

Final Report

Trials with a Modified Commercial Trawl

(FSP project MF045)

Prepared by

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Executive Summary

A twin-rig trawler, the Whitby-registered *Our Lass II*, was chartered to undertake further trials of a modified demersal trawl in September 2011 to look at selectivity in a mixed demersal fishery in the North Sea. As with earlier studies carried out by Cefas, the primary aim was to reduce catches of cod without affecting catches of other commercial species. The approach taken in this study was to insert large diamond-mesh panels of variable position and dimension into the sides of the trawl, and to compare the catches of modified and standard trawls towed in a twin-rig.

Out of 42 tows completed in the trials, 39 were considered valid.

The main effect was to reduce the overall numbers of all species in the catch to three-quarters of those caught in the standard trawl. Reductions in the catch bulk were of a similar scale. Very little difference in the species composition of catches was observed. Length frequency curves showed that insertion of large-mesh side panels made no difference to the size composition of any species, but rather that there was an even loss of fish across the length range.

The main conclusion was that large-mesh side panels used in this set of trials do not offer a preferential escape route for cod, so would not appear to offer any practical or economic benefit to the industry as a cod recovery measure.

Introduction

The Fishery Science Partnership (FSP) is a Defra-funded programme of scientific research between the UK fishing industry and scientists. Since it was established in 2003, the programme has undertaken numerous (about 90) projects including fishing gear selectivity trials, examinations of spatial patterns and catch compositions, investigations into new fisheries and time-series of relative abundance of commercial species. A full description of the development and aims and all completed reports of the FSP programme can be found at the Cefas website (www.cefas.co.uk)

This latest project continues the work funded by the FSP to modify the selectivity of demersal trawls in order to reduce catches of cod with minimal loss of other species (e.g. Revall and Doran, 2008; Revall *et al.*, 2009; Metcalfe, 2010). The recent increase in the abundance of cod observed in various fisheries in UK waters has made further selectivity work highly relevant while the scientific advice for cod stocks is for them to be allowed to recover further.

As with previous projects, the aim of the work was to identify a design feature that would take advantage of any differences in fish behaviour exhibited by different species or size ranges of fish, and provide a means of changing the selectivity of a demersal trawl in favour of releasing cod.

Understanding fish behaviour in response to the various aspects of capture in a demersal trawl is sketchy. There is some suggestion (Metcalfe, 2010) that fish become sorted laterally across the mouth of the trawl and within it, with certain species swimming to the sides, whereas other species remain in the centre of the trawl. To test this possibility, it was decided to insert large-mesh diamond panels into the sides of the belly panel, and to compare the catches made with those of an unmodified net of the same design and construction towed as a twin rig.

Material and Methods

FV *Our Lass II* (WY 261), a twin-rig trawler, was chartered for the fishing trials that took place over the period 15–29 September 2011 to coincide with the mixed fishery off Co Durham and Northumberland that traditionally is followed by English vessels working from North Sea ports. *Our Lass II* has taken part in previous fishing trials with Cefas in ICES Area IVb aimed at reducing catches of cod, although conservation measures require her to work in the Norwegian sector targeting saithe for most of the year. Her particulars are described elsewhere (e.g. Revall *et al.*, 2009).

All fishing took place in statistical rectangles 38E8, 38E9, 39E8 and 39E9 (see Figure 1). Bottom depths ranged between 48 and 101 m. The catch consisted mainly of whiting, haddock and cod, with lesser quantities of plaice, lemon sole and monkfish.

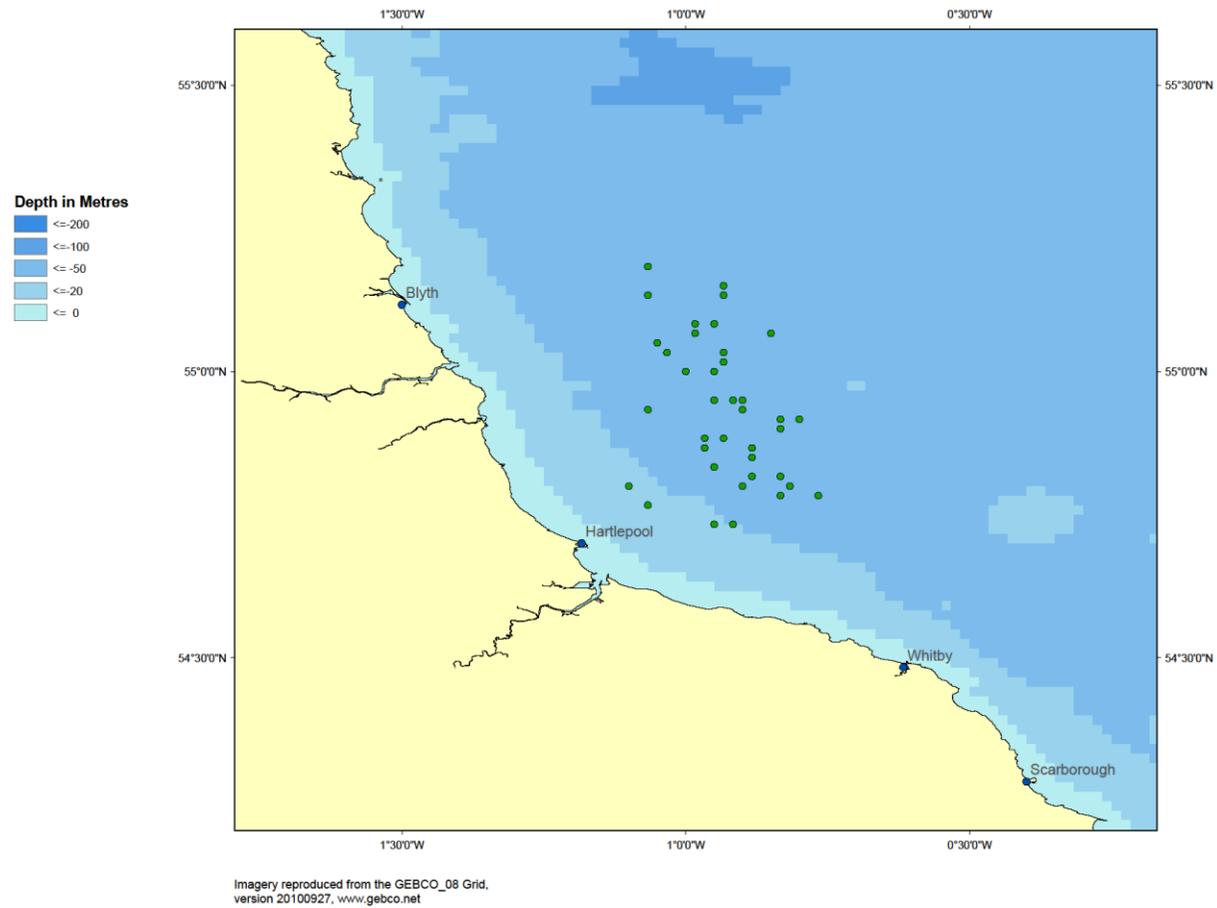


Figure 1. Experimental trawl positions occupied during the gear trials.

Fishing Gear

The gear consisted of two 48.7 m (160 ft) scraper trawls newly constructed by Lockers Trawlers to their own design and specification. The wings were constructed of 160 mm mesh, whereas the rest of the trawl was made of 100 mm mesh throughout. Both trawls were fitted with ground gear that consisted of 8", 7" and 6" rubber discs in the bosom, bunt and wing sections of the trawl, respectively. These were towed as a twin-rig using 4.3 m (14 ft) bridles to a dan leno, with 152 m (83 fm) of single wire to 2.5 m² doors and a 1 tonne middle clump. Both trawls were fitted with a 100 mm square-mesh panel in the top of the extension piece in accordance with current fisheries regulations.

Details of the net design were provided by Lockers Trawlers, and were drawn up by Mike Montgomery of Seafish. They are presented in Figure 2.

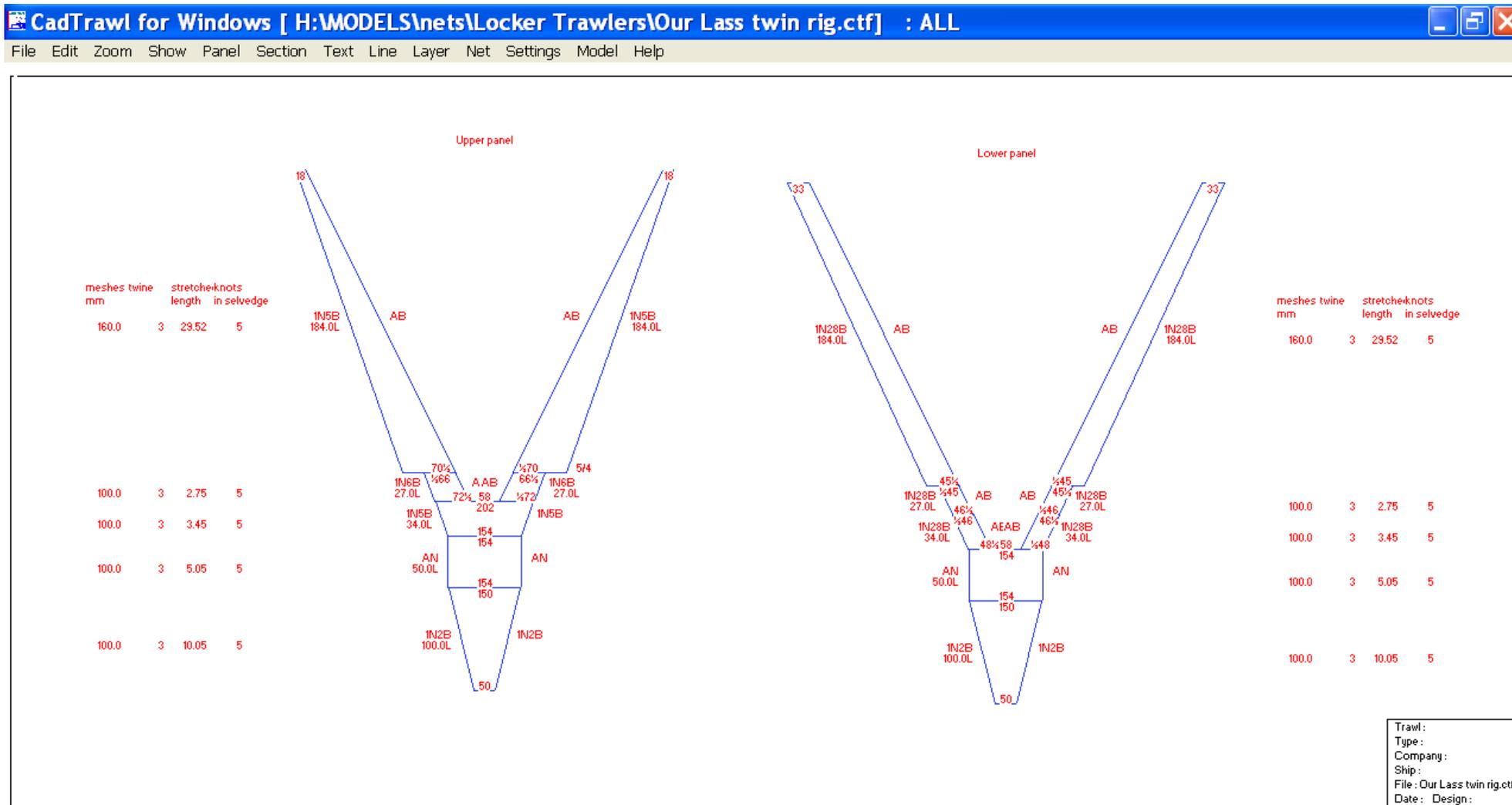


Figure 2. Net plan for the scraper trawls used in the trials.

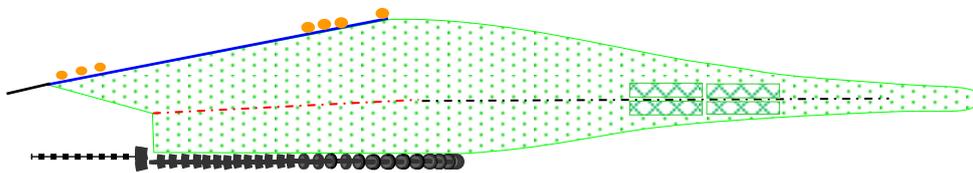
Experimental Configurations

The aim of the trials was to look at the effect on selectivity of introducing large-mesh panels into the sides of the trawl. The original plan (described in Appendix 1) was to fit large-mesh panels into the sides of the belly panel that could be covered with the original 100 mm mesh of the trawl to allow the dimensions and position of the panel to be varied. At a meeting in Whitby of the vessel owner, net riggers, Seafish Gear Technologist, and the Project Manager, the following experimental plan was agreed:

- Start with the configuration likely to have the greatest effect. Fit a panel of 300 mm mesh into the sides of both top and belly panels, equivalent in width to 9 meshes of the 100 mm mesh, stretching from a point just aft of the footrope to the stonerope (a row of strengthening meshes between the belly and the extension piece).
- Complete a number of tows to determine the effect this has on catch and discards.
- Close up variable portions of top and/or bottom panels with 100 mm mesh as determined by this and subsequent test configurations.
- Replace 300 mm mesh with 200 mm mesh about half-way through the allocated sea time.

The Seafish Gear Technologist drew up a method for opening and rolling up the standard 100 mm mesh that would allow the position and dimensions of the large-mesh panel to be varied easily. This is shown in Figure 3.

(a) Side view of trawl with panels above and below the selvedge.



(b) Expanded view of the aft end of the trawl. Red vertical lines indicate cuts in the 100 mm mesh; dotted black lines indicate position of the rolled up mesh.

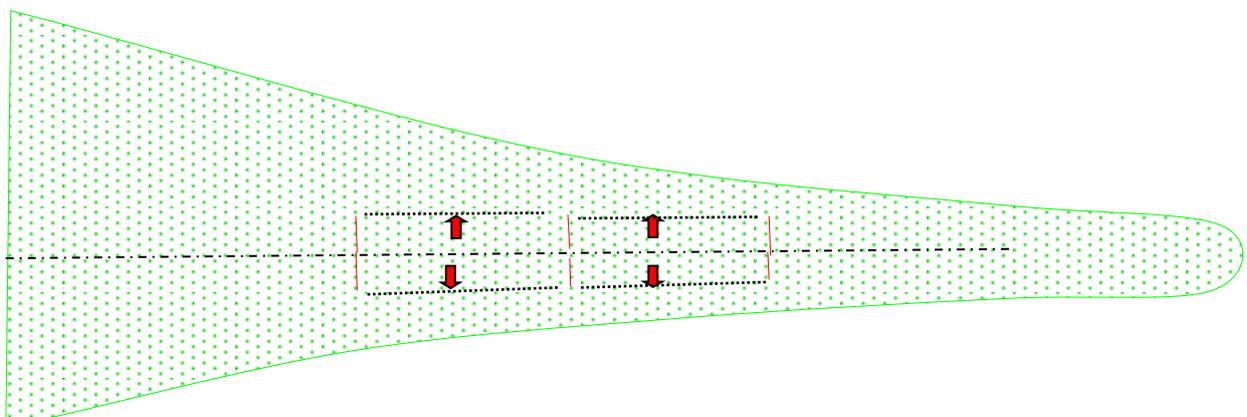
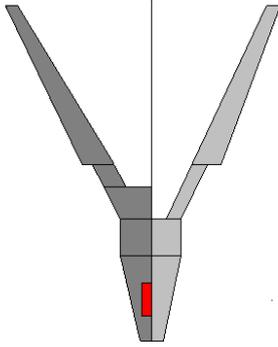


Figure 3. Side views of the trawl showing the method for inserting large-mesh panels.



The experimental configurations tested are described in the Results section below by means of diagrams that provide a plan view of the trawl. The codend has been omitted. The darker, left side of the trawl is the top panel of net (and includes the square-mesh panel in the extension piece coloured red), and the lighter side is the bottom panel of net. Large-mesh panels inserted in the sides of the top/bottom of the trawl are shown in the Results section as yellow (300 mm) or green (200 mm).

Fishing Trials Procedure

Tow duration fell within the normal range for commercial operations (3–7 h), and towing speeds of 2.5–3.0 knots were maintained. One trawl was modified by including large diamond-mesh panels; the other was left in its standard commercial configuration to provide direct comparison. Acoustic instrumentation provided a measure of door spread (generally, about 130-140 m), and a check on the geometry of the gear.



Adjustment of side panel dimensions.

During each tow, the port net fished the test configuration and the starboard net was the control. In gear trials of this type, it has been common practice to tow the test rigs on alternate sides to overcome any inherent differences in fishing performance that may exist between port and starboard deployment. In discussion with the skipper, however, it was agreed not to switch sides because (a) the fishing performance of each trawl had always been comparable during commercial trips, and (b) fishing time would have been lost, and the number of tows or tow duration would have had to have been reduced.

A baffle was placed in the hopper to keep the contents of each cod-end separate. A fixed routine for handling and sorting the catch was maintained throughout the trials. While the crew sorted, gutted, cleaned, boxed and iced the catch, one observer was on deck sampling flatfish, monk, squid, and the less frequently caught species, as well as the discards. The other observer was stationed down in the

fish-room sampling the cod, whiting, haddock, hake, ling, turbot and brill. Unfortunately, the scales normally used at sea for weighing the catch were unavailable during the trials, so catch quantities were recorded by volume for the purposes of raising sub-samples to total catch. A census was carried out on cod across its entire length range on each haul. Catch numbers of haddock and whiting necessitated that a fraction be sampled. For all other species, a sampling rate of at least 50% was maintained.



Sampling in the fish room.

Results

Over the course of the trials, 42 tows were completed, of which 39 were valid for comparative purposes. Six side-panel configurations were tested. Total fishing time was 224 h, with an average tow duration of 5½ h. This information is summarised in Table 1.

Overall, the number of fish caught by the modified trawl (combining data from all test configurations) was about three-quarters of that caught by the standard trawl. Comparative estimates of bulk catch by the skipper (1069 boxes caught by the standard trawl, relative to 804 boxes by the modified trawl) matched this difference.

In all, 41 species of finfish were caught. Inserting large-mesh side panels into the trawl appeared to make very little difference to the species composition of the catch, as is apparent from Table 2. The large-mesh side panels appeared to allow partial escape of all species.

Table 1. Comparison of numbers of fish caught by species for all test configurations combined. The dominant commercial species are indicated in bold typeface.

Species code	Modified				Standard			
	Number retained	Number discarded	Total number caught	% of total catch	Number retained	Number discarded	Total number caught	% of total catch
BIB	0	56	56	0.1	0	34	34	0.0
BLL	38	0	38	0.1	60	0	60	0.1
CDT	0	0	0	0.0	0	52	52	0.1
COD	5129	1699	6828	9.0	5589	1963	7552	7.4
CUR	37	10	47	0.1	37	55	92	0.1
DAB	0	776	776	1.0	1	2068	2069	2.0
GAG	0	2	2	0.0	0	0	0	0.0
GUG	0	126	126	0.2	0	82	82	0.1
HAD	13669	2879	16548	21.9	16231	4247	20478	20.0
HAL	3	0	3	0.0	2	0	2	0.0
HER	0	39	39	0.1	0	51	51	0.0
HKE	266	246	512	0.7	291	321	612	0.6
HOM	3	82	85	0.1	7	10	17	0.0
JOD	1	0	1	0.0	1	0	1	0.0
LEM	3577	1404	4981	6.6	4745	3463	8208	8.0
LIN	41	18	59	0.1	60	25	85	0.1
MAC	0	94	94	0.1	0	51	51	0.0
MEG	2	0	2	0.0	0	0	0	0.0
MON	242	79	321	0.4	261	209	470	0.5
MUR	4	0	4	0.0	5	0	5	0.0
NOP	0	107	107	0.1	0	99	99	0.1
OMX	0	17	17	0.0	0	10	10	0.0
PLA	0	1317	1317	1.7	0	2418	2418	2.4
PLE	4831	1737	6568	8.7	6384	2867	9251	9.1
POD	0	36	36	0.0	0	60	60	0.1
POG	0	3	3	0.0	0	0	0	0.0
POK	11	8	19	0.0	9	30	39	0.0
SDR	14	16	30	0.0	12	5	17	0.0
SDS	0	0	0	0.0	1	0	1	0.0
SOL	204	0	204	0.3	226	0	226	0.2
SOS	0	0	0	0.0	1	0	1	0.0
SQC	41	12	53	0.1	47	0	47	0.0
SYR	0	214	214	0.3	0	286	286	0.3
TBR	0	4	4	0.0	0	0	0	0.0
TBS	0	0	0	0.0	0	1	1	0.0
THR	1	10	11	0.0	4	0	4	0.0
TUB	0	0	0	0.0	0	1	1	0.0
TUR	169	1	170	0.2	183	0	183	0.2
WAF	16	3	19	0.0	7	17	24	0.0
WHG	28365	7138	35503	46.9	36401	11803	48204	47.2
WIT	678	228	906	1.2	830	596	1426	1.4
TOTAL	57342	18361	75703	100.0	71395	30824	102219	100.0

The data for each of the flatfish species in the above table, with the exception of Dover sole, show a very slight drop in the proportion by number of fish caught in the modified trawl, and a slight increase in the proportion of cod and haddock numbers. The proportion of whiting caught shows very little difference.

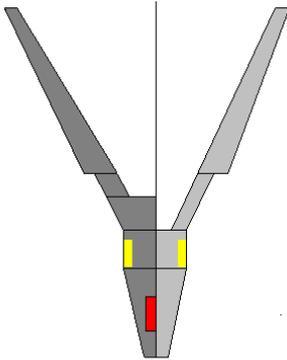
Throughout the trials, the numbers of fish discarded from catches by the modified trawl appeared to be significantly less than those from the standard trawl. The discard rates provide a useful indication

of the sizes of fish caught by each net. This is illustrated for the dominant commercial species in Table 2. The 'All Species' figures refer to trash fish species as well as commercial species. The greatest difference was seen in the numbers of discards of lemon sole, monk and witch, which suggests a difference in size selectivity between the trawls for these species. There is, somewhat disappointingly, very little difference in the numbers of cod discarded.

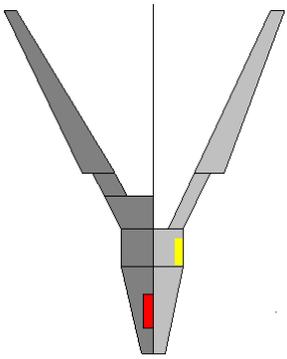
Table 2. Discard rates for the dominant commercial species.

Species code	Modified				Standard			
	No. retained	No. discarded	Total	% discard rate	No. retained	No. discarded	Total	% discard rate
COD	5129	1699	6828	24.9	5589	1963	7552	26.0
HAD	13669	2879	16548	17.4	16231	4247	20478	20.7
HKE	266	246	512	48.0	291	321	612	52.5
LEM	3577	1404	4981	28.2	4745	3463	8208	42.2
MON	242	79	321	24.6	261	209	470	44.5
PLE	4831	1737	6568	26.4	6384	2867	9251	31.0
WHG	28365	7138	35503	20.1	36401	11803	48204	24.5
WIT	678	228	906	25.2	830	596	1426	41.8
All species	56757	15410	72167	21.4	70732	25469	96201	26.5

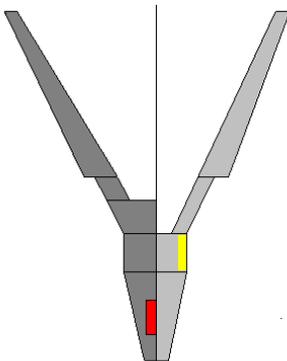
Before sailing, the vessel owner expressed concern that the first test configuration with large-mesh panels above and below the selvedge would result in all fish being lost, and it was expected that partial 'closure' of panels would take place very early in the trials. This was certainly not the case and, in fact, led to the dimensions of the side panels being increased in subsequent experiments in an attempt to reveal any potential for modifying selectivity using this approach, as shown below in Figure 4.



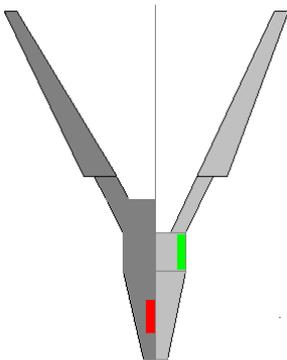
Expt 1 300 mm side panels above and below seldge.



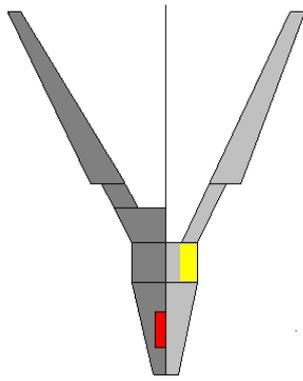
Expt 2 300 mm side panels in bottom panel only.



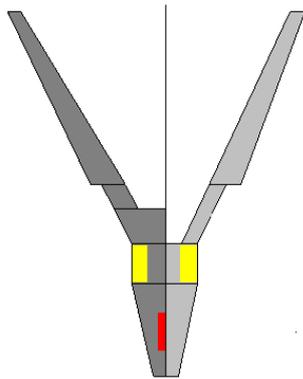
Expt 3 300 mm side panels in bottom panel only, but extending from strengthening meshes aft of footrope to stonerope.



Expt 4 Repeat of Expt 3, but with 200 mm side panels in bottom panel only, extending from strengthening meshes aft of footrope to stonerope.



Expt 5 Repeat of Expt 3 but with double-width 300 mm side panels in bottom panel only extending from strengthening meshes aft of footrope to stonerope.



Expt 6 Repeat of Expt 3, but with double-width 300 mm side panels in top and bottom panels extending from strengthening meshes aft of footrope to stonerope.

Figure 4. Net plans showing different test configurations for the modified trawl.

Another measure of the effect of inserting large-mesh panels in the sides of the trawl is the bulk of discards. The term “Discards”, as shown in Table 3, refers to the combined volume of undersized fish, trash fish (e.g. long rough dab, gurnards), shellfish (including edible crab) and benthos. It does not include discarded cod, which was picked out, counted, and measured separately. For all sampled tows combined, the total volume of discards from the standard trawl was 315 five-stone baskets, compared with 196 baskets from the modified trawl. The majority of this bulk consisted of small whiting.

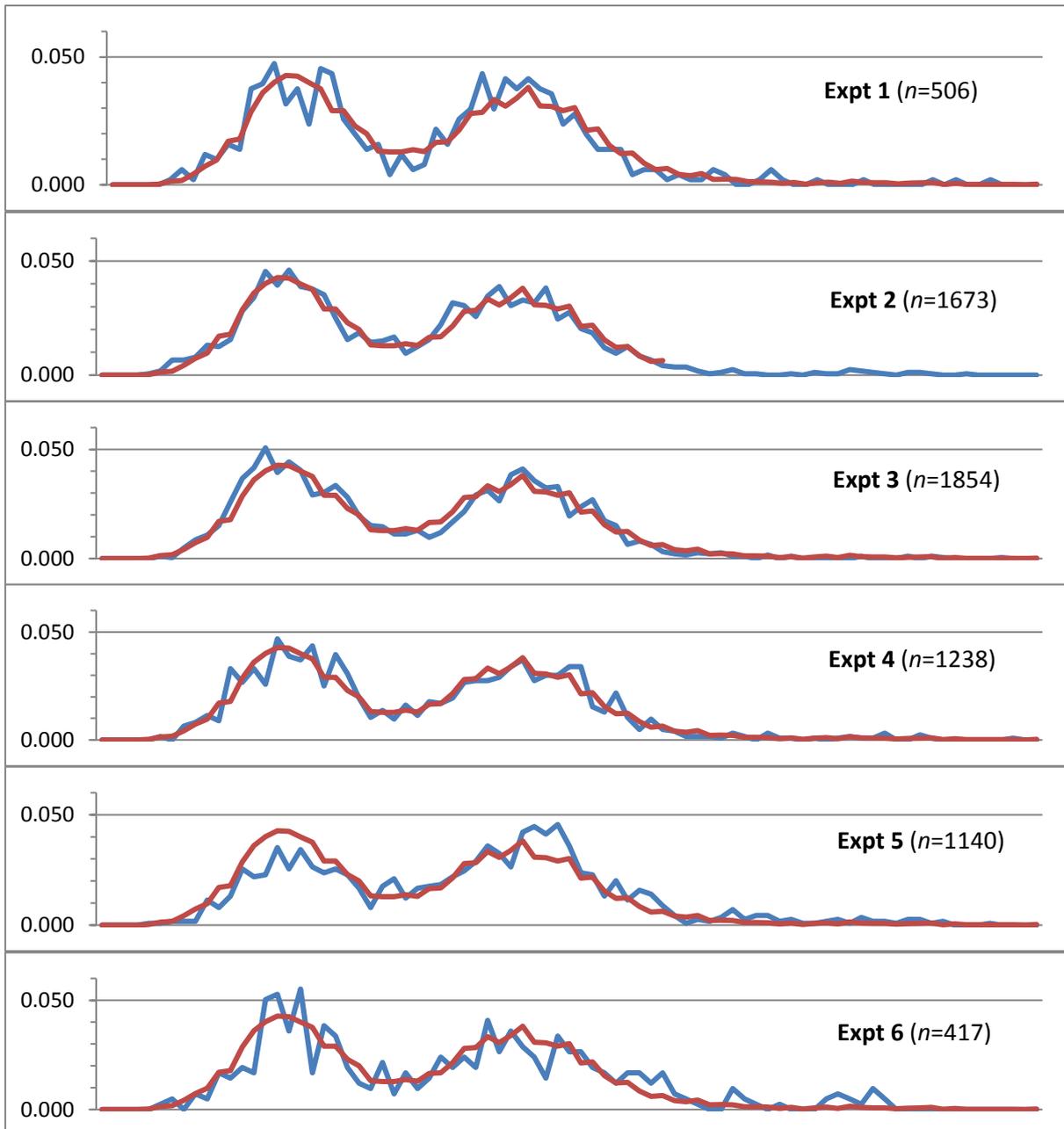
Table 3. Summary of fishing effort by test configuration and estimated bulk catch.

Number of tow	Expt	Date	Tow Length (h)	Estimated bulk catch (boxes)		Volume of "Discards" (number of 5-stone baskets)		Notes
				STD	MOD	STD	MOD	
1	1	15/09/2011	3.00	10	8			
2	1		3.00	15	15	3.5	3.5	
3	1		5.67	20	15	17.0	15.0	
4	2	16/09/2011	5.40	6	6	5.0	7.0	
5	2		6.25	40	25	10.0	4.0	
6	2		6.25	30	20	5.0	3.5	
7	2	17/09/2011	5.00	15	10	6.0	3.5	
8	2		6.00	30	25	12.0	7.0	
9	2		6.33	45	30	18.0	11.0	
10	2	18/09/2011	6.50	25	15	3.0	3.0	
11	2		6.90	30	25	8.0	5.0	
12	3	19/09/2011	6.17	40	30	10.0	6.0	Slight damage to wing on modified net
13	3		4.00	25	20	4.5	3.5	
14	3	20/09/2011	4.50	25	20	6.5	3.5	
15	3		5.40	25	20	4.5	3.0	
16	3		5.90	25	25			Parted out belly on standard net. Invalid tow.
17	3		5.67	30	18	8.0	5.5	
18	3	21/09/2011	4.17	20	15	11.0	7.0	
19	3		6.17	35	25	8.5	4.0	
20	3		6.50	25	20	5.0	5.0	
21	3	23/09/2011	5.33	25	15	7.5	4.0	
22	3		5.25	25	15	5.5	5.0	
23	3		3.25	20	12			Came fast after 2.5 h. Not sampled
24	4	24/09/2011	5.00	18	10	4.5	3.5	
25	4		5.00	25	20	7.5	5.5	
26	4		5.00	25	25	7.0	4.5	
27	4		5.00	25	20	8.0	5.0	
28	4		4.67	25	15	8.5	5.5	
29	4	25/09/2011	5.67	30	25	10.0	6.0	
30	4		7.25	30	25	8.5	4.5	
31	4		5.00	25	20	7.0	4.0	
32	5	26/09/2011	6.00	25	20	8.5	5.5	Problems with door stability and spread – not proper comparison for hauls 32 + 33
33	5		6.00	25	20	10.5	5.5	
34	5	27/09/2011	4.83	25	25	11.0	5.0	
35	5		5.00	25	25	10.0	5.5	
36	5		4.75	20	15	7.0	4.0	
37	5	28/09/2011	5.15	20	15	6.0	4.0	
38	5		5.00	35	25	11.0	5.0	
39	5		5.00	25	15	6.5	3.0	
40	6		5.50	15	10	6.0	3.0	
41	6	29/09/2011	6.00	25	20	8.0	4.0	
42	6		6.00	40	25	11.0	4.0	

Another simple method for showing the effect of the modification is to compare length frequency distributions from each trawl by species. Because of the very large numbers of whiting and haddock recorded, frequencies at length were converted to proportions of the total catch for ease of illustration. Analysis is restricted to the more important species by number and commercial value, and is presented in the following series of charts. In all cases, the size distribution from the modified net is shown in blue, and that from the standard net in brown. The number, *n*, shown against each experiment refers to the total number of fish of that species caught by the modified trawl for all hauls made with that test configuration, i.e. the data have been aggregated. *N* is the total number of fish of that species caught by the standard trawl for all sampled hauls combined.

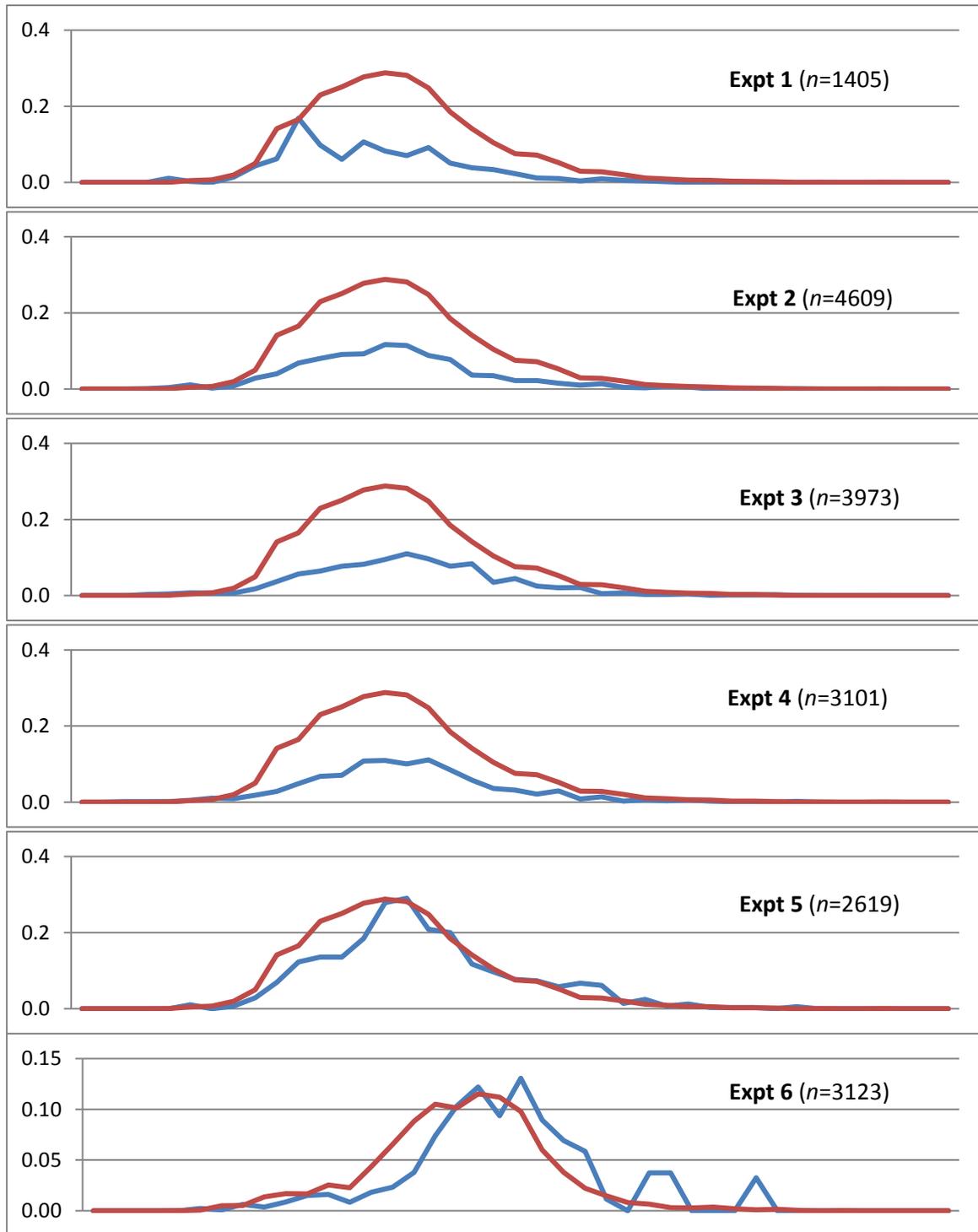
COD

($N = 7552$)



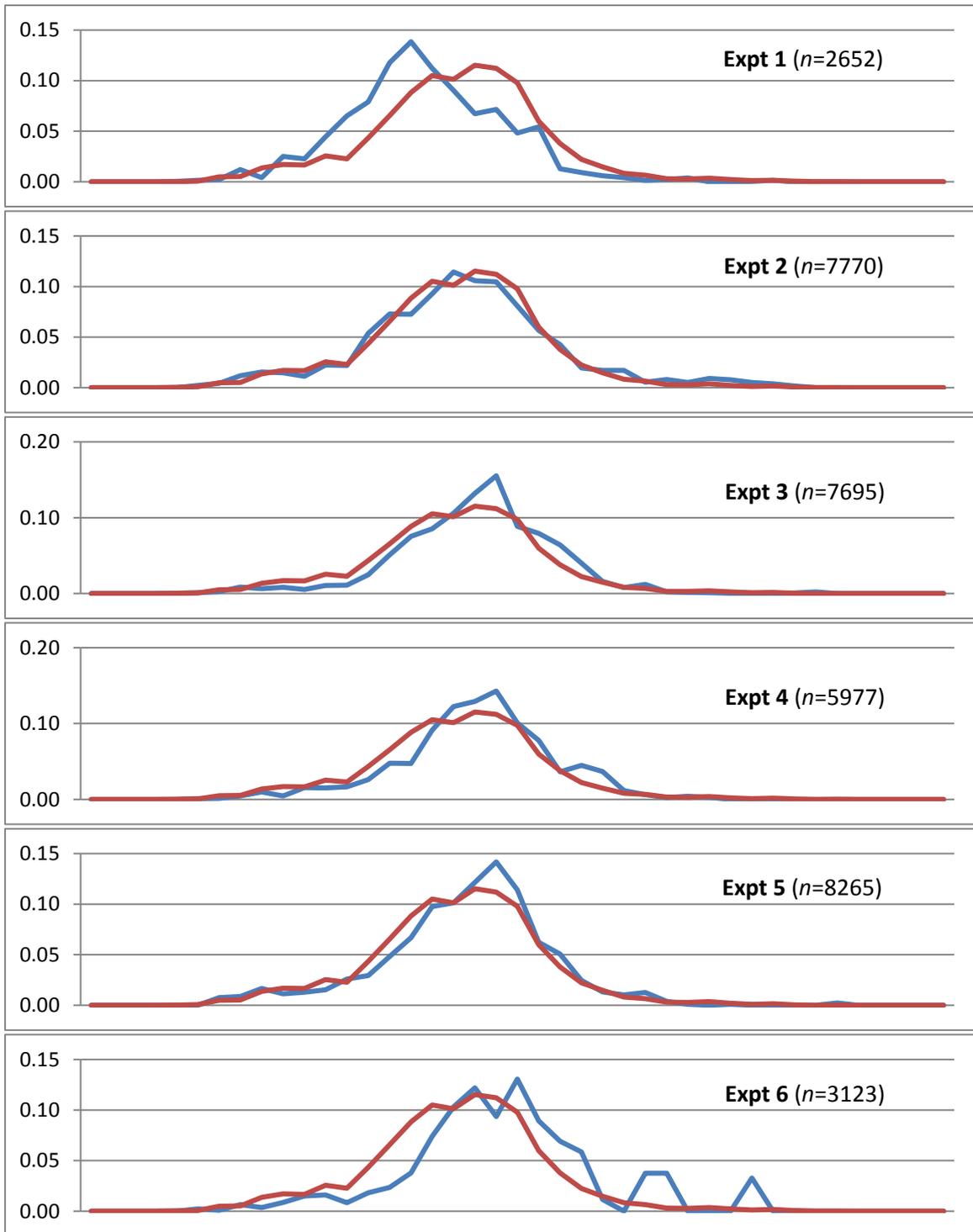
HADDOCK

(N = 20473)



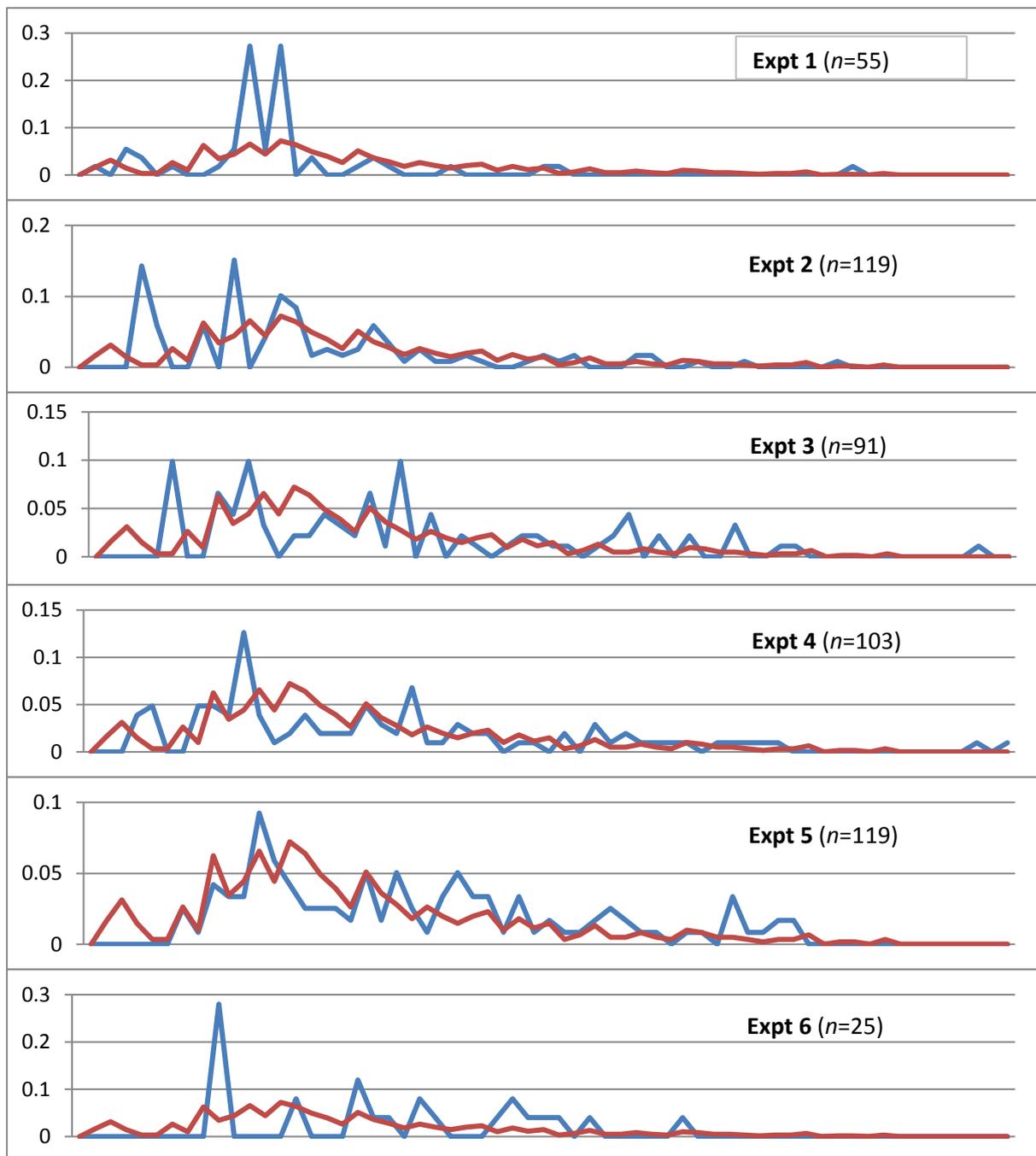
WHITING

(N = 48,199)



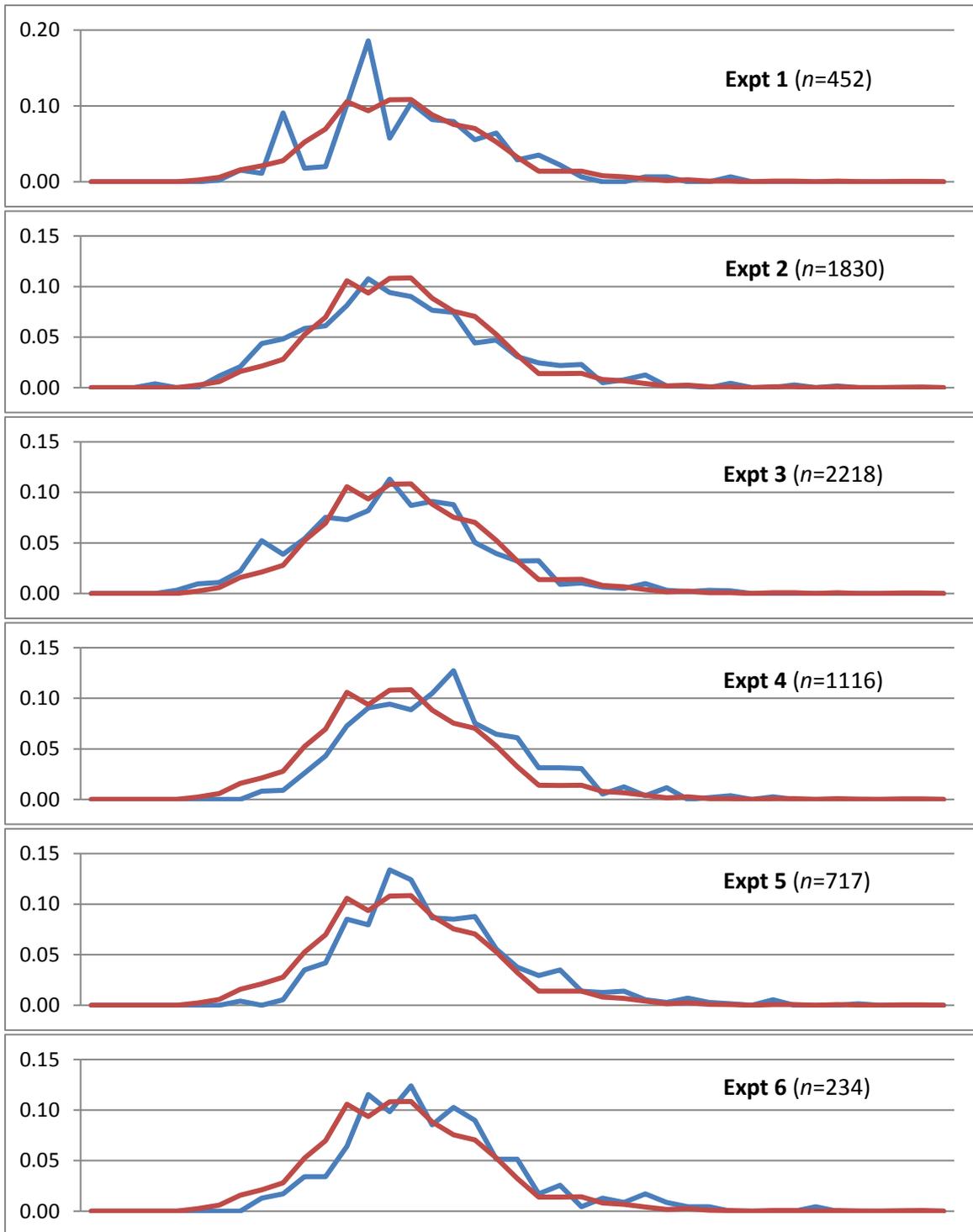
HAKE

(N = 609)



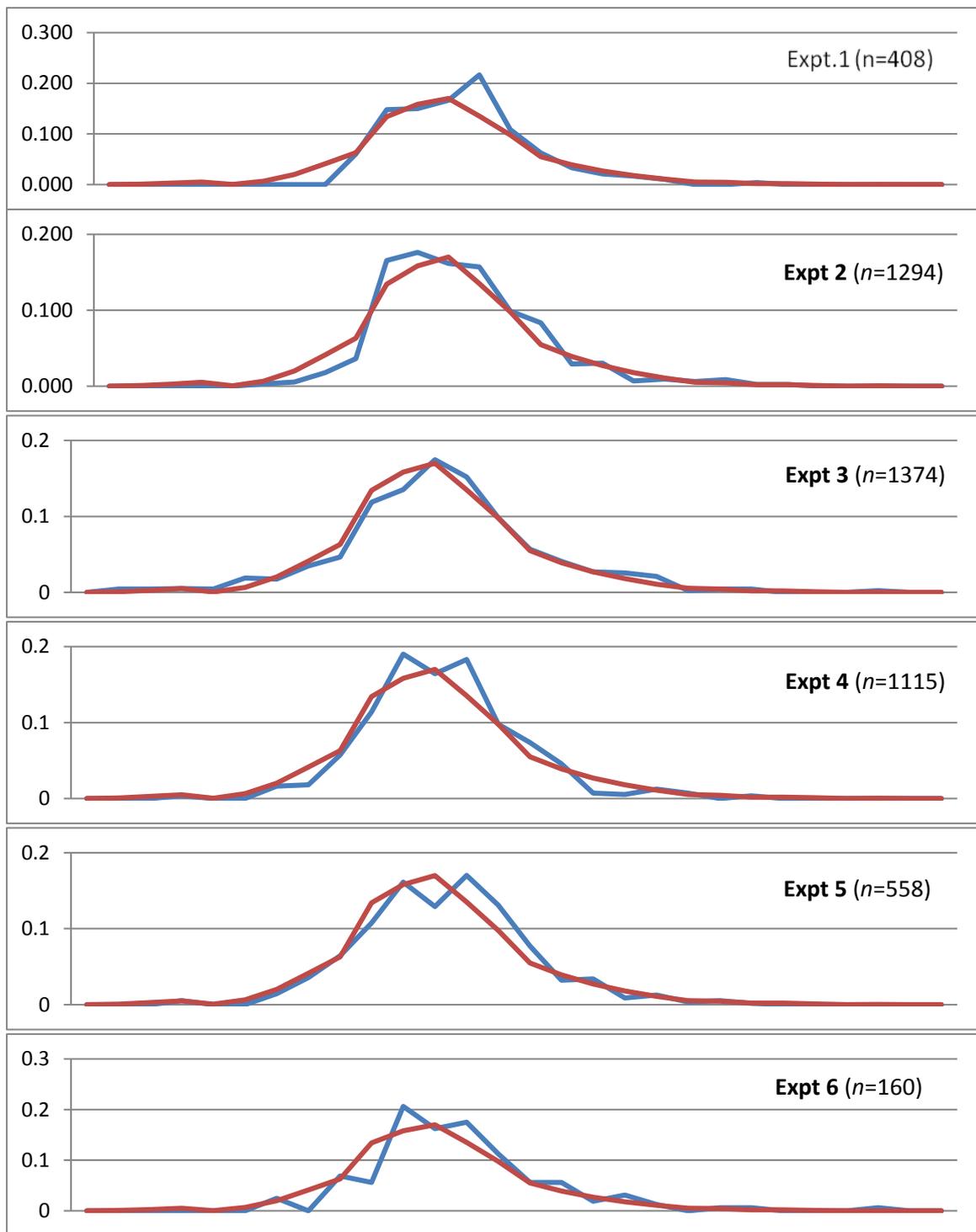
PLAICE

(N = 9246)



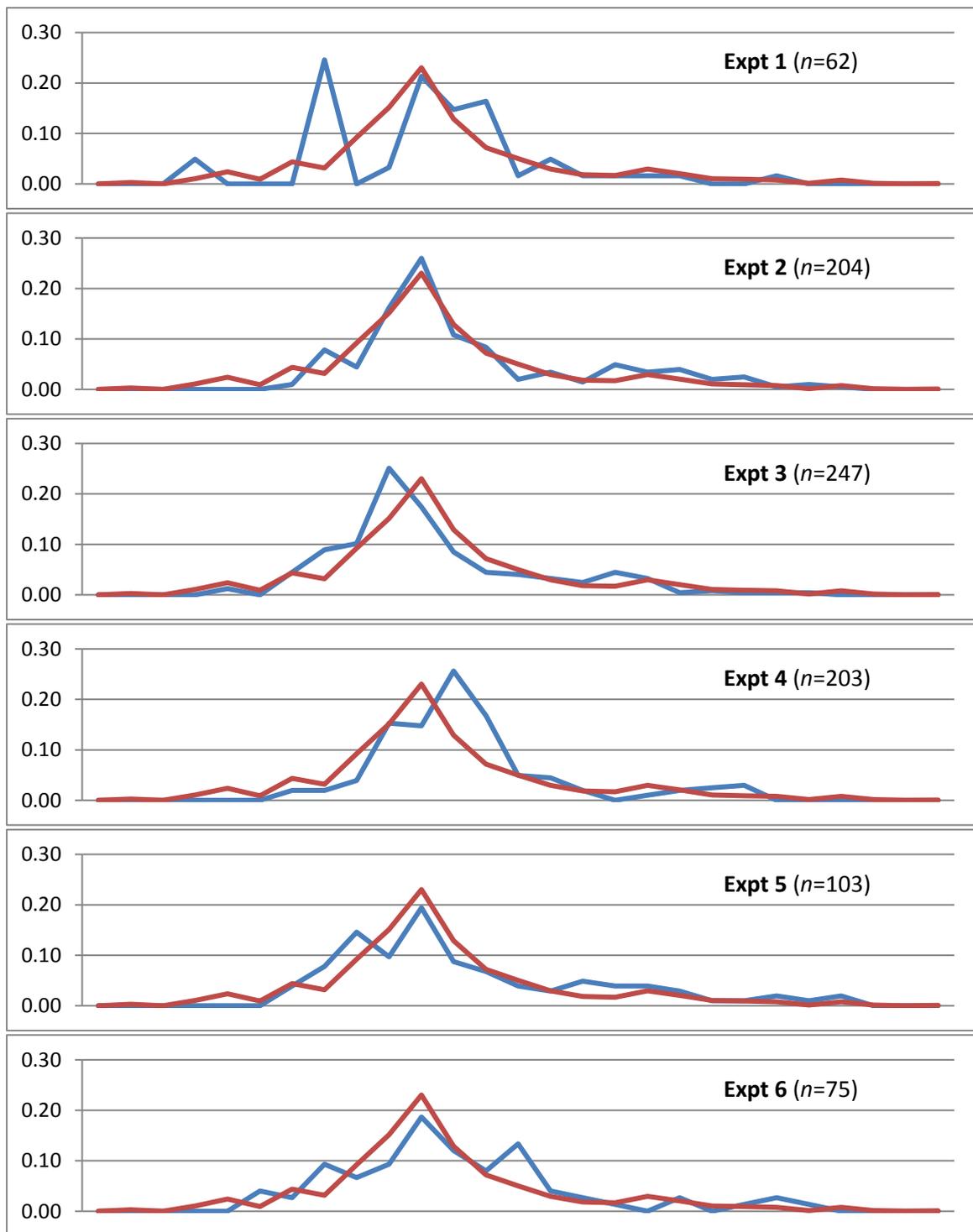
LEMON SOLE

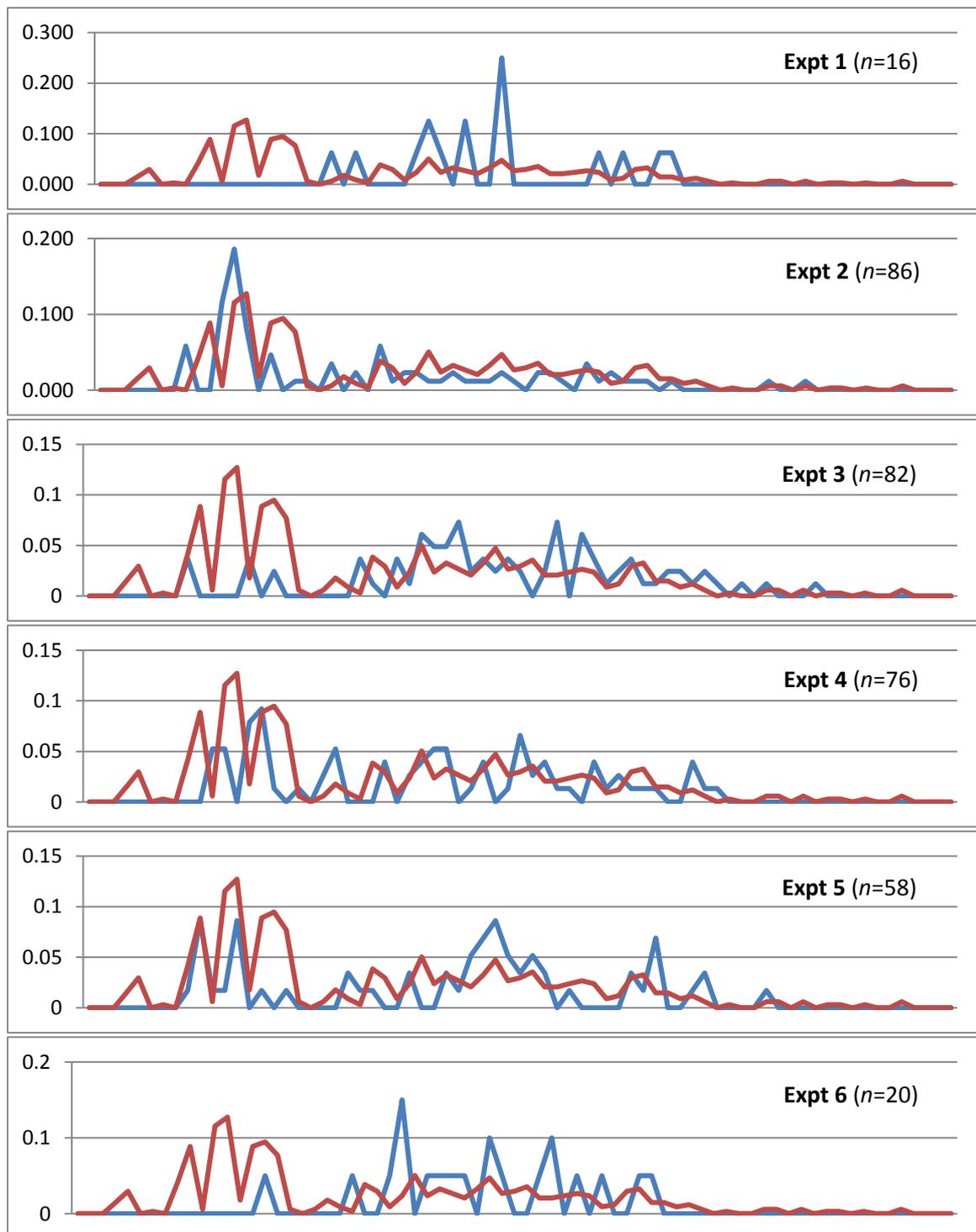
(N = 8206)



WITCH

(N = 1420)



ANGLERFISH $(N = 494)$ 

For all the species considered above, and in every test configuration, the size frequency curve for the modified net is almost identical to that for the standard net. Any catch losses that did result from the insertion of large-mesh panels in the sides of the trawl would, therefore, seem to be independent of the size of the fish.

The only instance where there appears to be a difference is demonstrated by haddock and whiting in Experiment 6, in which a double-width 300 mm mesh was inserted into top and bottom panels. The frequency curves from the modified trawl for those species shows an increase in the length of fish caught, and this would allow the commercial value of quotas to be utilised more effectively. Only three tows were completed for this configuration, however, but the difference is noticeable.

Any differences in appearance of the standard curve are due to changes in the y-axis scale to accommodate the modified curve. Many of the slight differences that are apparent between modified and standard curves can be explained by small catch numbers over a large range of fish length, e.g. for hake and anglerfish.

Discussion

One recommendation advanced from earlier trials in the North Sea with a modified trawl (Metcalf, 2010) was to explore further the possible separation of fish species across the mouth of the trawl using vertical separator panels and multiple cod-ends. It was hoped that the insertion of large diamond-mesh side panels would be a simple test that would reveal any species showing a preference for moving to the sides of the trawl during capture. These earlier trials had been conducted on a modified Jackson Hopper Trawl, whereas the trials reported here used a modified scraper trawl that is more adapted to catching flatfish. The grounds fished and timing of the trials were, however, similar, and they were a valid test of selectivity because the catch composition was varied.

The decision on the mesh size to use in the side panels was based on previous work and advice from the vessel owner. As gear selectivity is likely to depend on many factors, it was important not to introduce too many changes to the experimental design. Working with 300 mm diamond mesh in the panels was consistent with earlier work carried out on this fishery. The scale of reduction in fish catches observed throughout the trials suggests that this mesh size is suitable for any further selectivity work, but there remain few parts of the demersal trawl that have not been tested already in this way.

This attempt to reduce cod catches without affecting catches of other commercial species was regrettably unsuccessful, but the insertion of large-mesh side panels resulted in less trash fish being caught, and this could offer environmental advantages.

Conclusions

- In broad terms, the effect of inserting a large diamond-mesh panel into the sides of a demersal trawl was to reduce the overall numbers of all species in the catch to three-quarters of those caught in the standard trawl. Reductions in the catch bulk were of a similar scale.
- Very little difference in the species composition of catches was observed.

- Some minor differences in size selectivity for lemon sole, monk, and witch were deduced from differences in discard rates. Length frequency curves showed that insertion of large-mesh side panels made no difference to the size composition of any species, but rather that there was an even loss of fish across the length range.
- Large-mesh side panels used in this set of trials do not offer a preferential escape route for cod, so would not appear to offer any practical or economic benefit to the industry as a cod recovery measure.

Acknowledgements

The collaborative efforts of the skipper, James Locker, and the crew of *Our Lass II* during these fishing trials is gratefully acknowledged, as also are those of Arnold Locker and Mike Montgomery for their time in devising the experimental plan and preparing the nets; Jules Martin for sharing all the sampling work and as an invaluable companion throughout the trials; Mary Brown (Cefas) for mapping haul positions for the report; Patsy Falconer (Cefas) for the essential administrative and management support; and Andy Payne (Cefas) for reviewing this report.



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Appendices

Appendix 1.

THE CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE
(Lowestoft Laboratory, Suffolk, NR33 0HT, England)

COMMERCIAL CHARTER 2011

DETAILED OPERATIONS PLAN – Sea trials of a modified commercial trawl (FSP Project MF045)

Aim:

To look at the effect of varying the dimension and mesh size of large mesh panels positioned in the sides of the belly panel on the selectivity of a demersal trawl, with particular reference to cod (*Gadus morhua*) and other commercially important fish species.

Charter vessel: MFV 'Our Lass II' WY 261

Charter vessel skipper: James Locker

Cefas observers on board: Rob Forster (Project Manager) and Jules Martin

Responsibilities:

- The Skipper has ultimate authority on board, and is responsible for ensuring the safety of the vessel and all persons on board.
- The Skipper has the experience of fishing and the grounds, and should advise where and how the fishing trials should take place.

- The fishing programme will be agreed by the Skipper and the Project Manager.
- The Project Manager has authority on the scientific work undertaken during the charter, and the observations needing to be recorded.
- Safety takes priority over all other aspects of the charter.

Planned departure dates and duration:

- 14 days of sea trials available between 1st September and 30th November 2011.
- Planned departure date is 15th September.
- Intend two back-to-back trips of about 7 days each depending on results of fishing.
- The vessel will sail from and return to Whitby.
- 1 day set aside for rigging and de-rigging the vessel.
- Landings made during the sea trials by mutual agreement between James Locker and Rob Forster depending on weather, gear, and other considerations.

Fishing area:

- North Sea (ICES area IVb) on grounds off the coast of Yorkshire and Co Durham traditionally supporting a mixed demersal fishery in the autumn.
- It is expected that most fishing will take place within the following statistical rectangles:
 ~ 38E8, 39E8, 40E8, 38E9, 39E9, 40E9, 38F0, 39F0 and 40F0.

Dispensation:

- A dispensation has been issued by the MMO and will be carried on board the vessel for the duration of the sea trials. It will be made available to any Marine Enforcement Officer on request.
- Fishing is 'off quota'.
- Undersized fish can be retained on board for measuring but must not be landed.
- No dispensation has, as yet, been given for fishing in Real Time Closures, but there do not appear to be any in force north of Flamborough Head during September. MMO is looking to see if the current dispensation can be amended.
- No fishing to take place unless recorded by the Cefas observers.
- Copies of log sheets will be required by the MMO verifying dates and times of gear trials to avoid Days at Sea Restrictions.
- Cefas will provide a paper copy of the dispensation before sailing.

Fishing gear to be used:

- Twin-rigged otter trawl based on a scraper trawl design, with a foot rope length of 100 ft (+/- 6 ft), as discussed with Arnold Locker in Whitby at the end of July.
- Each trawl to be identical in construction and design in every respect apart from the inclusion of large mesh panels in the sides of the belly panel of one of the trawls.

- Large mesh panels to be attached in a manner that will allow variable portions of the panel to be replaced with standard 100 mm mesh.
- The trials will experiment with 200 mm and 300 mm panels.
- Sufficient net of each large mesh to be carried on board for any repairs.
- Full details of the rig to be recorded and available before sailing.

Trials design:

- Fishing should follow normal commercial methods as closely as possible, but focus on the mixed demersal fishery comprising gadoids, flatfish, and other demersal species.
- The focus of the project is to trial gear performance on a mixed fishery rather than to provide data on the distribution of species.
- Trials to start with 300 mm mesh with the full panel in the modified trawl, and to progressively reduce the panel area by replacing the large mesh with the standard 100 mm mesh. About half-way through the trials, the panels will be replaced with 200 mm mesh throughout, and the process repeated.
- Unless the loss of fish through the panels is unacceptably high for most species, there should be a minimum of 6 tows for each configuration.
- The modified trawl should be towed from both sides of the rig during the course of the trials to take account of any inherent port-starboard differences that may exist in the performance of the gear.
- Tow duration to be 3-5 hours depending on catches, sea conditions, and time constraints.
- Aim to complete a minimum of 4 tows per 24 hr cycle.
- Plan fishing, if possible, to complete some tows with the tide, and some against. Similarly, for swell direction.

Working pattern:

- The catch from each trawl must be kept apart in the hopper (e.g. with a baffle), and during subsequent sorting, to enable the effect of the large mesh panel to be measured.
- The catch to be sorted by the crew following normal commercial practice except that all sizes of commercial species will be retained for recording.
- Non-commercial species, invertebrates and other by-catch to be estimated as a combined volume, e.g. number of 5 stone baskets, excluding guts as necessary.
- Nominated member(s) of the crew to assist the observers' access to all parts of the retained catch.
- Observers will attempt to record numbers and length of all retained fish, unless catch quantities are such that sub-sampling is required.
- A system for recording the catch weight of each species from each trawl will be available, e.g. board and marker.

Rest periods:

- The aim will be to make as much use of the time available as possible for fishing.
- Sufficient rest periods should be given to ensure work is carried out safely.
- There will be a continuous period for sleep of a minimum of 6 hours per day. Fishing should stop to allow this, if necessary.

Data to be recorded by the skipper:

- As part of the dispensation, logbook entries associated with the survey should be labelled “Sea trials of modified trawl. FSP/MF045.”, and countersigned by the Project Manager.
- A copy of the landings/sales notes is needed by Cefas to enable 95% of the total agreed price (including VAT) to be paid.
- During the fishing trials, the skipper should record (*log sheets to be provided by Cefas*):
 - Time, position and depth for the start and end of each tow
 - Sea and wind conditions
 - Tidal current speed and direction
 - Tow speed and direction
 - Wing end spread??
 - Door spread??
 - Rough estimate of bulk catch for each trawl
 - Any damage to either net.

Contacts and procedures (responsibility of Project Manager):

- Contact the local MMO office to advise the start of trials 1 day before sailing.
- Contact the Cefas Shore-Based Contact (07831 319362) on sailing and landing.

I agree with the contents of this Detailed Operations Plan, and am willing to participate in these trials on these terms.

..... (Lockers Trawlers)

..... (Cefas)