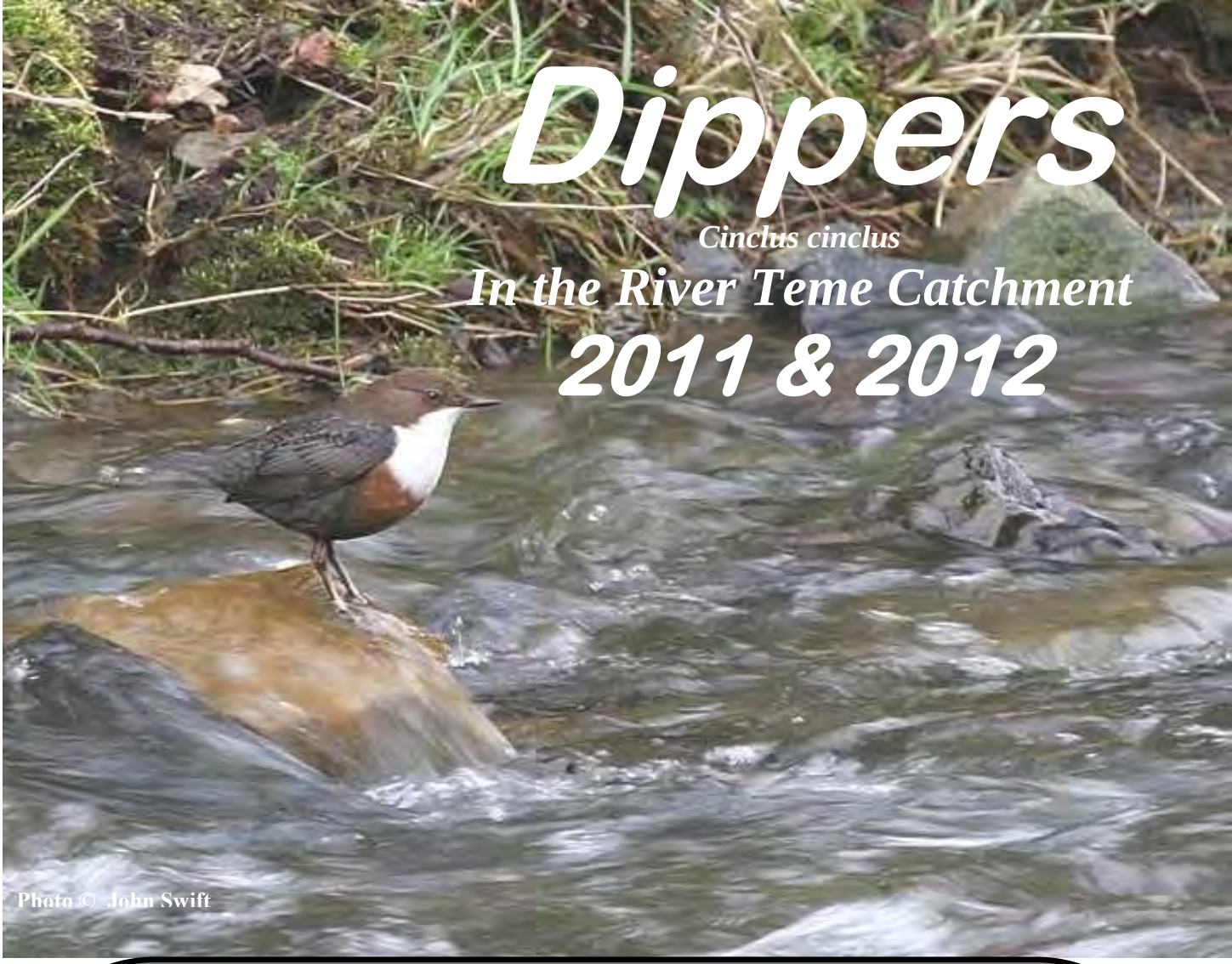

Dippers

Cinclus cinclus

In the River Teme Catchment

2011 & 2012

Summary

Dippers were monitored at around 70 winter roost sites in the River Teme Catchment from 1987 to 2000. This Project resumed this monitoring in 2006, and has also implemented a nest box scheme. By the start of the 2012 breeding season, boxes had been installed at around 150 sites. In 2011 and 2012 a total of 141 nesting pairs were found, with 85 (60.3%) nesting in boxes.

Comparison of results obtained in 2006 - 2009 with those from the 1980s and 1990s show an initial overall decline in the number of Dippers, with a much greater decline on the lower reaches of the rivers than on the upper reaches, and a deterioration in the condition of the birds (measured by average body weight).

This is attributed to a reduction in food supply as a result of poorer quality rivers, primarily due to pollution from, and silting up by, agricultural activities.

However, more Dippers were found in 2009 and 2010 than in any previous year, due to an increase in the number of nest sites in the upper reaches of the rivers, and improved breeding success, as a result of the nest boxes.

Further long term monitoring of the Dipper population, and extending the nest box scheme, is recommended, to iron out any effect on the results from annual fluctuations, and the Environment Agency is recommended to analyse water sampling results from these river systems for the last 25 years, to ascertain if specific causes of the Dipper decline can be identified.

Dippers

Cinclus cinclus

In the River Teme Catchment

2011 & 2012

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"LEADER in the Shropshire Hills: Project part financed by the European Agricultural Fund for Rural Development 2007-2013: Europe investing in rural areas".

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INTRODUCTION

Dippers feed almost exclusively on larvae that live on the stony beds of rapids and fast flowing streams, and they are never far from such waters. The rivers in the South Shropshire hills, particularly the East and West Onny, the Clun (and its tributaries, the Unk and the Folly Brook), and other parts of the Teme catchment, are the County strongholds. Dippers stay here throughout the year, and might be seen either bobbing up and down on the rocks in the middle of the stream, or flying low over the water.

Breeding usually starts early, in late February or early March, and many nesting pairs will attempt to raise two broods. Though some Dippers nest in natural cavities along the riverbank, others build nests on ledges under bridges, and they take readily to nest boxes located directly above the flowing water, where predators are unable to reach them.

They are very territorial, so nests are evenly spaced on each stretch of river.

Because Dippers are restricted to, and dependent on, food from the river, they are relatively easy to monitor. Pairs nesting along poor quality (acidic or silted up) streams tend to lay their eggs later, lay smaller clutches, raise smaller broods, and raise only one brood. The average size of the territory, breeding success, productivity and survival rate are therefore all good indicators of the water quality.

Conservation Status

As a result of the decline in the local population up until 2006, Dipper was added as a Target Species to the Shropshire *Biodiversity Action Plan* (BAP) in the 2007 review.

The Habitat Action Plan for Rivers and Streams in the Shropshire BAP also makes reference to Dippers as a key indicator species, and includes a number of actions to reduce the enrichment of the watercourses by agricultural activities (which cause diffuse pollution which in turn affects the Dippers' food supply). The use of sheep dip / cypermethryn still continues to cause problems with invertebrates on certain smaller watercourses, and this can have a direct and dramatic effect on Dippers' food sources. Other pesticides, such as avermectins and neonicotinoids, may also be having an adverse effect.

Dipper Project

The Dipper population in the River Teme catchment was monitored extensively in the late 1980s and 1990s, up until 2000. Concern about the apparent recent decline led to a reinstatement of this monitoring, together with action to improve breeding success, initially through the Upper Onny Wildlife Group, beginning in 2005, and subsequently through the Upper Clun Community Wildlife Group, from 2007 onwards, and the Kemp Valley Community Wildlife Group (including part of the Lower Clun), from 2010 onwards.

Additional volunteers were recruited to monitor the nest boxes in the Upper Clun, Lower Clun (including the Kemp) and the Redlake, and search for natural sites, in 2010. A further volunteer was recruited in 2012, to install boxes and monitor them on the Lower Onny and the remainder of the Lower Clun, and another fieldworker reported nests on the Rea, near Cleobury Mortimer. This provided information to the ringer about which sites to visit when, and consequently more broods were

ringed in 2010 than ever before. The same effort was made in 2011 and 2012, but fewer broods were ringed because poor weather conditions increased the number of failed nests.

Two of the new volunteers have also been trained to ring Dippers, so more of the chicks in second brood nests can be ringed as well. This should enable monitoring of second brood nests to be improved.

Colour-ringing of adults caught at nest sites, and adults and first year birds caught at winter roost sites, started in 2011. The colour rings are all numbered, so if the ring is read the bird can be identified. This is relatively easy, so it provides much more data than conventional ringing, because the bird has to be caught, or found dead, before an ordinary metal ring can be read.

The Project now consists of four complementary activities:-

1. Monitoring the overall population and survival rate by catching birds at night-time roosts during the winter. Around 70 bridges were surveyed 1987-1992, and all of these have been re-surveyed 2006-10, together with an increasing number of new sites made suitable for roosting by the provision of nest boxes (a total of 125 sites by 2012).
2. Ringing nestlings (and adults when they can be caught), and ringing adults and first year birds at winter roost sites.
3. From 2011 onwards, colour-ringing all the adults that are caught at nest sites, and all the adults and first year birds caught at winter roost sites. The colour-rings include a unique combination of letters (see photo on p. 21), so breeding birds at nest sites can be individually identified without the need to catch them.
4. Installing specially designed nest boxes under all bridges and other suitable structures, to improve breeding success, and monitor population levels and productivity.

This Report presents the Results for 2011 and 2012 (no report was produced in 2011), and also incorporates the results from 2006 onwards for ease of comparison. Where appropriate it compares these recent results to those from the late 1980s and 1990s.

The Report also outlines the way in which it is intended to develop the Project. It is a public document, and the contents should be disseminated as widely as possible.

Funding

In 2006-09 this Dipper Project was part-funded by the Shropshire Hills AONB Sustainable Development Fund and the Upper Onny Wildlife Group. The Project was extended in 2007, and Natural England's River Teme Catchment Sensitive Farming Project contributed additional funding in 2007 and 2008, but was unable to continue funding in 2009. However, another division of Natural England, and the Severn Rivers Trust, contributed to the costs in 2009.

The work in 2010 was funded only by the Shropshire Hills AONB Sustainable Development Fund and the Severn Rivers Trust, and the Trust continued its funding in 2011 and 2012, as match funding for a grant for a Community Wildlife Groups project from the "LEADER in the Shropshire Hills" programme, co-ordinated by the Shropshire Hills AONB Partnership with Defra as the Managing Authority.
This support is gratefully acknowledged.

"LEADER in the Shropshire Hills: Project part financed by the European Agricultural Fund for Rural Development 2007-2013: Europe investing in rural areas".

No funding has been secured to continue with the Dipper project beyond 2012, and the need for further funding is highlighted at the end of this report.

PART 1. MONITORING WINTER ROOST SITES

The work in 2011 and 2012 repeated surveys carried out at many of the same sites, by the same surveyor (A.V. Cross), since 2006, and in the late 1980s and 1990s.

Methods

During 2011 survey work was conducted at 121 past and present roosting sites for Dippers under road and footbridges over the Rivers Corve, Teme, Onny, Clun and Redlake and the Quinney Brook. Surveys were carried out on the nights of 17-18, 18-19, 20-21, 23-24 and 26-27 September.

In 2012, 125 roost sites were visited on 29-30 September and 1-2, 2-3, 3-4, 6 and 10-11 October.

Bridges were visited in the hours of darkness and were inspected with a torch to see how many birds were roosting underneath them. Birds commonly roost on girders or in holes, drainpipes and other cavities below the bridges, including inside old Dipper nests and nest boxes.

The white breast shows well on a roosting bird and counts are a true measure of the numbers present.

Once a count had been obtained an attempt was made (under a BTO ringing licence) to catch as many of the Dippers as possible in order to ring or examine any ring already present. Catching is relatively simple as the birds sit tight and can be lifted off by hand or netted in a small hand-net. After ringing/examining the birds are replaced back under the bridge and the majority settle back down. A small percentage fly off and presumably then roost in bank side trees or under riverbanks.

Results

i) Numbers Present

A total of 125 sites were visited in 2012, four more than last year. The 2011 total itself was 21 more than in 2010. Four sites were visited for the first time in 2012, of which three were new sites (not previously available as roost sites), and one was available previously, but it was not known to the project until 2012. Twenty were visited for the first time in 2011 (11 new, nine not previously known). A further site, also known previously, was visited in 2011 but not 2010.

The number of sites has increased considerably in recent years as the installation of nest boxes allows some bridges to be utilised as roost sites which were previously unusable.

Table 1 shows the number of sites checked, the total number of birds found, and the average number of birds per site checked and per occupied roost, for the 2011 and 2012, and for each previous year since monitoring recommenced in 2006.

Table 1. Bridges Checked and Dippers Found

Bridges Checked & Dippers Found	Year						
	2006	2007	2008	2009	2010	2011	2012
No of Bridges Checked	67	70	87	92	100	121	125
No of Bridges with Dippers	37	42	52	55	56	53	61
No of Dippers Found	87	90	129	145	147	122	123
Dippers / bridge checked	1.30	1.29	1.48	1.58	1.47	1.01	0.98
Dippers / occupied roost	2.35	2.14	2.48	2.64	2.63	2.30	2.02

Apart from a decline in 2007, attributed to the extremely wet weather which created swollen rivers which made it difficult for Dippers to find food and raise young, these figures have shown a steady increase from 2006 up until 2009. However, although the number of birds found in 2010 was the

highest ever, the number per Occupied Roost levelled off. Water levels in 2011 were very low, and conditions in 2012 were similar to those in 2007, with a similar effect on the number of Dippers.

In 2006 and 2007, when these figures were plotted against figures obtained in the 1980s and 1990s and fitted with linear trendlines, the trendlines clearly showed a marked decline both in the number of Dippers per bridge and the number of Dippers present at occupied sites. The rate of decline in the number of Dippers per bridge checked was much steeper as many former bridge roost sites had been abandoned completely.

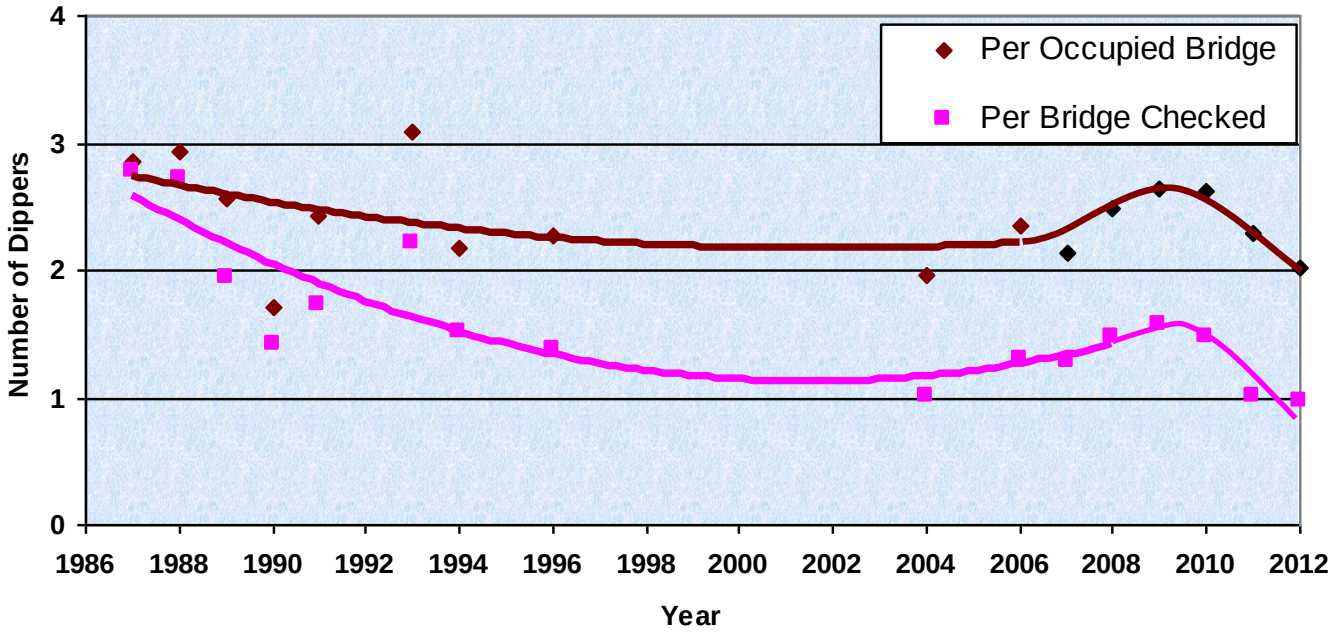
However, the total number of Dippers found in 2008 (129) was the highest ever up until that year, and the numbers in 2009 (145) and 2010 (147) were even higher

The increase is attributed to improved breeding success in 2008, partly due to calm river conditions in the breeding season, and in 2009 and 2010, when a relatively large number of broods of 5 were found. Perhaps more importantly, the nest box scheme has also led to increased breeding success, as a result of creating additional nest sites, and facilitating bigger brood sizes. The evidence for this is set out later in this Report.

The decline in 2011 and 2012 is attributed to unusual weather conditions, leading to very low water levels in 2011, and very high water levels, with particularly fast-flowing turbid water, in 2012. Both these conditions make it difficult for Dippers to feed, so brood sizes were smaller than those found in most of the previous years, and the survival rates of young birds were also very low, as described in more detail later in the Report.

The results summarised in Table 1 are shown in Figure 1.

Figure 1. Decline and Subsequent Increase in Number of Dippers at Bridge Roost Sites in the Teme, Onny, Clun & Corve Catchments



ii) Variation in Decline Between Higher & Lower Reaches of Rivers

When the monitoring at winter roost sites re-started in 2006, it was felt whilst undertaking the fieldwork that the bridges on the higher reaches of the rivers had maintained numbers quite well whilst the numbers found under bridges on the lower reaches seemed to have dropped much more. To investigate this further, the rivers were divided into lower and upper sections and the data for total number of birds found under all bridges on these sections over the past 20 years were plotted.

The divisions made are, on the Clun at Clun bridge, on the Onny below Horderley, and on the Teme below Knighton.

This analysis has been repeated for each subsequent year, and the results are shown in Table 2. Note that some of the monitored winter roost sites are not in these seven River Sections, so the Dippers caught there are not included in Table 2 (i.e. the total number of Dippers found in table 2 is less than in Table 1).

Table 2. Dippers Caught at Winter Roost Sites, by River Section

	1987	1988	1989	1990	1991	1993	1994	2006	2007	2008	2009	2010	2011	2012
Total - Upper Teme	9	15	13	6	14	30	7	15	22	23	24	21	17	15
Total - Upper Onny	23	25	7	9	13		18	18	22	26	31	35	18	18
Total - Upper Clun	12	14	11	6	11	15	19	14	22	32	20	29	28	26
Total - Redlake	15	16	12	10	12	9	10	9	8	8	13	16	5	12
Total - Lower Teme	13	17	14	14	13	13	7	11	8	12	12	7	10	12
Total - Lower Onny	7	14	5	7	9		9	4	2	8	13	13	16	14
Total - Lower Clun	10	10	7	8	5	3	5	3	4	7	12	12	14	14
TOTAL - Dippers Found	97	117	72	65	85	71	83	87	90	129	125	133	108	111

The data in Table 2 is shown graphically in Figure 2 (linear trendline).

The same data is re-presented in Figure 3 with non – linear trendlines, which perhaps more accurately reflect the pattern of change. The trendlines have been drawn "by eye" to give a best fit of the trends (none of the options in "Excel" provide a good fit).

It can be seen in the case of all three major Rivers (the Onny, Clun and Teme) that the number of birds on the lower reaches had indeed dropped by 2006 and 2007, whereas numbers on the upper reaches had started to increase. The linear trendlines show that the populations in the upper reaches increased rapidly up until 2010, whereas the numbers in the Redlake and lower Teme are still below their previous levels (numbers have not increased at all), and the (delayed) increases in the Lower Onny and Lower Clun occurred later, and much more slowly.

The rapid upward trend continued in 2009 and 2010 for the Upper Teme and Upper Onny, although numbers subsequently declined again, following poor breeding seasons. Numbers on the Upper Clun in 2009 were not as high as 2008, but they were still higher than in 2006 or any previous year, and almost recovered to the 2008 level in 2010. Similar numbers were found in 2011 and 2012, and the population for the last three years is double what it was 20 years ago.

Numbers on the River Redlake up until 2008 had declined similarly to those on the lower reaches of the other rivers despite, on face value, being more similar in river morphology to the upper reaches of these rivers. However, numbers showed a welcome increase in 2009 and 2010, and reached similar levels to 20 years ago, followed by a huge decline in 2011, and a recovery in 2012. The linear trendline shows that, overall, numbers have fallen, and this was the case up until 2010 as well, before the recent recovery.

In more recent years the numbers found on the lower reaches of the rivers Onny and Clun has also increased, presumably reflecting the increase in the total population as a result of the nest box scheme, and the populations on the lower reaches are slightly more than those found 20 years ago. However, although the numbers on the lower reaches have recovered, the relative occupancy of these sections of river is still poor compared to 20 years ago, as the numbers on the upper reaches are now considerably more.

Note that the recovery in population in the lower reaches of the rivers Onny and Clun occurred some years later than that in the upper reaches, reinforcing the conclusion that the increase is due to overspill from the upper reaches, rather than improved habitat in the lower reaches. The numbers in the Lower Teme are still less than 20 years ago.

Figure 2. Dippers Counted At Winter Roost Sites 1987 – 2012, By River Section (Linear Trendline)

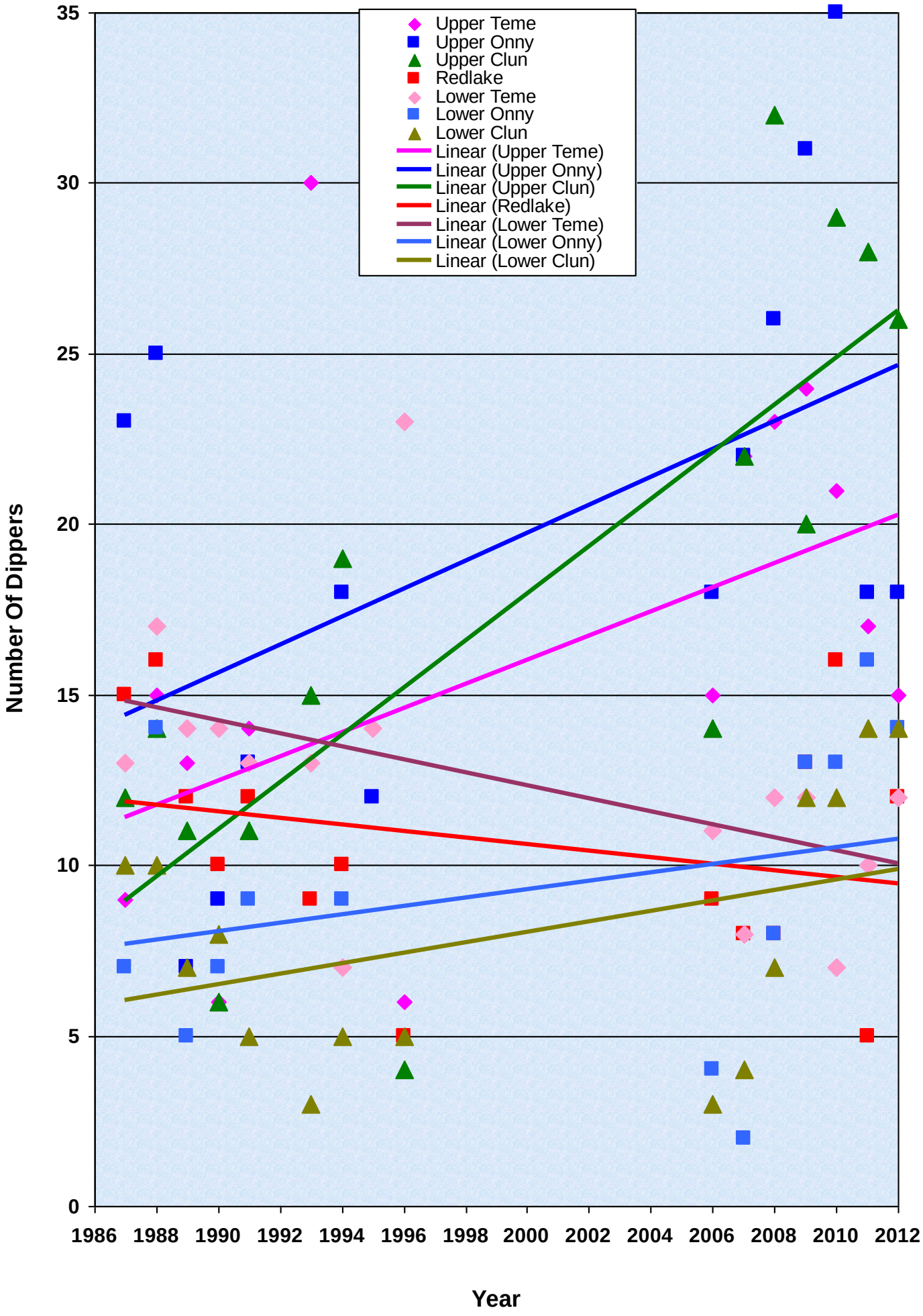
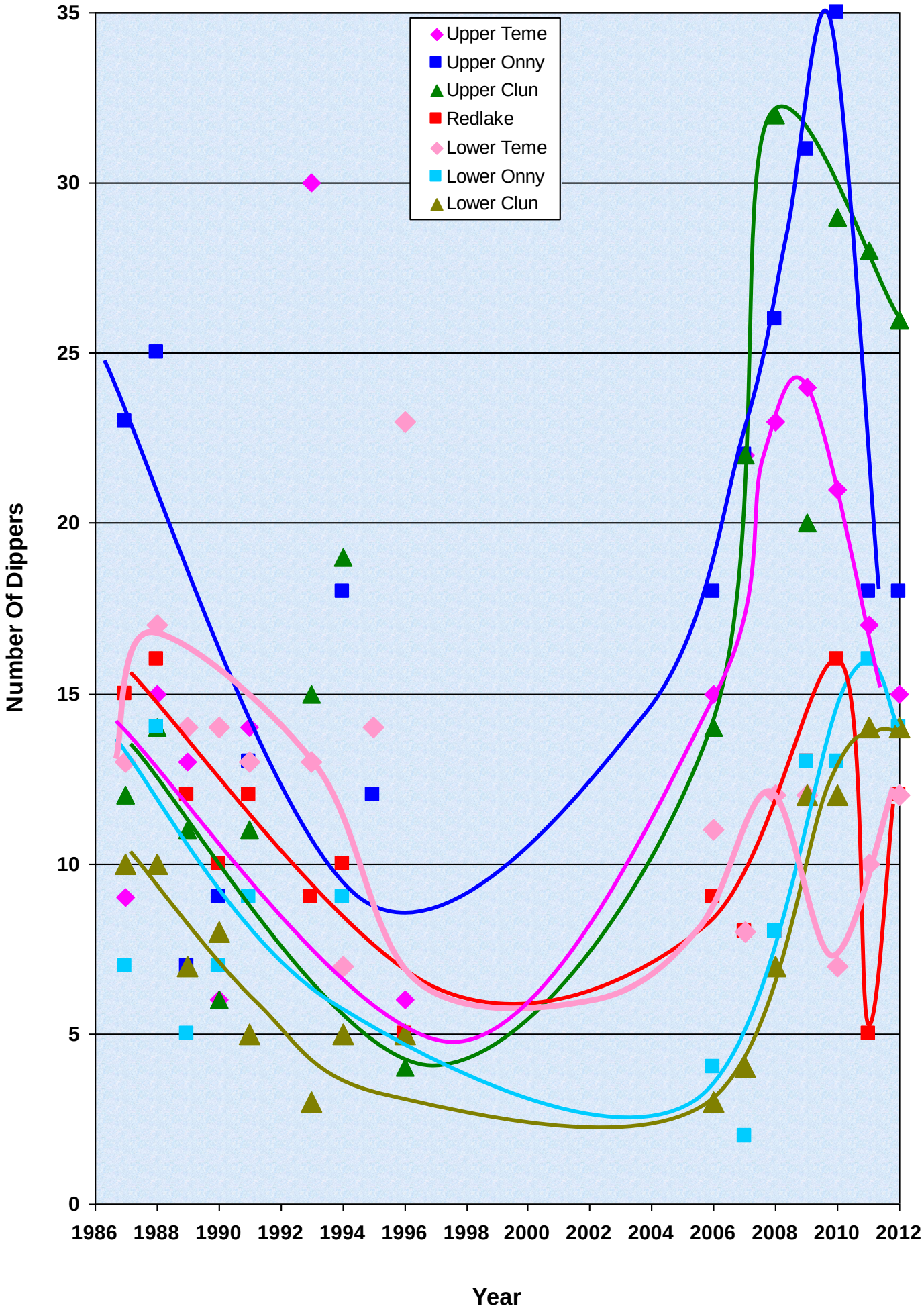


Figure 3. Dippers Counted At Winter Roost Sites 1987 – 2012, By River Section (Curved Trendline)



The Severn Rivers Trust agree with this assessment: "The research over recent years into the Dipper population on the Teme can be compared to the invertebrate monitoring data collected over a similar period. There appears to be a direct correlation between the Dipper numbers in the upper catchment where invertebrate numbers are still good, and the lower Dipper numbers in the lower catchment where invertebrate counts are also poor. A similar picture is revealed when assessing habitat, which not surprisingly is better in the upper catchment compared with the lower catchment. This confirms that the Dipper is a very important indicator species in the health of the river, its ecology and ecosystem (Tony Bostock, Director SRT, *pers.comm*. 2012).

ii) Age/Sex Ratios

Of the total of 122 birds observed roosting in 2011, and 123 birds observed roosting in 2012, 110 and 119 respectively were caught for examination. The Age and Sex of 105 and 112 respectively of these birds was determined, and the number of each, together with the ratio of Males to Females, and of Adults to First-year birds, is shown in Table 3 below. The comparable figures for previous years are also shown in Table 3.

Table 3. Age and Sex Ratios of Dippers Caught at Winter Roost Sites

Age & Sex	Number of Birds							
	Up to 2000	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
First Year Females	162	17	19	26	27	23	13	25
Adult Females	211	17	20	32	21	34	35	28
Total Females	**373**	**34**	**39**	**58**	**48**	**57**	**48**	**53**
First Year Males	171	19	18	33	33	27	19	23
Adult Males	197	26	20	34	33	35	38	36
Total Males	**368**	**45**	**38**	**67**	**66**	**62**	**57**	**59**
Total First Years	**333**	**36**	**37**	**59**	**60**	**50**	**32**	**48**
Total Adults	**408**	**43**	**40**	**66**	**54**	**69**	**73**	**64**
Ratios								
Males : Females	0.99	1.32	0.97	1.16	1.38	1.09	1.19	1.11
Adults : First Years	1.23	1.19	1.08	1.12	0.90	1.38	2.28	1.33
Percentage								
Adults as % of Total	55.06	54.43	51.95	52.80	47.37	57.98	69.52	57.14

A population bias in first year birds towards males has been found in every year except 2007 and 2012 (average 15% for the seven years 2006-12). This probably reflects behaviour, also found amongst several other species, where females disperse further from the natal sites than males, presumably a natural selection defence against "in breeding". The number of adult males and adult females has been more or less equal (difference less than 10%) in four of the last seven years, although the number of males was substantially higher (difference more than 50%) in 2006 and 2009, and 29% higher in 2012, for reasons unknown.

The ratio of adults to first-years birds found in 2006 was approximately the same as that found in earlier years, suggesting that there has been little change in the breeding success and productivity of those birds which survive to breed, or the survival rate of newly-fledged young birds. However in 2007 this ratio was considerably less (1.08:1), compared to 1.23:1 in the earlier years, indicating either an increase in mortality of adults, or an increase in newly fledged birds, due to increased brood size, or an improved juvenile survival rate, or increased opportunities for adults to be able to breed (or a combination of all these factors). The ratio in 2008 reflected the same pattern, and in 2009 the proportion of young birds substantially exceeded the adults for the first and only time. However, this pattern was reversed in 2010, when the proportion of adult birds was the highest ever recorded. In 2011

the proportion of adults was much higher still (almost 70% of the total number caught), and the 2012 figure was almost the same as the previous high in 2010.

It will be seen from Part 2 of this Report, summarised in Table 6, that the average brood size of birds ringed in the nest was also lower in 2007, 2011 and 2012 (3.89 or lower, compared to 4.03 or higher in all other years). Low brood size in 2007 was attributed to the abnormal extremely wet weather in May and June, which affected breeding success.

However, the average brood size found in 2008 was higher than in any previous year, and that in 2009 was the second highest, so it is not unexpected that the ratio of adults to first-year birds showed a corresponding decrease. While there is little change in the ratio for 2008 compared to 2007, it is still considerably less than the 2006 or the "Up to 2000" ratio. The high proportion of young birds in 2008, and the even higher proportion in 2009, is attributed to increased brood size, and an increasing number of breeding pairs, due to the nest box scheme (see Part 3 of this Report).

The proportion of adults found in 2010 was the highest ever recorded up until that year. This is unlikely to be due to poor breeding success (the average brood size was only marginally less than in 2009 – see Table 6 on page 12), so either the juveniles dispersed much further than usual, or their survival rate was much worse than in previous years. In either case, a shortage of food for the less-experienced young birds is likely to be the explanation. There are several possible causes for poor conditions in the rivers which could have inhibited the production of invertebrates, all of which happened at different times between the main fledging period (early May) and the counts at the roost sites in late September 2010

- low rainfall for a lengthy period, which reduced water flows and probably concentrated pollution
- increased pollution from stock, which will have used their access to the rivers to drink more in periods of low rainfall
- high water flows and cold weather at different times
- pollution from other (unknown) sources
- more violent storms

The proportion of young birds was even lower in 2011, when the period between fledging and the roost counts was characterised by an even longer period of low rainfall. The proportion in 2012 was almost identical to that in 2010, although the weather was the opposite – frequent heavy rain storms during the breeding season, and subsequently. Conditions in both years would again create a shortage of food for the less-experienced young birds, although this would be exaggerated by lower average brood size (a result of the poor conditions in both breeding seasons).

iv) Movement of Newly-Fledged Birds

In 2011, 73 of the 110 different birds caught were already wearing rings, including 11 individuals (9 males and 2 females) ringed earlier in the year as nestlings. In 2012, 84 out of 119 were ringed, including 14 individuals (9 males and 5 females) ringed earlier in the year as nestlings.

The average distances moved by these newly-fledged Dippers in 2011 and 2012, with comparative data from 2006 onwards, are summarised in Table 4.

It is known that the females of several species move further from the natal site than males. This is believed to be a natural selection mechanism to promote genetic diversity (i.e. reduce the risk of in-breeding).

N.B. The "distance travelled" is the length of the straight line between the natal and roost sites, not the (much longer) distance that the birds probably actually travelled along the river system.

Table 4. Movements of Recently Fledged Dippers

Movements	2006	2007	2008	2009	2010	2011	2012
Number of Males	7	1	9	11	17	9	9
No. Moving more than 5 Km.			3	0	3	0	2
Average Distance Moved	3.00	15.98	3.57	2.07	4.51	2.37	2.41
Number of Females	6	6	6	1	7	2	5
No. Moving more than 5 Km.			3	1	3	2	5
Average Distance Moved	12.85	24.5	8.02	17.81	6.35	7.72	7.41
Total Number of Dippers	13	7	15	12	24	11	14
No. Moving more than 5 Km.			6	1	6	2	7
Average Distance Moved	7.55	23.28	4.34	3.38	5.27	3.35	4.19

v) Weight of Birds Present

Almost all birds captured in 2011 and 2012 were weighed and the mean weight is shown in Table 5, together with that for similar age/sex groupings in 2006-10, and the years before 2000 combined.

The 2006 Report stated "All sexes/age classes have therefore shown a decrease in mean body mass of between 3.3% and 2%, suggestive of decreased food supply". This decrease was even more pronounced in 2007, for all except Adult males. For them the mean weight went up slightly in 2007, compared to 2006, but it was still considerably lower than the "Up to 2000" figure.

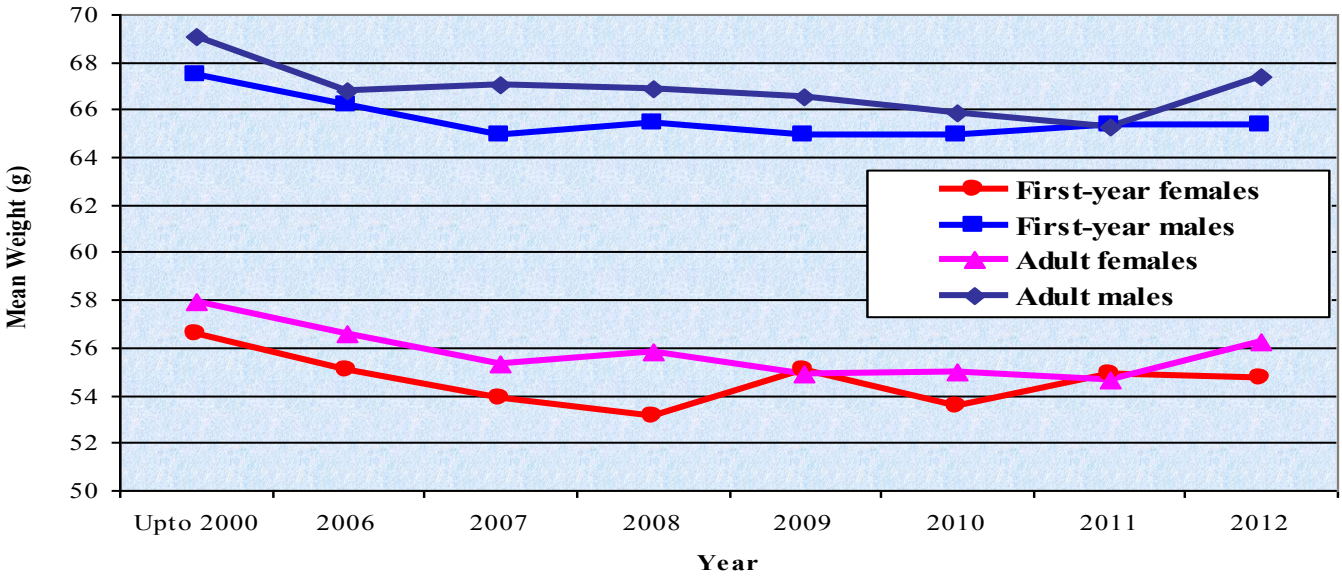
In 2009, all except First-year females were the lowest mean weight ever recorded up until that year, and all except Adult females weighed even less in 2010. The mean weights of both male and female adults decreased still further in 2011, but both first years increased, and the young and adults of each sex weighed the same. In 2012, the mean weights of both male and female adults increased, while the young of each sex stayed approximately the same.

Table 5. Mean Weight of Dippers Caught at Winter Roost Sites

Age & Sex	Mean Weight (grammes)							
	Upto 2000	2006	2007	2008	2009	2010	2011	2012
First-year females	56.6 (n = 162)	55.1 (n = 17)	53.86 (n = 19)	53.14 (n = 26)	55.04 (n = 26)	53.58 (n = 23)	54.89 (n = 13)	54.71 (n = 25)
First-year males	67.5 (n = 171)	66.2 (n = 19)	64.96 (n = 18)	65.45 (n = 33)	64.96 (n = 33)	64.93 (n = 27)	65.39 (n = 19)	65.40 (n = 23)
Adult females	57.9 (n = 211)	56.6 (n = 17)	55.32 (n = 20)	55.85 (n = 32)	54.92 (n = 21)	54.98 (n = 34)	54.64 (n = 35)	56.25 (n = 28)
Adult males	69.1 (n = 197)	66.8 (n = 26)	67.05 (n = 20)	66.88 (n = 34)	66.52 (n = 33)	65.85 (n = 35)	65.25 (n = 38)	67.36 (n = 36)

The annual change is shown in Figure 4.

Figure 4. Annual Variation in Mean Weight.



The Severn Rivers Trust believes that good populations of invertebrates are vital to the river's ecosystem including Dippers and is now monitoring invertebrates on a monthly basis on the Teme and some of its tributaries. The Trust hopes to build up data over a period of time, and attempts will be made in future to correlate this data with the Dippers' body weight.

The 2010 Report stated:-

It has been suggested that the reduction in weight may not be due to a deterioration of diet, but the result of the birds getting leaner and fitter because environmental changes, such as

- *a more reliable, less intermittent food supply*
- *a rise in winter temperatures*
- *an increased likelihood of encountering a predator such as Sparrowhawk*

These changes may mean they need less reserves of body fat for survival.

River pollution appears to have increased over the last 25 years, and water levels and flow rates still fluctuate markedly over the course of the year, so it is unlikely that the first possible change has in fact occurred. Nationally, Sparrowhawks have not increased at all since 1995 (BTO BBS Report 2010), and they are not common in the catchment (which is mainly upland sheep pasture), so the third possible change is also unlikely to be a factor. The only likely predator which is believed to have increased in the period is Mink, although it was well established 20 years ago, and any evolution in Dippers to offset the possibility of predation by Mink is unlikely to involve weight loss. A rise in winter temperatures has occurred, so it will be interesting to see if the decline in weights continues after the second successive hard winter in 2010-11.

It will be seen that the weights of the adults and young of each sex converged in 2011. The weight of both adults continued to decline, whereas that of both young increased.

However, the weight of adult males and females increased in 2012, in the case of males to the heaviest since monitoring restarted in 2006, and for females almost back to the 2006 weight. The weight of first year birds, perhaps under stress (a reflection of their low survival rate), remained unchanged in 2012.

While the increase in mean weight of both male and female adults probably reflects adaptation to an even more unreliable food supply, and colder weather, in both cases the weights have not returned to their pre-2000 level.

Therefore, there appears to be no reason to revise the conclusion drawn in previous reports:-

The condition of the Dippers,
as measured by mean body weight, has deteriorated over the last 20 years.

PART 2: RINGING

At Winter Roost Sites

The 110 birds caught for examination in 2011, and 119 caught in 2012, described in Part 1 of this Report and summarised in Table 1, were all ringed.

At Nest Sites

Because of the importance of this Dipper Project, an increased effort was made to find nests and ring nestlings from 2008 onwards. The increased provision of nest boxes year on year (see next section of this Report), together with monitoring of the boxes so the timing of ringing visits was more efficient, contributed to the large increase in nests visited.

The number of nests, and the number of nestlings, ringed in 2010 were much higher than in any previous year. An even greater effort was put into monitoring nest sites in 2011 and 2012, but the unfavourable conditions meant that fewer nests were successful. Only two known broods were not ringed in 2011, but 19 nests failed. In 2012, a total of 31 sites were monitored where the nest failed. Of

these, four nests had abandoned dead chicks, and five had abandoned eggs (a first and a second brood were ringed at three of these sites).

The poor conditions were also reflected in the lower average brood size – 3.89 in 2011, and 3.78 in 2012, compared with an average of 4.10 in 2010. The average was more than 4.0 in all previous years as well, apart from the exceptionally bad year in 2007.

Data for 2011 and 2012, and comparison with previous years, is shown in Table 6.

The Average Brood Size found in 2010 was rather less than in the previous two years, but the average in 2011 and 2012 was substantially less, approaching the lowest recorded in 2007.

Table 6. Dippers Ringed at Nest Sites

Nests & Birds	Number of Birds Ringed							
	Up to 2000	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Nests (Ringed Broods)	99	21	19	33	35	49	47	41
Nest Sites		19	17	30	33	46	45	38
Nestlings	399	85	69	145	145	201	183	155
Adult Males					1	2	n / a	n / a
Adult Females				1	1	2	n / a	n / a
Average Brood Size	**4.03**	**4.05**	**3.63**	**4.39**	**4.14**	**4.10**	**3.89**	**3.78**

Notes

1 *The difference between Nests and Nest Sites = the number of sites where two broods were ringed*

2 *In 2009, two nestlings escaped without being ringed. They are included within the 145, to reflect the actual brood size, but the number of ringed nestlings was actually 143*

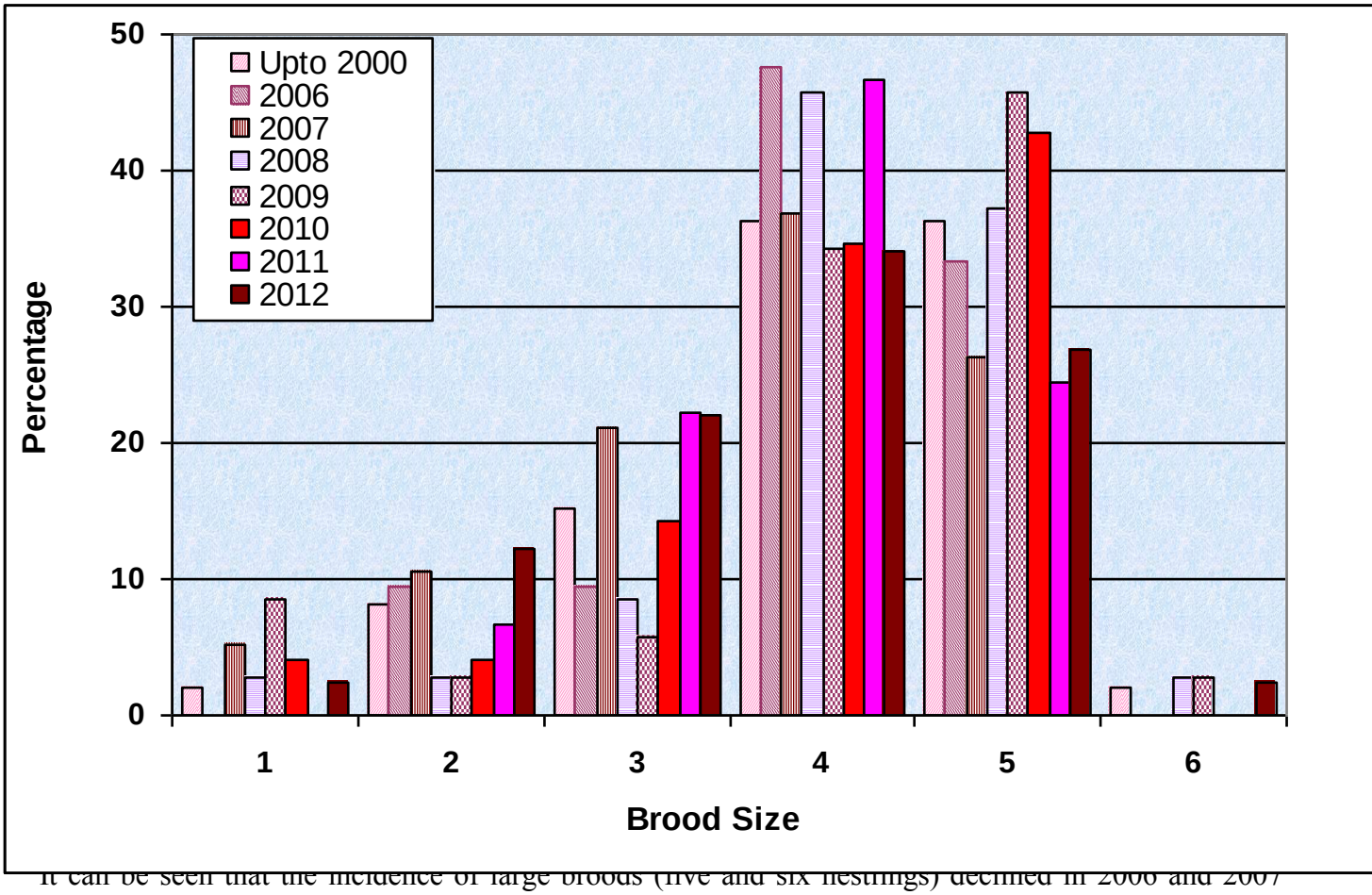
3 *From 2011 onwards, a systematic attemp was made to catch adult birds at nest sites, so they could be colour ringed. The results are described in the Chapter in the report on colour ringing.*

The annual variation in different brood sizes is set out in Table 7, and is shown as Annual Percentages in Figure 5.

Table 7. Annual Variation of Brood Sizes at Ringed Nests

Brood Size	No of Broods							
	Upto 2000	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
1	2	0	1	1	3	2	0	1
2	8	2	2	1	1	2	3	5
3	15	2	4	3	2	7	10	9
4	36	10	7	16	12	17	21	14
5	36	7	5	13	16	21	11	11
6	2	0	0	1	1	0	0	1
Total	**99**	**21**	**19**	**35**	**35**	**49**	**45**	**41**

Figure 5. Annual Variation in Brood Size at Ringed Dipper Nests (Percentages)



It can be seen that the incidence of large broods (five and six nestlings) declined in 2006 and 2007 compared with the earlier years, but recovered in 2008, perhaps due to the natural tendency of many species to increase productivity following years of poor breeding success. However, the incidence of larger broods was even higher in 2009, and the proportion of broods with 5 young (almost half) was the highest found so far. The proportion of broods of five declined again in 2010, and there were no broods of six, but the average brood size (see Table 6) was only slightly less than that found in 2009. The average brood size found 2008-10 has been higher than that found in any previous year.

The impact of the nest box scheme, described later in Section 3 of this Report, has almost certainly been the driving force in this increased brood size, and the increase in productivity generally.

The incidence of large broods declined again in 2011 and 2012, reflecting the decrease in average brood size

It should be noted that ringing effort has always been rather variable and fitted in around work on other species. Little data has been collected on the frequency and timing of second broods.

PART 3: INSTALLATION & MONITORING OF NEST BOXES

Dippers take readily to nest boxes. Each nest box must be located directly above the flowing water, in a position where predators are unable to reach it. Installation of boxes therefore increases the number of available nest sites (and potentially the number of possible territories, if suitable stretches of river would otherwise have no suitable nest site), and reduces the level of predation. Installation of boxes should therefore improve breeding success, and potentially increase the population. Regular inspection of the boxes also facilitates monitoring of the population and productivity, and helps determine the range of the species (i.e. which parts of the rivers are inhabited, and which are not).

Installation and monitoring of nest boxes started in 2005, and has expanded steadily throughout the catchment since then. From 2010 onwards, additional project volunteers have been recruited, to

undertake more systematic monitoring of the boxes, and search for natural sites between the boxes. In 2011 the Lower Onny below Horderley was added, and in 2012 new volunteers reported nests on the Rea (near Cleobury Mortimer).

Installation

Eighty-two bridges were surveyed by John Swift on the Rivers Onny and Clun, and their tributaries, in 2005-07. Sixty-five specially designed nest boxes for Dippers were made and installed at 55 different sites, mainly under these bridges.

The Upper Onny scheme started when two boxes were installed in 2005. A total of 40 boxes had been installed under 26 bridges prior to the 2008 breeding season (12 on the West Onny, 17 on the East Onny, two on Darnford Brook and nine on Criftin Brook). Virtually every bridge in the area which is marked on the OS Map now has a Dipper nest box, and several bridges have two. The possibility of installing boxes at other locations, for instance under fallen trees which span suitable rivers, or on private bridges in the area that are not shown on Ordnance Survey maps, will continue to be explored.

The Upper Clun scheme started in 2006, and 29 boxes had been installed prior to the start of the 2007 breeding season.

In 2007-08 a further 28 boxes were installed, 10 in the Upper Clun, and 18 on the Lower Clun as far as Clunbury. These latter boxes are intended to find out how far downstream the Dippers' current range extends.

In 2008–09, 24 more boxes were installed prior to the end of the calendar year 2008:-

- Firstly, a few more bridges were surveyed on the Onny and Clun, mainly small footbridges or on private tracks to farm buildings, and four new boxes were installed.
- Secondly, the boxes already installed prior to the 2007 breeding season were checked early in 2008, as some were washed away in last years floods. The missing ones were replaced.
- Thirdly, the nest box scheme was extended to the River Redlake, where nine boxes at seven sites were installed after the 2008 breeding season, but in good time for 2009.

Some further boxes were installed prior to the 2009 breeding season, and in 2010 five further boxes were installed on the Upper Teme, and one near Leebotwood.

Before the 2012 breeding season, a further 33 boxes were installed on the Lower Onny and Lower Clun (outside the Community Wildlife Group areas).

In total over 150 boxes have been installed at over 130 locations in the Teme catchment since 2005 (not counting replacements). All of the boxes installed beforehand were monitored during the 2011 and 2012 breeding seasons.

The relevant parts of this work have been carried out under the auspices of the Upper Onny Wildlife Group since 2005, the Upper Clun Community Wildlife Group since 2007, and the Kemp Valley Community Wildlife Group since 2010. The relevant part of the work is summarised in the respective Annual Reports of these Community Wildlife Groups.

Nest Box Design

All the boxes installed prior to 2009 were made of wood. Single boxes are one foot long, with an eight inch square entrance. Double boxes are twice that length, with an entrance at each end. However, several of these boxes were washed away each year when the rivers flooded during the winter.

As a result, a new design was trialled in 2009. A one-foot length of eight inch round flexible plastic pipe was used, and a plastic plant pot was forced into the downstream end to enclose it. The intention is that, when the water level rises, the plant pot will be washed away, but the water will flow through the pipe, which will remain in place. Thus the whole box does not need to be replaced, but a new plant pot needs to be inserted into the remaining pipe.

Several boxes of this type were installed prior to the 2009 breeding season, and at least two of them were used. Several more were installed and used prior to the 2010 breeding season, and in each year subsequently.

This design will be used in future on bridges prone to flooding, for both new and replacement boxes.

Occupancy

Monitoring of the boxes, and known natural sites, continued in 2011 and 2012.

The number of sites monitored, pairs with nests that were found, together with the number in boxes and in natural sites, the number of successful pairs, and the number of nests that were ringed, is shown in Table 8, together with comparative data (where available) from previous years.

N.B. Table 8 initially lists the number of pairs found, not nests (i.e. a pair is counted once only, irrespective of whether the nest was completed, or whether nests failed or succeeded, and whether or not two broods were attempted or raised). It has been assumed that all ringed nestlings fledged, whether or not fledged young were actually seen. Where the outcome of nests is unknown (i.e. broods were not ringed, and no fledged young were seen), they are not included in the count of "successful nests".

Pairs Found, Territory Size and Nearest Neighbour Distance

Initial survey work in the Upper Onny area in 2005 found seven Dipper nests. In three cases where the nest in each of two adjacent territories was found, the average nearest neighbour distance extended 1.4 kilometres along the river. More nest boxes, and more systematic monitoring since then, has shown that the river will support a higher breeding density than that.

In 2007, seven nests were found along around 9 kilometres of river along Darnford Brook and the East Onny (including five in 2 kilometres, a neighbour distance of only 500m), and there were eight on this stretch in 2008, and seven in every year 2009-12. In all three years 2007-09 there were three on 7.5 kilometres of the West Onny (including two nests 1.3 kilometres apart), and in 2010 there were five nests in only 5 kilometres of river (1.25 kilometre average neighbour distance). However, there were fewer nests on the West Onny in 2011 (five) and 2012 (three), presumably because of unfavourable water conditions.

One nest was found on Criftin Brook in 2010, and in two of the previous three years – none were found there in 2009, 2011 or 2012. The twelfth nest in 2007 was at Eaton, just past the confluence of the West and East Onnys, but in 2008 there were nests at two different sites at Horderley, and one of these was occupied again in 2009. In 2010, 2011 and 2012, four pairs nested on the Onny between the confluence and Horderley, a distance of approximately seven kilometres.

On the upper Clun, there were 20 nesting attempts in 2007 (i.e. 13 completed nests with eggs and seven other nests which were started but not completed), and 16 in 2008 (eggs were laid in at least 14 of the 16 nests).

In 2007 there were eight nests on 7 kilometres of the River Clun in Newcastle and upstream from there (average neighbour distance = 1 kilometre) and seven in 2008. There were also two more nests in Newcastle on the Folly Brook, and two more further up the Folly Brook, in both 2007 and 2008 (total of four in around 4 kilometres on Folly Brook). No nests were found between Newcastle and Clun, but there were two in Clun itself (one outside the UCCWG area) in 2007, three on the Unk in 2007 and two in 2008, and one on the Mardu at Whitcott Keysett in both years, but another three on the Mardu in 2008. In 2009, the territorial spacing was similar - nests of 14 pairs were found, eight on the Clun itself, four on the Folly Brook, one on the Unk and one on Mardu Brook.

In 2010, 2011 and 2012, the territorial spacing was again similar – 5, 10 and 7 on the Clun itself, 5, 6 and 5 on the Folly Brook (only 4.5 kilometres long), 3, 3 and 1 on the Unk (3.4 kilometres of occupied river) and 3, 1 and 1 on Mardu Brook (only 3.5 kilometres long), respectively.

Table 8. Summary of Monitoring Results (Including Nests in Boxes)

	2007	2008	2009	2010	2011	2012
Upper Onny						
Sites Monitored	31	31	31	31	31	31
Pairs Nesting in Boxes	10	9	6	12	10	10
Other Pairs	2	5	6	6	6	5
Total Pairs Found	12	14	12	18	16	15
Successful Nests in Boxes				7	8	6
Other Successful Nests				5	3	2
Total Successful Nests Found	0	11	8	12	11	8
Successful Second Brood Nests			1	1		
Successful Nests Ringed				13	11	8
Upper Clun						
Sites Monitored			35	27	29	29
Pairs Nesting in Boxes	10	13	12	14	10	14
Other Pairs	3	3	2	2	1	1
Total Pairs Found	13	16	14	16	11	15
Successful Nests in Boxes				9	6	6
Other Successful Nests				2	1	0
Total Successful Nests Found	7	10	10	11	7	6
Successful Second Brood Nests				1		
Successful Nests Ringed				9	7	6
Upper Teme						
Sites Monitored					18	18
Pairs Nesting in Boxes					6	7
Other Pairs					5	6
Total Pairs Found					11	13
Successful Nests in Boxes					5	3
Other Successful Nests					2	6
Total Successful Nests Found					7	9
Successful Second Brood Nests					1	2
Successful Nests Ringed					7	9
Redlake						
Sites Monitored				26	32	32
Pairs Nesting in Boxes			4	6	7	5
Other Pairs			1	3	3	2
Total Pairs Found	0	0	5	9	10	7
Successful Nests in Boxes				6	7	7
Other Successful Nests				3	3	1
Total Successful Nests Found	0	0	0	9	10	8
Successful Second Brood Nests				1		2
Successful Nests Ringed				9	10	8
Other						
Sites Monitored				13	11	11
Pairs Nesting in Boxes				4	1	2
Other Pairs				9	4	5
Total Pairs Found				13	5	7
Successful Nests in Boxes				4	0	0
Other Successful Nests				9	3	2
Total Successful Nests Found				13	3	2
Successful Second Brood Nests						
Successful Nests Ringed				13	3	2

Table 8. Summary of Monitoring Results (Including Nests in Boxes) - continued

	2007	2008	2009	2010	2011	2012
Lower Onny						
Sites Monitored					10	12
Pairs Nesting in Boxes					1	1
Other Pairs					4	5
Total Pairs Found					5	6
Successful Nests in Boxes					1	1
Other Successful Nests					1	1
Total Successful Nests Found					2	2
Successful Second Brood Nests						
Successful Nests Ringed					2	2
Lower Clun						
Sites Monitored				15	16	17
Pairs Nesting in Boxes			4	5	3	5
Other Pairs			1	2	1	1
Total Pairs Found	0	0	5	7	4	6
Successful Nests in Boxes				6	3	1
Other Successful Nests				1	1	0
Total Successful Nests Found	0	0	0	7	4	1
Successful Second Brood Nests				1		
Successful Nests Ringed				5	4	1
Lower Teme						
Sites Monitored					7	7
Pairs Nesting in Boxes					2	1
Other Pairs					1	1
Total Pairs Found					3	2
Successful Nests in Boxes					2	1
Other Successful Nests					1	1
Total Successful Nests Found					3	2
Successful Second Brood Nests					1	0
Successful Nests Ringed					3	2
Rea						
Sites Monitored						14
Pairs Nesting in Boxes						0
Other Pairs						9
Total Pairs Found						9
Successful Nests in Boxes						0
Other Successful Nests						4
Total Successful Nests Found						4
Successful Second Brood Nests						0
Successful Nests Ringed						3
TOTAL						
Sites Monitored	n/a	n/a	n/a	112	154	171
Pairs Nesting in Boxes	20	22	26	41	40	45
Other Pairs	5	8	10	22	25	35
Total Pairs Found	25	30	36	63	65	80
Successful Nests in Boxes	n/a	n/a	n/a	32	32	25
Other Successful Nests	n/a	n/a	n/a	20	15	17
Total Successful Nests Found	n/a	n/a	n/a	52	47	42
Successful Second Brood Nests	n/a	n/a	n/a	4	2	4
Successful Nests Ringed	19	33	35	49	47	41

In 2010, equally intensive monitoring was started by new Project volunteers on the Lower Clun, and the Redlake.

On the lower Clun and Kemp, five nesting pairs were found. All five were in boxes, and no natural nest sites were found. This part of the lower Clun is in the Kemp Valley Community Wildlife Group area. In 2011 there were four pairs and the same number in 2012. Only one of the nests was on the River Kemp, which is canalised for most of its length. There were three nests on the part of the Clun between Clun itself and Beambridge, a linear distance of nine kilometres, giving a territorial spacing of 4.5 kilometres. In practice the spacing is much greater than this – this river section has many bends and meanders.

On the Redlake, a new natural site was found, to add to the other two known natural sites, and six pairs nested in boxes, making nine nesting pairs in total (eight on the Redlake itself, one on a tributary). The length of occupied river is around nine kilometres, so the territorial spacing averages 1.1 kilometres.

In 2011 there were 10 nests on the Redlake (average territorial spacing = 0.8 kilometres), and eight in 2012 (average = 1.0 kilometres).

No systematic monitoring was carried out in other parts of the catchment, but several sites on the Upper and Lower Teme, Lower Corve, Quinney Brook and Cound Brook, which are known to have been used in previous years, were visited in late April and early May to check for chicks and ringed adults. These sites are included in the summary data in Table 8, but it must be stressed that only these sites are included in the Table, and these river sections have not been systematically searched.

It is noteworthy that sites at Marshbrook, and Marshbrook level crossing, both on the Quinney Brook, were occupied in both 2011 and 2012 (and in many previous years). These sites are only 1.1 kilometres apart.

It should be noted that all the lengths of river quoted above are estimates from looking at the OS map. All will be under-estimates of the actual length of the rivers, because little allowance has been made for bends and meanders. Accurate measures will be sought for next years report.

The nest box scheme was extended from Beambridge to Leintwardine on the Lower Clun, and from Horderley to Onibury on the Lower Onny, just before the start of the 2012 breeding season, so data from these stretches of river should be available in future years.

Inspection of a map of the nest sites on the Upper Onny and Upper Clun shows regular spacing, but several gaps. There are boxes in some of these gaps, but it is not yet known whether Dippers are using other (natural) nest sites on these stretches of river, or they are really absent; and if so, whether this is due to absence of suitable feeding habitat. Now the number of nest boxes is close to the maximum possible, further work will be done to clarify this, and identify where Dippers are absent.

The average neighbour distance on the different sections of river where Dippers are found will also indicate the relative quality of the habitat, which may reflect natural variations, but may also indicate sections of river which have been rendered unsuitable by farming activity, or other man-made influences.

Impact of Nest Box Scheme on Breeding Success and Population

In 2009 and 2010 the total number of Dippers found at winter roost sites was considerably higher than the number found in 2008, which was already the highest since monitoring started in 1987. The average brood size found in 2008 (4.39) was the highest found, and that in 2009 (4.14) and 2010 (4.10) were only slightly lower, and higher than in any previous year except 2008.

While low rainfall in the spring of 2008 undoubtedly helped adults raise large broods, as finding food in the unswollen rivers would have been easier than usual, analysis of the number of birds in the 34 ringed broods suggests that the nest box scheme has also played a part in the population increase. While the average brood size of the 33 ringed complete broods was 4.39, the average of the 10 in nest boxes was 4.60, compared with 4.26 in the 23 other nests.

A similar analysis has been carried out in each subsequent year. In total, since 2008, a total of 173 broods have been ringed in parts of the catchment where a good number of boxes have been installed (106 in boxes, and 67 outside boxes). The average brood size in boxes (4.04) is 3% higher than outside the boxes (3.94).

Details are summarised in Table 9.

Note that several broods were ringed in each year since 2008 in parts of the Catchment where no boxes had been installed by that year, so these broods are excluded from Table 9.

The Project has shown that Dippers that nest in boxes are more successful

Boxes provide more secure nest sites, and are often preferentially selected by the Dippers. For example, in the early years of the project, five pairs moved from previously known nest sites into boxes in the Upper Onny and Upper Clun. This includes a pair that regularly built a nest on a girder that was too narrow to support it, so the nest usually fell off into the water, and another pair whose nest was regularly predated by rats. Neither of these two sites produced any fledged young in the two years prior to installation of boxes, but both pairs have succeeded in raising young since, as a result of the secure nest sites provided by the boxes. There are likely to be similar examples in other parts of the catchment, but little systematic monitoring of nests was done there prior to installation of the boxes.

Table 9. Comparative Size of Broods in Nest Boxes (Ringed Broods Only)

	Upper Onny					Upper Clun					Upper Teme			Redlake			
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012	2010	2011	2012	2009	2010	2011	2012
Chicks (Ringed Broods Only)																	
In Boxes	23	11	27	31	19	23	21	30	24	24	14	23	13	15	31	26	28
Other	21	29	21	11	7	13	15	10	4	0	12	7	22	6	9	10	4
Total	44	40	48	42	26	36	36	40	28	24	26	30	35	21	40	36	32
Ringed Broods																	
In Boxes	5	3	7	8	6	5	6	7	6	6	3	5	3	3	7	7	7
Other	5	6	6	3	2	3	4	2	1	0	4	2	6	2	2	3	1
Total	10	9	13	11	8	8	10	9	7	6	7	7	9	5	9	10	8
Average Brood Size (Ringed Broods Only)																	
In Boxes	4.60	3.67	3.86	3.88	3.17	4.60	3.50	4.29	4.00	4.00	4.67	4.60	4.33	5.00	4.43	3.71	4.00
Other	4.20	4.83	3.50	3.67	3.50	4.33	3.75	5.00	4.00		3.00	3.50	3.67	3.00	4.50	3.33	4.00
Total	4.40	4.44	3.69	3.82	3.25	4.50	3.60	4.44	4.00	4.00	3.71	4.29	3.89	4.20	4.44	3.60	4.00

	Lower Onny		Lower Clun				Lower Teme		Other		Total
	2011	2012	2009	2010	2011	2012	2011	2012	2011	2012	
Chicks (Ringed Broods Only)											
In Boxes	0	1	9	11	9	5	9	5	0	0	432
Other	7	4	5	10	4	0	5	4	13	7	260
Total	7	5	14	21	13	5	14	9	13	7	692
Ringed Broods											
In Boxes	0	1	2	3	3	1	2	1	0	0	107
Other	2	1	1	2	1	0	1	1	3	2	66
Total	2	2	3	5	4	1	3	2	3	2	173
Average Brood Size (Ringed Broods Only)											
In Boxes		1.00	4.50	3.67	3.00	5.00	4.50	5.00			4.04
Other	3.50	4.00	5.00	5.00	4.00		5.00	4.00	4.33	3.50	3.94
Total	3.50	2.50	4.67	4.20	3.25	5.00	4.67	4.50	4.33	3.50	4.00

While boxes provide more secure sites for established pairs, they also, more importantly, create new nest sites. By 2008, seven pairs in the Upper Onny and Upper Clun had moved into boxes on bridges that were previously unsuitable (there was no ledge or hole where a nest could be constructed). Some of these were almost certainly additions to the total breeding population, as the boxes allowed new territories to be occupied in stretches of suitable river that had no available natural nest site. There were similar occurrences on the Redlake and Lower Clun in 2009, and other parts of the catchment in 2010.

From 2011, the availability of a possible alternative to a used nest box was recorded systematically.

In 2011, 65 nesting pairs were found. Of these, 26 (40.0%) were at sites that could only be occupied because of the box (although in one case, the nest was built on top of the box, rather than in it). At the 39 remaining sites, 14 were in boxes, and 25 were not in boxes. In total, 40 (58.4%) of the 67 pairs nested in boxes.

In 2012, 76 nesting pairs were found. Of these, 32 were at sites that could only be occupied because of the box. At the 44 remaining sites, 13 were in boxes, and 31 were not in boxes. In total, 45 (61.0%) of the 76 pairs nested in boxes.

Nests in boxes are also more productive. In 2011, the average number of (ringed) young for the total number of 42 nests in boxes was 2.98. For 25 nests not in boxes, it was 2.32. In 2012, the average number of (ringed) young for 49 nests in boxes was 1.94. For 32 nests not in boxes, it was 1.86.

Nests in boxes are also less likely to fail. In 2011, 23.81% (10 out of 42) nests in boxes failed, compared with 40% (10 out of 25) of nests not in boxes. However, in 2012, the failure rate was virtually the same – 49% (24 out of 49) of the nests in boxes failed, compared with 50% (16 out of 32) of nests not in boxes.

Over the whole area, the boxes have allowed some pairs to move from natural sites into more secure boxes, and, more importantly, they have allowed new pairs to become established in territories where a nest site has become available for the first time. It is therefore almost certain that the nestbox scheme is the main factor which has contributed to the increase in population that this Project has found, through an increase in the number of breeding pairs, and in the average brood size of successful pairs. Unfortunately there is no quantified data to calculate the actual increase in breeding pairs or improved breeding success (proportion of successful pairs) as a result of this.

However, recollections from many years of monitoring Dippers suggest that the level of nest success in natural sites on riverbanks, or amongst boulders in the streams, is much lower than those under bridges, as they are more vulnerable to flooding or predation. It must be stressed that these more marginal sites are more difficult to find, and most of the nests included in the current study, apart from those in new boxes, were still in relatively secure sites under bridges. The average brood size actually found outside nest boxes is therefore likely to be much higher than the overall average for the area.

It must also be stressed that nest boxes will not in themselves allow the re-colonisation of the whole of the Dippers' former range. The birds are very territorial, and each territory requires a food supply as well as a nest site. Action is necessary by the statutory agencies to improve the river quality to restore the previously available feeding sites, particularly in the lower reaches of the rivers.

It is important that the Project continues to monitor breeding success in nest boxes in future years, to confirm that their apparent benefit does not just a reflect an unusual pattern in 2008 - 10, and they make a real contribution to achieving the Shropshire BAP target to increase the population.

PART 4. COLOUR RINGING

Colour-ringing of adults caught at nest sites, and adults and first year birds caught at winter roost sites, started in 2011. The colour rings are all numbered, so if the ring is read the bird can be individually identified. This provides much more data than conventional ringing, as the bird has to be caught, or found dead, before the ordinary metal ring can be read.

The population is being monitored as part of the British Trust for Ornithology's *Ringing Adults for Survival* (RAS) monitoring, which, by collating data over several years, aims to establish the survival rate of the adults (further information can be found on the BTO's website, www.bto.org.uk). Dippers are also being colour-ringed in adjacent parts of Wales outside the Teme catchment as part of this RAS scheme.

In 2011, 115 colour rings were put on. Nineteen birds (11 males and eight females) were caught at nest sites, and the remainder at the winter roost sites. Another 89 were put on in 2012, including 17 (six males and 11 females) caught at nest sites. Fifty-eight of the 115 birds ringed in 2011 were seen in 2012.

This is a long tem monitoring project, and it is too soon for it to have produced significant results. However, over time it should show how far breeding adults move in the winter, and whether they are faithful to individual nest sites (and partners!), as well as survival rates.

IMPORTANCE OF THE TEME CATCHMENT FOR DIPPERS

Twenty years ago, Dippers were widespread on Shropshire's rivers, but they have disappeared from many of them, and the Teme catchment is now the local stronghold.

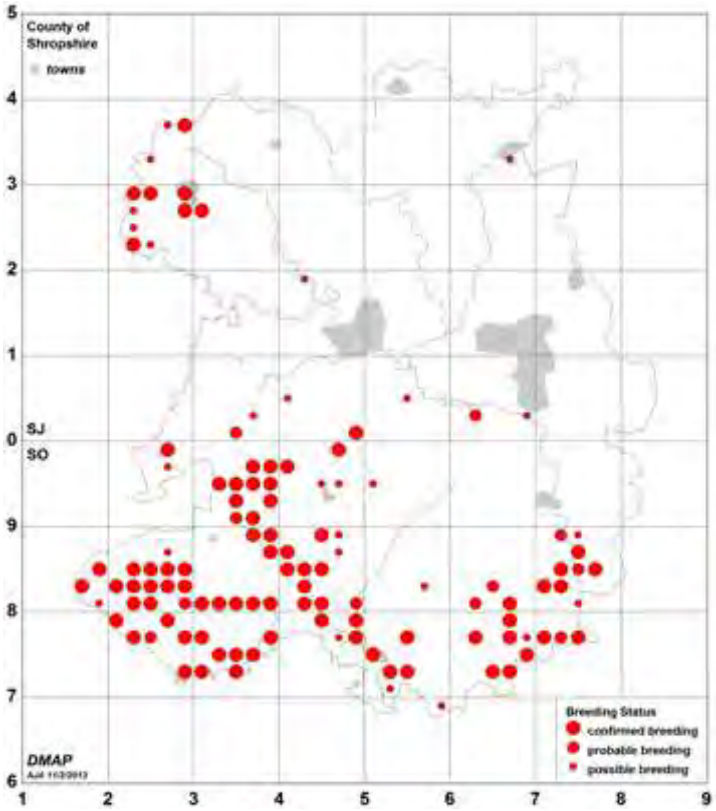
The decline is shown graphically in Figure 6. This compares the draft distribution map from current Bird Atlas work, after five of the planned six years, with the map in *An Atlas of the Breeding Birds of Shropshire*, based on six years fieldwork 1985-90, and published in 1992.

Both maps have been compiled on the same basis – the survey unit is a "tetrad" (a 2x2 kilometre square on the Ordnance Survey National Grid, of which there are 870 in Shropshire). A large dot indicates that breeding was proved in the tetrad (usually a nest was found, or a bird was seen incubating, or dependent young were seen), a middle size dot indicates probable breeding (usually a pair was seen, or territorial behaviour was observed), and a small dot indicates possible breeding (a bird was seen or heard in the breeding season). Such an observation needs to occur at least (but perhaps only) once in the whole Atlas / survey period, and it gives no indication of the number of breeding pairs.

It is clear from the distribution maps in Figure 6 that Dippers are much less widespread here than they were 20 – 25 years ago. It is likely that more fieldwork has taken place in the current period, so the decline is undoubtedly real, though the final year may perhaps locate a few more pairs.

1985 – 90 (From *An Atlas of the Breeding Birds of Shropshire* 1992)

2008 – 12 (From *New Atlas* fieldwork)



Comparison of the maps shows that Dippers have disappeared from the Long Mynd and streams to the south of Church Stretton, but the biggest decline is in the Severn Valley, where the species has disappeared entirely from the River Worfe (and the streams north and west of Bridgnorth), streams around Much Wenlock, the Rea Brook (south-west of Shrewsbury), and the headwaters of the Tern. It has also declined on Cound Brook., where it is now restricted to the upper reaches.

<u>This indicates a major reduction in the quality of the river as a wildlife habitat, which the Environment Agency is required to address under the requirements of the *Water Framework Directive*.</u>

FUTURE OF THE DIPPER PROJECT

The funding to continue this project into 2013 has not yet been secured.

Because Dippers are restricted to, and totally dependent on, food from the river, they are relatively easy to monitor. Pairs nesting along poor quality (acidic or silted up) streams tend to lay their eggs later, lay smaller clutches, raise smaller broods, and raise only one brood. The average size of the territory, breeding success, productivity and survival rate are therefore all good indicators of the river condition water quality.

A number of statutory and voluntary organisations will benefit considerably if the Dipper project continues to monitor population and breeding success, and provides data on long term trends for current initiatives:-

- Natural England are currently preparing Restoration Plans for the River Teme Site of Special Scientific Interest (SSSI) and the River Clun SSSI and Special Area of Conservation. Dipper is one of the species included in the criteria for SSSI designation.
- The Environment Agency has a commitment to attain "good ecological status" for all rivers, under the European Union's *Water Framework Directive*.
- The Government is promoting river catchment management plans, and Severn Rivers Trust is promoting and co-ordinating a River Teme Catchment Pilot Project.
- The Shropshire Hills AONB Partnership has established a Clun Catchment Working Group, to co-ordinate the activity of several statutory and voluntary organisations active in the area. The AONB is producing a Catchment Management Plan.
- Several of these organisations are co-operating on improving water quality on the river Clun Special Area of Conservation to save the Fresh-water Pearl Mussel, which is threatened with local extinction. The Fresh-water Pearl Mussel has similar, but more exacting, habitat requirements to Dipper.

It is therefore necessary to continue long term monitoring of the Dipper population, and extend the nest box scheme, to iron out any effect on the results from annual fluctuations (particularly those resulting from the abnormal conditions in 2011 and 2012), and provide a continuing assessment of the water quality in the different sections of the river for the various initiatives listed above.

Funding applications will be made to the appropriate Organisations.

If they are successful, the existing level of monitoring and ringing will be continued, and the project will grow further - another volunteer will monitor the river Rea (near Cleobury Mortimer), and attempts will be made to improve the monitoring of second brood nests throughout the catchment.

REFERENCES, ACKNOWLEDGEMENTS AND DISTRIBUTION

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(Referred to as *The Atlas (1992)* throughout)

Shropshire Biodiversity Action Plan, produced on behalf of the Shropshire Biodiversity Steering Group by Shropshire County Council November 2002, Revised and Updated November 2006 (including an Action Plan for Dippers)

Management Plan 2004-2009 and *Management Plan 2009-14* for the Shropshire Hills Area Of Outstanding Natural Beauty, published by the Shropshire Hills AONB Office July 2004 & 2009

The Breeding Bird Survey, organised by the British Trust for Ornithology (BTO), with reports published annually by BTO, Joint Nature Conservation Committee, and Royal Society for the Protection of Birds (RSPB). (Referred to as BTO BBS, with year)

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Smith, L. *Upper Clun Community Wildlife Group Report* Annually since 2007

Smith, L. *Kemp Valley Community Wildlife Group Report* Annually since 2011

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Tony Cross carried out the survey work at Winter Roost Sites, and ringed the Dippers there, together with broods at a number of nest sites, and provided most of the information (including the historical information) contained in this Report.

John Swift made and installed the original batch of Dipper nest boxes. Subsequently boxes have been made and installed in different parts of the catchment by Tony Cross, Vince Downs and Dave Pearce.

The nest boxes were monitored from 2010 onwards, and other nests were searched for, by

- John Swift (Upper Onny)
- Peter Carty (Upper Clun)
- Vince Downs (Lower Clun, including the Kemp Valley)
- Lloyd Gifford (Redlake)
- Dave Pearce (lower Lower Clun, and Lower Onny, from 2011)

who provided the remainder of the information contained in this Report.

Jonathan Lingard reported nests on the River Rea in 2012.

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- Severn Rivers Trust

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Further information on the Severn Rivers Trust can be found on their website www.severnriverstrust.com, or obtained by emailing severnriverstrust@btconnect.com.

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- John Swift, Gareth Thomas and Tony Cross, for permission to reproduce the photographs.

Leo Smith prepared this Report, which is printed on recycled paper.

Distribution

The Report and its content are public documents, and the results should be disseminated as widely as possible. Copies are being supplied to

Natural England

- Chris Hogarth (Team Leader, Shropshire Land Management, Parkside Court, Telford)
- Phil Grice (Senior Ornithologist, Peterborough)

Environment Agency

- Alan Jones (Team Leader, Biodiversity, Shrewsbury)
- Simon Cumin (Biodiversity Officer, Shrewsbury)
- Stuart Gamble (Environment Manager, Shropshire, Shrewsbury)
- Adam Shipp (Environment Officer, Shrewsbury)

Shropshire Hills AONB Partnership

- Mike Kelly (Rivers Officer)

Severn Rivers Trust

- Tony Bostock (Director)
- Emma Buckingham (Teme Catchment Pilot Project Officer)

Shropshire Wildlife Trust

- Colin Preston (Director)

Shropshire County Council

- Dan Wrench (Biodiversity Officer)

Royal Society for the Protection of Birds

- Frank Lucas (Conservation Manager, Central England Regional Office, Banbury)

British Trust for Ornithology

- Rob Fuller (Director of Habitats Research, Thetford)

Shropshire Ornithological Society

- Geoff Holmes (County Bird Recorder)

Birds in Counties

- David Ballance (Minehead, Somerset)

Project Workers

- Tony Cross
- John Swift
- Peter Carty
- Vince Downs
- Lloyd Gifford
- Dave Pearce
- Leo Smith

Electronic copies (.pdf file format) have been supplied to

Natural England

- Robert Duff (Lead Adviser, Landscape & Biodiversity, and NE representative on the Shropshire *Biodiversity Partnership Steering Group*)
- Jeff Edwards (Senior Adviser, Landscape & Biodiversity Delivery, Parkside Court, Telford)
- Frances McCullagh (Lead Adviser (Ecologist), Shropshire Land Management Team, Parkside Court, Telford)
- Ken Downward (River Teme Catchment Area Sensitive Farming Project Officer)

Shropshire Hills AONB Partnership

- Phil Holden (AONB Manager)
- Cath Landles (Community Officer)

Severn Rivers Trust

- Tony Bostock (Director)

Teme Catchment Pilot Project Steering Group

- All members of the Steering Group

Shropshire Hills AONB Clun Catchment Partnership

- All members of the Partnership

JBA Consulting (working on Natural England's River Teme Site of Special Scientific Interest Restoration Plan)

- Kieran Sheehan

Upper Onny Wildlife Group

- John Muller (Chairman)

Upper Clun Community Wildlife Group

- Michelle Frater (Bird Recorder)

Kemp Valley Community Wildlife Group

- Chris Penny (Chairman)

Shropshire Ornithological Society

- Graham Walker (Chair, Conservation Sub-committee)

It is hoped that people on the Distribution List will pass the Report on to other relevant members of their organisations.

Additional copies (either paper, or electronic .pdf format) are available from

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CONCLUSIONS & RECOMMENDATIONS

When the monitoring of Dippers restarted through this Project in 2006, there was little doubt that, in the catchments of the Rivers Teme, Clun, Onny, Corve and the Quinney Brook, which drain a large part of the South Shropshire Hills (as well as neighbouring Radnorshire and Herefordshire), there had been a steady decline in the number of Dippers roosting at traditional bridge winter roost sites over the previous 20 years or so.

Despite fairly major changes in the bridge network in neighbouring areas during the 20 odd years of this study prior to 2006, little renovation work had been undertaken in this area, and only two bridges had been altered to such an extent that they became unsuitable as roost sites. Several other bridges were actually improved as potential roost sites by renovation / maintenance work.

Observations, although not well documented, also pointed to an abandonment of some of the traditional nest sites on the lower reaches of the rivers, especially on the Rivers Clun and Corve, despite the sites themselves appearing to remain suitable. Loss of habitat in the lower reaches of the rivers was confirmed by analysis of the numbers found at roost sites in the upper and lower reaches of the rivers in 2006-08, which showed that substantial declines had occurred in the lower reaches of all the rivers in this study.

These observations point to the causal factor of the decline being something other than the availability of suitable nest / roost sites.

The impression derived when visiting the roost sites, especially on the lower reaches of the rivers, is of a river-bed which is now subject to a much greater growth of slimy algae than it was during the late 1980s and early 1990s. This is presumably due to nutrient enrichment from agricultural run-off. Some silting up also appears to have occurred. Hopefully routine Environment Agency water sampling has recorded the increase in nutrient loading, and silt, in these rivers.

Much concern has also been expressed about the possible effects of sheep-dip chemicals such as cypermethryn on aquatic invertebrates, which would further reduce Dippers' food supply.

The reduction in mean body mass of all age and sex categories of Dipper caught during 2006-12, in comparison to those caught in earlier years, strongly suggests a decline in food supply. The relatively poor condition in which they start the winter threatens their survival through to the next breeding season, and this has almost certainly contributed to the decline found when monitoring resumed in 2006, and is of great concern. In addition, the number of fish observed in the torch beam whilst searching under roost bridges also appears to have declined greatly during the same period.

However, the number of Dippers found at roost sites in 2008, 2009 and 2010 was higher than in any of the previous years, and this appeared to represent the beginning of a partial reversal of the decline. There is clear evidence that the nest-box scheme improved breeding success in the upper reaches of the rivers, but provision of additional potential nest sites will be of no help to birds in the lower stretches of river where there is no food. However, the poor weather conditions in 2011 and 2012 resulted in lower breeding productivity and higher mortality of young birds, reducing the population again.

The nest-box scheme, coupled with favourable weather conditions in the breeding seasons 2008-10, led to an increase in the population, but the poor condition of the rivers, particularly in the lower reaches, has led to a contraction of range, and reduced the condition of the surviving birds.

Further monitoring of the Dipper population in these catchments is therefore necessary, through a combination of continued roost counts and the ringing of birds present, together with extending the nest box scheme, as well as visiting nest sites and ringing the birds there too. This

will help to iron out any effect on the results from annual fluctuations in the weather, and facilitate a much more systematic study of the range, neighbour distances, breeding success and productivity. In particular, extending the nest box scheme into the lower reaches of the rivers will confirm whether or not these waters have become unsuitable. In turn, this will provide a continuing assessment of the water quality in the different sections of the river. Appropriate funding provision is needed.

All this information will help discover the causal factors in the recorded decline of Dippers in some parts of the catchment. Their population is a key indicator of the health of the aquatic ecosystem in these upland rivers, and addressing the factors responsible for their decline will help to restore these increasingly barren waters to their previously healthy state, in accordance with the targets in the Shropshire *Biodiversity Action Plan* and the European Union's *Water Framework Directive*.

This work should be repeated for several more years to remove any random annual fluctuations in the counts, particularly insofar as it might affect the relative population trends in the upper and lower reaches of the rivers, the anomalous trend on the River Redlake, the high counts in 2008, 2009 and 2010, and the poor breeding success found in 2011 and 2012. A rigorous statistical analysis of the data should also be carried out, to clarify the apparent trends identified above.

In addition, the Environment Agency is recommended to analyse water sampling results from these river systems for the last 25 years or so, to measure nutrient enrichment and pesticide concentrations from agricultural run-off, and silting up, and assess whether these or other factors are responsible for the overall decline in the Dipper population, the variation in the decline between the upper and lower reaches of the rivers, the apparently anomalous trend on the River Redlake (particularly the decline in 2011, after partial recovery in 2010), and the observed reduction in mean body weight.

The Environment Agency is also recommended to address the decline in river quality in the rest of the Severn Catchment, as evidenced by the disappearance altogether of Dippers from streams where they bred successfully only 25 years ago, and return the river to "good ecological status", as required by the European Union's *Water Framework Directive.*

Tony Cross
Leo Smith
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