Marine Management Organisation

North Sea Cod Catch Quota Trials: Interim Report 2013

Contents

Summary

The Marine Management Organisation (MMO) is continuing trials of catch quota management for North Sea cod in 2013. There are 11 trawlers and 1 gill netter taking part.

Vessels taking part have been awarded additional quota for North Sea cod and are obliged to land and count all catches against quota.

Vessels are fitted with electronic monitoring (EM) systems with CCTV to allow the landing obligation to be monitored.

Interim results show an overall estimated discard rate of North Sea cod of 0.03% (225kg) from a total sampled catch of 638 tonnes at the interim stage.

Interim results show self reported landings of unmarketable North Sea cod (both damaged and undersized) of 0.5%.

Analysis of EM data and CCTV footage has been carried out at 10% of hauls for trawlers and 10% of 24-hour hauling cycles for gill netters.

Interim results show consistent compliance with the obligation to land all catches of cod and low levels of unmarketable cod catch.

As a result of 2012 EU/Norway negotiations, trials remain single-species. The MMO considers that future trials need to take a more holistic approach in the context of mixed fisheries in the North Sea.

A final report will be published in 2014 providing results from the total 2013 catch of North Sea cod by participant vessels. This will also provide findings as to the efficacy and ability of the EM system to be used in quantifying discards of other species by count and length frequency and to develop a scoring system relating to EM data integrity.

Introduction

Twelve English-administered fishing vessels are taking part in catch quota trials for cod in the North Sea during 2013. Additional North Sea cod quota has been allocated based on the 2011 discard rates evaluated by Scientific, Technical and Economic Committee for Fisheries (STECF).

The terms and conditions of the trial remain the same as for 2012 and are based on the regulatory requirements stipulated in Council Regulation (EU) No 40/2013, which sets out opportunities for stocks subject to international negotiations. Specifically, vessels taking part in fully documented fisheries can be allocated additional quota for cod provided all catches are retained, landed and counted against quota. Vessels must be equipped with electronic monitoring (EM) equipment incorporating CCTV to allow the landing obligation for cod to be monitored.

The UK negotiated for other North Sea stocks to be made available for catch quota trials in 2013 although no additional opportunities were agreed. It was therefore decided to examine the potential for EM to be used to assess the levels of discards of other species in mixed North Sea fisheries but also recognised that this is dependent on the cooperation of participant vessel crews.

Objectives

1. To analyse 10% of random hauls from EM data and CCTV footage.
2. To monitor the landing obligation by quantifying the level of discards of North Sea cod (if any) from observed hauls using standard methodology.
3. To verify self-reported data on levels of undersized catch retained on board.
4. To examine the potential to use EM as a means of quantifying discards of other species.
5. To develop a scoring system to evaluate the quality of data integrity provided by each vessel.

Quota management

Participating vessels were awarded additional quota in accordance with Article 6 of Council Regulation (EU) No 40/2013 of 21 January 2013. Table 1 shows individual allocations and the total catch at the interim stage.

A discard rate of 17.5% for vessels using trawls of over 100mm (TR1) was used. This was the discard rate in 2011 for UK vessels as evaluated by STECF. A discard rate for the gillnet category (GN1) of 4.5% was used – this was based on STECF data evaluated for Danish vessels in the absence of sufficient UK data.

As of 25 September 2013 the additional allocation across the England fully documented fleet amounted to 14.59% of the total catch. It is expected that for the full year this percentage will decrease as further landings are made. This suggests that the fully documented fleet are catching more than their initial allocations and that there is a net influx of quota to this segment.

In the light of the monitoring results provided below it is considered that the total catch to date has been fully accounted for in terms of quota uptake and there has been no additional fishing mortality.

Table 1: Catches of North Sea cod by participant vessels as of 25 September 2013 showing additional allocations in tonnes and as percentage of total catch – this includes trips which are not included in the results at the interim report stage

Vessel	Vessel category	Total catch (as of 25 September 2013) in tonnes	Additional allocation (tonnes)	Additional allocation as a percentage of total catch (as of 25 September 2013)
1	TR1	126.312	14.1	10.04
2	TR1	48.819	13.5	21.66
3	TR1	219.117	39.5	15.27
4	TR1	100.360	23.4	18.91
5	TR1	119.421	17.1	12.53
6	TR1	30.733	9.4	23.42
7	TR1	48.538	0	0
8	GN1	24.565	3.4	12.16
9	TR1	157.234	26	14.19
10	TR1	99.590	11.3	10.19
11	TR1	103.453	14.2	12.07
12*	TR1	9.348	13.9	59.79
Total		1,087.490	185.8	14.59%

* Vessel 12 started fishing in August 2013

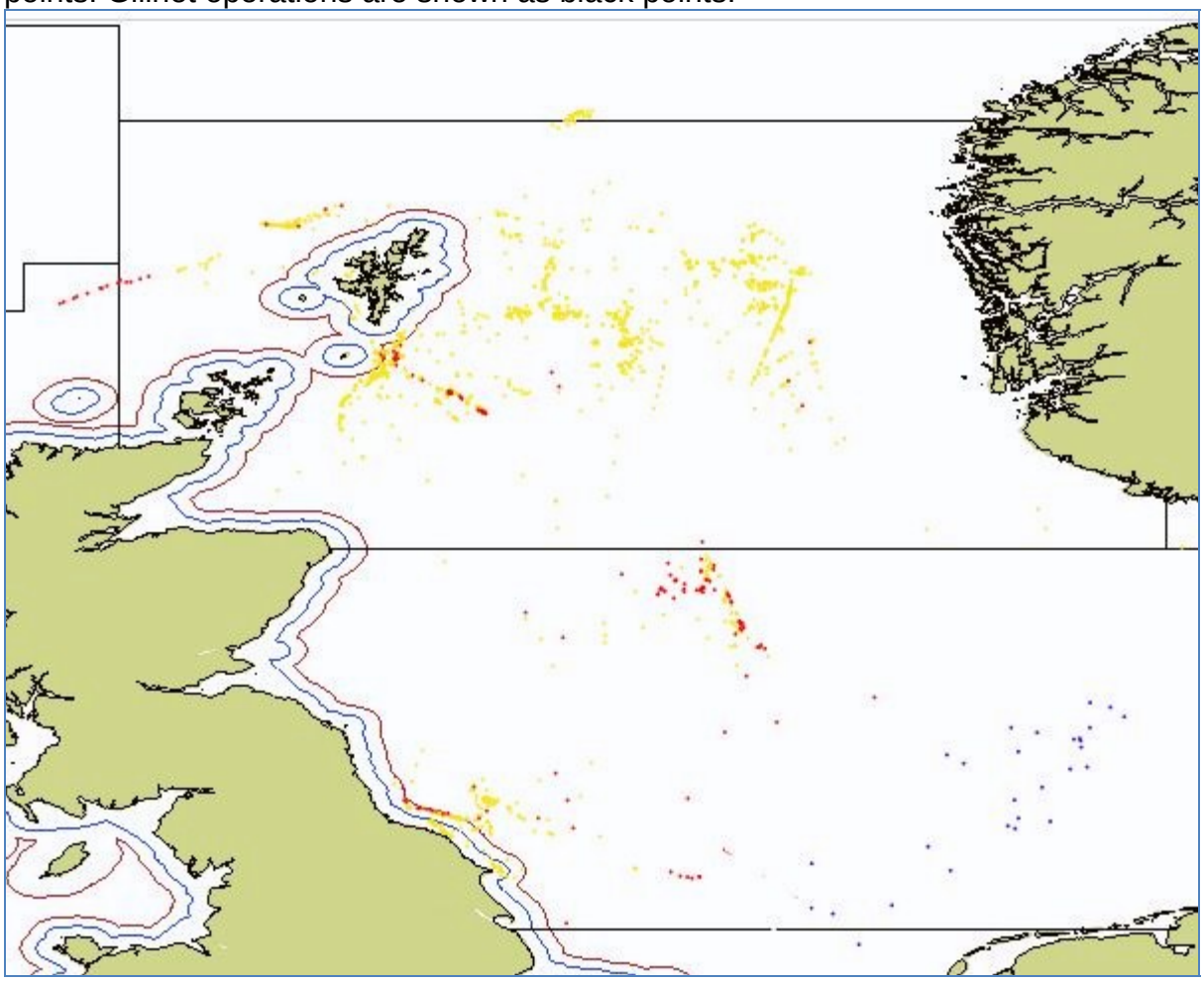
Fishing activity

Participant vessels have engaged in targeted cod, saithe and haddock fisheries in the North Sea with codend mesh sizes of greater than or equal to 120mm and mixed demersal fisheries with codend mesh sizes of less than 120mm.

Figure 1 shows the spatial distribution of fishing activity with haul positions as identified and recorded by the onboard EM systems and on-shore observers.

Figure 1: Spatial distribution of all hauls fished by the North Sea catch quota fleet

The less than 120mm codend mesh otter trawls are shown as red points and the greater than or equal to 120mm codend mesh otter trawls are shown as yellow points. Gillnet operations are shown as black points.



Methodology

As with previous trials, the participant vessels are equipped with EM systems supplied by Archipelago Marine Research Ltd (AMR). The EM system fulfils the requirements of Article 6 of Council Regulation (EU) No 40/2013 to allow the catch handling and sorting to be monitored. Sensor data (winch rotation, hydraulic pressure, GPS) and video data are stored on a removable hard drive for retrospective analysis by on-shore observers.

Analysis of EM data is carried out on a random basis with a target level of analysis of 10% of fishing operations. On-shore observers review the data and monitor footage using AMR software to quantify the levels of cod discards and retained undersized or damaged cod.

For the purpose of estimating the quantity of cod that is returned to the sea contrary to the landing obligation set by Article 6 of Council Regulation (EU) No 40/2013, any

cod seen to be discarded are assumed to be just below minimum size of 35cm and a standard weight conversion is used to estimate total discards:

$$\text{Weight} = a \times L^{b}$$

Where a=0.0102164, L=34cm and b=3 for North Sea cod quarter 1. Nominal weight applied to undersized cod is 0.35kg.

Note: Factor 'a' relates to fish condition and varies by quarter.

Interim results

Sampling levels

Table 1 shows the amount of fishing effort that has been sampled in 2013.

Approximately 11% of all hauls or 24-hour cycles from 121 trips have been reviewed by on-shore observers. Out of all 124 fishing trips completed, 3 have been unusable, resulting in 40 hauls (2.7%) not being analysed. This was due to equipment faults (2 trips) and a trip for which the hard drive was not submitted at the time of collating data for this report.

Very little gillnet effort has occurred this year (6 valid fishing trips) as the vessel has been carrying out a significant amount of non-fishing activity. Of the 27 days fishing, 3 (10.8%) have been sampled.

Table 2: The number of trips and hauls fished by participant vessels where data has been returned and analysed – trips where data could not be used are also shown

Gear type	Number of trips	Number of hauls	Number of hauls sampled	Percentage of hauls analysed	Valid and usable fishing trip?
Otter/Pair trawl less than 120mm	10	1,48	18	12.2	Yes
Otter/Pair trawl greater or equal to 120mm	105	1,253	133	10.6	Yes
Gillnet	6	27	3	11.1	Yes
Total sampled	121	1,428	154	10.8	Yes
Otter/Pair trawl greater or equal to 120mm	3	40	0	0	No
Total not sampled	3	40	0	0	No
Total catch quota fleet fishing effort	124	1,468	154	10.5	

Observed discards

Observers randomly selected hauls for analysis. 0.35kg of cod was observed being discarded at sea in the less than 120mm trawl fishery. When raised to catch quota fleet, effort using the ratio between valid fished hauls and sampled hauls, this equated to 2.9kg from 148 hauls.
In the greater than 120mm trawl fishery the amount observed was higher at 23.6kg from 133 observed hauls, which when raised equated to 222.3kg from 1,253 valid hauls.

These quantities are both extremely low and indicate that the fishers did not deliberately discard cod or attempt to break this part of the terms and conditions of the programme.

No cod were observed being discarded from 3 days fishing sampled in the gillnet fishery.

Table 3: Weight of discarded cod observed

Gear type	Number of hauls fished	Number of hauls sampled	Quantity observed on sampled hauls (kg)	Raising factor*	Raised weight observed (kg)
Otter/Pair trawl less than 120mm	148	18	0.35	8.22	2.9
Otter/Pair trawl greater than or equal to 120mm	1,253	133	23.6	9.42	222.3
Gillnet	27	3	0	9	0
Total	1,428	154	23.95		225.2

*Raising factor calculated by hauls fished divided by hauls sampled.

Undersized and damaged catch

On-shore observers observed 109.15kg of undersized or damaged cod in the less than 120mm trawl fishery on 18 randomly selected sampled hauls, which, when raised by effort (hauls fished/hauls sampled), equated to 897.5kg of cod for the 148 hauls fished.

In the greater than or equal to 120mm trawl fishery, 287.7kg of undersized or damaged cod was observed on 133 sampled hauls. When raised by effort to the 1,253 valid fishing hauls completed, this equated to 2710.4kg of undersized or damaged cod caught by this gear group.

No undersize or damaged cod were observed being discarded in the 3 sampled days in the gillnet fishery. This is shown in Table 4.

Table 4: Weight of undersized or damaged cod observed

Gear type	Number of hauls fished	Number of hauls sampled	Quantity observed on sampled hauls (kg)	Raising factor*	Raised weight observed (kg)
Otter/Pair trawl less than 120mm	148	18	109.15	8.22	897.5
Otter/Pair trawl greater than or equal to 120mm	1,253	133	287.7	9.42	2,710.4
Gillnet**	27	3	0	9	0
Total	1,428	154	396.85		3,607.9

*Raising factor calculated by hauls fished divided by hauls sampled.
**Days fishing (a cycle of nets), not hauls.

As mentioned above, using raised data from a subsample (10% of days fished) in the gillnet resulting in no undersized/damaged being observed, despite 40.5kg being recorded by the master. This is due to the infrequent catches of undersized or damaged fish not being observed in sampled fishing events. A similar situation occurred in the less than 120mm otter trawl fishery where 18 of 148 hauls were sampled.

Observed undersized and discards as a proportion of total catch

The percentage discard rates and the percentage of undersized/damaged cod caught and retained are shown in Table 5. The table shows the quantities of undersized and damaged cod reported by the master as well as the on-shore observer estimates raised to trips level from the 10% sample.

The discard rates for both the less than 120mm trawl and the greater than or equal to 120mm trawl fleets are virtually zero at less than 0.05%. This shows that the fishermen are adhering to the terms and conditions by not allowing cod to be discarded. The undersized and damaged retained quantities are also low with a catch rate of 1.6% in the less than 120mm trawl fishery and 0.4% in the greater than or equal to 120mm trawl fishery.

It should be noted that the less than 120mm trawl fishery generally targets flatfish in the summer months in the central to southern North Sea and nephrops in the central to northern North Sea. Of the 10 fishing trips undertaken using the mesh range 100 to 119mm, it is thought that only 4 trips were targeting flatfish. Data was available up to 6 August 2013, leaving several weeks of summer flatfish fishing still expected.

This shows that the smaller codend mesh size retains proportionately more undersized fish than the greater than or equal to 120mm codend, as one would expect. In addition, the greater than or equal to 120mm codend fishery usually operates further offshore and in deeper waters than the less than 120mm codend fishery and, therefore, may not encounter the smaller cod associated with inshore grounds.

In the gillnet fishery the discard rate and catch rate of undersized or damaged cod are both 0, as none were observed on the sampled days. 39.5 kg of damaged cod and 1kg of undersized cod were recorded by the master for the 6 valid fishing trips.

Between 1 January and 30 June 2012, the same gillnet vessel caught 223.5kg undersized or damaged cod from 8 valid fishing trips compared to 6 fishing trips so far in 2013. The undersized and damaged catch rate is lower than the same period in 2012 so far.

The majority of the cod classified as undersize or damaged are in fact damaged fish above the minimum landing size in the gillnet fishery as would be expected by the high degree of selectivity for large cod. In summer the cod caught in gillnets can spoil or be eaten by lice if the nets are left fishing for too long. This damage is greatly increased in the summer months due to an increase in water temperature and abundance of sea lice.

The gillnet vessel ceased fishing and switched to guard work in May 2013, before the water temperatures increased. This may account for the reduction in undersized or damaged quantity this year compared to last year where the vessel fished throughout the summer.

Where there was high fishing effort (1,253 hauls) and correspondingly high number of hauls sampled (133) in the greater than or equal to 120mm otter trawl fishery, the raised weight estimate observed by the on-shore observer and the weight declared by the master, were almost identical (0.3% over estimate). Overall the on-shore observer estimated the undersized and damaged cod 5% higher than reported by the master. Obviously both are estimates and not exact weights and we cannot say who is closer to the true weight, but it is encouraging to get this comparable result.

Table 5: Discard rate and undersize catch rate from analysed data

Gear type	Total catch (kg)	Raised discard quantity (kg)	Discard rate (%)	Raised undersized or damaged quantity		Declared undersized or damaged quantity	
				(kg)	(%)	(kg)	(%)
Otter/Pair trawl less than 120mm	56,066	2.9	0.01	897.5	1.60	760	1.35
Otter/Pair trawl greater than or equal to 120mm	614,458	222.3	0.04	2710.4	0.44	2,586.25	0.42
Gillnet	12,521	0	0	0	0	40.5	0.32
Total	683,045	225.2	0.03	3607.9	0.53	3,386.75	0.50

System functionality

Table 6 below summarises system faults that have been recorded at the interim stage of 2013 in the North Sea.

Table 6: Summary of EM system faults that have been recorded at the interim stage of 2013 in the North Sea

Control box failures	Camera failures	Rotation sensor failures	Pressure sensor or GPS failures	Lost fishing days	Man hours to rectify (including travel)
3*	4	1	0	0	15.5

*Of the 3 'control box faults', 2 were the result of camera short-circuits that rendered the control boxes inoperable until the cameras were repaired. The only true control box failure was due the failure of a cooling fan which caused the unit to overheat and cease operating.

Collection of length frequency data

During 2012 various methods were used to quantify retained catch. These included the use of digital measuring software to obtain length frequency of retained catch to compare with the landed size distribution or to convert to weight. As part of the 2013 trials an additional objective is to examine the potential to quantify discards of other species by number and length.

The EM software in use has recently been upgraded to include an internal tool which allows on-shore observers to measure and record fish lengths. Before this new development, additional software from other providers had been trialled. This usually took the form of virtual on-screen callipers, but this was found to be time consuming and cumbersome to use in the absence of an integrated data recording function.

The new EM software is more user-friendly and reduces the time it takes to measure and record fish lengths. It should be noted though that successful measurement depends on a number of factors, including fish orientation and presentation relative to camera, camera position, angle and distance from measuring area and accuracy of calibration measurements. Work is ongoing at this stage to examine the efficacy of the measuring tool in the provision of length frequency data.

Audit scoring and data integrity

Some data loss (2.7% of hauls) has been experienced as a result of system failure although this has been at a low level. There has been some variance in the quality of imagery and catch recording although this has not compromised the ability of on-shore observers to ensure the duty of care of the system is adhered to and to monitor for discards. Nevertheless it is considered that the quality and integrity of data should be carefully monitored to ensure sufficient standards are maintained.

A key factor in maintaining confidence in fully documented fisheries is to ensure the integrity of data collected both in terms of quality and coverage. A scoring system

framework has been developed to measure the degree of data integrity and to feed back any shortcomings to the vessel operator.

The system was introduced in May 2013 with a view to a first stage audit to measure any gaps in video and sensor data, submission of catch records and performance of function tests. This stage 1 scoring is carried out upon receipt of the data hard drive.

A second stage score is then applied by the on-shore observer to measure the accuracy of self reported data, catch handling requirements and image quality. Development of this scoring system will continue during 2013 and will be reported on at the final report stage.

Discussion

Catches of cod by the English North Sea catch quota fleet have increased in comparison to 2012 with less time being devoted to non-fishing activity such as cable guard work. Despite higher catches the results show compliance with the landing obligation for North Sea cod. The methodology used to monitor the landing obligation has remained the same as that for 2011 and 2012 with an analysis target of 10% of random hauls. Any observed discarded cod have been assumed to be just below the minimum size of 35cm and a corresponding length to weight ratio applied which may give rise to an overestimate of the true discard level as some discards are smaller than 35cm. If an obviously large and damaged or infested cod has been discarded to avoid cross-contamination of retained fish, then an estimate of the weight has been made by eye. The very low rates of discards observed have not necessitated any enforcement action.

Although continued compliance with the landing obligation for cod has been observed this remains a single species catch quota program and it has not been possible to assess the impact of a landing obligation across a mixed range of species. The participants have agreed in principle to self report discards of other species but consider that this will require the crew to carry out additional sorting during the catch processing operation and therefore expect some form of incentive in return.

Next steps

Monitoring of cod catches will continue for the remainder of 2013 in line with standard methodology as described.

The audit scoring system will be further developed and trialled with a view to assessing it's capability to maintain or improve the quality of data integrity and accuracy for the purpose of full documentation of catches.

The on-screen measuring system will be further trialled and developed to assess the potential to provide data on length frequency of retained and discarded catches of a range of species.

The potential to extend the trials to include the monitoring of other species or the potential for multi-species catch quota management will be explored during the lead in to EU negotiations with Norway for North Sea stocks.