A review of consented trout stockings into riverine environments

WRc plc

R&D Technical Report W74

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Statement of use
This report should be used to assist in the production of a national standard consent form and database to record the introductions of consented stockings of trout into waters in England and Wales. It will also act as a valuable reference document to fisheries managers who may wish to use the collated data in any historic or future analysis of fisheries status or performance.

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EXECUTIVE SUMMARY

This document reports on the findings of a review of NRA stocking consents (as per Section 30 of the Salmon and Freshwater Fisheries Act, 1975) relating to the introduction of trout into rivers in England and Wales. The work was undertaken at the request of the NRA in order to provide information which could be used in relation to a concurrent study examining the impact of stocked trout on wild fish populations (R&D Project W2-452).

The review assesses:

- the size and species of trout stocked into rivers in England and Wales;
- the range of stocking densities employed;
- the nature of spatial and/or temporal patterns in stocking.

The principal findings indicate that:

- (in terms of the total number of fish stocked each year) Section 30 consented stocking by angling clubs and fishery owners is far more important than stocking by the NRA;
- the majority of trout stocked by angling clubs and fishery owners tend to be large (>24cm) and are often introduced early in the angling season - both of these factors increasing the potential for competitive impacts on natural (indigenous) populations;
- In any one year in any given region, Section 30 consent records suggest that brown trout stocking is generally (numerically) dominant over rainbow trout stocking - comparative data for stocking undertaken by North-West and Thames NRA imply that it is not common practice for either region to stock rainbow trout into rivers;
- the quality of the data held within the Section 30 consent records was reasonably high, although there was some potential confusion due to the *ad hoc* use of unsuitable combinatons of size metrics.

The absence of information regarding the 'target' area for the stocking exercise precluded the derivation of stocking densities for specific sites or rivers. This had the effect of restricting spatial anlaysis to a large scale. Notwithstanding this, an informal assessment of the Section 30 consent records which were collated suggested that the numbers and sizes of fish which have been stocked at the experimental sites for R&D Project W2-452 are comparable to consented stockings from throughout the regions.

It is recommended that the EA rationalises the collation of Section 30 consent information - through the adoption of a national standard consent application form and the development of an electronic database to facilitate the storage and retrieval of processed applications. Such a system would allow the potential value of Section 30 consent information to be more fully realised.

KEY WORDS

TROUT, STOCKING, SECTION 30, CONSENT.

1. INTRODUCTION

1.1 Impact of stocking on natural populations

The stocking of salmonids into rivers and streams is a widespread practice throughout all of the Regions of the former NRA. There has been a progressive increase in the number of brown and rainbow trout (*Salmo trutta* and *Oncorhynchus mykiss* respectively) stocked into rivers in England and Wales over the past 20 years. Such stocking particularly involves fish of takeable size (invariably stocked for angling interest) and has lead to increasing concern being expressed over the potential ecological effects on resident wild fish populations.

WRc recently completed an R&D project, on behalf of the NRA, looking at some aspects of the potential for introduced trout to impact on native salmonid populations (NRA R&D Project W2-452; see Barnard *et al.*, 1997).

1.2 Objectives of Section 30 consents review

In order to be able to place the findings of R&D Project W2-452 into a national context, it was felt necessary to review and quantify the current stocking practices for trout in rivers throughout England and Wales. Therefore, at the request of the NRA, a review of stocking was undertaken, through recourse to Section 30 consents from recent years. In addition to providing valuable information on the extent of current stocking (in terms of both the sizes and numbers of fish stocked) this review has produced information relating to the use of different metrics within records of Section 30 consents and the general quality of information which is recorded.

It was intended that this review, which would provide information on the total number of trout being stocked by angling clubs and fishery owners into rivers in England and Wales over recent years, should assess the available information within each of the following categories:

- species of trout being stocked (i.e. brown, rainbow or brook trout (*Salvelinus fontinalis*);
- size-range (<15cm / 15-20cm / >20cm);
- year;
- location (main river system and catchment).

From the outset it was recognised that, ultimately, it may not be possible to accurately report data within each of these categories. Necessarily, the quality of the Section 30 consent information that was made available would dictate the level at which it may be effectively asessed.

1.3 Section 30 of the Salmon and Freshwater Fisheries Act, 1975

1.3.1 Definition of Section 30

Section 30 of the Salmon and Freshwater Fisheries Act (1975; as amended by the Water Resources Act, 1991) concerns the requirement of any person who introduces, or intends to introduce, fish or their spawn into an inland water to have the prior consent of the NRA / EA. The original purpose of the legislation remains largely unsubstantiated (A.Owen, personal communication) although it has been widely used both to regulate the movement of fish and to consider the desirability of their introduction to certain waters on ecological grounds.

Section 30 is stated below:

> **A person shall be guilty of an offence if he introduces any fish or spawn of fish into an inland water, or has in his possession any fish or spawn of fish intending to introduce it into an inland water, unless he first obtains the written consent of the water authority within whose area any part of the water is situated.**

This legislation was amended by Section 34 of the 1986 Salmon Act Amendment so as to include fish farms within the definition of inland waters, where such farms discharge into another inland water through a conduit constructed or adapted for the purpose. In turn, a fish farm is defined as 'any pond, stew, fish hatchery or other place used for keeping, with a view to their sale or to their transfer to other waters (including any other fish farm), live fish of the salmon family, live freshwater fish, live eggs of fish, or foodstuffs for fish, and includes any buildings used in connection therewith, and the banks and any margins of any water therein'.

1.3.2 Interpretation and application of Section 30

Draft PINs produced within the NRA have highlighted several complexities regarding the interpretation and application of Section 30. These complexities lie principally in the following four areas:

- general ecological considerations;
- the alternative use of density and biomass metrics;
- fish health;
- genetic integrity (especially coarse fish).

The recent R&D project examining the effects of stocked fish on the survival of wild fish populations (Environment Agency R&D Project W2-452) was initiated, in part, to establish an informed basis for the adequate assessment of those general ecological considerations which need to be made when assessing stocking applications for brown or rainbow trout.

Historically, each of the NRA Regions (and, previously, each of the Water Authority Regions) have adopted different policies regarding Section 30 and have developed quite different administrative procedures. Notwithstanding this, basic information on the species, size and number of fish being introduced is invariably recorded for the majority of introductions which are undertaken.

1.4 The relative importance of NRA stocking

Although not a specific objective of the review, information on the stocking of trout by the NRA was collated such that comparisons could be made regarding the size and numbers of trout stocked by the NRA and the timing of such actvities in relation to (Section 30) consented stocking undertaken by angling clubs and fishery owners.

It was agreed with the Project Leader that the more comprehensively recorded data pertaining to NRA stocking should be used in this comparison. In this context, records from both North-West Region and Thames Region have been used.

2. METHODS

2.1 Collation of Section 30 consent information

2.1.1 Data acquisition

Information on stocking by clubs and fishery owners

The NRA Project Leader was responsible for gathering Section 30 information for riverine stockings from the regions, and for forwarding it to WRc. Information in certain key fields from the consents (see Table 2.1) were entered onto a database. Initially, dBASE IV was used to enter and store the information, although subsequent interrogation was undertaken using Microsoft Access software. Note that it was not possible to independently verify the validity of each of the consents that were forwarded to WRc, and it is therefore possible that some consents relating to stillwaters may have been inadvertently included with those relating to riverine stockings. However, in general terms it is believed that if this type of mis-reporting did occur, it is likely to have been very infrequent.

Section 30 consent information was supplied by the NRA in several formats, including original consent applications (e.g. Welsh Region), summarised consent information (e.g. North-West Region) and in an electronic database format (e.g. Welsh and Southern Regions).

Note that, as this report deals primarily with historical data, all reference to the NRA Regions relates to the former ten regions of the NRA.

Table 2.1 Information initially recorded from Section 30 consent forms

Information relating to:	Data recorded for the following fields:
Site	Region
	Main river system
	River being stocked
	Location of stocking site
	NGR of stocking site
Date	Year
	Month
Stock	Species
	Number
	Mean size of fish
	Size range of stocked fish (i.e. range about mean)
	Units employed

Information on stocking by the NRA

Data concerning stocking by the NRA North-West and Thames Regions was also collated by the Project Leader and forwarded to WRc. The information was obtained from annual reports and other pertinent summaries of NRA activities.

As with the Section 30 consent data, information relating to each of the fields given in Table 2.1 was entered onto a dBASE IV database which was subsequently interrogated using Microsoft Access.

2.1.2 Data standardisation

Size of fish

Where the size of fish to be stocked was recorded as a range (e.g. 10-12") the mid-point of the range (e.g. 11") was entered onto the database as being representative of the mean size at stocking. This allowed the direct comparison of Section 30 consent records irrespective of whether the size of fish to be stocked had been recorded as a range of sizes or as a mean size.

All four combinations of length/weight and Imperial/Metric measures had been used on the original Section 30 consent forms to record the size of fish being stocked. Consequently, it was necessary to convert the size metric to a single standard. Initially, all lengths were converted to centimetres and all weights to kilograms. Subsequently, weights were converted to lengths assuming isometric growth and a standard condition index (see below). This relationship (reproduced below as Figure 2.1) was derived from data on hatchery reared trout detailed by Leitritz and Lewis (1976).

$$L = [(1.17 \times 10^5).W]^{1/3}$$

Where L=length of fish (cm)

W=weight of fish (kg)

In practice, it is likely that there would be some degree of variation in the condition of stocked fish. However, following discussion with the Project Leader, it was not felt to be within the scope of this project to assess or allow for any such variation. The adoption of a single standard length:weight conversion was assumed to introduce only minimal errors into the data.

Numbers of fish

In some instances the number of fish stocked was not recorded, but was replaced by either the total weight or the total cost of the fish stocked. Where the total weight stocked was recorded, the number stocked was derived by dividing by the total weight

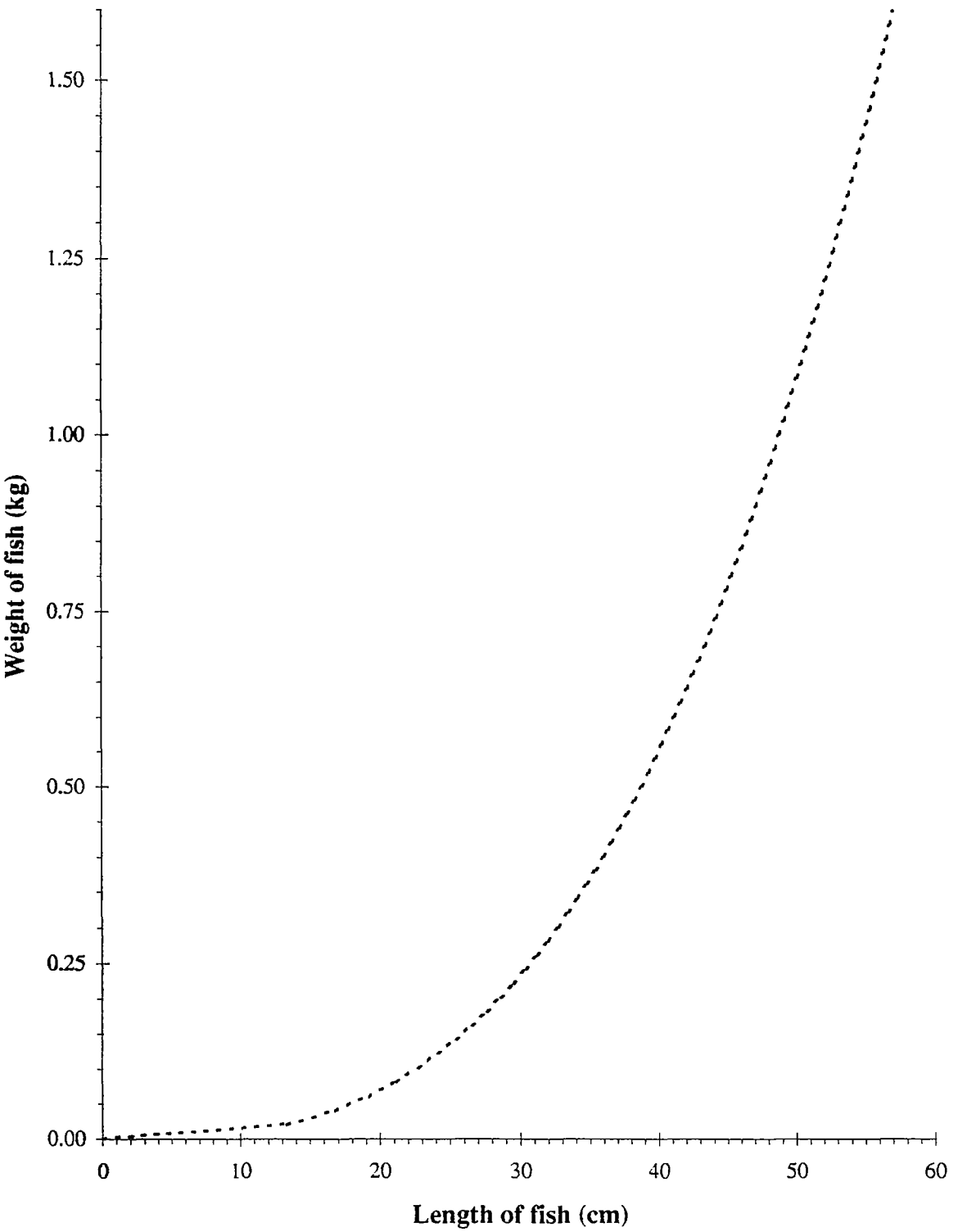

Figure 2.1 Relationship between length and weight for rainbow trout (after Letritz and Lewis, 1976)

by the mean weight of the stocked fish. Similarly, where the total cost of the stocked fish was recorded, it was agreed with the Project Leader that the number of fish stocked should be approximated by assuming a standard value of £2.00 per kilogram. As with the conversion of weight to length (above) it is acknowledged that this is a generalisation, although it is not felt that it has been the source of any great discrepancies in the data.

General

Other instances became apparent were inappropriate metrics had been used in conjunction with each other. For example, size ranges were sometimes quoted as being from X inches to Y pounds. Such records were considered on an individual basis, with appropriate (and approximate) conversions from weight to length being used where necessary.

2.2 Analysis of Section 30 consent data

2.2.1 General

The data contained in the final database was analysed using Microsoft Access software. Full statistical analyses were not applied to the data, but temporal trends and variations between regions were assessed by means of graphical output.

For all of the analyses described, it is assumed that the stocking of trout is accurately represented by the Section 30 consent information which has been forwarded to WRc.

Where a temporal component within the data was being analysed, it was necessary to ensure that the time-bases for the data were comparable across regions. Therefore, for such analyses, a three year subset of the available data was used - representing what was felt to be the most completely recorded period. However, for other analyses, all of the data available for each NRA region was used as appropriate.

2.2.2 Size at stocking

Initially, the relative frequency of stocking with different sizes of trout was examined. This provided a pragmatic basis for the division of the full database into a series of length-classes. This new classification could then be applied in subsequent analyses.

The relative frequencies of stocking for different sizes of trout were defined as the total number of trout of each given length which were stocked, expressed as a percentage of the total number of trout for which Section 30 consents had been issued. Initially, these calculations were performed on a combined data set comprising all of the available data, irrespective of the source region. Inspection of the data derived from this exercise suggested that the inclusion of fish <5cm in length had the effect of biasing the resultant frequencies to an unacceptable degree, since it was common for trout <5cm in length (i.e. fry and 0+ fish) to be stocked in very high numbers. To remove the effects of this

bias (and so increase the clarity of any derived size-frequency plots - see Section 3.1.1) trout <5cm in length were excluded from subsequent size-frequency calculations.

Note that the data for brook trout (only stocked to rivers in Welsh Region) were not of sufficient magnitude to be discernible in any of the figures derived from this analysis. All of the recorded Section 30 consents for brook trout were for fish of 30cm in length. In terms of the total number of fish stocked by Welsh Region, brook trout made up less than 1% of trout stocked.

No formal assessment was made of the frequency of use of the alternative options for recording the size at stocking (i.e. a size range or a single mean size).

2.2.3 Time of stocking

The pattern of stocking activity through the year was examined (on a region-by-region basis) by calculating the total number of fish stocked per month within each of four size-classes for the 36 month period covering the years 1991-3. The size-classes used were derived from the preceding analysis, and are discussed below in Section 4.1.1.

As discussed above (Section 2.2.1) it was felt important to use the standardised three year time period in order to enable meaningful between-region comparisons of temporal patterns in stocking activity to be made.

2.2.4 Intensity of stocking

General trends in stocking intensity were assessed in terms of the total number of fish stocked per region per year, within each of a series of species / size-classes. The results of this analysis are based on the full database (i.e. information for the period 1987-94).

2.2.5 Frequency of stocking by size and number

An analysis of the general relationships between the number of fish introduced in a given stocking action and the size of the fish being stocked was performed in the following manner:

- for each recorded Section 30 consent the number of fish which were stocked was assigned to one of a series of ranges (1-50; 51-100; 101-150; ... *et seq.* - up to 951-1000; & >1000);
- the total number of Section 30 consents for each combination of size at stocking (as size-class - see Section 2.2.2 and 4.1.1) and derived class of 'number of fish stocked' was subsequently calculated for each region;
- finally, individual totals were expressed as a percentage of the overall total number of trout stocked in each region.

As with the preceeding analysis, all of the available information (irrespective of year) was used.

2.3 Assessment of the quality of Section 30 records

The frequency of occurence of the different potential combinations of imperial and metric values for length and weight measures was assessed. The relative occurence of each combination was calculated, on both an annual and regional basis, and expressed as a percentage.

In addition, the quality of the data which was collated for the Section 30 consents database was subjectively reviewed and is discussed briefly.

2.4 Comparisons to NRA stocking

The relative importance of stockings undertaken by the NRA compared to consented stockings was assessed by reference to two particular regions (North-West and Thames). Available information was assessed in a similar manner to that relating to Section 30 consents (i.e. size at stocking; time of stocking; intensity of stocking; and relationship between the size at stocking and the number of fish stocked on each occasion).

3. RESULTS

3.1 Trout introduced by angling clubs and fishery owners: information derived from Section 30 consents

3.1.1 Size at stocking

Frequency histograms were produced (on a region by region basis) with the mean length of trout stocked as the horizontal axis and the relative frequency of stocking with each length of trout given as the vertical axis. This series of plots are shown below as Figure 3.1. Data for all of the regions combined are reproduced as Figure 3.2.

3.1.2 Time of stocking

The temporal pattern of stocking for the 1991-3 period for each of the regions and for all regions combined are shown as column plots (Figures 3.3 to 3.12 and Figure 3.13, respectively). The vertical axis in each of these plots represents the total number of trout (within the indcated size class) which are stocked in any given month. With the exception of the combined data set (Figure 3.13) the plots for each different size class of trout are based on the same vertical scale to facilitate between-region comparisons.

Note that the data presented for Wales (Figure 3.10) does not include information for brook trout, as records of Section 30 consents for their introduction to rivers in the Welsh Region of the NRA show that they were only stocked during 1989.

3.1.3 Intensity of stocking

The intensity of stocking, interms of the total number of fish stocked per region per year, was assessed for each species / size class combination for which data were available. The results are reproduced as column plots (Figures 3.14 to 3.25).

Note that these plots do not have a fixed vertical axis scale. Although it would have been easier to make direct comparisons between different combinations of species / size class, it was felt that a fixed vertical axis scale for each of Figures 3.14 to 3.25 would lead to a lack of clarity in certain of the plots.

In addition, it should be noted that, for those species / size class ombinations not represented in Figures 3.14 to 3.25 (brook trout $\leq$24cm and rainbow trout <5cm) there were no Section 30 consent records held within the database.

3.1.4 Frequency of stocking by size and number

The results of this analysis (the percentage of a given region's total number of consented stockings which fall within each size class / 'number of fish stocked' class combination) are presented as column plots (Figures 3.26 to 3.35).

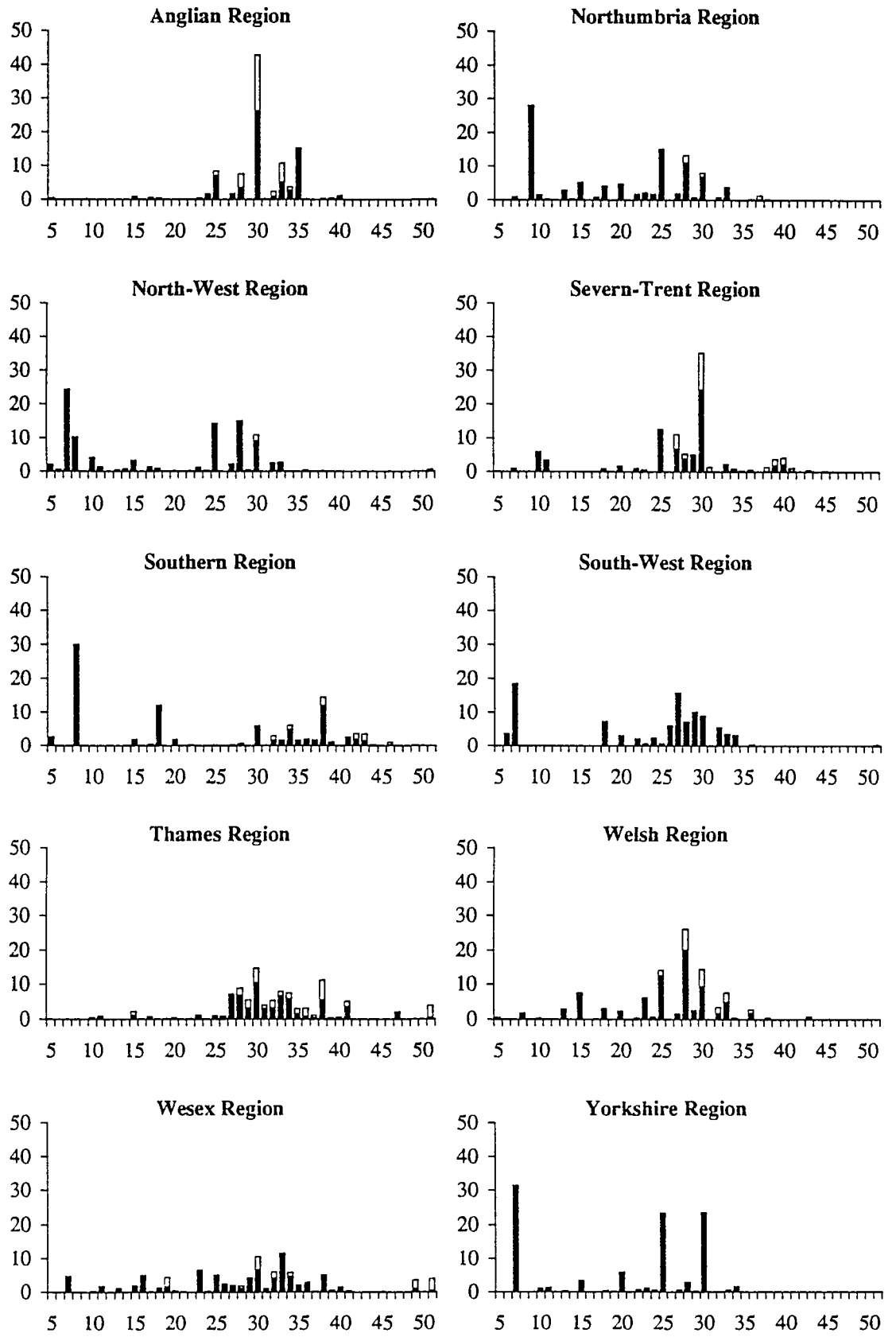

Figure 3.1 Size composition of stock: percentage of total fish >5 cm stocked against mean size at stocking (cm). Solid bars: brown trout - open bars: rainbow trout

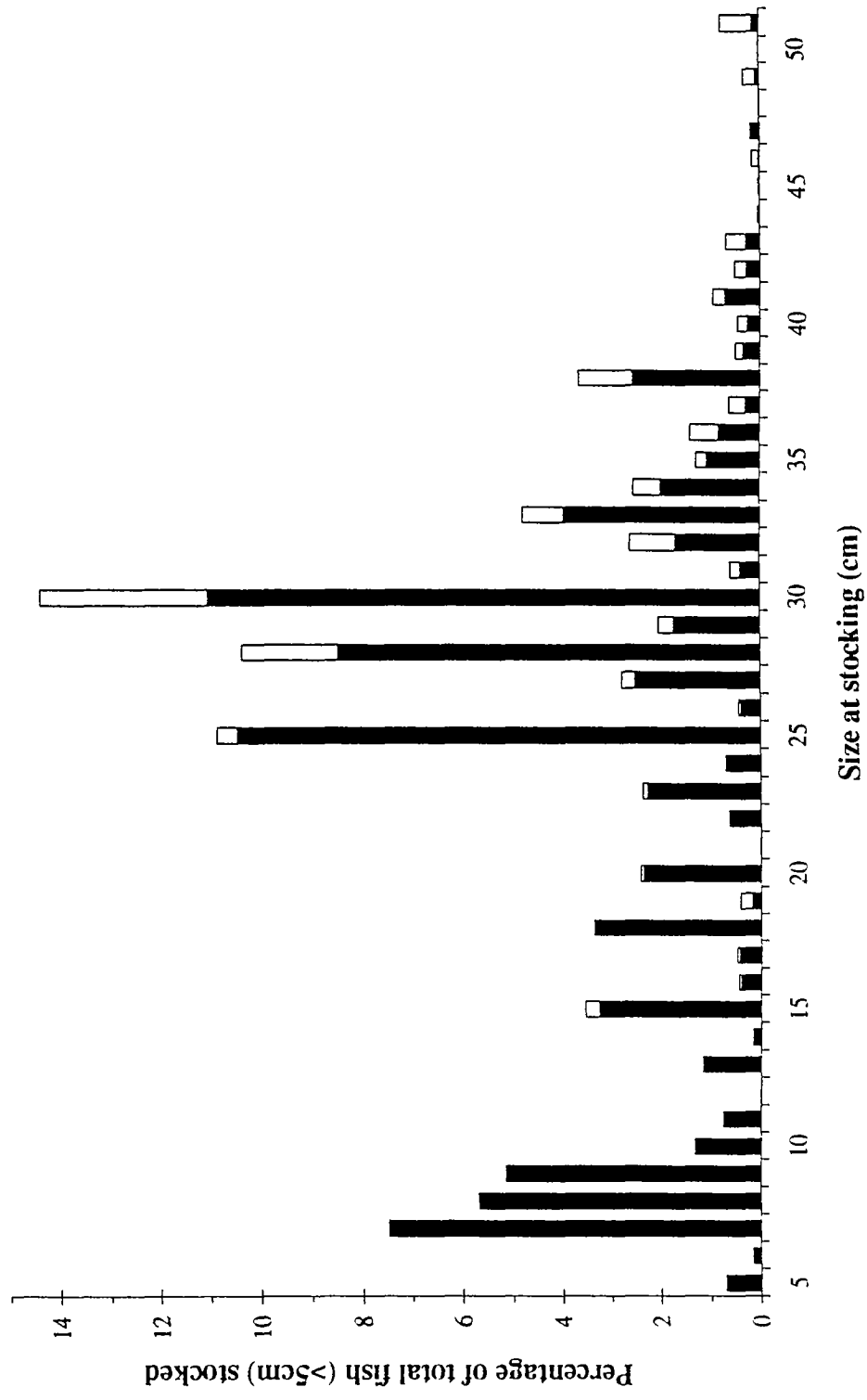

Figure 3.2 Size composition of stock - all regions combined. Solid bars: brown trout - open bars: rainbow trout

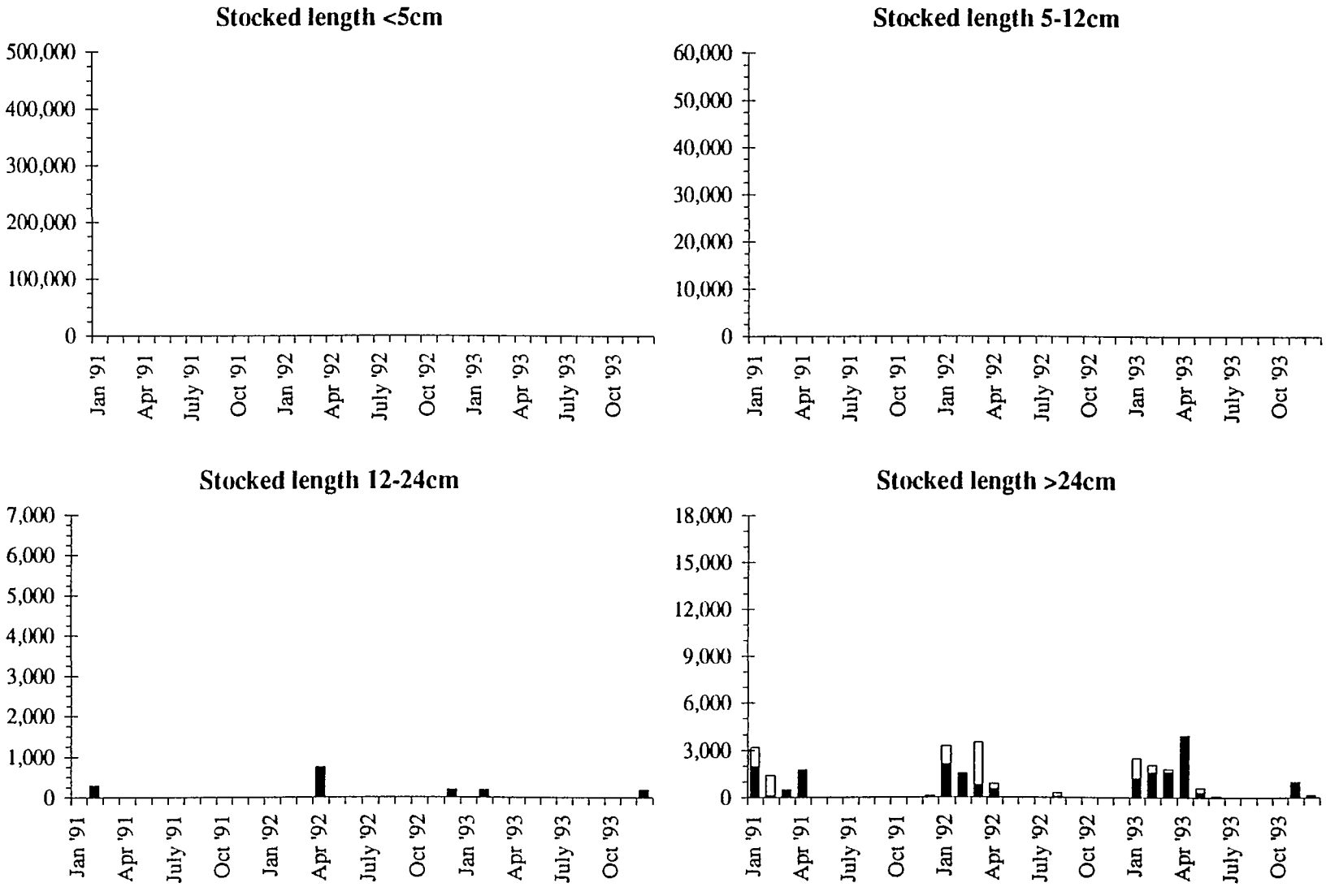

Figure 3.3 Trout stocking intensity (as total number stocked per month): Anglian Region
Solid bars: brown trout - open bars: rainbow trout

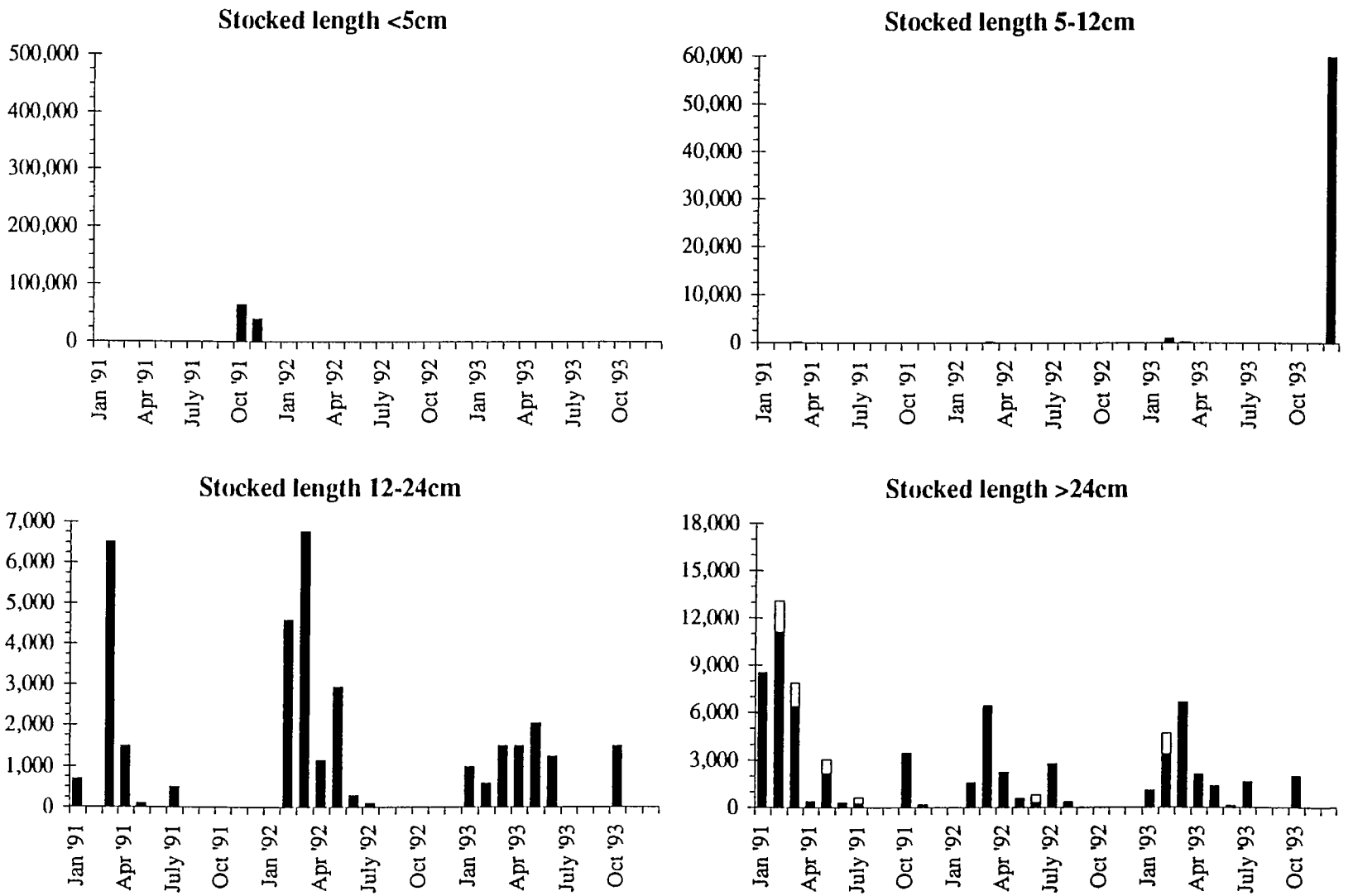

Figure 3.4 Trout stocking intensity (as total number stocked per month): Northumbria Region
Solid bars: brown trout - open bars: rainbow trout

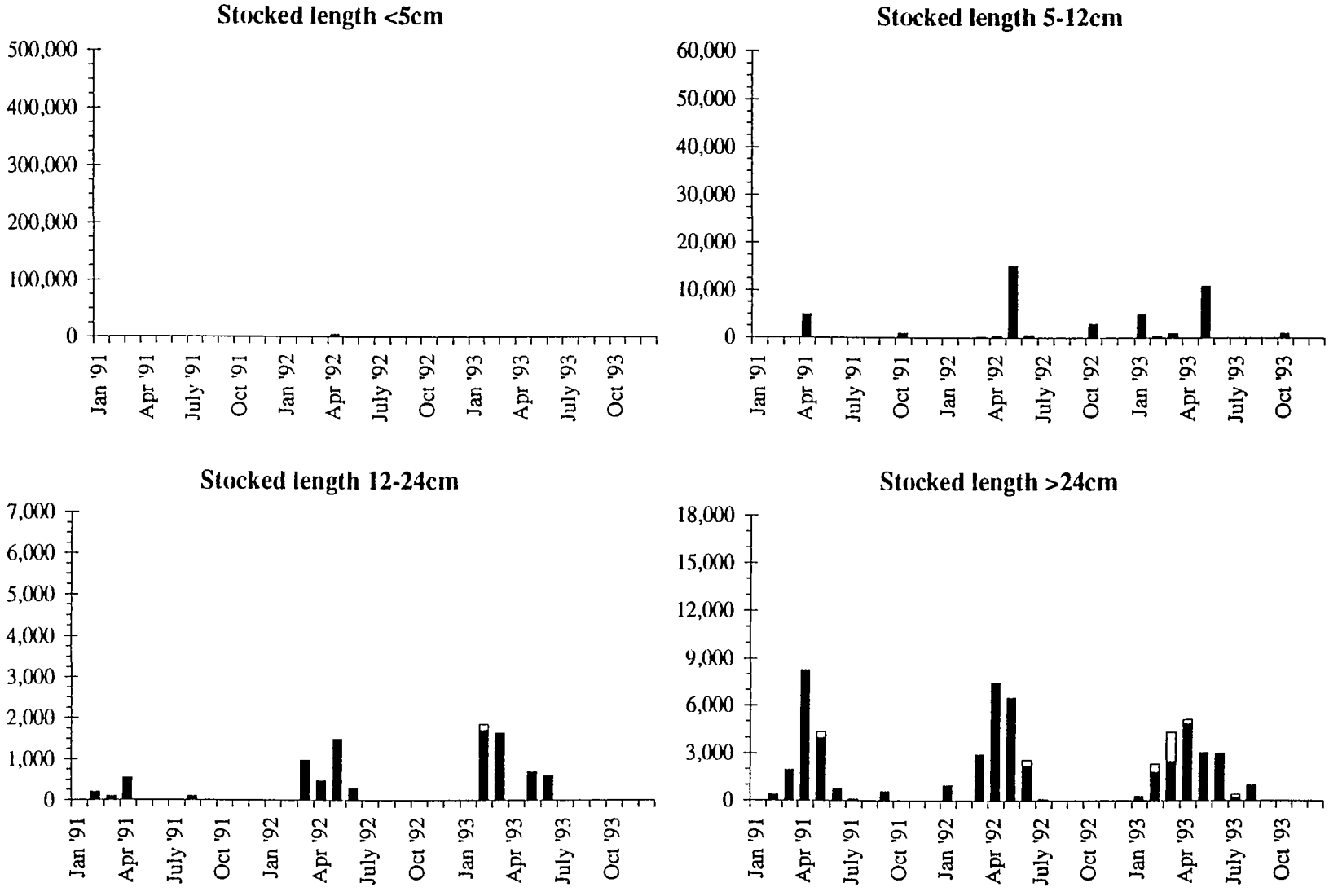

Figure 3.5 Trout stocking intensity (as total number stocked per month): North-West Region
Solid bars: brown trout - open bars: rainbow trout

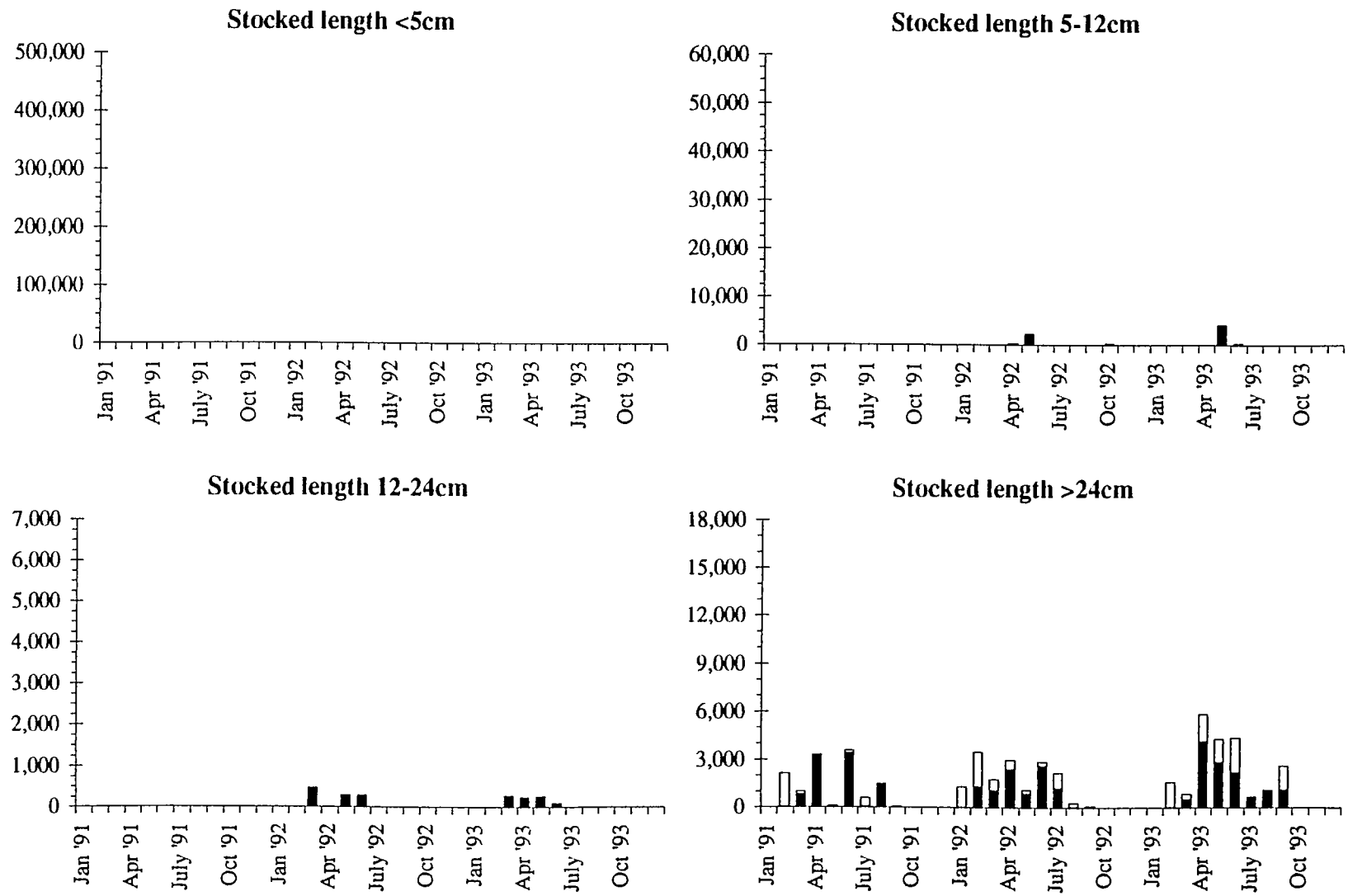

Figure 3.6 Trout stocking intensity (as total number stocked per month): Severn-Trent Region
Solid bars: brown trout - open bars: rainbow trout

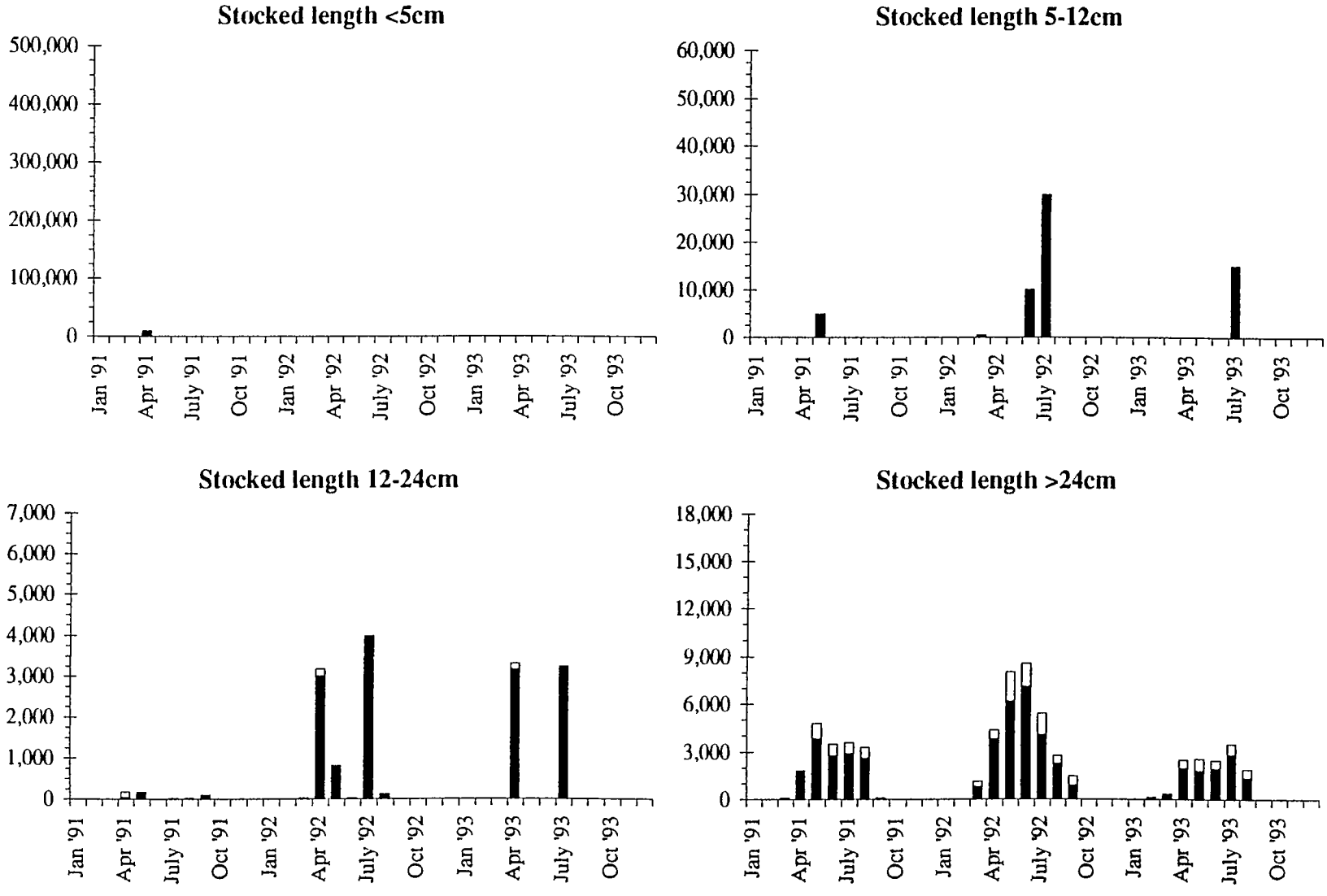

Figure 3.7 Trout stocking intensity (as total number stocked per month): Southern Region
Solid bars: brown trout - open bars: rainbow trout

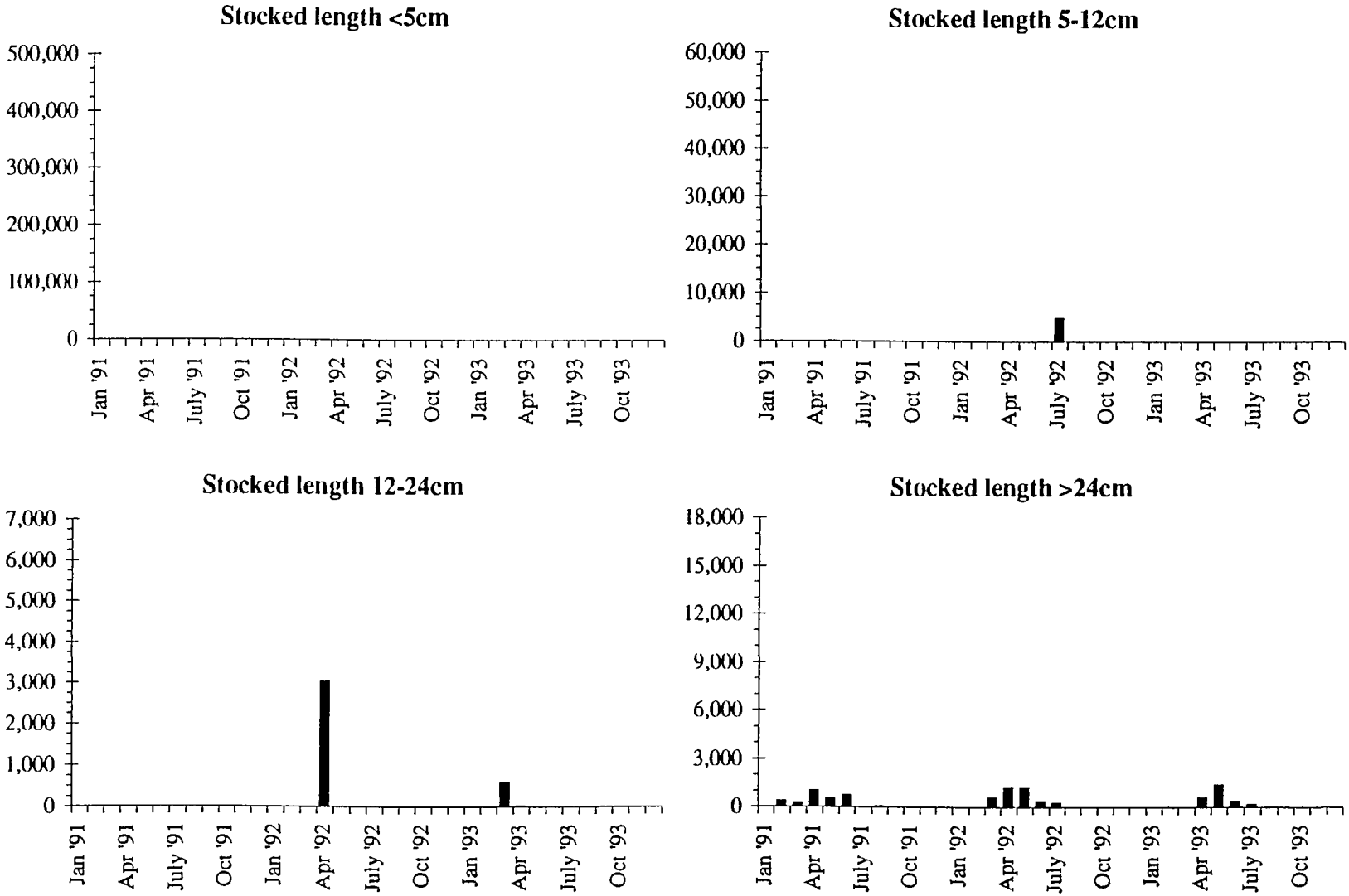

Figure 3.8 Trout stocking intensity (as total number stocked per month): South-West Region
Solid bars: brown trout - open bars: rainbow trout

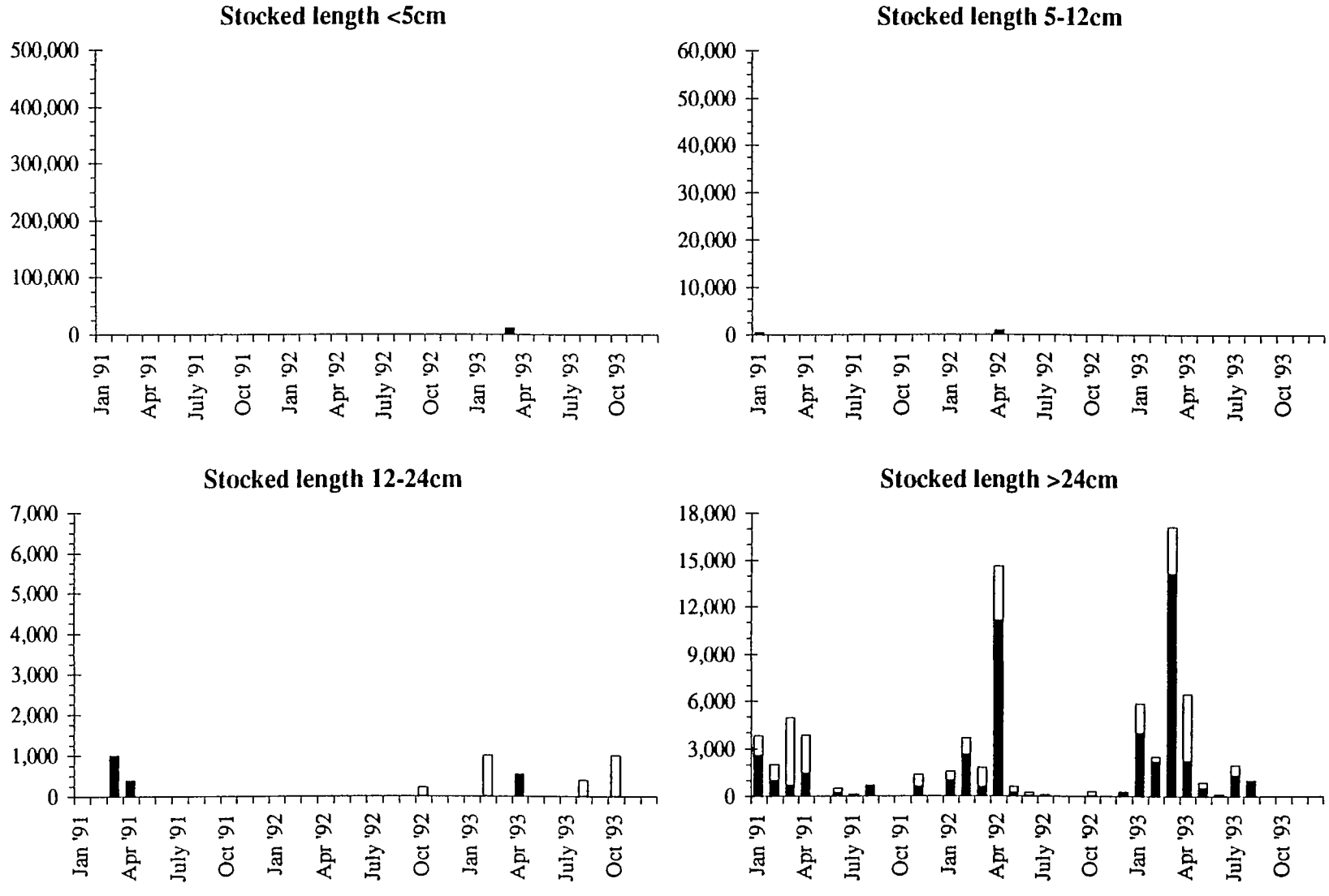

Figure 3.9 Trout stocking intensity (as total number stocked per month): Thames Region
Solid bars: brown trout - open bars: rainbow trout

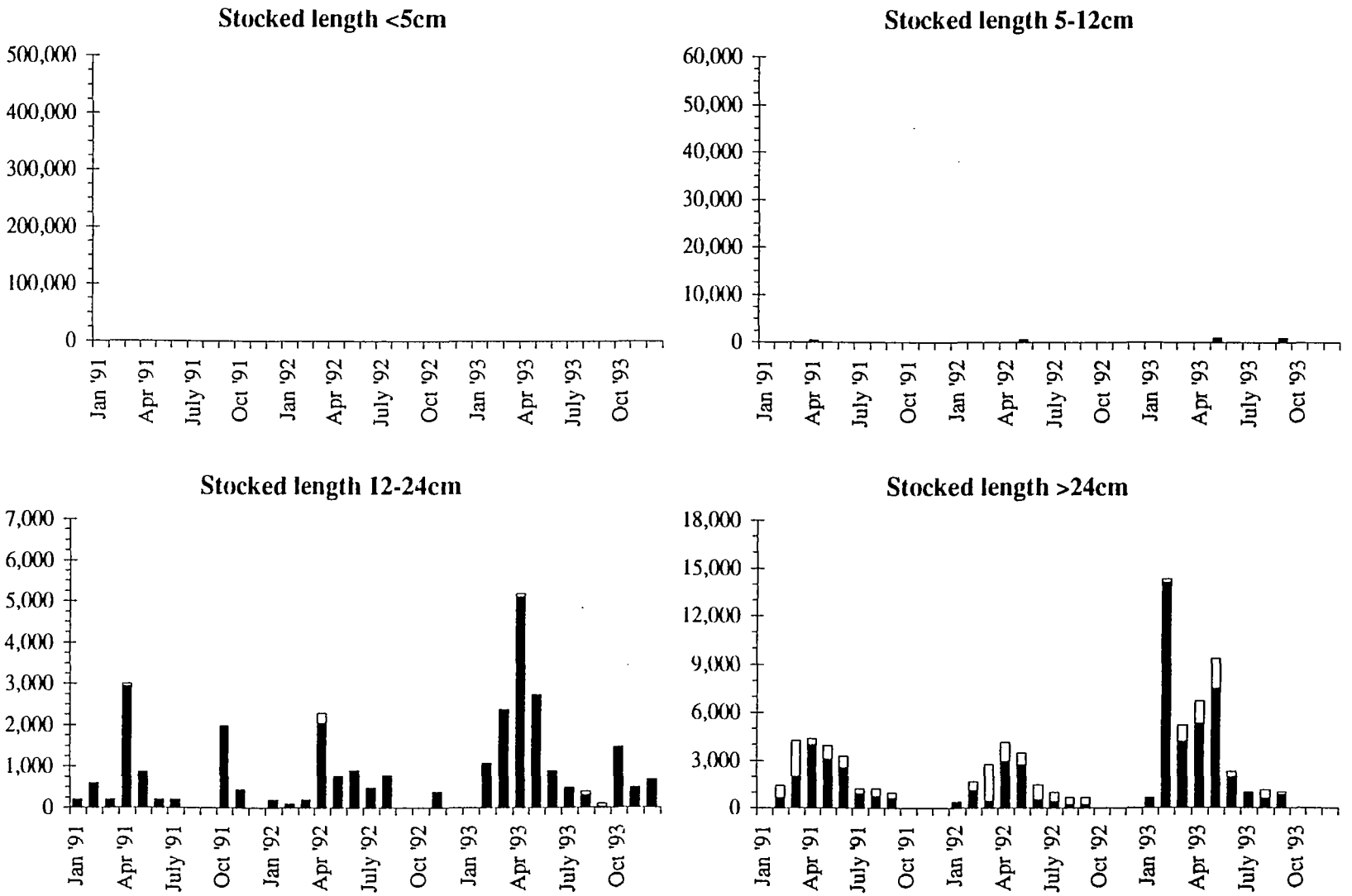

Figure 3.10 Trout stocking intensity (as total number stocked per month): Welsh Region
Solid bars: brown trout - open bars: rainbow trout

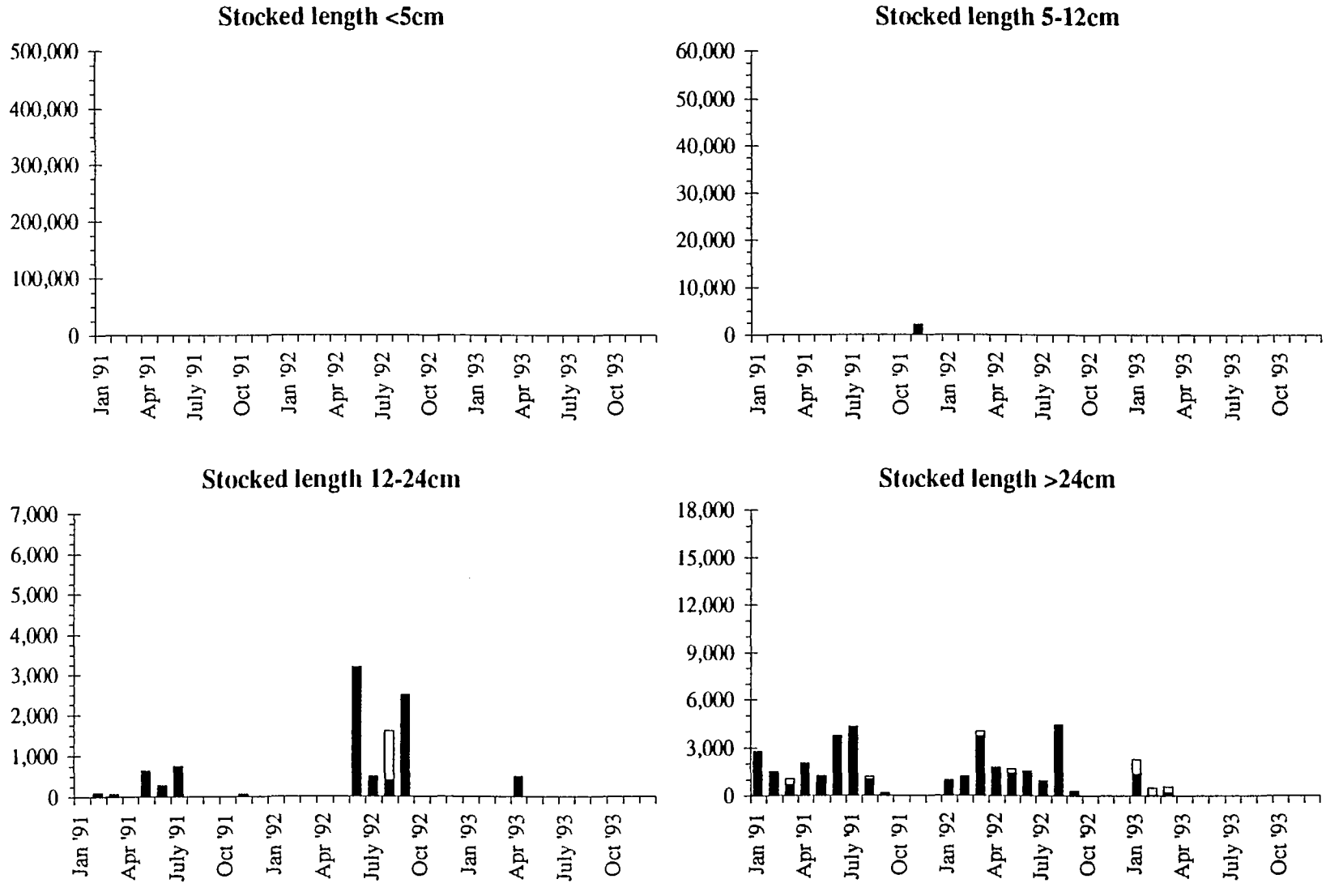

Figure 3.11 Trout stocking intensity (as total number stocked per month): Wessex Region
Solid bars: brown trout - open bars: rainbow trout

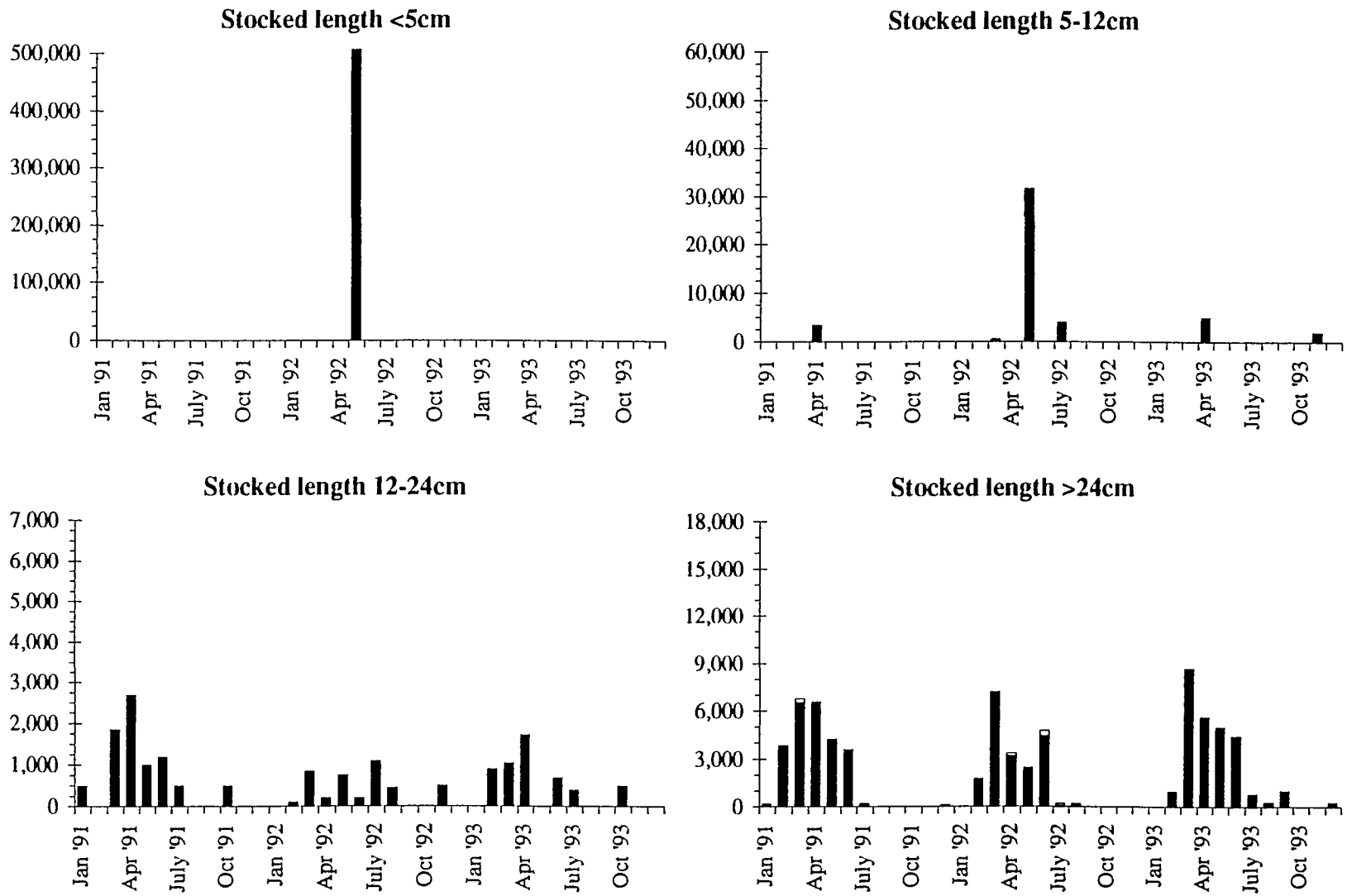

Figure 3.12 Trout stocking intensity (as total number stocked per month): Yorkshire Region
Solid bars: brown trout - open bars: rainbow trout

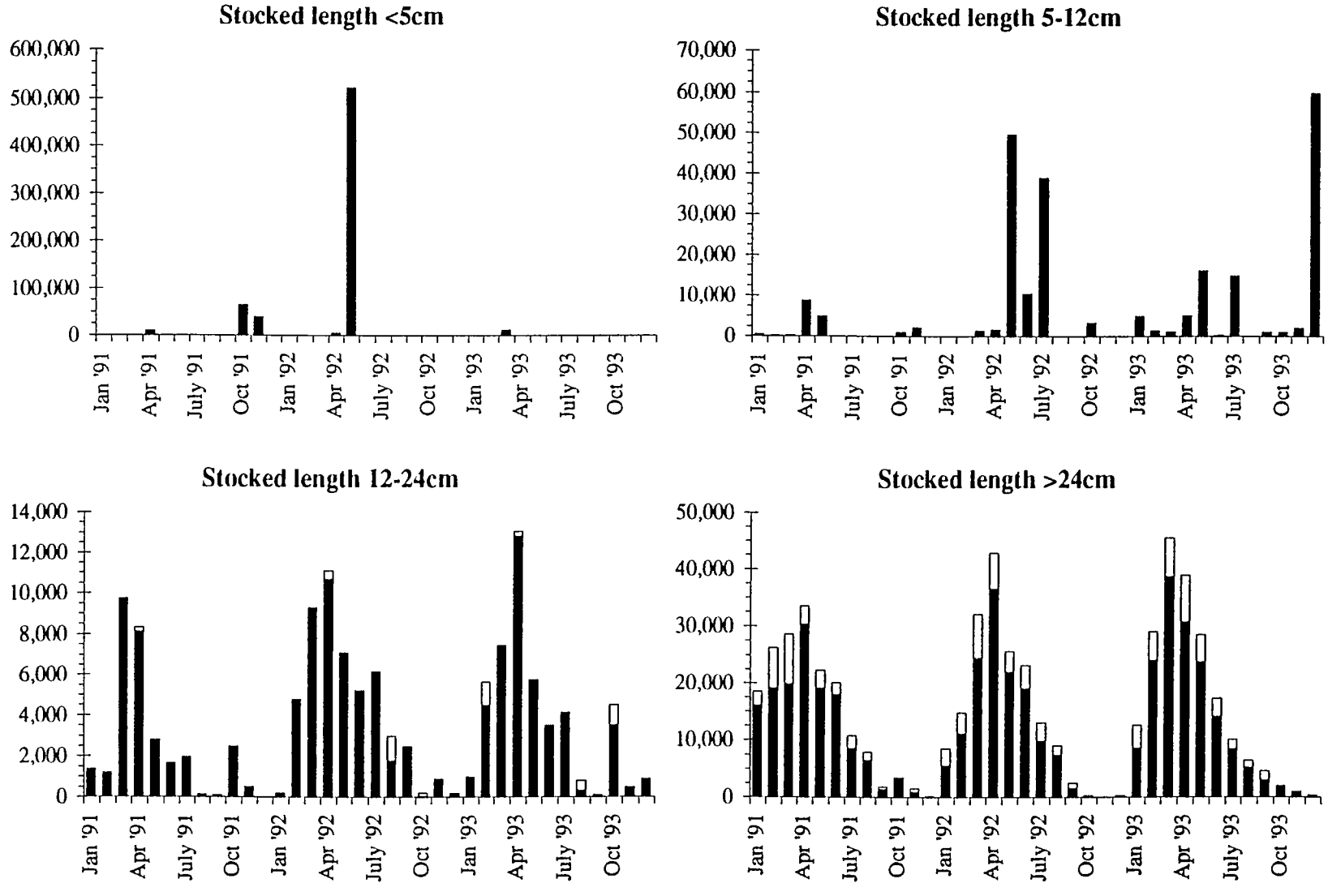

Figure 3.13 Trout stocking intensity (as total number stocked per month): All regions combined
Solid bars: brown trout - open bars: rainbow trout

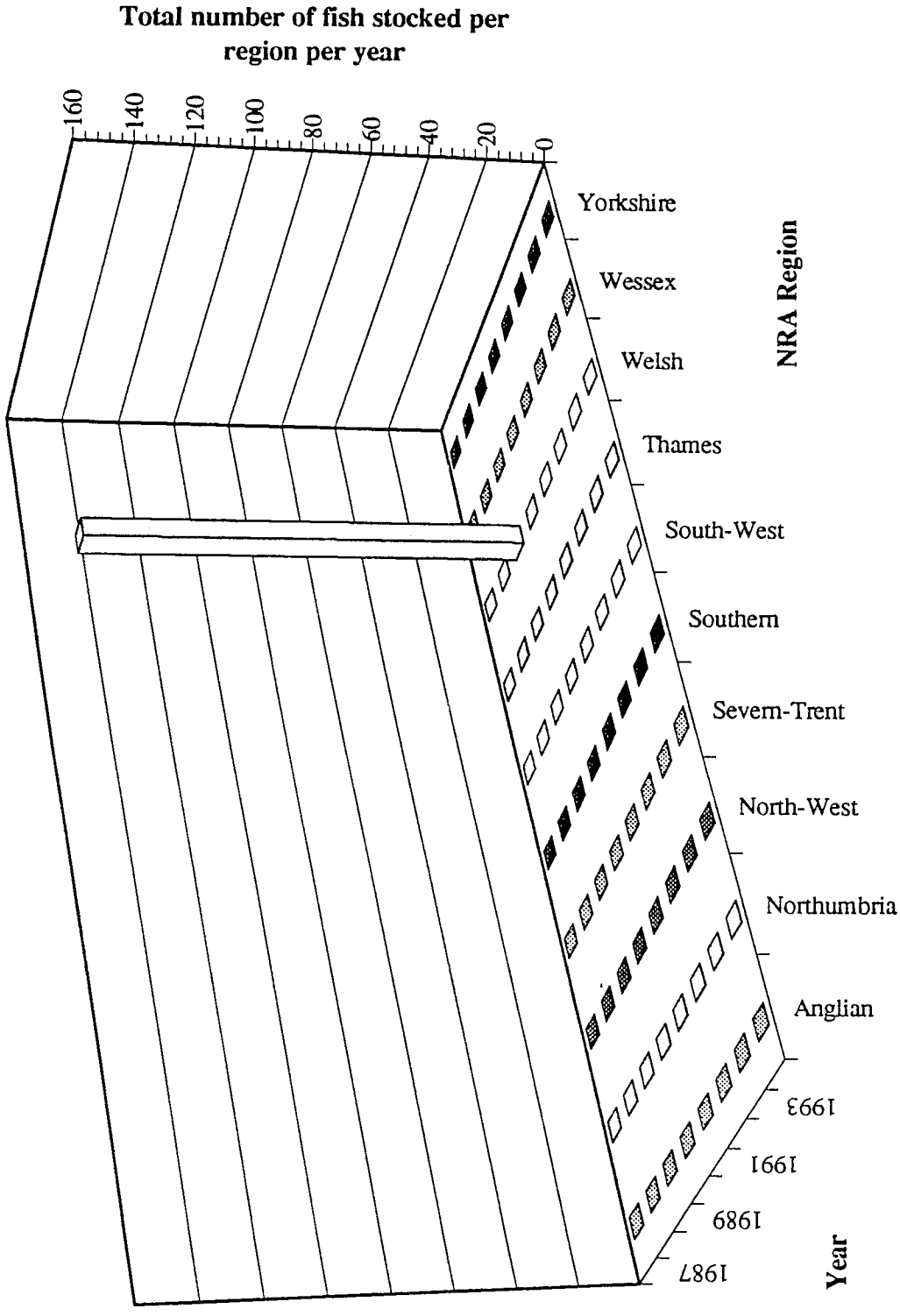

Figure 3.14 Regional variations in stocking intensity Brook trout >24 cm

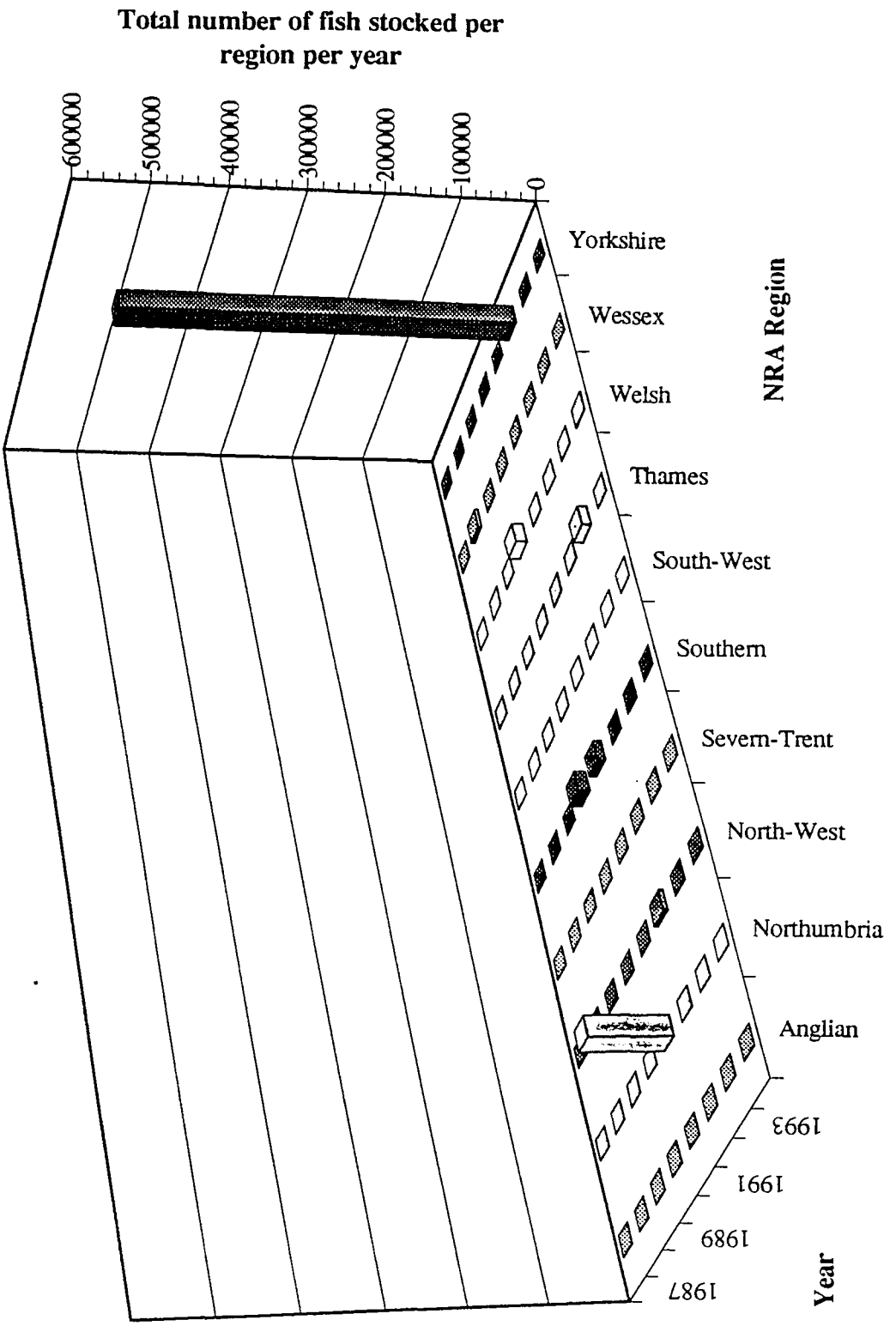

Figure 3.15 Regional variations in stocking intensity Brown trout <5 cm

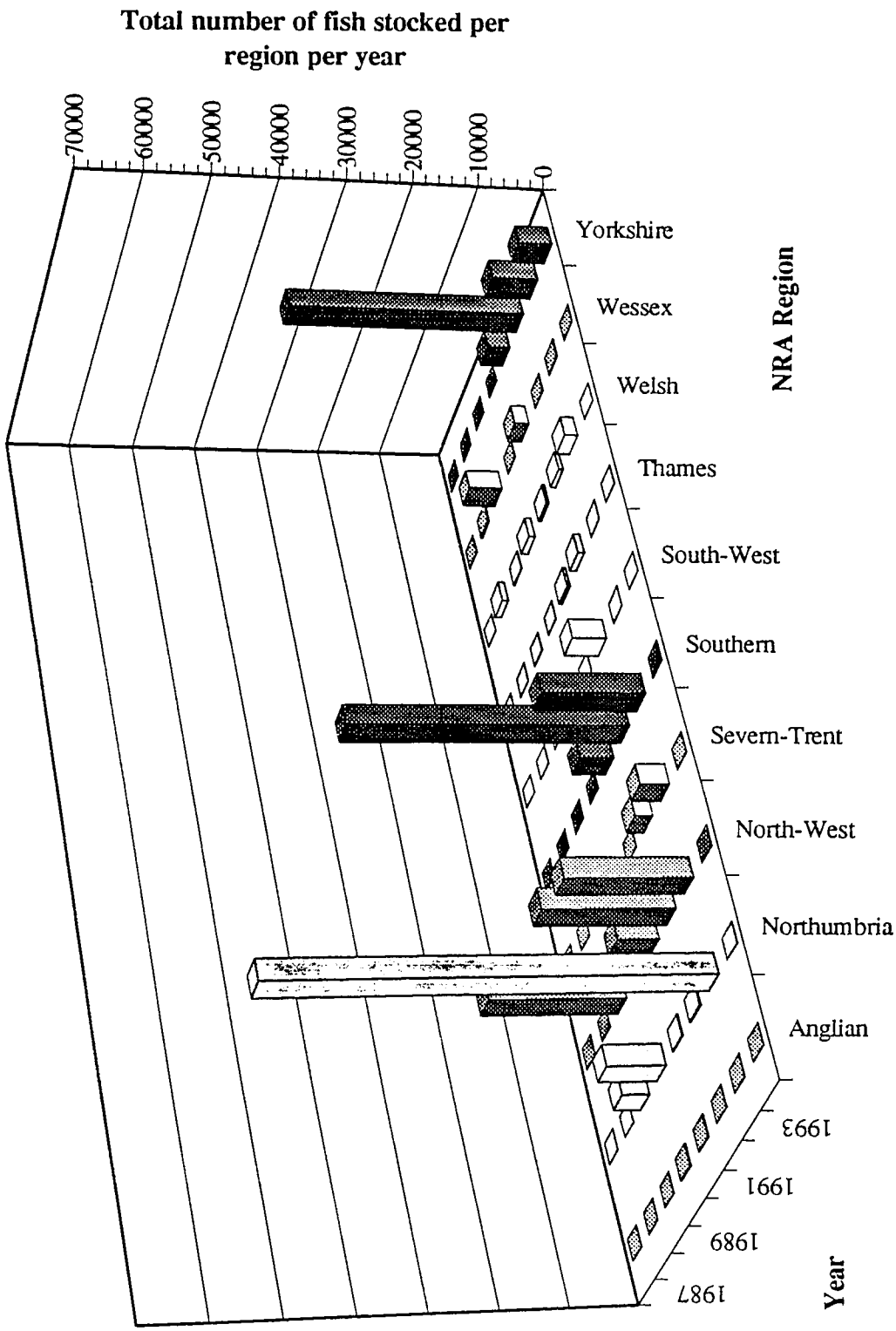

Figure 3.16 Regional variations in stocking intensity Brown trout 5-12 cm

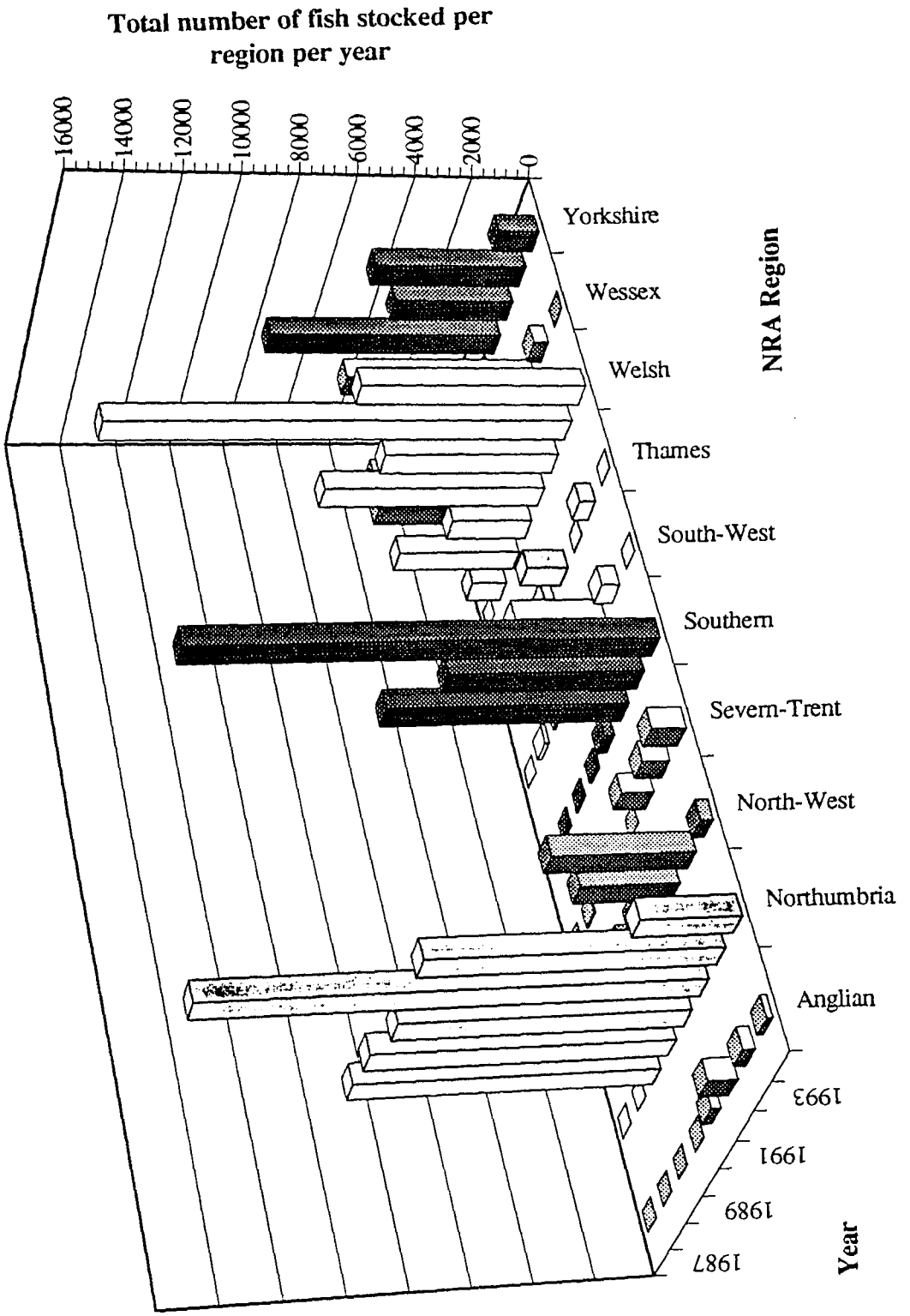

Figure 3.17 Regional variations in stocking intensity Brown trout 12-24 cm

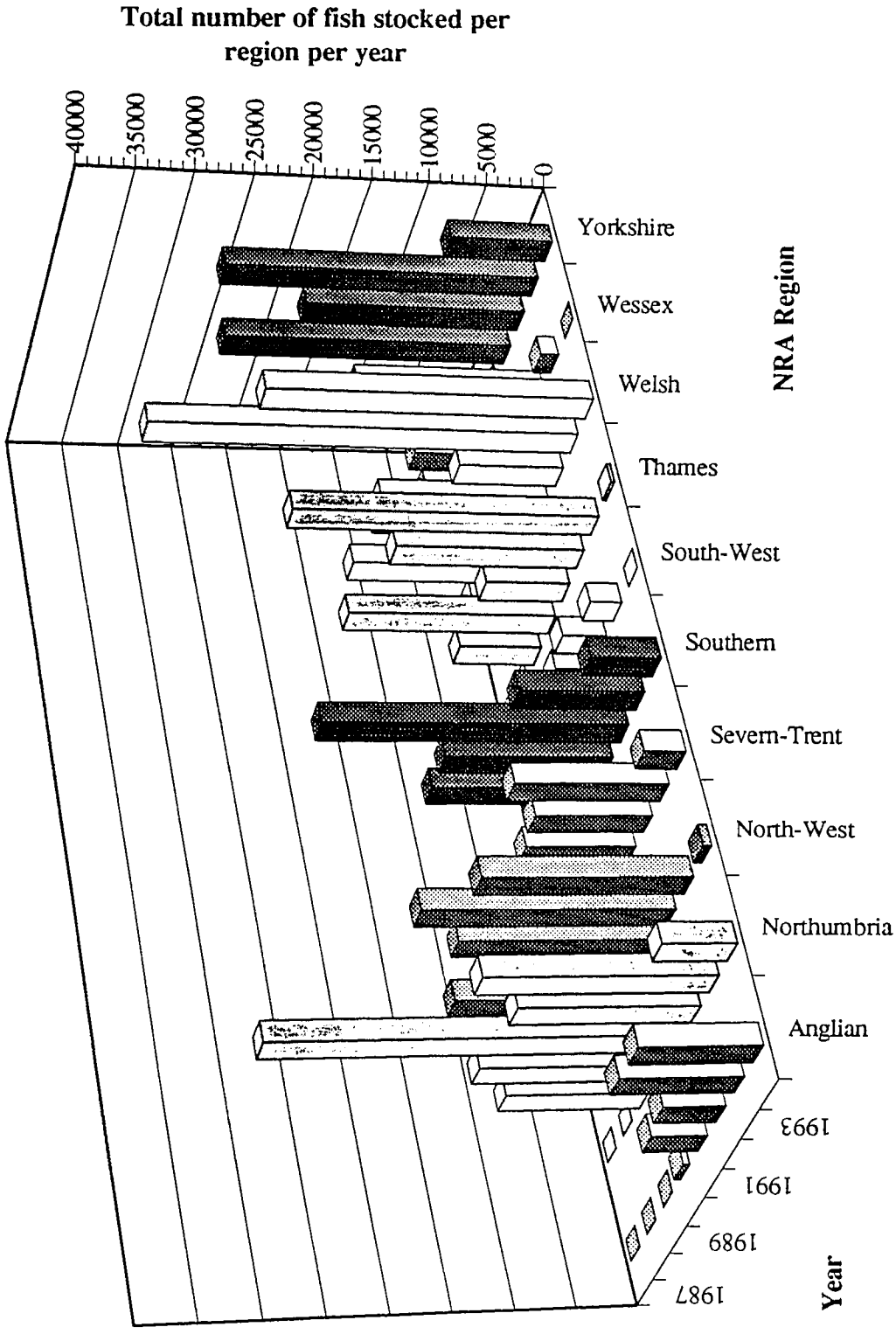

Figure 3.18 Regional variations in stocking intensity Brown trout >24 cm

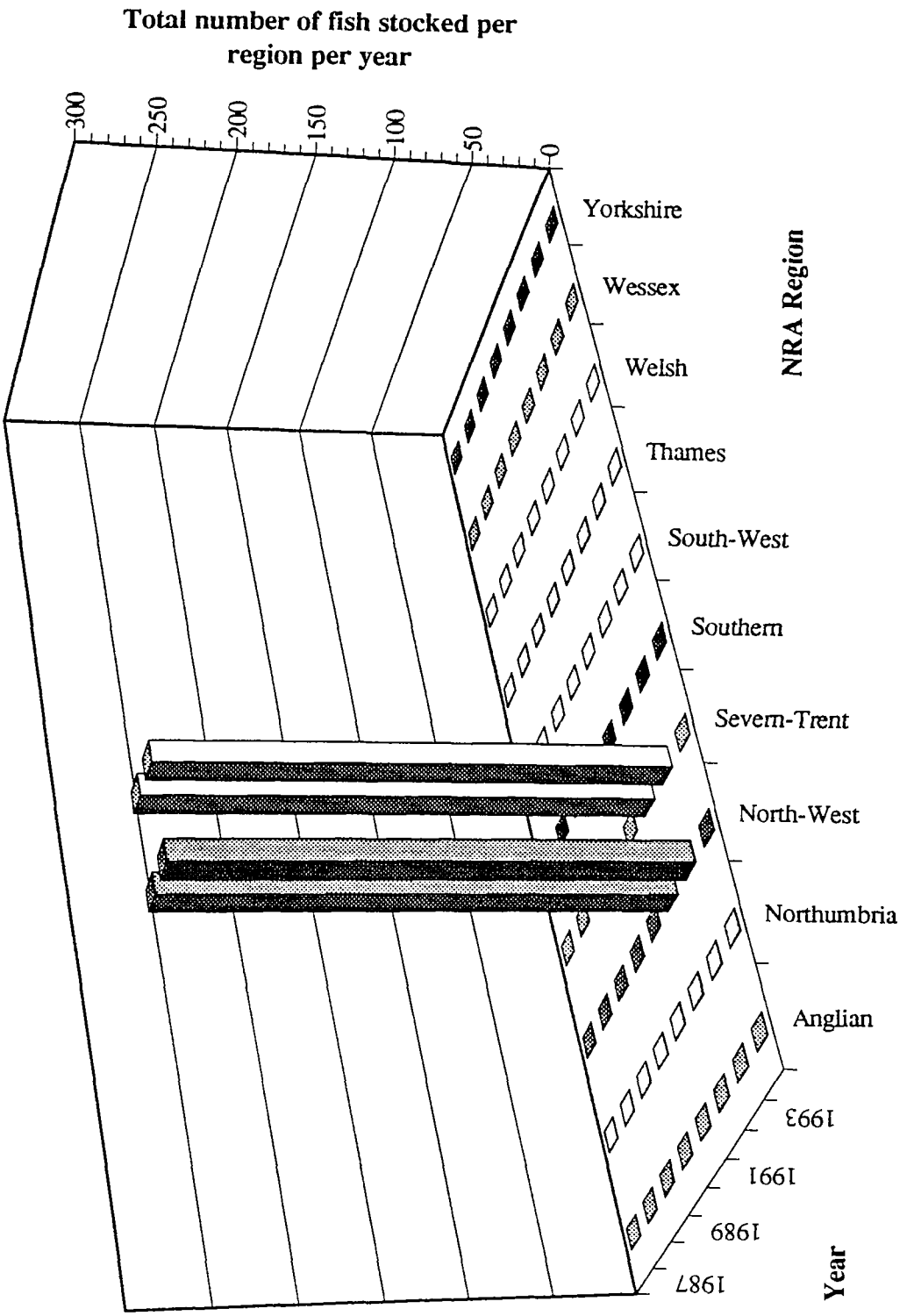

Figure 3.19 Regional variations in stocking intensity Rainbow trout 5-12 cm

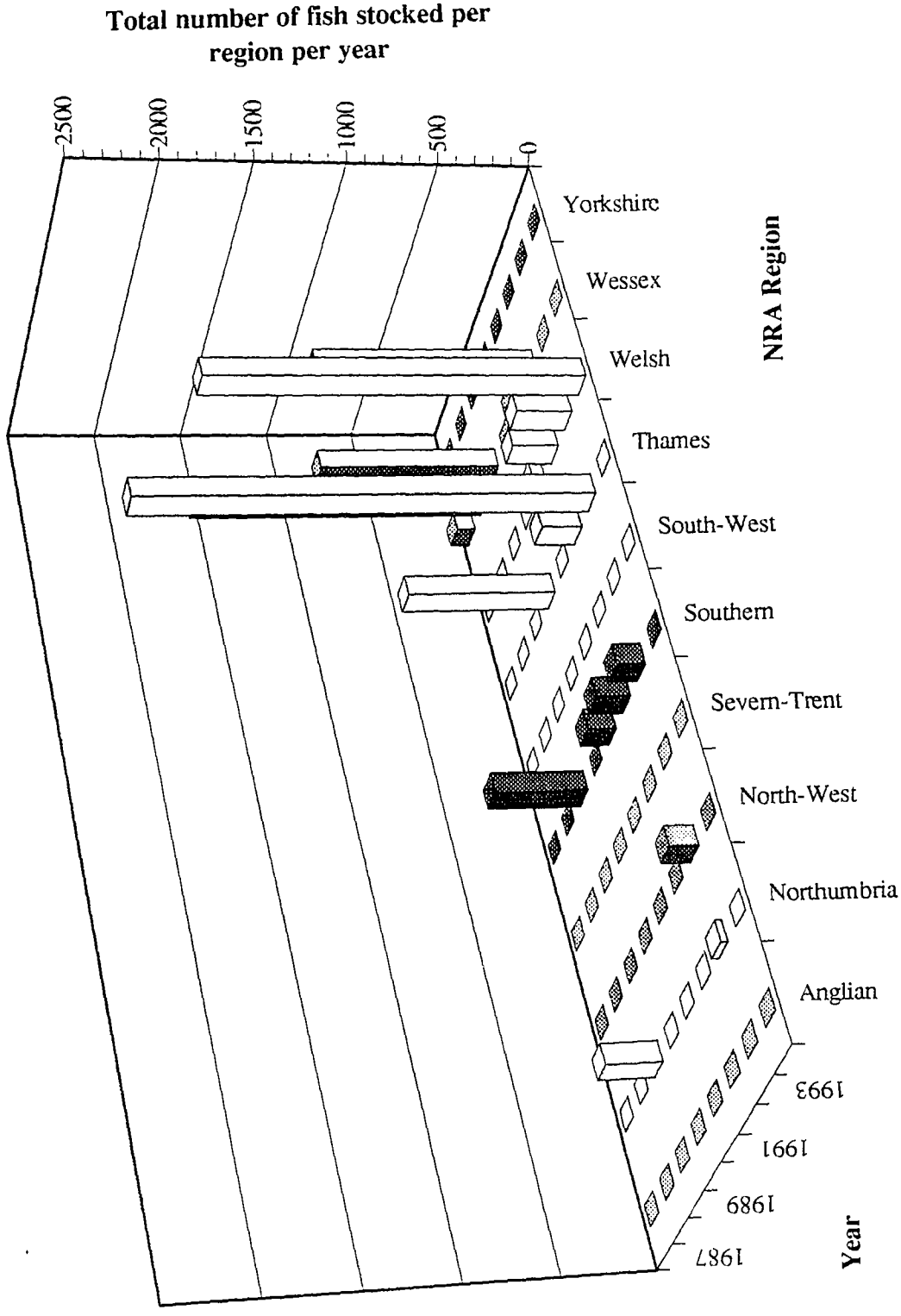

Figure 3.20 Regional variations in stocking intensity Rainbow trout 12-24 cm

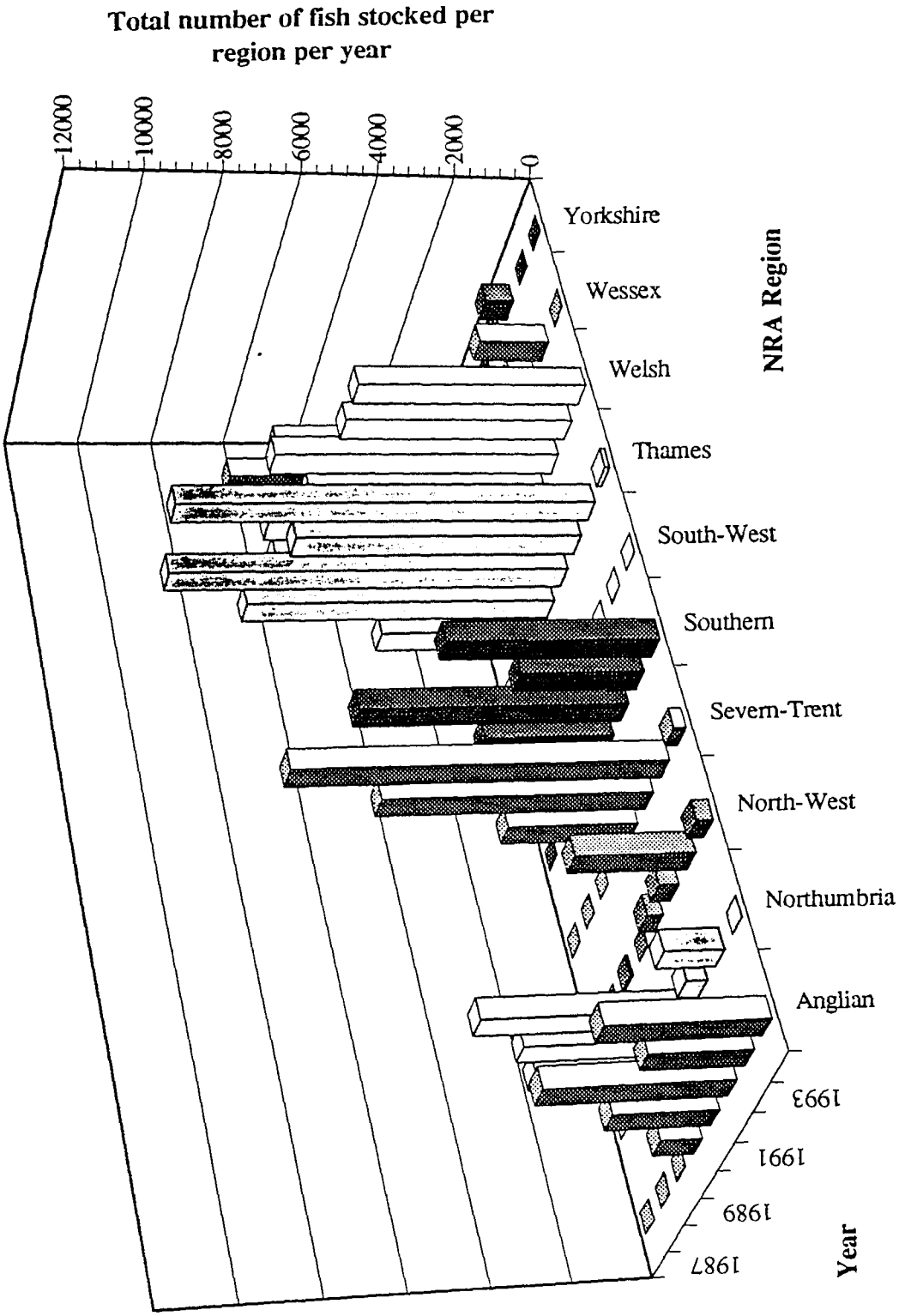

Figure 3.21 Regional variations in stocking intensity Rainbow trout >24 cm

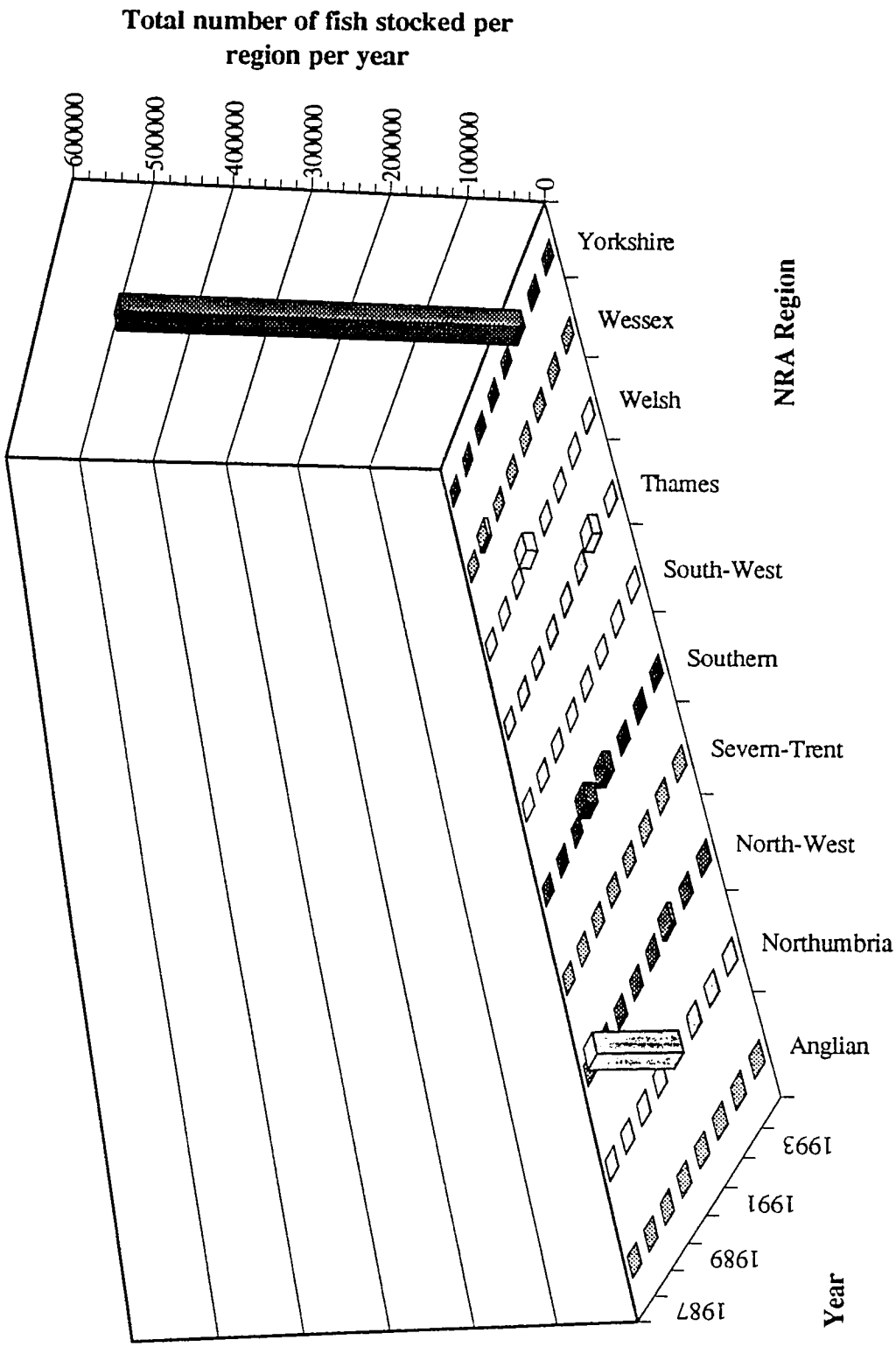

Figure 3.22 Regional variations in stocking intensity Total trout <5 cm

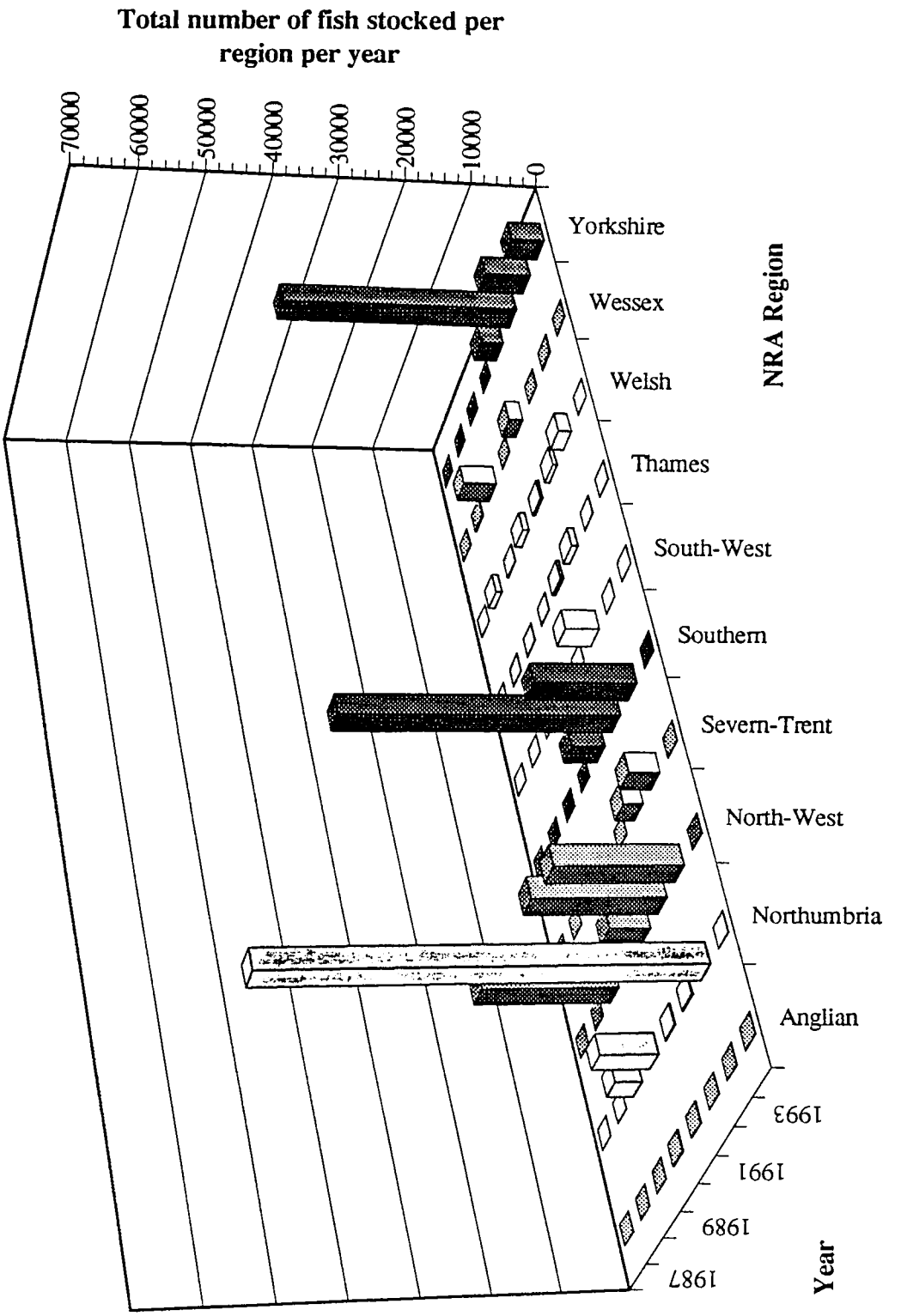

Figure 3.23 Regional variations in stocking intensity Total trout 5-12 cm

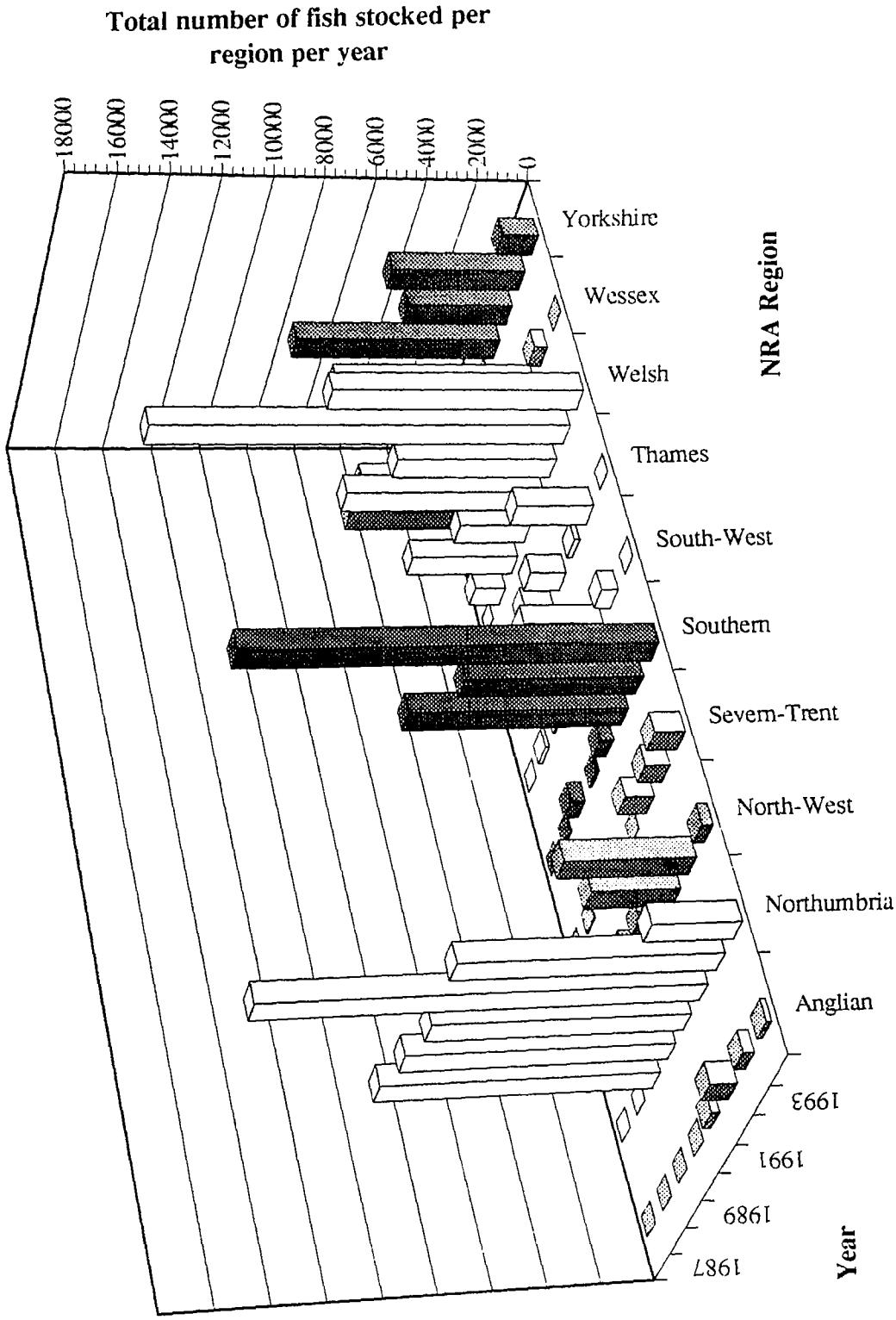

Figure 3.24 Regional variations in stocking intensity Total trout 12-24 cm

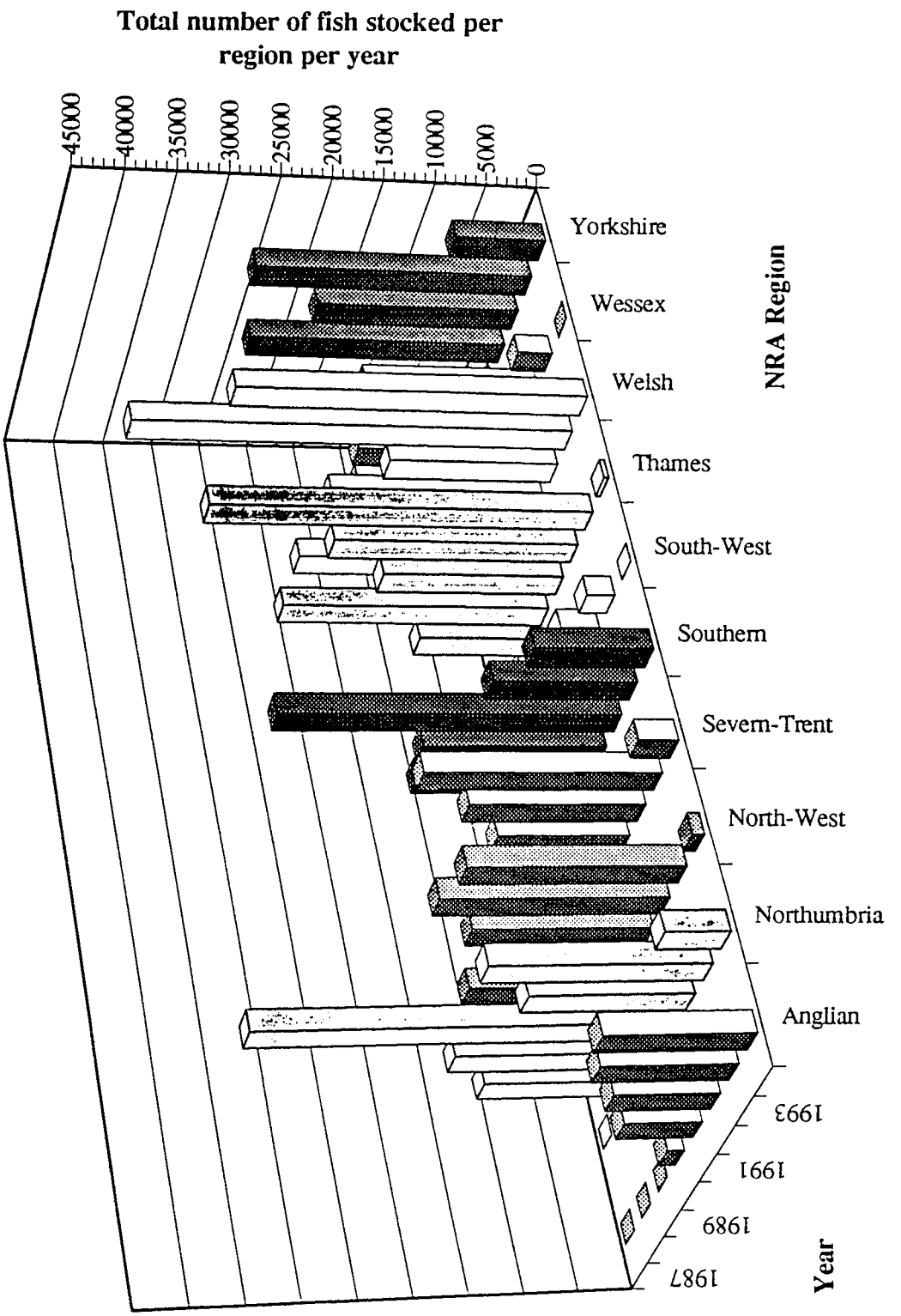

Figure 3.25 Regional variations in stocking intensity Total trout >24 cm

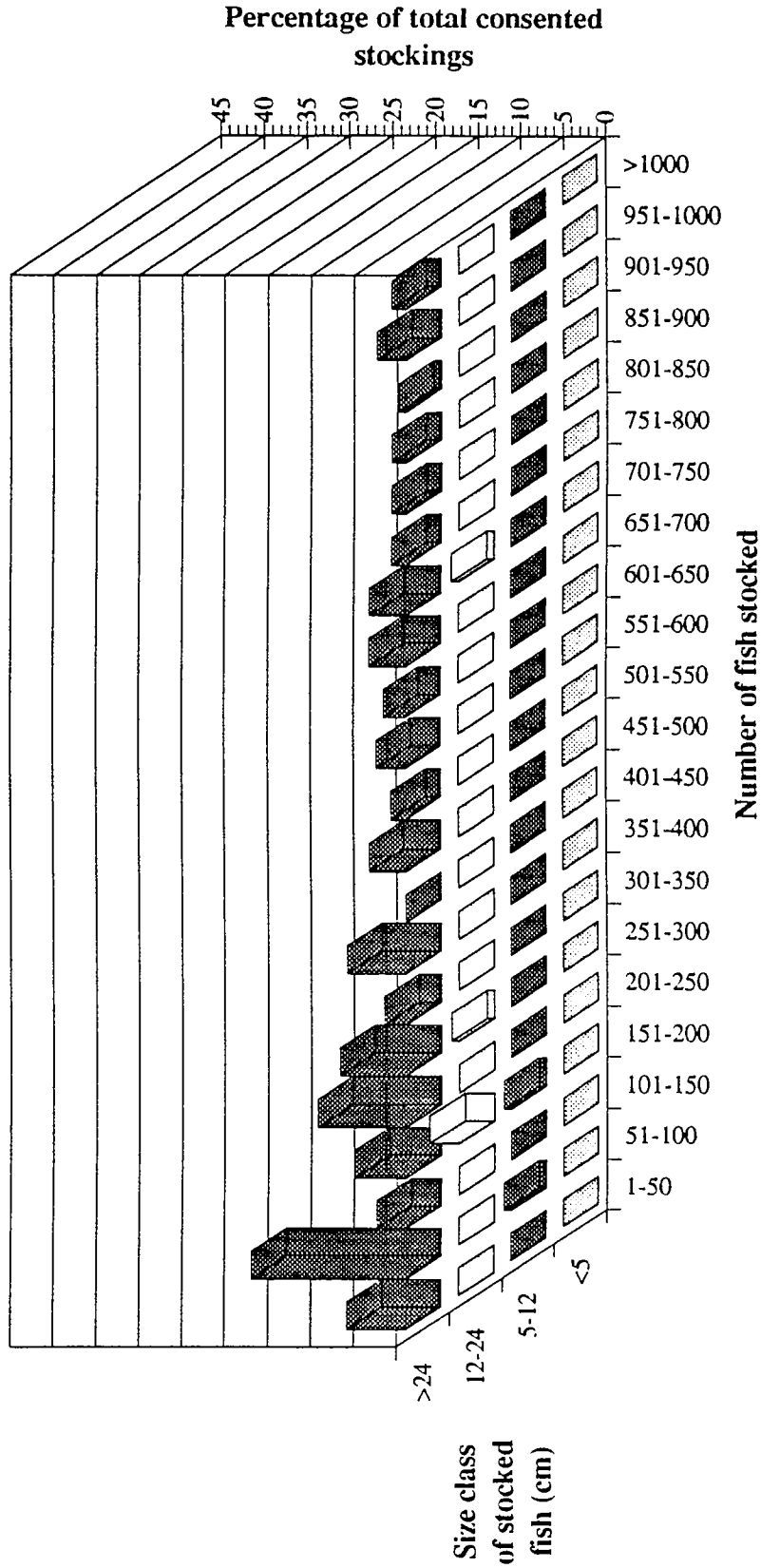

Figure 3.26 Trends in the size-at-stocking / stocking intensity relationship Anglian Region - all species combined

Figure 3.27 Trends in the size-at-stocking / stocking intensity relationship Northumbria Region - all species combined

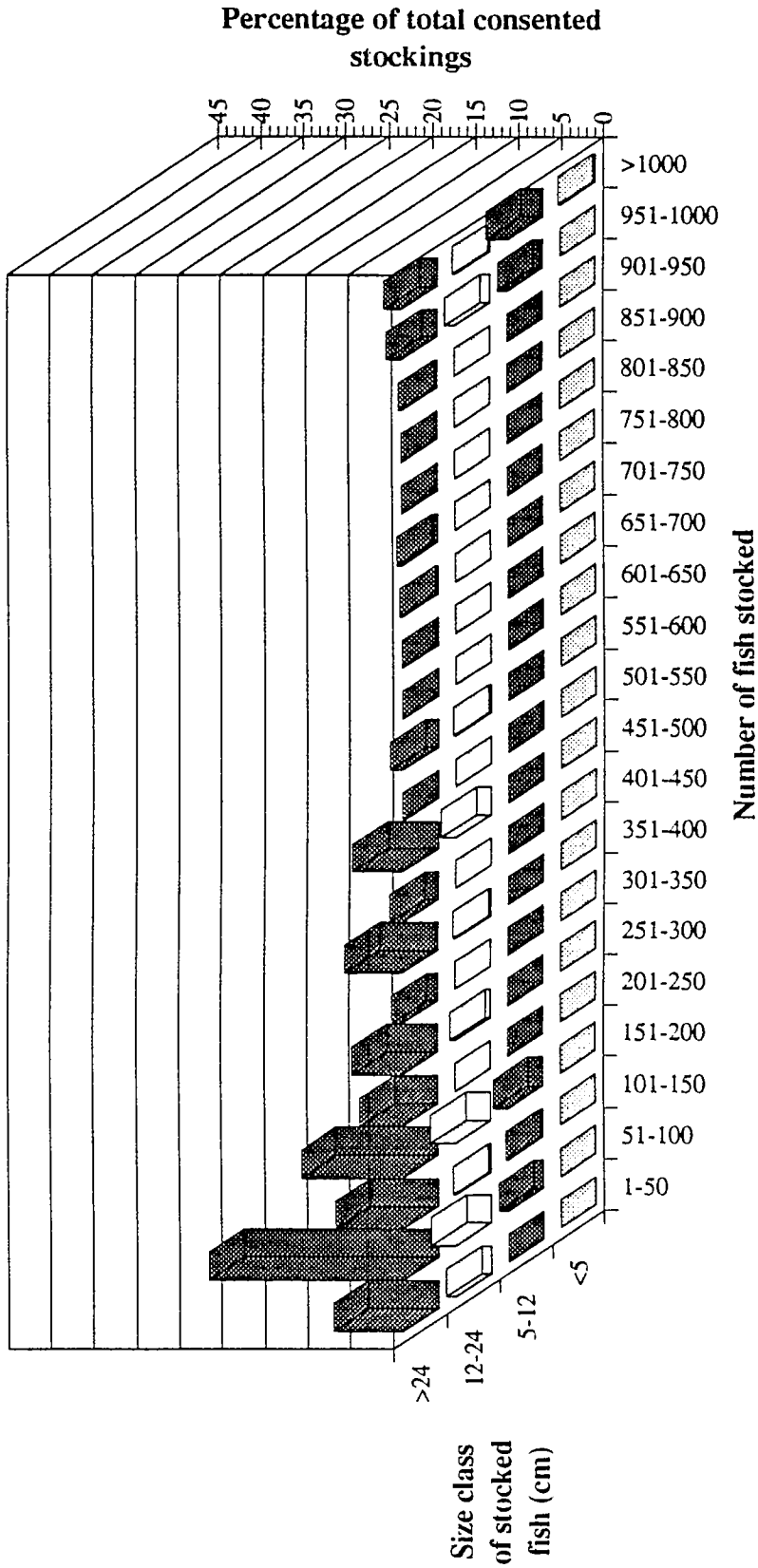

Figure 3.28 Trends in the size-at-stocking / stocking intensity relationship North-West Region - all species combined

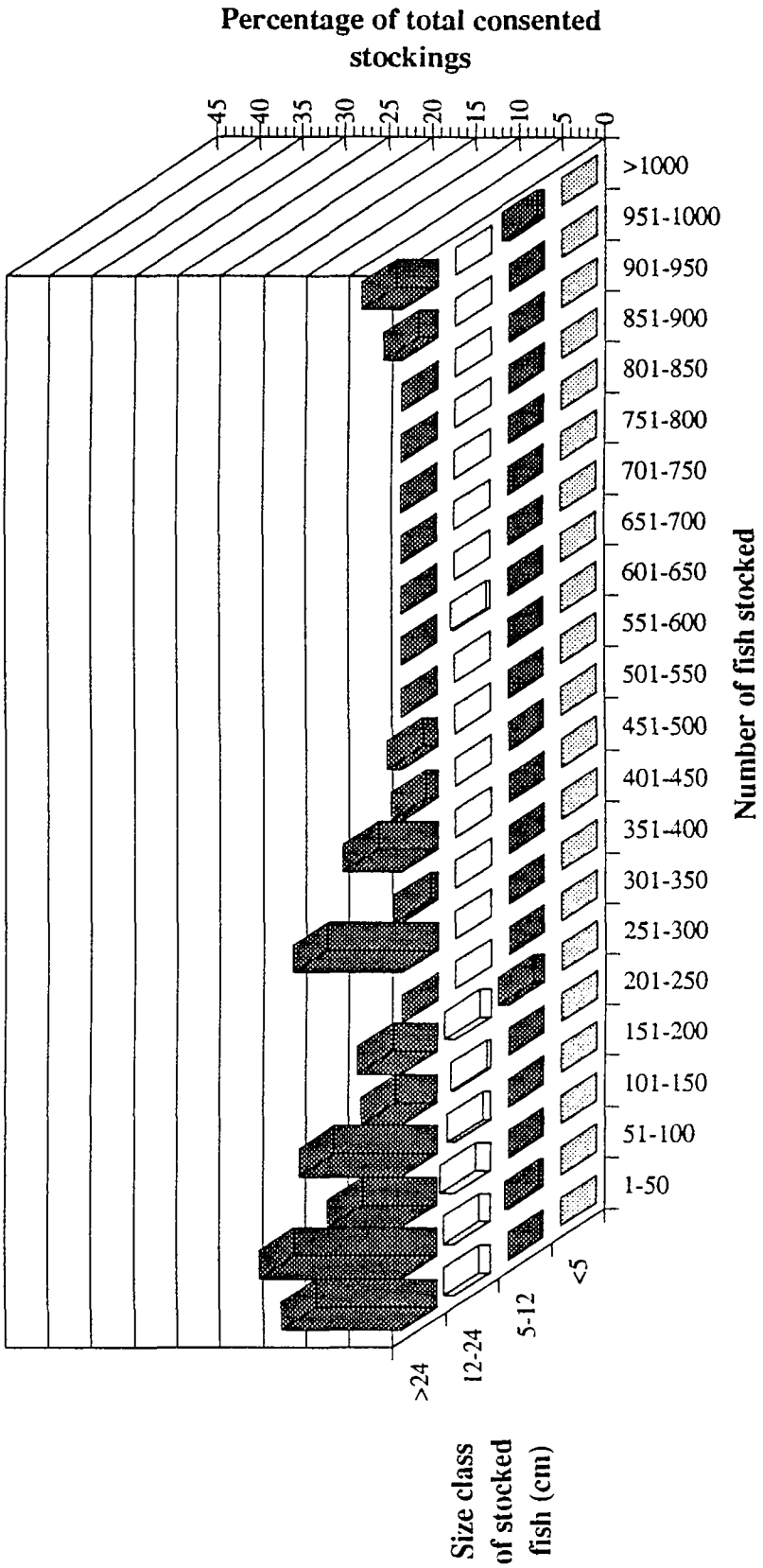

Figure 3.29 Trends in the size-at-stocking / stocking intensity relationship Severn-Trent Region - all species combined

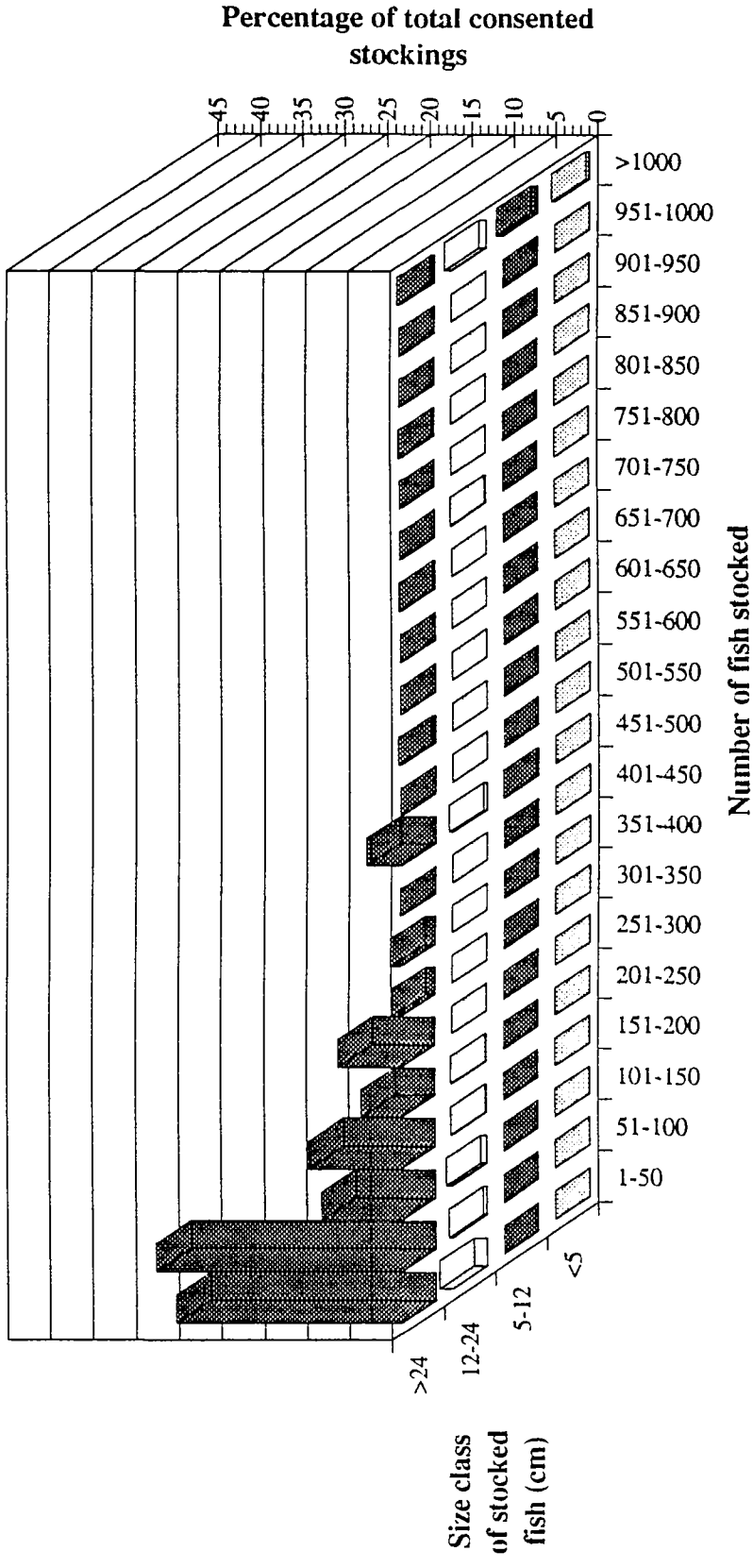

Figure 3.30 Trends in the size-at-stocking / stocking intensity relationship Southern Region - all species combined

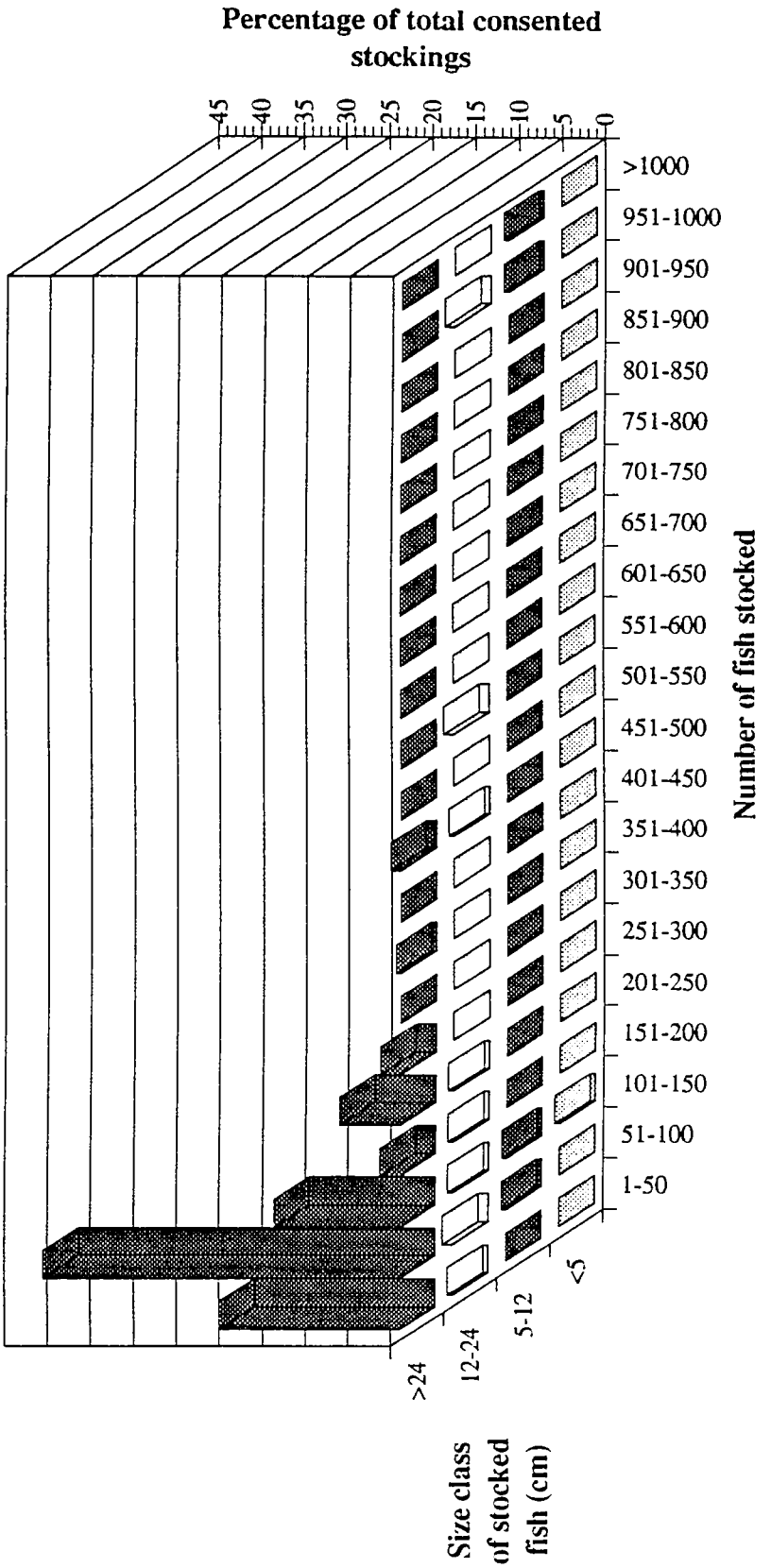

Figure 3.31 Trends in the size-at-stocking / stocking intensity relationship South-West Region - all species combined

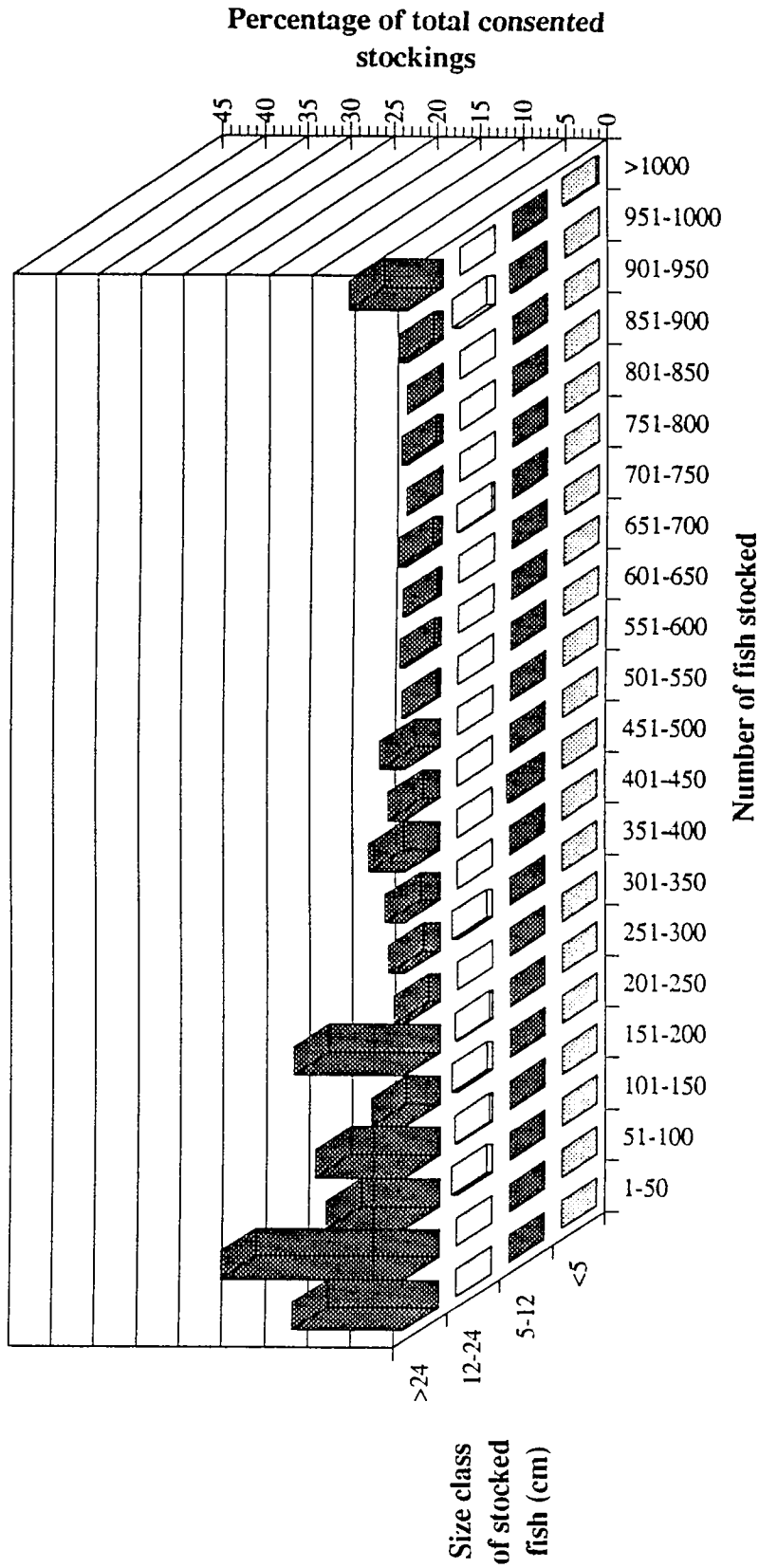

Figure 3.32 Trends in the size-at-stocking / stocking intensity relationship Thames Region - all species combined

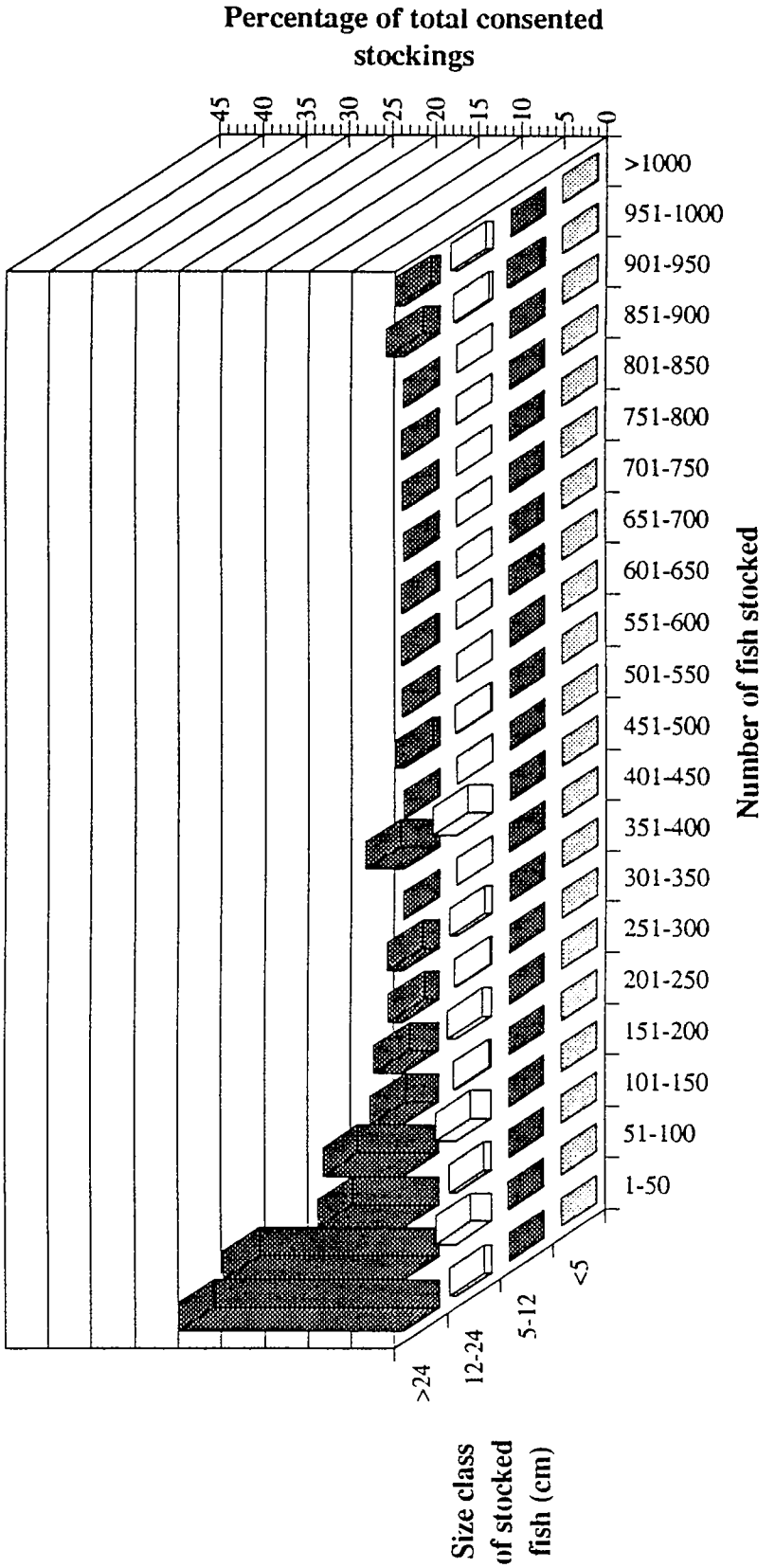

Figure 3.33 Trends in the size-at-stocking / stocking intensity relationship Welsh Region - all species combined

Figure 3.34 Trends in the size-at-stocking / stocking intensity relationship Wessex Region - all species combined

Figure 3.35 Trends in the size-at-stocking / stocking intensity relationship Yorkshire Region - all species combined

3.2 The quality of Section 30 records

3.2.1 General quality

Information on the general quality of the Section 30 consents originally made available to WRc is of a more subjective nature. The main points arising are discussed in Section 4.5, although some key faults with the data which were identified during the data entry phase (along with estimates as to their frequency of occurence) are given below in Table 3.1.

3.2.2 Metrics

The percentage frequency of use of the four different metrics used in the collated Section 30 consents are shown in Table 3.2 (over).

Table 3.1 Subjective assessment of Section 30 consents data quality

Nature of the fault (with examples)	Aproximate frequency of occurence
Use of mixed metrics [1]	<5%
Missing or inappropriate data [2]	<5%
Illegible or ambiguous details [3]	<5%
Detailed site information absent [4]	>75%
Site dimensions absent [5]	~100%

Key to examples

1 Size of fish recorded as 8" - 2lbs

2 Size of fish not recorded

3 Where more than one species is being stocked - no indication given of whether 'number of fish to be stocked' is overall the overall total or a total for each of the species

4 No specific site or reach recorded / no grid reference supplied

5 No indication of the size of the stocking site (e.g. the reach length) given

Table 3.2 The frequency of use of Imperial / Metric and length / weight measures

		1987		1988		1989		1990		1991		1992		1993		1994	
		Imperial	Metric	Imperial	Metric	Imperial	Metric	Imperial	Metric	Imperial	Metric	Imperial	Metric	Imperial	Metric	Imperial	Metric
Anglian	Length	0	33.33	0	0	-	-	0	100.00	47.10	41.20	34.80	56.50	45.70	45.70	14.30	77.10
	Weight	0	66.67	100.00	0	-	-	0	0	11.80	0	8.70	0	8.60	0	5.70	2.90
Northumbria	Length	-	-	-	-	65.00	1.25	78.30	0	79.70	3.10	98.70	0	92.20	1.60	100.00	0
	Weight	-	-	-	-	32.50	1.25	21.70	0	17.20	0	1.30	0	4.70	1.60	0	0
North-West	Length	-	-	-	-	96.25	0	90.00	0	92.50	0	81.50	0	90.60	0	71.40	0
	Weight	-	-	-	-	2.50	1.25	10.00	0	6.00	1.50	10.90	7.60	7.10	2.40	28.60	0
Severn-Trent	Length	-	-	0	0	100.00	0	100.00	0	70.00	0	59.50	0	49.30	8.20	90.50	4.80
	Weight	-	-	100.00	0	0	0	0	0	30.00	0	39.20	1.40	41.10	1.40	4.80	0
Southern	Length	-	-	0	0	50.00	0	20.10	0	62.90	0	39.30	0	73.00	0	17.30	0
	Weight	-	-	100.00	0	50.00	0	79.90	0	37.10	0	60.70	0	27.00	0	82.70	0
South-West	Length	-	-	65.00	0	81.40	0	57.10	0	61.90	0	91.70	0	92.00	0	-	-
	Weight	-	-	35.00	0	18.60	0	42.90	0	38.10	0	6.30	2.10	8.00	0	-	-
Thames	Length	-	-	-	-	62.75	13.73	37.00	24.70	51.00	15.70	44.80	25.90	29.30	16.00	33.30	66.70
	Weight	-	-	-	-	19.61	3.92	19.20	19.20	33.30	0	27.60	1.70	53.30	1.30	0	0
Welsh	Length	-	-	100.00	0	99.22	0	100.00	0	92.50	0	100.00	0	81.90	0	96.10	0
	Weight	-	-	0	0	0.78	0	0	0	7.50	0	0	0	18.10	0	3.90	0
Wessex	Length	0	20.00	15.19	50.63	19.28	49.40	8.00	44.00	8.60	70.50	1.30	77.90	0	78.60	-	-
	Weight	0	80.00	12.66	21.52	7.23	24.10	22.00	26.00	3.80	17.10	1.30	19.50	0	21.40	-	-
Yorkshire	Length	-	-	-	-	-	-	-	-	92.80	0	92.90	0	88.20	0	93.10	0
	Weight	-	-	-	-	-	-	-	-	4.80	2.40	3.60	3.60	10.80	1.10	3.40	3.40

3.3 Trout introduced by the NRA

3.3.1 Size at stocking

Frequency histograms of size at stocking for trout stocked by North-West and Thames Regions of the NRA are shown as Figure 3.36.

3.3.2 Time of stocking

The monthly patterns in the intensity of NRA stocking over the period 1991-3 are shown for North-West and Thames Regions in Figures 3.37 and 3.38 (respectively).

3.3.3 Intensity of stocking

The annual intensity of stocking for each combination of species and size class of trout stocked by the NRA is shown in Figures 3.39 to 3.42 (for North-West and Thames Regions respectively).

Note that only data pertaining to brown trout are reproduced in these figures. The only introductions of rainbow trout by either of these two regions were recorded by Thames Region; in 1990 and 1992. A total of 100 rainbow trout were stocked by Thames NRA in 1990, whilst ten were stocked in 1992. In both of these years the total was composed of single stocking events, and both involved fish of >24cm in length.

3.3.4 Frequency of stocking by size and number

Figures 3.43 and 3.44 show the percentage frequency of stockings for each size class / 'number of fish stocked' class combination for North-West and Thames Regions respectively. Within each region, the data were combined from all years which were available (1988-94 for both Regions).

The results of this analysis (the percentage of the total number of consented stockings from each region which fall within each size class / 'number of fish stocked' class combination) are presented as column plots (Figures 3.26 to 3.35).

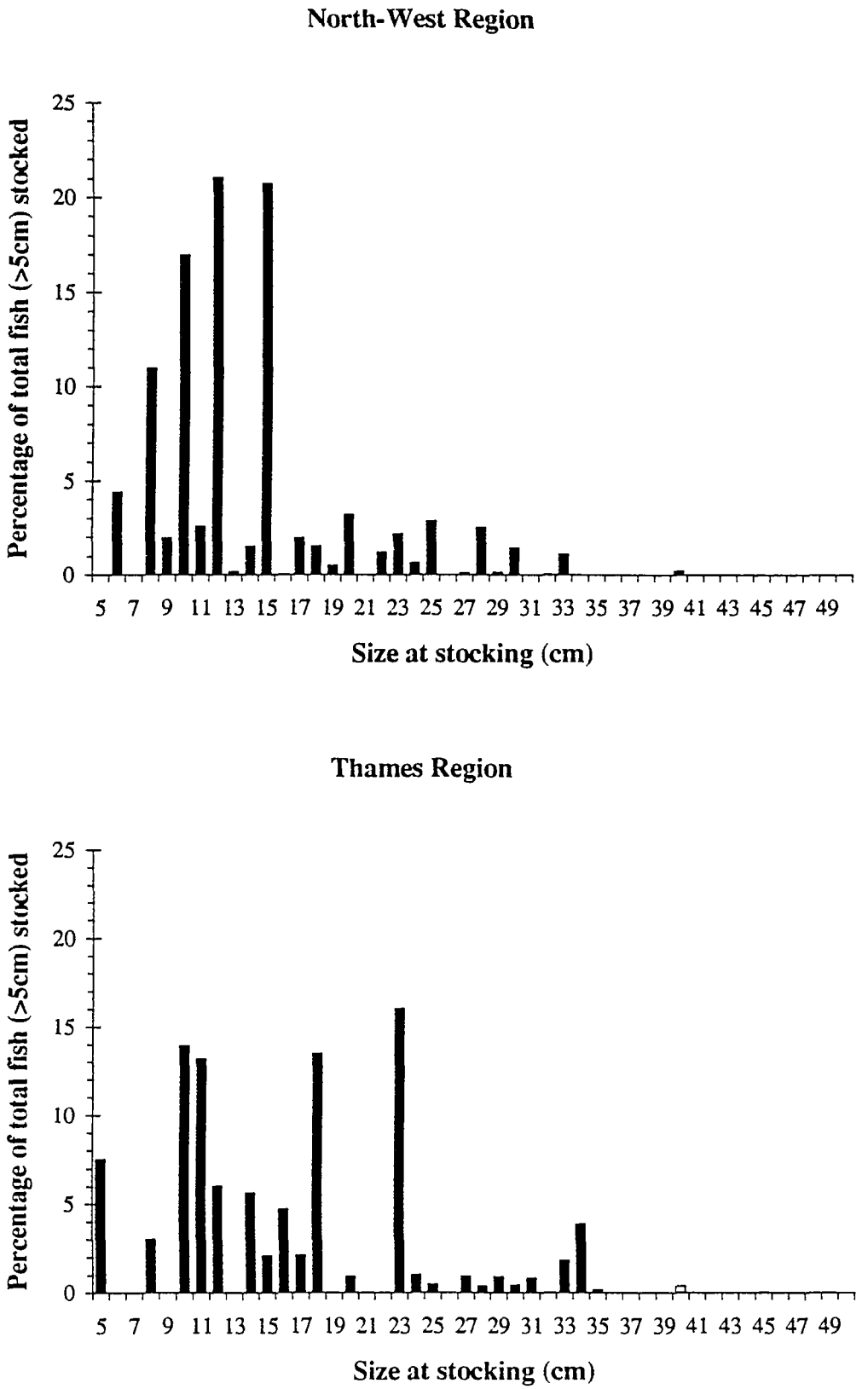

Figure 3.36 Size at stocking as a percentage of total fish (>5cm) stocked by the NRA
Solid bars: brown trout - open bars: rainbow trout

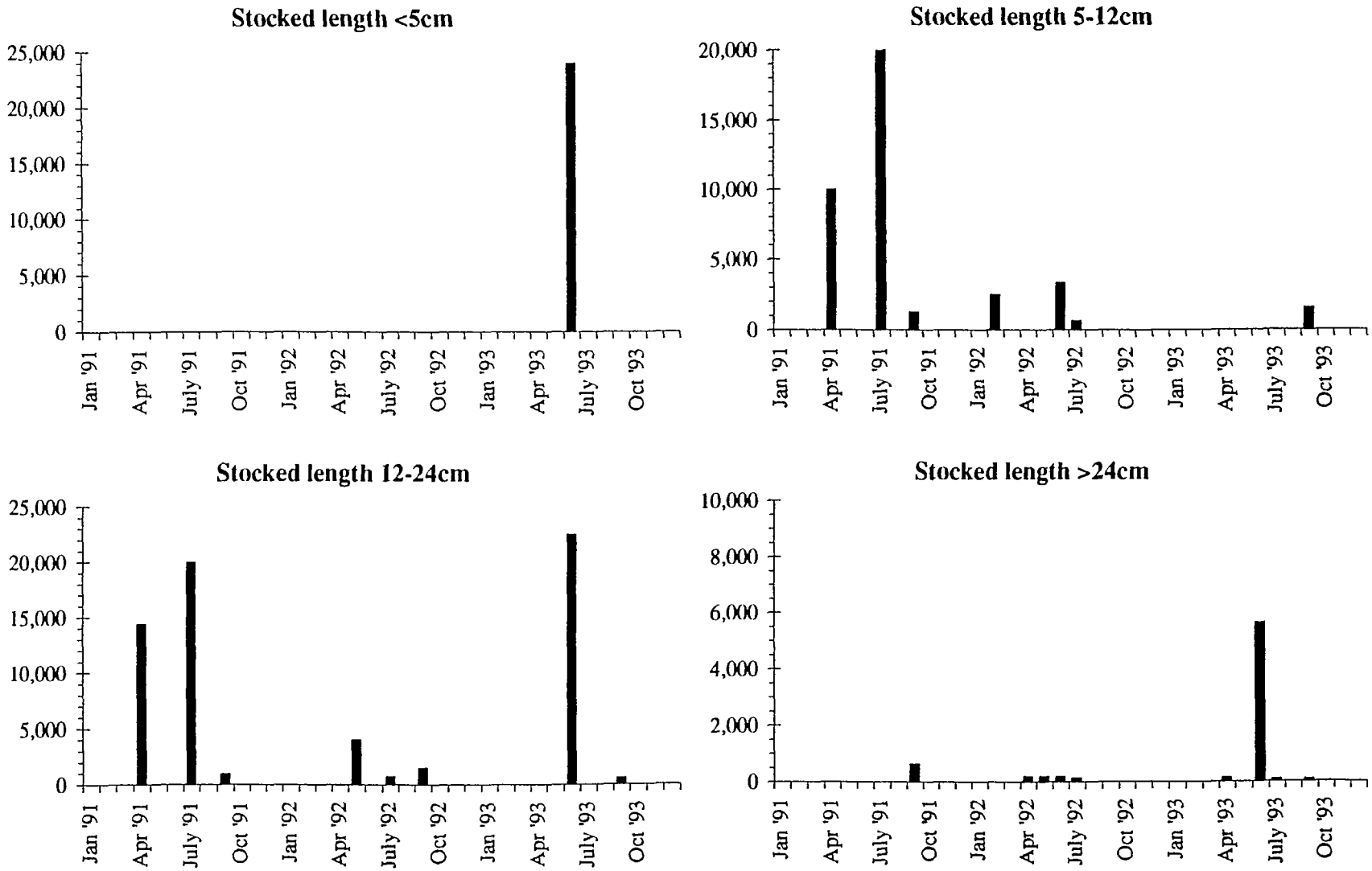

Figure 3.37 Total number of trout stocked per month: NRA stocking - North-West Region
Solid bars: brown trout - open bars: rainbow trout

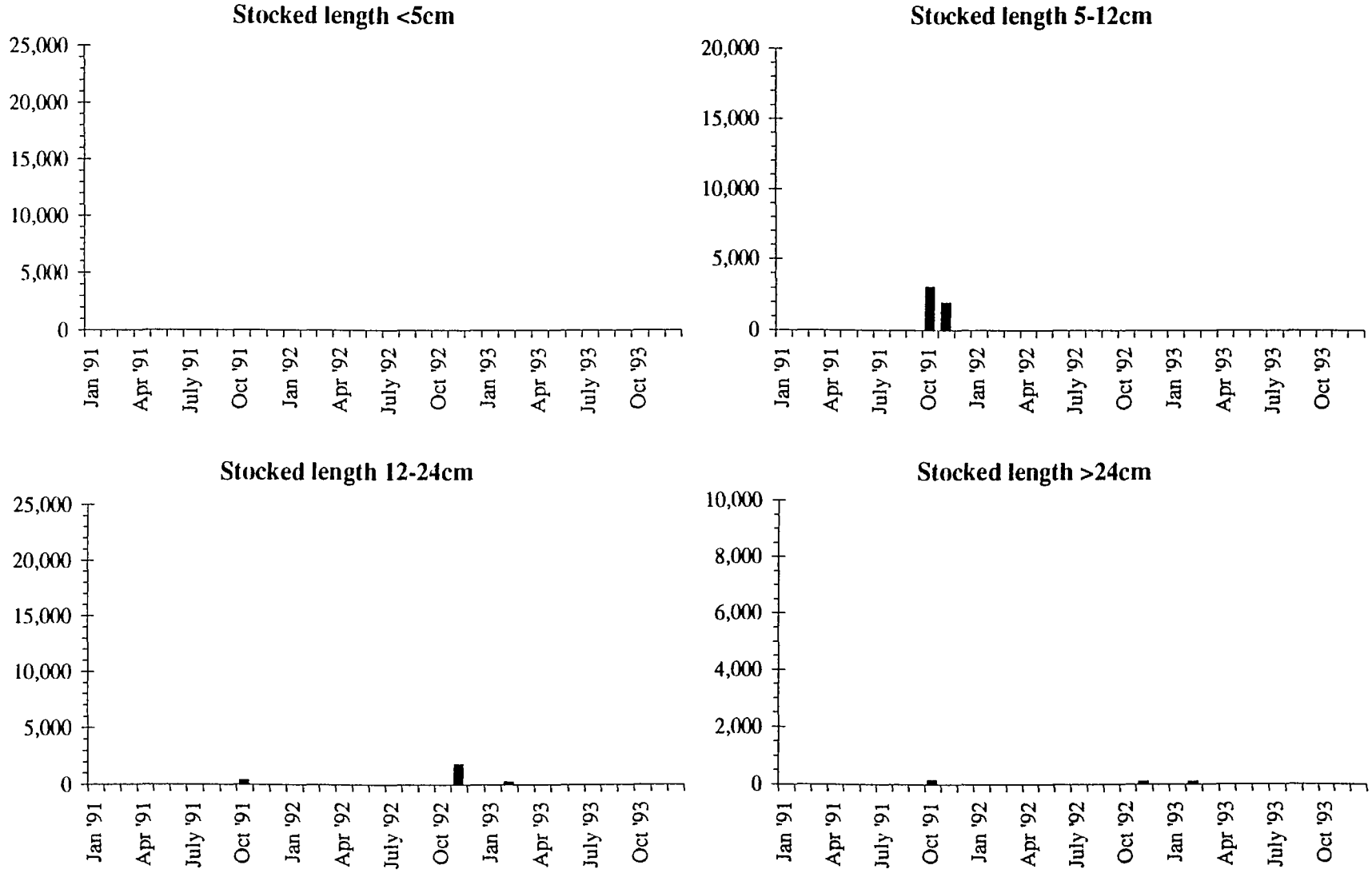

Figure 3.38 Total number of trout stocked per month: NRA stocking - Thames Region
Solid bars: brown trout - open bars: rainbow trout

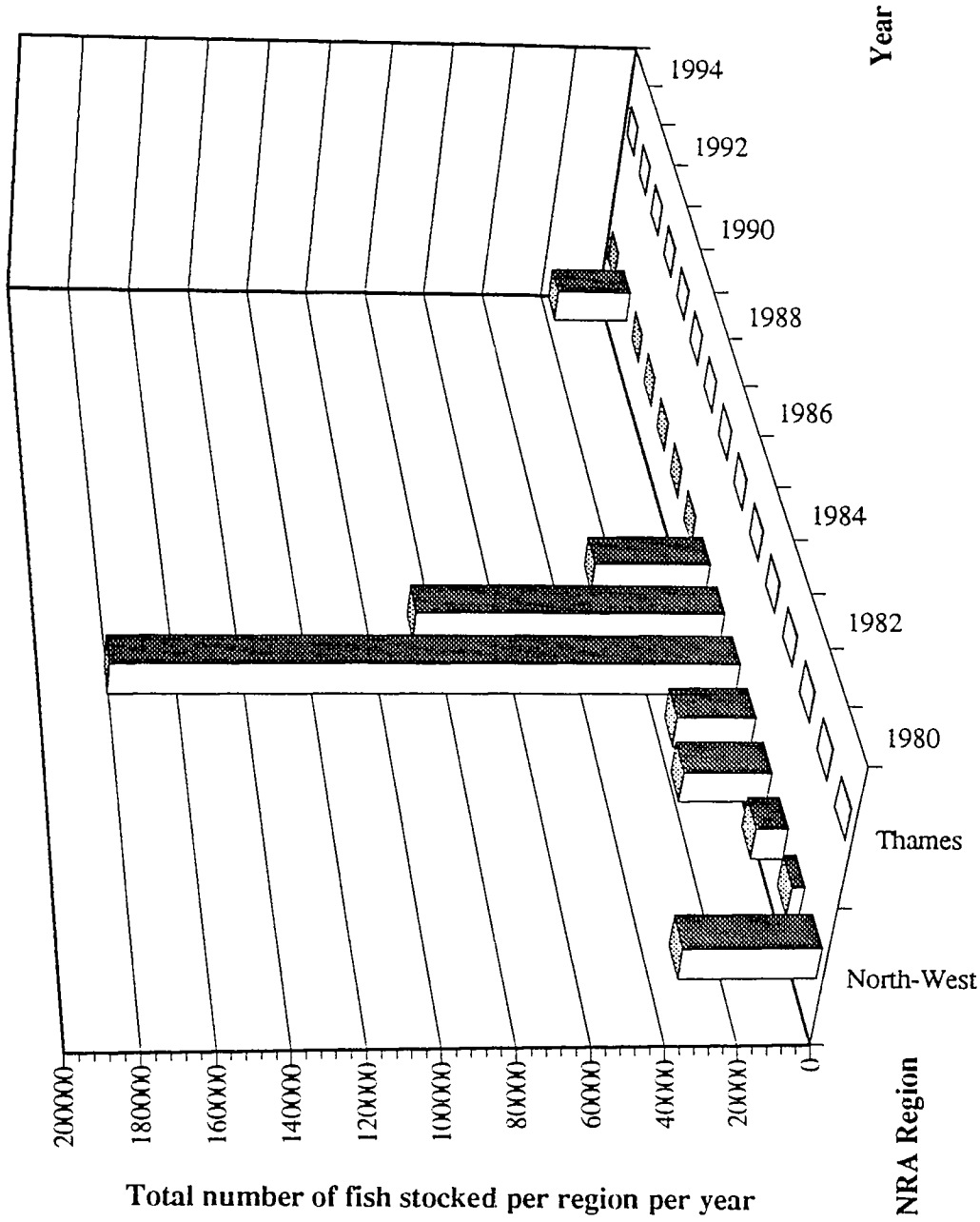

Figure 3.39 Variations in stocking intensity - brown trout (<5 cm) stocked by the NRA

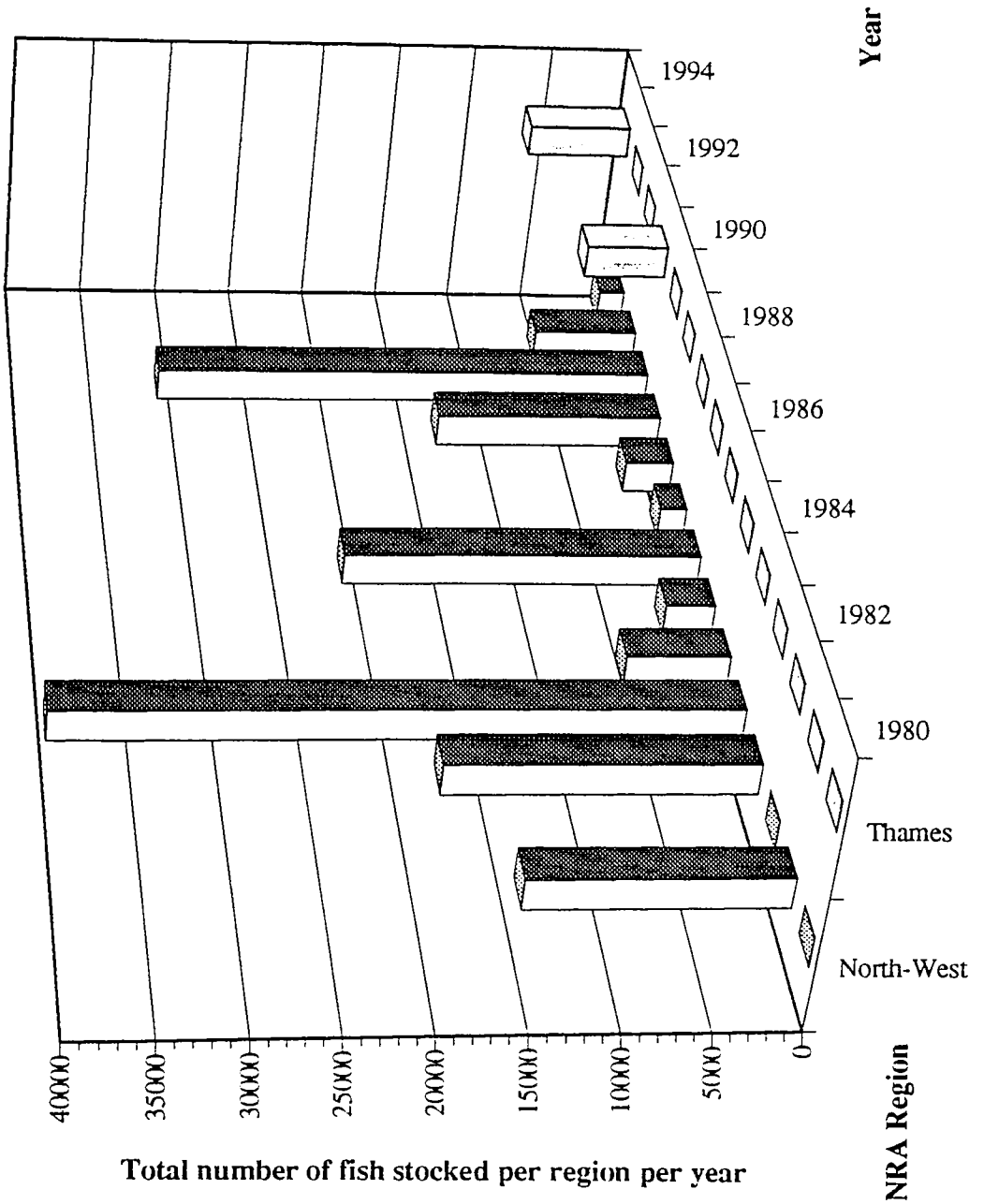

Figure 3.40 Variations in stocking intensity - brown trout (5-12 cm) stocked by the NRA

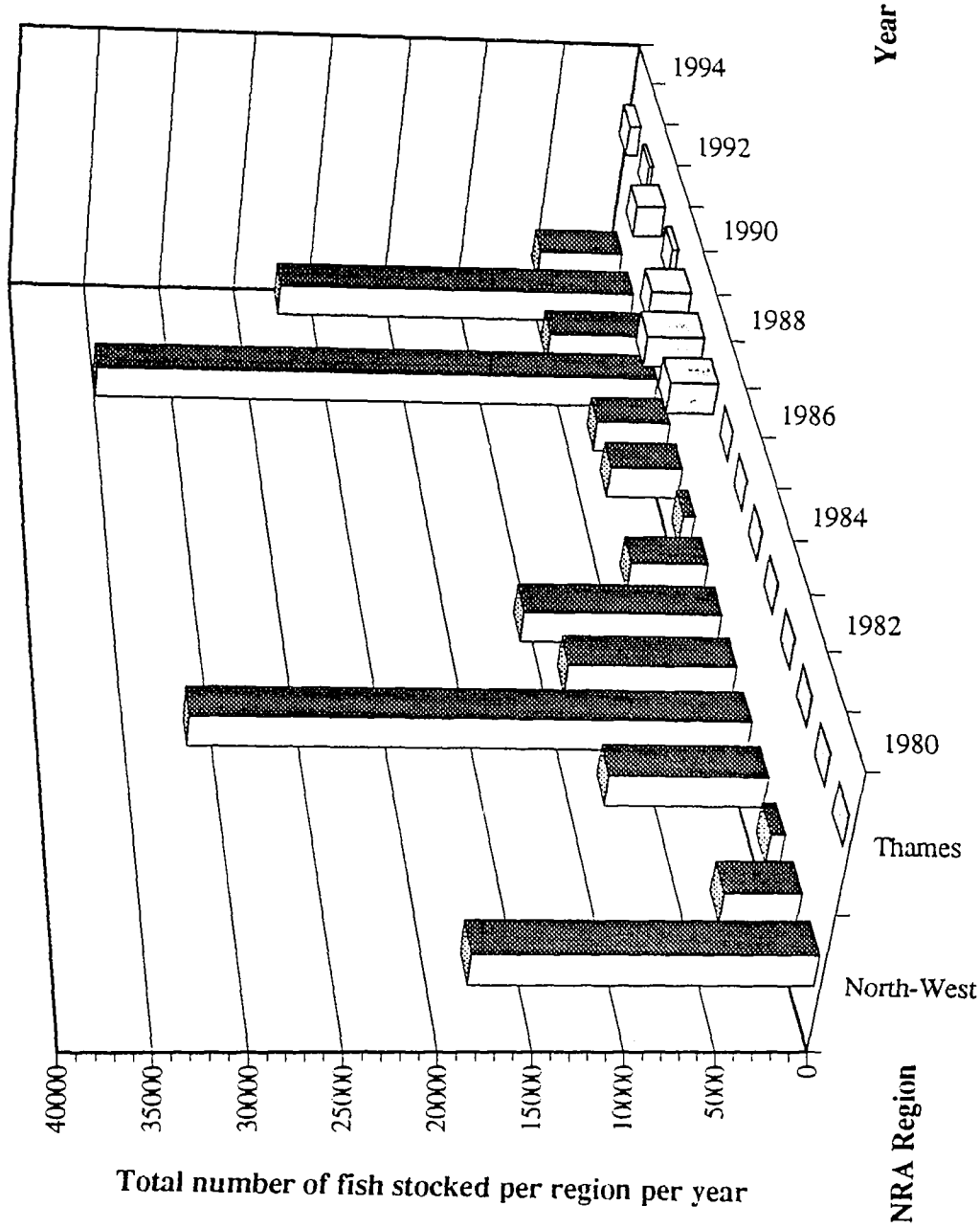

Figure 3.41 *Variations in stocking intensity - brown trout (12-24 cm) stocked by the NRA*

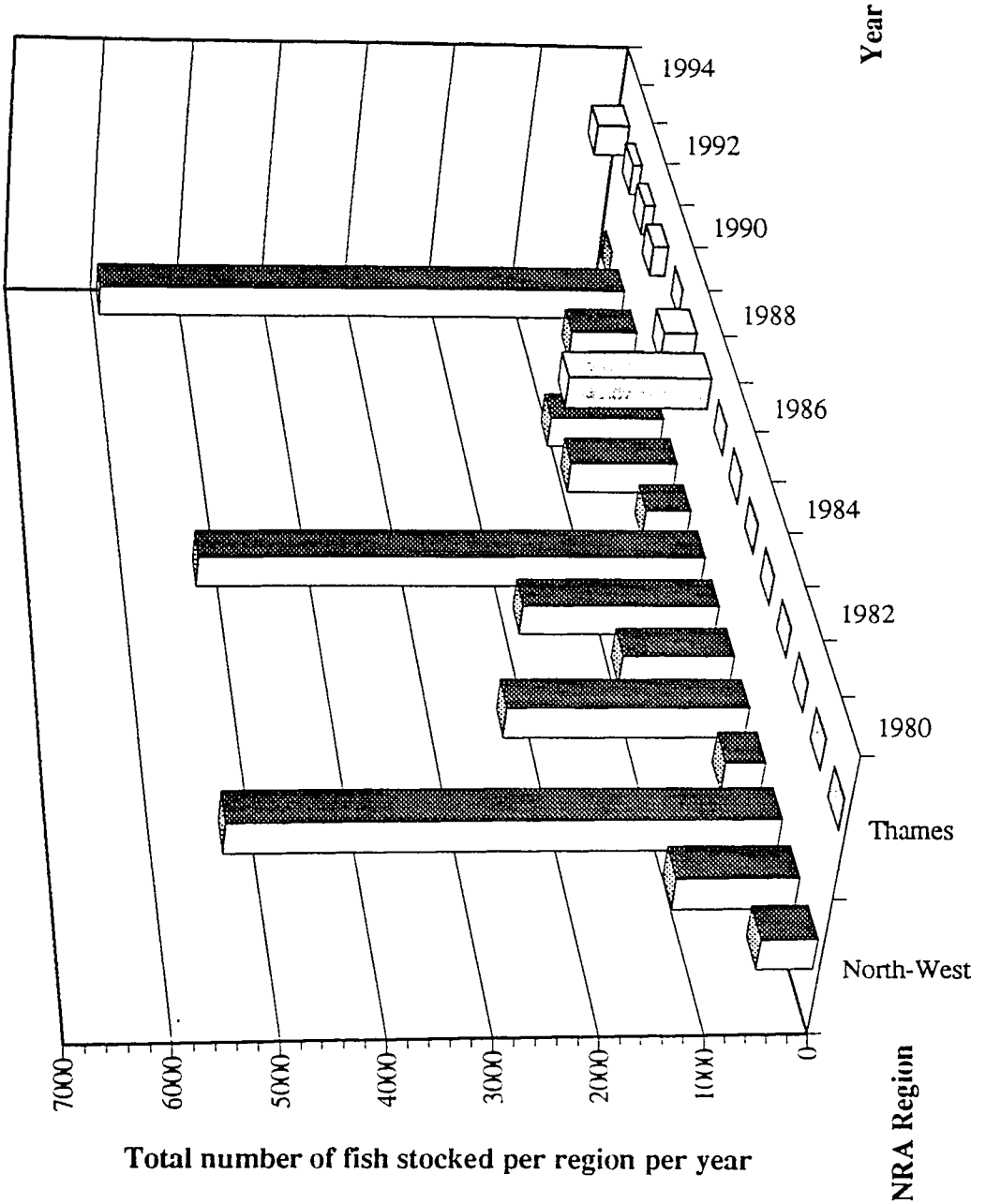

Figure 3.42 Variations in stocking intensity - brown trout (>24 cm) stocked by the NRA

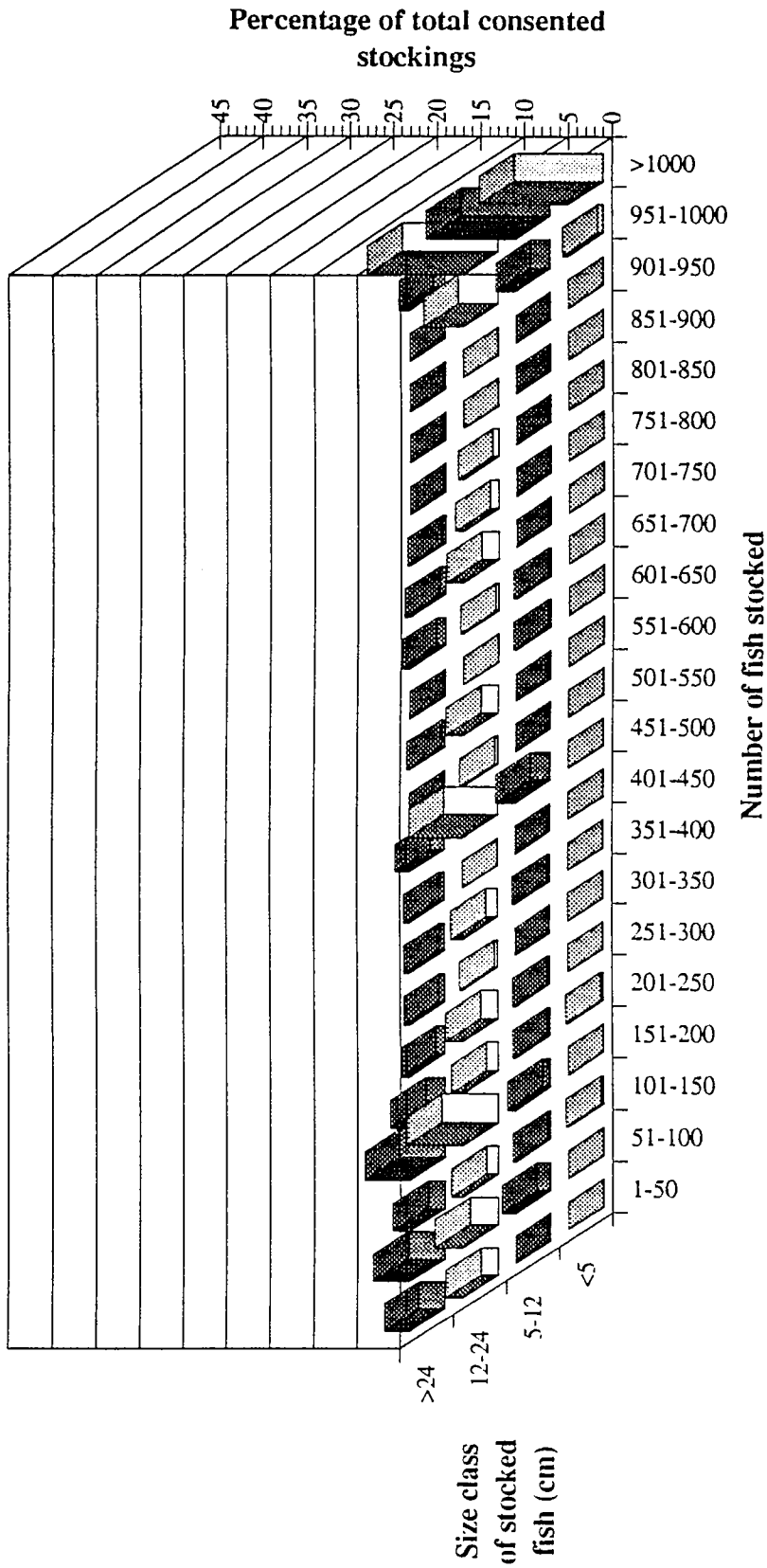

Figure 3.43 Trends in the size/stocking intensity relationship - fish stocked by the NRA North-West Region - all species combined

Figure 3.44 Trends in the size/stocking intensity relationship - fish stocked by the NRA Thames Region - all species combined

4. DISCUSSION

4.1 Size at stocking

4.1.1 General

The data presented in Figure 3.1 show clearly that, within most of the regions of the NRA, the stocking of trout by angling clubs and fishery owners predominantly involves fish of length 25-35cm.

Northumbria, North-West, Southern, South-West and Yorkshire Regions have records of the introduction of large numbers of smaller trout (<12cm). However, of the remaining five regions, only in Thames Region does this practice appear to have been totally absent.

When the data from the individual regions is combined (Figure 3.2) the stocking of trout by angling clubs and fishery owners can be seen to be effectively divided into three basic categories:

- stocking involving fish of 5-12cm;
- stocking involving fish of 12-24cm;
- and (perhaps most notable) stocking with fish >24cm.

These three size classes (along with the <5cm 'fry' class discussed in Section 2.2.2) were subsequently used to assign each entry in the database to one of four size classes. All subsequent analyses were based on this categorisation.

The available data suggest that fish with a length of 12cm and less (which are not of 'takeable' size) are not stocked to the same extent as larger fish. Fish of greater than 24cm, which would contribute immediately to the pool of 'takeable' fish present in a water, effectively offer angling clubs a far more immediate return (in terms of sport for their members) and it is perhaps for this reason that they tend to be stocked in preference to smaller fish.

4.1.2 Between-species differences in size at stocking

To some extent, the relative importance of stocking with brown and rainbow trout can be inferred from Figure 3.1. It is apparent that, with the possible exception of 30cm fish in Anglian and Severn-Trent Regions, rainbow trout contribute only a small percentage to the overall total of stocked fish (when data for all available years is considered). This is perhaps more clearly seen in a series of summary tables (Tables 4.1 to 4.4) showing the relative contribution of brown & rainbow trout to the annual total number of trout stocked in each region within each of four size-classes. The percentage contribution

Table 4.1 Annual total number of trout (size <5 cm) stocked within each region and composition of this total in terms of percentage brown and rainbow trout (B% : R%)

	Anglian		Northumbria		North-West		Severn-Trent		Southern		South-West		Thames		Welsh		Wessex		Yorkshire	
Year	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %
1987	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
1988	0	-	0	-	0	-	0	-	0	-	125	100 : 0	0	-	0	-	5000	100 : 0	0	-
1989	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
1990	0	-	0	-	0	-	0	-	15000	100 : 0	0	-	0	-	15000	100 : 0	0	-	0	-
1991	0	-	105000	100 : 0	0	-	0	-	10000	100 : 0	0	-	0	-	0	-	0	-	0	-
1992	0	-	0	-	5000	100 : 0	0	-	0	-	0	-	0	-	0	-	0	-	522500	100 : 0
1993	0	-	0	-	0	-	0	-	0	-	0	-	12000	100 : 0	0	-	0	-	0	-
1994	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1000	100 : 0	0	-	0	-

Table 4.2 Annual total number of trout (size 5-12 cm) stocked within each region and composition of this total in terms of percentage brown and rainbow trout (B% : R%)

	Anglian		Northumbria		North-West		Severn-Trent		Southern		South-West		Thames		Welsh		Wessex		Yorkshire	
Year	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %
1987	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
1988	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1000	100 : 0	200	100 : 0	0	-
1989	0	-	4000	100 : 0	20000	100 : 0	0	-	0	-	0	-	0	-	100	100 : 0	5150	100 : 0	0	-
1990	200	100 : 0	8500	100 : 0	3000	100 : 0	0	-	0	-	1000	100 : 0	0	-	1000	100 : 0	0	-	0	-
1991	100	100 : 0	200	100 : 0	6000	100 : 0	0	-	5000	100 : 0	70	100 : 0	500	100 : 0	450	100 : 0	2180	100 : 0	3500	100 : 0
1992	0	-	200	100 : 0	19300	98.4 : 1.6	2900	89.7 : 10.3	40500	100 : 0	5125	100 : 0	1000	100 : 0	700	100 : 0	0	-	36100	100 : 0
1993	0	-	61200	100 : 0	18425	98.4 : 1.6	4500	93.3 : 6.7	15000	100 : 0	0	-	0	-	2000	100 : 0	100	100 : 0	7000	100 : 0
1994	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	5000	100 : 0

Table 4.3 Annual total number of trout (size 12-24 cm) stocked within each region and composition of this total in terms of percentage brown and rainbow trout (B% : R%)

	Anglian		Northumbria		North-West		Severn-Trent		Southern		South-West		Thames		Welsh		Wessex		Yorkshire	
Year	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %
1987	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	120	16.7 : 83.3	0	-
1988	0	-	0	-	0	-	50	100 : 0	50	100 : 0	150	100 : 0	0	-	1225	100 : 0	5540	70.2 : 29.8	0	-
1989	0	-	10250	97.1 : 2.9	2850	100 : 0	0	-	550	9.1 : 90.9	100	100 : 0	150	100 : 0	4250	100 : 0	5479	81.7 : 18.3	0	-
1990	0	-	9800	100 : 0	1000	100 : 0	0	-	100	100 : 0	500	100 : 0	1150	30.4 : 69.6	2790	100 : 0	2750	100 : 0	0	-
1991	300	100 : 0	9325	100 : 0	950	100 : 0	0	-	500	70 : 30	0	-	1400	100 : 0	7729	99.1 : 0.9	1910	96.9 : 3.1	8250	100 : 0
1992	950	100 : 0	15875	100 : 0	3260	100 : 0	1080	100 : 0	8180	97.8 : 2.2	3050	100 : 0	216	0 : 100	6200	96 : 4	7795	84.6 : 15.4	4171	100 : 0
1993	400	100 : 0	9385	99.6 : 0.4	4800	96.9 : 3.1	905	100 : 0	6560	97.7 : 2.3	630	100 : 0	2950	18.6 : 81.4	16025	98.1 : 1.9	500	100 : 0	5275	100 : 0
1994	200	100 : 0	3200	100 : 0	400	100 : 0	1135	100 : 0	15150	100 : 0	0	-	0	-	9550	79.1 : 20.9	0	-	1400	100 : 0

Table 4.4 Annual total number of trout (size >24 cm) stocked within each region and composition of this total in terms of percentage brown and rainbow trout (B% : R%)

	Anglian		Northumbria		North-West		Severn-Trent		Southern		South-West		Thames		Welsh		Wessex		Yorkshire	
Year	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %	N	B % : R %
1987	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	640	54.7 : 45.3	0	-
1988	0	-	0	-	0	-	2	100 : 0	2060	82 : 18	2310	100 : 0		-	5779	55.7 : 44.3	13450	74.4 : 25.6	0	-
1989	0	-	14635	79.1 : 20.9	14132	99.5 : 0.5	3400	100 : 0	1540	45.8 : 54.2	3825	100 : 0	11305	62.9 : 37.1	21472	69.1 : 30.2	14026	48.7 : 51.3	0	-
1990	1510	33.8 : 66.2	18540	80.2 : 19.8	4175	100 : 0	5250	92.4 : 7.6	16470	84.1 : 15.9	1521	100 : 0	25690	69.1 : 30.9	14683	52.9 : 47.1	15155	58.8 : 41.2	0	-
1991	6965	63.5 : 36.5	37639	86.6 : 13.4	16505	97.6 : 2.4	12285	73.7 : 26.3	17156	81.1 : 18.9	3055	100 : 0	17267	41.4 : 58.6	20633	70.3 : 29.7	18003	94.5 : 5.5	25495	99 : 1
1992	9400	51.9 : 48.1	14870	96.6 : 3.4	20672	97.6 : 2.4	16153	59.1 : 40.9	31613	78.9 : 21.1	3730	100 : 0	23093	68.7 : 31.3	16193	55 : 45	16845	96 : 4	19895	96.2 : 3.8
1993	12065	79.7 : 20.3	19670	92.8 : 7.2	19601	85.1 : 14.9	21433	57.8 : 42.2	13360	77.1 : 22.9	2640	100 : 0	35793	70.9 : 29.1	41651	86.1 : 13.9	3320	45.8 : 54.2	27073	100 : 0
1994	13385	71.2 : 28.8	5850	100 : 0	1080	63 : 37	3675	91.8 : 8.2	10935	52.6 : 47.4	0	-	450	72.2 : 27.8	33002	82.6 : 17.4	0	-	8787	100 : 0

made by rainbow trout to the overall annual total of trout can be seen to be low for the three classes of smaller fish (<5cm; 5-12cm; 12-24cm - Tables 4.1 to 4.3 respectively).

Only in a few instances (e.g. Wessex Region in the late 1980's) do rainbow trout smaller than 24cm contribute to the annual total number of fish stocked.

Although they still generally represent less than 50% of the annual total number of trout stocked, rainbow trout in the >24cm size class (see Table 4.4) are obviously stocked in much higher proportions than the smaller size-classes (Table 4.1 to 4.3).

Information for the period 1991-3 was combined to produce (see Table 4.5) which highlights further the tendency for rainbow trout to constitute a high percentage of the total number of stocked fish only in the large size-classes. Of especial note are Anglian, Severn-Trent, Thames and Welsh Regions - where, over this three year period, rainbow trout constitute more than 20% of the total number of >24cm trout stocked to rivers.

Table 4.5 Relative percentage contributions of brown and rainbow trout to the total number of fish stocked in the period 1991-3 (all figures as % brown trout : % rainbow trout)

	Size class of fish stocked:			
Region	<5 cm	5-12 cm	12-24 cm	>24 cm
Anglian	-	100 : 0	100 : 0	66.5 : 33.5
Northumbrian	100 : 0	100 : 0	99.9 : 0.1	90.4 : 9.6
North-West	100 : 0	98.6 : 1.4	98.3 : 1.7	93.3 : 6.7
Severn-Trent	-	91.9 : 8.1	100 : 0	62.1 : 37.9
Southern	100 : 0	100 : 0	96.9 : 3.1	79.1 : 20.9
South-West	-	100 : 0	100 : 0	100 : 0
Thames	100 : 0	100 : 0	42.7 : 57.3	63.5 : 36.5
Welsh	-	100 : 0	97.9 : 2.1	75.5 : 24.5
Wessex	0 : 0	100 : 0	87.7 : 12.3	90.9 : 9.1
Yorkshire	100 : 0	100 : 0	100 : 0	98.6 : 1.4

4.2 Temporal patterns in stocking activity

Figures 3.3 to 3.12 (each of which shows the intensity of stocking in a given region, as the total number of brown and rainbow trout stocked per month, within each of the four size-classes) do not show any clear temporal patterns regarding the stocking of smaller trout (<5cm and 5-12cm fish). However, they do demonstrate the 'seasonality' which is apparent in the stocking of larger trout (12-24cm and >24cm).

In most regions, the stocking of larger trout is at its most intense during the months of February, March and April, although there are some instances of stocking being

undertaken during the months of November, December and January (e.g. Welsh and Wessex Regions). Other than this, there are no clear regional differerences in the pattern of stocking - apparent differences between the regions being attributable more to different numbers of trout being stocked than to different temporal patterns in stocking activities.

There is limited evidence of a reduced level of stocking during the late summer / autumn period in all regions.

Figure 3.13 (which relates to data for all regions combined) shows the temporal patterns in stocking intensity of larger fish (12-24cm and >24cm) more clearly still. For both of these size-classes, stocking is at its greatest during February, March and April with a gradual decline in intensity through the rest of the year. The difference in the vertical scale between the plots for trout 12-24cm and trout >24cm should be noted; the range covered by the scale for trout 12-24cm being less than a third of that covered by the larger size-class. Consequently, it can be inferred that the stocking of trout >24cm not only occurs with a slightly more regular pattern than that of trout 12-24cm, but that the numbers involved are (in terms of the monthly totals stocked throughout the period 1991-3) invariably higher for the larger fish.

As discussed in Section 4.1.2, rainbow trout make up a higher proportion of stocked fish in the largest of the four size classes. This is likely to be a reflection of the nature of those fisheries stocked with rainbow trout. That is, rainbow trout may be stocked into 'put-and-take' style fisheries rather than being introduced as a supplement to a fishery which is seen to be more or less self-sustaining.

Whilst there is an obvious numerical dominance regarding the stocking with small (<5cm) trout (with total of around 500,000 fish being stocked in March 1992) there are no clear temporal patterns in evidence.

The timing of trout stocking by angling clubs is probably linked to the dates of the fishing season. Clubs may introduce large numbers of takeable size fish prior to the start of the season in an attempt to boost early season sport. This practice may have implications for the survival of natural populations. For example, the introduction of large numbers of adult trout may place undue predation pressure on recently emerged young-of-the-year trout, whilst the circumstance of older native fish may be compromised through, for example, an increased level of competition for food or space resources.

4.3 Stocking intensity

The annual variations in stocking intensity (as the annual total number of stocked trout of a given species and size-class) across the regions (shown in Figures 3.14 to 3.25) follow no clearly defined patterns. Equally, stocking intensity does not appear to have remained consistently high or low either across regions or across years for any of the species/size-class combinations consisdered.

4.4 Frequency of stocking by size and number

Figures 3.26 to 3.35 demonstrate the relationship between the size-class and number of fish stocked. These plots demonstrate that, for all regions, the degree of stocking activity (measured as the percentage of the total number of Section 30 consents recorded for any given region) is far greater for large fish (>24cm) than for the smaller size-classes.

In addition, the trend for smaller fish to be stocked in larger numbers (per stocking action - i.e. per Section 30 consent) can also be seen from these plots. This may be the product of several factors. For example, a greater loss rate for smaller fish may be anticipated, with higher numbers being introduced to fisheries as a compensatory measure. Alternatively, the number of fish introduced may be limited by the Section 30 applicants' finances which are available for the purchase of trout from a fish farm or other supplier. In effect, a choice may have to be made between a small number of large, expensive fish in contrast to a large number of smaller, less expensive fish. Other factors, such as the perceived ability of the water to hold introduced fish in conditions which are suitable for their 'growing-on', and the short-term needs of the fishery, are also likely to affect such decisions.

4.5 The quality of Section 30 records

4.5.1 The use of different metrics

The Section 30 consent records which have been collated suggest that, in the majority of regions for the majority of years, applicants have used length in inches as the principal metric for recording the size of fish to be stocked (see Table 3.1). A notable exception to this is Southern Region. Over the period 1987 to 1994 the size of fish to be stocked has been recorded exclusively in Imperial units, although applications have alternated between length and weight metrics (i.e. inches and pounds / ounces).

Whilst this non-standardisation of metrics presents problems in terms of the ability to make direct comparisons between regions or between years, it is possible to use standard conversions to redefine all size metrics on a common basis. What is of more concern is the tendency for applicants to 'mix' metrics when recording the size of fish to be stocked (see Section 4.5.2).

4.5.2 General quality

The subjective assessment of the available records of Section 30 consents which was undertaken indicated that there were five main inconsistencies. Of these, the first three listed in Table 3.2 (use of mixed metrics; missing or ambiguous data; illegible or ambiguous details) are of relatively minor significance. For example, mixed metrics can be converted to a common base (as was done during this review). Whilst the occurence of records with missing or illegible details was only low (in general terms <5%) through

reference to earlier or later Section 30 consent requests by the same club or individual it was often possible to insinuate the likely nature of the missing data.

The lack of detailed site information (which affected up to 75% of the records which were reviewed) was a major stumbling block. Without information on the location of the proposed stocking it was not possible to assess the database in terms of the number of fish stocked into specific stretches of river, as had originally been intended. The lack of this information also leads to problems in that repeat stocking to a site is is not readily identifiable.

The absence of site dimensions (i.e. a direct or implicit estimate of the area of the 'target' water to be stocked) precludes any possibility of deriving stocking densities from the available Section 30 consent records. In addition, the absence of 'target' river lengths for proposed stocking actions prevents the derivation of surrogates for stocking density (such as the number of fish introduced into a known lengths of river).

The finest level of (spatial) detail at which it was felt possible to meaningfully report the Section 30 consent records was as a series of an annual summaries, detailing the number of fish of different species and size-classses, stocked into different main river sytems. However, this level of detail was felt to be so general as to prevent meaningful comparisons between river systems being drawn. These summary statistics are presented (in tabular form) as an appendix to this report.

4.6 Stocking by the NRA

4.6.1 Size at stocking

There is a clear difference as regards the size at stocking for fish stocked by North-West and Thames Regions of the NRA (Figure 3.36) compared to fish stocked by angling clubs and fishery owners (Figure 3.2). The majority of fish >5cm which are stocked by the NRA are less than ~18cm in length, whereas those stocked by clubs are generally >24cm in length.

This is likely to be a reflection of the fact that NRA stocking is more often in terms of enhancement rather than for a rapid return in terms of angling sport.

4.6.2 Temporal patterns in stocking activity

Stocking by North-West and Thames Regions of the NRA (Figures 3.37 and 3.38 respectively) does not follow the same temporal patterns revealed in the analysis of Section 30 records (see Section 4.2). Again, it is likely that this is because of the underlying reasons for the NRA's stocking actions. Unlike angling clubs, the NRA are not compelled to provide early-season sport for anglers and so the need to supplement stocks at the start of the season does not constitute such an important aspect of the NRA's stocking plans.

4.6.3 Stocking intensity

The data which is available regarding stocking by the NRA suggest that there is considerable variation in the annual level of stocking for any given size-class of fish (see Figures 3.39 to 3.42).

In addition, the increased importance of stocking with smaller size-classes of trout (compared to Section 30 consented stocking activity- see Figures 3.16 and 3.17) can be seen in the data for North-West Region presented in Figures 3.40 and 3.41.

4.6.4 Frequency of stocking by size and number

Whereas Section 30 consent records indicate that the majority of stocking actions undertaken by angling clubs and fishery owners concern trout of >24cm, stocking undertaken by the NRA tends to involve trout of all size-classes. Of particular note is the tendency for North-West NRA to introduce trout in apparently high numbers (see Figure 3.43). During the period for which data has been made available, more than 30% of the total number of stocking actions undertaken involved the introduction of $\geq$1000 trout at a time. This value was made up of around 10% of each but the largest size-class of fish. This contrasts sharply with the pattern seen for Section 30 consent records, where the majority of stocking actions involved large trout stocked in lower numbers. It is likely that this pattern of stocking is the product of the NRA's requirement to re-generate fisheries following pollution incidents, and represents an attempt to reproduce a complete population size / frequency profile.

This pattern of NRA stocking is not displayed by Thames Region, where the majortiy of stocking actions involved trout of >12cm generally introduced in numbers of up to 250 at at time (see Figure 3.44). According to the information which has been made available, Thames NRA have not introduced any trout of <5cm in length. However, larger fish (in the 5-12cm size-class) were stocked by the Region and, in nearly 5% of the total number of stocking exercises undertaken, such stocking actions involved $\geq$1000 trout being introduced on each occasion.

Of the larger fish which were introduced by Thames Region, there appears to be a more equitable distribution of stocking intensity over the larger size-classes at the lower end of the stocking intensity range than is evident in the Section 30 consented stockings in any of the regions (Figures 3.26 to 3.35). The two separate factors which contribute to this observed distribution (the importance of stocking with fish <12cm rather than just those >24cm; and the stocking of fish at a range of 'intensities') are both likely to be the result of stocking being for fishery regeneration purposes rather than for the direct improvement of angling returns.

5. CONCLUSIONS

5.1 The nature of stocking

5.1.1 Stocking densities

The principal objective of this review was to report the nature of trout stocking to rivers in England and Wales over the last few years, such that it would be possible to place current or proposed stocking activities into a national perspective. As discussed further below, the lack of information on 'target' areas precludes any form of assessment based on stocking densities. At a larger scale, the lack of precision regarding the location of the site of proposed stocking leads subsequently to difficulties in assessing the total number of fish stocked to discrete lengths of river. The data which is currently available can, realistically, only be used to assess the level of stocking on a relatively large (and consequently imprecise) scale. In this way it is only possible to produce values for the total number of fish stocked to main river systems (as shown in the appendix to this report).

Whilst it has not proved possible to meet the principal objective, other statistics have emerged from the review which provide a series of valuable insights into trout stocking at the national scale that have not been previously available.

5.1.2 Relative importance of NRA stocking and observed trends in the nature of stocking activity

The available information suggests that, in terms of the total number of fish stocked each year, Section 30 consented stocking by angling clubs and fishery owners is far more important than stocking by the NRA.

With the exception of a limited occurrence of stoking with fish <5cm, the majority of trout stocked by angling clubs and fishery owners tend to be large (>24cm). In addition, they are often introduced early in the angling season; a factor which may increase the potential for competitive impacts on natural (indigenous) populations.

According to Section 30 consent records, it is generally the case that brown trout stocking is (numerically) dominant over rainbow trout stocking in any year in any Region. Only in four of the (former) ten Regions of the NRA are large rainbow trout stocked into rivers by angling clubs or fishery owners to anything approaching the same extent as are brown trout. Comparative data for stocking undertaken by North-West and Thames NRA imply that it is not common practice for either Region to stock rainbow trout into rivers.

5.2 The quality of data

The quality of the data held within the Section 30 consent records was reasonably high, and the quality appeared to be independent of the source region. The potential confusion which may be brought about by the use of alternative metrics can be overcome relatively simply (e.g. through the adoption of standard length:weight relationships) although the precision of any derived estimates may be compromised by a lack of knowledge on the condition of the stock at the time of their introduction. As the basis of the Section 30 consent application system is effectively founded on the provision of information by the members of the general public, it is not likely that the quality of the data which is recorded can be markedly improved. However, it may be possible to improve the value of the data by changing the nature of the information that is recorded (see below).

One of the principal inadequacies of the data lay in the absence of information regarding the 'target' area for the stocking exercise. As discussed in Section 4.5.2, lack of such pertinent information currently precludes the derivation of stocking densities for specified sites from the available information. Consequently, it is not strictly possible to make meaningful comparisons between stocking events at different sites, nor to attach any level of potential 'risk' to a stocking application at any given site.

In addition, it has been assumed throughout this report that applications for Section 30 consents form an accurate record of actual stocking activity. It is possible that, because of the un-consented introduction of fish, the level of stocking activity may be under-estimated from Section 30 consent records. It is also possible that stocking activity may be over-estimated, through the inclusion of Section 30 consents where the proposed stocking levels (as recorded on the applications) exceded the actual number of fish stocked. The level of un-consented stocking is a largely unknown factor, although informal discussions with staff from the NRA's fishery function have suggested that, in the case of certain river systems, as few as 50% of the actual stockings undertaken have been consented.

5.3 Implications

The current study on the impact of stocked trout on wild fish populations (R&D Project W2-452) is based on the comparison of trout populations in stocked (experimental) and unstocked (control) reaches of two rivers. In order to be able to extrapolate from the study's results, it is important to ascertain that the stocking intensity of the experimental stretch is representative of the level of stocking seen at the national scale.

As discussed above (Section 5.1.1) it has not been possible to produce figures for stocking densities. Consequently, it is not possible to directly confirm or refute the assumption that the stocking seen in the experimental stretches is representative of stocking levels seen nationally. However, an informal assessment of the data which were entered onto the Section 30 database prior to undertaking the assessment exercises detailed in this report suggested that consented stockings from throughout the regions have been comparable to the numbers and sizes of fish which have been stocked to the two experimental reaches. Therefore, there is no reason to assume that the stocking of the two experimental reaches is in any way atypical of the level or pattern of stocking seen nationally.

6. RECOMMENDATIONS

The terms of reference for this R&D Note did not include the production of recommendations. However, it is felt that there are several points arising from the review which should be addesssed. These are considered further below (Section 6.1) whilst their implementation is discussed in Section 6.2.

6.1 Detail

In general terms, the recommendations which arise from this assessment of Section 30 consent records are three-fold:

- to reassess the value of the data which are requested and consider the request of alternative or additional information;
- to subsequently standardise the layout of the Section 30 consent application form throughout the regions of the NRA;
- to rationalise the storage of information derived from Section 30 consent applications through the development of an electronic database for the storage and retrieval of consent applications.

6.1.1 Improvement of recorded information

The quality of the information which is recorded could be improved given the adoption of a series of basic conventions.

- The adoption of standard metrics (length or weight; Metric or Imperial) would remove the need for conversion before subsequent analysis.
- The inclusion of an estimate of the intended target area (possibly in terms of the mean river width and the length of river which is likely to benefit from the proposed stocking) would enable stocking densities to be derived. The ability to estimate stocking densities would allow direct comparisons to be made between the stocking level recorded at two different sites.
- Confirmation of the number and size of fish which are stocked by angling clubs and fishery owners would make Section 30 records a far more reliable source of information regarding the actual state of stocking than is the case at present.

As Section 30 consents represent the only formal record of fish introductions it is reasonable to expect that they should present as true and accurate a reflection of stocking activity across the country as is possible. For whatever reason, there may be situations where, despite a Section 30 consent having been issued, fish are not subsequently stocked. Consequently, values for the number of fish stocked based on Section 30 consent records are effectively 'maximum' estimates and do not necessarily accurately reflect the true level of stocking. The subsequent confirmation of the level stocking would improve the value of the data which is held by the EA, and would help to increase the significance of any conclusions which are drawn from the data.

6.1.2 Standardisation of application form

At present there are several different versions of Section 30 consent application forms. In nearly all cases these are hard-copy only (i.e. they are not associated with a corresponding electronic database). Although they tend to request the same basic data, their layout and ease-of-use varies between regions and, in some cases, between the areas within a given region.

A standard form would greatly increase the ease of interpretation of the data which is held. The adoption of such a standard would also lend itself to the subsequent development of an electronic database of Section 30 consent applications.

It is recommended that a standard form should include the following items:

Applicant details

- Club name
- Name of applicant
- Address for applicant

Site location details

- Detail of water to be stocked (i.e river/canal or pond/lake/reservoir)
- Name of water and general location (e.g. nearest village or town)
- Detail of site location (e.g. in relation to local features)
- NGR
- If stocking site is a river: approximate width of water to be targetted & potential length of river which will benefit from the stocking)

Details of proposed stocking

- Date of stocking
- Species
- Number
- Size (including units used)
- Source of fish
- Details of health checks

6.1.3 Use of data

It is recommended that, in the future, Section 30 consent application data should be used to establish a national database detailing stocking activites throughout the EA.

Under the 1991 Water Resources Act the EA has a statutory duty to 'maintain, improve and develop' freshwater fisheries in England and Wales. The threats to wild fish populations posed by the extensive stocking of reared brown and rainbow trout need to be addressed in order to fulfill this duty. In this context, it is obviously of great importance for the EA to have access to reliable statistics regarding the introduction of trout by angling clubs and fishery owners.

As discussed above, Section 30 consents represent a unique and valuable source of information regarding the stocking of salmonids and other fish species. At present, however, their nature is such that it is not possible either to gain easy access to the information or to interpret and report it in a consistent and objective manner. The collation of Section 30 consents into a database structure would facilitate the production and reporting of statistics that could be easily interpreted and compared across regions.

6.1.4 Electronic database development

The development of an database of Section 30 stocking consent applications in an electronic format would also facilitate the recording of 'confirmations', as suggested above (Section 6.1.1). Through the development of appropriate computer software, it would be possible to generate listings of all consents issued over a pre-determined period along with information on whether or not they have subsequently been confirmed.

6.2 Implementation

It is recommeded that a project is initiated which will address these recommendations in a coordinated manner. The principal objective should be to set in place a revised, national Section 30 consent application system linked to the development of an easily accessible electronic database.

The requirements of the EA regarding the value of stocking statistics should be sought. These requirements will, necessarily, dictate the structure of the database, and therefore the nature of the information that is requested from the consent applicant.

7. REFERENCES

BARNARD, S., WYATT, R.J. and MAINSTONE, C.P. (1997) *The effects of stocked brown trout on the survival of wild fish populations*. Report to the Environment Agency N° W5; WRc.

LEITRITZ, E. and LEWIS, R.C. (1976) *Trout and salmon culture (hatchery methods)*. Fish Bulletin **164**: State of California Department of Fish and Game.

APPENDIX

STOCKING INTENSITY SUMMARY TABLES

Table A.1
Anglian Region

Main river	Year	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
BURE	1993	0	0	0	0	1250	1250	0	0	0	0	1250
	1994	0	0	0	0	1300	1300	0	0	0	0	1300
	1992	0	0	0	0	100	100	0	0	0	0	100
	1993	0	0	0	0	100	100	0	0	0	0	100
	1994	0	0	0	0	200	200	0	0	0	0	200
CAM	1992	0	0	0	0	500	500	0	0	0	0	500
	1993	0	0	0	0	200	200	0	0	150	150	350
	1994	0	0	0	0	400	400	0	0	100	100	500
CHELMER	1990	0	0	200	0	300	500	0	0	0	0	500
	1991	0	0	100	300	75	475	0	0	0	0	475
	1992	0	0	0	0	400	400	0	0	0	0	400
	1994	0	0	0	0	400	400	0	0	0	0	400
COLNE	1990	0	0	0	0	10	10	0	0	50	50	60
DEBEN	1992	0	0	0	0	150	150	0	0	25	25	175
	1993	0	0	0	0	200	200	0	0	0	0	200
	1994	0	0	0	0	300	300	0	0	0	0	300
GLAVEN	1991	0	0	0	0	700	700	0	0	0	0	700
	1992	0	0	0	0	200	200	0	0	0	0	200
	1993	0	0	0	0	750	750	0	0	0	0	750
	1994	0	0	0	0	800	800	0	0	0	0	800
GREAT OUSE	1992	0	0	0	200	1475	1675	0	0	350	350	2025
	1993	0	0	0	0	3915	3915	0	0	0	0	3915
	1994	0	0	0	0	2085	2085	0	0	700	700	2785
NENE	1991	0	0	0	0	1950	1950	0	0	1740	1740	3690
	1992	0	0	0	0	700	700	0	0	3300	3300	4000
	1993	0	0	0	0	1300	1300	0	0	1400	1400	2700
	1994	0	0	0	0	850	850	0	0	2200	2200	3050

Table A.1 (cont.d)
Anglian Region

Main river	Year	Brook trout	Brown trout					Rainbow trout				Overall total
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	
STOUR	1990	0	0	0	0	200	200	0	0	950	950	1150
	1991	0	0	0	0	100	100	0	0	800	800	900
	1992	0	0	0	0	150	150	0	0	850	850	1000
	1993	0	0	0	0	100	100	0	0	900	900	1000
	1994	0	0	0	0	150	150	0	0	850	850	1000
WELLAND	1991	0	0	0	0	750	750	0	0	0	0	750
	1992	0	0	0	0	900	900	0	0	0	0	900
	1993	0	0	0	0	600	600	0	0	0	0	600
	1994	0	0	0	0	800	800	0	0	0	0	800
WENSUM	1991	0	0	0	0	750	750	0	0	0	0	750
	1992	0	0	0	750	300	1050	0	0	0	0	1050
	1993	0	0	0	200	950	1150	0	0	0	0	1150
	1994	0	0	0	0	1250	1250	0	0	0	0	1250
WITHAM	1991	0	0	0	0	100	100	0	0	0	0	100
	1993	0	0	0	200	250	450	0	0	0	0	450
	1994	0	0	0	200	1000	1200	0	0	0	0	1200

Table A.2
Northumbria Region

Main river:	Year:	Brook trout	Brown trout					Rainbow				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
ALN	1990	0	0	0	0	400	400	0	0	0	0	400
	1991	0	0	0	700	50	750	0	0	0	0	750
	1992	0	0	0	0	500	500	0	0	0	0	500
	1993	0	0	0	0	550	550	0	0	0	0	550
	1994	0	0	0	0	500	500	0	0	0	0	500
BLYTH	1989	0	0	1000	200	1530	2730	0	100	200	300	3030
	1990	0	0	0	100	1150	1250	0	0	0	0	1250
	1991	0	0	0	0	1400	1400	0	0	0	0	1400
	1992	0	0	0	0	1350	1350	0	0	0	0	1350
	1993	0	0	0	200	1150	1350	0	0	0	0	1350
	1994	0	0	0	200	800	1000	0	0	0	0	1000
COQUET	1989	0	0	0	0	1950	1950	0	0	0	0	1950
	1990	0	0	0	0	1800	1800	0	0	0	0	1800
	1991	0	0	0	0	6400	6400	0	0	0	0	6400
	1992	0	0	0	300	2700	3000	0	0	0	0	3000
	1993	0	0	0	0	4175	4175	0	0	0	0	4175
	1994	0	0	0	0	2750	2750	0	0	0	0	2750
HUTTON BECK	1991	0	0	200	25	0	225	0	0	0	0	225
KILTON BECK	1991	0	0	0	0	8500	8500	0	0	0	0	8500
LOWER TEES	1989	0	0	0	0	1900	1900	0	0	0	0	1900
	1990	0	0	0	3250	1000	4250	0	0	0	0	4250
	1991	0	0	0	1500	1774	3274	0	0	0	0	3274
	1992	0	0	0	2500	700	3200	0	0	0	0	3200
	1993	0	0	0	3950	1100	5050	0	0	0	0	5050
LOWER TYNE	1989	0	0	0	600	275	875	0	0	2400	2400	3275
	1990	0	0	0	800	4525	5325	0	0	2750	2750	8075
	1991	0	105000	0	0	5575	1E+05	0	0	4350	4350	1E+05
	1992	0	0	0	100	1860	1960	0	0	500	500	2460
	1993	0	0	61000	150	3700	64850	0	0	1300	1300	66150
LOWER WEAR	1989	0	0	0	200	300	500	0	0	100	100	600
	1992	0	0	0	0	300	300	0	0	0	0	300
	1993	0	0	0	300	200	500	0	0	0	0	500

Table A.2 (cont.d)
Northumbria Region

Main river:	Year:	Brook trout	Brown trout					Rainbow				Overall total
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	
NORTH TYNE	1989	0	0	0	1300	2350	3650	0	0	265	265	3915
	1990	0	0	0	0	540	540	0	0	425	425	965
	1991	0	0	0	0	4050	4050	0	0	600	600	4650
	1992	0	0	0	0	1450	1450	0	0	0	0	1450
	1993	0	0	0	0	1670	1670	0	0	0	0	1670
SOUTH TYNE	1989	0	0	0	0	100	100	0	0	0	0	100
	1990	0	0	0	0	350	350	0	0	0	0	350
	1991	0	0	0	0	1000	1000	0	0	0	0	1000
	1992	0	0	0	0	600	600	0	0	0	0	600
	1993	0	0	0	0	500	500	0	0	125	125	625
SKELTON BECK	1991	0	0	0	100	50	150	0	0	0	0	150
UPPER TEES	1989	0	0	0	3700	1450	5150	0	0	0	0	5150
	1990	0	0	500	4300	2600	7400	0	0	0	0	7400
	1991	0	0	0	400	850	1250	0	0	0	0	1250
	1992	0	0	200	9700	1000	10900	0	0	0	0	10900
	1993	0	0	200	1300	1300	2800	0	0	0	0	2800
WANSBECK	1989	0	0	0	0	1625	1625	0	200	0	200	1825
	1990	0	0	0	0	2300	2300	0	0	0	0	2300
	1991	0	0	0	5000	2250	7250	0	0	90	90	7340
	1992	0	0	0	175	2700	2875	0	0	0	0	2875
	1993	0	0	0	0	300	300	0	0	0	0	300
	1994	0	0	0	3000	100	3100	0	0	0	0	3100
WEAR	1989	0	0	3000	3950	100	7050	0	0	90	90	7140
	1990	0	0	8000	1350	200	9550	0	0	500	500	10050
	1991	0	0	0	1600	700	2300	0	0	0	0	2300
	1992	0	0	0	3100	1210	4310	0	0	0	0	4310
	1993	0	0	0	3450	3600	7050	0	35	0	35	7085
	1994	0	0	0	0	1700	1700	0	0	0	0	1700

Table A.3
North-West Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
EEA	1989	0	0	0	0	100	100	0	0	0	0	100
	1990	0	0	0	0	100	100	0	0	0	0	100
	1991	0	0	0	100	100	200	0	0	0	0	200
	1992	0	0	0	80	100	180	0	0	0	0	180
	1993	0	0	0	0	0	0	0	0	150	150	150
GOWY	1993	0	0	0	0	350	350	0	0	300	300	650
	1994	0	0	0	0	100	100	0	0	0	0	100
KEER	1990	0	0	0	0	150	150	0	0	0	0	150
KENT	1989	0	0	0	0	1812	1812	0	0	70	70	1882
	1990	0	0	0	0	2425	2425	0	0	0	0	2425
	1991	0	0	0	150	2500	2650	0	0	0	0	2650
	1992	0	5000	1000	0	4650	10650	0	0	120	120	10770
	1993	0	0	0	0	1050	1050	0	0	0	0	1050
	1994	0	0	0	0	480	480	0	0	0	0	480
LUNE	1989	0	0	20000	2350	1750	24100	0	0	0	0	24100
	1990	0	0	3000	1000	1500	5500	0	0	0	0	5500
	1991	0	0	5000	500	1880	7380	0	0	400	400	7780
	1992	0	0	17000	2280	2135	21415	0	0	0	0	21415
	1993	0	0	13000	1500	1350	15850	0	0	0	0	15850
MERSEY	1993	0	0	1000	1150	100	2250	100	100	362	562	2812
RIBBLE	1989	0	0	0	500	9200	9700	0	0	0	0	9700
	1991	0	0	1000	200	10450	11650	0	0	0	0	11650
	1992	0	0	1000	500	10045	11545	100	0	262	362	11907
	1993	0	0	4000	1300	10039	15339	0	0	0	0	15339
WEAVER	1992	0	0	0	400	850	1250	200	0	10	210	1460
	1993	0	0	125	700	1150	1975	200	50	2100	2350	4325
	1994	0	0	0	400	100	500	0	0	400	400	900
WYRE	1989	0	0	0	0	1200	1200	0	0	0	0	1200
	1991	0	0	0	0	1175	1175	0	0	0	0	1175
	1992	0	0	0	0	2400	2400	0	0	100	100	2500
	1993	0	0	0	0	2650	2650	0	0	0	0	2650

Table A.4
Severn-Trent Region

Main river:	Year:	Brook trout >24cm	Brown trout <5cm	Brown trout 5-12cm	Brown trout 12-24cm	Brown trout >24cm	Brown trout Total	Rainbow trout 5-12cm	Rainbow trout 12-24cm	Rainbow trout >24cm	Rainbow trout Total	Overall total
DERWENT	1990	0	0	0	0	2600	2600	0	0	0	0	2600
	1991	0	0	0	0	5200	5200	0	0	300	300	5500
	1992	0	0	0	0	3600	3600	0	0	400	400	4000
	1993	0	0	0	0	1100	1100	0	0	550	550	1650
DOVE	1989	0	0	0	0	2900	2900	0	0	0	0	2900
	1990	0	0	0	0	2200	2200	0	0	0	0	2200
	1991	0	0	0	0	3500	3500	0	0	0	0	3500
LOWER AVON	1991	0	0	0	0	130	130	0	0	2785	2785	2915
	1992	0	0	0	0	0	0	0	0	3563	3563	3563
	1993	0	0	0	0	0	0	0	0	2809	2809	2809
LOWER SEVERN	1992	0	0	0	0	0	0	300	0	0	300	300
	1993	0	0	0	0	0	0	300	0	30	330	330
MIDDLE TRENT	1989	0	0	0	0	300	300	0	0	0	0	300
	1990	0	0	0	0	50	50	0	0	0	0	50
	1991	0	0	0	0	220	220	0	0	150	150	370
	1992	0	0	0	0	340	340	0	0	0	0	340
	1993	0	0	0	0	240	240	0	0	0	0	240
SOAR	1988	0	0	0	50	2	52	0	0	0	0	52
	1989	0	0	0	0	200	200	0	0	0	0	200
	1990	0	0	0	0	0	0	0	0	400	400	400
	1992	0	0	0	0	0	0	0	0	400	400	400
	1993	0	0	0	0	0	0	0	0	300	300	300
TAME	1992	0	0	0	0	100	100	0	0	0	0	100
TEME	1992	0	0	0	930	1402	2332	0	0	800	800	3132
	1993	0	0	0	680	1030	1710	0	0	0	0	1710
	1994	0	0	0	435	1305	1740	0	0	300	300	2040
UPPER AVON	1993	0	0	0	100	150	250	0	0	65	65	315
UPPER SEVERN	1992	0	0	300	150	3008	3458	0	0	1380	1380	4838
	1993	0	0	0	125	5874	5999	0	0	5255	5255	11254
	1994	0	0	0	700	1070	1770	0	0	0	0	1770
VYRNWY	1992	0	0	2300	0	1100	3400	0	0	60	60	3460
	1993	0	0	4200	0	4000	8200	0	0	30	30	8230
	1994	0	0	0	0	1000	1000	0	0	0	0	1000

Table A.5
Southern Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
ADUR	1989	0	0	0	0	105	105	0	0	835	835	940
	1990	0	0	0	0	915	915	0	0	410	410	1325
	1993	0	0	0	0	75	75	0	0	0	0	75
	1994	0	0	0	0	875	875	0	0	440	440	1315
	1990	0	0	0	0	4	4	0	0	15	15	19
	1994	0	0	0	0	0	0	0	0	80	80	80
AVON WATER	1991	0	0	0	0	0	0	0	150	0	150	150
DARENT	1993	0	0	0	160	120	280	0	0	1000	1000	1280
	1994	0	0	0	0	200	200	0	0	2400	2400	2600
HAMBLE	1990	0	0	0	0	0	0	0	0	56	56	56
ITCHEN	1988	0	0	0	0	680	680	0	0	0	0	680
	1990	0	10000	0	0	3210	13210	0	0	0	0	13210
	1991	0	10000	0	100	4390	14490	0	0	0	0	14490
	1992	0	0	5000	3900	5786	14686	0	150	0	150	14836
	1993	0	0	0	3250	300	3550	0	150	0	150	3700
	1994	0	0	0	150	1100	1250	0	0	0	0	1250
LYMINGTON	1990	0	0	0	0	502	502	0	0	198	198	700
	1991	0	0	0	0	1600	1600	0	0	0	0	1600
	1992	0	0	0	0	930	930	0	0	0	0	930
	1993	0	0	0	0	40	40	0	0	0	0	40
MEDWAY	1992	0	0	0	0	367	367	0	30	0	30	397
	1993	0	0	0	1000	190	1190	0	0	0	0	1190
	1994	0	0	0	0	0	0	0	0	1800	1800	1800
MEON	1988	0	0	0	50	600	650	0	0	60	60	710
	1989	0	0	0	50	100	150	0	0	0	0	150
	1990	0	0	0	100	1370	1470	0	0	170	170	1640
	1991	0	0	0	100	1580	1680	0	0	60	60	1740
	1992	0	0	0	100	1765	1865	0	0	275	275	2140
OUSE	1989	0	0	0	0	500	500	0	0	0	0	500
	1990	0	0	0	0	850	850	0	0	50	50	900
	1993	0	0	0	0	300	300	0	0	0	0	300
	1994	0	0	0	0	600	600	0	0	0	0	600

Table A.5 (cont.d)
Southern Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
ROTHAM MILL STREAM	1989	0	0	0	0	0	0	0	500	0	500	500
STOUR	1992	0	0	30000	4000	540	34540	0	0	0	0	34540
	1993	0	0	15000	2000	300	17300	0	0	150	150	17450
	1994	0	0	0	15000	300	15300	0	0	190	190	15490
TEST	1988	0	0	0	0	410	410	0	0	310	310	720
	1990	0	5000	0	0	7005	12005	0	0	1715	1715	13720
	1991	0	0	5000	150	6335	11485	0	0	3191	3191	14676
	1992	0	0	5500	0	15570	21070	0	0	6380	6380	27450
	1993	0	0	0	0	8970	8970	0	0	1915	1915	10885
	1994	0	0	0	0	2680	2680	0	0	270	270	2950

Table A.6
South-West Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
AXE	1988	0	0	0	150	0	150	0	0	0	0	150
CLYST	1991	0	0	0	0	100	100	0	0	0	0	100
DART	1989	0	0	0	100	0	100	0	0	0	0	100
	1990	0	0	0	0	100	100	0	0	0	0	100
	1991	0	0	0	0	50	50	0	0	0	0	50
	1992	0	0	125	0	0	125	0	0	0	0	125
DEVON AVON	1988	0	125	0	0	0	125	0	0	0	0	125
	1989	0	0	0	0	100	100	0	0	0	0	100
	1990	0	0	0	0	100	100	0	0	0	0	100
	1991	0	0	0	0	100	100	0	0	0	0	100
	1992	0	0	0	0	100	100	0	0	0	0	100
	1993	0	0	0	0	100	100	0	0	0	0	100
ERME	1991	0	0	0	0	295	295	0	0	0	0	295
EXE	1988	0	0	0	0	340	340	0	0	0	0	340
	1989	0	0	0	0	500	500	0	0	0	0	500
	1990	0	0	1000	500	0	1500	0	0	0	0	1500
	1991	0	0	0	0	75	75	0	0	0	0	75
	1992	0	0	0	2000	0	2000	0	0	0	0	2000
FAL	1992	0	0	5000	0	0	5000	0	0	0	0	5000
LOWER EXE	1988	0	0	0	0	325	325	0	0	0	0	325
	1989	0	0	0	0	75	75	0	0	0	0	75
	1990	0	0	0	0	150	150	0	0	0	0	150
	1991	0	0	70	0	300	370	0	0	0	0	370
	1992	0	0	0	200	380	580	0	0	0	0	580
	1993	0	0	0	0	180	180	0	0	0	0	180
OTTER	1988	0	0	0	0	770	770	0	0	0	0	770
	1989	0	0	0	0	800	800	0	0	0	0	800
	1990	0	0	0	0	871	871	0	0	0	0	871
	1991	0	0	0	0	1400	1400	0	0	0	0	1400
	1992	0	0	0	850	1350	2200	0	0	0	0	2200
	1993	0	0	0	600	1230	1830	0	0	0	0	1830

Table A.6 (cont.d)
South-West Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
TAMAR	1989	0	0	0	0	1500	1500	0	0	0	0	1500
	1992	0	0	0	0	1300	1300	0	0	0	0	1300
	1993	0	0	0	0	620	620	0	0	0	0	620
TAW	1988	0	0	0	0	250	250	0	0	0	0	250
	1989	0	0	0	0	300	300	0	0	0	0	300
	1990	0	0	0	0	300	300	0	0	0	0	300
	1991	0	0	0	0	250	250	0	0	0	0	250
	1992	0	0	0	0	300	300	0	0	0	0	300
	1993	0	0	0	30	0	30	0	0	0	0	30
TEIGN	1991	0	0	0	0	60	60	0	0	0	0	60
	1993	0	0	0	0	60	60	0	0	0	0	60
TORRIDGE	1988	0	0	0	0	400	400	0	0	0	0	400
	1989	0	0	0	0	450	450	0	0	0	0	450
	1991	0	0	0	0	100	100	0	0	0	0	100
	1992	0	0	0	0	250	250	0	0	0	0	250
	1993	0	0	0	0	450	450	0	0	0	0	450
UPPER EXE	1988	0	0	0	0	225	225	0	0	0	0	225
	1989	0	0	0	0	100	100	0	0	0	0	100
	1991	0	0	0	0	325	325	0	0	0	0	325
	1992	0	0	0	0	50	50	0	0	0	0	50

Table A.7
Thames Region

Main river:	Year:	Brook trout >24cm	Brown trout <5cm	Brown trout 5-12cm	Brown trout 12-24cm	Brown trout >24cm	Brown trout Total	Rainbow trout 5-12cm	Rainbow trout 12-24cm	Rainbow trout >24cm	Rainbow trout Total	Overall total
CHURN	1990	0	0	0	0	50	50	0	0	0	0	50
	1992	0	0	0	0	120	120	0	0	0	0	120
	1993	0	0	0	0	50	50	0	0	0	0	50
COLN	1990	0	0	0	200	1650	1850	0	0	1300	1300	3150
	1991	0	0	0	0	100	100	0	0	100	100	200
	1992	0	0	0	0	2375	2375	0	0	560	560	2935
	1993	0	0	0	0	1925	1925	0	0	725	725	2650
COLNE	1989	0	0	0	0	350	350	0	0	200	200	550
	1990	0	0	0	0	200	200	0	0	600	600	800
	1992	0	0	0	0	200	200	0	0	0	0	200
	1993	0	0	0	300	475	775	0	0	425	425	1200
EVENLODE	1989	0	0	0	150	0	150	0	0	100	100	250
	1990	0	0	0	150	0	150	0	0	50	50	200
	1991	0	0	0	0	100	100	0	0	0	0	100
	1992	0	0	0	0	150	150	0	0	0	0	150
	1993	0	0	0	0	200	200	0	0	0	0	200
KENNET	1989	0	0	0	0	2035	2035	0	0	1950	1950	3985
	1990	0	0	0	0	2920	2920	0	0	1620	1620	4540
	1991	0	0	0	1400	2275	3675	0	0	7025	7025	10700
	1992	0	0	1000	0	7450	8450	0	0	1300	1300	9750
	1993	0	12000	0	250	13535	25785	0	1000	2925	3925	29710
LEACH	1989	0	0	0	0	220	220	0	0	20	20	240
	1992	0	0	0	0	100	100	0	0	0	0	100
	1993	0	0	0	0	200	200	0	0	0	0	200
LEE	1989	0	0	0	0	850	850	0	0	300	300	1150
	1990	0	0	0	0	4300	4300	0	0	1830	1830	6130
	1991	0	0	0	0	800	800	0	0	1060	1060	1860
	1992	0	0	0	0	800	800	0	216	1768	1984	2784
	1993	0	0	0	0	743	743	0	0	1350	1350	2093
	1994	0	0	0	0	125	125	0	0	125	125	250

Table A.7 (cont.d)
Thames Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
LODDON	1989	0	0	0	0	2300	2300	0	0	800	800	3100
	1990	0	0	0	0	4600	4600	0	0	1400	1400	6000
	1991	0	0	500	0	3217	3717	0	0	1210	1210	4927
	1992	0	0	0	0	1210	1210	0	0	550	550	1760
	1993	0	0	0	0	5515	5515	0	0	1735	1735	7250
	1994	0	0	0	0	200	200	0	0	0	0	200
MOLE	1990	0	0	0	0	0	0	0	0	270	270	270
	1992	0	0	0	0	0	0	0	0	300	300	300
THAMES	1989	0	0	0	0	680	680	0	0	570	570	1250
	1990	0	0	0	0	100	100	0	0	0	0	100
	1991	0	0	0	0	325	325	0	0	425	425	750
	1992	0	0	0	0	575	575	0	0	0	0	575
	1993	0	0	0	0	140	140	0	400	2000	2400	2540
WEY	1989	0	0	0	0	680	680	0	0	250	250	930
	1990	0	0	0	0	3280	3280	0	800	155	955	4235
	1991	0	0	0	0	80	80	0	0	250	250	330
	1992	0	0	0	0	565	565	0	0	165	165	730
	1993	0	0	0	0	2200	2200	0	1000	380	1380	3580
WINDRUSH	1990	0	0	0	0	650	650	0	0	715	715	1365
	1991	0	0	0	0	250	250	0	0	50	50	300
	1992	0	0	0	0	2315	2315	0	0	2590	2590	4905
	1993	0	0	0	0	385	385	0	0	885	885	1270

Table A.8
Welsh Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
AERON	1989	0	0	0	0	300	300	0	0	0	0	300
AFAN	1993	0	0	0	0	1000	1000	0	0	0	0	1000
	1994	0	0	0	0	1000	1000	0	0	0	0	1000
CLWYD	1991	0	0	0	0	700	700	0	0	328	328	1028
	1992	0	0	0	0	1650	1650	0	0	175	175	1825
	1993	0	0	0	0	1100	1100	0	0	120	120	1220
	1994	0	0	0	0	0	0	0	0	70	70	70
CONWY	1990	0	15000	0	0	0	15000	0	0	0	0	15000
CWMNANTCOL	1990	0	0	0	0	400	400	0	0	0	0	400
DOVEY	1991	0	0	0	0	150	150	0	0	0	0	150
DYSYNNI	1990	0	0	0	0	100	100	0	0	0	0	100
	1991	0	0	0	100	300	400	0	0	0	0	400
	1992	0	0	0	0	300	300	0	0	0	0	300
	1993	0	0	0	0	300	300	0	0	0	0	300
	1994	0	0	0	0	100	100	0	0	0	0	100
EASTERN CLEDDAU	1992	0	0	0	0	200	200	0	0	0	0	200
	1993	0	0	0	0	400	400	0	0	0	0	400
	1994	0	0	0	0	100	100	0	0	0	0	100
EBBW	1989	0	0	0	0	371	371	0	0	476	476	847
	1990	0	0	0	300	150	450	0	0	1040	1040	1490
	1991	0	0	0	2000	715	2715	0	0	1620	1620	4335
	1992	0	0	0	0	0	0	0	0	1129	1129	1129
	1993	0	0	0	100	800	900	0	0	800	800	1700
	1994	0	1000	0	0	0	1000	0	0	0	0	1000
ELY	1989	0	0	0	0	0	0	0	0	300	300	300
	1990	0	0	0	1000	0	1000	0	0	500	500	1500
	1991	0	0	0	0	0	0	0	0	250	250	250
	1992	0	0	0	0	0	0	0	0	100	100	100
	1993	0	0	0	0	0	0	0	0	200	200	200
	1994	0	0	0	0	0	0	0	0	300	300	300

Table A.8 (cont.d)
Welsh Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
ERCH	1991	0	0	0	200	0	200	0	0	0	0	200
	1994	0	0	0	0	200	200	0	0	0	0	200
GWENDRAETH	1993	0	0	0	0	450	450	0	0	0	0	450
	1994	0	0	0	0	300	300	0	0	0	0	300
KENFIG	1993	0	0	0	0	300	300	0	0	0	0	300
LOWER DEE	1991	0	0	0	0	1100	1100	0	0	1177	1177	2277
	1992	0	0	0	1300	1200	2500	0	0	1410	1410	3910
	1993	0	0	0	3100	2000	5100	0	200	1460	1660	6760
	1994	0	0	0	1000	1200	2200	0	0	700	700	2900
LOWER USK	1989	0	0	0	500	1900	2400	0	0	110	110	2510
	1990	0	0	1000	0	1800	2800	0	0	340	340	3140
	1991	0	0	0	1100	1450	2550	0	0	0	0	2550
	1992	0	0	0	200	2064	2264	0	0	0	0	2264
	1993	0	0	0	2390	3350	5740	0	0	0	0	5740
	1994	0	0	0	0	1000	1000	0	0	100	100	1100
LOWER WYE	1988	0	0	1000	1100	2130	4230	0	0	649	649	4879
	1989	0	0	0	2350	2214	4564	0	0	700	700	5264
	1990	0	0	0	650	2370	3020	0	0	827	827	3847
	1991	0	0	0	2080	3130	5210	0	0	114	114	5324
	1992	0	0	0	2370	1710	4080	0	0	0	0	4080
	1993	0	0	0	1235	2298	3533	0	0	30	30	3563
	1994	0	0	0	1800	1970	3770	0	0	60	60	3830

Table A.8 (cont.d)
Welsh Region

Main river:	Year:	Brook trout >24cm	Brown trout <5cm	Brown trout 5-12cm	Brown trout 12-24cm	Brown trout >24cm	Brown trout Total	Rainbow trout 5-12cm	Rainbow trout 12-24cm	Rainbow trout >24cm	Rainbow trout Total	Overall total
LLAN	1993	0	0	0	500	600	1100	0	0	0	0	1100
	1994	0	0	0	0	600	600	0	0	0	0	600
LOUGHER	1993	0	0	0	0	800	800	0	0	0	0	800
	1994	0	0	0	0	300	300	0	0	0	0	300
NEATH	1993	0	0	0	0	2312	2312	0	0	0	0	2312
	1994	0	0	0	1500	4912	6412	0	0	0	0	6412
NYFER	1989	0	0	100	0	0	100	0	0	0	0	100
OGMORE	1993	0	0	2000	1000	10900	13900	0	0	0	0	13900
	1994	0	0	0	0	4600	4600	0	0	0	0	4600
RHONDDA	1989	0	0	0	200	0	200	0	0	1500	1500	1700
	1990	0	0	0	200	0	200	0	0	1950	1950	2150
	1991	0	0	0	350	0	350	0	0	1850	1850	2200
	1992	0	0	0	500	500	1000	0	250	700	950	1950
RHYMNEY	1989	0	0	0	200	300	500	0	0	0	0	500
	1990	0	0	0	400	0	400	0	0	0	0	400
	1991	0	0	0	200	0	200	0	0	0	0	200
	1992	0	0	0	200	0	200	0	0	0	0	200
	1993	0	0	0	200	650	850	0	0	0	0	850
	1994	0	0	0	200	200	400	0	0	100	100	500
TAFF	1989	0	0	0	0	5000	5000	0	0	0	0	5000
	1990	0	0	0	0	1200	1200	0	0	0	0	1200
	1991	0	0	0	400	2000	2400	0	0	0	0	2400
	1992	0	0	700	0	0	700	0	0	1000	1000	1700
	1993	0	0	0	700	4430	5130	0	0	2150	2150	7280
	1994	0	0	0	1300	5225	6525	0	2000	3315	5315	11840
TAWE	1993	0	0	0	500	2200	2700	0	0	0	0	2700
	1994	0	0	0	1500	2850	4350	0	0	0	0	4350
TEIFI	1989	0	0	0	0	1800	1800	0	0	0	0	1800
	1990	0	0	0	0	300	300	0	0	0	0	300
	1991	0	0	0	400	50	450	0	0	0	0	450
	1993	0	0	0	600	0	600	0	0	0	0	600
	1994	0	0	0	0	200	200	0	0	0	0	200

Table A.8 (cont.d)
Welsh Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall total
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	
THAW	1989	0	0	0	400	440	840	0	0	12	12	852
	1991	0	0	0	380	200	580	0	0	12	12	592
	1992	0	0	0	180	200	380	0	0	0	0	380
	1993	0	0	0	0	581	581	0	0	0	0	581
TYWI	1989	0	0	0	0	1000	1000	0	0	0	0	1000
	1990	0	0	0	160	500	660	0	0	0	0	660
	1991	0	0	0	150	0	150	0	0	0	0	150
	1992	0	0	0	0	300	300	0	0	0	0	300
	1993	0	0	0	200	300	500	0	0	0	0	500
UPPER DEE	1991	0	0	450	300	400	1150	0	0	0	0	1150
	1992	0	0	0	1000	150	1150	0	0	100	100	1250
	1993	0	0	0	1000	250	1250	0	0	0	0	1250
UPPER USK	1994	0	0	0	0	1100	1100	0	0	0	0	1100
UPPER WYE	1988	0	0	0	125	1090	1215	0	0	1910	1910	3125
	1989	152	0	0	600	1516	2116	0	0	3381	3381	5649
	1990	0	0	0	80	850	930	0	0	2256	2256	3186
	1991	0	0	0	0	4301	4301	0	69	786	855	5156
	1992	0	0	0	200	635	835	0	0	2670	2670	3505
	1993	0	0	0	2700	760	3460	0	100	1010	1110	4570
	1994	0	0	0	250	1300	1550	0	0	1100	1100	2650
WESTERN CLEDDAU	1993	0	0	0	1500	0	1500	0	0	0	0	1500
WYGYR	1990	0	0	0	0	100	100	0	0	0	0	100
YSTWYTH	1993	0	0	0	0	100	100	0	0	0	0	100
	1994	0	0	0	0	100	100	0	0	0	0	100

Table A.9
Wessex Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
BRISTOL AVON	1987	0	0	0	0	0	0	0	100	0	100	100
	1988	0	0	200	150	4640	4990	0	150	1300	1450	6440
	1989	0	0	100	1050	3885	5035	0	0	3675	3675	8710
	1990	0	0	0	250	2675	2925	0	0	2080	2080	5005
	1991	0	0	2180	500	5405	8085	0	60	586	646	8731
	1992	0	0	0	2195	3750	5945	0	0	200	200	6145
	1993	0	0	100	500	1520	2120	0	0	1800	1800	3920
FROME	1987	0	0	0	0	350	350	0	0	290	290	640
	1988	0	0	0	260	1335	1595	0	0	915	915	2510
	1989	0	0	50	529	670	1249	0	0	3100	3100	4349
	1990	0	0	0	0	560	560	0	0	0	0	560
	1991	0	0	0	0	832	832	0	0	0	0	832
	1992	0	0	0	0	2380	2380	0	0	0	0	2380
HANTS AVON	1987	0	0	0	20	0	20	0	0	0	0	20
	1988	0	5000	0	3400	3615	12015	0	1500	225	1725	13740
	1989	0	0	5000	2900	1946	9846	0	1000	300	1300	11146
	1990	0	0	0	2500	5125	7625	0	0	3900	3900	11525
	1991	0	0	0	1350	9470	10820	0	0	300	300	11120
	1992	0	0	0	4400	8905	13305	0	1200	165	1365	14670
SOMERSET FROME	1988	0	0	0	80	0	80	0	0	1000	1000	1080
	1990	0	0	0	0	0	0	0	0	200	200	200
STOUR	1988	0	0	0	0	420	420	0	0	0	0	420
	1989	0	0	0	0	325	325	0	0	125	125	450
	1990	0	0	0	0	550	550	0	0	65	65	615
	1991	0	0	0	0	1300	1300	0	0	110	110	1410
	1992	0	0	0	0	1140	1140	0	0	305	305	1445

Table A.10
Yorkshire Region

Main river:	Year:	Brook trout	Brown trout					Rainbow trout				Overall
		>24cm	<5cm	5-12cm	12-24cm	>24cm	Total	5-12cm	12-24cm	>24cm	Total	total
AIRE	1991	0	0	0	450	1200	1650	0	0	250	250	1900
	1992	0	274000	4500	800	900	280200	0	0	0	0	280200
	1993	0	0	0	500	875	1375	0	0	0	0	1375
	1994	0	0	0	800	500	1300	0	0	0	0	1300
CALDER	1991	0	0	0	0	150	150	0	0	0	0	150
	1992	0	12500	0	455	100	13055	0	0	0	0	13055
	1993	0	0	0	825	1350	2175	0	0	0	0	2175
COLNE	1993	0	0	0	200	2050	2250	0	0	0	0	2250
DERWENT	1991	0	0	0	1100	800	1900	0	0	0	0	1900
	1992	0	0	0	700	1900	2600	0	0	0	0	2600
	1993	0	0	7000	0	2950	9950	0	0	0	0	9950
	1994	0	0	0	0	600	600	0	0	0	0	600
DON	1992	0	225000	100	200	0	225300	0	0	0	0	225300
ESK	1991	0	0	0	0	1395	1395	0	0	0	0	1395
	1992	0	0	0	0	1390	1390	0	0	0	0	1390
	1993	0	0	0	0	1128	1128	0	0	0	0	1128
NIDD	1991	0	0	1000	700	6700	8400	0	0	0	0	8400
	1992	0	0	500	966	5550	7016	0	0	200	200	7216
	1993	0	0	0	1100	3650	4750	0	0	0	0	4750
	1994	0	0	5000	300	3150	8450	0	0	0	0	8450
RYBURN	1991	0	0	0	1100	0	1100	0	0	0	0	1100
	1993	0	0	0	600	0	600	0	0	0	0	600
	1994	0	0	0	0	250	250	0	0	0	0	250
SEVEN	1991	0	0	0	0	100	100	0	0	0	0	100
	1992	0	0	0	0	100	100	0	0	0	0	100
	1993	0	0	0	0	50	50	0	0	0	0	50

Table A.10 (cont.d)
Yorkshire Region

Main river:	Year:	Brook trout >24cm	Brown trout <5cm	Brown trout 5-12cm	Brown trout 12-24cm	Brown trout >24cm	Brown trout Total	Rainbow trout 5-12cm	Rainbow trout 12-24cm	Rainbow trout >24cm	Rainbow trout Total	Overall total
SWALE	1991	0	0	0	100	3050	3150	0	0	0	0	3150
	1992	0	0	31000	300	2355	33655	0	0	0	0	33655
	1993	0	0	0	0	1975	1975	0	0	0	0	1975
	1994	0	0	0	0	350	350	0	0	0	0	350
URE	1991	0	0	1000	2300	3050	6350	0	0	0	0	6350
	1992	0	0	0	50	2050	2100	0	0	350	350	2450
	1993	0	0	0	1450	4775	6225	0	0	0	0	6225
	1994	0	0	0	300	0	300	0	0	0	0	300
WENT	1991	0	0	1500	1500	300	3300	0	0	0	0	3300
WHARFE	1991	0	0	0	1000	8500	9500	0	0	0	0	9500
	1992	0	11000	0	700	4800	16500	0	0	200	200	16700
	1993	0	0	0	600	8270	8870	0	0	0	0	8870
	1994	0	0	0	0	3937	3937	0	0	0	0	3937