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(Inside front cover)
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Mission Statement

"To preserve a valuable part of our natural heritage for the enjoyment of current and future generations, through the conservation, enhancement and development of our freshwater habitats and the fisheries they support."

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Cover photos:
The River Stinchar from Knockdolian
Peter Minting working on River Doon smolt trap
Three salmonid species from the River Ayr – from top to bottom; trout, salmon and grayling
Maidens Primary, Salmon in Classroom project
Stonefly *Perla bipunctata* - indicator of excellent water quality

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Ayrshire Rivers Trust

Chairman's Introduction

Our 6th year was one of considerable progress which kept our biologists at full stretch. We have continued with all our routine work but also diversified and expanded in a number of ways. I thought it would be interesting to highlight some of the latest developments.

A first for Ayrshire in 2006 was the use of a smolt trap, in this case to measure the smolt run in the River Doon. This has helped increase our understanding of salmonid production in this river catchment and has resulted in new ideas for research next year.

In June we achieved another milestone when we were awarded Investors In People Accreditation (IIP). This was no mean achievement and shows how advanced our management and development of our employees have become. All involved are to be congratulated, particularly Brian Shaw, who put in the bulk of the work in achieving this

We also acquired a YSI Multimeter, with the help of funding from the Minerals Trust and Awards For All. This allows us to measure dissolved oxygen, temperature, conductivity and pH levels. When used at the same time as electrofishing and invertebrate sampling, it adds substantially to our knowledge of local water quality and often highlights problems.

Other activities included the continued expansion of "Salmon in the Classroom" where we were able to extend the project to 10 schools and Dolphin House at Culzean. It is proving highly popular with the kids and we hope to extend this to 12 schools next year. Electofishing was completed in over 150 sites adding not only to our knowledge of our rivers but also allowing us to carry out surveys where new works are proposed, particularly in the area of renewable energy in the form of wind farms.

Fund raising continued to occupy our Trustees and Staff. A successful Dinner Auction took place at Ayr Racecourse and raised over £15,000. A new venue for our Country Fair was at Auchincruive. It was a lively event where dog agility demonstrations and archery added attractions and it raised over £2,200. The popular Fisherman's Supper in the Autumn raised over £500. We continue to be very grateful to all our supporters who gave us lots to auction or bid for them, supported our functions, gave us donations and who renewed or became members. We are also most grateful to all those organisations who have given us grants and they are acknowledged on the back cover of this report.

Last spring we welcomed Janette Galbraith to our staff. She works part time in our office at Auchincruive as administrator with great humour and enthusiasm. Our biologists Brian Shaw and Peter Minting have gone from strength to strength. Not only is the Trust becoming widely acknowledged for its expertise and quality of work (as can be seen in this report) but it also remains financially sound. It is the staff with their dedication who have achieved this. That is, with the help of our dedicated and happy band of Trustees. We are indeed lucky to have such a great team!

PETER KENNEDY
Chairman

Biologist's Summary

Significant progress was made during 2006 in all aspects of the Trusts work. The Salmon in the Classroom educational program has been a great success with positive feedback received from all participating schools.

Last year the Trust was successful in securing funding for habitat restoration work on the River Girvan and work has now started on erecting streamside fencing alongside what is potentially a very good spawning and nursery burn. We are also working closely with the Farm and Wildlife Advisory Group and other interested organisations on a project to reduce the impact of agriculture on the lower River Doon.

The Trust has been gathering electrofishing data for a number of years and we now have a fairly good understanding of the state of fish populations in our rivers. For 2006 we have adopted the new Scottish Fisheries Coordination Centre salmonid ranking system for all density electrofishing sites. A summary of the results appears inside this report where it can be seen that there are many sites with fish densities in the top 10 - 20% of Scottish sites. There are also sites where salmonid densities are very low. We need to work towards improving these sites whilst protecting the existing productive areas.

For 2007 we are working on many projects interesting and valuable project applications and hope to be able to consolidate the good progress made since the Trust was established.

BRIAN SHAW
Senior biologist

Website news

See www.ayrshireriverstrust.org for news and more information on the Trust's activities. The website has recently been updated with information on all of Ayrshire's major rivers and useful links to other organisations. Thanks to Charles Ellis for his assistance with the website.

Membership

Members receive many benefits including free newsletters, Annual Reports and invites to special events run by the Trust. Membership cards can also be used to obtain discounts at local angling stores. For those interested in joining the Trust, a membership form can be downloaded from the website (see above) or telephone: 01292 525142.

Electrofishing surveys 2006

Electrofishing surveys of fish populations continues to be one of the Trust's core activities. Along with invertebrate sampling and water quality measurements, electrofishing surveys allow the Trust to develop an understanding of the state of Ayrshire's rivers. During 2006 over 150 sites were surveyed across Ayrshire, including for the first time the Gogo and Noddsdale Waters at Largs. Different electrofishing techniques and survey methods are used depending on the particular question to be answered at any site.

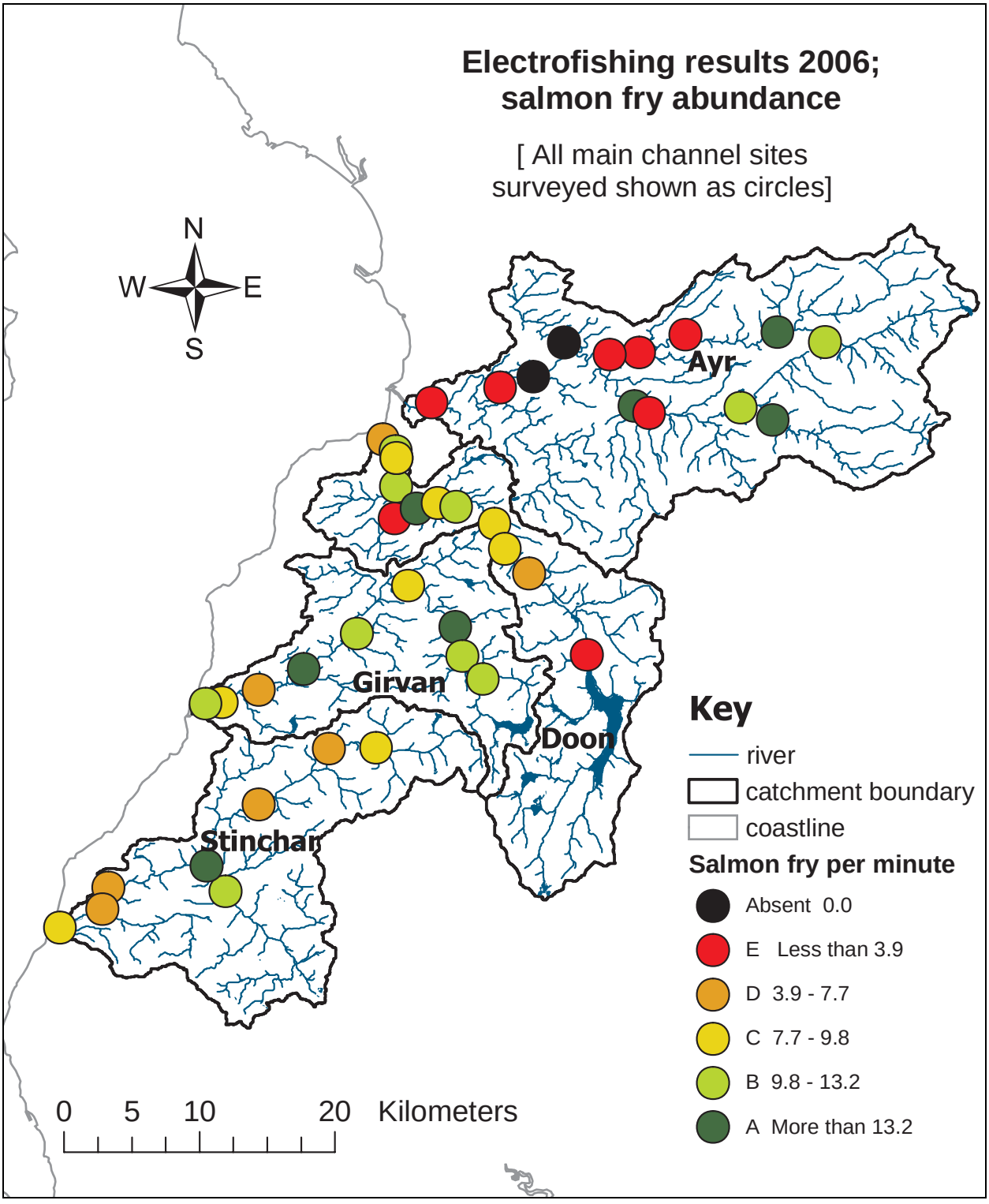
Firstly, timed electrofishing is carried out in shallow areas of the main channel to assess the abundance of salmonid fry (0+ fish). Large numbers of sites can be completed in a single day, giving a clear picture of abundance throughout the main river, plus a useful indication of growth rates in different parts of the river.
Secondly, where it is possible to survey the entire width of the river or tributary, estimates of total fish density can be produced by fishing the same section three times. The decline in catch is used to derive the density estimate.
Finally, at many sites where the three-run method has been completed in the past, a single run can be used to provide a quick and accurate estimate of fish density.

Timed surveys of salmon fry abundance

The Trust now has several years of comparative data for timed electrofishing on the Rivers Stinchar, Girvan, Doon and Ayr, allowing some assessment of trends in recent years. A total of 43 timed sites were completed on the above four rivers in 2006, providing comprehensive coverage of the main stem and major tributaries. The 2006 results are summarised below.

- Salmon fry were recorded at all sites, except two on the lower River Ayr
- Mean salmon fry abundance was relatively high in the Girvan, Doon and Ayr in 2006
- Mean abundance decreased slightly in the Stinchar in 2006, compared to 2005
- Two new sites were surveyed in the lower Girvan, where moderate and good levels of fry abundance were found
- A larger number of timed sites were surveyed on the Doon than in any previous year. The Doon has a narrow catchment with few significant tributaries and the bulk of salmon spawning and production probably occurs in the main stem. Fry were found at all sites, although in variable numbers. At the upper site in the lower Ness Glen salmon fry numbers have been consistently low, although it is a regular spawning site. This may be a result of low pH water emanating from Loch Doon
- The results from the River Ayr show that salmon fry production in the lower main stem is poor in comparison to the upper Ayr and the lower reaches of other Ayrshire rivers. Providing an explanation for this is a priority action for the Trust, as there are large areas of suitable juvenile habitat in the lower Ayr.
  Although this survey technique is designed to assess salmon fry abundance, salmon parr are also captured and during timed surveys in the upper Ayr, salmon parr were found to be very abundant. This should bode well for future smolt runs.
- Grayling fry were recorded from four main stem sites on the Ayr, suggesting that grayling spawning had been particularly successful in 2006

The results are presented in the map below. It should be noted that the categories are based on the results from all the 2006 Ayrshire timed-electrofishing results, which were collated and split into quintiles (20% divisions), and sites where no fry were recorded. This allows sites from one river to be compared to others in Ayrshire. It may eventually be possible to generate a banding system for the whole of Scotland, if a standard protocol for timed electrofishing is adopted.



Ayrshire timed electrofishing sites salmon fry classification (2006)

Salmon fry range (no/min)	Classification
0.0	Absent
<3.4	E – Very poor
3.4 -<7.8	D - Poor
7.8 - <10	C - Moderate
10 - <13.2	B - Good
>13.2	A - Excellent

Density estimates on area based tributary sites

In previous years the Trust has presented the results from the area based sites using a classification system based on results from across Ayrshire. However, the Scottish Fisheries Coordination Centre (SFCC) has recently published a national classification system based on the results from over 1600 Scottish semi-quantitative sites. This allows the Trust and the reader to place local fish densities in a Scottish-wide context. A system of quintile bands has been generated for salmon and trout, with individual bands for fry and parr of each species. Any sites in the excellent category are in the top 20% of Scottish results, whilst any in the very poor category are in the bottom 20%.

SFCC Density sites – juvenile salmon

Salmon fry (No/100m^2)	Classification	Salmon parr (No/100m^2)
0.0	**Absent**	0.0
<4.7	**E – Very poor**	<2.6
4.7 -<10.3	**D - Poor**	2.6 -<5.1
10.3 - <20.3	**C - Moderate**	5.1 - <9.1
20.3 - <42.1	**B - Good**	9.1 - <15.8
>42.1	**A - Excellent**	>15.8

SFCC Density sites – juvenile trout

Trout fry (No/100m^2)	Classification	Trout parr (No/100m^2)
0.0	**Absent**	0.0
<2.5	**E – Very poor**	<1.6
2.5 -<5.3	**D - Poor**	1.6 -<3.1
5.3 - <12.4	**C - Moderate**	3.1 - <5.6
12.4 - <30.3	**B - Good**	5.6 - <10.4
>30.3	**A - Excellent**	>10.4

The results from the 2006 density electrofishing sites are mapped on pages 9-10. Maps of this type are useful for showing regional variations in fish densities. It can be seen that there are many sites where no salmon were recorded. This is usually because that part of the catchment is inaccessible to salmon due to the presence of natural or man-made obstructions. Trout are more widespread as established resident populations exist upstream of many impassable obstructions.

Some of the key findings in 2006 were:

- 55% of Stinchar sites were in the good or excellent category for salmon fry, the best result for all of the Ayrshire catchments surveyed
- Monitoring of salmon stocking found that good to excellent fry populations had been established in the stocked tributaries.
- Results from the Girvan tributary sites were mixed. The results from the lower accessible tributaries such as the Barlewan and Dyrock were poor. Habitat restoration will be targeted accordingly.
- There was a concentration of survey sites in the Dalmellington area of the Doon in 2006 where results for both salmon and trout were generally good. The improvement previously noted in the Culroy Burn at Minishant was maintained.
- Salmon parr were recorded in Carrick Lane, the major tributary entering Loch Doon. This was almost certainly the result of salmon fry stocking in 2005.
- Salmon distribution on the River Ayr is limited by obstructions such as Sundrum Falls on the Water of Coyle. However, they were found to be absent from sites in the Water of Fail and the Glaisnock Water, probably the result of poor water quality.
- There were very good salmon fry and parr densities in the upper Ayr tributaries.
- On the River Irvine there are significant parts of the catchment currently inaccessible to migratory salmonids, such as the upper Kilmarnock and tributaries. Good trout populations

were recorded in these areas, indicating that habitat and water quality are not limiting factors.

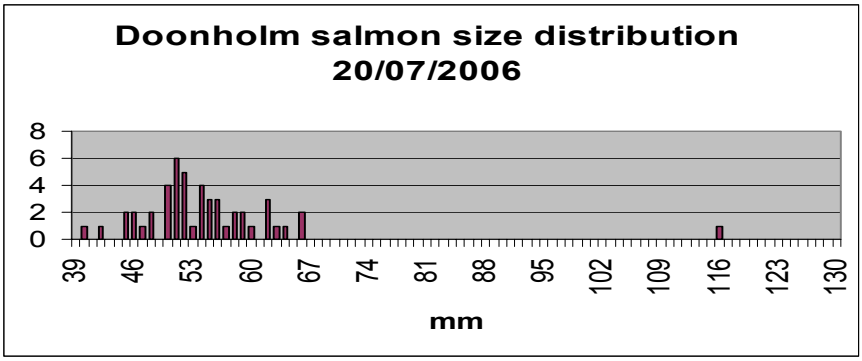
- A number of sites were surveyed on the Garnock Water to provide continuity. Good fry numbers were found at all sites although parr densities were in the very poor category.
- The Gogo and Noddsdale Waters were surveyed for the first time by the Trust in 2006. No salmon fry were recorded at any of the sites suggesting that there may be no natural salmon production in these small watercourses at present. Salmon parr recorded in the lower Noddsdale were almost certainly the result of stocking carried out in 2005.

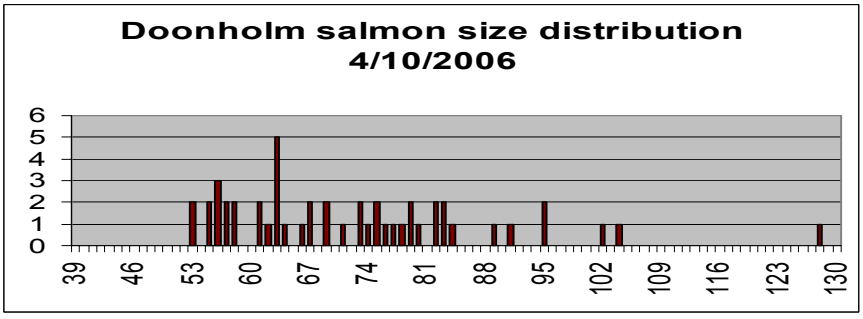
Two new species were recorded during the 2006 surveys. One surprise find was a large common carp in the upper Fenwick Water. Roach fry were recorded in an upper Lugton Water site on the Garnock. A stillwater near the source of the Lugton is known to contain coarse fish.

Temporal study

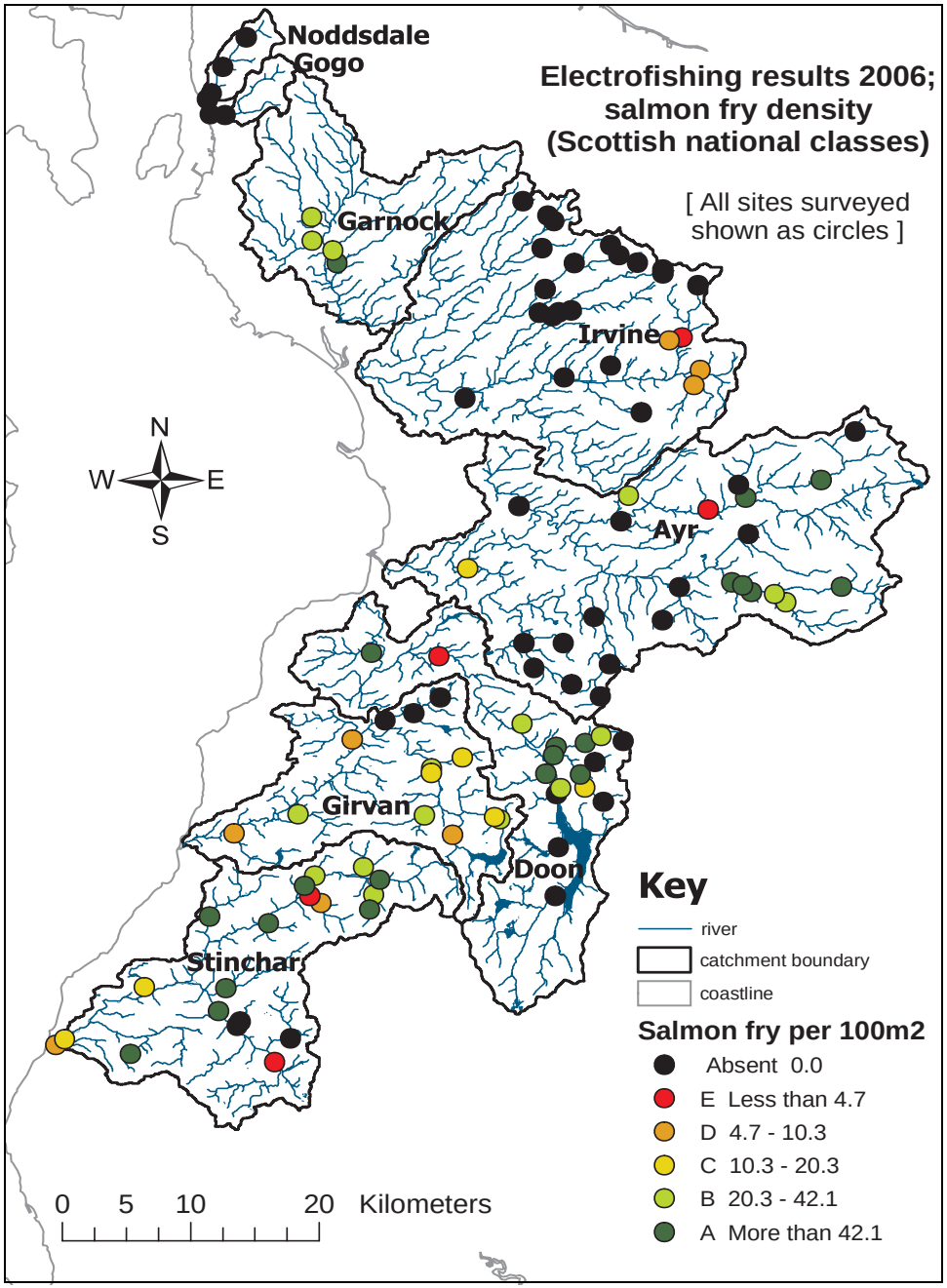
Until 2006 the Trust had not carried out many studies of fish growth over an extended period. Most site surveys are carried out on a single day during the summer and therefore only provide a snapshot of the fish population present at that time. Although inferences about growth and survival can be drawn from the different age classes present, this information is quite limited. By surveying the same site more than once during a year it is possible to see how fish are progressing, especially during the main growth period of April to October.

During the River Doon smolt trap project in 2006 (see separate section), it became apparent that there is significant production of one year old smolts in the Doon, higher than previously suggested by scale readings of adult fish. It was decided that the growth rate of salmon fry should be studied in more detail, to see how many salmon fry reach a size suitable for seaward migration the following spring. A second visit was made to the monitoring site at Doonholm in October, to re-examine the size distribution of the salmon fry. The results are shown below.





In July there was a narrow size distribution, ranging from 39mm to 67mm, with a single one year old parr captured. In October the size distribution of the salmon fry was much wider, ranging from 53mm to 104mm, again with a single older parr captured. Scales samples were taken from all the larger fry up to 104mm, which confirmed that they were fish hatched in spring 2006. The Trust is now working with FRS to establish a protocol for collecting data to model smolt production in productive lowland rivers such as the lower Doon.


Noddsdale
Gogo
Electrofishing results 2006;
salmon fry density
(Scottish national classes)
[All sites surveyed
shown as circles]
Garnock
Irvine
Ayr
Girvan
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Stinchar
N
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E
S
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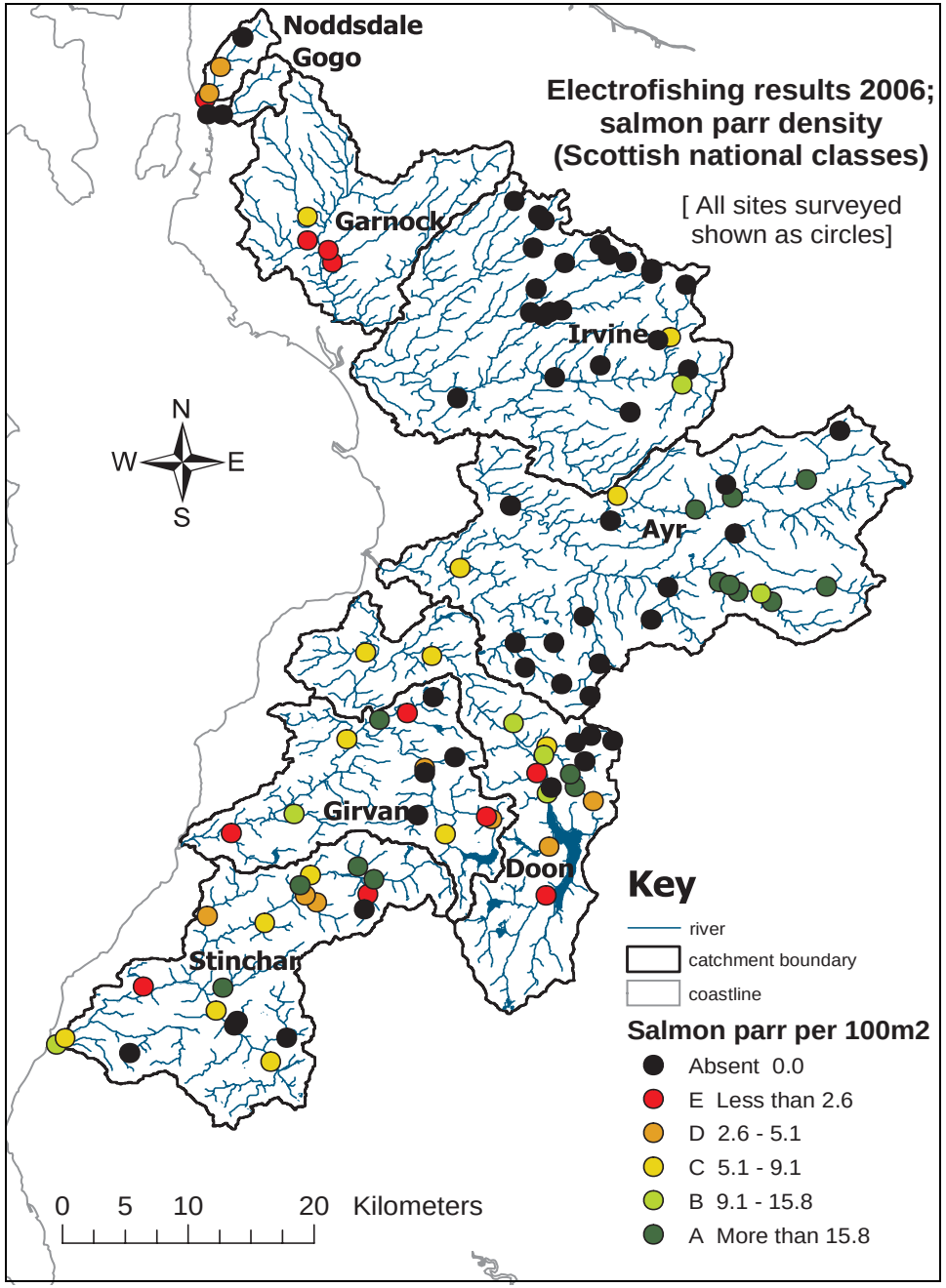
river
catchment boundary
coastline
Salmon fry per 100m2
Absent 0.0
E Less than 4.7
D 4.7 - 10.3
C 10.3 - 20.3
B 20.3 - 42.1
A More than 42.1
0 5 10 20 Kilometers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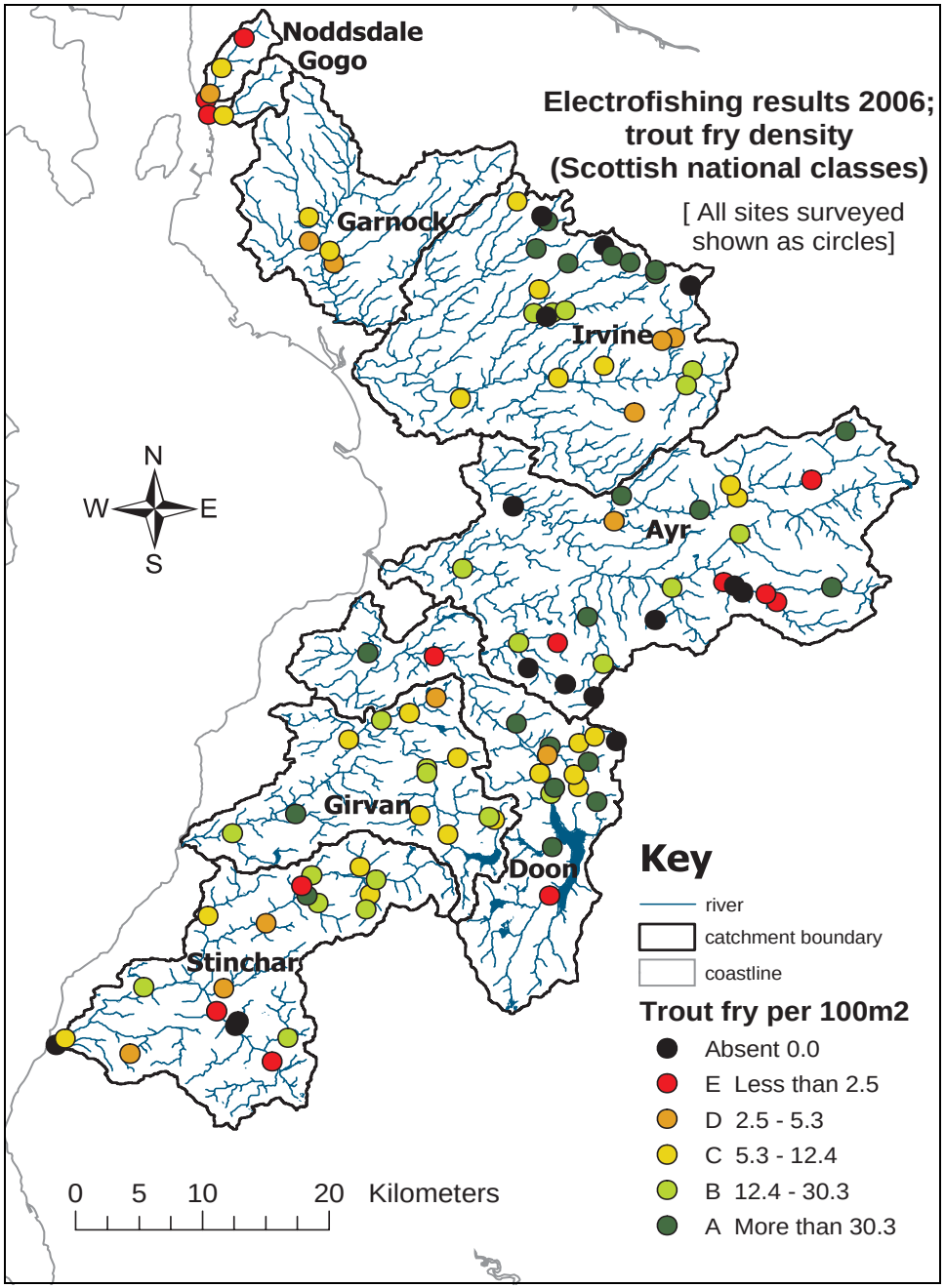
Salmon parr per 100m2
Absent 0.0
E Less than 2.6
D 2.6 - 5.1
C 5.1 - 9.1
B 9.1 - 15.8
A More than 15.8
0 5 10 20 Kilometers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trout fry density
(Scottish national classes)
[All sites surveyed
shown as circles]
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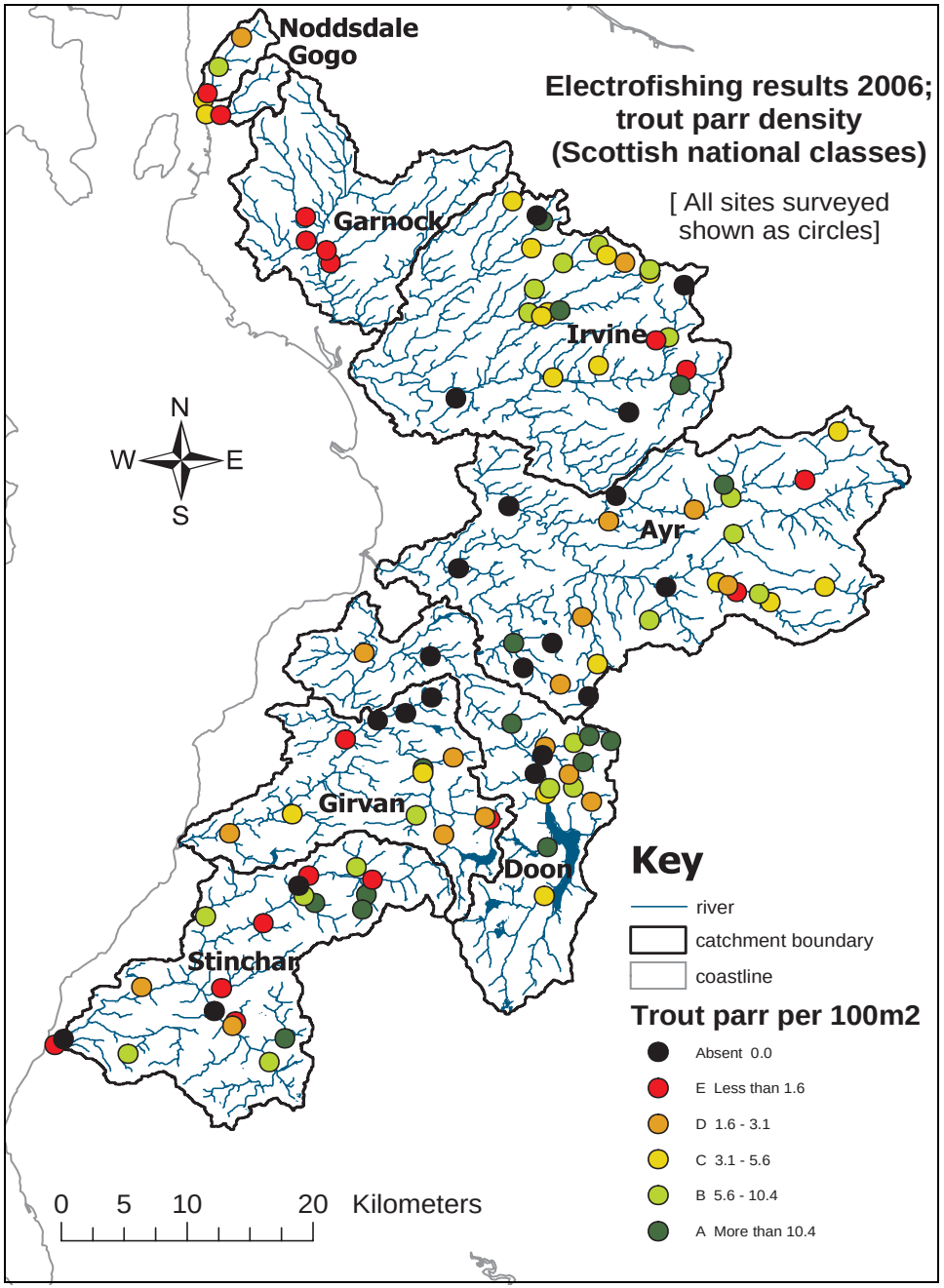
catchment boundary
coastline
Trout fry per 100m2
Absent 0.0
E Less than 2.5
D 2.5 - 5.3
C 5.3 - 12.4
B 12.4 - 30.3
A More than 30.3
0 5 10 20 Kilometers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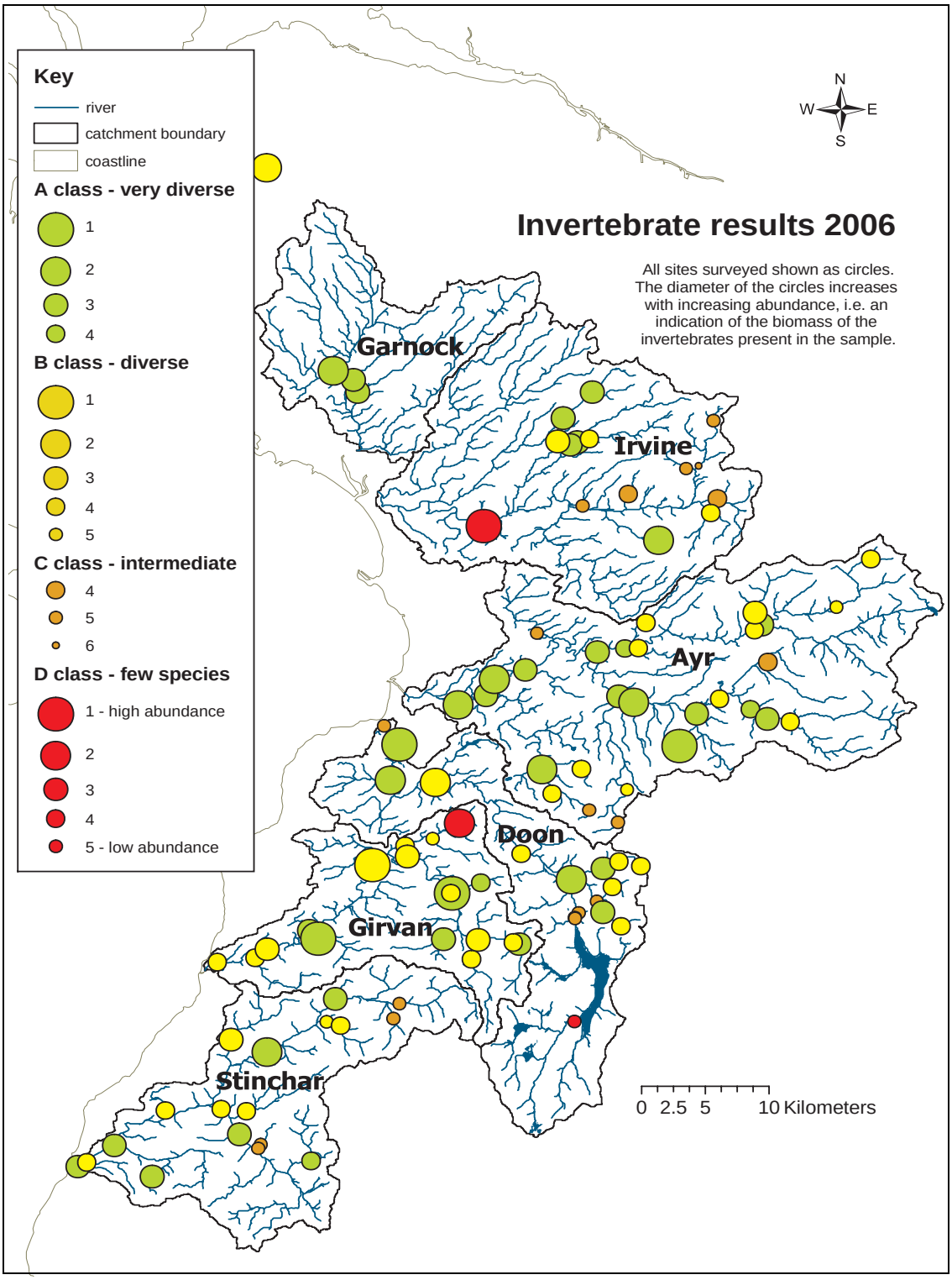
trout parr density
(Scottish national classes)
[All sites surveyed
shown as circles]
Key
river
catchment boundary
coastline
Trout parr per 100m2
Absent 0.0
E Less than 1.6
D 1.6 - 3.1
C 3.1 - 5.6
B 5.6 - 10.4
A More than 10.4
0 5 10 20 Kilometers

Parks garage advert
½ pg col
(but supplied B&W, use anyway)

Invertebrate monitoring

The invertebrate monitoring introduced by the Trust in 2005 has proven to be extremely useful in building up a picture of general water quality across Ayrshire as well as in identifying sources of pollution. The system used by the Trust, which was based on the Riverfly Partnership methodology, was developed further in 2006, and its application tested in other areas of Scotland. A further class abundance class (6) was added to indicate sites where less than 50 individuals were found during the three minute kick sample. The scoring system ranges from A1 (high diversity and abundance) to D6 (low diversity and abundance).



What do the results mean?

The two large red circles in the Girvan and Irvine catchments indicate sites where organic enrichment has resulted in an invertebrate population with high abundance of a few species tolerant of these conditions. Fish populations tend to be limited at these sites as high organic loading can result in reduced oxygen levels. The small red circle in the upper Doon highlights the reduced diversity of invertebrates which can exist in areas subject to the effects of acidification. Whilst the issue of acidification in the upper Doon area has been well documented, the 2006 monitoring carried out by the Trust suggests that there are other areas of Ayrshire also subject to low pH episodes.

Several sites in the south of the Ayr catchment and in the upper Irvine were found to be populated by invertebrates typical of those found in acidified areas. In the Ayr sites, which were in the upper Burnock Water, the underlying geology consists of limestone and coal-bearing rocks, which should buffer against acidity in surface waters. It was therefore quite surprising to find evidence of acidification here. However, there is a high proportion of conifer forestry in both these parts of the Ayr and Irvine catchments which may be a factor, as conifer trees are known to increase the risk of acidification.

In order to make details of the methodology developed by the Trust more widely available the biologists have been working with Craig Macadam, of the Ephemeroptera Recording Service and the Clyde Foundation towards publishing details of the methodology as a scientific paper.

River Girvan: recovery from sheep dip incident

In autumn 2005 the Trust biologists discovered a pollution incident in the upper River Girvan, the result of an accidental spillage of sheep dip. Immediately after the incident, invertebrates were almost non-existent in a large section of the river. Following the incident the biologists continued to monitor the recovery in the invertebrate population. The results of the monitoring are shown in the table below.

Date	Score	Invertebrates present
17th Oct 2005	**D6**	9 individuals, mainly worms
5th Feb 2006	**C4**	100 baetid mayfly nymphs, 2 stoneflies, 2 shrimp
31st May 2006	**D4**	120 baetid mayflies and 4 flattened mayflies
18th July 2006	**B3**	20 caseless caddis, 200 baetid and 20 flattened mayflies, 50 stoneflies and 2 snails

In this particular incident fish numbers seem to have been relatively unaffected, probably due to the pollution occurring in the autumn, when salmonids are not feeding as actively as they do at other times of the year. If the incident had occurred in spring or summer, the effects could have been much more dramatic.

'Flattened' mayfly nymph (Heptageniid)

Physical and chemical data

With the aid of grants from the Minerals Trust and Awards for All the Trust was able to purchase a YSI multimeter, for recording various water quality parameters.

YSI multimeter, funded by the Minerals Trust

Treated sewage outfall on the Lugar at Cumnock

The meter was used at every electrofishing site as well as on other occasions either do spot checks or when deployed as a logger to monitor water quality over a longer time series. The meter provided a greater understanding of the factors influencing the quality of Ayrshire's rivers and burns. Some of the most interesting findings were:

- Out of a total of 169 recordings made during the course of the year only 19 were below pH 7, i.e. acidic, with most of these being from the upper Doon catchment.
- There can be large fluctuations in the pH at some sites, e.g. Carrick Lane in the upper Doon, pH 7.1 on the 4th Aug and 4.8 on the 7th Dec.
- pH readings from the River Ayr and tributaries were generally well above neutral (alkaline). Much of the underlying geology in the Ayr consists of limestone which can result in highly productive conditions.
- Low oxygen levels were recorded in a number of tributaries, including the Water of Fail and Bogend Burn in the Ayr catchment.
- Worryingly low oxygen levels were recorded in the Lugar Water downstream of Cumnock when the meter was deployed overnight. The oxygen level dropped to below 5mg/l for over six hours overnight during late July. The accepted standard for salmonid waters is a minimum oxygen level of 7mg/l. Further investigations into the reasons for these low oxygen levels are planned in 2007. Water temperatures of over 23°C were recorded on occasions, which could have been a problem for salmonids.
- The highest conductivity recorded was at Dalmellington in the Cummock Water where a reading of 1076µs was obtained. Similarly high conductivities have been recorded in the upper Ayr catchment in tributaries draining from coal mines.

Polluted burn at Glenbuck, River Ayr

Mine pollution at Dailly, River Girvan

Fish kill in upper River Irvine

In early November 2006 the Trust biologists were notified of a fish kill at Darvel in the upper Irvine. Investigation revealed that the fish kill had occurred several days previously further upstream and that an increase in flow following rain the previous night had washed the dead fish down into the Darvel stretch of the river. The fish kill was caused by a slurry spill into the Gower Burn upstream of Priestland. SEPA had been made aware of the incident but had not informed the Trust, the River Irvine Angling Improvement Association or local angling club.

According to SEPA, the fish kill extended for 800m downstream of the source. Survey work carried out previously by the Trust had found that the Gower Burn was the most productive tributary of the River Irvine supporting high densities of both salmon and trout. In 2005 the Trust electrofished a survey site in the Gower Burn which extended to 25.1m in length. A total of 143 juvenile salmon and trout were captured during the single run survey. This represents the minimum density of fish present in the survey section. Multiplying that figure by the length affected suggests that over 4000 fish would have been killed in the incident. The Trust biologists found large numbers of dead fish ranging from salmon fry to adult salmon and sea trout.

An example of the many dead fish found in the River Irvine upstream of Darvel.

The River Irvine has one of the highest human population densities of any salmon river in Scotland and is still recovering from its industrialised past. Incidents of this nature, in one of the few tributaries of the river where there is still good habitat and fish populations, will have an impact on the health of the river for years to come.

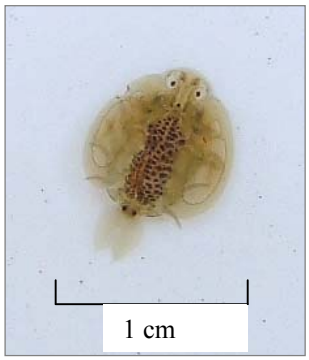
The Trust were notified of a number of other river pollution incidents in Ayrshire in 2006 which, although not resulting in fish kills, would have had a negative impact on water quality. These were all referred to SEPA by the Trust.

Anglers Conservation Association

The Anglers Conservation Association (ACA) is an organisation which has a formidable reputation. In its 60 years of existence it has taken on more than 2000 cases and lost only three. The ACA use criminal law to seek compensation for pollution incidents which can then be used by angling organisations or proprietors who have been affected to restore damages fisheries or stocks. After refocusing its activities in England and Wales the ACA is now seeking to re-establish its presence in Scotland following an earlier break, and formation of a Scottish branch. A Scottish law firm has been hired to represent its interests in Scotland. The ACA is now recruiting members in Scotland and is seeking potential pollution cases to take forward. Details of how to join the ACA are available in their website www.a-c-a.org.

Freshwater lice in the River Ayr

During the summer a concerned River Ayr angler contacted the Trust biologists regarding the presence of high numbers of lice on fish caught in the lower River Ayr. The same angler then provided a specimen taken from a small grayling, again caught in the lower river. The Marine Laboratory in Aberdeen were able to identify the louse as *Argulus coregoni*, the largest of the freshwater louse species found on salmonids in Scotland. They are parasites which feed on the blood and tissue fluids of host fish, and in low numbers generally do little harm, although heavily parasitized fish can become prone to secondary infections.



They can grow up to 1cm in diameter, are convex shaped with two noticeable eye spots. The lice lay eggs that survive through the winter in the river bed before hatching out the following spring. Individual lice can produce several broods of eggs in a single year which can lead to high infestation numbers in low flow conditions.

Although this was the first time that the biologists had been made aware of their occurrence in the River Ayr, discussions with some of the more senior local anglers confirmed that they had been present for decades. In recent years infestations of *Argulus* have caused serious problems in stocked stillwaters and it is thought that the parasite is spreading, probably through movements of infected fish or water.

Habitat improvements

Over the years the Trust has built up an extensive database on habitat quality across the majority of river catchments in Ayrshire. This allows habitat improvement work to be targeted towards areas where meaningful improvements can be made. During 2006 the Trust has been working with the Farm and Wildlife Advisory Group (FWAG) and the Doon District Salmon Fishery Board on the 'Banks O'Doon' project which is designed to reduce the impact of intensive agriculture on river water quality. As well as important salmonid populations the River Doon supports a significant remnant population of freshwater pearl mussels although its status as a breeding population is thought to be under threat. The 'Banks O'Doon' project will benefit all river life, including the mussel population.

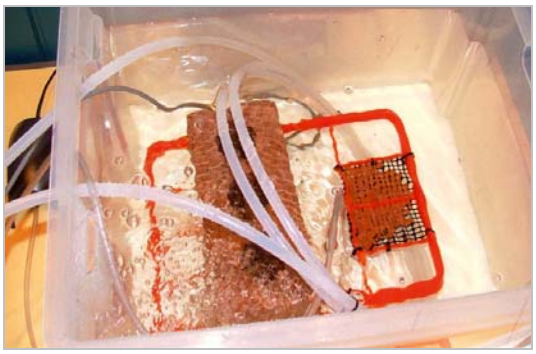
Intensive dairy farming can have a negative impact on bank structure and river water quality

The Trust has secured funding from the Big Lottery Fund's Fair Share Trust and South Ayrshire Council's Rural Affairs Committee for an enhancement project on the River Girvan. Habitat improvements on the main river and the Dyrock Burn were included as part of the project. On the main river, the project allowed Dailly Angling Club to implement the recommendations of the Wild Trout Trust report of 2002 with the aim of reconstructing a more natural flow pattern in a previously dredged section of river. The Dyrock Burn has be identified by the Trust as a part of the catchment where there are large areas of poor habitat. By working with the farmers and landowners the Trust have been able to start a comprehensive program of bankside fencing to improve habitat and water quality. In order to assess the effectiveness of the work the Trust biologists will monitor the results of the habitat improvement works over the next few years.

The Dyrock Burn before habitat work.

Salmon in the Classroom 2006

The Salmon in the Classroom project continued to grow in 2006. More funding has been secured and news of the success of the project has reached many teachers. Eventually the Trust hopes to complete the project at all of Ayrshire's primary schools. Ten schools and Dolphin House Education Centre (Culzean) took part in 2006. A total of twelve schools plus Dolphin House will be taking part in 2007.



Left:: Aquarium set up with salmon eggs Right: Salmon fry reared by Maidens Primary

The project takes place on three separate days at each school. Day 1 begins with a presentation (tailored to each class) on local river geography, the water cycle, river wildlife and food webs. Specific local issues such as pollution, habitat loss and over-fishing are also covered. Pupils learn about the salmon life cycle, including breeding behaviour, migration and threats to survival.

At the end of Day 1, each class is provided with an aquarium containing 100-250 salmon eggs. These eggs are supplied by local salmon hatcheries which operate on every large river in Ayrshire, with the approval of District Salmon Fishery Boards. Hatcheries have been set up to try and artificially boost salmon stocks in areas of river which have suffered from negative impacts. Each hatchery usually contains several hundred thousand salmon eggs each year, so the use of a small number of eggs for education is thought to be worthwhile. The children and staff are given advice on how to look after the salmon eggs which need specific conditions to survive.

The aquaria are fitted with air-pumps and thermostatic coolers, which allow the salmon to be kept in a prominent position in a centrally-heated classroom.. Ayrshire Rivers Trust has pioneered the use of thermostatic coolers for Salmon in the Classroom (SITC) in Scotland. The coolers ensure a high survival rate and allow the children to see the development of the fish for longer before they are released. At one school a 100% survival rate to release (4-6 weeks after hatching) was achieved in 2006 and over 95% is common. The water is typically changed twice, using water from a clean local stream.

On Day 2 (late March or early April) the pupils release their salmon in the nearest suitable section of their local river. By the time the salmon are released their yolk sac has almost been absorbed and they can swim powerfully enough to find refuges in the river. Local journalists frequently attend Day 2 and the project has been appeared in the Ayrshire Post, Carrick Gazette and Cumnock Chronicle. Between Day 1 and Day 2 pupils are asked to keep a record of the progress of their salmon and design and create a poster.

Monkton Primary pupils on their way to release fry at the Glenstang Burn, Stair

Logan Primary pupils and biologist Pete Minting on a visit to the Lugar Water, River Ayr

In the summer pupils re-visit the river (Day 3), normally the same section in which they released their salmon fry in the spring. This time the Trust biologists electro-fish a short stretch to capture a variety of fish species. The pupils then learn how to identify, measure and record different fish species. A kick sample of invertebrates is also collected. The children are shown how to assess the quality of the river water from the types of animals found and by using a meter to check oxygen and pH levels.

One secondary school, Mainholm Academy, took part along with nine primaries in 2006; Ballantrae, Dailly, Crosshill, Kirkmichael, Maidens, Fisherton, Monkton, Logan and Lainshaw. Around 280 pupils (plus staff) were involved in the project in 2006 and a similar number will be involved in 2007. Schools planned for 2007 include Barr, Dailly, St Cuthberts and Cairn (Maybole), Dolphin House (Culzean), Minishant, Heathfield, Dundonald, Tarbolton, Catrine, Patna, Dalmellington and Muirkirk.

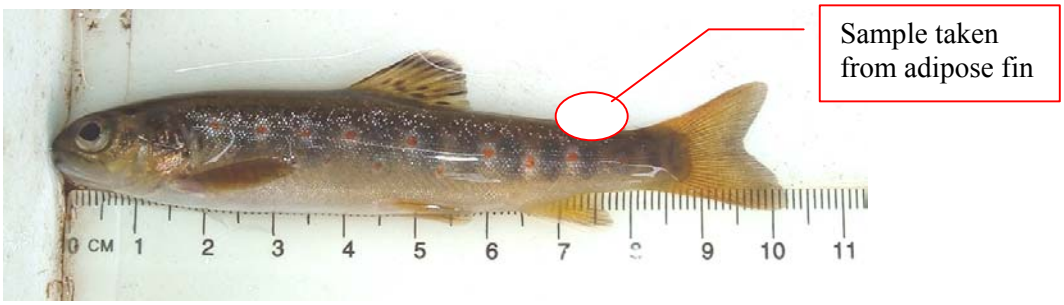
Many thanks to funders!

The majority of funding for the expansion of SITC in 2006 was provided by the Big Lottery Fund's Fairshare Trust. The Fairshare Trust is funding 5 schools in the Maybole area from 2006-2008, plus two youth groups. The first of the youth groups to take part were children staying at the Dolphin House Education Centre, Culzean.
Scottish Natural Heritage has continued to help fund SITC at several Ayrshire schools and will make a significant contribution to the expansion of the project in 2007. The British Trust for Conservation Volunteers fully funded SITC for the Extended Support for Learning (ESFL) group at Mainholm Academy in 2006. BAe Systems (now Spirit Aerosystems) of Prestwick helped fund equipment in 2005-6 and has provided funds for one school in 2007. East and South Ayrshire Council have also agreed to fund several schools in 2007 and the Minerals Trust has funded the purchase of four new coolers.

While doing fieldwork on the River Ayr, Mainholm pupils got to see grayling (right, pic: Stuart Brabbs)

Update on salmon genetics

Genetic analysis of salmon samples has been completed by Exeter University, with some interesting results for Ayrshire and Scotland. The analysis took place during Stage 1 of the Atlantic Salmon Arc Project (ASAP). The main aim during Stage 1 was to examine the genetic similarity of salmon stocks in different rivers, with a view to improving salmon management techniques across member states. Lead by the Westcountry Rivers Trust based in Cornwall, ASAP partners include representatives from Scotland, England, Wales, Ireland, France and Spain. Exeter University in England and Oviedo University in Spain have been carrying out the genetic analysis. Ayrshire Rivers Trust collected samples and organised sampling across western Scotland for the project during 2005-2006.
The method consisted of taking adipose fin clip samples (non-lethal) from around 30 salmon parr at each sampling site. A number of locations were sampled for each river, to achieve thorough coverage of the population.



Background to the analysis

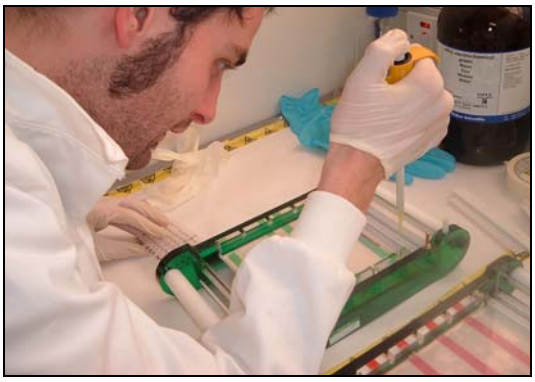
Scientists studying salmon genetics have used several methods for analysing differences between populations. The genetic markers used in this project are known as micro-satellites. In 2004, an international group of researchers met in the US and decided on a panel of 15 micro-satellites for distinguishing Atlantic salmon stocks. Subsequently the ASAP team selected 12 of these, which were thought to be sufficient for the aims of this project.

Salmon have colonised many parts of north-western Europe since the last ice age 12,000 years ago. Any separation into distinct genetic groups is therefore expected to have occurred since the ice retreated and salmon were able to enter the rivers we see today. A particular type of DNA, known as micro-satellite DNA, is thought to provide the necessary resolution for investigating changes over this period of time.
Micro-satellites consist of relatively small sequences of nucleotide base pairs in the DNA helix which change fairly frequently within populations due to chance mutations. Micro-satellite DNA is not thought to be functional, i.e. observed changes are not usually a result of natural selection for a particular trait. However, the different versions of micro-satellites possessed by salmon can be used as an indication of relatedness. For instance, given the known fidelity of salmon to their natal rivers, it would be expected that salmon within Scotland are more closely related to each other than they are to salmon from Spain. This would not be true of European eels, for instance, because although eels are also migratory, they spawn on the other side of the Atlantic and drift passively on ocean currents back to Europe. There is therefore no obvious mechanism by which eels could sort themselves into different sub-populations at the scale of individual rivers.

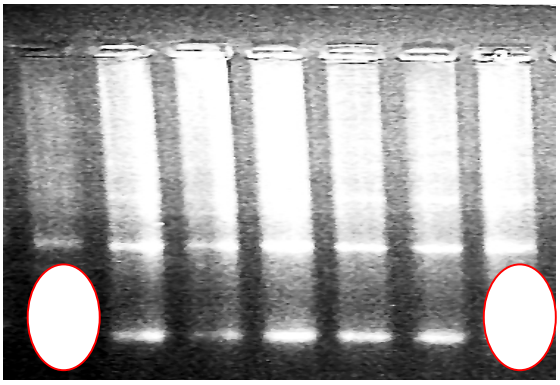
Results

By examining genetic similarity between salmon stocks in individual rivers the ASAP team has confirmed that there is a clear geographic pattern. By entering the DNA results into a computer program, it is possible to generate a family tree or ‘dendrogram’ showing which samples are most

closely related. In Ayrshire, samples were taken from the Rivers Stinchar, Girvan, Doon and Ayr. Results show that salmon from the main River Ayr are more closely related to those in the Lugar sub-catchment of the River Ayr than they are to those from the neighbouring River Doon. If salmon migrating back to the Firth of Clyde showed no preference for a particular river, it would be difficult to distinguish between them genetically either during the same year or subsequent years. The first 'temporal stability' sample taken and analysed from the River Ayr has shown that the genetic pattern is persistent, at least between 2005 and 2006. Although distinct from each other, the River Ayr and River Doon salmon are on a separate branch on the tree to those from either the Clyde or Galloway rivers, the closest rivers from which other samples have been analysed. Unfortunately it has not been possible to analyse samples from the River Stinchar or Girvan but the Trust hopes that this will be completed in the future.



Andrew Griffiths completing genetic tests



Salmon/trout hybrids show a double band

Once the results have been generated, it is possible to use them as a tool for identifying the origin of other samples, provided the samples originate from one of the rivers used to create the model. To test the effectiveness of the model, blind tests have been performed using the samples already collected. Most groups of samples have been assigned back to their source river with a high degree of confidence, showing that the method works.
One limitation of this type of model is that it will always assign samples of unknown origin back to a source even if it is incorrect. If a wild salmon sample from Norway, for example, was entered into the ASAP model it might well be assigned to a Scottish river with a low level of confidence. The low confidence reading would be suggestive of a different origin but would not identify the location. With sample data from across the entire natural range of Atlantic salmon it may be possible to test salmon caught anywhere in the Atlantic and identify their origin with a high degree of confidence.

The ASAP team have done an excellent job of producing results from across a large number of European states, using funds derived from the European Union's social fund known as Interreg Area IIIB. This fund was set up to encourage collaboration between member states with a view to providing benefits for the European community.
The results of the project could be used to identify the source rivers of individual salmon caught at sea, or salmon suspected of illegal capture and deliberately mis-labelled. The impacts of non-native stocking and escapes from salmon farms on the genetics of wild populations may also be revealed.

Dr Dylan Bright of Westcountry Rivers Trust is now planning a stage 2 for ASAP, which is likely to include some habitat restoration work in countries where the genetic studies took place.

Westcountry Rivers Trust
Lead partner, ASAP

River Doon Smolt Trap Project

In 2006 the Trust took a bold leap into the world of smolt trapping, with the financial assistance of the River Doon District Salmon Fishery Board. For those unfamiliar with the variety of names applied to the different life stages of salmon and trout, smolts are juvenile salmon or trout which are migrating downstream to the sea. At this point in their life, these fish change dramatically in appearance as their bodies become adapted for a different environment.

The reasons why salmon and sea trout migrate to the sea at a particular time are not fully understood. The process is complicated further by the fact that not all trout migrate to the sea, many residing permanently in freshwater as brown trout. Despite the complex nature of smolting behaviour, it is possible to find out how many salmon and trout are migrating to the sea from a particular river by installing a trap which captures fish moving in a downstream direction.

The results can provide some very useful information for fisheries biologists. For instance, if a river produces a vast number of smolts but very few adult fish return from the sea to breed one or two years later, this might indicate a marine problem. Other useful information can be gathered such as the size and age of smolts, the timing of smolt migration and the ratio of salmon to sea trout smolts. This all helps to build up a clearer picture of local salmonid ecology.

Smolt trap installed at Dalrymple, River Doon

Salmon smolt – few spots and deep fork to tail

Sea trout smolt, with predator damage to tail

A suitable location for a smolt trap was identified by the Trust on the River Doon at Dalrymple. The River Doon has a fairly stable flow compared to many other Ayrshire rivers, as a result of the influence of the Galloway Hydroelectric Scheme at Loch Doon. This means that a trap is less likely to get damaged by floods. It is also important to install a trap as near to the sea as possible if the aim is to assess production from an entire catchment. Some traps can sample the entire river but in this case it was only possible to sample a proportion of the flow, using a fyke-net type trap. A trap which samples the entire river is usually a major engineering feat and very expensive. It is still possible to estimate smolt production from a small proportion of the flow using mark and recapture techniques.

If the smolts which are captured are marked and re-released upstream of the trap, the number which are recaptured relative to the number of unmarked captures can be used to estimate the total number of smolts which are moving downstream on that particular day. If this process occurs throughout the main smolt migration (usually April-May in Scotland), totals from different days can be added to estimate smolt output. This is the theoretical basis of the project. Below is a summary of the main findings. The trap was operational from March 18th – 17th May 2006. The trap was visited every day during this period in order to process and release the fish captured.

Results

River temperatures remained relatively low until mid-April, with the smolt run beginning in earnest on 21st April, once the water temperature consistently exceeded 8ºC. The peak of the salmon smolt run was on May 2nd (434 unmarked smolts) and sea trout later on May 4th. Increases in the number of smolts captured occurred following heavy rain and increases in river flow.

In total 1392 salmon smolts were captured, 1079 of which were tagged and re-released upstream of the site. A total of 61 salmon smolts were recaptured. This information was used to generate an estimate of the total salmon smolt run, using a recognised population estimate model (Schwarz and Dempson, 1994). The figure produced of 20,265 salmon smolts may have been a slight under-estimate, as the smolt run will have continued for a few days following 17th May, however the majority of the run had already occurred. The total for the River Doon upstream of Dalrymple was therefore likely to have been at least 25,000 in 2006. An unknown number of smolts will also have been produced from the main river and tributaries downstream of Dalrymple.

Far left: tagging a smolt
Left: Salmon smolt with red polymer tag applied behind left eye

A much smaller number of sea trout smolts were captured (62) of which 54 were tagged. Only 4.5% of smolts captured were sea trout. This is similar to the ratio of rod catch for sea trout relative to salmon (4.8% sea trout on the River Doon between 2000-2004). The number of sea trout recaptures (2) was too small to generate an estimate of the total sea trout smolt run.

Scale samples and measurement data yielded some interesting information. It was thought that 95% of salmon in Ayrshire migrate to sea at just over 2 years of age, as indicated by scale readings from adult salmon mainly caught by anglers. However, the scale readings from the salmon smolts captured in the River Doon trap suggest that around 20% migrate to sea at just over one year old, with only 80% being two year old smolts. The contrast between the 95% and 80% proportion of two year old smolts could be explained by poorer marine survival of one year old smolts relative to two year olds. Adult and juvenile scale readings combine to suggest that three or four year old salmon smolts are rarely produced by the River Doon. Salmon smolt size ranged between 65mm and 175mm, with the average size being 132mm.

In other areas of Scotland different patterns are seen. Further north in colder rivers juvenile salmon take longer to smolt and are often smaller. For instance, data from the North Esk show that until 2004 the majority of smolts migrated to sea as 2 or 3 years old with an average of size of approximately 126mm, slightly smaller than those found on the Doon in 2006.

Conclusion

The River Doon smolt trap was a very interesting project. Unfortunately the mark and recapture method was only moderately successful, with a fairly low and erratic number of smolt recaptures. Ideally the recapture rate should be at least 10%, rather than 5.7%, in order to have a high degree of confidence in the population estimate generated. However the wide variety of information gathered has provided the Trust with a much better understanding of smolt production on a local river. Until now, the nearest traps installed to assess smolt production have been on the River Bladnoch (Galloway) and Loch Awe (Argyll), so the River Doon project has helped fill a large geographical gap. It is hoped that the experience gained in 2006 will prove useful if funding and resources can be found for future studies in Ayrshire.

Consultations

During the course of the year, the Trust biologists spend a considerable amount of time responding to consultations on a wide range of subjects, including both national and local issues. During 2006 ART contributed to the following national consultations:

- **Diffuse Water Pollution from Rural Land Use General Binding Rules – A Consultation:** The Trust contributed on two occasions to the Scottish Executive's consultations on Diffuse Pollution. Diffuse pollution is recognised by SEPA as the major threat to water quality in Ayrshire and new legislation is required to control it.
- **Making a difference for Scotland's species: A Framework for Action**: The Trust contributed to SNH's consultation on Scotland's Biodiversity.
- **Proposals to establish Scotland's first coastal and marine national park**: The Trust has responded to initial plans for a park by the Scottish Executive.

The Trust was also consulted on a number of local developments including trunk road realignments, flood control, opencast mining developments and renewable energy infrastructure proposals.

Consultancy work

Consultancy work has become an increasingly important part of the Trust's activities. The data collected by the biologists over the years is an invaluable resource for providing an context for developments and for informing the development of baseline monitoring. With its extensive database of scientific data and in depth local knowledge the Trust is well placed to assist developers or environmental consultants with the collection of the baseline data required with any development which requires to produce an Environmental Impact Assessment. The collection of baseline data combined with during and post works monitoring is essential ensure that the impacts of any development can be assessed fully.

During 2006 the Trust was asked to collect baseline data for a number of developments, primarily renewable energy developments but also mining and road developments.

Investors in People

As part of its commitment to continually develop its organisation and staff the Trust decided to make the commitment in early 2006 to work towards attaining Investors in People Accreditation. Investors in People (IIP) is the Gold Riband standard for organisations committed to improving their performance and the delivery of its objectives through the management and development of the people involved in running the organisation. The Trust worked closely with an advisor provided by Scottish Enterprise Ayrshire to review and update its operating procedures following an initial assessment. The work done by the Trust in its formative years proved to be a good structural and cultural foundation for its application for Investors in People status.

Following formal assessment on the 27th June 2006 the Trust was very pleased to hear that it had been granted an Investors in People award on the 5th of July 2006.

Brian Shaw receives the Ayrshire Rivers Trust Investors in People Award from Peter Russian of Investors in People Scotland

Events and meetings

Country Fair at Auchincruive

The Country Fair was based at Auchincruive Estate on 21st May and featured a number of attractions including archery, falconry, and dog agility demonstrations. Stalls included hand-made crafts, home-baking and a honey seller with working beehive. Attendance was excellent and good weather persisted throughout the day. Visitors were able to enjoy walks through the Estate and along the River Ayr. Many thanks to staff at SAC Auchincruive who helped to make the event a success.

Dog agility demonstration at Country Fair in 2006

Working beehive display by Tony Riome

Auction Dinner at Ayr racecourse

The Auction Dinner was held at the Princess Royal Stand, Ayr Racecourse on 9th June 2006. The event was a great success and many thanks to everyone who donated and purchased lots. The lots ranged from fishing and shooting to hypnotherapy, wildlife photography and tooth whitening! Auctioneer Jim Craig again did an excellent job and kept everybody amused. The Dinner made a profit of £15,532 - a major contribution towards the Trust's funds in 2006.

Christmas Raffle

For the top prize in the 2006 Christmas Raffle the Trust were able to offer a Hardy Angel trout fly rod, thanks to Hardy's generous sponsorship of the Wild Trout Trust. The lucky winner of the rod was David Russell of Darvel.

Pictured with the Hardy Angel fly rod are George Steel (Trustee) and John Scott MSP. John Scott drew the winning tickets on December 8th 2006.

There were many other prizes on offer and the top ten prize winners in 2006 were:

Prize	Winner	Prize	Winner
Hardy Angel Rod	*David Russell*	Tower Hotel Voucher	*James Elder*
£100 note	*Alan Ferguson*	Jim Tomlinson Casting lesson	*M. Thomson*
Christmas Hamper	*Dawn Slider*	Falconry Experience	*Shirley Sprott*
Gallon Whisky	*Anne Wilson*	Dan Mackay's voucher	*Jim Mair*
Ardneil Hotel Car Valet	*James M^cCreath*	Holms Fishing River Doon	*Struan Candlish*

The Trust would like to thank the organisations and individuals for their generous donations which made the raffle such a success.

Account for year to 31st January 2007

The accounts show that the Trust is in a healthy financial state, with a surplus for the year of £9,735. Our fund raising efforts brought in £19,356 which was some £5,500 lower than the previous year. This was balanced to some extent by a welcome increase in membership income of over £1,000, but mainly by an increase of some £18,000 in other income. All items in this sector showed increases with donations up £2,500, Grants up by £1,300 and consultancy up by just under £14,000. This was due to the increased work carried out in connection with biological surveys in respect of renewable energy developments.
Expenditure rose by around £6,400 to £87,759, where the main increase was in staff costs. The balance sheet is currently healthy with cash reserves rising by over £12,000 to £50,748.

Insert INCOME AND EXPENDITURE (file Accounts2006-7.pdf supplied)

Insert BALANCE SHEET
(file Accounts2006-7.pdf supplied)

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Whitley Animal Protection Trust

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North Ayrshire Council
Hillhouse Quarry Group Ltd

Ayr, Doon, Girvan and Stinchar District Salmon Fishery Boards
River Irvine Angling Improvement Association

Dalry Garnock AC
Kilwinning Eglinton AC
Kilbirnie AC
Barnshean Fishing Club
Colmonell AC and Barr AC
Dailly AC
Ladykirk AC
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