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Pair Seine Catch Comparison Charter

Charter Fishing Vessels *Jasper* and *Crystal River*

Cruise 1501H

11 May 2001 - 25 May 2001

REPORT

Personnel

Jasper (PD 174)

M Breen	(in charge)	11-25 May 2001
I Penny		11-18 May 2001
J Mair		18-25 May 2001
B Mackie		11-25 May 2001

Crystal River (FR 178)

G I Sangster	(in charge)	11-25 May 2001
R J Kynoch		11-18 May 2001
D O'Driscoll		18-25 May 2001
C Duff		11-25 May 2001

Objective

To demonstrate the effect of proposed Scottish emergency technical conservation measures upon the landed and discarded catch from a commercial pair seine team. This required the systematic comparison of the catches obtained by both of the following codend/extension assemblies in combination with the vessels' own demersal pair seine gear:

Case A - Codend/extension assembly as defined by current legislation:

- Codend: 100 mm diamond mesh, 5 mm double "compact" twine, 100 open meshes round, 100 meshes long.
- Square-mesh panel: 90 mm square mesh ultracross panel, 3 m long, positioned between 9 m and 12 m from the codline.
- Extension: 500 meshes long, consisting of 100 mm diamond mesh (100 open meshes round) in the following configuration (from the forward end): 200 meshes 4 mm compact single twine and 300 meshes 5 mm compact single twine.
- Lifting bag/cover: 265 mm mesh lifting cover made of 6 mm double compact twine.

Case B - Codend/extension assembly as defined by proposed emergency legislation:

- Codend: as case A.
- Square-mesh panel: as case 1 but positioned between 6 m and 9 m from the codline.
- Extension: 200 meshes long, consisting of 100 mm diamond mesh, 100 open meshes round, with 5 mm compact single twine.
- Lifting bag/cover: non fitted.

Out-turn costs per project: 15 days MF06qz

Narrative

The vessels were loaded and instrumentation installed at Peterhead on 11 May 2001. After minor modifications to fish handling equipment, both vessels left Peterhead Harbour at 1505 hours and steamed to the East by North Hole (North East of Lerwick, Shetland), where a catch comparison exercise was conducted. Three other sites were used in this general area, Balta Hole, Corona Hole and Pobie Bank, as dictated by the availability of fish.

Only one of the vessels' seine nets was used for the entire operation, to eliminate variability in catch due to different nets. The net used was a Caley Pair Seine Hopper net, with 670 x 200 mm meshes round the fishing circle. The total ground gear length was 41.5 m (136') and consisted of 406 mm (16") and 356 mm (14") hoppers. The gear was towed with four coils of combination seine rope (40 mm) (each 200 m long) at each wing-end, with 270 m (150 fm) of heavy wire (28 mm) between the seine rope and the towing warp. Each haul was 3 ½ hours long, from the time the gear settled to the beginning of the hauling process. The test cases were alternated systematically in an attempt to ensure an unbiased comparison between cases with respect to grounds fished, time of day and tidal conditions (Table 1).

The catch was recorded in terms of total weight of landed and discarded catch for each marketable species, in addition to the total weight of non-marketable species. For key species (haddock, whiting and cod) the length frequency distribution was also described.

There was a half-landing in Lerwick on 17 May to land catch and transfer crew. On 18 May at 1230 hours , a burst cooling water pipe was discovered in the engine room of the Crystal River. The subsequent repairs lasted approximately three hours and the haul planned for 1300 hours was abandoned.

The vessels returned to Peterhead on 24 May, arriving at 1700 hours. Both vessels were unloaded the following day, when staff and equipment returned to Aberdeen.

Results

A total of 40 hauls were completed during these trials. Only two scheduled hauls were lost: one due to the burst cooling pipe on board the Crystal River and the second as a result of steaming between grounds. Weather conditions throughout the 15 day programme were good and the catches considered to be "typical to good" for the grounds at this time of year.

The total mean catches are summarised in Table 2 with respect to the two test cases (A and B) along with the results of a paired t-test analysis, comparing corresponding hauls on consecutive days. It was noted during the trials that both codend/extension assemblies had a tendency to twist during the haul. In extreme cases, this twisting could trap a proportion of the catch within the

extension (where the meshes consisted of only single twines) and as a result may have effected the selectivity of the gear. The occurrence of these twisting events is summarised in Table 3, from which it is apparent that case A had a greater tendency to twist than case B.

Table 4 summaries the standardised catches with respect to the two test cases (A and B) and also between the four different fishing grounds. These data were analysed using Generalised Linear Modelling, assuming normally distributed residuals and using a canonical link function. The model fitted included case, fishing grounds, time of day and twisting events as explanatory variables.

It is apparent from this analysis (Tables 2 and 5), that there was no significant difference between the catches obtained using cases A and B. A significant difference between catches from different grounds was evident for all components of the total and whiting catches. Also, the occurrence of twisting in the two cases did not have a significant effect upon the observed catches.

Therefore, it is clear that the quantities of discards and marketable fish caught by the two gears are similar, suggesting that, in combination, reducing the extension length from 600 to 300 meshes, removing the lifting bag and moving the square mesh panel further aft does not affect the selectivity of this gear significantly. However, it must be stressed that only the compound effect of these changes has been assessed in this study and therefore no conclusions can be drawn from this work as to the effect that individual changes may have upon the selectivity of this gear.

A preliminary comparison of pooled length frequency data for haddock, whiting and cod (Figs 1a-c), indicate that for haddock there is no difference in length based selectivity for the two cases (A and B). However, these data do suggest that case A is losing some small and large whiting, in comparison to case B, and is retaining a greater proportion of large cod.

In summary, if applicable to the whole fleet, this work would suggest the introduction of the proposed package of technical measures (Case B) to the pair-seine fleet would do little, in terms of reducing discards, to improve conservation in this fishery. The sensitivity of this catch comparison exercise and subsequent analysis is demonstrated by its ability to detect significant differences in catch between different fishing grounds. The effect of twisting in the codend and extension upon these observed catches is unclear and further analysis, in particular on the length frequency data, may be enlightening.

M Breen
Jasper (PD 174)

31 May 2001

G I Sangster
Crystal River (FR 178)

31 May 2001

Table 1 - Scheme for alternating test cases

Haul Times	Day												
	2	3	4	5	6	7	8	9	10	11	12	13	14
0400 - 0800		A	B	A	B	B		A	A	B	B	A	
0900 - 1300		B	A	B	A	A		B	B	A	A	B	
1400 - 1800	A	B	A	B	A		X	X	B	A	A	B	
1900 - 2300	B	A	B	A	B		B	A	A	B	B	A	

A	Case A	B	Case B	X	Missed haul		Half landing
	E by N Hole		Pobie Bank		Balta Hole		Corona Hole

Table 2 - Mean total catch weights with paired t-test results

Catch component	Mean total catch weight (kg)		Paired t-test results	
	Case A	Case B	n	P
Total catch	1831.8 ± 336.9	1738.2 ± 346.6	19	0.5111
Landed catch	1310.0 ± 234.8	1265.2 ± 270.9	19	0.6105
Discarded catch	513.9 ± 137.4	473.0 ± 110.2	19	0.4503
Proportion of discards	0.277 ± 0.033	0.275 ± 0.041	19	0.8916

All means presented with 95% confidence intervals.

Table 3 - A summary of codend/extension twisting events during the trials

Category	Case A	Case B
Full twists with clear catch retention	8 hauls	6 hauls
Half twists with no apparent effect on catch	3 hauls	3 hauls
No twists	9 hauls	11 hauls
Total	20 hauls	20 hauls
Mean number of twists (in hauls where twisting occurred)	3.50 twists per haul	1.28 twists per haul

Table 4 - Mean catch per unit area swept between vessels (kg/km^2) by case and by fishing grounds

Category	Case	Mean catch all grounds (kg/km^2)	Mean catch by grounds (kg/km^2)			
			Balta Hole	Corona Hole	E by N Hole	Pobie Bank
Total catch	A	187.0 ± 17.8	222.1 ± 70.7	116.7 ± 36.6	244.8 ± 89.0	138.6 ± 43.0
	B	183.1 ± 39.8	264.9 ± 64.6	102.4 ± 31.1	219.5 ± 80.6	122.3 ± 40.5
Total landed catch	A	133.8 ± 27.8	174.3 ± 68.6	87.5 ± 33.8	167.1 ± 58.1	90.2 ± 20.9
	B	133.5 ± 32.0	210.8 ± 57.9	75.5 ± 34.4	149.9 ± 60.1	83.0 ± 22.3
Total discards	A	53.2 ± 13.8	47.8 ± 8.4	29.2 ± 10.9	77.8 ± 40.0	48.3 ± 25.5
	B	49.6 ± 11.4	54.1 ± 14.2	26.9 ± 12.5	69.6 ± 28.6	39.3 ± 20.9
Whiting total catch	A	100.8 ± 29.4	130.2 ± 43.5	50.6 ± 32.3	156.4 ± 57.3	45.0 ± 31.5
	B	116.7 ± 39.1	213.6 ± 92.5	47.2 ± 24.2	140.5 ± 44.5	46.8 ± 28.8
Whiting landed catch	A	81.6 ± 23.7	115.4 ± 42.7	43.1 ± 27.8	121.1 ± 38.4	31.4 ± 20.3
	B	98.5 ± 35.1	191.2 ± 77.1	41.1 ± 24.4	110.9 ± 45.8	36.9 ± 22.4
Whiting discards	A	19.2 ± 8.7	14.9 ± 8.0	7.5 ± 8.4	35.3 ± 26.0	13.6 ± 14.0
	B	18.2 ± 8.2	22.5 ± 19.4	6.1 ± 5.6	29.6 ± 22.8	10.0 ± 10.4
Haddock total catch	A	24.3 ± 7.8	18.9 ± 5.9	12.5 ± 4.2	34.4 ± 21.6	26.9 ± 21.7
	B	25.3 ± 7.5	24.1 ± 10.7	15.5 ± 9.8	35.2 ± 24.2	22.6 ± 12.1
Haddock landed catch	A	3.9 ± 1.5	1.7 ± 0.7	1.1 ± 0.5	4.8 ± 2.3	7.3 ± 4.4
	B	3.8 ± 1.2	3.0 ± 1.7	2.4 ± 1.8	4.1 ± 3.7	5.5 ± 2.5
Haddock discards	A	20.3 ± 6.6	17.2 ± 5.4	11.4 ± 4.2	29.5 ± 19.7	19.6 ± 17.3
	B	21.5 ± 6.6	21.1 ± 10.2	13.1 ± 9.0	31.1 ± 20.7	17.1 ± 10.3
Cod total catch	A	27.8 ± 8.1	28.5 ± 34.2	20.7 ± 5.4	27.4 ± 17.9	33.3 ± 6.4
	B	19.7 ± 3.4	20.4 ± 7.9	16.0 ± 10.1	18.3 ± 9.1	23.5 ± 6.6
Cod landed catch	A	27.0 ± 8.2	27.4 ± 35.3	20.1 ± 5.8	26.6 ± 17.9	32.7 ± 6.2
	B	18.1 ± 3.7	15.8 ± 9.8	15.1 ± 9.7	18.0 ± 9.2	23.1 ± 6.7
Cod discards	A	0.8 ± 0.5	1.1 ± 2.2	0.6 ± 0.4	0.8 ± 0.4	0.6 ± 0.5
	B	1.5 ± 2.3	4.6 ± 11.4	0.9 ± 0.6	0.1 ± 0.3	0.4 ± 0.20

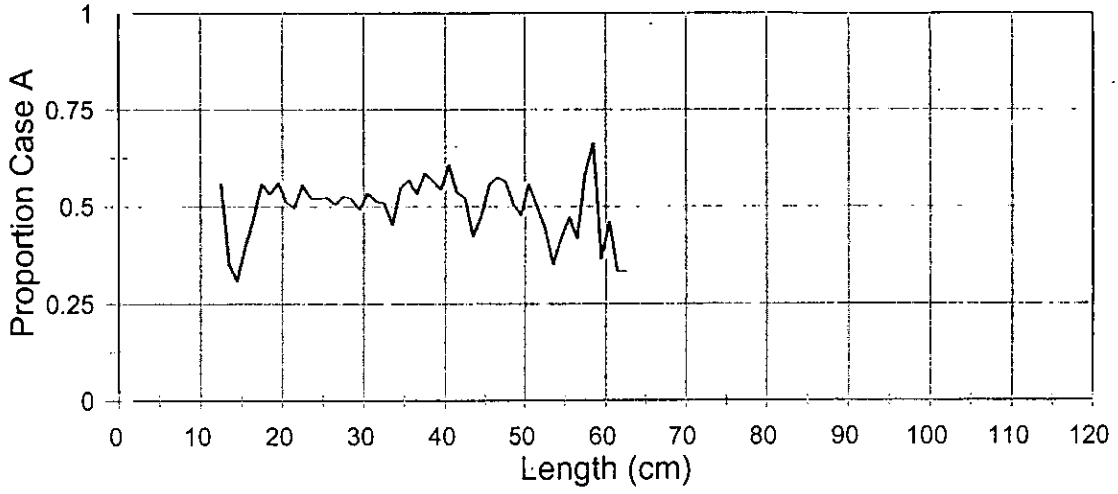
All means presented with 95% confidence intervals.

Table 5 - Results of generalised linear regression analysis

	Regression analysis				Accumulated ANOVA (P-values)			
	n	Res df.	R^2	P	Case	Area	Time	Twisting
Total catch								
Landed	40	30	47.3	<0.001	0.987	<0.001	0.517	0.366
Discards	40	30	40.1	<0.001	0.587	<0.001	0.055	0.614
Total	40	30	48.9	<0.001	0.838	<0.001	0.381	0.450
Whiting								
Landed	40	30	56.7	<0.001	0.213	<0.001	0.662	0.500
Discards	40	30	55.5	<0.001	0.791	<0.001	<0.001	0.804
Total	40	30	57.6	<0.001	0.303	<0.001	0.217	0.641
Haddock								
Landed	40	30	22.4	0.046	0.892	0.002	0.948	0.714
Discards	40	30	11.4	0.174	0.782	0.032	0.582	0.402
Total	40	30	9.0	0.220	0.829	0.039	0.658	0.434
Cod								
Landed	40	30	3.5	0.355	0.053	0.482	0.606	0.385
Discards	40	30	12.1	0.161	0.466	0.342	0.282	0.056
Total	40	30	-	0.610	0.077	0.511	0.818	0.722

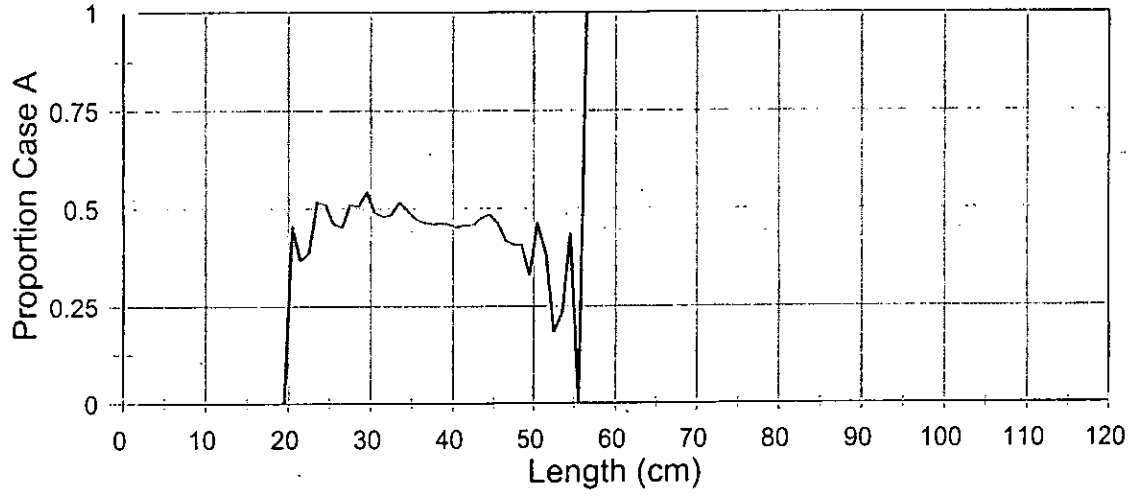
Proportion of Catch by Length

Haddock



Proportion of Catch by Length

Whiting



Proportion of Catch by Length

Cod