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(129)

TECHNICAL MEMORANDUM

BC.88.2.

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Subject: Electrofishing, survey of Skirden and Swanside Beck
August/September 1987.

Date 4 February 1988. Author B Williams Biol file: Ribble

~~1. Objectives~~

As a follow-on from the 1986 survey, to assess:-

1. The status of these systems as salmonid nursery streams.
2. The success of planting with salmon fry and parr, carried out earlier in the year.

Introduction

A survey carried out in August 1986 confirmed that parts of both catchments were well below their potential as salmonid nursery streams. Areas for further investigation were indicated and this latest survey was carried out in August and September 1987, incorporating sites additional to those visited in 1986.

Method

*For this sketch (2x) or 3x
same effort with the depletion method*

4 x 4/1 stop-nets

Multi-catch removal electric fishing using our standard methods was undertaken at sites selected to give representative cover for each system and most of them correspond with those from previous surveys.

Sites

Skirden Beck System

- | | | |
|----|---|------------|
| 1. | Tosside Beck, Grunsagill | SD 780 541 |
| 2. | Skirden Beck, u/s Bolton by Bowland STW | SD 783 495 |
| 3. | Skirden Beck, d/s Bolton by Bowland STW | SD 784 494 |
| 4. | Bond Beck, Beckfoot | SD 773 537 |
| 5. | Holden Beck, Ouzell Hall Bridge | SD 776 491 |

Swanside Beck System

- | | | |
|----|---|------------|
| 1. | Howgill Beck (u/s Gated Road) | SD 832 451 |
| 2. | Crag Clough (u/s Gated Road) | SD 840 453 |
| 3. | Howgill Beck ptc Thistleber Beck | SD 816 463 |
| 4. | Swanside Beck d/s Newby Weir u/s Rimington STW | SD 814 463 |
| 5. | Swanside Beck u/s Railway Line (u/s Abbattoir stream) | SD 803 463 |

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.....continued(Swanside Beck System)

- | | | |
|----|--|------------|
| 6. | Swanside Beck d/s Railway Line
(d/s Abbattoir stream) | SD 800 463 |
| 7. | Swanside Beck, Smithies Bridge | SD 776 454 |
| 8. | Thistleber Beck (Eel Beck)
ptc Howgill Beck | SD 817 465 |

Results

In Cragg Clough (upstream of gated road), un-fed salmon fry had been

See Table and Summary Map.

Each site is assessed on a similar basis to last year but with additional reference to the salmon planting records where available.

SKIRDEN SYSTEM

Skirden Beck

The upper reaches of this beck were sampled at Grunsagill (same site as last year). Taken as a whole, the results were as bad as those last year but it was noticed whilst sampling, that fish numbers were better in the lower part of the stretch electrofished. When the catch returns for each part of the stretch were treated separately, the population estimate for the lower part was much better, especially in terms of O+ trout. There were no discharges to the stretch but there was a general lack of cover for fish in the upper part. In any future surveys, a more suitable stretch should be used. As was found last year, trout were the dominant species and planting with salmon fry has had limited success. This site had been planted with unfed fry at a rate of about 250 per 100 metres. The return for O+ salmon was only 4 per 100 metres and O+ trout at 84 per 100 metres. In July 1987 this site was affected by a silage pollution, so it was encouraging to find fish at all.

Further downstream at Bolton by Bowland an extra site was introduced to check whether the poor results here in 1986 were an effect of the sewage works discharge. The result downstream of the works was as poor as in last year's survey but there was no evidence of improvement upstream of the discharge. Planting with salmon had been carried out at a rate of 250 fry and 72 parr per 100 metres and ^{the} population was found to be dominated by salmon but at densities of ninety six O+ and eleven 1++ fish per 100 metres.

Skirden Beck Tributaries

Bond Beck

Bond Beck was sampled further downstream than last year and whilst the results in both years were good in terms of total salmonids, planting with salmon has had only limited success. Fry and parr had been planted at a rate of 160 and 52 per 100 metres but the returns were only twelve O+ and three 1++ respectively. In Holden Beck the salmonid population as a whole was satisfactory, although not quite as good as last year. Planting with unfed fry at a rate of 470 per 100 metres might have helped to boost the O+ salmon population to 37 per 100 metres.

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SWANSIDE SYSTEM

Two small streams in the upper reaches of this system were added this year to assess the success of fry planting. Howgill Beck (upstream of gated road) had been planted with 200 unfed fry per 100 metres. Electrofishing demonstrated an excellent salmonid population but it was dominated by 0+ trout and the numbers of salmon were very low with only eight 0+ and two 1++ fish per 100 metres. In Cragg Clough (upstream of gated road), unfed salmon fry had been planted at a rate of 200 per 100 metres of stream. Electrofishing indicated that only 0+ salmon were present at a density of 101 per 100 metres, which appears to show very good survival from the planting. In Howgill Beck ptc Thistleber Beck, the results from this year's survey were very disappointing. No salmon were recorded and the numbers of trout were well down on last year's catch. Stocking with salmon parr had been carried out about half a kilometre upstream at a rate of about 50 per 100 metres.

Further downstream in Swanside Beck below Newby Weir, electrofishing demonstrated an improved salmonid population but it was dominated by trout fry. The stretch had been stocked with fry at a rate of 225 per 100 metres but the return was only eight 0+ salmon per 100 metres. *1000's of fish / distance. Range of sizes not dens. of fry. but, close to site*

Swanside Beck was also sampled at two points further downstream, above and below a stream with a history of pollution by abattoir waste. Upstream of the input, the results were very poor but the performance of the electrofishing gear at this site was erratic and no proper comment can be made on the status of this part of the stream. Just downstream, where the gear appeared to be O K, the results were improved on last year, numbers of fry were almost quadrupled, making the site just about satisfactory in terms of fry. There was no record of local planting but salmon were dominant over trout and 0+ salmon were caught at the rate of 82 per 100 metres of stream. Further downstream at Smithies Brook, u/s A59, the electrofishing results were better than last year, giving a more satisfactory population density. Planting with salmon fry had been carried out at a rate of 250 per 100 metres, and from the results of electrofishing, the return was two hundred and five 0+ salmon per 100 metres. There was no record of local stocking with parr but 1++ salmon were caught at the rate of 24 per 100 metres. *So length more important for nursery sites*

The tributary Thistleber Beck (Eel Beck) gave very bad results. The site was difficult to fish due to extensive plant growth and it is possible that in clearing this away, fish were scared out of the fishing stretch, but a qualitative check further upstream, where there had been no disturbance, also indicated a distinct lack of fish. Planting had been carried out at a rate of 250 salmon fry per 100 metres but none were caught in this survey.

SUMMARY AND RECOMMENDATIONS

There were several sites where reasonable numbers of first year (0+) trout were recorded but not much else. The sites in this category include Tosside Beck (Grunsaigill), Bond Beck (Beckfoot), Howgill Beck (u/s gated road) and Swanside Beck (d/s Newby Weir). It is possible that this imbalance is due to habitat restriction in the stretches fished but for those sites accessible to migratory fish (all those above except Howgill Beck), investigation for

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smolting fish early in the year might indicate if the imbalance is due to dominance by migratory trout. If the trout turn out to be resident, perhaps they should be cleared, along with other resident species from the planting areas.

The main Skirden Beck at Bolton by Bowland had not improved any since last year and the results from a new site upstream of the sewage works appear to rule out the discharge from this works as the cause of the problem. The indications from the upstream tributaries were better, especially in terms of 0+ trout and further investigation should be directed at the main stream at least up to Forest Becks.

In the Swanside system, good salmonid densities (mainly first year fish (0+)) were shown in the upper Howgill Beck and its tributary Cragg Clough. As already mentioned, Howgill Beck was dominated by 0+ trout but Cragg Clough was populated exclusively by salmon fry indicating good survival from the planting, (these parts of the system are made inaccessible to adult fish by Newby Weir). Has Cragg Clough been cleared of resident fish? This result shows how well the salmon can do when there is no competition and indicates the potential benefit of clearing away resident fish before planting with salmon.

The lower part of Howgill Beck (ptc Thistleber Beck) was very disappointing compared with last year's results and according to River Protection staff, there have been farm problems which probably account for this, but Thistleber Beck was also very poor and a local farmer complained that a caravan site was regularly polluting this stream. (Reported at the time of the survey to River Protection).

If required, a joint investigation (Biology/River Protection) could be arranged to follow up these problems.

The Lower Swanside system was found to be better than last year, both downstream of the Railway and at the A59. Does this reflect an improvement following action against the abbattoir which had caused problems in the middle reaches?

Bryan Williams

SITE		CATCH DETAILS						FISH PLANTED OUT (SALMON)	
Mean Channel Width m	Species	Age Class	Mean Length mm	Catch Efficiency	Est no per 100 m ²	Est no per 100 m (length)	Stage	Rate per 100 m (length)	
SKIRDEN BECK 1. Tosside Beck Grunsagill a Overall 4.35		Salmon	0+	9.1	100	0.5	2	unfed fry (Middleton) 250	
		1+	-	-	0	0			
	Trout	0+	9.0	80	9.5	41			
		1+	14.2						
		2+	17.3	100	0.5	2			
	TOTAL SALMONIDS	0+			10.8				
		1++			1.0				
b Lower section 2.32	Salmon	0+			1.85	4			
		1+			0	0			
	Trout	0+			34.7	80			
		1+			3.7	9			
	TOTAL SALMONIDS	0+			36				
		1++			3.7				
2. Skirden Beck u/s B by B STM 5.73		Salmon	0+	9.2	62.5	10.1	58	Nothing Planted?	
		1+	15.2	80	2.5	14			
	Trout	0+	8.9	40e	1.2	7			
		1+	14.2	77	4.6	23			
		2+	16.7						
		3+	23.6						
	TOTAL SALMONIDS	0+							11.3
		1++			7.8				

25, 0. 10% eff.
 25, 12 50% eff.

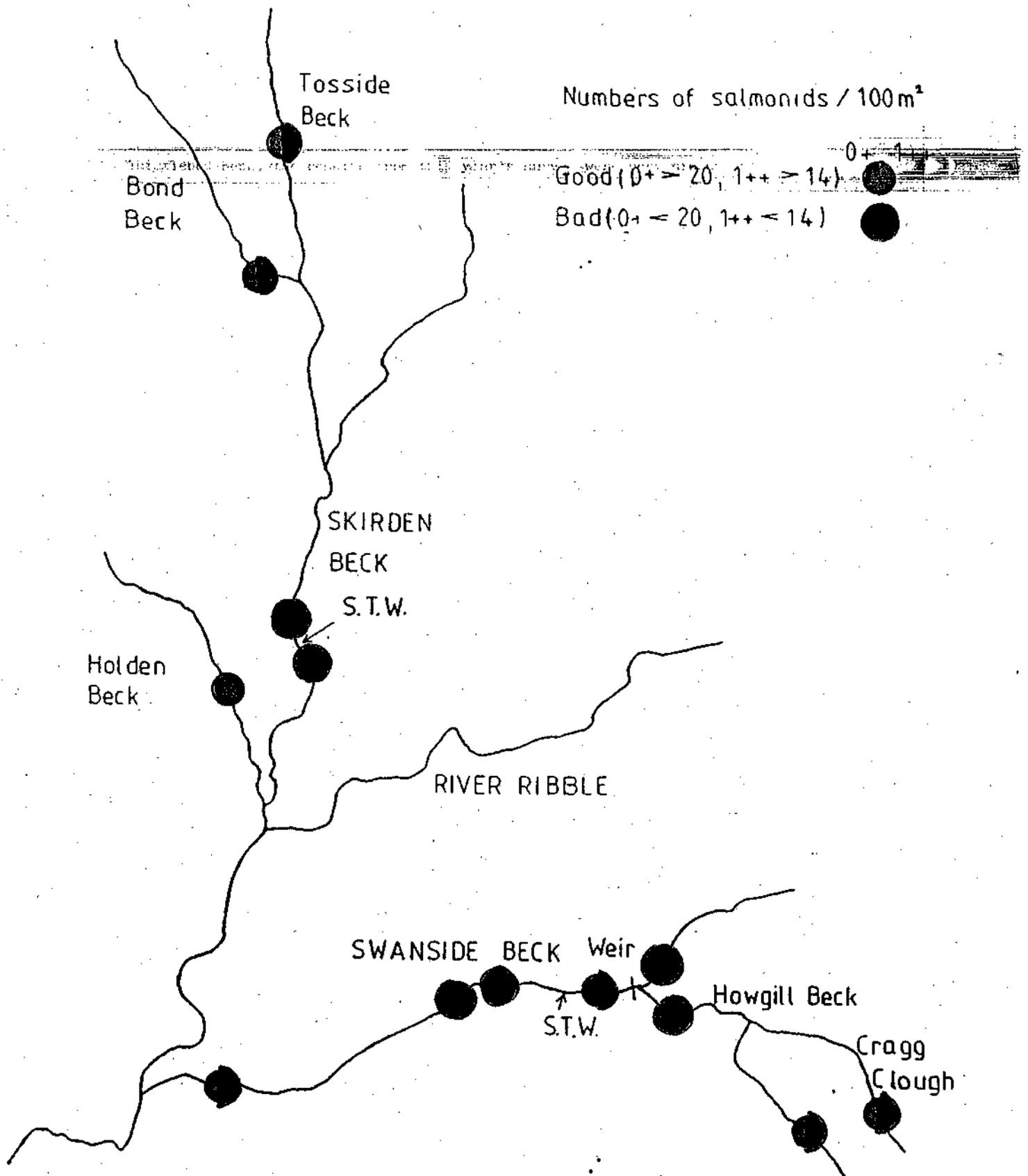
SITE		CATCH DETAILS					FISH PLANTED OUT (SALMON)	
Mean Channel Width m	Species	Age Class	Mean Length mm	Catch Efficiency	Est no per 100 m ²	Est no per 100 m (length)	Stage	Rate per 100 m (length)
3. Skirden Beck d/s B by B STW 7.34	Salmon	0+	8.5	40e	13.1	96	Fry (Dunsop Br)	250
		1+	12.8	66	1.6	11		
	Trout	0+	8.6	100	0.7	5	and Parr (Brow Well)	72
1+				0				
TOTAL SALMONIDS		0+			13.8			
		1++			1.6			
4. BOND BECK Beckfoot Fm 2.38	Salmon	0+	6.6				Fry (Dunsop Br)	160
		1+	11.5	66	4.9	12		
	Trout	0+	7.5	62.5	68.5	164	and Parr (Brow Well)	52
1+		14.7	40e	3.3	8			
TOTAL SALMONIDS		0+			73.8			
		1++			4.5			
5. Holden Beck Orzel Hall Br 3.59	Salmon	0+	6.7	40e	10.3	37	Unfed fry (Middleton)	470
		1+	12.6	87.5	4.63	17		
	Trout	0+	8.2	88	14.8	53		
1+		13.9	80	12.7	45			
2+		18.0						
TOTAL SALMONIDS		0+			25			
		1++			17.2			

SITE		CATCH DETAILS					FISH PLANTED OUT (SALMON)	
Mean Channel Width m	Species	Age Class	Mean Length mm	Catch Efficiency	Est no per 100 m ²	Est no per 100 m (length)	Stage	Rate per 100 m (length)
SWANSIDE SYSTEM								
1. Howgill Beck u/s Gated Road 2.25	Salmon	0+	7.2	50	3.7	8	Unfed fry (Middleton)	200
		1+	13.1	100	0.9	2		
	Trout	0+	6.8	65.8	53.5	120		
		1+	13.3	40e	5.8	13		
	TOTAL SALMONIDS	0+			57.2			
		1++			6.7			
2. Crag Clough u/s Gated Rd 1.71	Salmon	0+	7.5	77	59.3	101	Unfed fry (Middleton)	200
	Trout	NONE						
	TOTAL SALMONIDS	0+			59.3			
		1++			0.0			
Howgill Beck u/s Whistleber Beck 5.02	Salmon	NONE					Farr (Brow Well) (Stocked u/s)	55
	Trout	0+	7.3	87	16.1	81		
		1+	14.3	100	2.4	12		
	TOTAL SALMONIDS	0+			16.1			
		1++			2.4			

SITE		CATCH DETAILS					FISH PLANTED OUT (SALMON)	
Mean Channel Width m	Species	Age Class	Mean Length mm	Catch Efficiency	Est no per 100 m ²	Est no per 100 m (length)	Stage	Rate per 100 m (length)
4. Swanside Beck d/s Newby Weir (u/s STW) 5.19	Salmon	0+	9.2	100	0.4	2	Fry	200
		1+	11.8	100	1.1	6		
	Trout	0+	7.7	59.5	26.7	137	(Dunsop Br)	
		1+	14.6	60	3.2	16		
2+	18							
TOTAL SALMONIDS		0+			28.1			
		1++			3.2			
5. Swanside Beck u/s Railway 4.9	Salmon	0+	8.9	-	8.3	41	Fry	200
		1+	12.6	-	0.4	2		
	Trout	0+	9.1	-	4.3	21	(Dunsop Br) (To stretch	
		1+	14.1	-	1.9	10		
TOTAL SALMONIDS		0+			12.3			
		1++			2.3			
6. Swanside Beck d/s Railway 5.92	Salmon	0+	8.3	40e	13.9	82	As above	
		1+	14.7	66	5.3	32		
	Trout	0+	9.7	66	5.3	32		
		1+	14.7	90	3.3	19		
2+	17.6							
TOTAL SALMONIDS		0+			19.2			
		1++			3.3			

SITE		CATCH DETAILS					FISH PLANTED OUT (SALMON)	
Mean Channel Width #	Species	Age Class	Mean Length mm	Catch Efficiency	Est no per 100 m ²	Est no per 100 m (length)	Stage	Rate per 100 m (length)
7. Swanside Beck Smithies Br 8.1	Salmon	0+	7.7	62	25.5	205	Fry (Dunsop Br)	250
		1+	13.1	66	3.0	24		
	Trout	0+	8.4	78	7.7	63		
		1+	13.8	89	3.4	27		
		2+	16.5					
TOTAL SALMONIDS	0+			33.2				
		1++			6.4			
8. Thistleber Beck ptc Howgill Bk 3.9	Salmon	NONE					Unfed Fry (Middleton)	250
	Trout	0+ Very few, numbers not workable						

SKIRDEN AND SWANSIDE SALMONID DENSITIES



1987 Egg Survival - Swanside, Skirden and River RibbleMethod

Using stocked, recently eyed eggs from Middleton hatchery, stripped from a River Ribble hen 5/11/86, 6 sites on each of Swanside, Skirden and River Ribble were planted with two egg boxes. At each site 1 Harris box was planted with 50 eggs and the other box contained 25 eggs. Only live eggs were put in the boxes.

The sites were picked on spawning riffles and were spread through areas under investigation on each system.

Swanside Beck - Planted 19/1/87

<u>Site No.</u>	<u>Map Ref.</u>	<u>Area of site</u>	<u>Comments</u>
1	816 463	100m below Rimmington sewage works	
2	811 462	10m above Bridge End Farm Road Bridge	
3	811 462	10m below Bridge End Farm Road Bridge	Both boxes contain 50 eggs
4	798 462	300m below railway bridge, Rimmington station	
5	799 462	400m below railway bridge, Rimmington Station	
6	773 455	10m below A59 road bridge	

Skirden Beck - Planted 27/1/87

<u>Site No.</u>	<u>Map Ref.</u>	<u>Area of site</u>	<u>Comments</u>
1	784 489	20m below Beer Beck confluence	
2	785 491	400m below Bolton-by-Bowland road bridge	
3	785 516	800m above Forest Beck's road bridge	
4	785 517	850m above Forest Beck's road bridge	
5	781 541	Grunsa Gill 10m below road bridge	
6	768 544	Bond Beck 50m below road bridge	

River Ribble

Only one box containing 50 eggs was planted at each site. The sites were from Langcliffe Hatchery mill leat to Hellworth Bridge.

River Ribble sites -- Planted 27/1/87

<u>Site No.</u>	<u>Map Ref.</u>	<u>Area of site</u>	<u>Comments</u>
1	818 647	Bottom of Langcliffe Mill leat	
2	817 647	R. Ribble 20m above confluence with mill leat	
3	817 654	5m below Langcliffe footbridge	
4	818 655	100m above Langcliffe fish counter	Site deep and slow
5	821 657	Tail of Robinson's pool, Langcliffe Paper Mill	
6	811 702	2m above Hellworth Bridge footbridge	Site deep and slow

River Ribble results -- Planted 27/1/87, removed 24/3/87

<u>Site No.</u>	<u>% survived</u>	<u>Live alevins</u>	<u>Dead alevins</u>	<u>Live eggs</u>	<u>Dead eggs</u>	<u>Comments</u>
1	93	41	0	0	3	
2	94	44	3	0	0	
3	79	36	0	1	10	
4	72	33	3	0	10	Site deep, sl
5	84	36	0	0	7	
6	72	30	1	1	11	Site deep, sl

River Ribble comments

Sites 3 to 6 had lower than expected survival. Sites 4 and 6 were in deep, slow flowing positions and the intra-gravel flow would be poor.

There seems very little difference between sites above and below the paper mill. Site 5 is about 200m below the paper mill.

Swanside results -- Planted 19/1/87, removed 24/3/87

<u>Site No.</u>	<u>% survived</u>	<u>Live alevins</u>	<u>Dead alevins</u>	<u>Live eggs</u>	<u>Dead eggs</u>	<u>Comments</u>
1a	95	42	0	0	2	
1b	100	23	0	0	0	
2a	13	6	1	0	38	Eggs rotted in clumps
2b	89	16	0	0	2	
3a	98	47	0	0	1	
3b	96	45	0	0	2	
4a	6	2	1	0	32	
4b	13	3	1	0	19	
5a	0	0	0	0	48) Much very fi) black silt i) beck bed
5b	0	0	0	0	23	
6a	71	32	5	0	8	
6b	57	12	0	0	9	

Comments

The three sites from below Swanside weir, 50m below Rimmington sewage works to Bridge End Farm, had high percentage survivals, apart from Site 2 box a. All other boxes near Site 2 and box b, which was touching box a, all showed high survival. Site 3 was only 20m downstream from box a, Site 2. The high mortality in box a must be due to a very localised effect; probably the intra-gravel waterflow through the box was being blocked, causing low oxygen values in the box.

Sites 4 and 5 had only a maximum of 13% survival at Site 4, and Site 5 had complete mortalities of eyed eggs in both boxes. If green eggs had been used, there would have been no survival at Site 4. Site 4 was on a very good fast riffle with well graded gravel. When the boxes were removed at Sites 4 and 5, there was a lot of very fine black silt around the boxes. Any redds in this area would have very little chance of producing alevins.

Site 6 below the A59 bridge showed an improvement on Sites 4 and 5 but was still poor. If green eggs had been planted, the survival of these boxes would have been low.

When eyed eggs are planted, a very high survival rate can be expected. The experiments of 23/2/84 on the River Wyre and 5/3/84 on the River Hodder, where eyed salmon ova were planted, show that a 90% to 100% hatch can be expected. Any survival below 90% shows that some factor in the egg box environment is causing egg mortality. Above 90%, the egg loss is probably due to natural ova death.

From the sites at Rimmington Station downstream to the River Ribble, some factor in the beck environment, possibly pollution from the abattoir, is causing very high ova mortalities. I would expect very poor survival in natural redds in the area.

Skirden Beck results - Planted 27/1/87, removed 24/3/87

<u>Site No.</u>	<u>% survived</u>	<u>Live alevins</u>	<u>Dead alevins</u>	<u>Live eggs</u>	<u>Dead eggs</u>	<u>Comments</u>
1a	98	28	0	13	1	
1b	100	13	0	11	0	
2a	100	3	0	48	0	
2b	100	0	0	23	0	
3a	93	3	0	36	3	
3b	43	5	0	5	13	
4a	78	1	0	37	11) Site deep) and slow
4b	28	0	0	7	18	
5a	95	0	0	39	2	
5b	100	0	0	24	0	
6a	100	0	0	50	0	
6b	100	0	0	25	0	

Skirden comments

On four of the Skirden sites, we had very high survival. Most of the eggs had not hatched, so any hatching mortality is not shown. Skirden must have a colder temperature regime compared to R. Ribble at Langcliffe and Swanside Beck.

Sites 3 and 4 had lower survivals. Site 3 had a large variation between the two boxes - 93% in one and 43% in the other. Site 4 was fairly deep and slow; there was a lot of coarse silt in the box. The results at 3 and 4 suggest that there is a higher than expected egg loss in this area, but the results are not conclusive.

Over all the experiments there is little difference between the boxes containing 50 eggs and those containing 25 eggs. At 5 sites, the box containing 25 eggs had a survival higher than the 50 egg box, at 4 sites the 25 egg box had a lower survival. I thought that 50 eggs in the Harris box could be causing an increased mortality due to the death of one egg killing other eggs around it. The results from the Swanside and Skirden experiments show this is not so.

A. CLARKE

1987/88 Salmon ova survival -- Swanside, Skirden and Stocks BeckMethod

Using green ova, stripped from a R. Ribble hen, 5 sites on Skirden and 6 sites on Swanside Beck were planted within 8 hours of stripping.

Each site had two Harris boxes, containing 50 live eggs, packed in clean gravel, buried at a depth of 10cm in the pot of each redd.

In Stocks Beck, 3 sites were planted with one Harris box on suitable riffles.

The sites on Swanside and Skirden were the nearest redd to last year's experimental sites.

SWANSIDE BECK - planted 9/12/87

<u>Site No.</u>	<u>Map Ref.</u>	<u>Area of site</u>	<u>Comments</u>
1	817 463	Rimington sewage works	Just above outfall
2	811 463	Stopper Lane. 10 yds below bridge.	Near Bridge End Farm
3	809 463	Stopper Lane. 200 yds below bridge.	" "
4	799 462	Rimington Station	300 yds below railway bridge
5	795 460	" "	500 yds " " "
6	773 455	A59 10 yds below bridge	Near farm crossing

SKIRDEN BECK - planted 9/12/87

<u>Site No.</u>	<u>Map Ref.</u>	<u>Area of site</u>	<u>Comments</u>
1	784 489	Below Beer Beck confluence	500 yds below road bridge
2	784 491	100 yds below sewage works	200 yds below Bolton-by-Bowland road bridge
3	785 516	Below Skirden farm	Sewage fungus on beck bed
4	784 518	Above Skirden farm	" " " " "
5	781 541	Grunslagill	20 yds below road bridge *

* No redd available. Boxes planted in riffle.

STOCK BECK - planted 9/12/87

<u>Site No.</u>	<u>Map Ref.</u>	<u>Area of site</u>	<u>Comments</u>
1	828 497	Gisburn Park. Near Keeper's Cottage	Planted in riffle
2	829 496	Gisburn Park. Above Keeper's Cottage	" " "
3	856 497	200 yds below road bridge	" " "

Results

Of the two Harris boxes planted, one was removed soon after eyeing, the second soon after hatching.

SWANSIDE

<u>Site No.</u>	<u>Date</u>	<u>Live eggs</u>	<u>Dead eggs</u>	<u>Live alevins</u>	<u>Dead Alevins</u>	<u>% Survival</u>
1	24/2/88	2	47	0	0	4%
	5/4/88	0	48	0	0	0%
2	24/2/88	4	45	0	0	8%
	5/4/88	0	44	0	0	0%
3	24/2/88	3	44	0	0	6%
	5/4/88	0	45	0	2	0%
4	24/2/88	0	49	0	0	0%
	5/4/88	0	47	0	0	0%
5	24/2/88	0	47	0	0	0%
	5/4/88	0	44	0	0	0%
6	24/2/88	6	42	0	0	12%
	24/2/88	2	45	0	0	4%

The controls kept at Street hatchery had survivals of 82 and 84% (9 and 8 dead eggs) to hatching. The highest survival to eyeing of planted boxes was 37% at Site 1, Skirden Beck.

All sites planted on Swanside Beck had no survival after hatching. Only 2 eggs at Site 3 had hatched but those died before the Harris box was lifted. This box had been washed out of the gravel after eyeing and will have had a high water flow through it, keeping the eyed eggs alive.

The survival to eyeing in the top 3 sites was very poor with only 2 to 4 eggs alive. At sites 4 and 5, near Rimmington Station, all the eggs were dead. Site 6 boxes had been washed out before the eggs had eyed. Both boxes were removed and counted after eyeing. The survival in these boxes would probably have been higher if the boxes had remained in situ because the disturbance of being exposed kills green eggs.

When comparing these results with the 1987 eyed ova experiment, there is a similar picture of a black area around Rimmington station of no survival. This year's results have shown how poor the survival at sites 1 to 3 and 6 is. Planting with green eggs mirrors what is happening in the redds much better than planting with eyed eggs where a very high survival (90%+) is expected.

From the Harris box results, an extremely low survival from natural redds can be expected with just the odd egg in a perfect position surviving.

It is interesting to note that at Site 1 above Rimmington Sewage Works outfall, the eyed egg development was a week to a fortnight behind the sites below. There could be a warming effect from the sewage works, speeding up egg development.

SKIRDEN BECK

The first Harris box was removed after the eggs were eyed. If all the eggs were dead, the second box was removed and counted.

We could not find the boxes at the Grunsagill site. The posts had gone, probably vandalised.

<u>Site No.</u>	<u>Date</u>	<u>Live eggs</u>	<u>Dead eggs</u>	<u>Live alevins</u>	<u>Dead alevins</u>	<u>% Survival</u>
1	24/2/88	17	29	0	0	37%
	5/4/88	0	37	3	0	7.5%
2	24/2/88	0	47	0	0	0%
	24/2/88	0	45	0	0	0%
3	24/2/88	0	48	0	0	0%
	24/2/88	0	43	0	0	0%
4	24/2/88	0	49	0	0	0%
	24/2/88	0	46	0	0	0%
5	24/2/88	Could not find, probably vandalised.				

The controls for this experiment were the same as Swanside's.

When planting the Harris boxes, we found a farm discharge of slurry entering the beck 20 yards above Site 5. The redds and the beck bed were covered in sewage fungus for at least 1/2 mile downstream. There was no survival to eyeing in the first 3 sites downstream of this pollution. Site 1, below Beer Beck confluence, had the highest survival of any site, 37% to eyeing, but at hatching it was very poor with only 3 alevins surviving.

This year's results have shown the high egg loss I expected after the eyed ova experiment, especially in the area of Skirden Farm (above Forrest Beck road bridge). I suspect the farm discharge in this area caused the poor results in 1987 as well as this year.

As with Swanside, the natural production of alevins from salmon redds must be very low with just the odd egg surviving to hatching.

STOCK BECK

No redds were found when the boxes were planted. Only 1 box per site. Planted 9/12/87.

<u>Site No.</u>	<u>Date</u>	<u>Live eggs</u>	<u>Dead eggs</u>	<u>Live alevins</u>	<u>Dead alevins</u>	<u>% Survival</u>
1	24/2/88	4	44	0	0	8%
2	24/2/88	0	47	0	0	0%
3	24/2/88	3	43	0	0	7%

The sites on Stocks Beck showed very poor survival to eyeing. There would be no survival to hatching. This beck is grossly polluted and I did not expect the survival to eyeing.

Comments

All three becks surveyed showed no alevin survival, apart from Site 1 Skirden Beck. The spawning gravel on Skirden, Swanside and part of Stock Beck looks a reasonable size and type. Although well formed lowland catchments do not, in general, have as high a survival as upland streams, this does not account for such low survivals. Also, historically, Skirden and Swanside were good salmon spawning becks. The poor water quality of these streams must be having a major adverse effect on salmon ova survival.

On the River Wyre this year, the average Harris box survival is down to 15%, as opposed to 33% in 1983/84 and 45% in 1984/85. I think high, over-winter water temperatures have had a damaging effect on egg survival by reducing the percentage of oxygen saturation and increasing microbial activity and oxygen use. Any organic enrichment will have a major aggravating effect by lowering the oxygen reaching the eggs. Also, as eggs die, there is a snowball effect of these eggs killing any eggs close to them by fungal attack and microbial breakdown removing oxygen.

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