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Review of the Joint Recommendations concerning the implementation of EU-Norway agreement on Technical Measures in the Skagerrak

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1. Context

Regulation (EU) no. 2018/973 establishes a multiannual plan for the management of demersal stocks in the North Sea and the fisheries exploiting those stocks. Article 9 of Regulation (EU) no. 2018/973 empowers the Commission to adopt delegated acts in order to supplement this Regulation regarding technical measures in accordance with Article 16 of this Regulation. Such technical measures may entail specifications of characteristics of fishing gears and rules governing their use, as well as limitations or prohibitions on the use of certain fishing gears and on fishing activities, in certain areas or periods.

In accordance with Article 18 of the Regulation 1380/2013, where the Commission has been granted powers to adopt measures by means of delegated acts, Member States with a direct management interest may submit joint recommendations (JR) to achieve the objectives of the relevant Union conservation measures, the multiannual plans or the specific discard plans.

Against this background the Scheveningen group adopted a Joint Recommendation with a view to implement measures consulted and agreed with Norway in 2018[1]. These measures result from the work in the EU-Norway working group on technical measures in the Skagerrak and were agreed upon in consultations between EU and Norway on the 5th and 6th of September 2018 in Goteborg, Sweden, and in line with art 3 and 4 in the EU-Norway Agreement on reciprocal access to fishing in the Skagerrak[2].

Once the joint recommendation is received, it is necessary to evaluate the various elements of the joint recommendation on the introduction of additional technical measures in the context of real time closures (RTCs) and the proposed reduction of mesh size from 120 mm to 105 mm for the Danish anchor seine fisheries in EU waters of Skagerrak. This calls for the review of the supporting scientific information provided.

2. Terms of Reference

The terms of reference are as follows:

- To assess the details as provided in the Joint Recommendation for the introduction and implementation of a Real Time Closure (RTC) system for the Northern prawn (*Pandalus Borealis*). This RTC system was agreed with Norway during the consultations on 5-6 September 2018. The assessment should particularly assess whether the conditions outlined for the implementation of the RTC, and in particular the conditions set to exempt gears inside the RTC and the conditions for operating therein, meet the standards and requirements mentioned above in the introductory paragraph on the tasks under the ad-hoc contract.
- To assess the Joint Recommendation to reduce the current mesh size in Danish Seines fisheries, from 120mm to 105mm. To assess if this reduction is warranted against the standards and requirements mentioned above; this assessment needs to be based on the supporting scientific documentation, in particular if this provides sufficient evidence that the expected exploitation pattern of fisheries with 105mm for Danish Seines is at least as selective and/or reducing unwanted catches as of fisheries with a 120mm trawl.

[1] Agreed record of fisheries consultations between the European Union and Norway on technical measures in Skagerrak. Göteborg, 6 September 2018

[2] Agreement between the European Union and the Kingdom of Norway on reciprocal access to fishing in the Skagerrak for vessels flying the flag of Denmark, Norway and Sweden

Comparisons with selectivity data from other experiments using similar gears for the key species concerned may be used. If the assessment is positive, to describe potential impacts on technical regulations expressed in definitions of gears and detailed rules governing the use of different mesh sizes.

- To assess the Joint recommendation to supplement existing gear exemptions in Regulation (EU) No. 724/2010[3], in accordance with Article 9(1)(a) of Regulation (EU) 2018/973, with two additional gears to be exempted:
    - *Pandalus* trawls equipped with a Nordmøre grid without a collecting bag, and
    - *Nephrops* trawls equipped with a species selective grid.

  In particular, assess whether the selectivity characteristics and operational conditions of these two gears to be exempted from moving-on or exclusion provisions are sufficient and consistent with the objectives of the RTC system and provide for improved selectivity, reduction of unwanted catches and protection of juveniles of marine organisms, as referred to in Article 9.1 of Regulation 2018/973.

3. Background

The Scheveningen group representing Member States in the North Sea submitted a Joint Recommendation concerning the implementation of a formal agreement on technical measures in the Skagerrak made between EU and Norway. This JR followed from consultations by an EU-Norway Working Group that took place on the 5th and 6th of September 2018 in Göteborg, Sweden. The JR contains three elements:

1. The implementation of a joint Real Time Closure (RTC) system for the Northern prawn (*Pandalus* borealis) fishery in the Skagerrak. The main objective to limit capture of large concentrations of juvenile *Pandalus*. This objective is achieved by introduction of conservation measures in line with article 9 in Regulation (EU) No 2018/973 that will limit the use of less size-selective fishing gears in areas with large aggregations of small *Pandalus*.
2. The reduction of the mesh size from 120mm to 105mm for the Danish anchor seine fishery in EU waters of the Skagerrak, based on a review of the gear selectivity characteristics by the EU/Norway working group on technical measures in the Skagerrak. This review indicated that the Danish Anchor seine is more size-selective fishing gear in comparison to otter trawls.
3. A review of the existing gear exemptions for *Pandalus* and *Nephrops* fisheries within the existing RTC system for the protection of juvenile cod, haddock, saithe and whiting in EU waters, as set out in Regulation (EU) No. 724/2010. This review focused on allowing the use of *Pandalus* trawls equipped with a Nordmøre grid without a collecting bag as well as *Nephrops* trawls equipped with a species selective grid within RTC closed areas for cod, haddock, saithe and whiting. This is based on documented bycatch of juvenile cod, haddock, saithe and whiting being very small. The JR recommended supplementing the existing gear exemptions set out in Regulation (EU) No. 724/2010 with these additional two gears.

[3] Regulation (EU) No 724/2010 laying down detailed rules for the implementation of real-time closures of certain fisheries in the North Sea and Skagerrak.

4. TOR 1

4.1. Background

The Joint Recommendations (JR) submitted by the Scheveningen Group and the Agreed Record of the Conclusions between the European Union and Norway of 6 September 2018 lay down procedures and sampling methodologies for the adoption of real-time closures for *Pandalus* in the Skagerrak. The Scheveningen group recommends that these measures are transposed into EU legislation based on article 9.1.c of the multiannual plan for demersal stocks in the North Sea (Regulation (EU) No 973/2018[4].

4.2. Basis

The *Pandal*us RTC described in the JR builds on the RTC system in place in the North Sea and Skagerrak designed to protect juvenile cod, haddock, saithe and whiting in fisheries in the North Sea and Skagerrak. It was introduced following discussions between Norway and the EU and has been in place for more than 8 years. The details are set out in Commission Regulation (EU) No 724/2010[5] as amended through Regulation (EU) No 783/2011[6].

The details of the *Pandalus* RTC system were developed following two meetings of an EU-Norway Working Group on Technical Measures in Skagerrak[7]. Further discussions were held within the Working Group and with industry and the North Sea Advisory Council (NSAC) to agree on biological and technical parameters, procedural issues regarding initiating and lifting of RTCs as well as control and monitoring arrangements. Fishing gears that can and cannot be used within the closed area are also described.

The JR details the elements of the final RTC system agreed for *Pandalus.* These are summarised below in Table 4.2.1.

Table 4.2.1. Summary of the main elements of the proposed Pandalus RTC system

Specifications	Details
Source of Information	Inspections at sea on commercial fishing vessels conducted by control authorities.
Targeted Inspection resources	A risk-based strategy to identify areas and time periods where there is a risk of catching numbers of *Pandalus* below trigger length which exceed the threshold level. Inspections shall be carried out in areas to measure whether the percentage of small *Pandalus* exceeds the threshold level, including through Joint Deployment Plans
Trigger Length	14.8 mm carapace length (measured in accordance with Regulation (EC) 850/98, annex

[4] Regulation (EU) 2018/973 of the European Parliament and of The Council of 4 July 2018 establishing a multiannual plan for demersal stocks in the North Sea and the fisheries exploiting those stocks, specifying details of the implementation of the landing obligation in the North Sea and repealing Council Regulations (EC) No 676/2007 and (EC) No 1342/2008. O.J. L179, 16.7.2018, p.1.

[5] Commission Regulation (EU) No 724/2010 of 12 August 2010 laying down detailed rules for the implementation of real-time closures of certain fisheries in the North Sea and Skagerrak. O.J. L213, 13.08.2010, p.1.

[6] Commission Implementing Regulation (EU) No 783/2011 of 5 August 2011 amending Regulation (EU) No 724/2010 laying down detailed rules for the implementation of real- time closures of certain fisheries in the North Sea and Skagerrak. O.J. L203, 6.8.2011, p.7.

[7] EU-Norway Working Group Report on Technical Measures in Skagerrak. Göteborg, February and July 2018

	XIII, for Norway lobster)
Threshold level	More than 20% by number of *Pandalus* under the trigger length
Inspection and monitoring	Closures based on hauls with more than 100kg of *Pandalus* if the proportion of *Pandalus* below the RTC trigger length is more than 40%, a closure can be established based on one sample. Sampling from least 2 hauls in 96 hrs show that *Pandalus* below the trigger length is exceeding the threshold level except if the proportion of *Pandalus* below the RTC trigger length is more than 40%, then one sample is sufficient
Decision to close	Coastal Member State in consultation with neighbouring coastal states where applicable
Size and shape of the closed area	Shape of the area based on physical factors, inter alia depth contours, and other factors such as catch compositions, fishing activity etc. Upper area limit of 50 square nautical miles
Entry into force	Midnight UTC on the day of decision.
Duration and scope	Closure for 14 days Limited to demersal trawls within the mesh size range 35-69 mm targeting *Pandalus* Vessels fishing for *Pandalus* using a recognised size selective gear can continue to fish unless the threshold level is breached

4.3. Observations

The RTC system proposed has been developed following extensive discussion involving experts and the industry. The supporting information provided in the Working Paper is detailed and the final system does not deviate from the recommendations of the Working Group. It follows closely the existing RTCs in the Skagerrak and North Sea for the protection of juvenile cod, haddock, saithe and whiting. A comparison of the two systems is provided in Annex I. It contains all the same elements in the existing gadoid RTCs, a comprehensive control and monitoring regime as well as a review mechanism.

Several deviations are noted compared to the gadoid RTCs as follows:

1. Trigger length - The trigger length of 14.8mm carapace length proposed reflects the biology characteristics of *Pandalus* and seems appropriate to define juvenile *Pandalus* based on biological information contained in Sealifebase (2019) and Shumway et al. (1985). The use of carapace length as a measurement is in line with current Regulations for species such as *Nephrops* and Rose shrimp.
2. Threshold level – The threshold level of more than 20% by number is based on multiple observations from controlled hauls from Danish, Swedish and Norwegian vessels over the period 2015-2017. This data provides estimates of the likely proportion of hauls with catches of small *Pandulus* greater than different threshold levels based on different carapace lengths. The data presented validates the 20% threshold level proposed as a reasonable compromise.

3. Duration of the RTCs implemented – The proposed RTCs would remain in force for 14 days as compared to 21 days for the gadoid RTCs. No reason is provided for this difference, but it is unlikely it significantly reduces the effectiveness of the closures unduly.

The proposal includes a derogation for vessels using a size selective gear incorporating a combination sorting grid with a top section with a 19mm bar spacing and the bottom section having a 9.5mm bar spacing. Vessels using this type of grid may continue to fish in RTCs. This grid was specifically designed to reduce the catch of small *Pandalus* and Swedish and Norwegian trials of this grid showed reductions in small shrimp of at least 60%. Trials by Denmark showed no significant difference between the combination and a standard sorting grid in catch levels of small *Pandalu*s. The Danish trials also indicated that the combination grid with difficult to handle on board because it is longer than the standard grid.

Based on the information provided, it is not possible to assess the reasons for the significant differences in results between the Danish and Swedish and Norwegian trials. However, the three countries have subsequently agreed that it should be allowed within *Pandalus* RTCs as part of the EU/Norway agreement. There therefore seems no reason not to allow its use as proposed, provided the specifications of the grid are well defined and there is comprehensive monitoring of vessels using the combination grid. Monitoring would help to demonstrate that catches of small shrimps are consistently maintained below the threshold level. If this is found not to be the case, then the derogation should be discontinued.

The RTC system proposed has positive conservation benefits in line with the objective of Regulation (EU)2018/973. Therefore, it would seem appropriate to introduce it into the Skagerrak as per the specifications set out in the JR as submitted by the Scheveningen group. The effectiveness's of the RTC system should be subject to careful monitoring and evaluated according to the review mechanism set out in the JR. A specific monitoring programme of the combination grid to ensure it consistently maintains catches of small Pandalus below the trigger level should be built into the system.

5. TOR 2

5.1. Background

In 2018, the EU/Norway Working Group on technical measures in the Skagerrak reviewed available scientific evidence of the gear selectivity characteristics of Danish anchor seines used in the Skagerrak. Danish anchor seining is a fishing method which involves the use of an anchor where the fishing vessel is stationary whilst hauling the gear. The fishery with Danish anchor seines in Skagerrak is conducted by approximately 20 small-scale Danish vessels targeting demersal species, fishing mainly in the EU-waters of Skagerrak.

Danish anchor seining is widely recognized in the scientific literature as a relatively sustainable gear with minimal bottom impact and highly fuel efficient (ICES, 2011). According to the JR, there is evidence from selectivity studies carried out by Denmark that indicate Danish anchor seines are more size-selective than otter trawls with similar codend mesh sizes. Based on these findings Norway did not object to a reduction of the mesh size for this fishery in the EU waters of Skagerrak using this type of gear when this was discussed during the EU-Norway fisheries consultations held in September 2018.

Given the conclusions of the scientific review concerning the selectivity of Danish anchor seines, the Scheveningen group recommended to supplement the provisions set out in Regulation (EC) 850/1998[8], in accordance with Article 9(1)(a) of Regulation (EU) 2018/973, by allowing the use of Danish anchor seines with 105mm codends instead of the current regulated mesh size of 120mm. This would apply to fisheries for demersal species, other than for plaice, in EU-waters of Skagerrak.

5.2. Basis

The basis for the recommendation to allow the use of a 105mm codends in the Danish anchor seine fishery are two studies carried out by DTU in Denmark. One of these studies presents selectivity data from a trial on board an anchor seine vessel with a codend of 124mm (Noack et al., 2017). The other presents information from a further selectivity analysis of an anchor seine with a codend of 129.6mm (as measured during the trial). This study also presents model estimates of selectivity for a range of codend mesh sizes for both Danish anchor seines and otter trawls (Hermann et al. 2016). The model estimates were generated from the FISHSELECT selectivity model, developed by Hermann et al. (2009) and the model developed by Fryer et al. (2016). Data for cod, haddock, plaice and witch flounder are presented.

This information is summarised in a table in Annex XIII to the EU-Norway Working Group report on Technical Measures in Skagerrak. This is summarised in table 5.2.1

Table 5.2.1 Comparison of L50 values between demersal bottom trawls and Danish anchor seines separated by mesh sizes. Average value 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]Hermann et al. (2016), [12]Noack et al. (2017a), [13]Kynoch et al. (2004), [14]Fryer et al. (2016), [15]Wienbeck (unpublished data)

Source: Annex XII of Working Group Report on technical measures in Skagerrak

Two other reports were provided as supporting evidence to the JR. One of these detailed the gear performance and catch process of a commercial Danish anchor seine (Noack et al. 2019). The other estimated escapement of fish and invertebrates in a Danish anchor seine (Noack et al., 2016). These latter two studies provide interesting information on the catching process of a Danish anchor seine compared to standard otter trawls but are not considered relevant to this evaluation. There is also a short report presented in Annex XII of the Working Group report which provides a description of the historic and socio-economic background to the request to reduce the mesh size in the Danish anchor seine fishery. Again, while interesting, this report does not provide any data relevant to the assessment.

[8] COUNCIL REGULATION (EC) No 850/98 of 30 March 1998 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms. OJ L 125, 27.4.1998, p. 1.

5.3. Observations

The results from the trials and model estimates from Danish anchor seines are compared to existing selectivity data for otter trawls. Based on this analysis, the JR concludes that the Danish anchor seine is a more selective fishing gear than an otter trawl. Further, it concludes that the selectivity process in a Danish anchor seine is different that of a demersal otter trawls because of differences in gear construction and gear operations. While there is evidence to support the latter conclusion as undoubtedly there are significant differences in the two fishing methods, the supporting information provided in the JR that forms the basis for the first conclusion (i.e. higher selectivity) is limited and not necessarily supported by previous analysis of the different gear types.

According to the report from an ICES workshop on seine net selectivity, WKSEINE[9], there are few studies that directly compared the selectivity of the two-different towed gear fishing methods (ICES, 2011). ICES did highlight a simple statistical analysis of the overall selection factor estimates for individual experiments by Wileman (1992) and a review by Ferro (1996). Both suggested that differences between gear types were not significant (i.e. they could not distinguish variations in selection factor between vessel trips for Danish anchor seines and otter trawls.

ICES reported on a further analysis by Wileman (1997) which produced estimates of the size selectivity of the gears used principally by vessels participating in the Baltic Sea, Kattegat and North Sea. Selectivity data for cod provided in this report from both trawlers and Danish anchor seines was presented. Broadly comparable data for nominal 100mm codends constructed in 4mm double PE twine over the period from August 1991 to March 1997 was reported. These data are summarized below in Table 5.3.1.

Table 5.3.1 Summary of cod selectivity data for a Danish Anchor Seine compared to trawl selectivity data (codend mesh size is nominal 100mm x Double 4mm PE twine)

Table 1. Summary of Cod Selectivity Data for a Danish Anchor Seine compared to Trawl Selectivity Data (codend mesh size is nominal 100mm x Double 4mm PE. twine).

Parameters	SDN (Jun-92)	OTB (OCT-94)	OTB (Mar-95)	OTB (Mar-96)	OTB (Mar-97)	OTB (Mar-95)	OTB (Mar-95)
Mesh Opening mm	102.3	99.1	98.4	101.2	98.8	99.1	99.1
L25 cm	30.8	30.7	26.4	27.9	28.4	30.2	31.8
L50 cm	34.5	33.3	29.8	31.9	32.4	32.9	34.2
Selection range cm	5.8	5.2	6.9	7.9	8.1	5.3	4.9
Selection factor cm	3.37	3.36	3.03	3.15	3.28	3.32	3.45

Source: Wileman (1997).

Source: ICES, 2011

ICES highlight these data are limited with several confounding factors that make a more detailed analysis inappropriate, but they at least demonstrate a remarkably consistent pattern between Danish anchor seine net selectivity data and otter trawl data. This is somewhat contrary to the conclusions presented in the JR indicating significant differences in selectivity between anchor seines

[9] ICES Workshop on seine net selectivity (WKSEINE)

and trawls. This is not to say that this conclusion is wrong, it merely highlights the lack of information available to be able to make an assessment as to whether this is the case or not.

On the specific supporting information provided with the JR, the following observations are considered relevant:

1. Other than model estimates, there is no selectivity information (either absolute or relative) provided for the Danish anchor seine with a 105mm codend. No data is presented for otter trawls with 105mm codends or data for plaice with this mesh size (see table 5.2.1). These model estimates are compared to selectivity data generated from experiments at sea. Acknowledging there is a very detailed description of the model parameters and approach, the comparability of the model estimates and the experimental data is unclear. Ideally selectivity experiments to determine the absolute selectivity of the 105mm codend compared to the 120mm codends should be carried out to validate the model estimates. Accepting obtaining selectivity estimates from seine net gear is difficult, estimates of relative stability through catch comparison experiments would facilitate a more thorough assessment.
2. The L50s for cod and haddock presented do not show the Danish anchor seine and 105mm codend to be equivalent or more selective than an otter trawl with a 120mm codend. The model estimates for the 105mm codend give lower L50s than the otter trawl with a 120mm codend for both cod and haddock by 3.6cm and 3.3cm respectively. This is in line with observations from the analysis carried out at an EU Expert Meeting in 2003 that showed for haddock, a 10 mm increase in codend mesh size leads to an increase in L50 by ~3.3 cm (Anon., 2003).
3. The estimates of selectivity presented for the nominal 120mm codend in an anchor seine derived from the sea trials by Noack et al (2017) were obtained from codends measured as 124mm (Noack et al. 2017), and 129.8mm (Hermann et al., 2016). It is questionable whether this data is representative of an anchor seine with a 120mm codend and therefore cannot be compared directly against the selectivity of an otter trawl with a 120mm codend. This could be construed as a comparison between a 125mm-130mm codend and a 120mm codend. Intuitively a larger codend mesh size would give an increased L50 which would explain the differences between otter trawls and Danish anchor seines presented in table 5.2.1.
4. The estimates provided for otter trawls with 120mm codends come mainly from the Baltic Sea cod fishery. Some of these estimates are quite dated. The estimates for haddock are from the North Sea. It is unclear how representative these estimates are to the Skagerrak Danish anchor seine fishery in terms of codend construction, fish population structures and prevailing environmental conditions. A combination of the factors outlined above and other (uncontrolled) factors will influence the outcome (e.g. different population size structure, other trawl design differences or changed fish condition) and the validity of the comparisons.

The case is built on model outputs showing equivalence between the Danish anchor seine fitted with a 105mm codend to be equivalent or more selective than an otter trawl with a 120mm codend. There is a lack of agreement between the theoretical model estimates with parameters generated from selectivity experiments. The information presented in the form of L50s for cod and haddock derived from the selectivity experiments does not show equivalence and in fact indicates the Danish anchor seine fitted with the 105mm codend to be less selective for both species.

6. TOR 3

6.1. Background

The RTC system for the protection of juvenile cod, haddock, saithe and whiting in the North Sea and Skagerrak is set out in Regulation (EU) No 724/2010. This system was introduced following discussions between Norway and the EU over the period 2006-2010 and has been in operation since 2011. This Regulation contains a provision in Article 7(1) that exempts certain gears from RTCs because they have very low levels of observed catches of juvenile gadoids. These gears are:

a. pelagic trawls, purse seines, driftnets and jiggers targeting herring, mackerel, and horse mackerel;
b. pots;
c. scallop dredges;
d. gillnets;

The EU-Norway Working Group reviewed gears that reduce fish bycatches to an extent that they potentially could be added to the list of exempted gears. Based on this review, the Scheveningen group recommended supplementing the provisions set out (EU) No 724/2010, by adding two further gears. These are:

e. demersal trawls within a mesh size range 35-69 mm targeting *Pandalus* equipped with a Nordmøre sorting grid with a maximum bar spacing of 19 mm without a fish retention device; and
f. demersal trawls within a mesh size >70 mm targeting *Nephrops* equipped with a species selective grid with a maximum bar spacing of 35mm.

6.2. Basis

Numerous scientific studies that show both proposed exempted gears give significant reductions in the fish bycatches in *Pandalus* and *Nephrops* trawls form the basis for the proposal in the JR. In the case of the *Pandalus* trawl, three scientific papers (Isaksen et al., 1992; Broadhurst, 1999; and Gullestad, 2014) are provided in the JR. These reports review the use of sorting grids in shrimp fisheries and reference numerous other studies that demonstrate the effectiveness of sorting grids in reducing fish bycatch of fish in the *Pandalus* fishery. The JR concludes that, according to Swedish FDI data from 2016, landings from vessels using grids without a fish retention device comprise 99% of *Pandalus* shrimp, and in combination with a fish retention device, approximately 74% of *Pandalus*. This shows the level of fish bycatch in *Pandalus* trawls fitted with Nordmøre sorting grids is very low.

Similarly, the JR provides several papers (Valentinsson and Ulmestrand, 2008; Madsen and Valentinsson, 2010; and Hornberg et al. 2016) on the use of species selective grids in *Nephrops* trawls. These studies carried out by Sweden show such grids to be effective at reducing fish bycatch in the *Nephrops* fishery in the Skagerrak. Similar studies carried out in Ireland and the UK have yielded similar results in terms of fish bycatch reduction and are also referenced (Catchpole et al 2007; Cosgrove et al. 2016; Cosgrove et al. 2019). According to the JR, of the 764,2 tonnes landed in 2016 by *Nephrops* trawls fitted with a 35 mm *Nephrops* grid, 733,3 tonnes were *Nephrops* (96%), 547 kg (0.1%) cod, 103 kg (0.01%) haddock, 0 kg saithe and 4.5 tonnes (0.6%) whiting (Swedish FDI data 2016). This relates to catches of marketable fish rather than juveniles but shows the fish catch in the *Nephrops* fishery is very low as with the *Pandalus* fishery.

6.3. Observations

Regulation (EU) 724/2010 sets a trigger level for the gadoid RTCs of 15% by weight of juveniles of cod, haddock, saithe and whiting in any sampled haul or 10% by weight of juveniles if the sample of the catch taken contains 75% of cod. For the purposes of the Regulation, juveniles are defined as:

- Cod less than 35cm
- Haddock less than 30cm
- Saithe less than 35cm
- Whiting less than 27cm

To be exempted, the proposed gears must be able to achieve catches consistently below this trigger level (i.e. catches of less than 10-15% of juveniles).

Sections 6.3.1 and 6.3.2 summarise the results of trials with the two proposed selective gears (i.e. *Pandalus* trawls equipped with a Nordmøre grid without a collecting bag and *Nephrops* trawls equipped a with a species selective grid) demonstrating estimated catches of juveniles.

6.3.1. *Pandalus* trawls equipped with a Nordmøre grid without a collecting bag

Nordmøre sorting grids have been used in shrimp fisheries globally for many years. They have been subject to extensive testing and shown to be highly effective at reducing the bycatch of fish in shrimp fisheries. In many shrimp fisheries their use is mandatory.

Since 1997, *Pandalus* trawls used in Swedish national waters including the Skagerrak must be equipped with a Nordmøre grid, with a bar spacing of 19 mm. Following an agreement between EU and Norway, the Nordmøre grid has been mandatory since 1st February 2013 in all shrimp fisheries in Skagerrak (except Norwegian national waters within the 4 nm limit). From 1st of January 2015, this has been extended to the North Sea south of 62˚N.

Trials with such grids in *Pandalus* fisheries have shown that with a bar spacing of 19 mm, 100% of cod and haddock greater than approximately 20 cm length are excluded from the catch with approximately 50% of haddock and whiting less than 12cm also excluded (Larsen, 1991; Isaksen et al., 1992; brothers and Hickey, 1998; Larsen et al. 2017). The results across different trials are consistent and confirm the effectiveness of the grid as a bycatch reduction device. The design and installation of Nordmøre grids is well established and their use accepted by fishermen in the *Pandalus* fishery.

Given its proven effectiveness there seems no reason not to add Pandalus trawls equipped with a Nordmøre sorting grid with a maximum bar spacing of 19 mm without a fish retention device to the list of exempted gears in Article 7(1) of Regulation (EU) 724/2010.

6.3.2. *Nephrops* trawls equipped with a species selective grid

The "Swedish" 35mm grid in *Nephrops* trawls, was gradually introduced in Sweden since 2004 (Madsen and Valentinsson, 2010) as a management strategy, partly to cope with the imbalance between available fish- and *Nephrops* quotas. The overall aim was to minimise fish by-catch while maintaining catch rates for *Nephrops*. The implementation of the grid was incentivised by allowing fishermen to continue to exploit certain coastal areas otherwise closed for trawling, such as within the national trawl border (new regulations in place 2004) and in a marine protected area in the Kattegat established in 2009. In addition, fishermen who opted to use the Swedish grid were exempted from effort restrictions due to documented low cod catches (i.e.<1.5%; art. 11 in EC, 2008; EC, 2009). From 1st of February 2013, trawlers targeting *Nephrops* are required to use either the

Swedish grid or a size selective trawl with a large mesh window in the codend top panel (SELTRA-trawl; Madsen et al., 2012).

This widespread use of Nordmøre-type sorting grids in the Swedish *Nephrops* fisheries in the Skagerrak and Kattegat resulted from extensive research in the period between 2002 and 2006, as reported by Valentinsson and Ulmestrand (2007). The results were remarkably consistent showing that a trawl fitted with a grid and a square-mesh cod-end, caught less small and marketable cod, haddock, whiting, hake and plaice than did a standard commercial trawl. For cod larger than 35 cm, the catch reduction was close to 100%. A reduction in 71% of cod catches across all size ranges was found when a grid with 35mm bar spacing and 70mm square mesh codend was used compared to a standard gear without a grid fitted. While there has been extensive research aimed at improving the practicality and efficiency of the grid, the overall design has remained the same, the crucial element has been the 35mm bar spacing. Madsen et al. (2008) tested grids with a bar spacing of 40mm and found significantly increased levels of cod catches below the mcrs of 30cm compared to the 35mm bar spacing.

Trials with sorting grids in the Irish Sea and Celtic Sea *Nephrops* fisheries have shown similar results. Cosgrove et al. (2016; 2019) reported that in all trials with a 35mm bar spacing sorting grid, reductions in haddock and whiting catches of 60% and 70% above ~ 23cm were observed. Cod catches were reduced by almost 100%. However, these trials did show more mixed results with very small gadoids of less than ~20cm which can pass through the space between the bars of the grid. Typically, for fish < mcrs the grid reduced catches of whiting and haddock by around 40% and 70% respectively compared to a standard trawl fitted with a 70mm codend and 120mm square mesh panel.

The use of sorting grids with the same basic specifications as those tested in Sweden were also compared in the North Sea Farne Deeps *Nephrops* fishery (Catchpole et al. 2006). In these trials the grid trawl significantly reduced marketable cod, haddock and whiting bycatch by between 70-100% by number. The number of undersized whiting was significantly reduced but the grid trawl still retained similar quantities of juvenile haddock as the standard trawl. The numbers of undersized cod increased by 114%. The increase of capture of small cod with the grid was attributed to the reduced selectivity in the codend caused by a reduction in the quantity of catch retained. Codends containing more gadoids tend to float higher and the meshes remain more open than when the catch consists mostly of *Nephrops* and flatfish (Galbraith, 1991). Increased catches of small fish have not been observed in the Swedish trials, where the catch is made up of predominantly *Nephrops*.

There is clear evidence that *Nephrops* trawls equipped with a species selective grid with a maximum bar spacing of 35mm have positive conservation benefits. They have been demonstrated to significantly reduce the bycatch of gadoids above ~20-23cm. Below this size range, trials have shown between 30-60% of gadoids are retained. Therefore, it is possible that in areas with high concentrations of small gadoids the trigger levels to initiate gadoid RTCs could possibly be exceeded on occasions, even when using a sorting grid. In the absence of length frequency distribution typically encountered in the *Nephrops* fishery in the Skagerrak the likelihood of this occurring cannot be assessed.

Nephrops trawls fitted with a sorting grid with a 35mm bar spacing should only be added to the list of exempted gears in Article 7(1) of Regulation (EU) 724/2010 following a review of available length frequency data. This review would help to establish the likelihood that catches of juvenile gadoids with the grid trawl would exceed the trigger levels defined in the Regulation. Ideally this review should be accompanied with the establishment of a monitoring programme in the Nephrops fishery.

7. Conclusions

The main conclusions are as follows:

1. The RTC system proposed has positive conservation benefits in line with the objective of Regulation (EU)2018/973. Therefore, it would seem appropriate to introduce it into the Skagerrak as per the specifications set out in the JR as submitted by the Scheveningen group. The effectiveness's of the RTC system should be subject to careful monitoring and evaluated according to the review mechanism set out in the JR. A specific monitoring programme of the combination grid to ensure it consistently maintains catches of small *Pandalus* below the trigger level should be built into the system.
2. The case for the derogation to use a Danish anchor seine fitted with a 105mm codend is built on model outputs showing the Danish anchor seine fitted with the 105mm codend to be equivalent or more selective than an otter trawl with a 120mm codend. There is a lack of agreement between the theoretical model estimates with parameters generated from selectivity experiments. The information presented in the form of L50s for cod and haddock derived from the selectivity experiments does not show equivalence and in fact indicates the Danish anchor seine fitted with the 105mm codend to be less selective for both species.
3. Given its proven effectiveness there seems no reason not to add *Pandalus* trawls equipped with a Nordmøre sorting grid with a maximum bar spacing of 19 mm without a fish retention device to the list of exempted gears in Article 7(1) of Regulation (EU) 724/2010.
4. *Nephrops* trawls fitted with a sorting grid with a 35mm bar spacing should only be added to the list of exempted gears in Article 7(1) of Regulation (EU) 724/2010 following a review of available length frequency data. This review would help to establish the likelihood that catches of juvenile gadoids with the grid trawl would exceed the trigger levels defined in the Regulation. Ideally this review should be accompanied with the establishment of a monitoring programme in the *Nephrops* fishery.

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Annex I – Comparison of main elements of *Pandalus* RTCs and Gadoid RTCs

Specifications	Details	
Source of Information	Inspections at sea on commercial fishing vessels conducted by control authorities.	Inspections at sea on commercial fishing vessels conducted by control authorities.
Targeted Inspection resources	A risk-based strategy to identify areas and time periods where there is a risk of catching numbers of *Pandalus* below trigger length which exceed the threshold level. Inspections shall be carried out in areas to measure whether the percentage of small *Pandalus* exceeds the threshold level, including through Joint Deployment Plans	The coastal Member State and/or the Member State participating in a joint operation under a Joint Deployment Plan shall identify areas where there is a risk of reaching the trigger level.
Trigger Length	14.8 mm carapace length (measured in accordance with Regulation (EC) 850/98, annex XIII, for Norway lobster)	Cod smaller than 35 cm, Haddock smaller than 30cm, Saithe smaller than 35cm, Whiting smaller than 27cm.
Threshold level	More than 20% by number of *Pandalus* under the trigger length	10 % by weight of juveniles as compared to the total of the four-species referred to in Article 2, in a haul. 2. However, if the quantity

		of cod in the sample exceeds 75 % as compared to the total of the four species in a haul, the catch trigger level shall be 7,5 % by weight of juveniles as compared to the total of the four species in a haul.
Inspection and monitoring	Closures based on hauls with more than 100kg of *Pandalus* if the proportion of *Pandalus* below the RTC trigger length is more than 40%, a closure can be established based on one sample. Sampling from least 2 hauls in 96 hrs show that *Pandalus* below the trigger length is exceeding the threshold level except if the proportion of *Pandalus* below the RTC trigger length is more than 40%, then one sample is sufficient	sample shall be taken when it is estimated that at least 200 kg of any combination of cod, haddock, saithe or whiting are present in one haul. (a) The minimum size of the sample shall be 200 kg of any combination of cod, haddock, saithe or whiting. (b) The sample must be taken in such a way that it reflects the catch composition with respect to the four species. (c) When appropriate due to the size of the catch the sample shall be taken in th
Decision to close	Coastal Member State in consultation with neighbouring coastal states where applicable	Coastal Member State in consultation with neighbouring coastal states where applicable
Size and shape of the closed area	Shape of the area based on physical factors, inter alia depth contours, and other factors such	the area shall have 4, 5 or 6 joining points; (b) the midpoint of the

	as catch compositions, fishing activity etc. Upper area limit of 50 square nautical miles	fishing operation or operations with samples above the trigger level shall equal the midpoint of the closed area; (c) when the closed area is based on one sample and lies outside the waters up to 12 miles from the baseline of the coastal Member State, it shall be 50 square miles.
Entry into force	Midnight UTC on the day of decision.	enter into force 12 hours following the decision by the concerned Member State;
Duration and scope	Closure for 14 days Limited to demersal trawls within the mesh size range 35-69 mm targeting Pandalus Vessels fishing for Pandalus using a recognised size selective gear can continue to fish unless the threshold level is breached	apply for 21 days after which it shall automatically cease to apply at midnight UTC. any fishing gear other than: (a) pelagic trawls, purse seines, driftnets and jiggers targeting herring, mackerel, and horse mackerel; (b) pots; (c) scallop dredges; and (d) gillnets,