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## SECTION 6: STOCK ASSESSMENTS

*The aim of these stock assessments is to identify appropriate Management Levels for each stock of fish within the catchment. However, at present, this can only be done in broad terms as some basic information is lacking. Firstly, and most importantly, the home spawning areas of the different stocks of salmon and trout cannot yet be defined and mapped (as has been done elsewhere). This requires genetic testing of juvenile salmon and trout throughout the catchment to show where the different populations are, then the testing of adult salmon of each type (Spring, Summer, Autumn etc) to see which of these populations they belong to. This then allows the nursery areas with juveniles of Spring, Summer, Autumn etc. salmon and the areas of origin of adult trout in the main channels to be identified. That then means that habitat and electric-fishing data can be classified and analysed for each stock separately. Data on adult stocks can then be correlated with data on juvenile stocks to give a complete picture of the strength of each stock.*

*The other basic information lacking is the exploitation rates for each stock. This requires fish to be caught and tagged all through the season, so that the proportion later caught by anglers can be found for each run of fish (Appendix E2). Knowing what proportion of a stock is being killed is crucial information for setting Management Levels.*

*Until these two elements can become part of the assessment, conclusions have to be provisional other than for the Ettrick where the fish counter gives a count of the actual number of fish escaping to spawn and the characteristics of the population are better known than for other tributaries.*

**1 The Process for Setting Management Levels:** This is shown diagrammatically in Diagram 6.1 and is based on comparing the present data on stocks with data on their past states and / or with theoretical standards derived from research work to assess their present state:

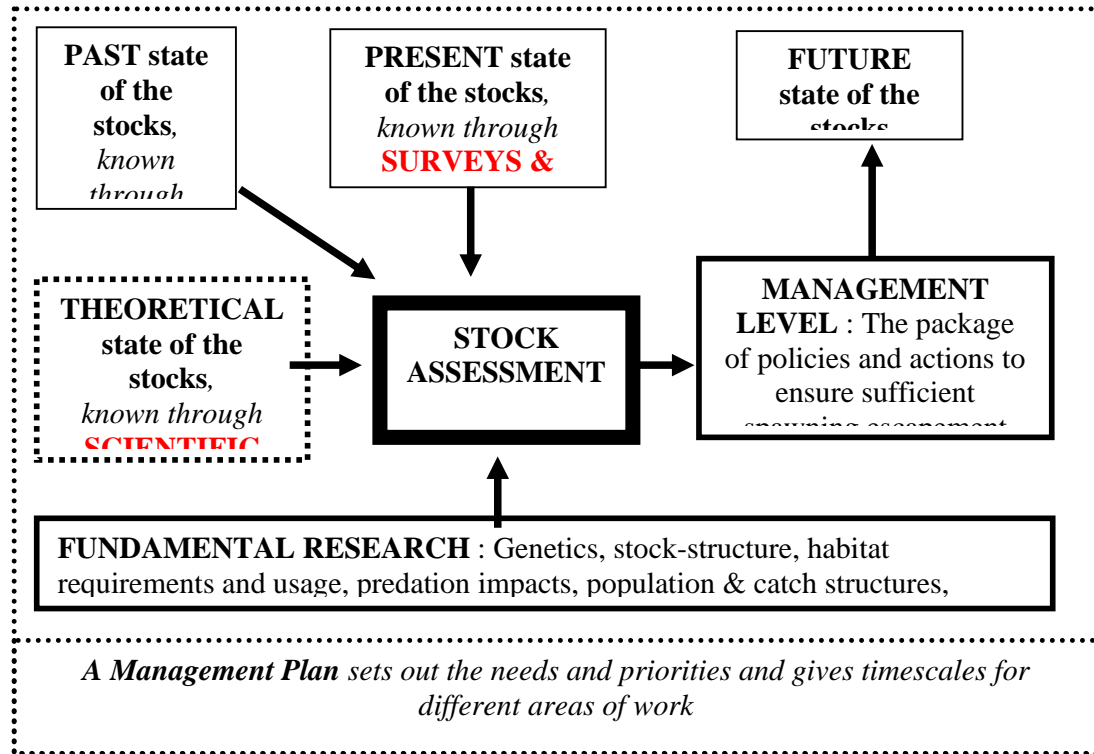
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DIAGRAM 6.1: The process for setting Management Levels for fish stocks



If the present state of a stock is found to be poorer than it was in the past or it appears to be at a lower level than would be expected from information based on studies of similar conditions elsewhere, then one of the more intensive Management Levels (Section 5, Diag. 5.8) will be appropriate. If, on the other hand, the present state appears to be the same or better than in the past and it matches what would be generally expected from research, then one of the less intensive Management Levels would be appropriate. The whole process, both the work to define which Management Levels are appropriate and that needed to implement the particular level appropriate for each stock, is co-ordinated through a Fisheries Management Plan.

Essentially, the first stage is to find out "where you are" - the present state of a stock : The second is to define "where you want to be" - the desired



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future state of the stock and the third is to define the management actions to get to that state. If a stock is in a good state for the present, then the desired future state will be the same and the Management Level will be chosen to preserve the existing situation (i.e. the defensive levels 4 and 5 in Diagram 5.8). If the desired future state is to be better than the present, then "attack" Management Levels 1, 2 and 3 would be appropriate to overcome the problems that are depressing the stock.

## **2 Analysing data on the present against information from the past:**

When fisheries management starts in an area, the data for the "Past" will be made up of a largely chance collection of catch, flow and rainfall records and odd surveys. A priority of the first edition of any Management Plan will therefore be to set up monitoring systems to systematically collect data on adult fish numbers and ages, juvenile numbers, habitat quality and quantity etc. so that as time progresses, data on the "Past" will be derived from such monitoring programmes instead of on chance surveys. The whole assessment procedure using this method will therefore improve over time as the "Past" becomes as well documented as the "Present" allowing firm comparisons to be made across the years. Because catch records have been recorded for other purposes for so long, they will, inevitably, be the only source of information on long term trends for a long time to come.

**3 Analysing data on the present against theoretical standards :** There is a great deal of information in the scientific literature about the densities of juvenile Salmonids to be found in different types of habitat and their food requirements and so on, from which it is possible to make general judgements about whether the densities that are found in surveys are at good or poor levels. It is not yet possible to be very precise about the numbers of juveniles that should be found in particular habitats as so many factors influence populations and these change as the fish increase in size. It also has to be said that much of the literature on this subject is of little use to practical fisheries management as it reports on the effects of only one or two factors during a single season. The information actually needed for management is on habitat requirements through the whole *process* of production, from the distribution of the holding pools in which adults wait to spawn (and which plays a major role in determining how well fish spread through spawning areas); through the quantity and distribution of spawning gravels and of

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shallow areas suitable for small Fry and of deeper areas more suitable for older Parr. Almost all the information available, however, is on how juveniles use their habitats in Summer, but they have to survive Winters too and their behaviour and habitat preferences at night have scarcely ever been studied. A juvenile trout or salmon has to survive several Summers and Winters, quadrupling in length, before it contributes to the adult or Smolt population and the number of scientific studies that follow this whole process through is very limited indeed. One very obvious piece of information lacking is on the relative abundance of habitat types that will give maximum production - the proportion of spawning gravel to Fry habitat to Parr habitat ( 1 to 2 to 3 has been suggested).

**4 Analysing data from juvenile monitoring programmes:** It should be noted that the relationship between number of eggs deposited and number of Smolts produced shown in Section 5, Diag. 5.5 means that juvenile densities can be difficult to interpret in terms of strength of adult spawning stock because of:-

(a) Difficulty in distinguishing variation in numbers of juveniles due to random factors such as the weather from variation due to numbers of spawning adults.

(b) Difficulty in knowing whether a good population of juveniles, at the full carrying capacity of an area, was produced by a large number of adults or whether it was produced by only the minimum number that could provide this. In the former case, there would be a large number of "surplus" adults available for fisheries, but in the latter, there would be none. Both numbers however, would produce similar, full capacity, juvenile populations as shown in this diagram.

If the number and sizes of adults can be estimated or counted, and their fecundity (the number of eggs that a female of any particular size will carry) is known then total number of eggs being deposited in an area can be estimated. This can then be measured against the numbers calculated to have been deposited by healthy spawning populations elsewhere to see if there is any apparent shortfall.

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**5 Setting the Management Levels for the different stocks of Salmon in the Tweed and the Eye:** In smaller river systems, there is less likelihood of there being more than one stock of salmon or trout, but in a large system like the Tweed, with many different large tributaries and several runs of fish through the year, it is very likely that there are many distinguishable stocks, and, in fact, there is evidence for several given in Appendix A1. Where these are sufficiently definable, Management Levels have been set for them, but work on finding out exactly how many different stocks there are and where in the catchment they are based is a continuing process.

As shown in Diagram 6.1, part of setting the Management Level for a stock is to compare its present state with that of its past. For Tweed salmon this, at present, means looking at rod catch data. Long series of netting catch records are available (Section 4.1) but their usefulness for Salmon is limited by the relatively short period of each year covered by the netting season - 14th February to 14th September. As shown by the records from rod fisheries (Section 4.2), there have been large scale swings over the past century) between Spring and Autumn salmon runs being dominant. This means that during the Spring-run dominated phase, the main salmon run is inside the netting season, but in the Autumn phases it is outside. No comparisons can therefore be made of net catches between these phases, they have to be treated separately as they are reflecting quite different situations. In more recent years too, there has been very little, if any, netting in the early part of the season so the data series from net catches is of limited value in comparing past and present.

Another approach uses juvenile densities and theoretical standards but as discussed above, there is, as yet, little good information available on this. One tributary however, the Ettrick, has had a fish counter since 1997, so the egg deposition method can be used for that river's salmon (see Appendix F1).

In the following Stock Assessments, the information considered comes from the six types of Input shown in Diagram 5.3 in Section 5 :-

- Input A – Stock definition & extent
- Input B – Habitat quantity and quality in the stocks' nursery areas
- Input C – State of the juveniles of each stock
- Input D – Catch records of each stock
- Input E – Exploitation rates of each stock
- Input F – Spawning escapement of each stock.

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## STOCK ASSESSMENTS FOR THE TWEED AND EYE FISHERIES DISTRICTS

### 1 SPRING SALMON:

**Input A - Definition and Extent of Spring Salmon Stocks :** These are identified in Appendix A1 as :-

Whiteadder	Till	Teviot	Gala (?)	Etrick
Upper Tweed		Leader (?)		

- with the Etrick and Whiteadder being the main populations, as shown by the destinations of radio-tagged Spring Salmon (Appendix A1). The rod catch records for the Whiteadder also show it to be a mainly "Spring" tributary (Appendix D2). The Tweed fishery, however, exploits all the different stocks while they are mixed together in the main channel, though this reduces upriver as the different stocks either run up their home tributaries or wait for Autumn in the main channel below their home junctions. The Lower River fishery takes fish from all the different stocks, but the Middle River fishery will be based on Gala (?), Etrick and Upper Tweed stocks only and the Upper River has only its own Spring stock to fish for. On the basis of the Radio-tracking results, it has been estimated that 50% of the Spring fish caught in the Lower River are of Etrick origin and 80% on the Middle River, making this stock the largest single support of the early season fishery and, for practical considerations, the stock that it is most important to manage and the one that the Management Level in the main stem has to be set for. The smaller stocks mixed in with it cannot be differentiated and have to be included in the same Management Level whilst they are in the main river fisheries. Once out of the main stem and in their own rivers, they could then have their own Management Levels. The age structure of Spring Salmon on the Tweed is given in Database I from which it can be seen that just one age class - five year old fish – dominate.

**Input B - The Habitat Conditions of the Nursery Areas of Spring Salmon Stocks :** As yet, no precise map can be made of Spring Salmon

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spawning areas throughout the Tweed catchment, but the radio-tracking in the 1990's did show that the Ettrick and Whiteadder catchments were the two major homing destinations for these fish. These two catchments are therefore taken as being of particular importance for the production of Spring Salmon.

- 1 Habitat Quantity: Both the Ettrick and Whiteadder have caulds with fish passes near their mouths. The Ettrick cauld is collapsing and may be causing access problems for the fish. The Newmills Cauld on the Whiteadder is not believed to be of difficulty for fish.
- 2 Habitat Quality: There is no evidence that there are any particular problems with the quality of spawning habitat in the Ettrick and Whiteadder catchments.

**Input C - Juvenile Stocks of Spring Salmon:** The results of juvenile salmon surveys are given in Appendix C1.

- 1 Ettrick Spring Salmon - This tributary has been surveyed five times in the last 20 years and the results are shown in Appendix C1, Tables 4b & 5b. Average Parr density has not reached the baseline 1988 levels in any of the four subsequent surveys and average Fry density has not only not matched the baseline survey either and it has fallen in to the third quartile in the two most recent surveys. As can be seen in these same tables, all the other sectors have matched or improved on their 1988 levels in either Parr or Fry densities or both in at least one survey since, so the failure of the Ettrick to do the same does raise a question mark over this stock. However, the intensive electric-fishing each September since 1997 to produce an Index of Fry Abundance to correlate with the numbers of adult salmon counted into the Ettrick the previous Autumn is not showing that numbers of Fry depends on numbers of adults (i.e is limited by their number), suggesting that spawning is adequate (Appendix F).
- 2 Whiteadder Spring Salmon - The history of this population is given in Appendix A4 and given the increasing area being occupied by salmon juveniles until recently, it is possible that this is still an expanding population. However, the most recent electric-fishing surveys have given contradictory results (Appendix C1, Tables 4b & 5b) with ever increasing

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Fry densities but continuing poor Parr densities. As suggested in Appendix C1, the Whiteadder may well have a high rate of Smolting at just one year old, so that Parr numbers will never be at high levels. The high densities of Fry therefore do suggest adequate spawning.

3 Other Spring Salmon stocks (Till, Teviot, Upper Tweed etc.) -As the precise areas in which the various minor Spring Salmon stocks spawn have not yet been worked out (see Appendix A1, Map.4, which is very much an approximation), it is not possible to be definite as to the state of their juvenile stocks and one of the key management needs is to find ways to do this. However, as it appears that the home areas of such stocks are in the upper reaches of their tributaries, (unlike the Ettrick where they appear to occupy most of the length of the rivers – see Appendix A1, Map 4), it can be said that there is no sign of juvenile densities in these Upland reaches being any less than those lower down : Excluding the Ettrick and the Whiteadder, 36 sites can be categorised as “Upland” in the remaining tributaries that have been identified as having Spring Salmon and 19 as “Lowland”. The average salmon Fry and Parr densities in the former were 90.3 and 20.0 per 100m<sup>2</sup> and in the latter, 65.4 and 18.6.

**Input D - Data from Catch Records** : The salmon rod catch records for the Tweed are given in Appendix D2 and the relevant points for setting a Management Level for Spring Salmon are :-

- 1 There has been a major and dramatic change in the numbers of Spring Salmon being caught in the Tweed system over the past 50 years. Before 1967, over half the annual catch was caught before the first of June, but since then, such early season catches have seldom amounted to over 20% of the annual total and are now dwarfed by catches made after the 1st of September. The same pattern can be seen in the catches for the Lower and Middle river sections but the Upper River records show that catches before the 1st of June almost completely disappeared after the 1960's.
- 2 The catch records for the different tributaries show some interesting variations (Appendix D2, Graphs D2.2 to D2.5). Those of the Whiteadder show a continuing predominance of pre-June catches; but those of the Till and the Teviot the usual decline. The Ettrick catches are of little relevance

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here as it is 50 kms upstream and it is known from the fish counter that relatively few fish enter it before the Autumn.

- 3 These catch records indicate a considerable and widespread reduction in the produce of the Spring Salmon stocks of the Tweed since the 1960's. Upper Tweed, Teviot and Till Spring stocks that once produced most of the fish caught in those tributaries no longer do so and these catches have been replaced by Autumn fish. As shown in Appendix A1, the largest single component of the Spring Salmon now caught in the Tweed is Ettrick stock, although that river is not itself an early-season fishery so the catch records in the main river below Ettrickmouth should reflect the levels of the Ettrick Spring stock.
  
- 4 The fragility of the Ettrick stock was shown by the occurrence of two five-year cycles of poor Spring catches in the Tweed in recent years (Appendix D2, Graph D2.9) one of which could apparently be traced back to the largest flood to have occurred on the Ettrick in recent times, on the 1<sup>st</sup> November, 1977. The persistence of poor catches every five years afterwards (until 2002, when this ceased) showed a limited ability to recover, suggesting that in those years, the Ettrick Spring Salmon stock was "below the curve" - and for some reason, not able to restore its numbers. Heavy angling exploitation could have been part of the problem since exploitation rates could have been very high on the reduced numbers in those years (such rates tend to increase as numbers fall). Another factor could have been the age structure of the Spring Salmon. In these "cycle years" , the proportion of 2.2 (five year old) Spring Salmon caught dropped to around 60% from the normal 75% or so, showing that a particular stock component was in trouble in those years (Database I). This heavy concentration of fish of one particular age in the stock would also mean that there could be little "cross-over" between generational cycles - as most fish produced in any one generation are five years old, there are few 1.2 (four year old) and 3.2 (six year old) fish that are would spawn in different years. The Fry Index electric-fishing of the Ettrick also shows that six year old Spring Salmon in the Ettrick must very largely come from just one small area at the top (Appendix C1), the only area where the two year old Parr that will become three year old Smolts are found, and as they will home back to that area, they are not likely to spawn elsewhere.

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**Input E - Exploitation Rates of Spring Salmon Stocks :** There are no Exploitation Rates for Tweed Spring Salmon Stocks as yet, as it is not possible at present to tag enough Spring Salmon to see how many are caught by anglers. Information from elsewhere is that up to 40% of the Spring Salmon entering a river can be caught by anglers. The "Catch and Release" policy for Spring Salmon on the Tweed does, however, means that 70% of those caught are released.

**Input F - Counts of Spawning Escapement of Spring Salmon Stocks :** The fish counter on the Ettrick has provided counts of the numbers of Ettrick salmon escaping to spawn since 1998, allowing a model to be made of this population (Appendix F1). This shows that in some years, if it was not for the fish returned to the water due to the "Catch and Release" policy, spawning escapement would be very close to failing the target.

**Output - Management Levels for Spring Salmon Stocks :** Since the mid-1960's, Spring Salmon have been the minor component of the rod catches of the Tweed instead of the major as they were from around 1915 till then. In itself this indicates a lower level of production of these fish within the catchment: This may or may not be linked to a reduction in the amount of nursery area producing these fish if Summer and Autumn fish have been expanding their area nursery areas upstream to higher altitudes under changed climatic conditions. Whatever the underlying mechanism, these stocks have to be regarded as being in a less robust condition than they were during the period when they dominated the rod catches. Within this overall picture it can be said for the different stocks :

- (a) Ettrick Spring Salmon: As the largest single supplier of Spring Salmon to the rod fishery, this can be considered the most important stock in the Tweed catchment. The five-year cycle of poor Spring catches that could be attributed to flood damage to this particular stock shows that this stock must be close enough to the curve of Diagram 5.7 in Section 5 to be vulnerable to such events, and to have limited ability to restore itself. There is also a question mark over the juvenile densities in this catchment which appear to be staying lower than they were in the 1988 baseline survey. These points led to a Management Level of 3 (Partial Catch and Release) being set for these fish for a five year period, beginning in 1998,

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with the aim of reducing the number killed by rods by half. This reduction has been more than achieved but the fact that the Population Model for the Ettrick salmon (Appendix F1) shows that its target egg deposition level is only securely reached with the estimated number of fish released under this policy shows that it is not in a robust condition.

**A Management Level of 3 is therefore recommended again for the Ettrick salmon stock. The habitat actions appropriate for this Stock and Level are protection of existing good nursery areas and restoration, with both instream and bankside works of damaged sections.**

(b) Whiteadder Spring Salmon: As this river enters the estuary, its fishery can be regarded as being separate from that of the main river, though the radio-tracking did show that all tagged Spring fish before the end of March went in to the bottom of the Whiteadder, whether they were Whiteadder fish or not. As the electric-fishing surveys have shown (Appendix C1), the upper area of this catchment, where early running fish can be expected to dominate the population, has recolonised very well, and very good densities of both Fry and Parr are now found. The lower Whiteadder and Blackadder still, however, have low densities of juveniles, but these are possibly Summer and Autumn stocks, though Fry numbers increased in the latest, 2005, monitoring. Why the former should have apparently recovered so much more quickly than the latter is unclear. Catches of Spring Salmon on the Whiteadder, however, remain low (Appendix D2, Graph D2.2). If the numbers caught at the bottom of the river are excluded from consideration, then these catches are considerably smaller suggesting a limited run of fish. Given the small size of the Whiteadder, exploitation rates are probably high which would make even the small numbers being caught possibly unsustainable.

**A Management Level of 3 is recommended for the Whiteadder Spring Salmon Stock. The habitat actions appropriate for this Stock and Level are protection of existing good nursery areas and restoration, with both instream and bankside works of damaged sections.**

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- (c) Till, Teviot, Upper Tweed and Leader (?) and Gala (?) Spring Salmon: Very little is known about these, apart from the catch records showing that the Upper Tweed and Teviot used to have significant catches of these fish (Appendix D2). Electric-fishing evidence does not show juveniles within their presumed home areas to be low and juvenile densities in their upper reaches are as good as those in their lower. All these stocks will be benefiting from the Level 3 approach brought in for the main stem rod fisheries to protect the Ettrick stock and it can be assumed that the numbers of their fish killed have also been reduced by two thirds. They could have Management Levels set within their home rivers, but as fishing pressure is not high in these areas this is not essential. While a Level of 2 would probably be the appropriate one for these apparently small stocks, their mixing with the Ettrick stock in the main river makes this impractical, and the **Management Level of 3** set for that stock must suffice for them as well. The appropriate habitat actions are the same as for Ettrick and Whiteadder Spring stocks, provided the nursery areas can be defined.

As outlined in Section 5, the aim of a Management Level of 3 should be to move the stock to a better situation and higher Management Level where controls could be relaxed. If the opposite happens, however, and the stock declines further, more restrictions on catches would be needed, as for Level 2, with artificial propagation possibly required as well. However, as also outlined in Section 5, upward progress may not always be possible if there is some problem or limitation on a stock that cannot be altered. This may, in fact, apply to the Ettrick Spring Salmon as the Ettrick is only 10% of the total catchment and yet supplies 60% of the early season catches. This may simply be too narrow a base of production for catches to ever be unrestricted. One answer to this problem would be to revive some of the other Spring Salmon stocks to take the pressure off the Ettrick stock as a supplier to the main stem fisheries and so reduce the exploitation rate on it. Till and Whiteadder stocks would be of limited use for this, given their positions at or near the bottom of the river, which leaves the Upper Tweed or Teviot stocks as the candidates for this option.

Another point about these Spring Salmon stocks is their heavy dependence at present on a single age group, five-year old fish (2.2's). During the period of their dominance of the rod catches, it appears that they were more evenly

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split between five and six year olds as many more juveniles took three years to reach Smolting than now do (Section 3.A1). The conservation of areas for slower growing juveniles may therefore be a management issue for these stocks.

## **2 SUMMER SALMON AND GRILSE**

**Input A - Definition and Extent of Summer Stocks:** The Radio-tracking information showed the largest proportion of these fish to home to the Ettrick (Appendix A1), with others going to the Till, Leader, Gala and Upper Tweed. None were tracked back to the Whiteadder or Teviot. Their home areas may, in fact, be separated from one another, as the Spring fish are, by the home areas of later running fish at the lower ends of the tributaries and in the main channel.

### **Input B - The Habitat Conditions of the Nursery Areas of Summer Stocks:**

- 1 Habitat Quantity: The same questions over access through the Philiphaugh Cauld as it collapses arise as for Spring Salmon. The camera in the Gala fish pass also shows that access could be more efficient there. Access over the cauld / rock-step on the Slitrig Water in Hawick must still be difficult given the low numbers of salmon juveniles found upstream – the Jed Water was also opened up in the early 1990's and has recolonised very successfully making a significant contrast with the Slitrig. The fish pass under the roadbridge at Hedgely, on the Breamish, and the ford at Haughhead on the Wooler Water need to be monitored for impacts.
- 2 Habitat Quality: There are no known habitat issues for the nursery areas thought to be used by these stocks.

**Input C - Juvenile Stocks of Summer Salmon and Grilse:** As with Spring Salmon, the nursery areas of these stocks have still to be defined on the ground but are probably the middle and lower parts of the medium-sized

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tributaries and channels. Excluding Whiteadder and Ettrick sites, the average densities per 100 m<sup>2</sup> of such sites were 109.7 Fry and 21.7 Parr for the "middle" areas and 65.4 and 18.6 for the "lower". The former would be Top Quartile for both Fry and (just) Parr and the latter, Second Quartile (see Appendix C for rating of juvenile densities by quartile), suggesting sufficient numbers of spawning adults.

## **Input D - Data from Catch Records on Summer Stocks:**

- 1 Rod Catches : As can be seen from the catch records (Appendix D4 Graphs A3.7 a & b) and scale readings (Section 3A.1) these fish are a relatively small proportion of the rod catches of the Tweed. Whether or not this also means they are also a relatively small proportion of the overall stock is uncertain - the months in which they return to the river, June, July and August, have not been peak fishing times until recently, so they may be under-represented in the rod catches. The graphs do show a definite increase in the rod catches of these fish on the Lower Tweed after the lower river nets were bought out in 1987 (Appendix E1, Graph E1.2). The Till has also shown an increase in Summer catches since 1996 (Appendix D2, Graph D2.3).
- 2 Estuary Net Catches : Since 2000, August and July fish have formed a large component of the estuary net catches (Appendix D1, Graph D1.15), which were previously very much dominated by September fish. This increase actually precedes the buy-out of the drift nets in 2002. While the catches of the remaining netting stations have increased in recent years, this is more likely to be due to the closure of competing netting stations than to any great increase in stocks of Summer fish.
- 3 North-east England Drift Net Catches : Summer fish must form the bulk of the Tweed fish taken in the North-east England Drift Net fishery, as its season starts on the 1st of June and ends on the 31st of August. Although the mixed-stock nature of this interceptory fishery makes any interpretation of its catches very difficult, it was almost certainly the major exploiter of this stock of Tweed salmon till the buy-out in 2002.

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The increase in rod catches once these nets were reduced (Appendix E1, Graph E1.2) strongly suggests that significant numbers are now reaching the Tweed that had previously been taken by these nets. This would also suggest that the numbers taken by these nets were a significant proportion of the total.

**Input E - Exploitation Rates of Summer Stocks** : There are no Exploitation Rates for Tweed Summer Stocks as yet, as it is not possible at present to tag enough Summer fish to see how many are caught by anglers. Information from elsewhere is that 20% of the Spring Salmon entering a river can be caught by anglers (Appendix E2).

**Input F - Counts of Spawning Escapement of Summer Stocks**: The fish counter on the Gala Water has only just completed its first year of full operation (2007). While one radio-tracked Spring Salmon did go into the Gala Water, it is not certain if it went above the cauld (it disappeared below it). Certainly, there has been no sign of an early season run through this counter so far, unlike the Ettrick, though on a small river this might not be appropriate behaviour for Spring Salmon which would be safer to wait for the Autumn spates. Based on the other radio-tracked fish that went into the Gala, it is assumed that it is mainly a Summer and Autumn Grilse area and work is under way to determine the spawning requirement of the river and how well the counts show this is being met. No data is available on this yet.

Given the radio-tracking information from the mid 1990's that many Summer fish went to the Ettrick, the buy-out of the drift nets was expected to result in an increase in the numbers fish counted going in to the Ettrick. This did not happen, despite the increases in the rod catches as a whole that could be correlated with the buy-outs and no explanation for this has yet been found. A repeat of the tagging work is needed to check that the 1990's results are still valid.

**Output - Management Levels for Summer Stocks** : It is not yet possible to properly evaluate the present state of these stocks given the new situation created by the buy-outs of most of the North-east England Drift Nets and of the main Tweed river and estuary nets. That these were having an impact on the number of fish entering the river is shown in Appendix E1, Graph E1.2

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which shows how rod catches increased when these buy-outs were made. It may also suggest that these stocks are not particularly large so that the numbers saved from the nets were a significant increase in the fish entering the river and for the rod fishery. The impact of these nets on Summer fish in the past was also shown by the recaptures of microtagged fish of Tweed origin which were reared in the Kielder hatchery then stocked back in to the Tweed. From 28,610 tagged Parr the adult recaptures were :- 4 in the Irish drift nets, 10 in the N.E. England drift nets, 2 in Scottish coastal nets, 1 in Tweed estuary nets and 2 by rods in the Tweed, (two of the recaptures by nets were in May, the rest were from June to August).

In habitat terms, however, protection of the existing spawning and nursery areas, if these can be defined sufficiently closely, would be an appropriate policy.

These fish are the "stale" fish in the main channels during the peak Autumn fishing period and as a precautionary measure, their release by anglers should be encouraged.

### **3 AUTUMN SALMON AND GRILSE**

**Input A - Definition and Extent of Autumn Stocks:** As shown in Map A1.4b in Appendix A1 it is possible that there is only the one stock of these fish in the Tweed system, occupying the main channels and the lower ends of the larger tributaries, though fish will home to the particular areas that they came from. The Radio-tracking work on the Ettrick in 1998 showed this to be the case for one particular tributary, though the restriction on passage through the fish pass at Selkirk at low water temperatures must restrict access by later running fish (Appendix A5). The spawning times on the lower Leader also show late spawning at the lower end of a tributary (Appendix A1, Table A1.1). More precise data on spawning times and locations is needed.

**Input B - The Habitat Conditions of the Nursery Areas of Autumn Stocks:** If, as is suspected, the nursery areas for these fish are in the Middle and Lower Tweed and the lower parts of the larger tributaries, then there are no known habitat issues relating to them. Access along the main channel, -

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though there are choke points at the various caulds and slaps (Coldstream Bridge, The Lees, Hendersyde, Kelso and Mertoun) - is not an issue. When the aerial survey is analysed, more will be learned about these nursery areas in channels that are too wide to be surveyed from the bank.

**Input C - Juvenile Stocks of Autumn Stocks:** Electric-fishing data is largely lacking for these fish as their home areas in the main channel and larger tributaries are not surveyable with the techniques that have been used up till 2006. With the change to Timed Fry Index monitoring, however, these areas should be assessable. Average Fry and Parr densities for electric-fishing sites at the lower ends of main tributaries, excluding the Ettrick and Whiteadder, were 65.4 and 18.6 which are Second Quartile and satisfactory.

**Input D - Data from Catch Records on Autumn Stocks:** The Rod catch records show a great increase in the catches of these fish since the mid 1960's (Appendix D2). The dramatic changes in run-timing of salmon that happen on the Tweed are also shown in the graphs of this section where it can be seen when the present Autumn-dominant phase began and when the previous one ended. Rod catch records from individual tributaries also show the changeover from Spring to Autumn catches in the mid-1960's.

As the Tweed netting season has ended on the 14th September since 1857, netting records do not cover the main run of fish when Autumn fish are dominant, as at present.

**Input E - Exploitation Rates of Autumn Stocks :** Tagging in late September since 1997 has shown the exploitation rate of these fish by anglers to be less than 10% (Appendix E2).

**Input F - Counts of Spawning Escapement of Autumn Stocks :** While both Spring and Summer stocks can be found in tributaries small enough for fish counters to be set up, the bulk of Autumn stock spawning will be in the main channel for which there is no appropriate and affordable type of fish counter yet. Genetic analysis can, however, estimate stock sizes and this may be an appropriate way to find out the numbers of these fish that are breeding.

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**Output - Management Levels for the Autumn Salmon and Grilse Stocks of the Tweed:** On these considerations therefore, a **Management Level of 4** is considered appropriate for Autumn Salmon and Grilse. The appropriate habitat action is the protection of the existing quality of spawning and nursery areas through bankside fencing, where channels are narrow enough to make this of significance. Much of the spawning area of this stock is probably in the main channel where bankside conditions can have little or no effect on the river. Further data on this stock would be useful, however, particularly on whether Autumn MSW fish have localised home areas - very few of such fish were obtained for radio-tracking in 1994-96, and on juvenile densities in the larger channels.

Starting at good levels, the aim for this stock must be to maintain the present situation. Unlike the Spring Salmon situation, starting at an intermediate level with the possibility of going "up" as well as "down", the only way for the Autumn fish is "down". As yet, only catch records are available to monitor these stocks over the years, but these could be improved by the recording of fishing effort data.

If the river should switch from Autumn fish dominance to Spring as it did in just a decade in the early 20<sup>th</sup> Century (as shown by the graphs in Appendix D2) some very rapid revision of these recommended Management Levels and the Management Plan would be required.

## 4: THE SALMON OF THE EYE WATER

This could be a new population – the Old Statistical Account whose reports were written in the 1790's has, in the Coldingham Parish report, the following : –

*"In this water ( The Eye) there are plenty of trouts of excellent quality, generally small: there are indeed some pretty large, from 16 to 24 inches in length, but none of the true salmon kind"*

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These 16" to 24" trout would appear to be "Whitling" (in the Tweed meaning), showing that some migratory fish came up the Eye in those days, but not salmon. However, a report from 1859 could mean that there were then salmon at the very bottom of the river: -

*"...A fall, not very far above Eyemouth, prevents salmon and other migratory fish from getting to the higher parts of the stream, and no Parr, therefore, are found above the fall at Netherbyres "(Robertson, 1859)*

However, Netherbyres is scarcely one kilometre from the sea, which makes it unlikely that there was a salmon population living in such a small length of river. The first electric-fishings of the Eye Water in 1994 and 1995 found no juvenile salmon, but the next, in 2002 found a few. However, during the fish rescue at Houndwood, on the middle Eye Water, also in 2002, a substantial population of salmon juveniles was found. As Tables C1.5 a & b in Appendix C1 show, juvenile populations are increasing in the river.

There being no exploitation of this stock, no Management Level is required. Monitoring will be by electric-fishing of juveniles.

## **5 THE MANAGEMENT LEVELS FOR TWEED AND EYE SEA-TROUT STOCKS**

The evidence summarised in Appendix A2, suggests that there are several stocks of Sea-trout within the Tweed system but, at present, it is not possible to define these very closely. The list of likely stocks that can be made at the moment is:

- 1 "Tweed" Sea-trout ( occupying the area upstream of the Till and possibly containing two stocks, a "Whitling-type" stock of smaller fish spawning just once or twice and a stock of larger fish that can spawn more than twice. There may also be a third stock, of large, fast-growing fish that grow to 10-15lbs in just two years at sea. Collection of scales from such large fish will allow genetic analysis to see if they are from a particular population)
- 2 "Till Whitling"

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3 "Till Large Sea-trout"

4 "Eye Sea-trout"

To what extent these stocks differ in run timing as well as in geography is not known. The Whitling of the Till run in April and May (though their repeat spawners are later) so are a geographical stock with a particular run timing. Whether the other geographical stocks have their own particular run timings or are split into different runs is not known.

## 5.1 "Tweed" Sea-trout

**Input A - Definition and Extent of "Tweed" Sea-trout:** This is speculative at present (Appendix A2) but could be the whole of the Tweed catchment other than the Till and those burns that have Brown-trout stocks (Appendix F2).

**Input B - The Habitat Conditions of the Nursery Areas of "Tweed" Sea-trout :**

1 Habitat Quantity: There is no evidence that any of the caulds in the areas occupied by these fish are a problem at normal flow levels or that there are significant obstructions on larger and medium sized channels. Some obstacles on small burns have been identified and prioritised for action (Appendix B3, Map B3.1 ) and work to identify others is continuing as part of the TTGI (the TTGI works on Brown-trout, but the habitat used by Sea and Brown-trout is largely the same).

2 Habitat Quality: There is no evidence of any general problem with habitat quality of the larger and medium sized channels in the areas occupied by these fish. Work on surveying smaller burns is continuing under the TTGI.

**Input C - Juvenile Stocks in "Tweed" Sea-trout Areas:** These areas can be defined as the whole catchment upstream of the Till and there have been electric-fishing surveys of both medium-sized channels and smaller burns (Appendix C1) The difficulty in assessing the state of Sea-trout (and Brown-trout) from juvenile surveys is that it is not possible to distinguish between them before the former reach the Smolting stage. Most of the burns with

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traps are clearly dominated by Sea-trout spawners (Appendix F2). Assuming that the trapped burns are typical of the catchment as a whole, it would appear that most juvenile trout found in the burns of the catchment come from eggs spawned by Sea-trout.

- 1 Trout Parr in Medium-sized channels: In Table C1.6b in Appendix C1 it can be seen that while most Parr and older trout sector averages fell into the Top or Second Quartiles from 1992-97 (7 out of 10) this declined in the second series (1997-2001) to 4 out of 10 but increased in the third series (2001-05) to 6 out of 10.
- 2 Trout Fry in medium-sized channels: (Appendix C1, Table C1.7b), there were 8 sectors averaging in the Top and Second Quartiles in the first electric-fishing series, 5 in the second and 4 in the third.

Smaller burns are not sampled on a rotational basis, so the results are for a single period :

- 3 Trout Parr in small burns : (Appendix C1, Table C1.8b) – 6.5 Sectors are Top or Second Quartile, and 3.5 Third (the Ettrick survey was in two parts, with different results)
- 4 Trout Fry in small burns : (Appendix C1, Table C1.9b) – Eight out of 11 sectors were Second Quartile, the remaining three were in the Third.

On the whole, the picture seems to be of declining Fry numbers in the medium-sized channels, though with Parr levels more steady. The small burns are being re-sampled as part of the TTGI.

## **Input D - Data on the Past and Present State of "Tweed" Sea-trout from Catch Records :**

- 1 Rod catch records for "Tweed" Sea-trout caught upstream of the Till: These are shown in Appendix D4 and it has to be said that the very low numbers of fish being reported in the 1970's and 80's, when it is known that the salmon records are accurate, is surprising. It may well be that the reporting of these relatively unconsidered fish was poor. In very recent years,

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reported catches have increased greatly. Records from the tributaries are too fragmented to be of much use.

- 2 Netting records (being based mainly in the estuary, these are of Tweed and Till stocks mixed together): As Sea-trout have had much the same run timing for the past 140 years, with their peak months of July and August always being within the netting season (though September was more important in the 1860-1899 period and June is more important in the present period), netting records are much more useful for this species than for salmon and are given in Appendix D1. Graph D1.14b in Appendix D1 shows the average annual catches of Sea-trout in the estuary from 1840-2000 from which it can be seen that the 1980's and early 1990's gave the best catches in the whole period. While average catches have declined since then, they remain at historically good levels.
- 3 Recent trends: The totals of the three surviving netting stations since 1985 show a slight upwards move in recent years (Appendix D1, Graph D1.15b) but this could be due to the closure of competing stations. Any decline could also be masked by the reduction in competition.
- 4 Northumberland nets: The catches in the coastal "T" nets on the Northumberland coast have been stable over the last few years, at historically good levels (Appendix D1, Graph D1.16b). Drift net catches decreased significantly with the buy-out in 2002. Although the Drift Net season now begins on the 1st of June, the Coastal Net season still begins on the 26th of March and it is these nets that take most Sea-trout and can still take early running fish. There has been an apparent increase in rod catches of Sea-trout on the lower Tweed in response to the drift-net buy-out, though more variable than for salmon, which would indicate that these nets had been having a significant impact on this stock (Appendix E1, Graph E1.3). As the exploitation rate of Sea-trout by the rod fishery is low (Appendix E), this suggests that only a small proportion of the fish now escaping the drift nets are being caught by anglers, increasing the spawning stock.

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**Input F – Counts of Adults of “Tweed” Sea-trout :** The results for the Etrick Fish Counter are given in Appendix F2, Graph F2.1. Trout numbers for the last three years (2005-07) have been better than any year previous year, other than 1998, so there is no sign in any decrease in adult numbers in this Sector.

Data from traps on Spawning Burns (Appendix F2): The data series from these are still short and it has become apparent that water levels have a very significant impact on the numbers of Sea-trout getting up these small burns to spawn. Numbers spawning may well be more of a reflection of water levels than fish numbers. In 2006 at both the Jed and Peebles traps, there were more Sea-trout caught than any previous year, though numbers are small.

Data from the Gala fish counter could prove very useful in the future as the first year’s results showed a good run of trout.

**Output - Management Level for “Tweed” Sea-trout:** The rod catch records for these fish show a generally upward trend over the years as do the netting records for the mixed stock in the estuary. The apparent declines in the densities of trout Parr and Fry actually suggest that, despite the increases in rod catches, some precautions might be appropriate for this stock and it should not be regarded as being at Full Capacity. The coastal net fishery in Northumberland probably takes Tweed Sea-trout and an unknown number of other net fisheries around North Sea coasts may do so as well, adding uncertainty to any assessment of this stock. However, the very low exploitation rates within the river itself (Appendix E1, Table E1.1) suggest that exploitation of the fish that escape the net fisheries is low. **A Management Level of 4 is considered appropriate.** Protection of the existing quality of trout spawning and nursery areas through bankside fencing is the appropriate habitat action, along with the easing of any obstacles barring or inhibiting spawning migrations.

## 5.2 Till Sea-trout (“Whitling” and “Large”)

As it is not certain yet whether there are indeed two distinct stocks within the Till, they are treated together at present - they are, anyway, subject to the same fishery.

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**Input A - Definition and Extent of Till Sea-trout Stock(s):** For the present, the whole of the Till is presumed to be their home area.

## **Input B - The Habitat Conditions of the Nursery Areas of Till Sea-trout Stock(s)**

- 1 Habitat Quantity : The fish pass under the roadbridge at Hedgely, on the Breamish, and the ford at Haughhead on the Wooler Water need to be monitored for impacts. The Hethpool linns are an important natural obstacle, preventing salmon from spawning in the College Burn upstream and, perhaps, limiting the size of Sea-trout that can pass to the "Whitling" group – no large Sea-trout have been found upstream of the linns either. Some culverts on smaller streams have been identified as needing improvement.
- 2 Habitat Quality: Other than the Hetton Burn, which appears to have water quality problems, there are no known areas where quality of habitat could be impacting fish of these stocks.

**Input C - The Present State of Juveniles of Till Sea-trout :** The results of electric-fishing surveys made in the Till catchment are shown in Appendix C1, Tables C1.6b, 7b, 8b & 9b): Neither Fry nor Parr & older Trout reached the levels of the 1988 survey in any of the three subsequent surveys (93, 99, 04). Both Fry and Parr averages were in their Top Quartiles in 1988 but have fallen to Second Quartile in the later samples and Parr to Third in the latest. Average Fry density did, however, almost double from 1993 to 1999 but fell back again in 2004. The results for the smaller burns, sampled in 1993, gave a Top Quartile average for Parr and a Second Quartile average for Fry.

## **Input D - Data on the Past and Present State of Till Sea-trout from Catch Records :**

- 1 The rod catch records for Till Sea-trout (Appendix D2, Graph D2.3) have been at much the same general level since 1985 but with wide annual fluctuations. There was obviously a major increase in fish caught in Summer after the river net buy-out in 1987. Assuming that exploitation rate of these fish by the rods is not excessive, then this buy-out should have increased the spawning stock of these fish.

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- 2 Netting records of Till Sea-trout : As the estuary nets exploit a mixture of "Tweed" and Till stocks, the data is covered in the section on "Tweed" Sea-trout above. There were netting stations on the Till itself in the past (Appendix D1, Graph D1.13b) but other than showing that the main run of Sea-trout was in the early part of the season, as at present, these are from too long ago to be of relevance.
- 3 Northumberland nets: The analysis is the same as for Input D (4) for "Tweed" trout, with the added point that the Till Sea-trout are generally earlier than the Tweed, so early season catches of the these nets could affecting these stocks more than the "Tweed" ones.

**Input F – Counts of Adults of Till Sea-trout:** As described in Appendix A2, the Till is the only part of the Tweed catchment in which substantial numbers of adult Sea-trout are found far up rivers and streams - and even quite small burns - in the summer. A measured kilometre of one of these burns, a tributary of the College Burn, was set up in 1998 to electric-fish and count the numbers each year (Appendix F3), but water levels have turned out to be the major determining factor on abundance, which is not surprising as the site is upstream of the major waterfall at Hethpool. The qualitative information on the ages and sizes of these Whiting that is collected, however, is proving extremely useful (Appendix A2).

**Output - Management Levels for Till Sea-trout:** The data on this stock shows a decline in juvenile densities; a slight increase in net catches and rod catches that, though, at an historically high level, are basically static with large annual variation. **A Management Level of 4 is therefore appropriate.** Protection of the existing quality of trout spawning and nursery areas through bankside fencing is the appropriate habitat action, along with the easing of any obstacles barring or inhibiting spawning migrations.

## 5.3 : Eye Sea-trout

**Input A - Definition and Extent of Eye Sea-trout:** That there is a long established Sea-trout population on the Eye Water is shown both by the account given in the Old Statistical Account quoted in the first paragraph on

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Eye Water salmon above and from present day specimens. Two adult Sea-trout were found at Houndwood, on the middle Eye Water, during a fish rescue on the 30<sup>th</sup> August, 2002, which shows that some, at least, run into the Eye in Summer, though as it is a small stream that can get very low, this may not always be possible. Beyond these specimens, and one other found dead and handed in July 1998, nothing is known of these fish. Whether or not the Sea-trout that spawn in the Eye are a separate and independent stock or part of a wider population that also spawn in the Tweed and any usable coastal burns will have to be determined by genetic analysis.

## **Input B - The Habitat Conditions of the Nursery Areas of Eye Sea-trout :**

- 1 Habitat Quantity: While the fish pass at Reston needs monitoring, there are no known obstacles having an adverse impact on these fish.
- 2 Habitat Quality: There are no known areas of poor habitat quality that could be impacting this stock.

**Input C - Juvenile Stocks of Eye Sea-trout :** The trout juveniles in the monitoring sites on the Eye (the trout survey did not include the Eye as the Monitoring sites gave sufficient coverage) show a contradictory pattern (Appendix C1, Tables C1.6b and 7b) : Parr falling from the Top Quartile to the Second, but Fry increasing from the 3<sup>rd</sup> Quartile up to the Second.

**Input D - Data from Catch Records on Eye Sea-trout :** None available.

**Input E - Exploitation Rate of Eye Sea-trout :** As there is no fishery for these fish, there is no exploitation rate.

**Input F – Counts of Adults of Eye Sea-trout:** None available.

**Output - Management Levels for Eye Sea-trout:** As there is no actual Sea-trout fishery on the Eye, a Management Level for this stock is not necessary. Protection of the existing quality of trout spawning and nursery areas through bankside fencing is the appropriate habitat action, along with the easing of any obstacles barring or inhibiting spawning migrations.

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## **6 THE MANAGEMENT LEVELS FOR TWEED AND EYE BROWN-TROUT STOCKS**

This is the most difficult of all the major populations to determine a Management Level for at present. There are no net or rod records as for salmon and Sea-trout, the only available being those of trout angling competitions, miscellaneous published reports and observations and a few trout fishermen's diaries, as covered in Appendix D3. An angler catch recording scheme for trout scheme has been re-started but will not provide a long enough data series for at least five years.. Trapping data too, is only available for a few years at a few sites (Appendix F2) but in future these sources should provide much stronger information. It is not possible at present to make even a preliminary list of possible Brown-trout stocks within the Tweed system, though this would possibly mirror that of Sea-trout. How far Brown-trout can be treated as separate stocks from Sea-trout is also unclear. The results from the traps (Appendix F2) indicate that many burns might actually be stocked by female Sea-trout and that the Brown-trout of the Tweed could be largely the males of the Sea-trout population. If this was the case, it would mean a fundamental re-think of trout management.

Tweed Trout have still therefore to be treated as one, broad, population, though that of Eye must be distinct, there being no freshwater connection between the Tweed and Eye catchments.

### 6.1 "Tweed" Brown-trout

**Input A - Definition and Extent of "Tweed" Brown-trout Stocks:** This is unclear, and needs considerable genetics work to sort out. There might be considerable variation within the catchment (Appendix A3).

**Input B - The Habitat Conditions of the Nursery Areas of "Tweed" Brown-trout Stocks :**

a Habitat Quantity: There are no known obstacles having major adverse impacts on Brown-trout migration in the larger and medium-sized channels. On the smaller burns, a number have been identified and are being dealt with under the TTGI (Appendix B3) and further surveys are being made.



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b Habitat Quality: Smaller burn surveys are being undertaken under the TTGI and any restoration or remedial habitat works will be undertaken as appropriate.

**Input C - Juvenile Stocks in "Tweed" Brown-trout Areas:** As juvenile Brown-trout and Sea-trout are not distinguishable, what has been said about trout juveniles for "Tweed" Sea-trout applies here as well.

The information from the traps (Appendix F2) is that only a minority of burns may have largely Brown-trout populations, most being dominated by Sea-trout. This point needs to be firmly established, which will require some way of being able to determine the type of juvenile trout in a burn (as all the burns of the Tweed cannot be trapped). No method of doing this is known at present.

**Input D - Data on the Past and Present State of "Tweed" Brown-trout from Catch Records:** There being no fishery rod or net records for Brown-trout as for salmon and Sea-trout, the picture of the population has to be put together from angling books, club competition records and anglers' diaries (Appendix D3). The general picture is of fewer but bigger fish being caught since the 1970's but how much of this is to do with changes in size limits and how much with actual changes in the stocks is problematic.

## **Input F – Counts of Adults of "Tweed" Sea-trout :**

- 1 Electric-fishing of medium sized waters and netting in the main channels has started to try and gain a qualitative picture of the adult trout that anglers fish for and the minimum numbers that are present in areas that are actually fished.
- 2 Traps on spawning burns (Appendix F2) have shown that larger Brown-trout of 25-45 cm are generally absent from the populations being sampled which are made up of two distinct groups, one of smaller, largely male, Brown-trout and another of much larger, mainly female Sea-trout. Only one of the trapped burns has a Brown-trout population in the sense that the eggs deposited in the stream come from female Brown-trout. This suggests that most Brown-trout in the system could be the males of the Sea-trout

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population with a relatively small number of female Brown-trout. Information from the one burn with a Brown-trout population showed that numbers returning to spawn declined after 2004 as larger and older trout that had died off were not replaced in the same numbers.

3 A "logbook" scheme for a sample of Tweed anglers to record their catches and the effort that went in to getting them was run from 1991 to 1999 and was re-started as part of the TTGI in 2006:

(a) The 1991 - 99 results show considerable variation between catch rates in different parts of the Tweed and between different tributaries and no particular trends.

(b) The 2006 & 07 results showed a major change from the 1990's in that 80% of Brown-trout were being returned and only 20% killed, the opposite of the 1990's situation.

4 Under the TTGI a programme of angler questionnaires and bankside creel surveys has begun to better assess the catches being made.

**Output - Management Levels for "Tweed" Brown-trout stocks:** It is not possible to set any Management Level for these fish with the present state of knowledge. However, the finding that most trout caught are now released does mean that pressure on the population(s) has been reduced, possibly significantly. Based on the findings outlined above and other information gained under the TTGI on angling pressure, advice has been formulated for the individual clubs that are members of the TTGI.

It may be that "slot-limits" would be more appropriate for managing trout fisheries than the present, simple, single, size limit: with slot-limits, fish under a lower length limit and above an upper can be taken, with the fish in between released. This would fit the pattern found at the traps, of many, mainly male small trout and very few larger, mainly female, mainly Sea-trout. A slot limit would allow the exploitation of the many smaller fish, while protecting the medium-sized breeding stock, but allow the taking of very large "trophy" fish near the end of their natural lives. This would both safeguard the core breeding stock, and maintain angling interest. Protection of the existing quality of trout spawning and nursery areas through bankside

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fencing is the appropriate habitat action, along with the easing of any obstacles barring or inhibiting spawning migrations.

## 6.2 Eye Brown-trout

**Input A - Definition and Extent of Eye Brown-trout :** A few published accounts of fishing on the Eye have been found and are given in Appendix D3a. From these records it can be judged that the Eye in the 19<sup>th</sup> and early 20th centuries had good population of 2 to 4 ounce trout, with just the occasional larger fish.

**Input B - The Habitat Conditions of the Nursery Areas of Eye Brown-trout:** As for Eye Sea-trout.

**Input C - Juvenile Stocks of Eye Brown-trout:** As for Eye Sea-trout.

**Input D - Data from Catch Records on Eye Brown-trout:** No angling diaries or competition records have been found for the Eye. Some records were made in the 1990's logbooks, but too few to be of use.

**Output - Management Levels for Eye Brown-trout:** Judging from the juvenile results, which is the only information available, the population is in a reasonable condition, but no Management Level can be set without more information. Protection of the existing quality of trout spawning and nursery areas through bankside fencing is the appropriate habitat action, along with the easing of any obstacles barring or inhibiting spawning migrations.

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## **7 SETTING THE MANAGEMENT LEVELS FOR THE GRAYLING OF THE TWEED**

Since Grayling have only been in the Tweed since 1855, it is unlikely that any distinctive stocks have developed in different parts of the system.

As an almost entirely catch and release fishery, a Management Level is not critical, but the high recapture rates of tagged Grayling show that (Appendix E4) limits on killing would be needed.

With the information gained from angler logbooks and other sources under the TTGI, advice has been given to individual angling clubs on size and catch limits.

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