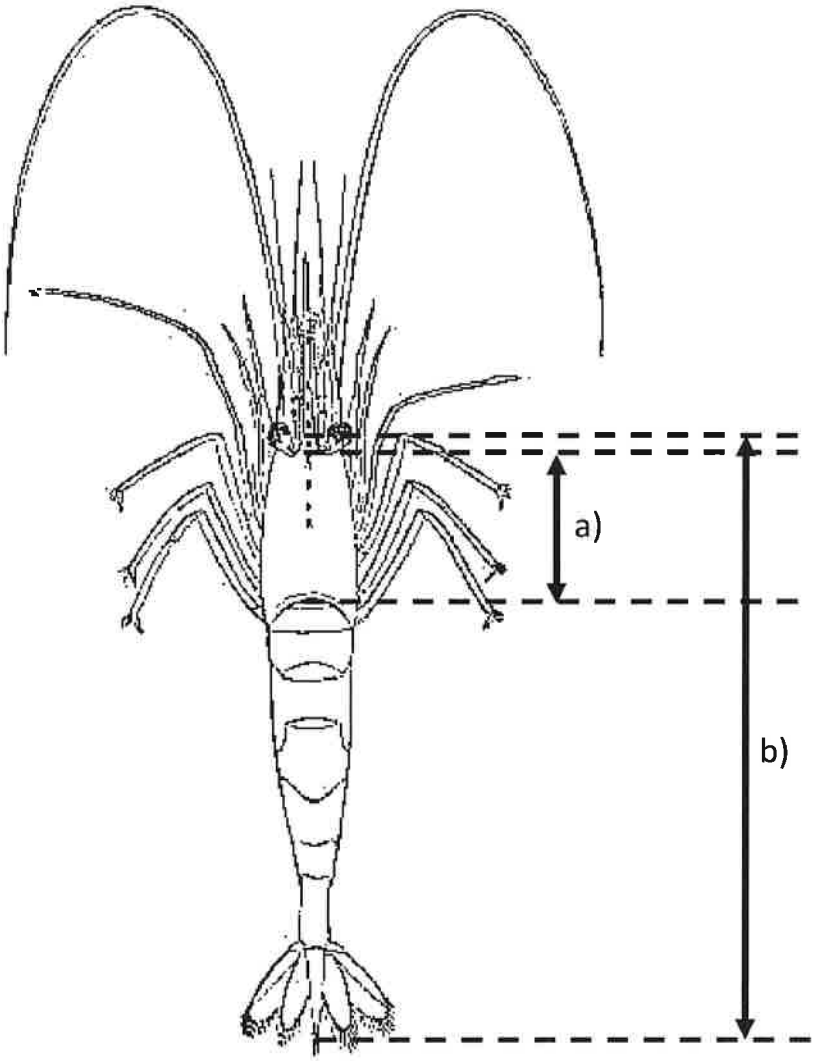


Image: Freshwater and Marine Image Bank

Annex IX: proportion of hauls with excess pandalus below trigger size using different trigger length and proportion threshold scenarios. Projections calculated using data from the Swedish onboard observer sampling program on Swedish vessels.

Trigger size																	
Norw TL	CL	Threshold	2015 - Q1	2015 - Q2	2015 - Q3	2015 - Q4	**2015 - Total**	2016 - Q1	2016 - Q2	2016 - Q3	2016 - Q4	**2016 - Total**	2017 - Q1	2017 - Q2	2017 - Q3	2017 - Q4	**2017 - Total**
50	11,2	10%	25%	0%	0%	0%	**7%**	0%	0%	0%	0%	**0%**	4%	0%	0%	0%	**1%**
55	12,4		38%	15%	0%	7%	**17%**	10%	4%	0%	0%	**5%**	48%	8%	0%	0%	**15%**
60	13,6		69%	31%	0%	7%	**30%**	33%	32%	0%	0%	**18%**	57%	12%	0%	0%	**19%**
65	14,8		69%	54%	9%	21%	**41%**	43%	64%	22%	0%	**38%**	61%	44%	0%	0%	**30%**
70	16,0		81%	69%	73%	57%	**70%**	71%	68%	52%	47%	**64%**	65%	88%	56%	17%	**60%**
80	18,5		88%	100%	100%	100%	**96%**	100%	84%	100%	100%	**99%**	96%	100%	100%	100%	**99%**
50	11,2	15%	25%	0%	0%	0%	**7%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**
55	12,4		31%	15%	0%	0%	**13%**	0%	0%	0%	0%	**0%**	26%	4%	0%	0%	**8%**
60	13,6		56%	31%	0%	0%	**24%**	5%	8%	0%	0%	**5%**	39%	12%	0%	0%	**14%**
65	14,8		63%	54%	9%	0%	**33%**	10%	48%	0%	0%	**17%**	52%	20%	0%	0%	**20%**
70	16,0		75%	62%	36%	36%	**54%**	48%	68%	35%	21%	**48%**	61%	76%	44%	17%	**52%**
80	18,5		88%	100%	100%	100%	**96%**	100%	84%	100%	100%	**99%**	91%	100%	100%	100%	**98%**
50	11,2	20%	6%	0%	0%	0%	**2%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**
55	12,4		25%	15%	0%	0%	**11%**	0%	0%	0%	0%	**0%**	17%	0%	0%	0%	**5%**
60	13,6		25%	23%	0%	0%	**13%**	5%	4%	0%	0%	**3%**	30%	8%	0%	0%	**11%**
65	14,8		38%	46%	0%	0%	**22%**	5%	40%	0%	0%	**14%**	39%	12%	0%	0%	**14%**
70	16,0		63%	54%	27%	7%	**39%**	19%	60%	30%	5%	**33%**	52%	68%	33%	17%	**45%**
80	18,5		88%	100%	100%	100%	**96%**	100%	80%	96%	100%	**95%**	83%	100%	100%	94%	**94%**
50	11,2	25%	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**
55	12,4		25%	0%	0%	0%	**7%**	0%	0%	0%	0%	**0%**	17%	0%	0%	0%	**5%**
60	13,6		25%	23%	0%	0%	**13%**	0%	4%	0%	0%	**2%**	26%	8%	0%	0%	**10%**
65	14,8		38%	31%	0%	0%	**19%**	5%	24%	0%	0%	**9%**	26%	12%	0%	0%	**11%**
70	16,0		56%	46%	18%	0%	**31%**	10%	52%	26%	5%	**26%**	39%	44%	28%	17%	**33%**
80	18,5		81%	92%	100%	100%	**93%**	100%	80%	78%	95%	**90%**	83%	92%	100%	83%	**89%**
Number sampled hauls			16	13	11	14	**54**	21	25	23	19	**88**	23	25	18	18	**84**

Annex X: proportion of controlled hauls with excess pandalus below trigger size using different trigger length and proportion threshold scenarios. Projections calculated using data from the Norwegian control program on Norwegian vessels.

	antall samplede hal		23	11	21	18	73	23	32	28	12	95	40	19	25	20	104
			% sampled hauls over the threshold														
Ref size TL (Norw)	Ref size (CL)	Threshold	2015 - Q1	2015 - Q2	2015 - Q3	2015 - Q4	2015 - Total	2016 - Q1	2016 - Q2	2016 - Q3	2016 - Q4	2016 - Total	2017 - Q1	2017 - Q2	2017 - Q3	2017 - Q4	2017 - Total
50	11,1	10%	9	0	0	0	3	9	0	0	0	2	3	0	0	0	1
55	12,4		22	0	0	11	10	22	0	0	8	6	13	0	0	0	5
60	13,6		35	55	0	11	22	39	6	0	8	13	48	11	0	5	21
65	14,8		61	82	10	11	37	52	25	4	8	23	58	42	4	5	32
70	16		96	100	76	72	85	83	84	79	58	79	73	95	72	25	67
80	18,5		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
50	11,1	15%	0	0	0	0	0	4	0	0	0	1	0	0	0	0	0
55	12,4		17	0	0	6	7	22	0	0	0	5	10	0	0	0	4
60	13,6		26	27	0	6	14	30	3	0	0	8	28	5	0	5	13
65	14,8		35	73	5	6	25	30	16	0	0	13	48	32	0	5	25
70	16		74	100	52	44	64	74	75	57	17	62	58	95	60	10	56
80	18,5		100	100	95	94	97	100	100	100	100	100	95	100	100	100	98
50	11,1	20%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	12,4		9	0	0	0	3	9	0	0	0	2	5	0	0	0	2
60	13,6		17	9	0	0	7	22	0	0	0	5	15	0	0	0	6
65	14,8		22	64	5	0	18	30	6	0	0	9	40	16	0	0	18
70	16		57	100	43	39	55	52	63	46	17	49	53	89	28	0	43
80	18,5		100	100	95	89	96	96	88	100	100	95	95	95	100	100	97
50	11,1	25%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	12,4		4	0	0	0	1	4	0	0	0	1	3	0	0	0	1
60	13,6		9	0	0	0	3	22	0	0	0	5	13	0	0	0	5
65	14,8		9	36	5	0	10	22	6	0	0	7	15	16	0	0	9
70	16		26	82	43	22	38	35	44	36	17	36	38	79	16	0	33
80	18,5		100	100	86	89	93	96	84	100	100	94	88	95	100	95	93

jeg har rundet ned ref.size i mm til hele mm, s.a. 11,2 mm er rundet nedover til 11 mm osv
for en ref.size på for eksempel 11 mm, antar jeg at alle reker >= 11 mm er "lovlige".
et område stenges når andelen reker >= ref.sizen er > stengningskriteriet (for eksempel 10%)

Annex XI: proportion of hauls with excess pandalus below trigger size using different trigger length and proportion threshold scenarios. Projections calculated using data from the Danish onboard observer sampling program on Danish vessels (47 hauls during 2015-2017). No hauls were sampled in quarter-3 in 2015 or quarter-1 in 2017.

Trigger size NTL (Norwegian Total Length)	Trigger size CL (Carapace Length)	Threshold percentage (maximum number of shrimps below trigger size)	Sampled hauls exceeding the threshold percentage												
			2015 (15 hauls)				2016 (17 hauls)					2017 (15 hauls)			
			Quarter 1	Quarter 2	Quarter 4	*Total*	Quarter 1	Quarter 2	Quarter 3	Quarter 4	*Total*	Quarter 2	Quarter 3	Quarter 4	*Total*
53	11,8	10%	38%	0%	0%	*20%*	66%	0%	0%	0%	*12%*	33%	0%	0%	*7%*
58	12,9		63%	0%	0%	*33%*	100%	0%	0%	0%	*18%*	100%	0%	0%	*20%*
62	14,1		88%	100%	100%	*93%*	100%	66%	0%	0%	*41%*	100%	0%	0%	*20%*
67	15,3		100%	100%	100%	*100%*	100%	100%	0%	0%	*53%*	100%	80%	0%	*47%*
72	16,5		100%	100%	100%	*100%*	100%	100%	100%	100%	*100%*	100%	100%	100%	*100%*
81	18,8		100%	100%	100%	*100%*	100%	100%	100%	100%	*100%*	100%	100%	100%	*100%*
53	11,8	15%	0%	0%	0%	*0%*	0%	0%	0%	0%	*0%*	0%	0%	0%	*0%*
58	12,9		38%	0%	0%	*20%*	100%	0%	0%	0%	*18%*	100%	0%	0%	*20%*
62	14,1		75%	100%	0%	*60%*	100%	66%	0%	0%	*41%*	100%	0%	0%	*20%*
67	15,3		100%	100%	100%	*100%*	100%	83%	0%	0%	*47%*	100%	40%	0%	*33%*
72	16,5		100%	100%	100%	*100%*	100%	100%	80%	100%	*94%*	100%	100%	71%	*87%*
81	18,8		100%	100%	100%	*100%*	100%	100%	100%	100%	*100%*	100%	100%	100%	*100%*
53	11,8	20%	0%	0%	0%	*0%*	0%	0%	0%	0%	*0%*	0%	0%	0%	*0%*
58	12,9		38%	0%	0%	*20%*	66%	0%	0%	0%	*12%*	100%	0%	0%	*20%*
62	14,1		63%	100%	0%	*53%*	100%	33%	0%	0%	*29%*	100%	0%	0%	*20%*
67	15,3		88%	100%	100%	*93%*	100%	83%	0%	0%	*47%*	100%	0%	0%	*20%*
72	16,5		100%	100%	100%	*100%*	100%	100%	80%	0%	*76%*	100%	100%	43%	*73%*
81	18,8		100%	100%	100%	*100%*	100%	100%	100%	100%	*100%*	100%	100%	100%	*100%*
53	11,8	25%	0%	0%	0%	*0%*	0%	0%	0%	0%	*0%*	0%	0%	0%	*0%*
58	12,9		13%	0%	0%	*7%*	33%	0%	0%	0%	*6%*	33%	0%	0%	*7%*
62	14,1		38%	100%	0%	*40%*	66%	33%	0%	0%	*24%*	100%	0%	0%	*20%*
67	15,3		75%	100%	100%	*87%*	100%	66%	0%	0%	*41%*	100%	0%	0%	*20%*
72	16,5		100%	100%	100%	*100%*	100%	83%	60%	0%	*60%*	100%	80%	14%	*53%*
81	18,8		100%	100%	100%	*100%*	100%	100%	100%	100%	*100%*	100%	100%	100%	*100%*

Annex XII: Description of the historic and socio-economic background for the request to change the minimum mesh size for Danish Anchor seine from 120 mm to 105 mm in Skagerrak (DK)

The fishing carried out with traditional Danish Anchor seine (DAS) using an anchor during the catching process is widely recognized in the scientific literature as a relatively sustainable gear with a minimal bottom impact. However, unfortunately DAS is a fishing method that is likely to disappear in a limited number of years unless this fishery is given preferential treatment. The basic reason for this is that trawl and Scottish seine are more economically efficient. The obligation to use a 120 mm mesh in the Skagerrak has enhanced this development: Historically, it used to be the dominant gear in the Danish fisheries, however the DAS fleet today is down to about 20 mostly elder vessels. There have been almost no investments in this fleet for the past 20 years, and the youngest vessels are made up of wooden vessels from around the mid 80's.

Denmark drew attention to the problem at the technical meeting between the EU and Norway in Gothenburg on the 2nd to 3rd May 2013. At the meeting it was therefore agreed that Denmark would conduct trials with mesh size of minimum 105 mm as well as with alternative mesh sizes and/or positions for the panels to find possible solutions to the problems related to the DAS fishery.

Work done by DTU Aqua confirms that the use of smaller mesh size than 120 mm in DAS fishery does not compromise the selectivity requirement that is set by the standard of 120 mm for the demersal trawl fishery.

Allowing a mesh size of minimum 105 mm in the DAS fishery would support a positive development for this fleet and raise awareness of the potential benefits of this fishing method. The potentials in the DAS fishery:

- Very limited bottom impact during fishing, as the gear is very light and the ropes run straight over the bottom. The catch method requires a level bottom without major obstacles, as the rope or the net otherwise will be destroyed. Per haul the DAS method will cover a larger area compared to trawl, which should be an advantage, especially when fishing for flatfish.
- Fuel-saving compared to all other fishing methods with towed gear, as the anchor holds the vessel so no energy is needed to drive the vessel through the water.
- High quality fish, as the fish have a very short period in the cod end before taken onboard the vessel. In particular, round-fish are only caught in the gear at the end of the catch process and therefore have a very short time in the cod end.
- Large selection in the gear as the meshes are kept open during the entire catch process. There is a two-part selection, one when the gear is pulled over the seabed and another one when the gear is pulled up through the water column and tackled onboard.

Annex XIII: Difference in size selectivity between Danish anchor seine and otter trawl (DTUaqua)

Selectivity data for Danish anchor seines (DAS) is generally sparse compared to otter trawls for which numerous studies have been conducted. Selectivity parameters for DAS presented here is based on direct estimates, selection factor conversion and selectivity-models.

A review of available selectivity data systematically indicated that a DAS is a more selective fishing gear than an otter trawl (Table 1). The selectivity process in DAS is different from that of demersal otter trawls (Herrmann et al., 2016; Noack et al., 2017), which likely is caused by the differences in gear construction and fishing operation between the two gears. Analyzing size selectivity in DAS requires more flexible models (e.g. double logit models) than what is normally used in otter trawls supporting that the selectivity process between the two gears are different (Herrmann et al., 2016; Noack et al., 2017).

Plaice (*Pleuronectes platessa*) is the most important species in both weight and value for DAS, but cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and witch flounder (*Glyptocephalus cynoglossus*) are also important. L50 values (the length where 50% of the fish are retained) of cod, haddock and plaice for DAS are systematically higher than for otter trawls using similar codend mesh sizes (Table 1). Comparison between the two gears for witch flounder has not been done, as there is no available selectivity data for otter trawls for this species. Herrmann et al. (2016), however, concluded that there was a low retention probability of witch flounder below 34 cm in the 120 mm DAS fishery, despite a minimum market size of ~27 cm, resulting a large loss of marketable fish when using currently legal mesh size. In general, the L50 values for DAS with 105 mm codends are lower than L50 estimates from otter trawls using 120 mm. 105 mm is, however, the mesh size suggested by Herrmann et al. (2016) for DAS as L25s for this mesh size nearly match the MCRS of cod and haddock (30 cm or 27 cm, respectively) – an approach to adapt mesh sizes to legislation suggested by Anon (1979).

Table 1. Comparison of L50 values between demersal bottom trawls and Danish anchor seines separated by mesh sizes. Average values in cm (Min-Max).

Species	Demersal otter trawl		Danish anchor seine	
	120-130 mm	140 mm	105 mm	120-130 mm
Cod	38.3 (30.5-50.0)[1,2,3,4,5,6,7,8,9,10]	45.7[9]	34.7[8] (model estimate)	42.6 (41.6-43.6)[11,12]
Haddock	34.8 (34.3-35.5)[10,13,14]	-	31.5[8] (model estimate)	38.4[11]
Plaice	26.4 (25.6-27.3)[15] (model estimate)	-	-	29.1 (28.7-30.1)[12]

[1]Strzyzewski et al. (1973), [2]Shevtsov (1981), [3]Lowry et al. (1995), [4]Netzel and Zaucha (1989), [5]Tschernij et al. (1996), [6]Tschernij and Holst (1999), [7]Moderhak (2000), [8]Wienbeck and Dahm (2000), [9]Madsen et al. (2002), [10]Graham et al. (2004), [11]Herrmann et al. (2016), [12]Noack et al. (2017a), [13]Kynoch et al. (2004), [14]Fryer et al. (2016), [15]Wienbeck (unpublished data)

References

Anon. 1979. Reports of the ICES Advisory Committee on Fisheries Management, 1978. ICES Cooperative Research Report 85, ICES, Charlottenlund. pp 59.

Fryer, R.J., O'Neill, F.G., Edridge, A. 2016. A meta-analysis of haddock size-selection data. Fish. 17(2): 358-374.

Graham, N., O'Neill, F.G., Fryer, R.J., Galbraith, R.D., Myklebust, A. 2004. Selectivity of a 120 mm diamond cod-end and the effect of inserting a rigid grid or a square mesh panel. Fish. Res. 67(2): 151-161.

Herrmann, B., Krag, L.A., Feekings, J., Noack, T. 2016. Understanding and predicting size selection in diamond-mesh cod ends for Danish seining: A study based on sea trials and computer simulations. *Marine and Coastal Fisheries* 8, 277-291.

Kynoch, R.J., O'Dea, M.C., O'Neill, F.G. 2004. The effect of strengthening bags on cod-end selectivity of a Scottish demersal trawl. Fish. Res. 68(1–3): 249–257.

Lowry, N., Knudsen, L.H., Wileman, D. 1995. Selectivity in Baltic cod trawls with square mesh codend windows. ICES CM 1995/B:5.

Madsen, N., Holst, R., Foldager, L. 2002. Escape windows to improve the size selectivity in the Baltic cod trawl fishery. Fish Res 57:223–235.

Moderhak, W. 2000. Selectivity properties of polyamide (PA) cod trawl codends made of meshes turned 90°. Meddelande från Havsfiskelaboratoriet 329:57–65.

Netzel, J., Zaucha, J. 1989. Investigation results of cod trawls' codend selectivity. ICES CM 1989/B:54.

Noack, T., Frandsen, R.P., Krag, L.A., Mieske, B., Madsen, N. 2017. Codend selectivity in a commercial Danish anchor seine. Fisheries Research 186, Part 1: 283–291.

Shevtsov, S.E. 1981. Selectivity of the bottom trawl codends with 100 and 110 mm mesh size used for the Baltic cod fishery. ICES CM 1981/B:7.

Strzyzewski, W., Szymanski, W., Zdziebkowski, G. 1973. Investigations on the selectivity of Baltic cod and flounder carried out in 1972/1973. ICES CM 1973/F:25.

Tschernij, V., Larsson, P.-O., Suuronen, P., Holst, R. 1996. Swedish trials in the Baltic Sea to improve selectivity in demersal trawls. ICES CM 1996/B:25.

Tschernij, V., Holst, R. 1999. Evidence of factors at vessel-level affecting codend selectivity in Baltic cod demersal trawl fishery. ICES Document CM 1999/R:02.

Wienbeck, H., Dahm, E. 2000. New ways for an improvement of the selectivity of trawl codends in the Baltic cod fishery. Meddelande från Havsfiskelaboratoriet 329:80–93.

Annex XIV - Species composition, seasonal and temporal trends for both Danish anchor seines and otter trawlers in Skagerrak

Gear	Q1			Q 2			Q 3			Q 4		
	Species	Weight (t)	Value (DKK*1000)	Species	Weight (t)	Value (DKK*1000)	Species	Weight (t)	Value (DKK*1000)	Species	Weight (t)	Value (DKK*1000)
Bottom trawl	Plaice	845	12680	Plaice	585	8440	Plaice	1044	14599	Plaice	694	14200
	Cod	660	16905	Cod	382	9324	Nephrops	762	35457	Cod	432	11080
	Nephrops	582	37189	Nephrops	277	19983	Cod	395	10610	Nephrops	426	24211
	Witch	254	4825	Saithe	218	2127	Saithe	302	2507	Saithe	243	2462
	Saithe	235	2109	Witch	183	3214	Hake	159	2068	Haddock	148	1692
Danish seine	Plaice	140	2083	Plaice	618	9041	Plaice	1433	19907	Plaice	326	6071
	Cod	48	1105	Cod	153	3747	Haddock	144	2182	Dab	26	291
	Witch	15	259	Haddock	115	1601	Cod	119	3107	Cod	24	670
	Haddock	9	122	Dab	52	401	Dab	86	731	Haddock	2	35
	Dab	8	83	Witch	51	977	Witch	78	1625	Cephalopods	2	76

Table 2. Catch weight and value for the five most important species caught by Danish anchor seiners and bottom trawlers (mesh size >90 mm) in 2017.

Conclusion

- Plaice is the most important in both weight and value for DAS in all quarters (Q)
- Cod, haddock and witch flounder are the most important "by-catch" species in the DAS fishery
- Q2 and especially Q3 is important for the DAS fleet
- Plaice is the most important species in weight and *Nephrops* in value for the trawl fleet
- There is no clear seasonal differences for trawls as observed for DAS