# A preliminary assessment of the relationship between angling quality and flow on the River Wylye

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***Report to:*** ***Environment Agency, South-West Region***
IFE Report Ref No: T11068H7/2
Report Date: October 1998

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## 1. EXECUTIVE SUMMARY

i) This report summarises attempts made during 1997 to relate angling quality to flow on the River Wylye.

ii) Two primary methods were used, these being a walkover assessment and assessments from video footage. It was concluded that not enough data had been collected in 1997 to make a full analysis of these methods, although it was thought that other management practices, such as hatch control and weed cuts, may make it difficult to develop a relationship between flow and angling quality on this river

iii) It was recommended that further limited data was collected and analysed during 1998, before a decision is taken on whether to pursue the use of either the walkover assessments or the recording of video footage in a water resource decision making process.

## 2. INTRODUCTION

This study is designed to address widespread concerns regarding the impact of abstraction on angling quality on the River Wylye. The main objective is to assess the impact of flow changes on trout angling quality. The results of this assessment may be used to help set instream flow criteria.

This is an interim report which explores the data collected in 1997 at three sites on the River Wylye. It discusses the merits of the two methods used to collect information on angling quality and makes recommendations for future data collection.

## 3. METHODS

Three study sites were selected on the River Wylye. These sites were:-

- Bishopstrow bridge (NGR ST 898 437) to Norton Bavant Gauging Station (NGR ST 909 427).
- Codford Bridge (NGR ST 973 394) to the footbridge at Stockton (NGR ST 985 384).
- Confluence above Stoford (NGR ST 083 357) to South Newton Gauging Station (NGR ST 087 342).

Walkover assessments were made and video footage was recorded on three occasions at each of these sites during 1997 (Tables 3.1, 3.2, 3.3).

**Table 3.1. Summary of data collected for angler assessment study on the River Wylye at Norton Bavant.**

| Date | Walkover assessment of whole reach by Anton Ibbotson | Video footage | Daily Mean Flow (cumecs) at Norton Bavant Gauging Station |
|---|---|---|---|
| 23/05/97 | XX | | 0.577 |
| 26/05/97 | | XX | 0.588 |
| 10/07/97 | XX | XX | 0.525 |
| 19/07/97 | XX | | 0.508 |
| 21/07/97 | | XX | 0.511 |

**Table 3.2. Summary of data collected for angler assessment study on the River Wylye at Codford Bridge.**

| Date | Walkover assessment of whole reach by Anton Ibbotson | Video footage | Daily Mean Flow (cumecs) at Stockton Park Gauging Station |
|---|---|---|---|
| 22/05/97 | XX | | 1.256 |
| 26/05/97 | | XX | 1.224 |
| 09/07/97 | | XX | 0.844 |
| 10/07/97 | XX | | 0.856 |
| 20/07/97 | XX | | 0.756 |
| 21/07/97 | | XX | 0.736 |

**Table 3.3. Summary of data collected for angler assessment study on the River Wylye at South Newton.**

| Date | Walkover assessment of whole reach by Anton Ibbotson | Video footage | Daily Mean Flow (cumecs) at South Newton Gauging Station |
|---|---|---|---|
| 22/05/97 | XX | | 2.204 |
| 26/05/97 | | XX | 2.053 |
| 09/07/97 | | XX | 1.519 |
| 11/07/97 | XX | | 1.533 |
| 20/07/97 | XX | | 1.381 |
| 21/07/97 | | XX | 1.363 |

## 3.1 Walkover assessments

From the upstream end to the downstream end of each of the three study sites the main river was habitat mapped and assessed for angling quality on a scale of 0-3 ranging from unfishable (0) through to excellent fishing conditions (3). The method was to start at the top of the section and assess angling quality at a series of transects working in a downstream direction. Assessments were made every 50 paces or each time angling quality changed. A protocol for completing this work is included in Appendix A and a schematic depiction of the results is shown in Appendix C.

Habitat mapping was completed at the same time as the walkover assessments. Depth was measured at the deepest point and visual assessments were made of the dominant velocity type, dominant substrate type and percentages of instream and outstream cover.

Depth was the only parameter that was measured quantitatively. Velocity type was assigned to one of the categories in Table 3.4, based on the authors visual interpretation of visible flow. Substrate was placed into one of the broad categories in Table 3.4.

**Table 3.4. Velocity and substrate types used in walkover assessments.**

| **Velocity type** | **Substrate type** |
|---|---|
| Slack | Silt |
| Slow glide | Sand |
| Medium glide | Gravel |
| Fast glide | Rock |
| Riffle | |

After the habitat mapping each transect could be placed into one of the habitat types described in Table 3.5, based on the actual measures of depth and velocity type (Appendix B).

**Table 3.5. A list and description of habitat types identified on the River Wylye study sites.**

| Habitat type | Description |
|---|---|
| Shallow Slack | Smooth, low gradient water surface. Little visible flow (includes slack and slow glide velocity types. Depth <0.5m |
| Deep Slack | Smooth, low gradient water surface. Little visible flow (includes slack and slow glide velocity types. Depth >0.5m |
| Shallow Glide | Smooth, low gradient water surface. Visible flow (includes medium and fast glide velocity types. Depth <0.5m. |
| Deep Glide | Smooth, low gradient water surface. Visible flow (includes medium and fast glide velocity types. Depth >0.5m. |
| Riffle | Steep water surface gradient, with broken water. |

## 3.2 Video footage

Coinciding with the walkover assessments video records were made of a number of transects (Norton Bavant, 3 transects; Codford, 5 transects; South Newton, 3 transects) within the study reach (Fig. 3.1, 3.2, 3.3). All video footage was recorded with an SVHS camera, with a light polarising filter, when the sun was not hidden behind clouds to maximise the quality of the film record. The span of each shot was kept consistent between times and a ranging pole was placed in the river within the shot to give it perspective.

Several shots of each transect were recorded and the best one selected by editing for eventual assessment. The procedure for recording the video footage is included in Appendix A.

A preliminary and experimental assessment was made of the angling quality from the videos using assessors that would not be used in the final assessment. Those present at the preliminary assessment were David Bird (Fishery Scientist, EA), Charles Crandwell (Fishery Scientist, EA), Simon Steel (Fisheries Inspector, EA), Julia Sherwood (Hydrologist, EA) and Anton Ibbotson (Fishery Scientist, IFE). All assessors were asked to independently complete a proforma judging each the angling quality of each transect from the videos on a scale of 0-3 representing unfishable condition (0) through to excellent conditions (3). For a full description of the video viewing procedure see Appendix A.

The results from all the methods used on the River Wylye were analysed, compared and presented to draw preliminary conclusions and provide recommendations for future data collection.

**Figure 3.1 Schematic diagram of study reach on the River Wylye at Norton Bavant.**

**Figure 3.2 Schematic diagram of study reach on the River Wylye at Codford.**

**Figure 3.3 Schematic diagram of study reach on the River Wylye at South Newton.**

# 4. RESULTS

## 4.1 Norton Bavant

Of the two methods used for assessing angling quality only the walkover assessment demonstrated a positive relationship between flow and angling quality (Fig. 4.1).

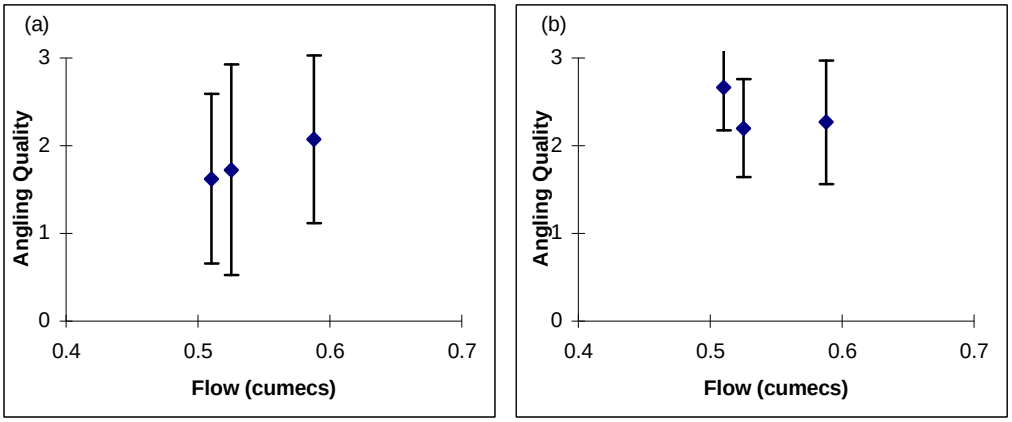


**Figure 4.1. The relationship between angling quality (a:- as assessed by Anton Ibbotson over whole reach; b:- as assessed by 1997 video footage) and flow (cumecs) at Norton Bavant (error bars represent standard deviation).**

Of the assessments of angling quality from the video footage the greatest score was given to the lowest flow. This result was consistent for all the video transects (Fig. 4.2).

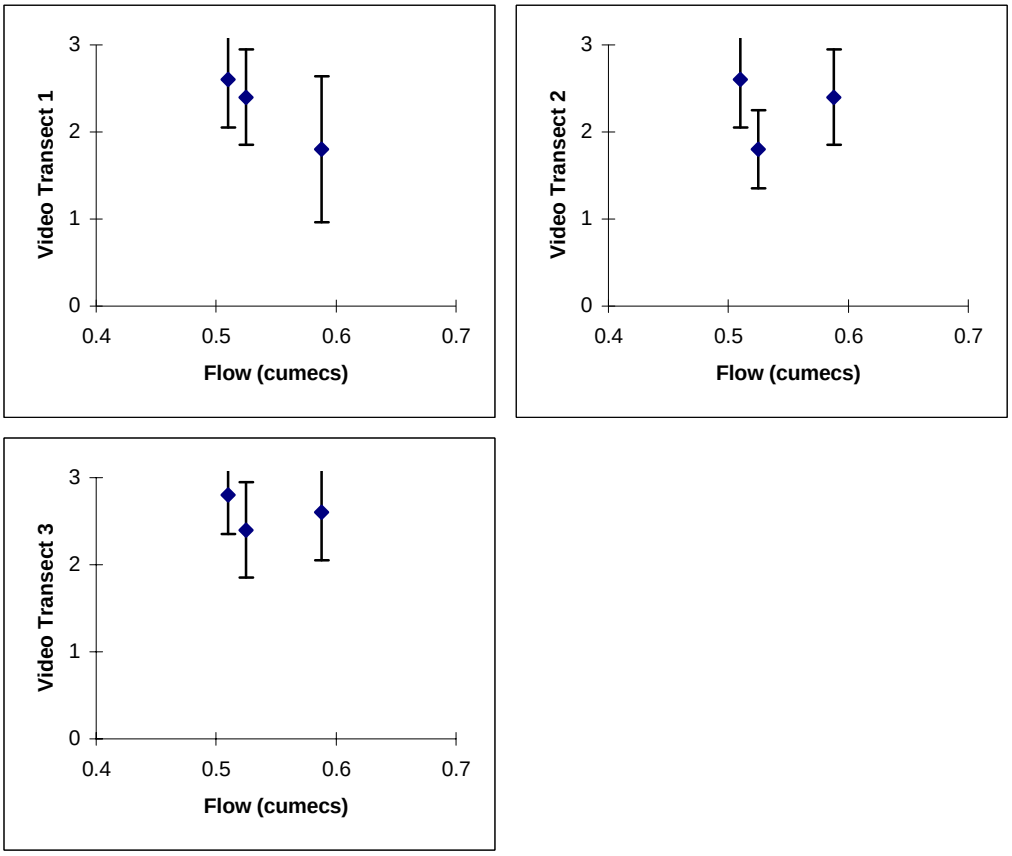


**Figure 4.2. The relationship between angling quality and flow on each of three video transects at Norton Bavant (error bars represent standard deviation).**

Of the three video transects viewed none demonstrated a relationship with the angling quality from the walkover assessments (Fig. 4.3).

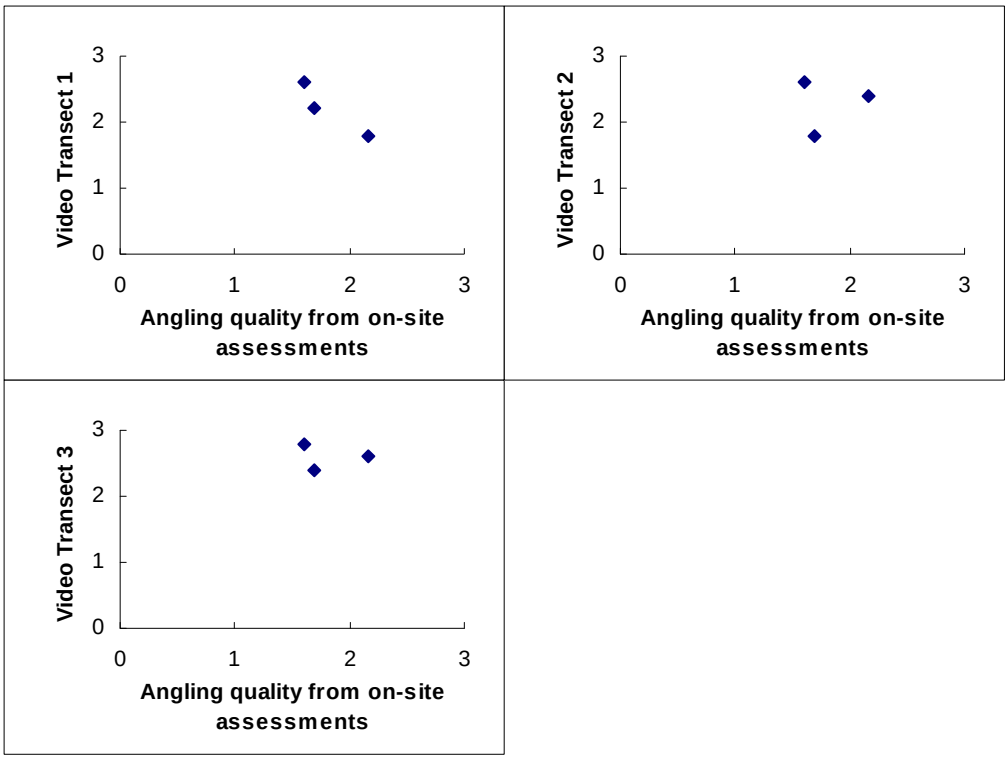


**Figure 4.3. Comparisons of angling quality assessed from each of three video transects and walkover assessment.**

Comparisons of the individual scores of the five video transect assessors with those of the walkover assessments showed that only assessor 2 scores were consistent with them. (Fig. 4.4).

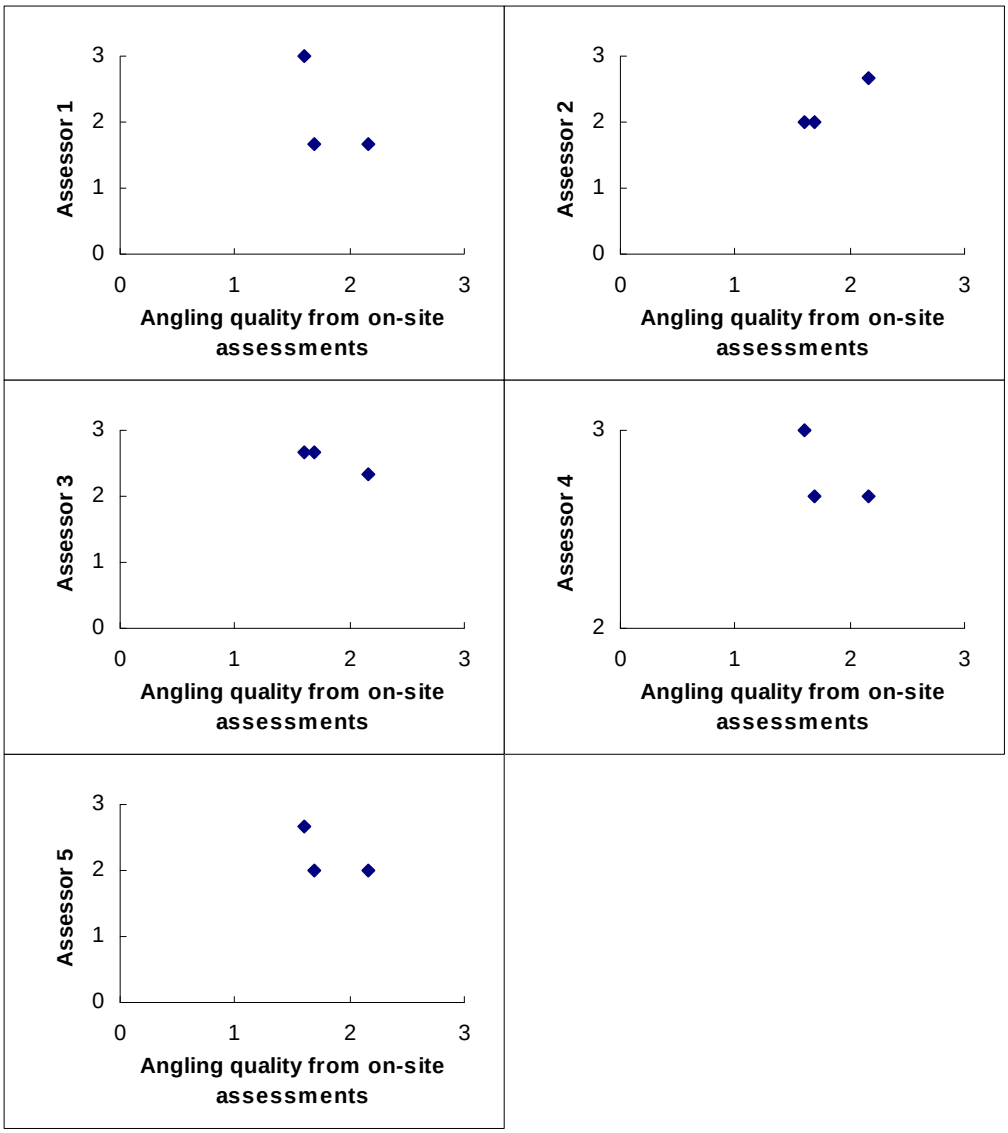


**Figure 4.4. Comparisons of angling quality assessed by individual assessors from three video transects and walkover assessments.**

## 4.2 Codford Bridge.

Both the walkover assessments and assessments made from the video footage showed a general decline in angling quality with decreasing flows (Fig. 4.5).

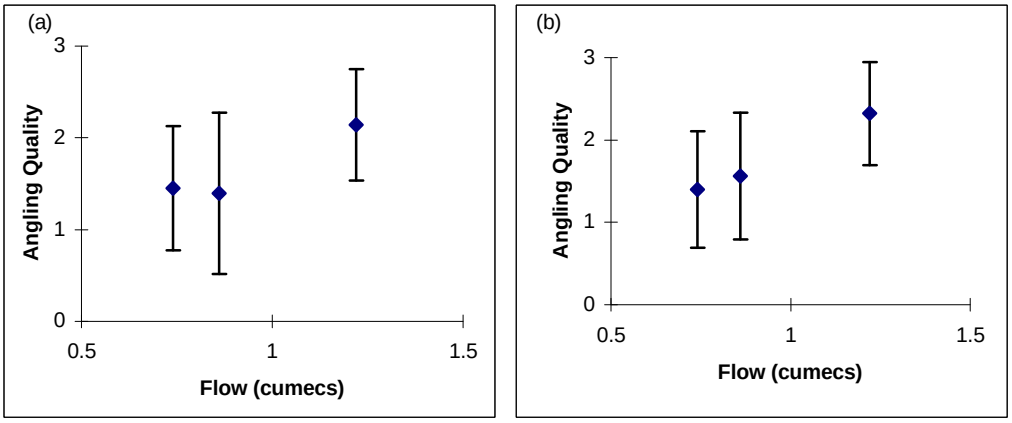


**Figure 4.5. The relationship between angling quality (a:- as assessed by Anton Ibbotson over whole reach; b:- as assessed by 1997 video footage) and flow (cumecs) at Codford Bridge (error bars represent standard deviation).**

Thus the two methods showed a correlation with one another (Fig. 4.6).

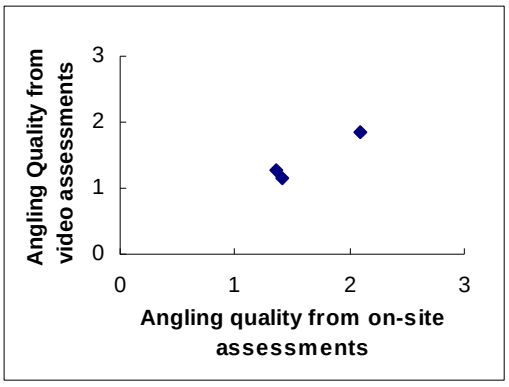


**Figure 4.6. Comparisons of angling quality assessed from video footage and walkover assessments at Codford Bridge.**

All five of the video transects viewed demonstrated a positive relationship between angling quality and flow (Fig. 4.7), as well as with the angling quality from the walkover assessments (Fig. 4.8).

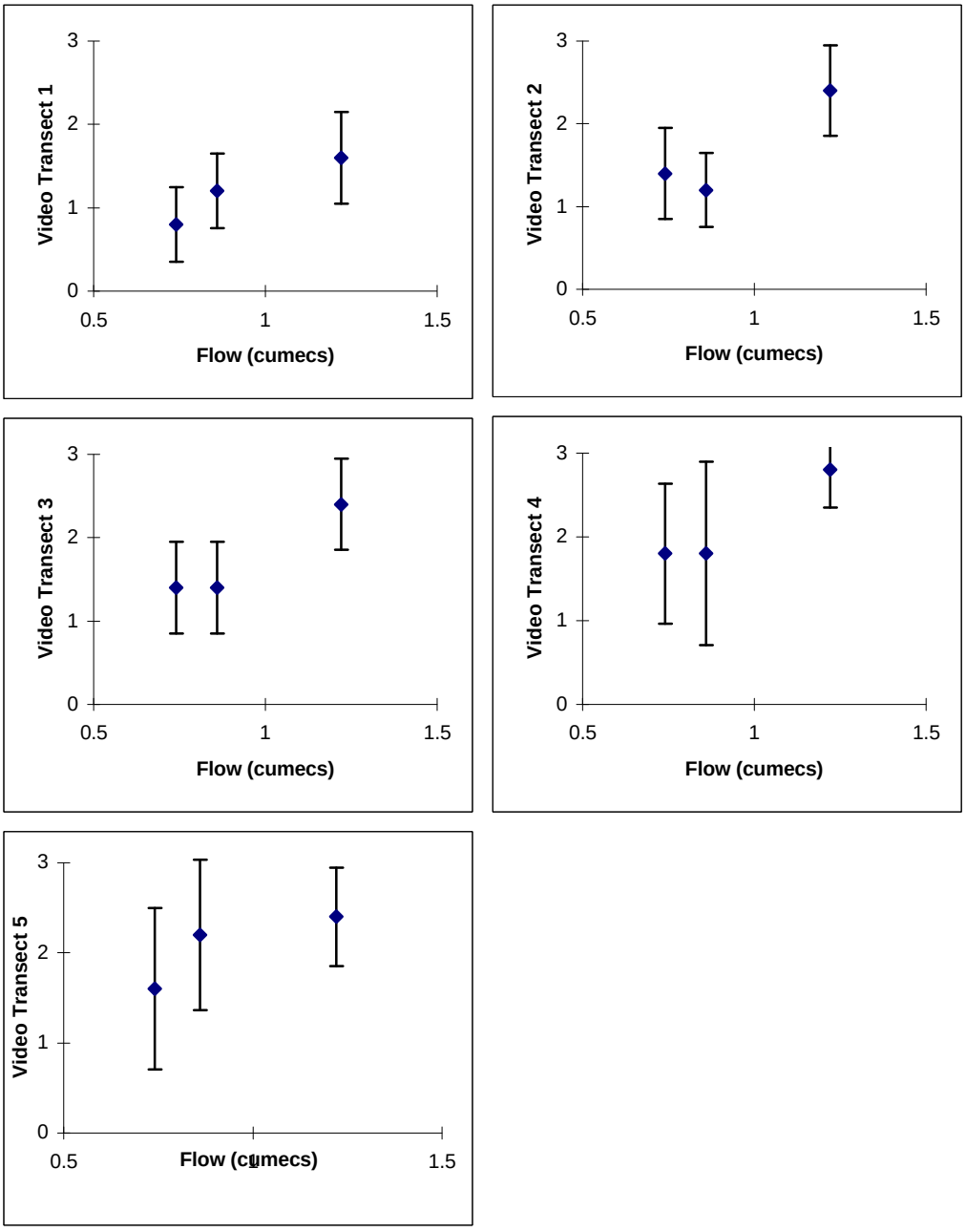


**Figure 4.7. Comparisons of angling quality assessed from each of five video transects and walkover assessments made on three different occasions at Codford Bridge.**

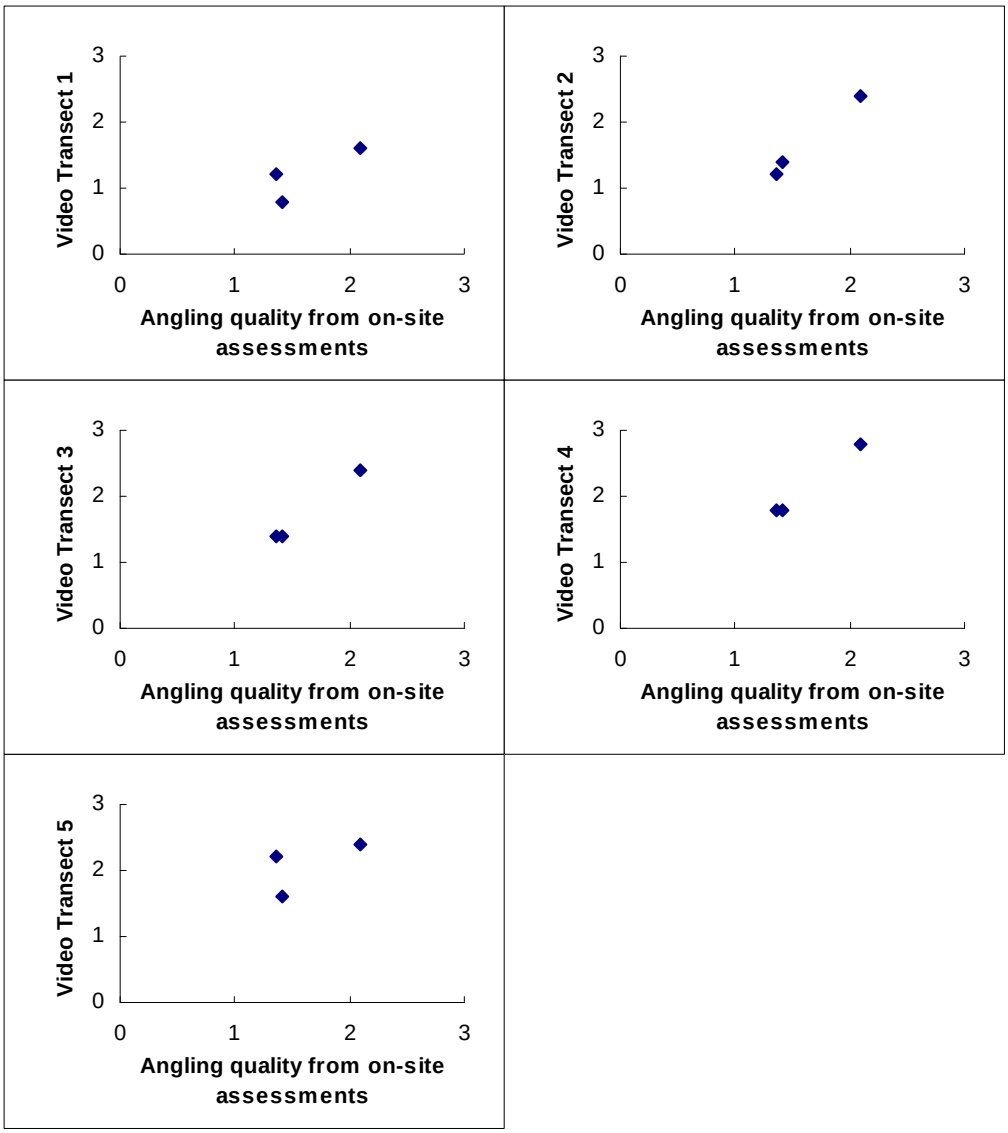


**Figure 4.8. Comparisons of angling quality assessed from each of five video transects and walkover assessments at Codford Bridge.**

However despite the generally good correlations between the angling quality as assessed from the video transects and the walkover assessments, not all individual assessors of the video footage had consistent results with the walkover assessments. Assessors 2, 3 and 5 were more consistent with the walkover assessments than assessors 1 and 4 (Fig. 4.9).

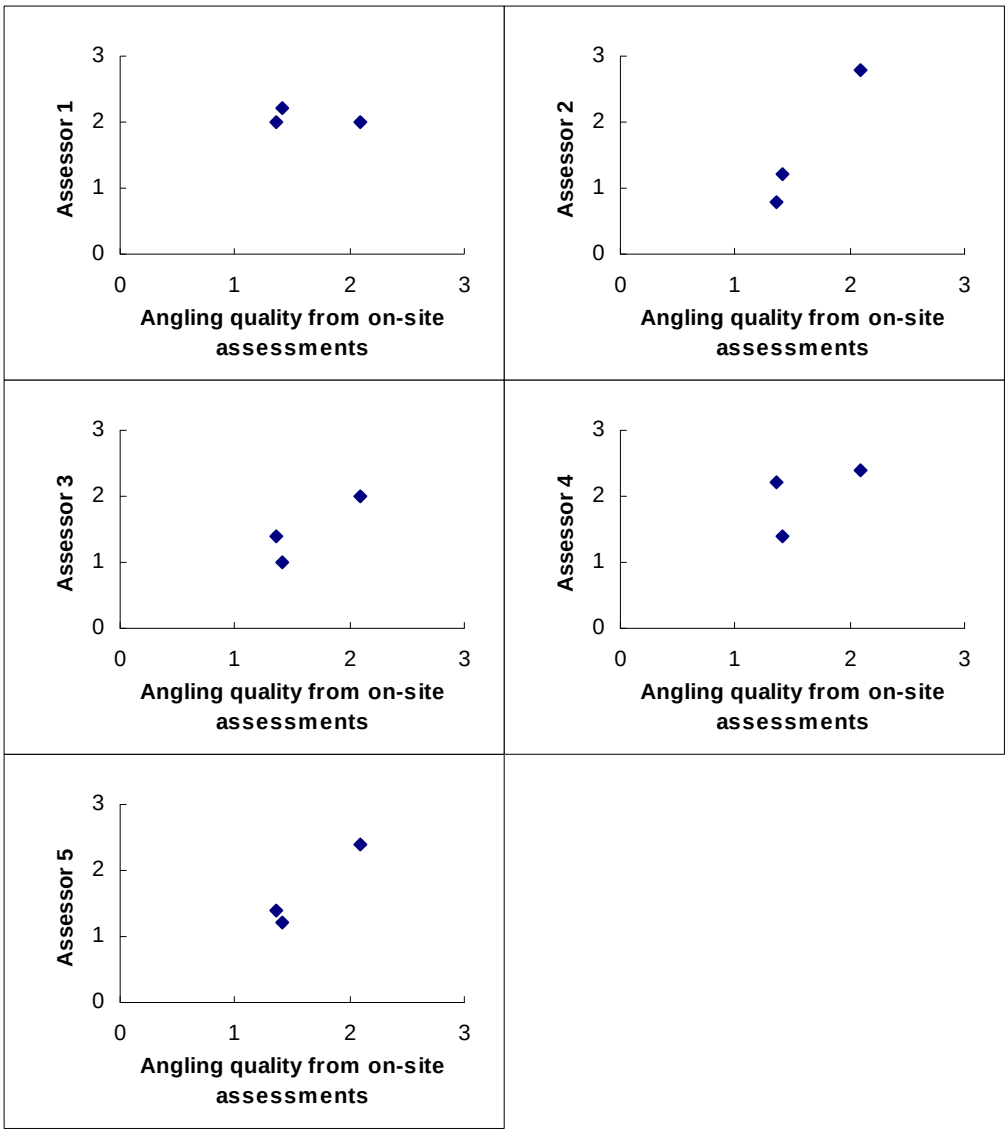


**Figure 4.9. Comparisons of angling quality assessed by individual assessors from five video transects and walkover assessments at Codford Bridge.**

## 4.3 South Newton

The angling quality from the walkover assessments and video footage declined with flow but there was very little detectable difference in angling quality at any flow with either method (Fig. 4.10).

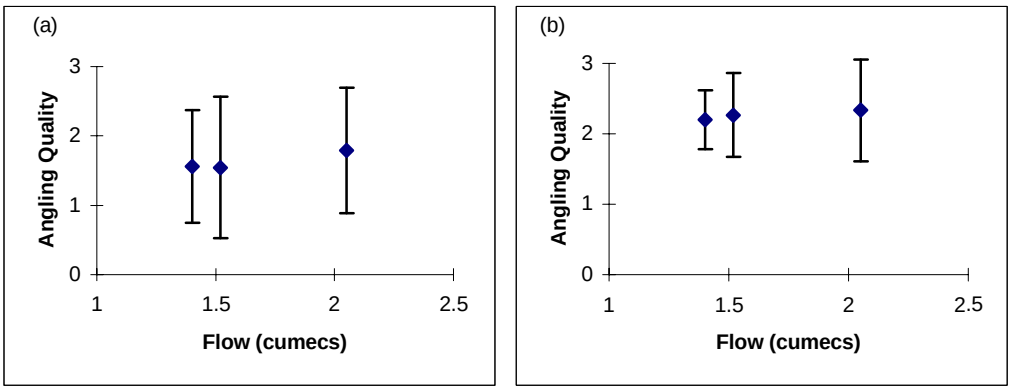


**Figure 4.10. The relationship between angling quality (a:- as assessed by Anton Ibbotson over whole reach; b:- as assessed by 1997 video footage) and flow (cumecs) at South Newton (error bars represent standard deviation).**

Of the three video transects assessed the highest flow was given the greatest score for both transects 1 and 2, but transect 3 showed a poor relationship between angling quality and flow (Fig. 4.11). Thus, angling quality assessed for both transects 1 and 2 demonstrate a positive relationship with angling quality from the walkover assessments, but transect 3 does not (Fig. 4.12)

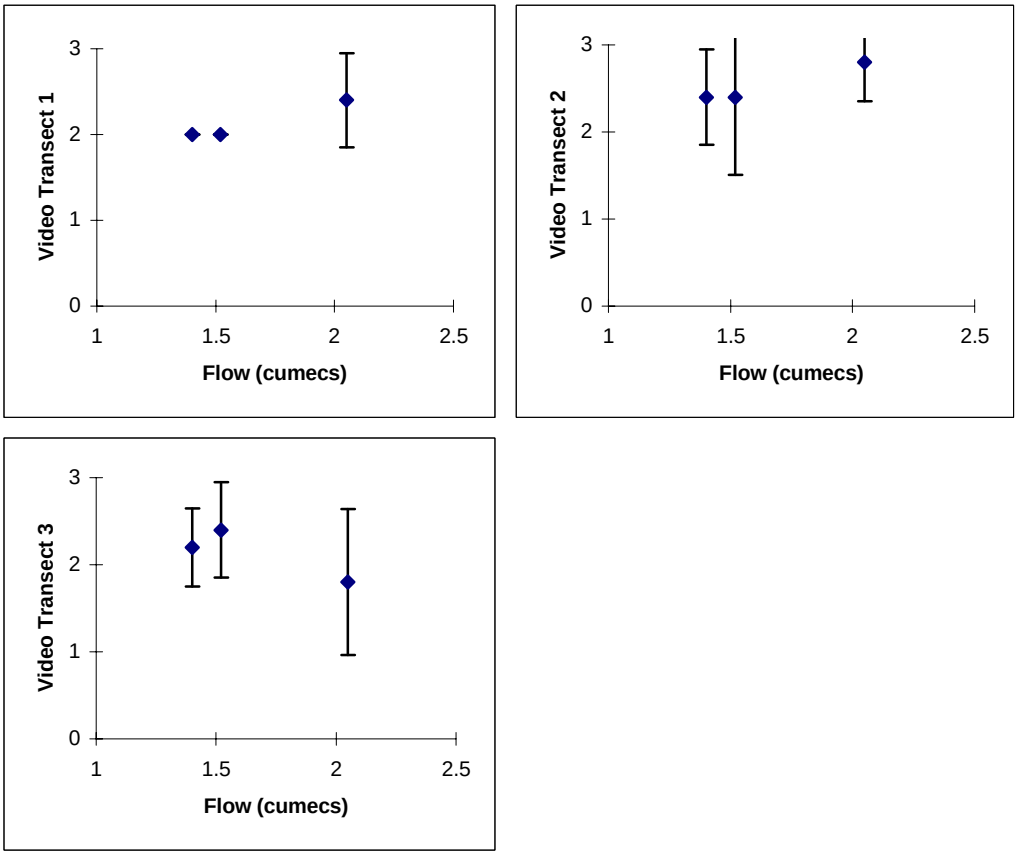


**Figure 4.11. The relationship between angling quality and flow on each of three video transects at South Newton (error bars represent standard deviation).**

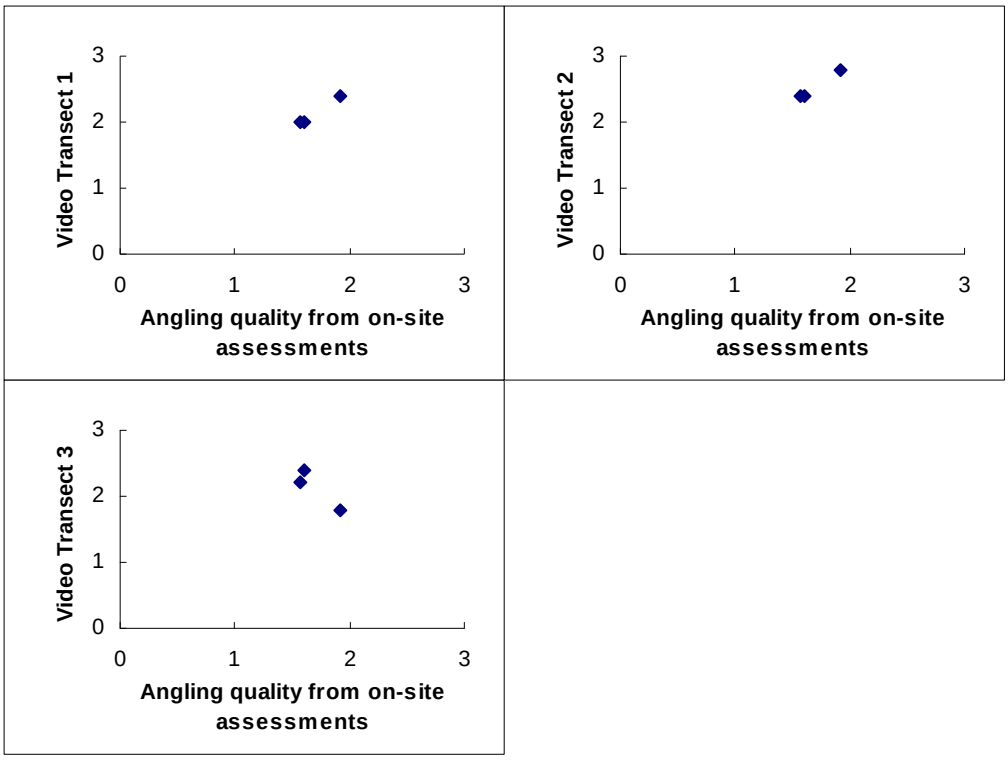


**Figure 4.12. Comparisons of angling quality assessed from each of three video transects and walkover assessments at South Newton.**

Of the five assessors used for the video assessments there appeared to be a general inability of all assessors to determine any relationship between angling quality and flow, with the possible exception of assessor 4 (Fig. 4.13)

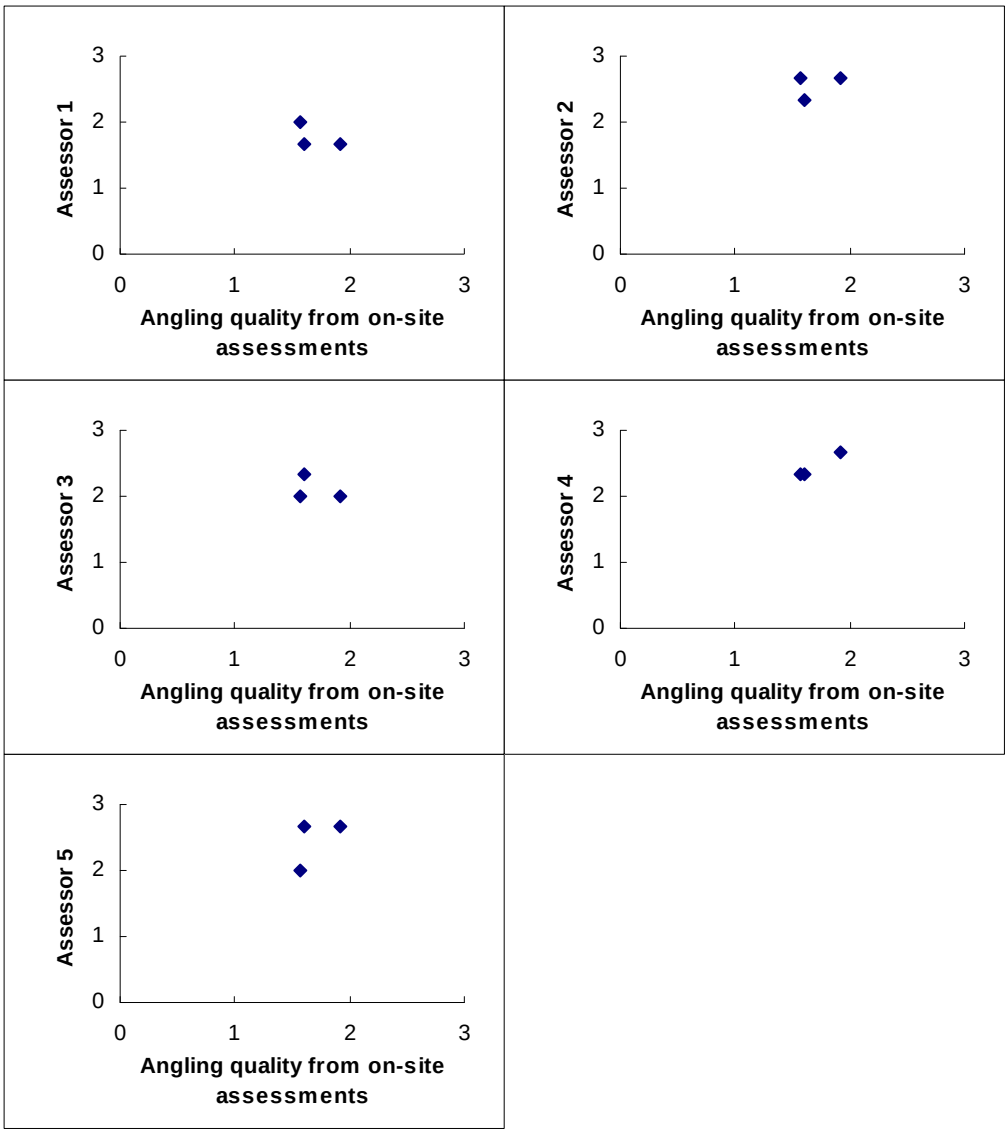


**Figure 4.13. Comparisons of angling quality assessed by individual assessors from three video transects and walkover assessments at South Newton.**

# 5. DISCUSSION

Overall, attempts to demonstrate a relationship between angling quality and flow on the River Wylye showed mixed results. Although the amount of data collected in 1997 was limited, of the three study reaches the most promising data came from the Codford Bridge site.

## 5.1 Walkover assessment of angling quality

This was the method which was most consistent at showing a declining relationship between angling quality and flow. Specifically, at Norton Bavant angling quality declined with flow; at Codford there was a general decline with the highest flow having the highest score; and at South Newton angling quality did decline with flow but the relationship was very flat.

However it is difficult to assess the value of this data for the following reasons:-

a) it only represents the opinion of one person,
b) there are only three data points,
c) at least at South Newton, large changes in flow had a small impact on angling quality,
d) whilst the data was collected it was noted that there were two other specific management practices which occurred which would also have an impact on angling quality other than flow. These were the presence and operation of hatches and weed cuts.

Despite the walkover assessment being completed by the same person, Anton Ibbotson, it was done using standard practices for habitat mapping which include actual measures of depth, for example. This would lead one to think that the angling assessments made by this method were a good reflection of true angling conditions at the time despite the lack of replication.

Ideally, any relationship between flow and angling quality needs to be developed using a large number of data points and one should expect scatter around that relationship. In part, this scatter will be caused by other management operations on the river and the more factors that affect angling quality, the greater the scatter will be.

The question that is difficult to answer is whether the presence and operation of the hatches, as well as the weed cuts, have a large influence on angling quality in respect to the influence that flow has. This, may for example, explain the flat relationship between angling quality and flow at South Newton. If they do, then this increases the number of data points that need to be collected to demonstrate a relationship between flow and angling quality. And even though such a relationship might be possible to develop, it may be of low importance to the management of angling quality on the Wylye.

In a similar study completed on the Malmesbury Avon (Ibbotson, 1998; Ibbotson & Lowans, 1996), it was recommended that walkover assessments should be continued because there were no other identifiable management processes that would influence angling quality and the habitat was variable and appeared to respond to changes in flow. However, the habitat of the current study sites on the River Wylye is homogenous and unresponsive to changes in flow (Appendix C). This is mostly a result of large areas of the study sites being backed up by hatches or copious amounts of weed growth. The risks of failure, therefore, of continuing this method on the River Wylye are greater than on the Malmesbury Avon.

If this method is to be used in a water resource management process it will need to be repeated by a specially designated panel of anglers at several flows. It is noted that Simon Steele (EA Fishery Inspector) is available to do this work in the future, but a number of local anglers should also be involved to help.

These anglers would not need to come on site all on the same day but could do the assessment when they were free. If they were given a target number of times to visit the river (e.g. 10 occasions between May and September) this could provide a statistically robust set of data. And if the walkover assessments proved to be successful they could play a role in validating the output from the video assessments.

### 5.2 Assessments of angling quality from video footage

This method was less successful at developing a relationship between angling quality and flow, particularly at Norton Bavant. A good relationship was developed at Codford but at South Newton the relationship was largely unresponsive.

As with the walkover assessments it is difficult to assess the value of this data for similar reasons, namely there are only three data points and, particularly, at Codford Bridge and South Newton the video transects were subjected to weed growth and cuts, altering their visual appearance markedly. At Norton Bavant all the video transects were given the highest score at the lowest flow, but otherwise the assessment of the transects was erratic.

It may not be coincidental that a better relationship between flow and angling quality as assessed from video footage occurred at the two sites where there were more video transects. The Norton Bavant and South Newton sites only had three video transects each. It is recommended that all sites have a minimum of five video transects.

An additional problem with these assessments was that the assessors used for the video footage were not all experienced fly fishermen and those individuals may have been making assessments from irrelevant cues. Comparisons between individual assessors of the video footage and the walkover assessments were mixed, although Assessor 2's results correlated well at both Norton Bavant and Codford Bridge. Comparisons for the South Newton site are difficult because angling quality appeared to be unresponsive to flow for both methods. Some of the other assessor's scores also appeared to show some correlation at Codford Bridge.

## 5.3 Why should angling quality change with flow?

The main hypothesis behind this study is that angling quality alters with flow. Angling quality could be measured in many different ways (e.g. number of fish caught per unit effort of angling; number of anglers visiting per unit time; angler opinion; number of fish present; behaviour of fish). In this study, it is angler opinion that is being used as the measure. To develop such a hypothesis it is worthy to try and explain why angling quality might change with flow.

In a similar study on the Malmesbury Avon (Ibbotson, 1998) values for angling quality from the walkover assessments showed a strong correlation with habitat type, namely deep glide, in the river at the time of the assessment and the amount of deep glide increased as flow increased.

Thus it appears that deep glide is a high quality habitat to the dry fly fisherman and quality over the whole reach is influenced by the proportion of this habitat present, which in turn was influenced by flow.

However, with the exception of Codford (Figs. 5.1 & 5.2) no positive relationships could be developed between flow and the percentage of deep glide available or between the percentage of deep glide and the angling quality.

This may have resulted because the other management practices, operation of hatches and weed cuts, previously discussed, have a large influence on habitat type and availability

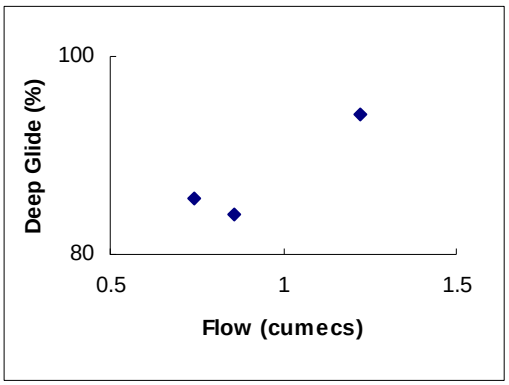


**Figure 5.1. Changes in the percentage of deep glide as a function of flow at Codford Bridge**

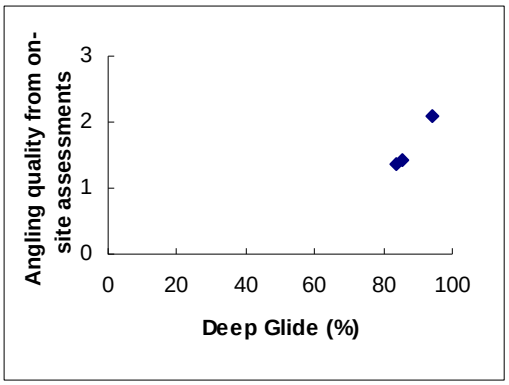


**Figure 5.2. Changes in angling quality with changes in the percentage of deep glide at Codford Bridge.**

## 5.4 Recommendations

Some more video footage has been collected during the summer of 1998, at all these sites and the number of transects has been increased to at least five at each site. It is recommended that all the footage collected to date is viewed by a panel of experienced fly fishermen only during the winter of 1998/1999 and proposals for future work of this nature on the River Wylye considered in the light of those results.

## 6. REFERENCES

Ibbotson, A.T. 1998. A preliminary assessment of the relationship between angling quality and flow on the Lower Malmesbury Avon. Report to EA South West Region, 15pp.

Ibbotson, A.T. & L. Lowans 1996 The use of angling quality criteria for setting flows in the Malmesbury Avon catchment: Data for medium and low flows. Report to EA South West Region, 54pp.

# APPENDIX A

PROTOCOLS FOR ASSESSING ANGLING QUALITY

**Procedure for walkover angling assessment.**

1. Start immediately at the top of the study reach and note this as transect 1.

2. Make assessment of dominant habitat type (see sheet) on transect.

3. Make assessment of dominant substrate type (see sheet) on transect.

4. Estimate the percentage of river bed covered by both instream and outstream cover on transect.

5. Make assessment of fishability from that position for both dry fly (upstream) trout fishing and wet fly (downstream) trout fishing on a scale of 0-3, where 0 = unfishable, 1 = poor, 2 = good and 3 = excellent.

6. Move in a downstream direction counting paces as you walk. As soon as habitat type or fishability changes stop. Make a note of the number of paces from transect 1 in the box next to transect number, enter number 2 in box below transect number 1 and repeat process.

7. Stop at the bottom of the study reach.

**Procedure for recording video footage**

1. Visits should only be made during conditions of bright weather and when flows are at a suitable level. This requires liaison with both EA hydrology staff and the Meteorological Office.

2. A preliminary visit needs to be made where individual transects should be chosen for recording videos. The following criteria should determine the location of these transects.

i) The quality of the video that can be obtained, that is high banks are easier to take video footage from than places level with the river bed.

ii) The suitability of the transect for fly fishing, for example, do not choose a place near a sewage outfall or a cattle drink.

iii) the potential of the fishability to change with flow levels, for example, do not choose a place immediately above a weir where the water will remain the same depth and have the same velocity over wide range of flows.

iv) transects should represent the habitat available in the fishery under study.

3 Once chosen the video camera should be set up, on its tripod and several preliminary shots should be taken and viewed with the view finder on the camera. Once the operator is content with the span of the transect and the positioning of the camera, the exact location of the camera should be marked with a peg.

4. When videos for angling assessment are to be taken a ranging pole should be placed in the river in the shot to give it perspective. Several shots should be taken over a period of 5-10 minutes to ensure that there will be a least one high quality.

5. It is recommended that the camera should be focussed on the substrate and use a polaroid filter to reduce glare. Filming should be done on bright days only. The span should not be longer than 10-15 m of river bank otherwise there is a risk of too much varying habitat being incorporated in the video shot.

**Procedure for viewing videos for assessment.**

1. Prior to viewing the videos should be edited and placed in order so that the assessor can view all the transects shot at one particular flow in sequence. Repeats of sequences should also be made.

2 Assessors should be asked:-

i) to view each transect in isolation from other transects

ii) after viewing each transect, to place a tick in box corresponding to the quality of the transect for dry fly angling, where 0 = unfishable, 1 = poor, 2 = good and 3 = excellent.

3. Before the assessment the assessor should be told:-

i) the objectives of the study

ii) that he is to imagine he is standing in the same position as the video camera and that his assessment should be of what the angling conditions would be like from that position and that position only.

iii) that there is no right or wrong answer to the assessments and that it is not the assessor that is being assessed

iv) that the ranging pole is there to give perspective and to help him with this a ranging pole will be placed at his side for reference.

v) that he may ask to see shots of each transect as many times as he likes before making the assessment.

4. At the assessment:-

i) the assessor will be kept separate from other assessors.

ii) each viewing transects at one flow will be separated from viewings at other flows by a break of half an hour filled with a mentally stimulating activity such as viewing an activity of interest.

iii) each assessment will be carried out in the same room with the same seating arrangements.

iv) a ranging pole will be supplied to provide visual comparisons with the ranging pole in the river.

v) repeats of some of the footage should be shown but the assessor should not be aware of this.

# APPENDIX B

# RAW DATA FOR WALKOVER ASSESSMENTS AND VIDEO FOOTAGE SCORES

# APPENDIX C

# SCHEMATIC DIAGRAMS OF HABITAT TYPE AND WALKOVER ASSESSMENT SCORES

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