Evaluation of the Close Season in Canals

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R&D Technical Report W96

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HO - 09/97 - B - BACK

Dissemination Status:
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Statement of Use
This report summarises the findings of research carried out to evaluate the impact of the close season in canals on fish populations. The information within this document is for use by Environment Agency staff to help in determining a uniform and consistent approach with regard to close season in canals.

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EXECUTIVE SUMMARY

The objectives of the study were to identify whether or not angling during the close season in canals was detrimental to fish populations. One of the first tasks was to define the criteria that could be used to identify what constitutes a canal, such that fish stocks in such environments can be managed as discrete populations. The criteria were developed with the primary requirement of providing a classification system which could be applied to populations in isolation from those contained in closely associated riverine environments.

A literature search was undertaken which confirmed that the main influence on fish populations in canals is the intensity of boat traffic. This has a marked impact on both productivity and community structure, at the extreme end of the spectrum populations being dominated by gudgeon. Whereas angling pressure can be comparatively high, all fish are returned. Evidence from Agency surveys show that many canals support moderate to good quality fish stocks and correspondingly fair to high quality angling. However, Agency fish survey data does not enable a direct comparison to be made between canals with and without a close season.

Examination of angling catch data demonstrates that angling effort tends to reflect angling opportunity and hence the presence or absence of a close season has an obvious impact. Although catch rates appear somewhat lower in canals with no close season, this is thought to be due to seasonal effects on catch rates. Peak activity in canals with no close season tends to be at times of year when catches are comparatively low, compared with peak activity in canals with a close season, which corresponds with periods when catches are relatively high. Significantly, in canals with no close season, there is no indication of a long term decline in catch rates and hence stock levels, in fact in many canals the reverse is true.

Consultation of expert opinion, using the Delphi Technique, confirmed the overall view from the data analysis that angling during the close season was not detrimental to fish populations. Following a series of interviews with angling organisations and the tackle industry the consensus was that removal of the close season would be beneficial in Socio-Economic terms.

Therefore the overall conclusions of this study are, that on the basis of the evidence examined, there would not appear to be any justification for maintaining a close season for coarse fish angling on canals.

KEY WORDS

Canals, Close Season, Angling Impact, Delphi Technique, Canal Classification, Socio-Economic Issues

1. INTRODUCTION

There is currently an inconsistent approach to the freshwater fish close season[1] in canals. In 1994, the National Rivers Authority (NRA) made and sought confirmation of fishery byelaws which would introduce national consistency in the freshwater fish close season. Whilst the majority of the proposals were approved, the Minister for Agriculture, Fisheries and Food considered that insufficient evidence had been presented to justify a change in legislation on canals and thus the regional *status quo* remained. However, the Minister, whilst not wishing to suggest that the close season be removed from canals which were currently subject to it without full consideration of all relevant factors, did state that, where anglers and canal owners felt that the close season should be ended on a particular canal, they should take the matter up with the NRA. It would then be for the NRA to consider each case on its own merits and propose the necessary change should it feel it to be justified.

Throughout the country there is widespread discontent with the current situation, the application of the close season in canals varying in different Environment Agency regions, and indeed within regions. The Agency in picking up its inherited duties from the NRA therefore wishes to remedy the situation and be consistent in its approach by establishing as uniform a position as possible with regard to the close season in canals.

The problem faced by the Agency in reaching a view on the issue, is the lack of information available on the impact and effectiveness of the close season, particularly with respect to fisheries dynamics and fishery performance. It is this area which the current project is intended to address. The study is limited to looking at historical data rather than starting new experimentation. There is a perceived frustration of the angling community regarding the canal close season issue and therefore this study is necessarily constrained by an appropriate timescale.

Specifically;

- 'Is there a noticeable difference between those canals where the close season has been lifted and those where it has not?'

- 'From a fisheries management point of view, are canals more akin to rivers or still waters?'

The strategy that has been adopted to provide answers to these questions comprises of four main elements as follows;

[1] Schedule 1 (4) of the salmon and freshwater fisheries act 1975 says 'if byelaws neither specify nor dispense with an annual close season for freshwater fish, the annual close season for such fish shall be the period between 14th March and 16th June'.

1) *Canal Classification* - a means of differentiating canals from other water bodies such that whatever management decision is made regarding close season, it can be applied effectively.

2) *Literature Review* - covering published data and unpublished internal reports on canals, close seasons and the impact of angling.

3) Data Analysis - examining fisheries survey data and angling data on selected canals offering an insight to the potential effects of maintaining or removing the close season on fish populations in canals.

4) *Expert Opinion Consensus* - application of the Delphi technique to establish the position of informed opinion on the issue of close season on canals.

In addition, the socio-economic impact of the removal or maintenance of the close season on canals was investigated by consultation with various organisations and individuals upon whom the close season has an impact.

2. CANAL CLASSIFICATION

One of the requirements of the study is to define what constitutes a canal. Agency Regions have commented that there is much confusion over how canals should be classified and hence there is a need for a clear definition such that close season byelaws can be applied effectively.

The 1968 Transport Act[2] attempted a broad classification of canals and came up with the following definitions;

- Commercial Waterways - canals still used for the commercial carriage of freight; including river navigations, tidal river navigations and larger ship canals.

- Cruising Waterways - canals principally available for cruising, fishing and other recreational purposes, including narrow canals (<7 foot beam) and broad canals (>7 foot beam).

- Remainder Waterways - No commercial or recreational value, minimal maintenance compatible with the requirements of public health and the preservation of amenity and safety.

With respect to the definitions given in the Act, this project is concerned primarily with cruising waterways. However, many such canals are connected to rivers, allowing direct and unimpeded access of fish populations in both directions from canal to river and *vice versa.* Hence in such a scenario fish populations in each water body cannot be regarded as discrete. This presents problems with respect to management of the coarse fish stocks, particularly because of the issues associated with application of the close season byelaws on rivers and streams. Hence the requirement to develop a classification system for canals which can facilitate the specific identification of their fish populations such that they can be managed in isolation from other water bodies.

During the process of developing a classification system the approach adopted has been to examine canal types from maps and identify problem areas and anomalies. A variety of organisations have then been consulted to determine their views as to what constitutes a canal, and as the classification develops, to comment on the proposals.

Most groups are in broad agreement as to what constitutes a canal. Typically a comparatively narrow, shallow artificial waterway, originally designed and built as a commercial navigation route, with negligible flow other than that derived from water

[2] Previous legislation, the 1962 Transport Act had transferred ownership and management of the nationalised canal network to British Waterways (British Waterways Board). A few canals such as the Bridgwater and Rochdale Canals remained in private ownership and hence strictly speaking outside the remit of this official classification.

resources and navigation. In addition they invariably have some form of towpath along most of their length except for short stretches, usually because of engineering difficulties.

However, anomalies in classification usually arise either where canals join other waterways, such as canalised or navigable rivers, or where specifically designed short bypass channels are encountered to provide access to navigation around obstacles (e.g. weirs).

With respect to the junctions between canals and rivers, as mentioned above, the main concern is the fact that fish stocks within such contiguous waterbodies are not discrete and can mix freely. Hence imposing an artificial line of demarcation, for example from where the river becomes canalised, would be nonsensical from the fishes perspective if no impediment to movement from the river to canal is encountered.

Similarly, short, artificial bypass channels into which fish can freely move do not represent a distinct and separate habitat to the adjoining river and thus cannot be sensibly regarded as such.

In light of the above it would appear prudent to consider a classification which takes the discreteness and isolation of the environment inhabited by the fish population into account. With this in mind it is suggested that a logical starting point from a fish management perspective would be to define the start of the canal as the first point at which fish stocks encounter an impediment to free movement, either from river to canal or canal to river. It is proposed that this is defined as an obstruction to fish movement[3] such as a lock, a blind ending canal, a weir, or other such structure (e.g. the Anderton Boat lift) which restricts the free movement and mixing of fish stocks. In practical terms this will often mean the canal begins and ends at the first and last locks prior to free access to a river.

Hence the following characteristics have been identified as being typical of a canal and are proposed as the basis for a classification.

- An Artificial Channel (cut) but not a main land drainage route.
- Artificially maintained water levels with negligible flow, other than that derived from water resources and navigation.
- Towpath over the majority of its length.
- Total length in excess of 250 metres.
- Commencing at the Pound(s) immediately adjacent to an impediment to fish movement - (i.e. a stretch separated by some physical obstruction from a river or stream and thus not allowing free movement of fish populations in both directions).

[3] An obstruction is defined as an impediment to free fish movement, at least in part. Hence individual fish could move through a lock, but this is dependant on other factors (i.e. boat movements) and is probably significant only at the individual level and is probably not significant when the stock as a whole is considered.

3. LITERATURE REVIEW

The literature review revealed a paucity of information on UK canals in general and close season in canals specifically. However, Pygott (1987) in his PhD thesis concerning the effects of boat traffic on canal ecosystems comments that much of the literature available centres on North American ship canals (typically large, deep navigations), with relatively little information pertaining to the narrow canals typical of England and Wales. A similar view is provided by Staples (1992) in her subsequent PhD thesis on ecosystem management in navigated waters.

In addition to the above academic publications a few specific but limited journal papers were accessed. However a large volume of fisheries survey reports were supplied by the various Agency regions providing useful background on fisheries in canals but with no specific detail on close seasons.

Staples (1992) states that there are 3,100 km of canal (navigable waterways) in Britain of which only 558 km actually still carry freight. Of the total, 1,877 km are designated as cruising or recreational waterways, 711 km are classified as remainder waterways. Boat users are the main source of revenue on canals although large numbers of anglers, over 0.75 million, fish them.

Pygott (1987) undertook a national questionnaire based survey aimed at gathering information on fish populations in canals. Typical species encountered include,

Roach,
Tench,
Gudgeon,
Common Bream,
Common Carp,
Chub,
Rudd,
Dace,
Eel,
Pike
Ruffe,
Perch,
Roach/Bream Hybrids.

The species mix above is typical of what might be anticipated in most canal systems having been confirmed by the Agency survey reports. However, it should be noted that many species are introduced into canals, such as carps, chub and barbel and some are not sustainable relying on stocking to maintain populations. Notable exceptions include zander, currently giving cause for concern in the Midlands canals.

In terms of the quality of the fishery, typical standing crop figures reported by Pygott from surveys undertaken by Severn Trent Water Authority in the early 1980s were of

the order of 12 g/m^2. From his own quantitative studies, Pygott reported standing crop values of between 10 and 20 g/m^2 depending on the level of boat traffic (see later). Similar figures, 9.5 to 13.1 g/m^2, were reported by Staples.

More up to date information from surveys undertaken by the Agency in the Midlands Region on the Shropshire Union Canal in 1989 (see Chapter 4) provided a biomass estimate of 12.25 g/m^2, the catch being dominated by larger fish, particularly carp and bream, the latter showing very high growth rates.

Data from a large fish kill following a silage pollution incident on the Birmingham and Worcester Canal revealed a much higher biomass than that above, totalling 35.4 g/m^2. This was comprised as follows;

Biomass of fish excluding eels & carp	11.1 g/m^2
Biomass of carp	22.8 g/m^2
Biomass of eels	1.5 g/m^2
Total Biomass	35.4 g/m^2

Interestingly, when the large carp are removed, the figure is remarkably consistent with the biomass reported elsewhere. A pollution incident on the Grand Union Canal undertaken by Thames Region revealed a biomass of 79 g/m^2, although it was unclear how the biomass was distributed among the population. Very high values have also been recorded on the Lee navigation (>100 g/m^2) although this level of biomass would not appear typical and is generally associated with some habitat feature and/or shoaling species.

Much of the information received from the Agency regions (Chapter 4) related to surveys instigated following complaints about the performance of fisheries. Although not a comprehensive sample, problems exist on canals which have a close season and those which do not. One respondent, commented that in his view a major influence on the decline of many canal fisheries was the introduction of so-called 'exotic' and 'alien' species to canals such as ghost Koi, mirror and common carp, chub and barbel. As was discussed above, such introductions can have a marked impact on the distribution of biomass within a canal stretch.

However, Pygott demonstrated that, water quality aside, the most significant impact on canal fisheries appeared to be frequency of boat traffic, a factor also severely impacting upon the macrophyte and macroinvertebrate communities. With respect to plants, the number of species present was optimum at a moderate level of traffic; too low and single species begin to predominate, too high and boat induced damage reduced the number of species. With increasing boat movements macroinvertebrate density and diversity decreased, the more sensitive species being progressively removed (Pygott *et al*, 1990).

Although the fish standing crop was more resilient than that of the macrophytes and invertebrates, at high levels of boat movements reductions in biomass were observed. The overall effect was to induce reduced growth, with smaller fish being present,

particularly with respect to roach. In general most canals are dominated numerically by roach, with significant biomass but comprising predominately small fish. For example, Staples observed roach comprised over 70% of the fish population by numbers and 80% by weight in the Leeds Liverpool Canal. However, such populations are frequently comparatively slow growing and stunted indicating that, due to a lack of predation, recruitment is usually not limited. This is because of a habitat induced shift in species composition, increasing turbidity due to a high density of boat traffic selecting against sight predators such as pike. At very high traffic densities, some species such as tench, pike and to an extent bream, were removed with benthic feeding gudgeon becoming dominant.

Staples (1992) refers to the impact of high levels of boat movement on physical habitat, reduced macrophyte densities impacting upon spawning substrate, fish refuge, nursery areas and invertebrate habitat. The effect of increasing turbidity on predators has already been mentioned, although it should be stressed that the removal of such population control gives rise to higher survival rates of young fish, increasing population densities and lowering individual size (stunting) where the food supply is finite and hence limiting.

Both Pygott and Staples observations have been confirmed in many of the Agency reports. For example a survey on the Kennet & Avon canal reported that 20% of larger fish had laceration marks associated with boat propellers, the threat of such damage forcing larger fish to modify their habitat, occupying the deepest part of the water course available. North West Region also cite increased recreational boat traffic during the spawning season as a major impact on fish stocks in canals, although no evidence was submitted to back this assertion.

Pygott's overall conclusion was that differences in the response of the component species resulted in different characteristic fisheries being present in canals depending on the level of boat traffic they are subjected to. This has important ramifications for data interpretation in subsequent sections of this project and should be borne in mind when interpreting data from different canals.

With respect to the impact of angling on canals during the close season no direct information has been found. However, several useful studies have been identified including work undertaken by Ayton (1976) on angling catch and its relation to available fish stock in the Midlands canals during the early 1970's. Although undertaken for different reasons to those which concern us here, this study was particularly interesting as it involved undertaking controlled angling matches in short isolated sections of canal which were subsequently quantitatively surveyed by seine netting. Moreover, much of the work was undertaken during the close season.

Studying on the Birmingham and Worcester Canal from 1970 to 1972, exploitation rates[4] during a competitive match varied between 1% and 16% (Ayton, 1972 & 1976). The average exploitation rate overall was 8% (Ayton, 1976). Interestingly the highest

[4] Number of fish caught by anglers divided by the population estimate derived from quantitative seine netting, not forgetting that all fish are returned to the canal.

catches, up to 16% occurred during the close season period (early June). This level of daily exploitation is in broad agreement with that reported elsewhere. For example when examining the use of data from the British National Angling Championships for stock assessment purposes, O'Hara & Williams (1991) estimated an exploitation rate on the Leeds Liverpool Canal of around 9%.

No published data on annual angling exploitation rates were found for UK canals, although figures have been published following a detailed study on a Belgian narrow canal, the Ath-Blaton (Gerard & Timmermans, 1991). The average annual exploitation rate was of the order of 55% overall. This was substantially lower than the level reported for one UK River, 94% on the River Trent (Cooper & Wheatly, 1981).

An examination of monthly catches on the Exeter Canal (Taylor 1995) confirms that experienced anglers (i.e. top three winning weights) perform well during the traditional close season period providing similar results to Ayton. However, less experienced anglers (as identified from the total weights from match returns) tend to increase their exploitation rate as the season progresses, building catches and improving efficiency over the spring period to a peak in the summer months.

Hence it would appear that whilst individual matches may not have a significant impact on fish populations in canals, typically less than 10% of the stock being caught on any one occasion, over a year a significant proportion, in excess of 50% might expect to be caught by anglers. Obviously the latter will depend on the general intensity of angling pressure including frequency of organised matches, but it should be borne in mind that this does not necessarily apply to entire lengths of canal.

4. STOCK DATA

4.1 Introduction

Although a robust routine monitoring programme exists throughout all regions of the country undertaken by the Agency and its predecessors it generally does not routinely cover canals. This is primarily due to the ownership of the majority of the system being in the hands of one body, British Waterways (BW), who have their own fisheries staff. However, BW staff resources tend to be targeted at management related issues, hence surveys are not routinely undertaken.

Where surveys are carried out the objectives have not been comensurate with the requirements of this project in relation to the impact of the close season but are primarily for some other purpose. Further much of the available survey data is unsuitable due to the presence of zander.

However, all Agency regions were contacted prior to the start of the project and relevant data requested. This Chapter provides an overview of the information received in relation to the status of fish stocks in canals in general. The information discussed is therefore intended to aid interpretation of other data used in the project and to put such data on Canal fisheries in some form of context.

4.2 Results

Fish stock data in the form of reports was received from most of the Agency Regions which had undertaken surveys. As a rule most investigations were in response to specific perceived problems with the fishery, although some were undertaken as information gathering exercises to classify the systems either for EU designation or River Quality Objective ratings. In the latter case, monitoring formed part of the routine rolling programme of surveys to determine the baseline status of the fish populations.

Generally, the species present conformed to the list provided by Pygott (1987), roach being typically dominant, with significant populations of bream in many canals. Perch were also present in many systems, with gudgeon being very important in the highly trafficked canals. Pike were common to virtually all canals, although biomass was extremely variable. Tench and carp were also frequently recorded, although the presence of carp was usually related to stocking. Chub and dace were also recorded in many systems but usually either as a result of stocking or commonly in locations where intersections with rivers were encountered allowing free movement of fish stocks. Occasionally relatively rare species such as the spined loach were also recorded (e.g. Grand Union)

The age structure within canals was again very much along the lines described by Pygott (1987) and Staples (1992). Typically populations consisted of large numbers of small, juvenile fish. They were often stunted populations indicative of good

recruitment and a lack of predation. As mentioned previously, boat traffic was considered a major influence on community structure, often indirectly via loss of fringe habitat (vegetation).

Biomass data was available for many canals, although not specifically for those which would be of value for use in the data analysis in Chapter 5. However, the information available was useful in providing an indication of the status of canal fisheries. Table 4.1 provides a summary of biomass data extracted from the many reports submitted by Agency regions.

Table 4.1 Biomass Estimates for Typical Canals

AGENCY REGION	CANAL	TYPICAL BIOMASS g/m^2
South West	Bridgwater & Taunton	35
North East	Stainforth & Keadby	30-52
Southern	Royal Military Canal	15-42[5]
Anglian/Thames	Grand Union	7- 30
Thames	Lee Navigation	3-20
Midlands	Shropshire Union	12
Midlands	Montgomery	26

Although some canal fisheries contain very high stock levels, most appear to be able to support fish populations at around the 20 to 40 g/m^2 level. This represents good quality wild fisheries (typically levels above 20 g/m^2 being considered adequate). As discussed previously many of the higher biomass estimates were biased by inclusion of large individual carp, mostly introduced by stocking.

In addition in several systems, notably the Grand Union and Exeter Canals fish distribution was often patchy. There was a high level of association with prominent habitat features, typically with macrophyte stands in turning pounds etc., around bridges and so on. In the most heavily trafficked canals the habitat available was extremely homogenous, with very little in the way of vegetation.

[5] Biomass as high as 103 g/m^2 has been recorded at isolated sites

However, from the regions where data are available, in general canal fisheries can be regarded as containing fish stocks which offer moderate to good quality angling. Highly trafficked canals contain stunted populations but the large numbers of individual fish are attractive to match anglers. In the most heavily trafficked scenarios, small bottom feeders, typically gudgeon predominate.

4.3 Conclusion

It was not possible to make a direct comparison of fish stock/biomass between canals with and without a close season. Therefore it has not been possible to demonstrate any direct impact on fish stocks from survey data.

5. ANALYSIS OF CATCH DATA FROM ANGLING MATCHES ON CANALS

5.1 Introduction

The use of catch data from organised angling matches is widely accepted as a valid method of monitoring the performance of a fishery. Axford (1979, 1991) reported that a close relationship had been observed in the River Nidd (Yorkshire) between estimated fish populations and angling catch rate. He suggested that monitoring of angling catches had a number of favourable features when compared with conventional survey methods, which were more selective with low efficiency and which were more expensive to operate. The use of angler catch statistics to monitor fisheries has proved to be particularly valuable in the case of large water bodies which are difficult to survey effectively by conventional methods. Catch data collected during organised matches has been used widely in studies on coarse fish populations in the former Severn-Trent region of the National Rivers Authority, for example in the lower River Trent (Cooper and Wheatley, 1981; Cowx and Broughton, 1986; Cowx, 1991), the River Derwent (Cowx *et al*, 1986) and on the River Severn (North and Hickley, 1989). A study on the status of the coarse fish populations of the Exeter Canal which was based on the use of angling match catch data was reported by Taylor (1995), and this study is particularly relevant to the present investigation into the close season issue on canals.

The data typically collected in this type of investigation have been summarised by Cowx (1991) and include location, date and duration of the match, the number of anglers fishing and the number actually catching fish, the total weight of fish caught, the top three individual weights, and the species caught. The measures of angling success most commonly used in subsequent assessments of the performance of the fishery concerned have been the percentage of anglers catching fish and the overall catch rate per angler, usually expressed as grams per angler per hour. However, Taylor (1995) in the report on the Exeter Canal fishery, also used the average catch rate for the top three weights, which he regarded as producing a reliable indicator of fishery performance.

Gerard & Timmermans (1991) compared fish population estimates based on seine netting and angling catch estimates in a narrow ship canal in Belgium. In this study the measure of angling success used was the weight of fish caught per angler per day. As reported earlier they estimated that the total angling catch per annum represented about 55% of the total biomass present.

5.2. The Use of Match Data in the Present Study

After consultation with the Agency a short list of canals was produced which it was considered should show whether or not the presence or absence of a close season, or the removal of a previously imposed close season, had any detectable impact on the

level of fish stocks. Approaches were made to various organisations to see if they could make data available from angling matches on these canals for use in this study. Bodies approached included Agency regions, the National Federation of Anglers (NFA), individual angling clubs and the angling press. The NFA was able to provide a limited amount of data, but the most productive source of information was the published match results held by the Angling Times. Eventually five canals were selected for study, namely the Shropshire Union Canal, the Trent and Mersey Canal, the Grand Union Canal, the Stainforth and Keadby Canal, and the Exeter Canal (using data from Taylor, 1995). The Shropshire Union Canal and the Trent and Mersey Canal both had stretches where a close season was still in force from 15th March to 15th June inclusive (Midlands Region of the Agency) and other stretches where the close season had been abolished in 1989 (North West Region of the Agency). Examination of data from these two canals forms **Experiment 1** of the study. The length of the Stainforth and Keadby Canal involved had a close season in force until 1995 when it was removed. Examination of data from this canal forms **Experiment 2**. The Grand Union Canal is subject to a close season throughout its length, and the Exeter Canal has never had a close season. Data from these two canals have been used as controls.

A detailed examination of the back copies held by Angling Times for the relevant canals was carried out and the following information recorded for the years 1993 through to 1997:-

> location of match, date of report (the best approximation to the match date), the number of pegs (i.e. the number of anglers), and the weights of individual catches down to at least the third place, and in some cases as far as the sixth place.
>
> In the cases of the Grand Union Canal and the Stainforth and Keadby Canal, data from all the locations for which records were available were used. However, for the Shropshire Union and Trent and Mersey Canals, only those locations where there had been a reasonable number of matches spread over the period 1993 to 1997 were used in the data analysis. Details of the numbers of matches at those locations used on each canal in each year are given in Table 5.1.

In the absence of any information on the total weight caught by all anglers in a match, it has not been possible to derive figures for the overall catch rate per angler. It has therefore been necessary to rely on the use of data for the top three anglers, but as Taylor (1995) indicated, this does provide a reliable estimate of the performance of a fishery. Following advice from the NFA and the British Waterways, it has been assumed that all matches were of five hours duration. For each match the top three weights were averaged and then divided by 5 to give a 'top 3' catch rate, expressed in grams per man per hour (g/man/hr). This 'top 3' catch rate was then used in comparisons between matches in 'open' (i.e. no close season) and 'closed' (i.e. with a close season) sections of the Shropshire Union and Trent and Mersey Canals (Experiment 1) and between the 'open period' (i.e. from 1995 onwards) and 'closed period' (i.e. prior to 1995) in the Stainforth and Keadby Canal (Experiment 2). 'Top

3' catch rates were also calculated for the Grand Union Canal, and were taken from Taylor (1995) for the Exeter Canal, to provide control data.

5.3 Results

The total numbers of matches held in each calendar month (all years combined) for each canal are given in Tables 5.2a - 5.2d, graphically in Figures 5.1-5.4, with 'closed' sites or periods and 'open' sites or periods shown separately. The distribution of matches over the calendar year varied considerably, depending on whether they were in 'open' or 'closed' sections. In the 'closed' part of the Shropshire Union Canal the majority of matches took place during the autumn and winter months, whereas in the 'open' part matches were concentrated in the March to June period, with very few matches during the autumn and winter. The same trend was apparent in the Trent and Mersey Canal, although to a lesser degree. In the Stainforth and Keadby Canal matches were fairly evenly spread over the fishing season during the 'closed' period, but after the lifting of the close season in 1995 the majority of matches took place during May and June. In the Grand Union Canal matches were concentrated in the autumn and winter periods, with relatively few being held in the summer months. (This may indicate deliberate avoidance of the period when recreational boating was at its peak.) Angling matches were held throughout the year on Exeter Canal except during the coldest months. Historically more matches were held during summer and autumn, although recent years have seen a trend towards May and June being the busiest months.

The annual average 'top 3' catch rates for each location on each canal are given in Tables 5.3, 5.4, 5.5 and 5.6. This series of tables also summarises the annual average 'top 3' catch rates for all 'closed' and 'open' sites/periods on each canal, and the overall averages for all years combined.

Experiment 1:
In the case of the Shropshire Union Canal the overall tendency was for the 'closed' sites to yield a higher 'top 3' catch rate than the 'open' sites, which on average gave a figure 29% lower. This difference was statistically significant, ($p<0.001$). There was considerable year to year variation in the catch rates, but with no particular trends evident over the 5 year period. The Trent and Mersey Canal also showed a tendency for the 'closed' sites to produce a higher catch rate than the 'open' sites, but here the difference was much less, amounting to only 6.2%, was not statistically significant. Again there was considerable year-to-year variation, but with both 'closed and 'open' sections showing an increasing trend over the 5 year period.

Experiment 2:
The situation in the Stainforth and Keadby Canal was somewhat confused by the absence of any match reports from Gutteridge during the 'closed' period. If the Gutteridge 'open' period figures are included, the overall 'open' and 'closed' period catch rate figures are very similar, but if they are excluded the 'open' period matches produced catch rates 6.1% lower than those in the

earlier 'closed' period. However, in all the locations where matches were held both before and after the lifting of the close season there was a decline in catch rates in the 'open' period.

Controls:
The Grand Union Canal showed a marked tendency for catch rates to increase during the 5 year period, although the results are biased by particularly high catch rates recorded for two matches at Milton Keynes in 1996.

Annual average 'top 3' catch rates for the Exeter Canal are given in Table 5.7 Two separate time periods are covered by the data, 1977 - 1983 and 1991 - 1993. Average catch rates in the later time period were almost double those in the earlier period.

Because of the differing seasonal distribution of matches in Experiment 1 and in Experiment 2 it was considered advisable to examine catch rates in different months of the year. Monthly mean 'top 3' catch rates for all the canals for which data were derived from the Angling Times database are given in Tables 5.8a - 5.8d and data for the Exeter Canal in Table 5.9a. Data for average catch rates by all anglers in the Exeter Canal matches were also given by Taylor (1995) and these are shown in Table 5.9b. No pronounced differences were apparent for the experimental canals, although catch rates tended to be lower during April and May than during the summer and autumn months. In the Grand Union Canal catch rates were much higher in the few matches held during the July - August period than during the rest of the year. In the Exeter Canal 'top 3' catch rates tended to be higher in the spring and summer months with another peak in the winter, whereas the highest catch rates for all the anglers in a match were recorded during the summer months.

5.4 Discussion

The objective of the examination of these match records was to determine whether or not they revealed any evidence that all-year-round angling was having a harmful effect on stock levels as indicated by performance figures. In Experiment 1, where sections of canals with and without a close season were compared, there was a 29% reduction in the 'top 3' average catch rates in the 'open' section of the Shropshire Union Canal as compared with the 'closed' section. In the Trent and Mersey Canal there was a much smaller reduction of 6% in the overall catch rate in the 'open' section. The pronounced difference in the distribution of matches over the calendar year in the 'open' and 'closed' section on both canals, and the tendency for catch rates to be lower during the months of April and May, may partly account for the lower overall catch rates in the 'open' sections, particularly in the case of the Trent and Mersey Canal.

In Experiment 2 on the Stainforth and Keadby Canal there was a decrease in the 'top 3' catch rates after the lifting of the close season, but there was a significant shift in the distribution of matches over the calendar year which again confuses interpretation,

as catch rates recorded during the months of April and May were lower than those recorded later in the year.

When the data for the two canals included in Experiment 1 are examined over the 5 year period under consideration there is no evidence of a significant decline in catch rate with time. In fact, in the case of the 'open' section of the Trent and Mersey Canal there is an increasing trend between 1993 and 1997, paralleling that in the 'closed' section. However, in the case of the Stainforth and Keadby Canal (Experiment 2) there was an overall downward trend in catch rates after 1995.

The Grand Union Canal showed a significant increase in catch rates with time at all locations, but no possible explanations for this are available. The Exeter Canal also showed a significant increase in catch rates between the two time periods covered, but no explanations for this are suggested by Taylor (1995), although turbidity of the canal declined and the water became very clear. There could thus have been an expectation of reduced catches but Taylor (personal communication) suggests improvements in angling techniques may have compensated for the impact of changing angling conditions.

Most of the information in the literature on catch rates during angling matches quotes average catch rate for all anglers rather than the 'top 3' catch rates. However, Taylor (1995) gives figures for the Exeter Canal which can be used for comparison. In the 1977 - 1983 period the mean 'top 3' catch rate was 394.68 g/man/hr, and by 1991 - 1993 the mean rate had increased to 730.24 g/man/hr. The catch rates recorded in the present study for the Shropshire Union and Trent and Mersey Canals are of the same order as the 1977 - 83 figure for the Exeter Canal, with the Stainforth and Keadby Canal catch rates falling between the Exeter Canal figures. The overall figures for the Grand Union Canal are equal to or exceed the 1991 - 1993 figure for the Exeter Canal, suggesting that it is a particularly productive fishery.

5.5 Conclusions

The initial assumption which has been made is that catch rates provide a reliable indication of stock levels, and the justification for this assumption has been outlined in the introduction to this part of the report. The examination of match catches from the canals being studied has shown that overall somewhat lower catch rates were recorded in those parts of canals which have no close season when compared with those parts where a close season is still in force. Therefore the assumption has to be made that stock levels were lower in the 'open' canals. However, the differences were relatively small, and may partly be explained by lower catch rates during the normal close season months, coupled with the concentration of matches during these months in 'open' canals. There is also a great deal of variability in the data, which makes interpretation difficult. In the case of Experiment 1, where 'open' and 'closed' sites were in different regions of the canal there may be real differences in fish production not related to angling practices. For example, as mentioned earlier it is known that the amount of boat traffic can significantly affect fish biomass levels (Pygott, 1987).

The absence of any downward trend in catch rates, and therefore presumably in stock levels, in those parts of the Shropshire Union and Trent and Mersey Canals where all-year-round fishing has been taking place for several years suggests that recruitment has not been affected deleteriously. Indeed in the Trent and Mersey Canal the observed increases in catch rates indicate that stock levels may have increased in recent years in both 'open' and 'closed' parts. In the case of the Stainforth and Keadby Canal, only a short time has elapsed since the removal of the close season, thus it may be too soon to draw any conclusions.

The observations made on the Exeter Canal are particularly relevant, as this canal has never had a close season. Despite the fact that all-year-round angling has been taking place there, a significant increase in catch rates, and presumably therefore of fish stock levels, has occurred since the mid-1970's.

It is acknowledged that many factors can impact on fish populations in canals such as boat traffic, water quality and climate change. These were outside the scope of this report. Purely based on the evidence from catch records, it therefore seems reasonable to conclude that the absence of a close season is not having a significant deleterious impact on stock levels in the canals covered in this report.

Table 5.1 Number of Matches Each Year

Canal	Location	Closed/ Open	Number of Matches in				
			1997	1996	1995	1994	1993
Shropshire Union	Norbury	Closed	1	4	7	2	6
	Eaton and Onn	Closed	1	5	6	7	13
	Goldstone	Closed	2	4	10	6	15
	Autherley	Closed	1	5	10	11	1
	Wardle	Open	9	7	13	5	1
	Nantwich	Open	1	3	1	5	4
	Henhull	Open	9	5	4	7	3
	Market Drayton	Open	7	1	1	9	11
Trent & Mersey	Rugeley	Closed	1	2	4	3	5
	Colwich	Closed	3	1	1	2	2
	Trentham	Closed	0	2	0	3	9
	Stoke	Closed	0	2	5	8	6
	Middlewich	Open	4	9	11	7	5
	Northwich	Open	3	3	4	1	5
	Marbury	Open	4	4	1	3	1
	Wheelock	Open	1	0	0	4	4
		Open	1	2	3	2	2
Stainforth & Keadby*	Hatfield	Open	4	3	0	3	9
	Motorway	Open	3	8	14	3	0
	Gutteridge	Open	5	5	7	0	0
	Marina	Open	0	10	15	3	0
	Ladyline	Open	3	5	6	8	4
Grand Union	Northampton	Closed	2	3	11	8	7
	Long Buckby	Closed	2	8	13	1	1
	Leighton Buzzard	Closed	0	4	3	2	2
	Milton Keynes	Closed	0	2	4	1	3

*Closed prior to 1995 at all sites

Table 5.2a Numbers of Matches per Month - Shropshire Union Canal (All Years Combined)

	J	F	M	A	M	J	J	A	S	O	N	D	Total Number of Matches
'Closed' Sites	17	21	15	0	0	6	10	12	9	11	10	6	117
'Open' Sites	3	7	20	20	35	13	4	1	1	2	0	0	106

Table 5.2b Numbers of Matches per Month - Trent And Mersey Canal (All Years Combined)

	J	F	M	A	M	J	J	A	S	O	N	D	Total Number of Matches
'Closed' Sites	16	8	5	0	0	1	2	4	3	5	10	5	59
'Open' Sites	6	11	7	13	15	7	4	4	5	5	1	6	84

Table 5.2c Numbers of Matches per Month - Stainforth & Keadby Canal (93-94 Combined, 95-97 Combined)

	J	F	M	A	M	J	J	A	S	O	N	D	Total Number of Matches
'Closed' Sites	5	2	1	0	0	2	6	4	1	5	3	5	34
'Open' Sites	5	3	2	3	21	14	7	10	7	6	4	2	84

Table 5.2d Numbers of Matches per Month - Grand Union Canal (All Years Combined)

	J	F	M	A	M	J	J	A	S	O	N	D	Total Number of Matches
All Sites 'Closed'	11	15	8	0	0	2	6	3	6	16	5	6	78

Table 5.3a Annual Average Top Three Catch Rates (g/man/hr) - Shropshire Union Canal

Sites Open/Closed	Location	1997	1996	1995	1994	1993	All Years Combined
	Norbury	750 (1)	344 (4)	402 (7)	743 (2)	436 (6)	452g/hr
'Closed' Sites	Eaton & Onn	765 (1)	538 (5)	607 (6)	560 (7)	553 (13)	569g/hr
	Goldstone	585 (2)	552 (4)	441 (10)	455 (6)	451 (15)	467g/hr
	Autherley	469 (1)	476 (5)	515 (10)	417 (11)	539 (1)	469g/hr
	Wardle	302 (9)	371 (7)	354 (13)	323 (5)	234 (1)	336g/hr
'Open' Sites	Nantwich	316 (1)	332 (3)	444 (1)	360 (5)	434 (4)	378g/hr
	Henhull	377 (9)	249 (5)	495 (4)	304 (7)	247 (3)	339g/hr
	Market Drayton	518 (7)	295 (1)	1087 (1)	410 (9)	187 (11)	371g/hr

Numbers in brackets represent numbers of matches in year

Table 5.3b Annual Average Top Three Catch Rates - Sites Combined (g/man/hr) - Shropshire Union Canal

Sites Open/Closed	1997	1996	1995	1994	1993	All Years Combined
'Closed' Sites	631 (5)	481 (18)	485 (33)	489 (26)	489 (35)	493g/hr (117)
'Open' Sites	387 (26)	300 (16)	427 (19)	355 (26)	251 (19)	349g/hr (106)

Numbers in brackets represent numbers of matches in year

Table 5.4a Annual Average Top Three Catch Rates (g/man/hr) - Trent & Mersey Canal

Sites Open/Closed	Location	1997	1996	1995	1994	1993	All Years Combined
	Rugeley	584 (1)	611 (2)	482 (4)	274 (3)	401 (5)	437g/hr
'Closed' Sites	Colwich	661 (3)	731 (1)	558 (1)	521 (2)	644 (2)	622g/hr
	Trentham	-	653 (2)	-	205 (3)	341 (9)	356g/hr
	Stoke	-	408 (2)	425 (5)	375 (8)	254 (6)	355g/hr
	Middlewich	307 (4)	404 (9)	321 (11)	375 (7)	328 (5)	352g/hr
'Open' Sites	Northwich	449 (3)	326 (3)	467 (4)	431 (1)	526 (5)	453g/hr
	Marbury	808 (4)	409 (4)	134 (1)	256 (3)	234 (1)	462g/hr
	Billinge	745 (1)	614 (2)	293 (3)	228 (2)	215 (2)	374g/hr
	Wheelock	497 (1)	-	-	272 (4)	408 (4)	357g/hr

Numbers in brackets represent numbers of matches in year

Table 5.4b Annual Average Top Three Catch Rates - Sites Combined (g/man/hr) - Trent & Mersey Canal

Sites Open/Closed	1997	1996	1995	1994	1993	All Years Combined
'Closed' Sites	642 (4)	582 (7)	461 (10)	342 (16)	358 (22)	417g/hr (59)
'Open' Sites	542 (13)	415 (18)	337 (19)	316 (17)	386 (17)	391g/hr (84)

Numbers in brackets represent numbers of matches in year

Table 5.5a Annual Average Top Three Catch Rates (g/man/hr) Grand Union Canal - Control (Closed)

Location	1997	1996	1995	1994	1993	All Years Combined
Northampton	756 (2)	798 (3)	576 (11)	697 (8)	634 (7)	653g/hr (31)
Long Buckby	905 (2)	703 (8)	701 (14)	741 (1)	387 (1)	707g/hr (26)
Leighton Buzzard	-	1163 (4)	1328 (3)	696 (2)	700 (2)	1039g/hr (11)
Milton Keynes	-	2228 (2)	1408 (4)	423 (1)	359 (3)	1159g/hr (10)

Numbers in brackets represent numbers of matches in year

Table 5.5b Annual Average Top Three Catch Rates - Sites Combined (g/man/hr) - Grand Union Canal

	1997	1996	1995	1994	1993	All Years Combined
All Sites	830 (4)	1007 (17)	805 (32)	678 (12)	562 (13)	790g/hr (78)

Numbers in brackets represent numbers of matches in year

Table 5.6a Annual Average Top Three Catch Rates (g/man/hr) - Stainforth & Keadby Canal

Location	1997	1996	1995*	1994**	1993	'Open' Sites Combined	'Closed' Sites Combined
Hatfield	455 (4)	395 (3)	-	459 (3)	715 (9)	429 (7)	651 (12)
Motorway	296 (3)	509 (8)	548 (14)	835 (3)	-	505 (25)	835 (3)
Gutteridge	629 (5)	585 (5)	744 (7)	-	-	663 (17)	-
Marina	-	637 (10)	716 (14)	692 (4)	-	683 (24)	692 (4)
Ladyline	328 (3)	434 (5)	382 (3)	438 (11)	431 (4)	391 (11)	436 (15)

Numbers in brackets represent numbers of matches in year
* Matches after 15/3/95
** Includes matches up to 15/3/95

Table 5.6b Annual Average Top Three Catch Rates - Sites Combined (g/man/hr) - Stainforth & Keadby Canal

	1997	1996	1995*	1994**	1993	'Open' Sites Combined	'Closed' Sites Combined
All Sites	456 (15)	539 (31)	633 (38)	546 (21)	628 (13)	567*** (84)	577 (34)

Numbers in brackets represent numbers of matches in year
* Matches after 15/3/95
** Includes matches up to 15/3/95
*** 542g/man/hr if Gutteridge figures omitted

Table 5.7 Annual Average Top Three Catch Rates - Exeter Canal

	1977	1978	1979	1980	1981	1982	1983	1991	1992	1993	Mean 77-83	Mean 91-93
Annual Averages	236	263	446	599	481	448	461	731	677	829	394	730

The annual averages and 77-83 & 91-93 mean figures are from Taylor's Appendix 7

Table 5.8a Monthly Mean Catch Rates - All Years Combined(g/man/hr) -Shropshire Union Canal

	J	F	M	A	M	J	J	A	S	O	N	D
'Closed' Sites	413	445	500	-	-	684	529	498	491	489	557	512
'Open' Sites	338	271	313	243	354	445	569	(1166)	(692)	355	-	-

Bracketed figures indicate that only one match was held in these months

Table 5.8b Monthly Mean Catch Rates - All Years Combined(g/man/hr) - Trent & Mersey Canal

	J	F	M	A	M	J	J	A	S	O	N	D
'Closed' Sites	385	480	283	-	-	(947)	366	416	699	401	360	433
'Open' Sites	316	277	368	246	404	616	440	582	558	534	(272)	331

Bracketed figures indicate that only one match was held in these months

Table 5.8c Monthly Mean Catch Rates - All Years Combined(g/man/hr) - Stainforth & Keadby Canal

	J	F	M	A	M	J	J	A	S	O	N	D
'Closed' Sites	274	478	(484)	-	-	726	921	456	(522)	511	628	611
'Open' Sites	406	273	547	406	518	552	776	778	612	642	467	302

Bracketed figures indicate that only one match was held in these months

Table 5.8d Monthly Mean Catch Rates - All Years Combined (g/man/hr) - Grand Union Canal

	J	F	M	A	M	J	J	A	S	O	N	D
All Sites 'Closed'	596	511	704	-	-	1544	1556	1209	736	953	693	436

Table 5.9a Monthly Mean Top Three Catch Rates (g/man/hr) - Exeter Canal (From Taylor, 1995)

	J	F	M	A	M	J	J	A	S	O	N	D
1977 - 1983	457	106	106	390	713	631	380	538	342	421	311	336
1991- 1993	544	-	900	852	944	698	642	878	457	405	-	979

Table 5.9b Monthly Mean Average Catch Rates (All Anglers) - Exeter Canal

	J	F	M	A	M	J	J	A	S	O	N	D
1977 - 1983	-	1	14	52	75	90	72	103	68	98	109	37
1991- 1993	-	-	108	96	133	182	251	262	147	120	-	49

Figure 5.1

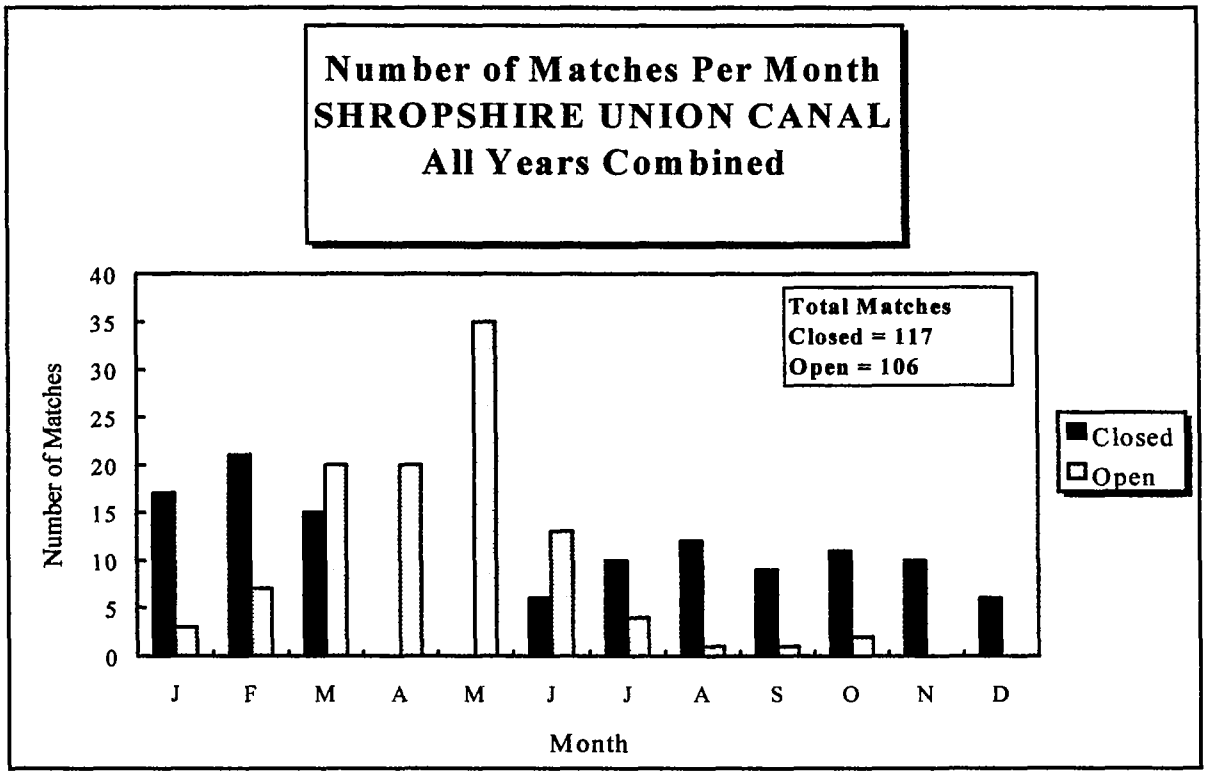


Figure 5.2

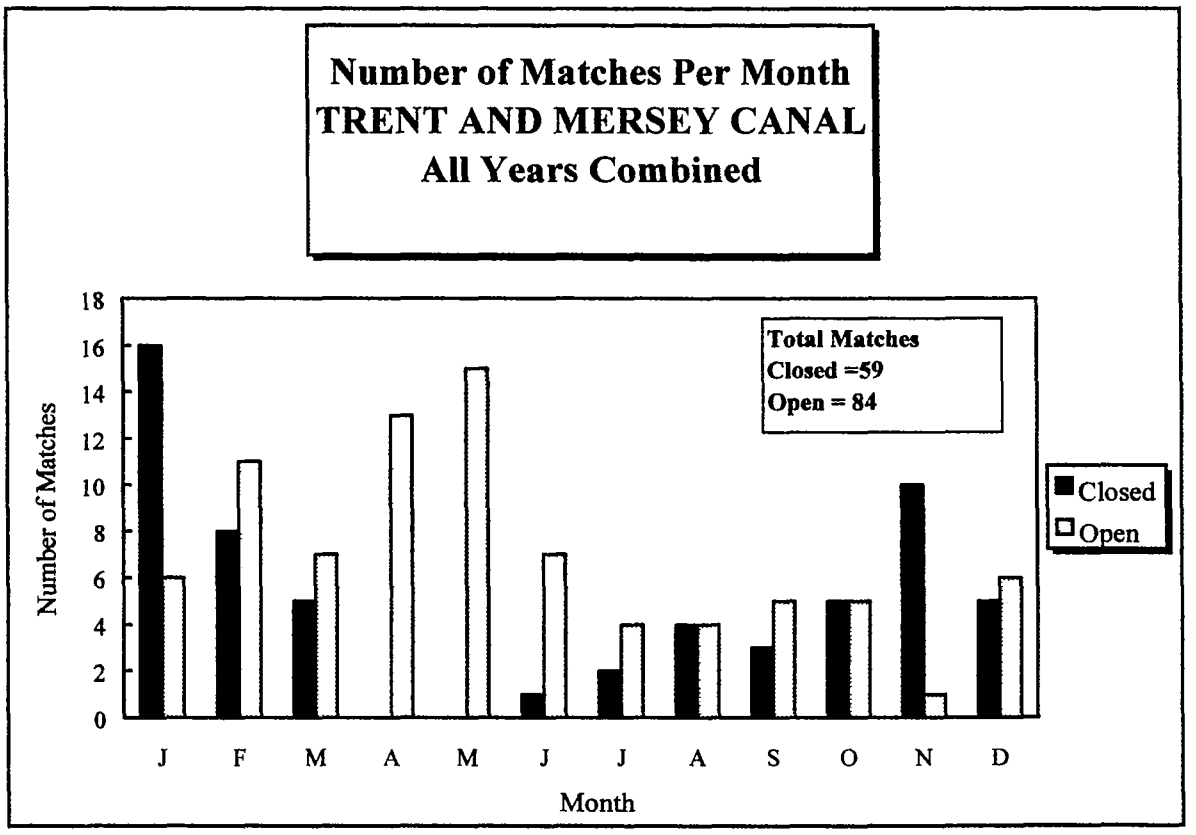


Figure 5.3

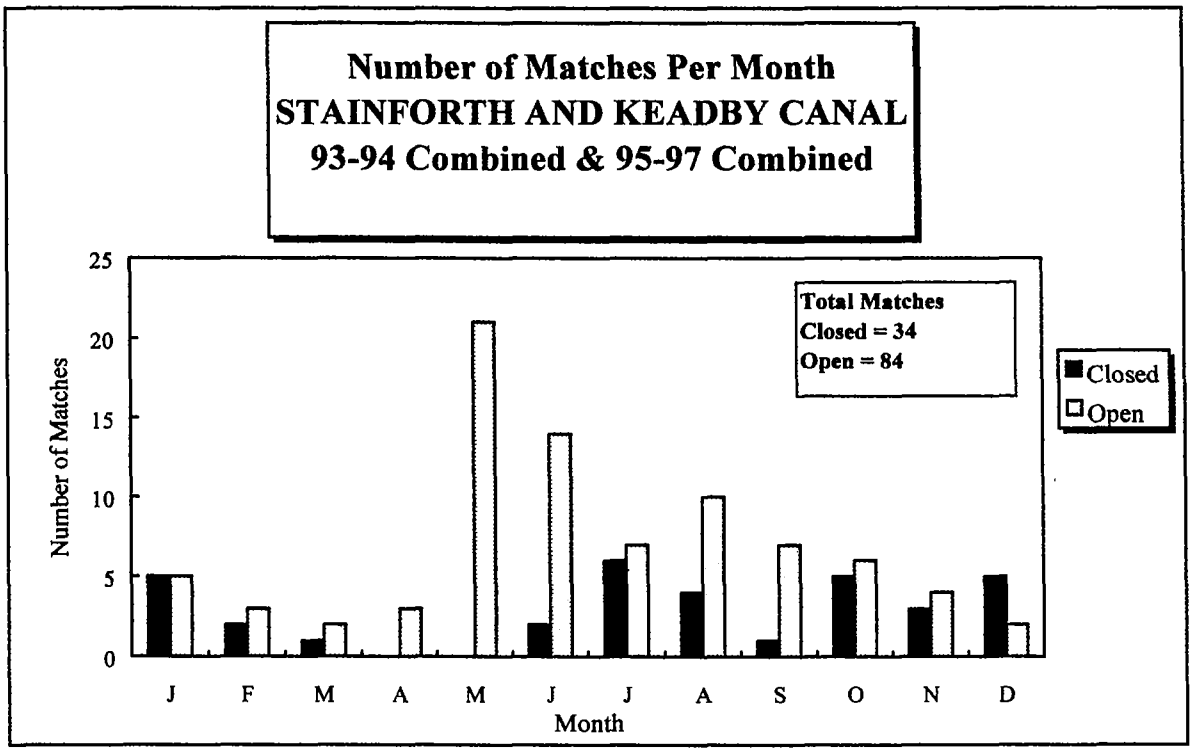
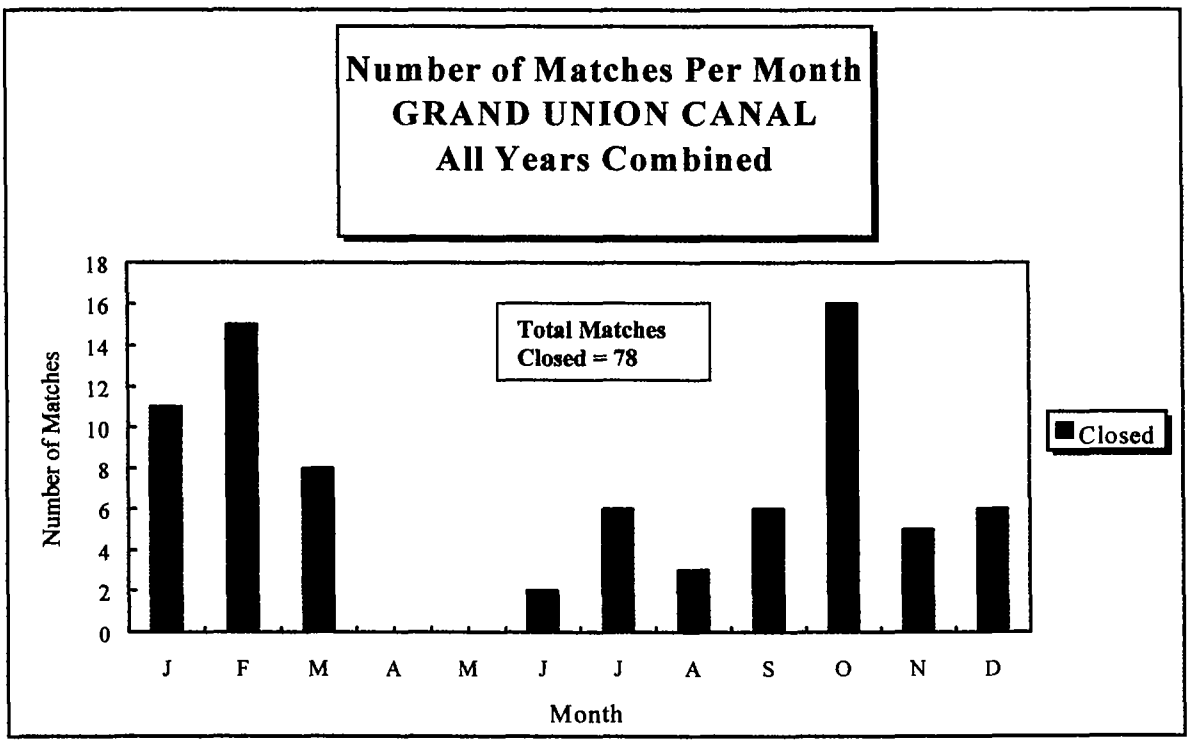


Figure 5.4



6. EXPERT OPINION CONSENSUS

6.1 Introduction

Due to the paucity of information on the issue of the close season and its effect on canal fisheries contained in the literature, an additional means of achieving an informed view was required. It was decided to consult individuals regarded as knowledgeable in this area with the objective of achieving a consensus of opinion. Whereas this in itself may not necessarily be regarded as definitive, in the absence of other data, it does provide an informed view with which to progress the issues further.

From North America, a methodology for undertaking an expert opinion consensus was identified known as the 'Delphi' technique. This methodology was originally developed during the cold war as a technological forecasting tool and has been adapted and used in such diverse areas as healthcare, transportation, environmental science and fisheries. Zuboy (1980) provides an overview of the technique and demonstrates an application of the technique to a fisheries problem.

In outline the technique involves identifying a group of experts knowledgeable in the area under investigation. The experts are then polled, usually by questionnaire. The results are summarised, generally determining the mean and ranges of the response to a given question. This information is then given to each respondent who is then asked to re-answer the question in the light of the 'new data' generated by the aggregate responses. Each respondent is given the opportunity to write a brief explanation of his subsequent response, justifying maintaining or changing their position as appropriate. These explanations are then provided to all the respondents in the next round. In this way, by undertaking several rounds of the procedure, a consensus opinion based on the mean or median of the responses is achieved.

6.2 Methodology

The Delphi technique proposed for the project was based on the following question:

> ***Do you think angling during the close season (between 14 March - 16 June) is either harmful or not harmful to coarse fish populations in canals?***

In order to maintain the focus of the experts involved the points below were emphasised;

- the question only relates to canals
- individual fish welfare is not a consideration
- answers should be targeted at the population level only

A scoring system (1 to 5) in the responses was proposed, asking participants to give a value based on whether they consider angling during the closed season is harmful or not to coarse fish populations in canals. The objective of this approach was to avoid the discrete variable which would result from a straight forward yes or no response. The latter has the potential to establish conflicting entrenched positions which would restrict subsequent room for persuasion and movement during the Delphi process, constraining a major advantage of the technique.

Therefore the scoring system adopted allowed a continuous variable to be generated which could then be plotted as a length frequency histogram representing the results from each round. The scoring system was defined as follows;

1 = No overall harm at all: to 5 = seriously damaging to the population

In addition, a graphic illustration of movement from previous rounds could therefore be provided, further influencing opinion by demonstrating the direction of movement in the overall consensus as the rounds progressed. A total of four rounds were proposed, thought to be sufficient to define existing positions and allow for movement following persuasion from the newly generated data on three occasions.

6.3 Expert Panel

One of the difficulties in establishing an expert panel on this issue is illustrated by the question;

"What constitutes an expert?
Is it a fish biologist, an angler or a riparian owner?"

Following consultation with the Agency's project board, the opinion of all three groups referred to above was considered valid. Therefore a panel was proposed which comprised individuals from;

- Fisheries Science
- Angling Community
- Canal Riparian Owners

Although individuals were selected on the basis of being associated with one of the above, the opinion expressed was to be their own and not that of their institution, association or employer. A fundamental issue was that the expert opinion, should be just that, an opinion expressed by a group of informed individuals and not the institutionalised view of organisations whose internal requirements may constrain the independence of individuals.

On this basis a short-list of 20 experts was identified, with 12 being selected for inclusion on the panel.Following commencement of the study one was unobtainable for the initial period resulting in a reduction in the panel to 11 members. Therefore to maintain consistency, the Delphi study proceeded with a panel of 11.

Anonymity of the individuals involved was maintained throughout the duration of the study, an important element of the technique, such that reputations are prevented from influencing the weight of argument put forward. The identity of the panel members is provided in Appendix I.

6.4 Results

The results of the four rounds are shown in Figures 6.1 to 6.4. The written responses from individual participants can be seen in Appendix II.

Following round 1, the mean score was 2.18, with a range of 1 - 4. During the course of the experiment the range of responses narrowed to 1 - 3, with a corresponding decrease in the mean to 2.0 by round 3. There was no further movement from round 3 to round 4, confirming that this was the logical consensus point at which expert opinion had converged. Throughout the process the movement that took place was in the direction of no overall harm.

6.5 Conclusion

The conclusion from the Delphi study is that angling during the close season is on balance not harmful to fish populations. Whilst a score of 1 would indicate no harm at all, the fact that by round 4 none of the respondents considered that angling during the close season was harmful (as indicated by a score greater than 3), provides a clear result.

Examination of the respondents individual comments during each round provides an indication of the reasoning behind this score, particularly for those respondents who did not move from a score of 3. A synthesis of perhaps the most common argument is that fish in canals may be in a stressed environment in any case, with increased boat traffic being the most significant influence on populations. Angling during the close season is considered an additional stress by some, which may compound the effects of the more prominent environmental problems. Hence, consideration of this somewhat special case precludes them giving a lower score in the absence of direct scientific evidence to the contrary.

However, the weight of this somewhat conservative argument is not enough to justify any of the respondents returning any level of score indicating that angling is harmful to populations. With this in mind, the expert consensus opinion of the assembled panel of experts is;

"angling during the close season is not harmful to fish populations."

Figure 6.1

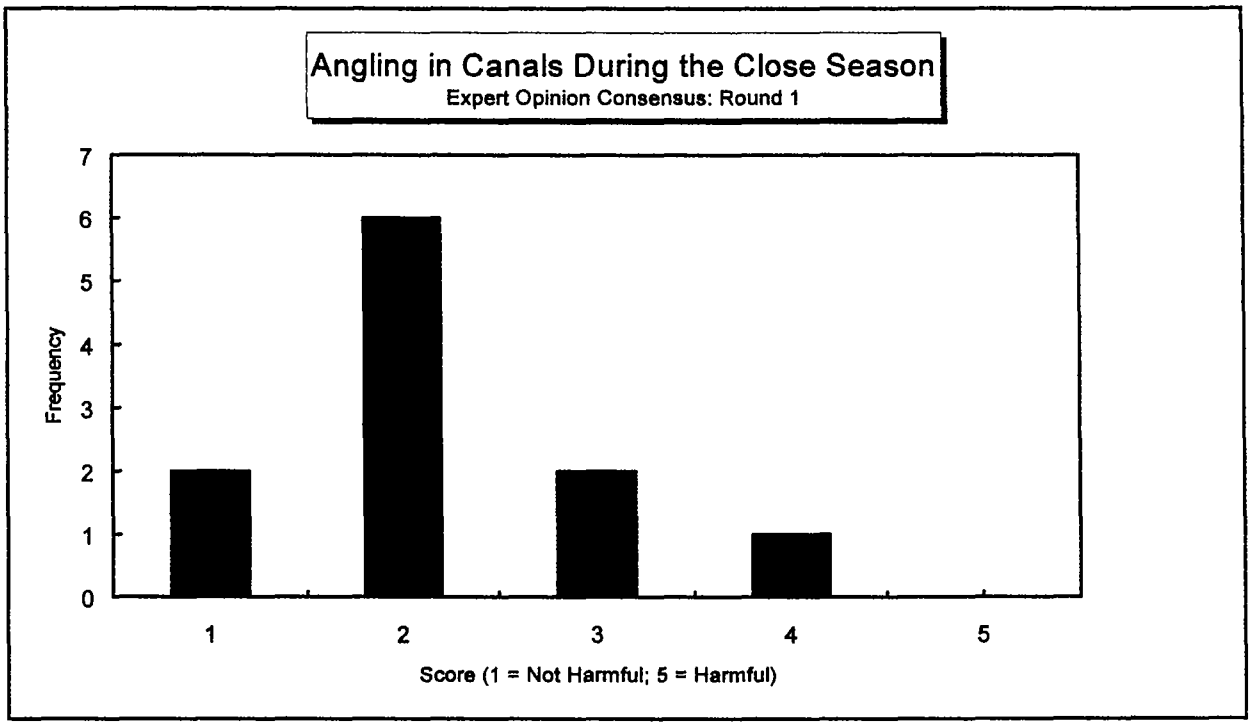


Figure 6.2

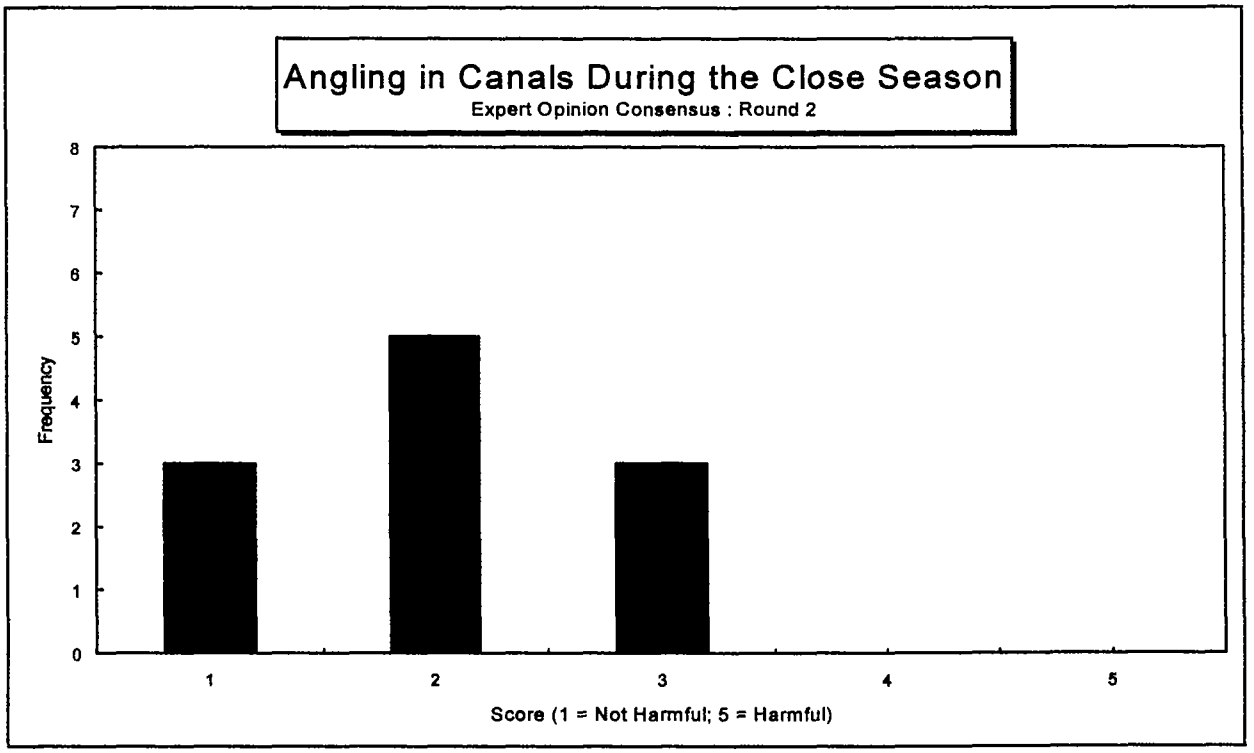


Figure 6.3

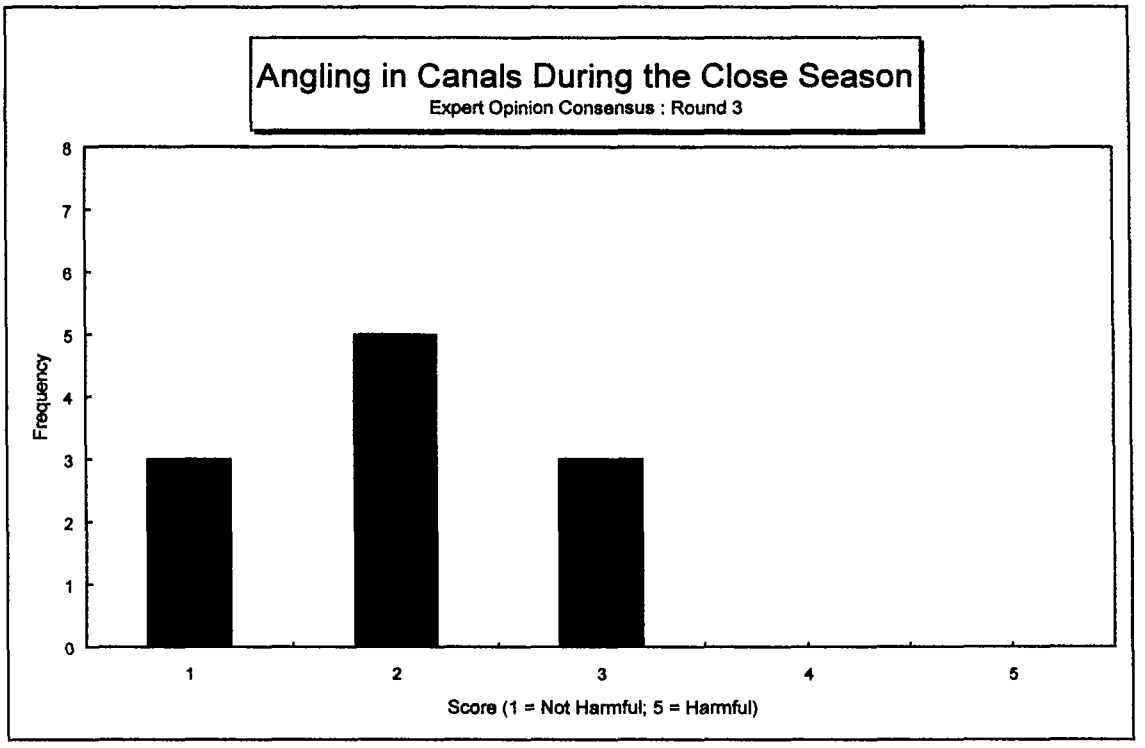
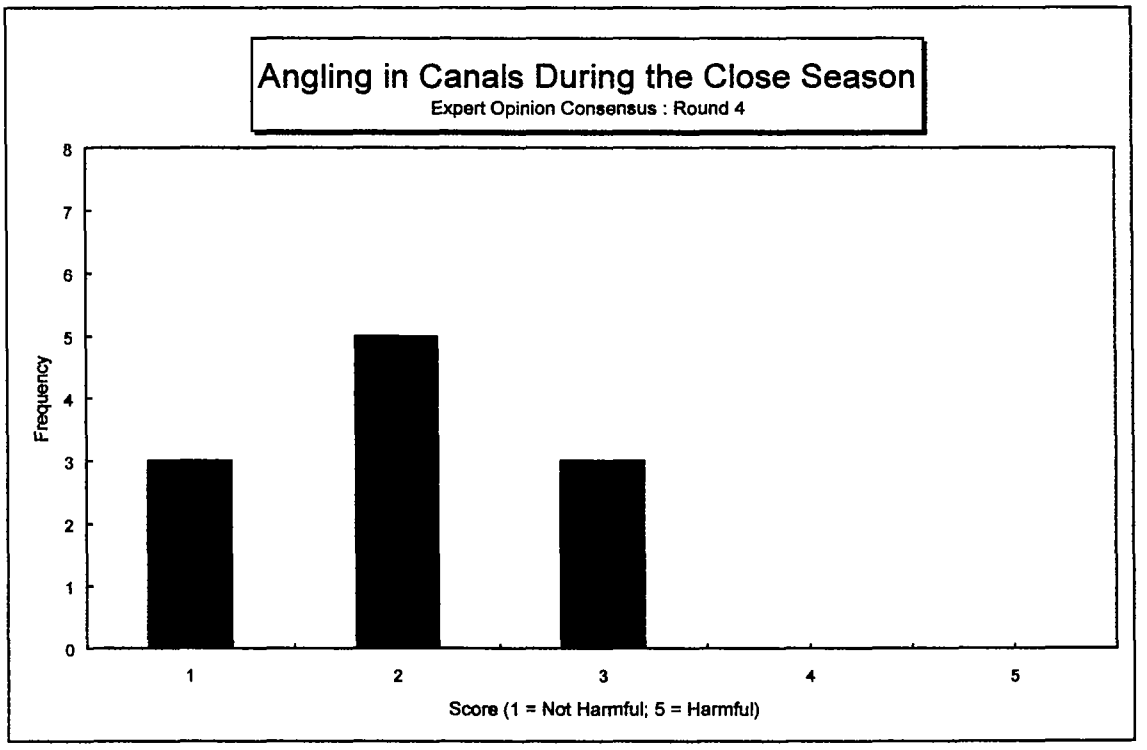


Figure 6.4



7. SOCIO-ECONOMIC ISSUES

The impact of a close season on canals on socio-economic issues surrounding angling is a complex issue. In order to evaluate the impacts a series of interviews were held with the following individuals representing various interests within the sport;

- Mr Frank Lythgoe (NFA Vice President)
- Mr John Williams (Birmingham Anglers Association)
- Mr Keith Fisher (British Waterways)
- Harry Peck (British Fishing Tackle Retailers Association)
- Malcolm Storey (Tackle & Angling Supplies Industry)

A significant reduction in club and association membership has been recorded over the past 5 years in many regions (e.g. BAA; 30,000 to 19,000 members). The major precipitous decline in the Midlands coincided with the lifting of the close season on still waters. This is considered to be due to the new-found availability of angling during the riverine close season in the privately run, intensively managed still water fisheries. Memberships of clubs and associations were not being renewed, with anglers deserting these organisations in favour of the private waters. With respect to BAA, this has resulted in an annual loss of income of £181,000 (£16.50 annual membership fees).

In the North West angling club membership has remained buoyant despite the decreases reported elsewhere. The disparity between regions is thought to reflect local differences, there being a comparatively low number of intensively managed commercial fisheries in the North West. This situation differs to that in the Midlands, where there is a very high density of commercial fisheries and hence intense competition for anglers.

Many of the larger and locally significant clubs in the North West rely heavily on canal fishing to maintain viability, supplementing their income with day ticket sales and matches during the close season. If a close season was imposed on canals in the North West, several would cease to exist. Hence the majority wish to maintain the regional *status quo*.

BAA suggest that the canal close season poses a major threat to many small angling clubs and associations, primarily because they are unable to compete with commercial still waters who offer year round angling. Consequently they suffer a decline in membership resulting in financial pressures, which for many, make the maintenance of fishing leases untenable.

Typically the angling season on canals is limited to the period between March and November. During the winter months the canals are either unfishable due to ice cover, or fish poorly due to the low water temperatures. With the imposition of the close season, in practical terms angling is restricted to around five months of the year (mid June to the end of November). Hence with many angling clubs relying heavily on

canals for their angling, they are limited in what they are able to offer to prospective members when compared to year round angling in private, heavily stocked still waters.

This is despite the disparity in cost, BAA membership fees being £16.50 for 12 months compared with typical day ticket prices of between £4 and £5 per day on commercial still waters. The obvious reason for the disparity is that the commercial fisheries stock heavily, three to four times the conventional carrying capacity based stocking rate, and they provide facilities (food, toilets, car bank access) which are either inappropriate or impossible to provide in most natural fisheries.

Whereas larger associations such as BAA are significantly affected by the decline in club fortunes but maintain sufficient membership to be viable, the survival of many small clubs and medium size associations is in jeopardy. Some have already ceased to exist. Put succinctly, the BAA views the current situation as an uneven battle for anglers financial resources between themselves and the commercial waters. They consider that lifting the close season on canals would be a major boost to many small clubs and associations allowing them to compete with commercial operations on still waters which remain open throughout the closed season. Canal fishing would be particularly popular between the end of March and the beginning of July, the period when boat traffic is comparatively minimal[6]. Hence anglers would be encouraged to return to the institutional, traditional sector of the sport with concomitant benefits for the environmental management of rivers and canals.

To a large extent, British Waterways experience has mirrored the declining fortunes of many angling clubs and associations over recent years. Five years ago there was a waiting list for leases on good quality canal fishing owned by BW. Now there is no waiting list. The reasons for this decline in interest in canal fishing are not clear cut by any means.

Areas of poor fishing have never been easy to let, specific problems such as water quality impacts on the central Birmingham canals have ensured that take up rates have always been low. More recently the zander problem has resulted in previously good quality stretches of canal being abandoned. For example the Ashby Canal, a once thriving 22 km stretch with no locks, is now mostly unlet following colonisation by zander in the late 70's. However, despite a slow increase in the amount of unlet waters, the good quality canals are holding their own in terms of lettings.

British Waterways are somewhat sceptical however, as to the impact removing the close season would have on the financial well-being of angling clubs. In their experience the lifting of the close season in the North West Region did nothing to either reverse the decline in angling club membership or improve on the uptake of leases of vacant stretches. The view was expressed that the over-riding influence on club membership has been the current trend or fashion in angling which has seen a consistent drift towards still water intensively managed fisheries, with all the attendant

[6] However, Boat Rallies tend to be organised in late spring.

attractions they have to offer over wild fisheries. This view is at odds with that reported by Angling Associations in the North West.

However, whilst BAA consider that removing the close season may encourage small clubs to reconsider taking on leases for canals, actively revitalising the angling economy, on balance it is unlikely that removal of the close season will initiate a membership recovery to the levels of three years ago. Anglers have become used to the comparatively easy guaranteed catches from commercial fisheries with their comprehensive range of facilities. However, for its survival angling needs a diverse range of fishing including rivers, canals and still waters. As it is primarily angling clubs and associations that maintain this diversity, arguably their survival is important for the future development and stability of the sport.

The view expressed by the angling retail industry was linked to the impact on business of the abolition of the mandatory close season on still waters. Although trade became more balanced throughout the year, gathering momentum in March following the quiet winter period of December through to February, overall profits were depressed due to a lower level of business. Rather than the traditional post close season peak, during the summer time a plateau of activity is reached. Whilst in practical terms this means better planning and utilisation of resources resulting in more profitable business, in overall terms trade was down. In some areas however, e.g. Midlands, an increase has been reported presumably due the proximity of a significant number of commercial still water fisheries open during the river close season. The tackle industry therefore anticipate no more than a moderate upturn in business if the close season on canals is revoked on the basis that angling effort will be spread more evenly throughout the warmer periods of the year.

8. CONCLUSIONS & RECOMMENDATIONS

On the basis of the literature and data analysed during this study the following conclusions are presented;

- Criteria have been developed to allow distinction between areas of canal that are more akin to still waters than running waters such that discrete management of their fish populations can be facilitated. For this specific purpose a canal has been defined as displaying the following characteristics;

    1. An Artificial Channel (cut) but not a main land drainage route.
    2. Artificially maintained water levels with negligible flow, other than that derived from water resources and navigation.
    3. A towpath over the majority of its length.
    4. Total length in excess of 250 metres.
    5. Commencing at the pound(s) immediately adjacent to an impediment to fish movement

- The intensity of boat traffic is the main influence on fish productivity and community structure in canals.

- In canals angling exploitation rates may be high, although all fish are returned.

- Angling effort is distributed differentially over the year in canals with a close season when compared with those without. Where there is no close season angling effort is concentrated in the March to June period. In canals with a close season, the majority of angling effort takes place in the autumn, reflecting the availability of angling opportunity.

- Catch rates tend to be somewhat lower in canals with no close season, implying lower stock levels. However, as catch rates tend to be lower in the spring months, when match angling effort is at its peak in canals with no close season, results are obviously biased.

- In canals with no close season, there is no indication of a long term decline in catch rates and hence stock levels, based on the evidence considered. In fact, in several canals, an increase is evident.

- Following application of the Delphi technique the consensus of expert opinion is that angling during the close season is not harmful to fish populations.

- Removal of the close season on canals may benefit the financial viability of many of the smaller angling clubs and associations, although regional

variations may temper the significance of the change depending on the proximity of commercial still water fisheries. A marginal increase in business might be anticipated for the angling tackle and supplies trade.

In view of the above conclusions the following recommendations are made;

On the grounds of fish stock protection and conservation, the evidence examined has indicated that there would not appear to be any justification for maintaining a close season for coarse fish angling on canals.

Further, whereas there is no evidence of significant harmful effects to fish populations, removal of the close season where it is currently applied will, by more evenly distributing fishing effort, be likely to reduce angling pressure during the March to June period on those canals where no close season applies at present.

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APPENDIX I

DELPHI TECHNIQUE - EXPERT PANEL MEMBERS

EXPERT PANEL MEMBERS

Banks, Dr. John	-	Retired Fisheries & Conservation Manager (Thames Region, NRA)
Bottomley, Dr. Peter	-	Honorary Biologist National Federation of Anglers
Broughton, Dr. Bruno	-	Fisheries Consultant & Angling Correspondent
Butterworth, Dr. Alan	-	Fisheries Scientist with the Environment Agency
Fisher, Keith	-	Fisheries Officer, British Waterways
Garner, Dr. Paul	-	Fisheries Scientist with the Institute of Freshwater Ecology & Angling Correspondent
Hatcher, Mark	-	Chairman of National Association of Fisheries & Angling Consultatives
Kennedy, Dr. Clive	-	Professor, Exeter University
Maitland, Dr. Peter	-	Fisheries & Conservation Consultant
Williams, John	-	Vice President of Birmingham Anglers Association
Winfield, Dr. Ian	-	Fisheries Scientist with the Institute of Freshwater Ecology

NB: To ensure anonymity of comments the panel members have been listed in alphabetical order. Their position in the list is therefore not related to the comment numbers.

APPENDIX II

DELPHI TECHNIQUE RESPONSES

DELPHI TECHNIQUE - ROUND 1
SUPPORTING EVIDENCE

NB: To maintain anonymity the comment numbers are not related to any of the panel members and hence are not consistent in successive rounds.

Comment 1 (Round 1)

I have never yet had any evidence to lead me to believe that coarse fishing on canals all year round has any detrimental effect on the overall population of fish in a canal. I therefore have to assume there is none.

Comment 2 (Round 1)

Damage to coarse fish stocks (e.g. roach, bream, tench) is unlikely to occur when ambient water temperature is below 15 °C, when the River Ecosystem Class is 3 or less, fish are not spawning and keepnets are not used. However, if ambient temperature is above 20 °C, RE Class is 4 or more, fish are spawning and keepnets are used, then damage can be expected in waters intensively fished. Fish mortality can be common in the current early open fishing season (late June/July/August) following fishing matches on waters of doubtful quality in hot weather. They could be expected in May/June in similar circumstances.

Comment 3 (Round 1)

Fish populations in canals (excluding remainder waterways) tend to be heavily biased towards small fish because boat traffic suppresses the invertebrate fauna. Canal anglers tend to use equipment and bait designed to target small fish.

Losses of small fish retained in keepnets may be disproportionately high and therefore there is a greater chance that canal fisheries could be more heavily affected by increasing the length of the fishing season than fisheries on still waters and rivers.

Comment 4 (Round 1)

The score reflects my belief that any period when angling is prohibited will cause some reduction to the premature death of fish from angling-related causes. I suspect that this is of real significance only to the very small fish, which are often targeted by canal anglers and which can suffer substantial scale losses arising from handling during unhooking.

I doubt that damage to spawning sites or disturbance of spawning activities are important given the considerable boat traffic on most canals. Indeed, I would allocate a score of at least 3 to the likely impact of boating!

Comment 5 (Round 1)

There is no evidence that fish in rivers are more harmed by fishing between mid-March and mid-June (Lincolnshire, Ireland, elsewhere), than at other times. There is no reason to suppose that the same will not hold good for canals.

Natural fecundity will outstrip any losses from angling casualties except perhaps in the most environmentally stressed lengths where there may be heavy fry mortality. Spring and early summer warming will enhance the functioning of the fishes immune systems. Populations with heavy angling pressure should actually withstand this pressure better during the close season than during the winter.

Comment 6 (Round 1)

It is my opinion that while the degree of harm done to coarse fish populations in canals by angling during the close season may run across a broad spectrum, on an overall basis it is only slight and similar to effects at other times of the year. Moreover, although robust relevant data equivalent to those available for the more tractable salmonids are lacking, I consider that the overall status (i.e. abundance, equitability of age classes, consistency of recruitment) of a canal coarse fish population is influenced far more by current and recent environmental factors other than angling.

Comment 7 (Round 1)

Canals are dominated by short lived, highly fecund species such as roach. Loss of a small number of individuals will have little impact at the population level.

Comment 8 (Round 1)

Experience on canals where there is currently no close season has given no indication that angling between 14th March and 16th June has any adverse effect on coarse fish populations.

This corresponds to the findings of studies carried out on behalf of the Yorkshire Region a few years ago which suggested that redundancy in spawning success of coarse fish compensated more than adequately for losses of individual fish or small numbers of fish caused by hooking, playing, handling or retaining in a keep net, whether during the close season or outside it.

Comment 9 (Round 1)

My comments on the score which I have given are:

1. Firstly two qualifications (i) I believe that each species of fish needs to be treated separately in relation to this topic. I realise that this is a complication when one is looking for a single close season for all species, but it must certainly be borne in mind. (ii) although individual fish and their welfare are not directly part of this review, the fact is that mature fish (already under stress at spawning time) are damaged and stressed by capture and handling and with small populations or intensive angling this can be of major relevance to the population as a whole.

2. The types of damage which fish populations might suffer because of angling during the close season may be related to the following:

a) The types of damage which fish populations might suffer because of inadequate numbers of eggs being laid, then angling during its spawning period will be detrimental - some fish (of both sexes) will die after capture, others may be so stressed that they will not spawn that year.

b) Spawning habitat may be so damaged or disturbed by anglers so that fish are forced to spawn somewhere less suitable.

c) Feeding of fry during their important first weeks will be disturbed by anglers - again affecting recruitment.

d) There may be some genetic change - for example, within species which spawn over the beginning of the close season (pike) or the end (some cyprinids). Those individuals which spawn within the close season are likely to have been more successful than those that spawn without. This factor will no longer operate.

Comment 10 (Round 1)

From my professional experience of canal fisheries, the commonest problems are scarcity of large fish in anglers' catches and too many small fish. This is particularly true of roach, but has been encountered in other species of fish. The usual causes are overstocking by angling clubs, or good year classes of fish. Both produce overcrowding and reduce growth rates, and so protection over the breeding season may actually exacerbate the problems. Reduction in numbers of common species may also benefit less common competitors such as rudd or tench, and improve individual growth of predators such as perch and pike.

DELPHI TECHNIQUE - ROUND 2
SUPPORTING EVIDENCE

Comment 1 (Round 2)

The comments from fellow correspondents generally reinforce my own view that harm from angling between 14th March and 16th June is minimal. The only possible exceptions being where the populations are very low, and stressed by other environmental causes. These causes, apart from spawning, will operate at other times as well. The question can then be rephrased as "are the populations which are low and under stress sufficiently numerous to justify imposing a close season on all canals on the grounds that any limitation of the period of angling will be beneficial in these cases?" It is not our task to answer this question.

Comment 2 (Round 2)

Since my score of 2 in Round 1 also turned out to be the modal score, I do not see any reason to change it. The comments of many other participants about the super abundance of small fish in canals confirms my own opinion, and some of the other reasons given for this, e.g. effect of boats on vegetation and invertebrates, are equally convincing. I also respect the opinions that there is no evidence that a lack of a close season has any deleterious effects.

Comment 3 (Round 2)

None of the responses to Round 1 have provided any evidence that the overall population of fish in canals would be effected by the removal of the close season, indeed the contrary is probably the case.

Fish living in still waters where there is no close season do not suffer difficulties at spawning time and there is no reason to suppose that fish in canals would behave differently.

The level of population in any fishery is determined by: water quality, abundance of food and predation, whilst spawning success is determined by availability of suitable spawning sites and conditions.

The presence or absence of fishing activity is immaterial to any of the former with the exception of food supply which is only enhanced by anglers baits.

Comment 4 (Round 2)

The evidence put forward in responses so far suggests that the extent and nature of coarse fish populations in canals is strongly influenced by factors other than angling: boating, canal management, water quality, temperature, stocking policies.

No evidence has been introduced that indicates that coarse fish populations in canals are affected in any way by angling between mid March and mid June.

Comment 5 (Round 2)

I maintain my opinion that the degree of harm done to coarse fish populations in canals by angling during the close season on an overall basis is only slight and similar to effects at other times of the year. Supporting evidence remains as given in my Round 1 response.

My additional comments are:

Although the following notes take my contribution over the 100 words limit, I think that some observations on the comments of Round 1 may be useful. Unless otherwise stated, I am in general agreement with the comments.

I disagree with the suggestion of *Comment 2 (Round 1)* that fish mortality is common in the current early open fishing season, and think that the detrimental effects discussed are more a result of water quality than of angling.

I think that the negative effects of close season angling considered in *Comment 3* would only be significant in very extreme situations of angling pressure.

I do not understand the logic of *Comment 5 (Round 1)* in relation to the immune systems of fish. Although the physiological rate of fish is higher at higher temperatures, I suspect that any beneficial effect in the present context would be more than outweighed by corresponding higher rates of fungal infections, etc.

In *Comment 9 (Round 1)*, I find it difficult to envisage the circumstances under which anglers' activities will disturb the feeding of fry to the extent that their survival is impaired.

I am not convinced by the arguments concerning competitors and predators offered in the last part of *Comment 10 (Round 1)*, but they are not directly relevant to the present issue.

Comment 6 (Round 2)

If all canals had good water quality I would be prepared to lower my score to 2. However, as most canals receive some form of organic pollution my score remains unchanged at 3.

Comment 7 (Round 2)

I see no reason to change my score of 2 in light of the other comments made.

Comment 8 (Round 2)

British Waterways lets out its canal fishing rights to angling clubs. Generally, the only areas not let to clubs are those where for some reason fishing is poor and angling clubs do not want to pay rent for those sections.

The areas of the network unlet are:-

i) the areas colonised by zander in the Midlands
ii) the central parts of the West Midlands conurbation because of poor water quality
iii) over 200 miles of "vacant" water in NW England.

NW England is the area where the close season has been removed for the longest on the main trafficked network. There may be a connection between this fact and poor fishing experienced on these canals.

DELPHI TECHNIQUE - ROUND 3
SUPPORTING EVIDENCE

Comment 1 (Round 3)

I still maintain my opinion that the degree of harm done to coarse fish populations in canals by angling during the close season on an overall basis is only slight and similar to effects at other times of the year.

Responses to the two additional specific questions in the covering letter of 30 June 1997 are as follows.

1. The supporting statements of Round 2 do not contain information which encourages a change to my score.

2. I cannot provide any feedback which may cause other respondents to modify their scores, other than that provided in my supporting statement to Round 2.

Comment 2 (Round 3)

None of the comments I have read cause me to change my score from 2. There are many still waters where angling pressure has been intense during the old close season, but the fishing has not apparently suffered. I see no reason why canals should be much different. I would accept that there may be some exceptions to this, but this could be managed by the owners as with still waters there would be no statutory requirement to open the fishery.

Comment 3 (Round 3)

The only views presented for harm are not supported by evidence, or appear to be marginal events, or both. This forces one to think harder about the question. If "population" is taken as referring the fish population of the canal system as a whole it seems pretty clear that there is no overall harm. The appropriate score is 1. In some parts of the system which are stressed by other factors angling is an additional stress. Therefore there must be some "harm" in the close season. It cannot be separated from other stresses, and is likely to be less than an apparent 20% increase above "no harm" which is imposed by the limitations of a five point scale. On balance therefore the overall score is still 1.

Comment 4 (Round 3)

My own initial score of 2 remains the modal score, and I still see no reason to change it in light of comments and information.

I accept there could be some slight harm, when populations of common species are low, and to rare species, hence my score of 2 and not 1. However, I am impressed by the lack of any evidence that angling in the close season is harmful or that fish populations in canals are actually affected by angling at all. It does appear that factors

other than angling, such as water quality, management and boat traffic, have far more impact on fish populations.

Comment 5 (Round 3)

With regard to the supporting statements, my comments are as follows.

1) They do not provide information which affects my estimate, which remains at 3.

2) My present position may be summarised as follows: (a) Does angling benefit or damage (i) fish populations and (ii) their habitat? The answer is that damage of some kind is done to both. There is significant evidence for this in the scientific literature (though little concerning canals). (b) Will such damage be lesser or greater during the close season than at other times of the year? The answer is that it is much more likely to be greater for both fish (stressed around spawning time, higher temperatures, etc.) and habitat (growing season for plants, etc.). We do not know the extent of such damage and it will vary with canal systems. Contrary to other opinions expressed, the 'best' (i.e. highest quality) canals are likely to suffer most because they are least impacted by other pressures. Thus the impact of angling will rate higher.

We are certainly short of evidence in this area. The comments concerning 'no evidence of damage' are unacceptable if little work has been done and what is really needed to solve this question properly is a suitable scientific study on appropriate canal systems.

Comment 6 (Round 3)

I remain convinced that there is no overall harm caused to the fish populations in canals by fishing either between 14 March and 16 June or at any other time of year.

Comment 7 (Round 3)

The comments from round 1 and 2 still do not convince me to alter my score from 3 towards the median of 2. Heavily trafficked canals contain unbalanced fish populations biased towards small fish especially roach. Studies elsewhere have shown that survival of small fish following capture by anglers is relatively poor. Anglers fishing such canals target these small fish which means that continuous angling pressure could affect the population by mortality overtaking recruitment.

I do not think that fishing during the spawning period is a problem in itself. The problem, particularly in canals, could be the increased number of angler visits resulting in increased mortality occurring on already sensitive fisheries.

Comment 8 (Round 3)

In general I agree with the comments of the other respondents. There is little evidence that angling has a significant effect on the populations of fish in canals and no evidence that this effect will be increased during the 'close season'. *Comment 8 (round 2)* suggests that in areas where close season fishing has previously been allowed on canals (i.e., in NW England), fishing is poor. There are equally areas of

the North West canal system which support good fish populations. Water quality and lack of spawning success are the most likely reasons for these differences. My score remains 2 because there may be some adverse effect of angling at sites with poor water quality.

Comment 9 (Round 3)

The responses merely reinforce my view that close season angling would have little impact on fish populations. The evidence indicates that there are no justifiable grounds to permit angling on still waters but prohibit the same activity on canals.

Comment 10 (Round 3)

If all canals had good water quality I would be prepared to lower my score to 2. However, as many stretches of canals receive some form of organic pollution my score remains unchanged at 3.

Comment 11 (Round 3)

The question we are asked to answer is whether or not close season angling on canals has a deleterious effect on coarse fish populations. The evidence available shows that the limiting factors on coarse fish populations on canals are boating, canal management and water quality. In comparison, the effect of angling, particularly between mid March and June, is undetectable. None of the evidence available from other sources, or from the comments made in this consultation exercise, indicates to the contrary. On this basis the score in answer to the question must be 1.

It is important to distinguish between evidence which is significant to the question, and what is not. Apart from being inaccurate, the concept of 200 miles of "vacant" canal in the North West does not demonstrate the impact of angling during the close season on fish populations. It could relate entirely to other activities which would make these waters unattractive to anglers. Similarly the mortality of some fish from angling early in the open season, during hot weather or where water quality is poor is no indication of any overall effect on fish populations of angling *per* se during the close season.

DELPHI TECHNIQUE - ROUND 4 RESPONSES

Comment 1 (Round 4)

I still maintain my opinion that the degree of harm done to coarse fish populations in canals by angling during the close season on an overall basis is only slight and similar to effects at other times of the year.

Comment 2 (Round 4)

None of the statements has altered my opinion that any harm to fish populations will be other than minor and insignificant. There is absolutely no scientific evidence to support, or deny, this and if abolishing the close season on stillwaters can be justified, then it is illogical not to do so on canals.

A number of concerns have been raised over the possible impacts on marginal canal fisheries. I suspect that the input of large quantities of high protein allochthonous material , in the form of bait and groundbait, particularly in the Spring, may be beneficial to the growth and survival of fish . The sudden cessation at the start of the close season could be a blow!

It might be worthwhile to persuade BWB, as the major managers of our canal system, to consider a programme to assess the impact of retaining the present close season, looking at a different close season (perhaps shorter) or none at all.

Comment 3 (Round 4)

The third round comments are illuminating. I am content with my last round change of score to 1. The other comments, or several of them, suggest that; (i) there is very little harm, (ii) in the end a score of 2 or 1 is virtually a matter of semantics.

Comment 4 (Round 4)

Even in this final round I see no reason to change my score which has remained at the modal 2 throughout.

I accept some of the comments about the lack of evidence in relation to canal fisheries. One can only judge on such evidence as exists, and there is some, and on one's own experience. Evidence I have collected from the canals around the country indicates to me that the major influences on fisheries are factors such as pollution and the degree of use (or disuse) of canals by boating, etc. I still find no evidence that a close season would have any significant effect. Equally, given the paucity of evidence, it would be difficult to say there would be no harm in all cases and so score 1.

Comment 5 (Round 4)

Having read the responses in round three I remain convinced that no damage would be caused to the overall population of fish in canals should the present close season be lifted.

It is interesting to note that respondees are now beginning to reply to comments made in previous rounds by others and reinforcing their own views and scores. I consider it to be unlikely that there would be any further significant change in the overall score or any greater degree of consensus should further rounds of consultation be carried out. It has been an interesting exercise and I hope that the results add to the knowledge of those who will advise the agency on the future policy relating to the close season on canals.

Comment 6 (Round 4)

I still remain committed to my original score of 3. It seems to me that most participants have felt that because very little actual evidence is available they have not been persuaded to alter their original "gut-feel" scores.

Overall I think that fishing all year round in stillwaters (and for that matter rivers) will have very little impact upon their fish populations. Because fish populations in trafficked canals are stressed by environmental conditions (heavy boat traffic) fishing all year round is more likely to have an impact on canals than other types of fishery. In addition, canal anglers tend to target small fish which is the component of the population most susceptible to damage by angling. All year round fishing is therefore bound to increase mortality rates well above that currently experienced on canals with a close season.

Comment 7 (Round 4)

The responses during the previous three rounds reinforces my view that a score of 2 is appropriate. No hard data has been presented to indicate serious damage, and most of the circumstantial and anecdotal evidence suggests little or no damage.

Comment 8 (Round 4)

The evidence presented by the participants does, in general, agree with my own findings. Unfortunately, there is a general lack of information in the scientific literature on canal fisheries. Thus, scoring appears to be based more upon opinion than fact. I do not doubt that the conclusions drawn, that angling will have little effect on fish populations in the 'close season' on canals, is correct.

Comment 9 (Round 4)

A number of respondees seem to be hedging their bets. Although a majority acknowledge there is little evidence to show that close season coarse fishing on canals has any effect on fish populations, their scores show a reluctance to reflect this completely, being marked down on what respondees are actually saying.

This may be the result of differing views as to what can be established scientifically and what cannot. Angling during the close season may cause some mortalities, which some respondees may view as "sight harm" to fish populations, but scientific study would find it very hard to separate this level of impact from other factors or normal population dynamics. In this respect, the impact of close season angling that causes less than significant harm, i.e. measurable harm, has to be disregarded.

One of the problems with such data as is available about the effects of angling on fish populations and the environment is that evidence of negative impacts tends to be taken out of context and extrapolated well beyond what is reasonable - an issue English Nature acknowledges needs to be addressed. The most recent *Comments 5 and 7* show this characteristic. Neither of the respondees making these comments offer any evidence to support their contention, implicit in their score of 3, that there is significant - measurable - damage to canal fish populations caused by angling itself during the close season.

In science there is a strong tendency to disregard data which comes from unapproved sources. In many fields this may be perfectly proper, but there is an attitude among a number of ecological scientists, and shown in the most recent *Comment 5*, which dismisses anglers as an "unapproved source" of scientific data, despite the fact that successful angling is the result of a high degree of field work and that science has been shown often enough to follow anglers, eventually confirming their views.

APPENDIX III

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