Ayrshire Timed Electrofishing Surveys

Summer 2010

Timed site TAM13, Stairaird

Ayrshire Rivers Trust

1. Introduction

The Ayrshire Rivers Trust (ART) was formed in 2001 to provide a source of local fisheries management and biological expertise in Ayrshire. The four Ayrshire DSFB's are affiliated to ART and in return receive management advice and survey work. A major part of the survey work involves examining the distribution and density of fish populations through electrofishing at a network of sites throughout Ayrshire. The timed electrofishing sites visited in 2010 by ART were examined both as part of a long-term monitoring strategy to investigate salmon fry production in the main stems of the Ayr, Doon, Girvan and Stinchar.

The aims of the 2010 electrofishing survey were:

- To examine salmon fry production in the main stems of the Ayr, Doon, Girvan and Stinchar.
- To collect water quality data at electrofishing sites
- To sample invertebrate populations at each electrofishing site and investigate relationships with fish populations.
- To provide the Ayrshire DSFB's with the information from these surveys.

2. Methods

Data recording

ART is a full member of the Scottish Fisheries Coordination Centre (SFCC), which is an association of Scottish fisheries management organisations including the River and Fishery Trusts of Scotland, the Scottish Office Freshwater Fishery Laboratory, and some District Salmon Fishery Boards. The SFCC has, in partnership, agreed a common methodology for data collecting and recording and has developed a database for entering and storing data in an agreed format. The SFCC also provides electrofishing training to its members, and ART's biologists have attended and passed electrofishing training courses organised by SFCC. Wherever possible, ART's surveys are therefore carried out to the standards required by the SFCC and data are recorded using the agreed format.

Techniques

Fish populations at each site were assessed using electrofishing. This is a widely used technique to examine freshwater fish communities. The method uses electricity to attract and stun fish, which allows operators to remove them from the water. The fish are transferred to a holding container until they have recovered and then anaesthetised using a mild solution of MS222 (Tricaine Methane Sulphonate). Each individual is then identified, measured and returned unharmed to the area from which they were captured.

At all sites a battery powered backpack equipment (Electracatch model # WFC-911) was used. (Occasionally generator powered equipment is used to provide sufficient power to enable efficient fishing in high conductivity water). Smooth DC was used at all sites, to maximise catch efficiency, while minimising potential damage to fish and other wildlife. A minimum voltage of 200V was used, to ensure efficient fish capture.

Two different techniques were used to relate the number of fish caught to actual fish densities, in the stream-area delimited and time-delimited surveys. In smaller watercourses, it was possible to cover the entire survey area accurately, and the number of fish captured could therefore be related the wetted area of the site. However, for the larger main stem sites, the full area of the river could not be electrofished effectively. In these cases, the ART survey followed existing guidelines, and carefully timed the electrofishing runs to obtain a figure for fry caught per minute. Protocols in both cases were followed to SFCC standards, a standard protocol for timed electrofishing having been agreed in 2007.

Timed surveys

Biologists are increasingly finding that timed surveys are an effective and efficient way of examining fish production, particularly in larger watercourses. While timed fishing does not provide an absolute value for fish densities, it can be extremely useful in comparing different parts of a catchment or wider area, provided that catch efficiency does not change between sites. This potential source of error can be minimised by ensuring that an identical protocol is followed at every site and by using a standard team of fully trained personnel.

Sites for this part of the survey were chosen to cover suitable salmon fry habitat throughout as broad a geographic range as possible up the main stem of the river. It is particularly important to examine these habitats, because in many rivers the majority of salmon spawning and juvenile production is likely to take place in the main stem of a river, rather than smaller side tributaries. Restricting electrofishing surveys to smaller watercourses, using area based surveys, may therefore fail to identify important factors affecting salmon populations.

Shallow run and riffle areas were targeted, preferably with a maximum depth of 30 cm. Electrofishing runs were timed, with a single 5-minute run being carried out at each site, all within typical fry habitat. The timer was started at the beginning of each run, and the 5-minute period included time spent transferring fish from the net to the bucket, and moving between sweeps. The electrofishing operators proceeded in an upstream direction throughout, working in a zigzag pattern to avoid covering the same area twice, and staying in shallow areas suitable for fry production. In some cases this meant that the whole channel width was not covered, however because the fish numbers were to be related to time, rather than area, this could be accounted for.

Results Classification

Timed sites

In order that the results from one river or site can be compared easily with others, a results classification scheme has been introduced. The results from all the timed-electrofishing sites surveyed across Ayrshire from 2006 to 2010 were collated and the total salmon fry densities figures ranked and split into 20% divisions, excluding sites where no fry were recorded. The groups were then assigned a classification indicating the relative number of salmon fry caught per minute. The timed results classification score was revised this year to include the five year average scores, with the 2005 results dropping out to be replaced by the 2010 results.

Table 1: 2006 - 2010 Ayrshire timed sites salmon fry classification

Salmon fry breakpoints (No/min)	Classification
0.0	**Absent**
0 < 3.2	**E – Very poor**
3.2 - 6.2	**D - Poor**
6.3 - 8.8	**C - Moderate**
8.9 - 12.4	**B - Good**
>12.5+	**A - Excellent**

If salmon fry are absent this often indicates that salmon cannot access this area, or there is another serious problem preventing survival.

Water Quality sampling

Water quality parameters were recorded using a YSI Model 556 multi-parameter field sampling meter. Samples were logged after allowing the meter reading to stabilise, in accordance with the manufacturers' recommendations. The meter was calibrated at

regular intervals throughout the sampling season using buffer solutions of pH 4.0, 7.0 and 10.0.

Invertebrate sampling

In 2005 ART introduced an invertebrate sampling system at each site. The methodology used was that developed by the Riverfly Partnership (***www.riverflies.org***). A three minute kick sample was taken at each site, identified to taxonomic group level along with an estimate of abundance to enable a score for each site to be calculated.

The invertebrate scoring system has two components, with a letter, from A to D, for diversity and a number, from 1 to 5 to represent abundance. A score of A1 would indicate high diversity and abundance, whilst D5 would be a site with low diversity and abundance. Scores such as B3-5 are typically found in upland areas with good water quality but relatively low productivity.

3. Results and Discussion

3.1 River Ayr Timed Electrofishing Sites

In total, ART examined 13 timed sites in 2010 in the Ayr catchment. Previous timed surveys in the River Ayr had found that salmon fry numbers in the lower main stem of the river were generally low. With the exception of a new site surveyed for the first time at Glenlogan all the other sites had been surveyed for at least three years in succession, some for the seventh successive year. The monitoring site at Howford Bridge (TAM3) was not surveyed in 2010 due to road closures on the day of the survey. Habitat quality at all sites was considered to be suitable for salmon fry. The results are shown in the table and map below.

Table 2: Results from the Ayr catchment salmon fry timed surveys 2010. * Codes for other species are: T = Trout, E = Eel, M = Minnow, SL = Stone loach, ST = Stickleback, G = Grayling.

Site	Location	Grid Ref E N	Date	Salmon fry caught per minute	Classification	Other species *	Invertebrate Score
TAM4a	A77 Stepping stones main channel	236206 621581	4 Aug	1.4	**E**	M, SL, E,	**A2**
TAM14	Upstream Oswald's Bridge	238742 623105	4 Aug	0.4	**E**	M, SL	
TAM15	Tarholm Bridge	239247 622126	4 Aug	4.0	**D**	SL	
TAM11	Below Stair Dam	243774 623549	4 Aug	2.0	**E**	M, SL, E, G	
TAM13	Stairaird	246773 626159	4 Aug	3.2	**D**	SL,G	
TAM2	Sorn upstream humpbacked bridge	255000 626700	4 Aug	0.2	**E**	SL, T	
TAM16	Sorn 100m u/s Glenlogan bridge	256297 626188	4 Aug	1.4	**E**	SL	**A2**
TAM9	Swinging Bridge, Limmerhaugh	261792 626876	4 Aug	14.6	**A**	M, SL	
TAM1	Netherwellwood Bridge	265280 626150	4 Aug	8.4	**C**	T, SL, M, G	**A1**
TAL2	Lugar Water, below Ochiltree Weir	251220 621350	13 Aug	6.2	**D**	M, SL, G	**A3**
TAL7	Lugar, Mill Affleck upper	252304 620824	13 Aug	3.4	**D**	T, SL, M	
TAL8	Lugar, Dumfries House	254369 620646	13 Aug	1.2	**E**	M, SL	**B3**
TAL6	Lugar, in Lugar village	259066 621127	13 Aug	5.0	**D**	T, SL	**A2**

A summary of the results from the last seven years are shown below in Table 5. The mean results from 2010 were one of the lowest recorded over the last seven years. All but two of the sites were in the lowest categories, very poor or poor in comparison to the average results from Ayrshire over the last five years.

None of the sites in the Ayr downstream of the meetings with the Lugar Water showed an improvement compared to previous surveys. At all of these sites except the site downstream of Stair Dam the results were the lowest of the series. It was not much better on the Lugar Water where all the sites were very poor or poor.

The new site at Glenlogan was surveyed as the existing site at Sorn was more suited to parr and had always produced relatively low numbers of fry. The habitat at the Glenlogan site was more suited for fry but the fry results at this site were also low, although the parr numbers were the second best of all the timed survey sites in the Ayr in 2010. Ultimately it is more important that there are good parr numbers at these sites; in the upper catchment a very high proportion of the smolts will be two year old plus and will spend at least one summer in the river as a parr before smolting. The Sorn and Glenlogan sites, which both supported low salmon fry numbers, are about one mile apart. It appears that fry production in this part of the river is low and that the parr present in high numbers at these sites may be as a result of downstream migrating fry/parr from the better spawning habitat in the upper river. The smolt trap operated by ART in spring 2010 recorded high numbers of small salmon parr during the early period of operation, peaking in early April. If there is a similar downstream movement of small parr in the upper river it could explain the presence of high salmon parr densities despite low local fry production. If this is the case it emphasises the need to protect the known important spawning areas.

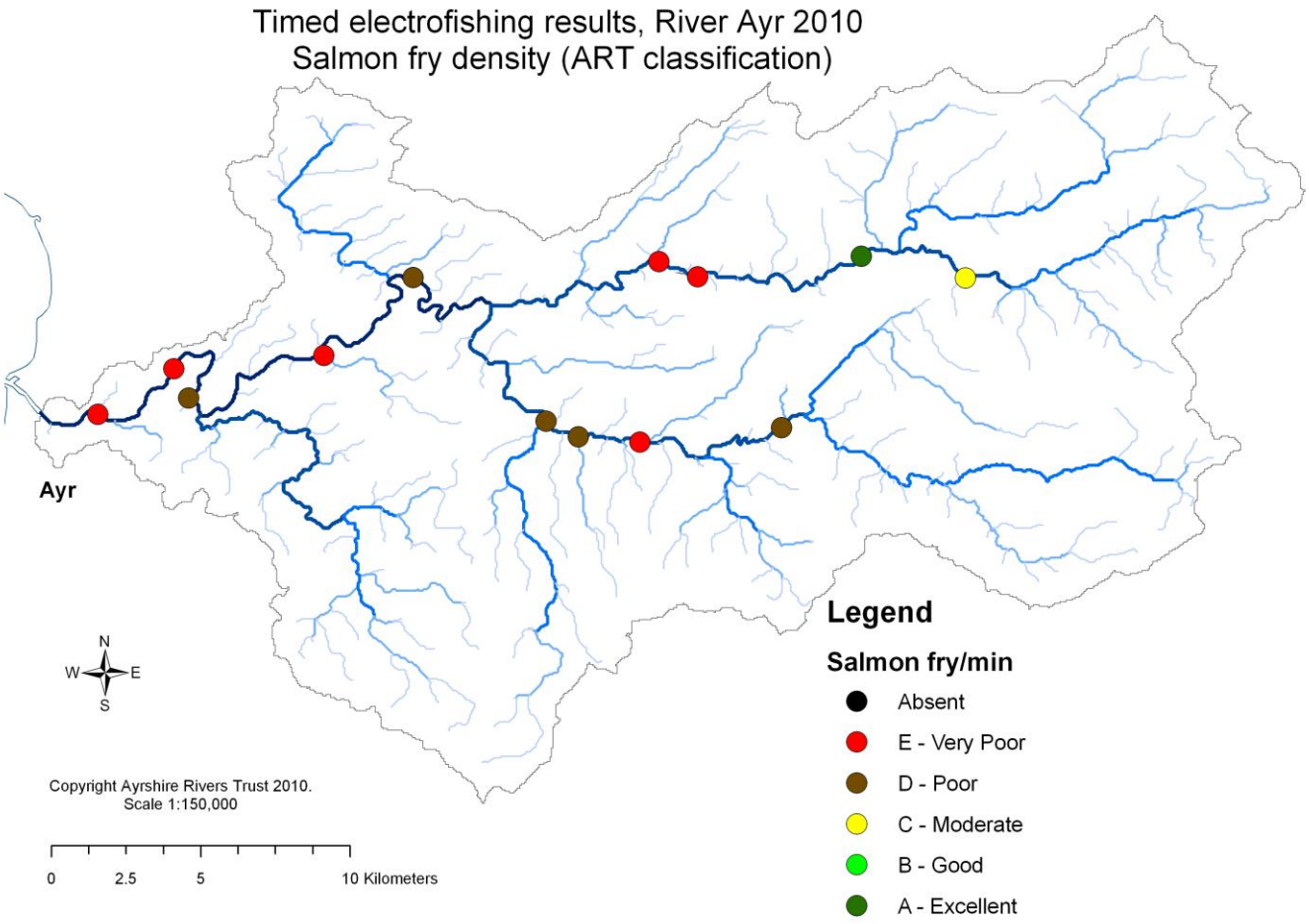


Figure 1: Ayr timed salmon fry survey results 2010

The timed salmon fry monitoring results for 2010 were only 68% of the average since 2005. The results were the lowest recorded since 2005, when a full monitoring program was put in place for the entire catchment. The results from the other monitored rivers in Ayrshire were varied. The results from the Doon and the Stinchar were well above average whilst on the Girvan they were just below average. So the

results from the other rivers were much better in comparison to the results from the Ayr. What reasons could there be for these poor results?

The official rod catch from the River Ayr in 2009 was 643 salmon and grilse, just below the 10 year average of 695. This suggests that there should have been similar numbers of spawners to recent years. The winter of 2009/10 was one of the coldest in recent years and the river was ice-bound for long periods. There is also some evidence that salmon spawning was delayed due to the cold weather. The cold winter was then followed by an exceptionally dry spring with no spates for three months after the first week of April. However, these are factors which operate on wide geographical scales and would have been similar for all four rivers.

In comparison to the other rivers mentioned above the Ayr suffers from the effects of diffuse pollution to a greater extent. Diffuse pollution includes issues such as siltation and enrichment. Siltation and enrichment may both lead to depressed oxygen levels within spawning gravels. The dynamics of water exchange within and through spawning gravels is very complex but exchange of river water through the gravel has been found to be correlated to river flow. Other factors such as decomposition of organic material trapped within the gravel and increased influence of upwelling groundwater are also likely to lead to low oxygen levels during periods of low river flow. These factors operate in all rivers but locally the Doon has the benefit of the compensation flow which maintains adequate flows whilst the Stinchar has generally much better water, and spawning gravel, quality. Analysis of the Girvan results shows that the results in the lower river were poorer in comparison to those recorded in the upper river. ART consider that the lower river Girvan suffers from the effects of diffuse pollution although to a lesser extent that the Ayr.

It may be that there is a specific problem with oxygen levels in the spawning gravels in the Ayr, and that this was exacerbated by the generally low river levels prevalent during 2010.

Another potential factor could be lack of spawning adults. The catch return for 2009 suggests average numbers of fish in the river but the published figures show that less than 18% of the salmon caught in the Ayr were returned. This compares with between 46% to 62% for the Doon, Girvan and Stinchar. There is plenty evidence to show that fish which are released carefully after capture do survive and go on to spawn successfully. There is considerable doubt over the accuracy of the catch data from the Ayr but the published release rate continues to one of the lowest in Scotland. If there is a problem with spawning success and recruitment into the population then it is vital that the existing spawning stock is protected. Increasing the catch and release percentage on the River Ayr should be considered a high priority.

Table 3: Ayr catchment timed electrofishing summary 2004 – 2010

Site	Location		2004	2005	2006	2007	2008	2009	2010
TAM4	A77 at stepping stones, side channel	Fry/min		0.6	1.6	0.4	1.8	2.6	
		Parr/min		0.0	1.4	0.4	0.0	1.2	
TAM4a	A77, stepping stones main channel	Fry/min					2.8	3.2	1.4
		Parr/min					0.0	0.0	0.2
TAM14	Oswald's Bridge	Fry/min				2.2	3.6	0.8	0.4
		Parr/min				0.4	0.4	0.6	0.2
TAM12	Tarholm Nursery	Fry/min				2.6	5.8	3.6	
		Parr/min				0.0	0.4	0.6	
TAM15	Tarholm Bridge	Fry/min					13.4	5.6	4.0
		Parr/min					0.4	1.0	1.2
TAM5	Upstream Gadgirth Bridge	Fry/min		0.6	0.4	0.2			
		Parr/min		0.0	0.0	0.0			
TAM10	At Failford	Fry/min			0.0				
		Parr/min			0.0				
TAM11	Downstream Stair Dam	Fry/min			0.0	1.4	3.8	1.6	2.0
		Parr/min			5.2	0.2	0.4	1.0	1.0
TAM13	Stairaird, Priest's Weel pool	Fry/min				5.2	6.4	11.0	3.2
		Parr/min				0.4	1.0	0.4	1.4
TAM6	Downstream of Barskimming	Fry/min		2.8					
		Parr/min		0.2					
TAM3	Downstream Howford Bridge	Fry/min	1.6	1.6	2.0	3.0	3.4	9.0	
		Parr/min	0.2	0.0	0.8	0.8	0.2	1.2	
TAM2	Sorn, above humped bridge	Fry/min	1.4	0.4	0.8	3.6	0.8	3.4	0.2
		Parr/min	1.8	1.5	4.8	6.0	6.0	4.4	6.6
TAM16	Glenlogan Bridge	Fry/min							1.4
		Parr/min							8.2
TAM9	Downstream of swinging bridge	Fry/min			13.6	14.6	28.0	29.8	14.6
		Parr/min			5.4	3.2	4.4	3.0	1.4
TAM1	Netherwellwood Bridge	Fry/min	7.8	9.2	10.6	9.6	20.4	28.2	8.4
		Parr/min	0.8	1.2	0.4	3.8	1.6	5.2	0.4
TAL1	Upstream meetings	Fry/min	1.4	1.8	1.8				
		Parr/min	1.4	0.0	1.4				
TAL2	Downstream Ochiltree Weir	Fry/min	2.6	12.0	20.2	10.4	3.2	6.2	6.2
		Parr/min	1.6	1.4	5.4	3.8	0.2	0.6	0.8
TAL3	Mill Affleck	Fry/min	1.2	1.4				5.6	
		Parr/min	0.8	0.0				0.0	
TAL7	Mill Affleck, upper	Fry/min			3.0	1.6	2.8	5.2	3.4
		Parr/min			0.4	0.4	0.2	0.0	0.4
TAL8	Opposite Dumfries House	Fry/min				1.6	0.8	3.0	1.2*
		Parr/min				0.8	0.4	0.2	0.0
TAL6	Lugar village	Fry/min		5.2	10.8	10.2	5.6	7.4	5.0
		Parr/min		1.6	11.8	4.2	8.4	4.4	8.8
TAGM3	Glenmuir Water at Glenmuir Bridge	Fry/min	5.4	14.6	23.8	7.6	8.4		
		Parr/min	1.2	3.0	9.4	6.4	2.2		
TAGK3	Greenock Water at B743 bridge	Fry/min	8.2	7.6		12.4			
		Parr/min	2.2	2.2		6.6			
Mean		Fry	**3.6**	**4.5**	**6.8**	**5.1**	**6.9**	**7.5**	**4.0**
		Parr	**1.3**	**0.8**	**3.6**	**2.3**	**1.6**	**1.5**	**2.4**

***** 2010 survey site was 100m upstream of usual due to water level on day of survey

3.2 River Doon Timed Electrofishing Sites

In 2010 ten timed sites along the main stem of the river were completed, including two new sites. The sites surveyed were selected to give a wide geographical coverage of the river. The aim of this type of survey is to examine the success of the previous winter's salmon spawning. The results of the 2010 survey results are shown in the Table and Figure 1 below.

Table 2: Results from the timed survey's River Doon catchment in 2010 ****Other species codes are: T= Trout, E= Eel, SL = Stone loach, M = Minnow, L = Lamprey***

Site	Location	Grid Ref E N	Date	Salmon fry caught per minute	Classification	Other species*	Invertebrate Score
TDM9	Riffle at top of Swallow Braes	232650 618855	3- Aug	23.4	**A**	SL, E	**A3**
TDM4	Doonholm, d/s Garden Pool.	233658 617467	3- Aug	8.6	**C**	SL, E, M	
TDM11	Auchendrane upstream A77	233599 615324	3 -Aug	12.6	**A**	SL, E	
TDM22	Monkwood Mill, u/s Lemon Pots pool	233829 613185	3 - Aug	17.6	**A**	E	**B3**
TDM8	Holms, riffle below Burn Pool	235150 613680	3 - Aug	8.0	**C**	SL, E, T, M, L	
TDM13	Upstream Dalrymple	236700 614100	3 - Aug	7.4	**C**	E	
TDM15	Upstream Skeldon Bridge	238075 613800	3 - Aug	8.4	**C**	none	**B2**
TDM20	Smithston, u/s Rabbie's Pool	240920 612660	3 - Aug	6.4	**C**	none	
TDM23	Craigengillan, d/s Ness Glen	247768 603049	3 - Aug	6.8	**C**	E	**B4**
TDM2	Ness Glen, above footbridge	247700 602708	3 - Aug	3.0	**E**	E, T	**D5**

In 2010 the salmon fry were recorded at all the survey sites during the timed surveys on the main stem of the River Doon. The mean number of salmon fry was towards the top end of the range recorded since monitoring began in 2002 (see Table 5 below). Three sites were "A" class, all in the lower reaches of the river. The results at the Swallow Braes site may be influenced by stocking carried out by the DSFB although excellent fry numbers have also been recorded in years when no stocking had taken place.

The highest fry numbers were recorded in the lower reaches of the river. This is in contrast to the nearby Ayr and Girvan where the highest numbers are generally found in the upper reaches.

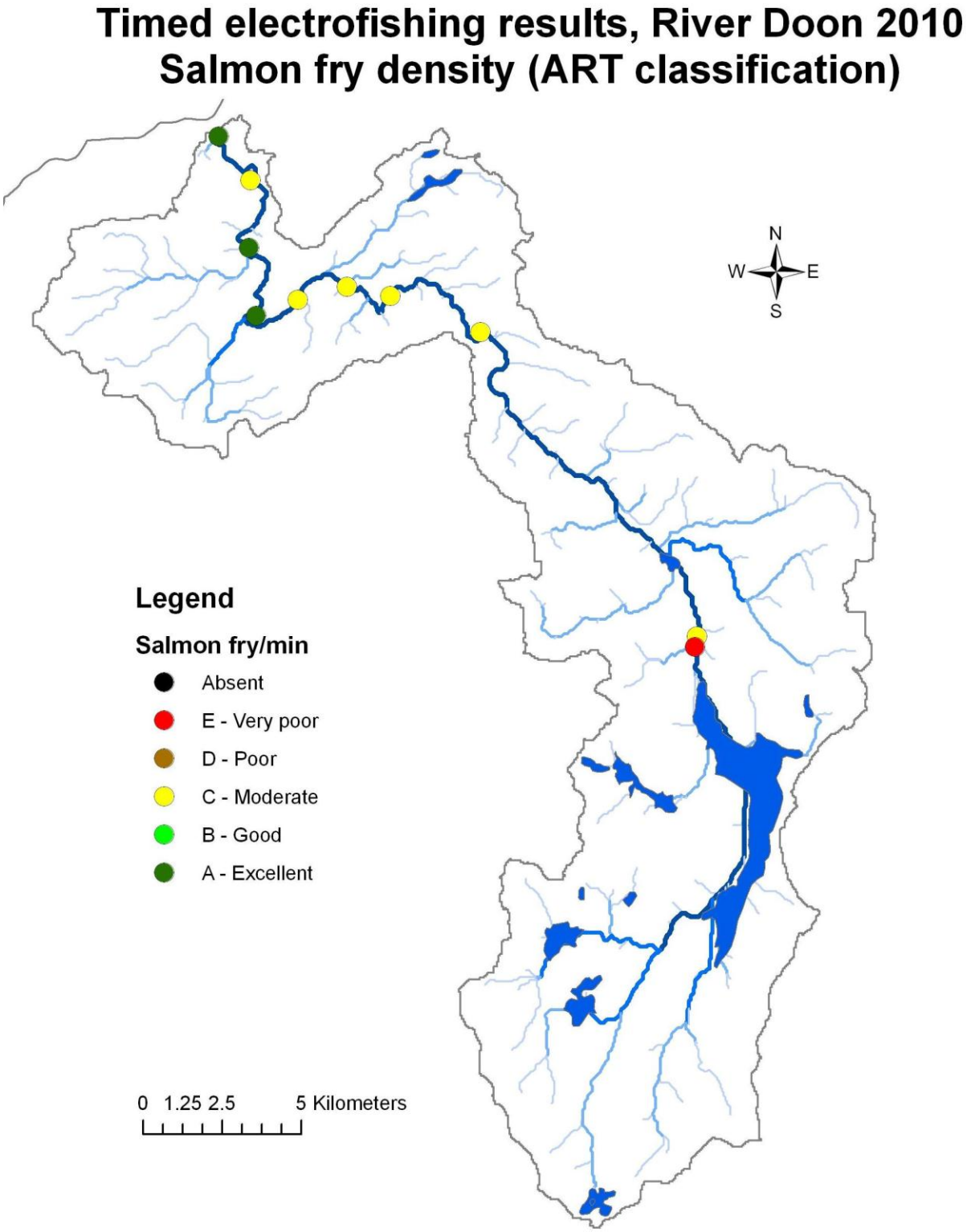


Figure 2: River Doon timed electrofishing results 2010

Two new sites were surveyed, one at Monkwood Mill in the lower middle reaches and another at Craigengillan the top end of the river. The habitat at the Monkwood Mill site was first class with shallow riffles and boulder cover providing ideal habitat for juvenile salmon. The results from the site were in the excellent category.

Figure 3: Monkwood Mill electrofishing site River Doon

The other new site was at Craigengillan. This site was located about 300m downstream of the established site at Ness Glen. In previous years the results from the Ness Glen site have been consistent with low salmon fry numbers, although salmon parr numbers are often the highest recorded during the Doon timed surveys (see Table 5 below). In order to investigate whether acidification was a significant issue affecting egg hatching success egg box trials were conducted in the locality in the spring of 2010. Egg boxes containing 100 eyed salmon ova were placed in six locations in the main stem of the Doon within and downstream of Ness Glen along with a single box placed in the lower Glessel Burn. The trial found 99 or 100% survival to hatching in all the boxes, ruling out acidification as a potential cause of the low salmon fry numbers.

Between the Ness Glen site and the new site at Craigengillan, two tributaries join the Doon, the Glessel Burn and Gaw Glen Burn. These tributaries contribute a significant quantity of gravel to the main stem of the Doon and as a result the spawning gravels are much more varied and more suitable for salmonid spawning. Sediment starvation is a known problem below dams and at the foot of Ness Glen the substrate consists largely of angular rocks, lacking the variety of sorted river gravels required for ideal spawning conditions. Within Ness Glen itself there are very limited spawning opportunities due to the high gradient. It may be that the consistent relatively low numbers of salmon fry at the Ness Glen site is related to the lack of availability and suitability of the spawning gravels upstream of the site. Within a short distance downstream spawning opportunities increase significantly.

Figure 4: New electrofishing site at Craigengillan

It is interesting to note that the invertebrate score at the Craigengillan site was much better than that recorded at the Ness Glen site, even though they are separated by only 300m. Perhaps the water chemistry changes enough to allow a greater range of species to survive or downstream recruitment of invertebrates from the tributaries may be responsible for the greater diversity recorded.

A summary of the timed electrofishing sites on the Doon from 2003 to 2010 are shown in Table 5.

Table 3: Results from timed fishing, main stem of the River Doon 2003-2010. All results expressed as numbers/minute.

Site	Location		2003	2004	2005	2006	2007	2008	2009	2010
TDM9	Top of Swallow Braes	Salmon Fry	4.9			7.2	5.4	18.2	12.0	23.4
		Salmon Parr	0.6			0.3	1.4	0.0	0.2	0.6
TDM1	Riffle at top of Mt Charles pool	Salmon Fry	4.3		4.2					
		Salmon Parr	0.2		0.0					
TDM10	Below Doonholm Dam	Salmon Fry				13.2				
		Salmon Parr				0.4				
TDM4	Doonholm, d/s Garden Pool	Salmon Fry	8.2		6.6	9.6	4.0	18.4	18.6	8.6
		Salmon Parr	0.7		0.0	0.2	1.0	0.4	0.6	0.4
TDM11	Auchendrane	Salmon Fry				11.6	11.6	8.8	15.8	12.6
		Salmon Parr				0.0	0.2	0.4	0.8	0.4
TDM12	Cassillis	Salmon Fry				3.4	5.2			
		Salmon Parr				0.2	0.0			
TDM22	Monkwood Mill	Salmon Fry								17.6
		Salmon Parr								0.0
TDM8	Holms, wide weedy riffle	Salmon Fry			10.6	15.0	4.0	9.8	18.6	8.0
		Salmon Parr			0.4	0.4	1.2	0.4	1.0	1.4
TDM13	u/s Dalrymple	Salmon Fry				8.6	6.6	11.0	7.8	7.4
		Salmon Parr				0.4	0.4	0.4	0.2	0.4
TDM15	Torr Bridge Skeldon	Salmon Fry				10.8	7.2	8.6	14.4	8.4
		Salmon Parr				1.8	0.0	0.6	0.0	0.0
TDM19	Boreland Glen, Boreland Farm	Salmon Fry					6.4			
		Salmon Parr					1.4			
TDM6	Smithston Fishing Hut	Salmon Fry	10.5		4.8	7.8	6.0	10.4		
		Salmon Parr	1.2		0.6	0.8	1.8	1.6		
TDM20	Smithston, u/s Rabbie's Pool	Salmon Fry						9.8	7.0	6.4
		Salmon Parr						1.0	0.6	1.8
TDM17	D/s Patna bridge weir	Salmon Fry				7.8	7.4	1.6		
		Salmon Parr				2.2	3.0	3.6		
TDM7	Below Keirs Glen Bridge	Salmon Fry			5.8	7.5	6.4			
		Salmon Parr			0.8	1.8	2.4			
TDM21	Waterside Bing	Salmon Fry							11.0	
		Salmon Parr							0.0	
TDM23	Craigengillan	Salmon Fry								6.8
		Salmon Parr								0.6
TDM2	Ness Glen, above footbridge	Salmon Fry	0.0	1.2	2.4	1.8	0.6		0.0	3.0
		Salmon Parr	2.4	1.2	1.2	1.4	1.4		3.6	1.2
Mean		**Salmon Fry**	**5.6**	**1.2**	**5.4**	**8.7**	**5.9**	**10.6**	**11.5**	**10.2**
		Salmon Parr	**0.8**	**1.2**	**0.5**	**0.8**	**1.2**	**0.9**	**0.8**	**0.6**

The 2010 mean salmon fry results were the third best recorded since 2003. In recent years the fry numbers in the lower river have improved considerably. Stocking may have influenced the results at one or two of these sites but it is the opinion of ART that natural recruitment in the lower river is sufficient to provide good numbers of salmon fry in the summer following hatching.

The sites surveyed by ART have been refined over the years so that only appropriate habitat is surveyed, although where possible when a site has been removed from the monitoring plan, it has been replaced by a more suitable site nearby. An example being the sites at Smithston where the original site, TDM6, was considered to be too deep, and the flow too powerful to provide ideal habitat and safe working conditions. A new site was introduced 200m upstream of Rabbie's Pool, TDM20, where conditions are more suitable. Despite this it can be seen that the results during the switchover years and before and after, were of a similar magnitude.

The 2010 salmon fry results maintain the good results recorded over the last few years. It is the opinion of ART that adequate numbers of salmon fry can be found in almost any site in the Doon where there is suitable habitat. The limiting factor is often lack of suitable habitat, e.g. the long canal like section upstream of Patna, or in the middle reaches where channel modifications, often for angling purposes, have changed the flow and character of the river to the detriment of the juvenile salmonid population.

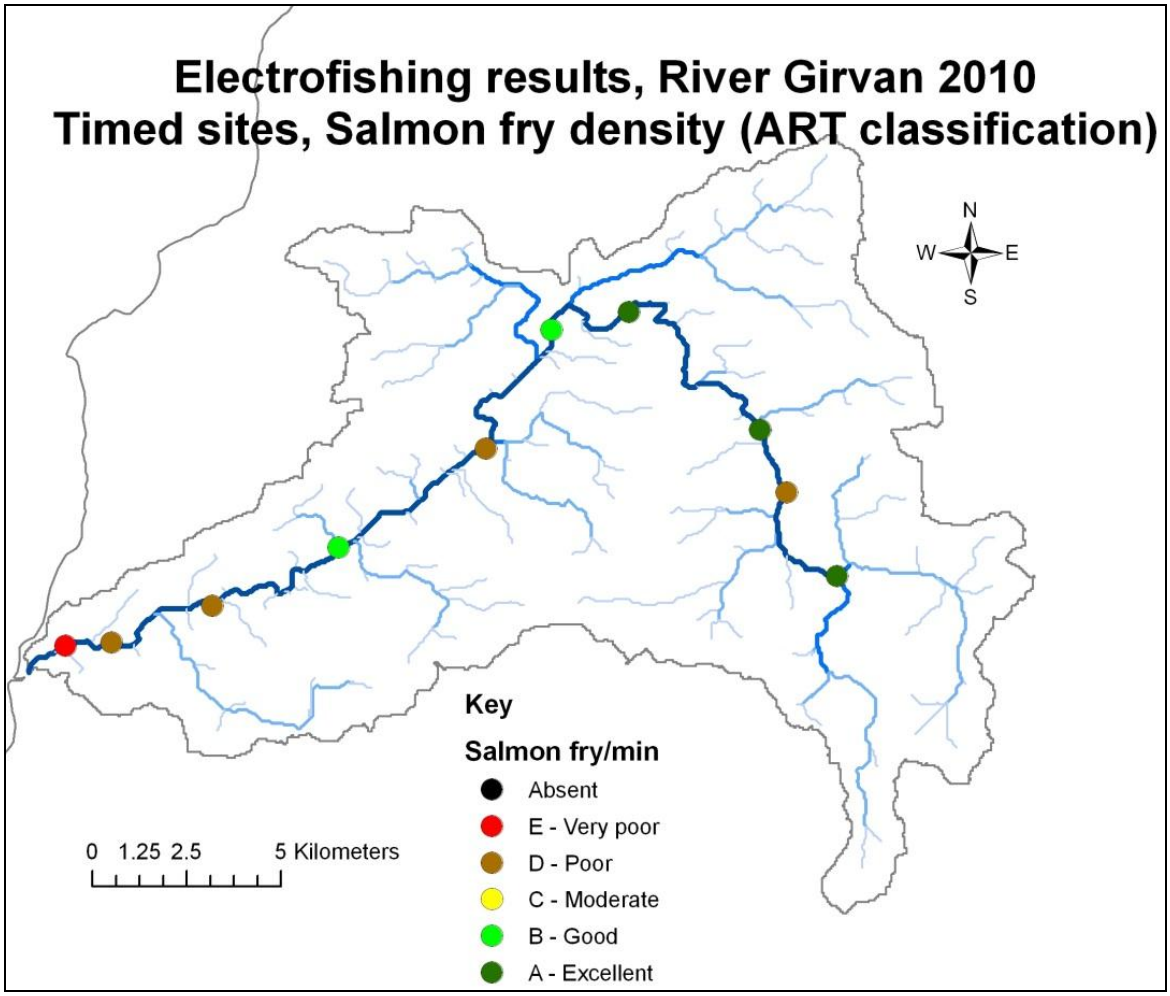
3.3 River Girvan Timed Electrofishing Sites

In total, 10 main stem sites were surveyed by ART in 2010, covering the entire main stem of the river from the Girvan weirs to Tairlaw Bridge upstream of Straiton. The results are given in Table 4 and in the map below.

Table 4: Results of the timed electrofishing surveys main stem River Girvan 2010.

Site	Location	Grid Ref	Date	Salmon fry/min	Class 2010	Other* species	Invert score
TGM13	Downstream Girvan dykes	E: 219551 N: 599047	30/07/10	2.4	E	SL, M, E, Fl	n/a
TGM14	Run below Peter Nobles Cabin	E: 220776 N:599128	30/07/10	3.6	D	SL, M, St	B3
TGM10	Upstream Cairnhill Bridge	E: 223450 N: 600100	30/07/10	6.2	D	SL, E, M	n/a
TGM11	Playing field, Dailly	E: 226800 N: 601660	30/07/10	10.6	B	SL	n/a
TGM15	Upstream bridge to Ladyburn	E: 230714 N: 604298	30/07/10	3.2	D	SL, E	B3
TGM17	Garpin Farm	E: 232458 N: 607459	30/07/10	9.2	B	SL	n/a
TGM3a	100m u/s road bridge at Merkland farm	E: 234517 N: 607940	30/07/10	21.6	A	None	C5
TGM9	Straiton Church	E: 238000 N: 604800	30/07/10	14.2	A	None	n/a
TGM18	Opposite Craig Farm	E: 238699 N: 603128	30/07/10	4.4	D	M, ST	A3
TGM8	Upstream of Tairlaw Bridge	E: 240050 N: 600900	30/07/10	16.2	A	None	n/a

**Other species codes are: Tr = Trout, SL= Stone loach, E= Eel, M= Minnow, St = Stickleback, Fl = Flounder.*



In 2009 the comment was made that the main stem timed survey results were all in the good or excellent class, the best annual results recorded from any river in Ayrshire. However in 2010 this was not the case and salmon fry numbers at a number of sites, particularly in the lower river were in the poor or very poor category.

One new upper river site, opposite Craig Farm, was included as the site at Craigfad Bridge was limited in size and in low water conditions there was insufficient space to survey for five minutes. The results from the new site were poor even though it is in the midst of an area with high salmon spawning density. This highlights the importance of habitat as the flows were probably too shallow and the substrate too small to be considered prime habitat for fry at that time of year (see photo right). It is likely that we will return to the monitoring site at Craigfad Bridge in 2011.

The full history of timed surveys in the River Girvan is shown in the table below.

Table 5: Girvan catchment timed electrofishing summary 2003 – 2010

Site*	Location		2003	2004	2005	2006	2007	2008	2009	2010
TGM13	Downstream Girvan Dykes	Fry				11.4	4.0	3.4	9.2	2.4
		Parr				3.2	0.0	0.0	0.8	0.2
TGM12	Enoch Farm Bridge	Fry	3.7		0.2					
		Parr	0.1		0.0					
TGM14	Run below Peter Noble's Hut	Fry				8.0	4.6	7.8	11.6	3.6
		Parr				0.2	0.0	0.0	1.4	0.2
TGM10	Upstream Cairnhill Farm bridge	Fry	6.4	1.4	3.2	7.4	4.0	9.0	15.0	6.2
		Parr	0.8	1.8	0.4	1.4	0.0	2.2	1.0	0.2
TGM11	In Dailly	Fry	4.8	0.2	13.4	17.2	2.8	17.0	12.6	10.6
		Parr	0.2	0.8	0.0	1.6	0.8	0.4	0.4	0.0
TGM7	400m upstream road bridge at Kilkerran	Fry	4.6	0.6	9.2					
		Parr	0.1	0.0	0.0					
TGM15	Upstream Kilkerran bridge	Fry				10.0	3.6	10.8	17.0	3.2
		Parr				1.0	0.0	0.4	0.6	0.6
TGM17	Garpin Farm	Fry						13.4	20.2	9.2
		Parr						0.0	0.2	0.6
Lower river average		Fry	**4.9**	**0.7**	**6.5**	**10.8**	**3.8**	**10.2**	**14.3**	**5.8**
TGM16	Opposite Barbrethan, channel beside island	Fry					6.5			
		Parr					0.0			
TGM3**	Upstream Merkland Bridge	Fry	5.7	1.6	3.2	8.2	1.0	5.8	18.4	21.6
		Parr	1.0	1.4	0.2	3.4	2.2	0.6	1.2	1.4
TGM1	At Blairquhan diversion	Fry	8.9	5.2	10.8					
		Parr	0.0	0.4	0.4					
TGM18	At Craig Farm	Fry								4.4
		Parr								0.0
TGM9	Straiton Church – across field	Fry		11.2	17	14.6	15.6	8.4	13.2	14.2
		Parr		0.6	1.0	0.2	0.0	0.2	0.0	0.2
TGM2	Craigfad Bridge	Fry	18.3	8.0	23.0	13.0	12.4	10.0	26.6	
		Parr	0.1	0.4	0.4	0.2	0.6	0.4	0.2	
TGM8	Below Tairlaw Bridge	Fry		4.4	3.6	10.0	3.4	5.8	12.0	16.2
		Parr		0.4	1.8	1.0	0.6	0.6	0.2	0.4
Upper river average			**11.0**	**6.1**	**11.5**	**11.5**	**7.8**	**7.5**	**17.5**	**14.1**
River Mean		Fry	**7.5**	**4.0**	**9.2**	**11.1**	**5.8**	**9.1**	**15.6**	**8.7**
		Parr	**0.3**	**0.7**	**0.5**	**1.4**	**0.4**	**0.5**	**0.6**	**0.4**

***Sites are ordered in an upstream direction**
**** 2009/10 site was 50m upstream of previous site.**

There has been considerable variation in the salmon fry numbers, both annually and between sites. In order to compare the results from the upper and lower river the river was split between the Garpin Farm and Merkland Bridge sites. The river itself changes character in this area with a higher gradient and more upland character. Not surprisingly the mean salmon fry number per minute is higher for the upper river than the lower river (10.8/min compared to

7.1/min). This would be expected due to the better water quality and habitat suitability in the upper river.

The results from 2010 were just below the average for the eight years monitoring although the results from the upper river were above average and the lower river below average. There has only been one year when the average salmon fry numbers were higher in the lower river than the upper, 2008, when there were a series of good results from almost all the lower river sites.

3.4 River Stinchar Timed Electrofishing sites

Eight sites were surveyed by timed electrofishing on the Stinchar in 2010. The results are shown in Table.4 and Fig.1 below.

Table 6: Results of the timed electrofishing surveys Main stem River Stinchar 2010. * Codes for other species are: E = Eel, M = Minnow, F = Flounder.

Site	Location	Grid Ref E N	Date	Salmon fry caught per minute	Classification	Other species *	Invertebrate Score
TSM1	Upstream Ballantrae Bridge	208800 582300	05/08/10	4.2	**D**	E, M, F	n/a
TSM17	Kirkhill, upstream Bridge Pool	215113 585722	05/08/10	13.2	**A**	E	A3
TSM15	Craig House	217130 586693	05/08/10	7.8	**C**	E, M	n/a
TSM3	Hallow Chappell	219600 586900	05/08/10	9.8	**B**	none	A2
TSM12	Laggansarroch, upstream bridge	220028 588881	05/08/10	3.4	**D**	none	n/a
TSM4	Pinclanty Mill	223450 591500	05/08/10	19.2	**A**	none	A3
TSM6	Downstream Auchensoul bridge	225750 592800	05/08/10	9.0	**B**	none	n/a
TSM7	At gravel extraction point	232150 595750	05/08/10	26.2	**A**	none	B2

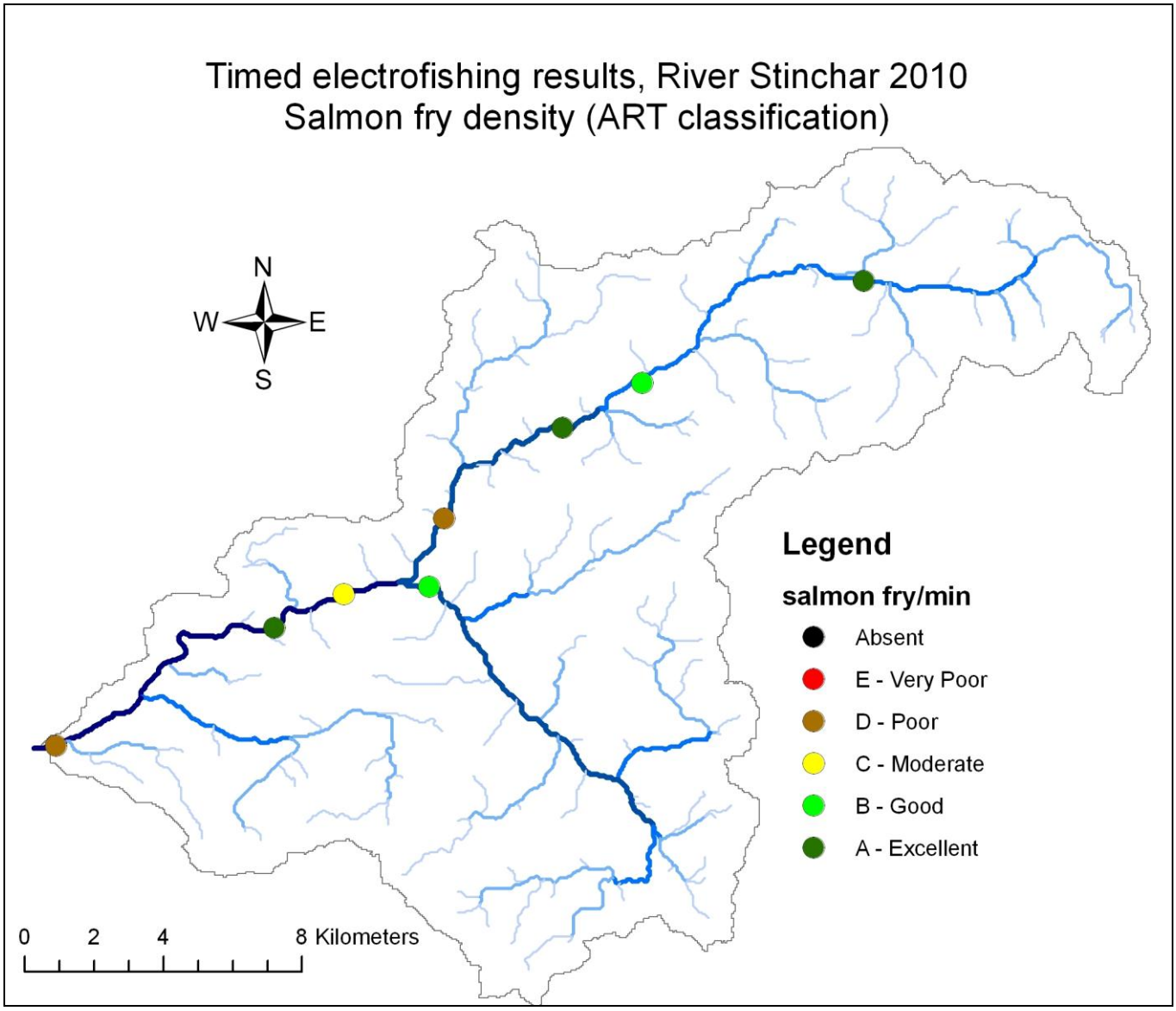


***Figure 1*: River Stinchar timed electrofishing results: salmon fry per minute**

A summary of the timed salmon fry electrofishing results for the River Stinchar over the period 2003 -2010 are shown in the table below.

Table 7: Results from timed fishing, River Stinchar 2003-2010. All results are expressed as numbers per minute.

Site	Location		2003	2004	2005	2006	2007	2008	2009	2010
TSM1	Ballantrae	Fry	2.9	3.2	8.2	8.6	8.0	6.0	6.2	4.2
		Parr	0.3	0.0	0.0	2.8	1.2	0.2	0.2	0.2
TSM13	Balnowlart	Fry					3.2			
		Parr					0.4			
TSM10	Downstream Knockdolian	Fry				4.4				
		Parr				0.2				
TSM13	Upstream Knockdolian	Fry					10.0			
		Parr					0.2			
TSM16	Knockdolian, McCallum's Beat	Fry						5.2		
		Parr						0.0		
TSM2	D/s Colmonell Bridge	Fry		8.6	7.8					
		Parr		0.2	0.2					
TSM17	Kirkhill, upstream Colmonell Bridge	Fry						11.6	9.4	13.2
		Parr						1.2	3.4	3.0
TSM15	Craig House	Fry					8.6	9.8	8.2	7.8
		Parr					0.0	0.2	0.6	0.0
TSM3	Hallowchapel d/s Duisk	Fry	5.73	5.0	11.8	26.2	12.0	10.2	8.3	9.8
		Parr	0.0	0.2	0.2	0.4	0.0	0.0	0.3	0.4
TSM12	Laggansarroch	Fry					7.6	9.6	8.8	3.4
		Parr					3.0	1.0	2.2	3.4
TSM4	At Pinclanty Mill	Fry	8.7	4.2	31.0	6.8	10.0		15.2	19.2
		Parr	0.2	0.0	0.8	0.8	0.6		1.0	1.4
TSM6	Downstream Auchensoul Bridge	Fry	10.7	10.4	16.4		7.4		9.0	9.0
		Parr	0.1	0.2	0.8		0.6		0.6	2.0
TSM11	Upstream Barr, close to Milton Bridge	Fry				4.2				
		Parr				1.0				
TSM7	At gravel extraction point	Fry	16.7	8.2	16.8	9.0	4.8		25.2	26.2
		Parr	0.3	0.6	1.4	4.4	1.2		0.8	3.2
TSM8	100m u/s of North Balloch bridge	Fry	10.5	8.6	11.2					
		Parr	0.5	1.0	0.8					
TSWT 1	Water of Tig at Kirkholm	Fry				5.2				
		Parr				1.0				
TSDM 1	Duisk, at Pinwherry Hall	Fry	8.27	12.4	12.2	13.2				
		Parr	0.7	1.2	1.6	2.0				
TSDM 4	Duisk, D/s Ballochmorrie House	Fry		7.2	12.6					
		Parr		1.0	1.4					
Mean		**Fry**	**9.1**	**7.5**	**14.2**	**9.3**	**8.0**	**8.7**	**11.2**	**11.6**
		Parr	**0.3**	**0.5**	**0.7**	**1.5**	**0.8**	**0.4**	**1.1**	**1.7**

Eight timed sites were surveyed on the main river in 2010. These were the same sites that had been surveyed in 2009 and they represent a good geographical spread covering the main stem of the river. These sites will form the cores sites for the timed electrofishing on the main stem of the river and will be monitored annually.

The average fry density was good in 2010, the second best over the series. Five of the eight sites were in the good or excellent category. The extended cold weather experienced in Dec-Jan last winter was unusual for the south west of Scotland leading to concern regarding its impact on salmon populations. The 2010 monitoring provides no indication of any impact on salmon fry numbers in the main stem of the Stinchar. However, the situation was not the same in all of the Ayrshire rivers, the results from the Ayr were well below average whilst the Girvan results were also below average. Issues such as low oxygen levels within spawning gravels in the River Ayr, a situation exacerbated by the low flows experienced during the dry spring of 2010, may be a contributory factor. Water and sediment quality in the Stinchar remain high, providing good conditions for egg survival.

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